NTPC SINGRAULI STPP
STAGE-III (2X800 MW)

TECHNICAL SPECIFICATION
FOR
MILL REJECT SYSTEM (CONVEYOR TYPE)

SPECIFICATION NO.: PE-TS-512-160-A101
ISSUE NO. 01
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BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA (U.P.), INDIA

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1.0 INTENT OF SPECIFICATION

1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site, Mandatory spares, E&C spares and maintenance tools and tackles, Supervision service for Erection & Commissioning, performance and guarantee testing and handing over of Mechanical Conveyor Type Mill Reject Handling System as per details in different sections of this specification for NTPC SINGRAULI STPP STAGE-III (2X800 MW) is being set up by NTPC at Sonebhadra Distt. of Uttar Pradesh. State.

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the contractor of the responsibility of providing such facilities to complete the scope of work of the MILL REJECT SYSTEM (CONVEYOR TYPE) and its accessories.

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

1.4 The extent of work under the contract includes all items shown in the flow diagram, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, extent of work also includes all items mentioned in the specification and/or schedules, notwithstanding the fact that such items may have been omitted in the drawing.

1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.

1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification within 10 days of receipt of tender documents. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication and delivery implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.

1.9 In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply.

1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.11 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or customer including their consultant as interpreted by BHEL in the relevant context. For details refer the relevant clause in GCC.

1.00.00 BACKGROUND

Singrauli STPP Stage-I(5X200 MW) and Stage-II (2x500 MW) units are in operation in Sonebhadra Distt. of Uttar Pradesh. The Present proposal is for Singrauli STPP, Stage-III (2x800 MW) as extension of existing stage-I and II.

2.00.00 LOCATION AND APPROACH

Singrauli Super Thermal Power Station (Singrauli STPS) is located in Sonebhadra District of Uttar Pradesh. The Project is located at 118 Km towards South of District Head Quarters Robertsganj and is well connected by State Highway SH-5A. Nearest National Highway NH-39 is at a distance of about 5 Km from the Project.

Nearest major city is Renukoot, located at a distance of 60 Km to the project. The nearest Railway Station is Shaktinagar at 3 Km. The nearest major town is Robertsganj, which is approximately 118 Km from the project.

The Sonebhadra District is bounded by the State of Chhattisgarh to the South, Madhya Pradesh to the West & Jharkhand to the East. The nearest airport is Lal Bahadur Shastri International Airport, Varanasi at a distance of about 220 Km from project site.

2.01.00 RAIL LINK

Nearest Railway Station is Shaktinagar Station which is About 3.0 Km from Singrauli STPP. Other Nearby Important Stations are Renukoot Junction About 60 Km, Mirzapur Station About 198 Km, Mughal Sarai Junction About 196 Km and Varanasi Cantt About 202 Km.

2.02.00 AIRPORT

Nearest Commercial Airport is Lal Bahadur Shastri International Airport, Varanasi About 220 Km from Singrauli STPP.

Vicinity Plan is placed at **Annexure-I.**

3.00.00 CAPACITY

Stage-I	:	1000 MW (5x200 MW) – Under Operation
Stage-II	:	1000 MW (2x500 MW) - Under Operation
Stage-III	:	1600 MW (2x800 MW) – Present Proposal

4.00.00 LAND

During the implementation of Singrauli STPS, Stage-I & Stage-II (5X200 MW + 2X500 MW), total area of about 4491 Acres of land was acquired for the project. The Plant facilities for Stage-III (2X800 MW) would be accommodated within the land acquired during Stage-I with dismantling and relocation of some buildings which exists in the power station. No additional land has been envisaged to be acquired for the plant and township.

5.00.00 WATER

Singrauli STPS, Stage-I and II are operating with once through cooling system with water drawn from Rihand reservoir. The source of water for SINGRAULI Stage-III (2 X 800 MW) units will be from hot water discharge channel of Stage-II of the project.

	Water Cooled Condenser is envisaged for SINGRAULI Stage-III (2 X 800 MW) units. Make up water requirement for this project would be about 4800 Cu.M/hr. Aux CT pumps shall draw the makeup water of stage-III from hot water discharge channel of stage-II and shall pump it to Aux CT for its cooling. Raw water pumps will draw the cooled water from Aux CT basin to supply to PT Plant & Ash Handling Plant. Six (6) numbers of Raw Water Pumps, i.e. three (3) for PT plant and three (3) for Ash Plant will be provided. Closed cycle cooling water system using cooling towers is envisaged for Stage-III of the project.
6.00.00	**COAL**
6.01.00	Coal requirement for Singrauli STPP, Stage-III (2x800 MW) would be about 7.0 MTPA million at 90% PLF and shall be met from coal mines of NCL in vicinity of the project.
6.02.00	**Coal Transportation** Transportation of Coal from Coal Mines to Singrauli Stage-III project is proposed by MGR system and Indian Railways. Suitable augmentation of MGR System and unloading systems shall be required Presently, Coal to Singrauli STPS is being sourced from Jayant and Dudhichua Coal Mines of Northern Coalfields Ltd (NCL) by MGR system/ Indian Railways.
6.03.00	**Coal Quality** The primary fuel for the main steam generator shall be coal. The coal quality parameters are indicated in **Annexure-IV-2** are to be considered for steam generator design.
7.00.00	**Fuel Oil** The fuel oils to be used for start-up, coal flame stabilization and low load operation of the steam generator shall be Light Diesel Oils having the characteristics given at **Annexure-IV-1**.
8.00.00	**MODE OF OPERATION** : Middle load (two shifting and load cycling)
9.00.00	**STEAM GENERATOR TECHNOLOGY** The steam generators shall be super critical, once through, water tube type, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant, dry bottom type, suitable for outdoor installation. The gas path arrangement shall be single pass (Tower type) or two pass type.
10.00.00	**FLUE GAS DESULPHURIZATION SYSTEM (FGD) & DeNOx ready System:** The project is envisaged with Flue Gas Desulfurization (FGD) system and DeNOx ready System. Limestone to be used for design of FGD system shall be as per the characteristic given at **Annexure-IV-5.**
11.00.00	**CONSTRUCTION POWER** The requirements of the construction power supply for the project would be met from the existing 11 kV Colony Switchgear located in switchyard area. Necessary 11 kV interconnection, Ring main/LT sub-stations shall be provided by the bidder for the required power plant area.
12.00.00	**POWER EVACUATION SYSTEM** Singrauli Stage-III is planned as 1600 MW (2x800 MW) Station located in the Sonebhadra District of Uttar Pradesh. Power generated from the project is envisaged to be allocated to Northern Region beneficiaries with majority share being allocated to home state of Uttar Pradesh. In view of above and considering the present capacity of the project (1600 MW), it is proposed to adopt the step-up/power evacuation voltage as 400kV. Accordingly provision for 6 Nos. of 400 kV line bays has been considered in the generation switchyard. Station supply shall be derived directly from 400kV voltage level through 400kV Class station transformers. Interconnection of Singrauli-III generation switchyard through LILO of both circuits of VSTPP-IV

SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)

1.0 The mill rejects handling system shall be designed on the basis of the following: -

S. No.	Descriptions	Unit	Quantity
1	No. of boiler unit	Nos.	2 nos.
2	Number of mills per boiler	Nos.	8 Nos. (Refer input drawings at annexure-VIII, for layout configuration of Mills for both the Boiler Units.)
3	Maximum mill rejects generation rate per mill (@ 1% of mill capacity) with worst coal firing	t/h	0.85 TPH per mill
4	Mill rejects temperature (max)	°C	200
5	Mill arrangement		Front mill arrangement
6	Density of material	Kg/m3	1600 kg/m^3 for volumetric calculation; 2400 kg/m^3 for civil & structural design calculation
7	Normal size	mm	(-) 40 mm (about 80-85 % of total reject)
	Maximum size	mm	50mm (about 15-20 % of total reject), however system shall be designed for maximum particle size of 100 mm.
Note: Material of Pyrite hopper and the chain conveyor shall be designed to withstand the temperature of 200 deg. C. However, occasional burning coal shall also be considered for system sizing.			

2.0 **System Description**

The mill rejects or pyrites, transferred from each coal mill are collected in a pyrite hopper through inlet chute. The water filled volume of the pyrite hopper has been considered as 30 minutes of maximum specified mill reject collection (approx. 500 kg or whichever is maximum). Each pyrite hopper shall be provided with pneumatically operated knife gate valve with limit switch at the inlet and outlet of the pyrite hopper. Therefore, Limit switch shall be used to monitor the inlet valve open / close position whenever the pyrite hopper is to be emptied. In normal condition, the inlet valve shall be open and outlet valve will be closed. However, when rejects are required to be removed from the pyrite hopper, inlet valve will be closed first and outlet valve shall open to discharge the pyrites / rejects to conveyor to transport these in to the silo.

Spray quenching arrangement shall be provided to bring the surface temperature of rejects below set point. For this, service water shall be sprayed over hot reject in the pyrite hopper or conveyor at suitable location after a pre-set time. Frequency of water quenching may be changed as required. One no. RTD (RESISTANCE TEMPERATURE DETECTOR) and One no. level switches (radio frequency type) shall be provided in each pyrite hopper which shall sense the temperature and level in the pyrite hopper respectively.

At the bottom of this pyrite hopper, pneumatically actuated knife gate valve shall be provided to allow the discharge of the material onto main conveyor. Each pyrite hopper will feed the main conveyor through discharge spout sequentially. The main conveyor will collect the pyrites from all working coal mills. Pyrites will be then discharged to vertical conveyor (Bucket conveyor) and then to silo.

Manual discharge sector gate shall be provided at the bottom of the silo along with canvass chute to unload the material onto purchaser's truck

A DDCMIS (By BHEL) control system based control system will be provided for mill reject handling system. Various controls and interlocks will be provided for the trouble free operation of the plant. Suitable alarm / annunciation system will be provided to warn of any mal-functioning of the mill reject handling system.

The mill rejects handling system shall be overground and shall be designed for minimum dust nuisance.

3.0 SCOPE OF WORK

Design, engineering, manufacture, inspection and testing at vendor's / sub-vendor's works, painting, forwarding, proper packing, shipment and delivery at site, including mandatory spares, maintenance tools & tackles and erection & commissioning spares, Supervision of Erection & Commissioning, Performance and guarantee testing and handing over of Metallic belt conveyor/Chain Flight Conveyor type Mill Reject Handling System as per details in different sections of this specification.

3.1 SCOPE OF SUPPLY

Scope of supply shall comprise of but not necessarily limited to the following:

1) Mechanical conveyor system (1 no. per boiler unit) of Metallic belt conveyor/Chain Flight Conveyor.type along with accessories including belt/chain flight, pans, carrying idlers, head pulley, tail pulley, take up device, suitable electric drives / gear box / geared motor, hydraulic/pneumatic tensioning arrangement, safety guard, sensors for automatic control system, bearings, shafts etc. as applicable for the system shall be provided. All necessary supporting structural, supporting frame, short support, stringers, conveyor gallery with walkway, platforms, anchor fasteners as required for mechanical conveyor system shall be provided. 800 MM walkways on both sides of the conveyor shall be provided for maintenance with short supports & required anchor fasteners at inclined portion. Conveyor shall be inclined at the end to discharge the material in bucket elevator (Bucket elevator shall be above ground no pit shall be provided for bucket elevator)

2) Bucket elevators (1 no. per boiler unit) along with all accessories and auxiliaries for successful installation and operation of the system shall be provided.

3) Pyrite Hoppers (1 no. per mill) complete with flexible / expansion joint at its inlet / outlet, rupture disc, by pass chute, inspection window, fasteners and connecting chutes, water spray nozzles & steel supporting structures.
Necessary insulation & cladding, if required, to maintain surface temperature of pyrite hopper within 60° C shall be provided. RTDs (RESISTANCE TEMPERATURE DETECTOR) for pyrite hoppers (one at each pyrite hopper) shall be provided. RF type level switches for pyrite hoppers (one per pyrite hopper) shall be provided. Vibrating feeders (if applicable) at pyrite hopper outlet for smooth unloading of rejects from pyrite hopper, shall be provided. The vibrating feeders shall be provided with electromagnetic drives, connection joints, inlet & outlet chutes along with steel supporting structures.

4) Mill reject storage silos (1 no. per boiler unit) factory prefabricated along with structures, complete with lining in the conical portion as well as straight portion, lever operated discharge gate with canvas chute at silo outlet, staircase up to silo top, operating & maintenance platform, hand railing, bag filter with pulse cleaning arrangement and vent fan, 1 no. RF type level transmitter (if RF type level transmitter is not available then radar type level transmitter can be used) at each silo, pressure relieve valve, vent fan, one no. electric hoist with monorail arrangement at each silo etc. The capacity of silo shall be as indicated elsewhere in the specification. All steel structures shall be fabricated in factory and transported to site. All factory fabricated structures shall have bolted field connections. During alignment for erection at site, welding requirement shall be kept minimum as per design.

5) Pneumatic panels or boxes / Solenoid box / Local Control Panel / JBs properly mounted on rack / pyrite hopper structure as required to complete the system. All signals from instruments sensors on each pyrite hopper are to be terminated on local control panel / pneumatic panel dedicated to each pyrite hopper. Suitable canopy to be provided.

6) Pneumatic cylinder operated knife gate valve with impulse tubing and open and close limit switches at mill outlet/pyrite hopper inlet, at pyrite hopper outlet, at by pass chute of pyrite hopper with manual override to provision hand-wheel operation of valve.

The chutes shall be provided between mill outlet and pyrite hopper, between pyrite hopper and conveyor, between conveyor discharge end pulley and silo. The chutes shall also be provided between pyrite hopper and vibrating feeder (if applicable), between vibrating feeder (if applicable) and conveyor and between conveyor and bucket elevator.

7) All piping / tubing, fittings, isolation valves, solenoid valves etc. as required for the water / air service shall be provided to complete the system shall be provided by the bidder. All counter-flanges with nuts, bolts and gaskets at all the terminal points shall be provided by the bidder.

8) Instrumentation shall meet the requirement of C&I requirements as mentioned elsewhere in the specification.

9) One set of maintenance tools & tackles, as defined in **Annexure-IV** in specification. These tools shall not be used for erection / commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in steel toolbox and with a copy of instruction manual. The items supplied shall be of the best quality and specially protected against rusting in tropical climate. Items indicated in Annexure-IV are mandatory, further if bidder feels necessary to provide additional tools and tackles for smooth maintenance of equipment, may supply the same shall be quoted.

   All insert plates, embedment plate, foundation bolts / anchor bolts etc. as required for bidder's equipment shall be provided by the bidder.

10) Mandatory spares as per Annexure-II

11) Initial fill of all lubricants and consumables.

12) Electrical scope and requirements are indicated elsewhere in the specification.

13) One set of Erection & commissioning spares and start up spares as required to complete the system shall be provided.

14) Any other instrument, item, structural items etc. as required for making the installation complete in all respect within battery limits and for satisfactory operation of the system **unless specifically EXCLUDED from the scope under Clause No. 4.0 below.**

3.2 SCOPE OF SERVICES

Detailed Erection and commissioning procedure shall be submitted by successful bidder for carrying out the erection and commissioning at site by BHEL.

Scope of Supervision for Erection & commissioning: Tentatively following visits shall be planned by site team: -
a) Visit for supervision for erection & commissioning.
b) Visit for initial operation of system.
c) Visit for PG test.
d) Any additional visit as per requirement of BHEL site office

For no. of visit kindly refer suggestive price schedule.

Note: Bidder shall be informed at least 10 days in advance for the requirement of visit at Site. Visiting team shall consist of one or two expert of bidder as deemed necessary by them.
Any other service required for making the installation complete in all respect within Battery limits and for satisfactory erection & commissioning of the system, unless specifically EXCLUDED from scope under Clause No. 4.0 below.

4.0 EXCLUSION

1) Civil work associated with Mill Reject Handling system including the following: -
a) Road approach for various facilities related to Mill Reject Handling System.
b) Conveyor drive unit foundation
c) Mill Reject silo foundation. However, the bidder to maintain the Civil loading & foundation location details as per drg no. PE-DG-512-160-A122 at Annexure-VIII. Detailed silo drawing shall be furnished by successful bidder after placement of order against NTPC doc. No. 1150-001-102-PVM-B-111/ GAD for Silo for MILL REJECT SYSTEM (CONVEYOR TYPE). Height of the silo shall be as per actual design for Singrauli Project. Seismic data, wind data and temperature data shall be considered as per Singrauli site conditions.

2) Lighting of Mill bay and silo area.
3) Electrical exclusion as per Electrical scope sheet enclosed elsewhere in the specification.

4) Relevant exclusion as per GTR, GCC, SCC & ECC

5.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

Relevant services as per GCC, SCC & ECC.

6.0 TERMINAL POINTS

Mill Reject inlet towards pyrite hopper side	:	Mill reject spout (tramp iron) as per details indicated in enclosed GA of Mills. Work downstream up to mill reject silo outlet with canvas chute and discharge gate is by bidder.
Mill Reject outlet towards road tanker / Truck	:	Mill reject silo outlet with canvas chute. Bidder shall terminate his work with the canvas chute and lever operated discharge gate.
Instrument Air	:	One no. 15 NB line for instrument air shall be provided by BHEL and terminal point at an elevation EL +4.71m (below mill maintenance platform) for each mill for each unit. One no. 15 NB line for instrument air shall be provided by BHEL and terminal point at an elevation EL +15.0 m (at mill column no. 110 for unit#1 & at mill column no. 102 for unit#2) for each MRS silo for each unit. Isolation valve shall be provided by BHEL Instrument air system supplier. Quantity and pressure at terminal point shall be 0.2 m3 /min and 5-7 kg/cm2
Service Water for quenching	:	Total 6-8 m3/ hour per unit with Service water quality for quenching of mill rejects at 2.5 to 3 Kg/cm2 shall be provided per unit. 50 NB Tapping / terminal point for the same shall be the first mill bay column of each unit. Isolation valve shall be provided by BHEL.

All terminal points are provided with Isolation valves by BHEL. Any additional isolation valves, expander reducer and any other fittings required at the terminal points from system design point of view shall be in the scope of the bidder.

Further bidder shall check the adequacy of service water being provided by BHEL as indicated above. In case these are not adequate, water requirement for these services shall be indicated by the bidder along with their bid.

7.0 LAYOUT REQUIREMENTS

Conveyor and equipment installation shall be according to the regulations and recommendations of recognized Indian/International Standards, Codes and Statutes, as and where applicable, practice in vogue (to be supported with back up document to the satisfaction of customer).

8.0 EQUIPMENT DESIGN CRITERIA

8.1 The minimum design criteria to be followed for various equipment shall be as per requirements indicated under **Annexure-A** equipment design/selection criteria for various equipment. In case of any contradictory requirement in specification of particular equipment, the stringent requirement as per the BHEL's engineer shall prevail. Further In case of any contradictory requirement within the same section, and clarifications not having been sought by the bidders within the stipulated period, the most stringent requirement as per interpretation of the BHEL's engineer / customer will prevail. Successful bidder will furnish detailed data sheets / specifications / design calculations for various equipment for customer's / consultant's approval during detail engineering. All comments made by

customer / consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

Note: All equipment sizing, capacity of pyrite hopper shall be subject to customer's approval during detail engineering without any cost implication to the customer.

9.0 SUB-VENDOR ITEMS

The tentative make of sub-vendor items shall be as per **Annexure-I** enclosed. All these makes along with make of any other bought out items required for the system will be subject to approval of Customer during detail engineering and before the main vendor places order on the sub-vendor. There will, however, be no commercial implication on account customer's comment on the same

10.0 MANDATORY SPARES

List of mandatory spares is attached as **Annexure-II**.

11.0 PAINTING

Painting details is attached as **Annexure III.**

12.0 LIST OF DRAWINGS/ DOCUMENTS ALONG WITH SCHEDULE OF SUBMISSION

The main drawings list along with schedule of submission after award of contract shall be done as per attached **Annexure-V.**

13.0 PERFORMANCE GUARANTEE

General technical requirement of end customer is attached as **Annexure VI.**

14.0 GENERAL TECHNICAL REQUIREMENT

General technical requirement of end customer is attached as **Annexure VII.**

15.0 INPUT DRAWINGS

Relevant input drawings are listed below and attached as **Annexure VIII.**

1) Flow diagram for Mill Rejects Handling System Drg. No.PE – DG – 512– 160 – A001

2) Layout for Mill rejects handling system for Unit 8 & 9

3) General Arrangement of Mill HP-1103 (with planetary gear box)

4) Foundation plan of Mill

The flow diagram shows the minimum requirement to be followed including minimum requirement of instruments. Any additional equipment/instruments required for safe, efficient & reliable operation of the system within the battery limit shall also be considered as included in bidder's scope without any commercial/ cost implication to BHEL.

16.0 OTHER REQUIREMENTS

i) Site Visit before submission of offer

Bidders shall make Site visit in order to familiarize themselves with the existing facility and condition of site, if required, before submitting the bid in order to make their offer complete. BHEL shall not entertain any cost implication for making the system complete for any lack of input data during detail engineering.

ii) Technical Requirements

1) End connections for IA pipelines for sizes 50 NB & below shall be screwed and then seal welded with zinc rich electrode.

2) Chain, drag link, sprocket and sprocket shaft shall be designed considering factor of safety as 10 (min).

3) Bag filter with vent fan shall be provided in the silo and in no case, conveyor shall be kept open to the atmosphere. Dusty air from the conveyor shall pass through vent fan only.

4) SS tubing is to be provided for pneumatic connection / instrument air connection.

5) All valves including isolation valves (water lines, air lines, before and after solenoid valves etc.) as required for successful operation shall be provided by bidder.

6) All structural supports except columns and pipe rack, as required for supporting of pipes of mill reject handling system, shall be provided by bidders.

7) Suitable protection shall be provided on complete mill bay to cover pyrite hopper, conveyor & instruments from coal and mill dust coming from above floor of mill bay

8) Operation philosophy and control philosophy shall be submitted by the vendor during detail engineering stage for BHEL /CUSTOMER /CONSULTANT approval and approved document shall be adhered and the system shall be provided accordingly for which no commercial implication shall be entertained by BHEL.

9) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

10) Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

11) Civil works will be provided by BHEL / customer. Hence, bidder has to furnish the civil inputs in time. Bidder to furnish the civil foundation drawing along with the loading data for approval during detailed engineering stage showing / indicating the following: -

a) Scope of work by BHEL / customer and bidder shall be indicated with different legend or in the form of note.

b) Recommended locations of earthing pads.

c) Civil loads shall be furnished showing detailed calculation.

d) Details of pockets as required for anchor bolts.

12) Bidder to depute competent designer (s) at BHEL's/ CUSTOMER /CONSULTANT office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum 7 days notice shall be served for the same.

ANNEXURE A: EQUIPMENT DESIGN/SELECTION CRITERIA

S. No	Equipment	Design / Selection / Sizing Criteria
01.	Metallic belt conveyor/Chain Flight Conveyor.	*a)* Continuous normal operating capacity – 7 T/Hr. *b)* Continuous maximum operating capacity – 10 T/Hr. *c)* Should have provision of variable speed through VVVF drive.
02.	Bucket Elevator	Design, type, speed, 75% filling shall be as per IS:7167 or equivalent standard Should have provision of variable speed through VVVF drive.
03.	Pyrite Hopper & Accessories	*a)* Capacity of pyrite hoppers: 30 Minutes of Maximum specified mill reject collection *b)* MOC: MS to IS 2062 Gr. A (min), min. 10 mm thk. suitably stiffened with rolled steel sections. *c)* Rupture Disc Bursting Pressure – 0.5 kg /cm2 (g)
04.	Silo & its Accessories	*a)* Quantity – One (1) per unit *b)* Effective Storage Capacity – **110 T** *c)* Minimum free board – 500 mm *d)* Silo Plate – 10 mm thk. MS Plate conforming to IS 2062 Gr A *e)* Liner: 3 mm thick SS - 304 in conical & straight length portion of the Silo Manually operated sector Gate along with canvas chute i. Size – 400 mm x 400 mm (clear open) ii. Type – Twin Sector, manually lever operated iii. MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 10 thick SAILHARD / TISCRAL LINER on inner surface Bag Filter a) Material of Filter Cloth – Polyester felt needle suitable for Prolonged operation up to a temperature of 200°C without losing its collection efficiency & durability. b) Air to Cloth Ratio – 1.5 (Further 10 % additional bags shall be provided) c) Filter body – MS, IS 2062, Gr. A (min), 3.0 mm thick (min) d) Bag cage – MS, IS 1079, galvanised e) Outlet Air Quality – 30 mg/nm3 (max) f) Bag Cleaning Mechanism – Automatic and shall comprise of solenoid valves, air nozzles, adjustable solid state timer, one no. pressure switch for supply air for filter cleaning, one no. differential pressure switch across bag filter, piping and fittings etc. g) Vent fan
05.	Knife Gate Valve (pyrite hopper inlet, emergency discharge, hopper isolation/maintenance)	Material of Construction Body – CI to IS 210 Gr FG 260 Gate – SS grade 304 (min. 10 mm thickness) Size – 200 NB (min) for all valves
06.	Lines for Various Services	<table><tr><td>Service</td><td>Velocity in m/sec</td></tr><tr><td>Compressed / Instrument Air / water lines</td><td>Pipe size below 50 mm, 15 m / sec</td></tr><tr><td></td><td>Material of Construction & other details</td></tr><tr><td></td><td>Pipes 50 NB & below shall have screwed / socket welded end. Material of construction of instrument air and water lines shall be IS 1239, Part –2. Instrument air pipe shall be galvanised as per IS 4736.</td></tr></table>

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CUSTOMER SPECIFICATION

MILL REJECT SYSTEM

1.00.00 To handle the Mill Rejects on a continuous basis, the Bidder shall provide a Mill Reject Handling System. The Mill Reject Handling System shall comprise Mechanical Conveying system. The Rejects shall be stored in storage silo. From the storage silo, the Mill Rejects shall be disposed off in trucks.

1.01.00 The scope of supply for mill reject handling system shall include but not limited to the following:

1.01.01 Mechanical conveying system:

(a) One (01) no. pyrite hopper with discharge chute, emergency chute work etc. for each mill as required.

(b) One (01) no. pneumatically operated isolation gate for inlet and one (1) no. pneumatically operated isolation gate for outlet of pyrite hoppers complete with compressed air pipe work, solenoid valves & supporting arrangement for each pyrite hopper.

(c) Mechanical feeder including Vibrating Feeder (if applicable) for mill rejects below each pyrite hopper for feeding at consistent rate to the mill reject conveyor.

(d) Metallic Belt conveyor/Chain Flight Conveyor along with drives, accessories, supports etc for conveying the mill rejects from the mills for each row of mills in each unit. The conveyor shall be fully enclosed.

(e) Bucket elevator along with drives, accessories and supporting structures to raise the mill rejects discharge by the metallic belt conveyor for discharging into storage silo.

(f) Mill reject storage silos, one (1) no for each row of mills in steel construction each having an effective storage capacity of sixteen (16) hours considering all the working mills of the respective Mill bay in operation and rejecting @ of 1 % of mill capacity for the worst coal conditions. Necessary supporting steel structure, platform, staircase, manual operated unloading Gate, 3 mm thick SS plate liners covering straight length portion and conical portion of mill reject system hoppers (bunkers), level switches, air relief devices, etc. shall also be provided.

The storage Silos shall be designed to provide a clear access of 4.5 m for a Road Tanker/Truck to be placed under the silo & receive the rejects using suitable chute work.

(g) Suitable spray quenching system, to cool the mill reject in pyrite hoppers.

(h) Complete control & instrumentation as specified in C&I section.

(i) Necessary electrical equipment as specified.

(j) Civil structural works associated with Mill reject handling system including foundation bolts, pockets, grouting and underpinning etc.

(k) One (1) no. fixed type sump pump of 10 m^3/hr capacity for each underground pit for Bucket elevator area, if applicable.

	B. Pressurized Ventilation System: Minimum 15 supply air changes per hour
	C. Air Conditioning System: Adequate number of air changes to Maintain in uniform temp. & humidity as specified elsewhere.
4.02.19	**Chutes:**
	Minimum clear cross section of chute: 1200 mm X 1800 mm (inside both ways) for coal handling plant.
4.03.00	**MILL REJECT HANDLING SYSTEM**
4.03.01	Mill Reject system shall be provided for all vertical type mills.
4.03.02	The capacity of mill rejects system shall be at least 1% of mill design capacity for worst coal or maximum actual, whichever is higher, considering maximum no. of working mills.
4.03.03	In case of mechanical conveying system, a vibrating feeder and metallic belt/chain flight conveyor carry mill reject from hopper to subsequent metallic /chain flight conveyor for further conveying to Bucket elevator for final storage at Silo.
4.03.04	Each Mill Bay shall be provided with an independent `SILO' having a collection capacity of 16 effective hours of mill reject considering all mills of that particular bay are working. Clear head room of minimum 4.5 m below silo outlet shall be kept for truck entry.
4.03.05	For the purpose of design temperature of rejects shall be assumed as 200^{o}C or as specified by the boiler/ mill manufacturer, whichever is higher. However quenching system shall be provided.
4.03.06	Sizing grid shall be provided in mill reject pyrite hopper to remove mill reject of size >40mm. The mill reject systems shall be designed for input size of 40mm.
4.03.07	Bulk density of mill reject shall be considered as:
	i) For volumetric computation -1600 kg/m^3
	ii) For load/ strength - 2400 kg/m^3
4.04.0	**LIMESTONE HANDLING PLANT AND GYPSUM HANDLING PLANT**
4.04.01	(a) Rated capacity of Limestone handling system for truck unloading and reclaim conveyors from storage shed/silo to limestone mill bunkers shall be 150 MTPH (min).
	(b) The rated capacity of all Gypsum handling conveyors shall be 150MTPH.
	(c) Belt speed for 150 MTPH conveyors shall not be more than 2.0 m/s.
4.04.02	All conveyors shall be designed for 110% of rated capacity.

10.05.17 Provide suitable arrangement for readily determining the oil level in the gear box(es) and all other lubricated parts.

10.05.18 For pulverized coal sampling for fineness and distribution:

(a) Provide tapping points on each PF pipe at pulverizer outlet suitable for coal sampling as per IS 16617: 2018.

(b) Ensure that the coal sampling provisions are complete with screwed plugs, compressed air purging connections at tapping points, heating arrangement and other requirements as required for IS 16617: 2018 sampling.

(c) Provide

(1) Rota Probe for coal sampling as per IS 16617: 2018 and ASME respectively.

(2) Dirty Pitot tubes per Steam Generator, suitable for measurement of coal-air velocity in coal pipes.

(d) Provide convenient approach/access for above coal sampling/measurement points, from nearest platform floor.

10.05.19 Provide suitable arrangement for readily determining the oil level in the gearboxes and all other lubricated parts.

10.05.20 Provide mill outlet temperature control capable of achieving and maintaining rated values for adequately drying the specified coal range for all unit loads.

10.05.21 **Primary Air Flow Measurement**

(a) Each PA flow measuring device shall be provided with three sets of tappings.

(b) The location, type and design of flow measuring devices shall be to Employer's approval.

(c) Necessary tapping points for temperature compensation shall be provided.

10.05.22 **Mill Rejects System:**

(a) Mill reject system shall automatically discharge the tramp iron and other non grindable material through an outlet connection at a suitable height (to be approved by Employer). The conveying system shall be as defined elsewhere in the specifications.

Pyrite hopper outlet spout should be having adequate ground clearance. Adequate maintenance space (as approved by employer) should be provided for various C&I instruments, valves and other equipment of mill reject system.

(b) Mill rejects collection & discharge system shall be designed (as detailed in Mill Reject sub-section in Part-B of Technical Specification) to ensure sequential automatic operation of the coal mill discharge gates for flow of rejects into the reject spout.

(c) The necessary mill isolation dampers/valves, to facilitate automatic continuous or automatic intermittent discharge of rejects to the conveyor.

~~10.05.24 Fire Detection and Extinguishing System shall be provided for the complete coal~~

1.00.00 **MILL REJECT HANDLING SYSTEM**

Mechanical conveying system shall be employed for handling of the mill rejects. Each mill reject discharge hopper shall be fitted with Feeder which shall discharge the mill rejects through Mechanical Conveyors to a storage Silo. The transmitting vessel shall operate on level probe mode with timer back-up.

2.00.00 **MILL REJECT HANDLING SYSTEM OF MECHANICAL TYPE MEETING THE FOLLOWING REQUIREMENT SHALL BE PROVIDED:**

The discharged rejects from coal mill shall be collected in a dedicated pyrite hopper. Each pyrite hopper shall be provided with cylinder operated knife gate valves at inlet and outlet. Material from pyrite hoppers shall be removed by Mechanical conveyor and fed to main conveyor for further conveying. The main conveyor shall feed to a bucket elevator which in turn will feed to main storage silo.

2.01.00

1.	**Pyrite Hopper**		
a)	Minimum effective storage	:	30 minutes of maximum specified mill reject collection
b)	No. pyrite hopper	:	One (1) for each mill, supported independently on steel columns
c)	Function	:	To store mill reject on load maintenance of conveyors and act as a transition tank for falling mill rejects during normal working.
d)	Number and type of isolation gates	:	Cylinder operated sliding type gates reject feeding at inlet and outlet of pyrite hopper.
e)	Accessories		
	Pyrite hopper	:	Access doors/ manholes /Inspection windows/ Poke holes Size: 300 mm dia circular or 300 mm x 300 mm, if rectangular
			or
2)	**Material of construction**	:	
a)	Pyrite hopper	:	Tested quality mild steel plates of thickness not less than 10 mm (IS: 2062) and suitably stiffened with rolled steel sections.

2.02.00 **Metallic Conveyors**

2.03.00 **Data Sheet**

1)	Function	:	To convey mill rejects, from pyrite hopper to main storage silo.
2)	Location	:	Under the coal mill, and up to main mill reject storage silo in each unit/ bucket elevator.
3)	No.	:	one (1) no. working set of conveyors per row of mills per boiler
4)	Capacity	:	It shall be designed for continuous removal of mill rejects.
5)	Continuous normal operating capacity	:	To meet the mill rejects removal rates specified.
6)	Continuous maximum operating capacity	:	At least 25% margin on normal operating capacity.
7)	Tensioning arrangement		Hydraulic/pneumatic
8)	Metallic belt conveyor/Chain Flight Conveyor will be required to handle highly abrasive rejects continuously. So all components shall be of proven design having a track record of trouble free-operation in order to avoid problems of frequent stoppages. The conveyor shall be sized for startup with load.		
9)	The conveyor shall be fully enclosed in casing.		
10)	Separate conveyor (<u>if applicable</u>) shall be provided to remove fines. The conveyor may operate continuously/intermittently.		
11)	The conveyor/rollers bearings shall be grease packed with facility of recharging from outside		
12)	Reliable and proven hydraulic/pneumatic auto take up arrangements, with facility of adjustment of tension. The tension assembly shall be designed to absorb any momentary shock loading.		
13)	800 mm walkway along both sides of conveyor for Maintenance shall be provided.		
	Crossover walkway shall be provided at 3 points in the mill bay area.		
14)	Suitable clean (<u>if applicable</u>) out conveyor shall be provided for removal of spillage/fines.		

2.04.00 Material of construction of conveyor components

a)	conveyor	:	Heat resistant stainless steel /Stainless steel / alloy carbon steel / carbon steel, suitable for 200 deg C (minimum). Any

			other suitable material of construction of proven design is also acceptable.
b)	casing		Carbon steel

2.05.00 **Bucket Elevator**

2.05.01 **General Requirement**

Suitable type of the Bucket Elevator shall be chosen for mill rejects handling. The bucket shall be sized to handle rated capacity of mill rejects discharge by the metallic belt conveyor at the minimum material bulk density and maximum bucket filling of 75%.

2.05.02.1.1 **Casing**

Casing to be self-supported, dust-tight construction and capable of supporting head shaft, drive, and service platform.

Boot section to be fabricated of minimum 6mm steel plate, with front and rear access panels as on shown in the attached layout drawing.

A beam is to be provided in casing for servicing internal gravity take-up. The beam may be located either in the boot section or intermediate section as applicable.

2.05.02.1.2 **Belting (if applicable)**

Suitable heat resistant and fire resistant belting shall be provided

2.05.02.1.3 **Take-up**

Take-up shall be screw or internal gravity type with guide rails and weights included.

2.05.02.1.4 **Drive**

Bucket elevator drive should be sized as follows:

Minimum power for drive, either:

100% bucket filling @ minimum material bulk density, or

75% bucket filling @ maximum material bulk density, whichever is greater.

2.05.06 **Inspection and Access Doors**

Inspection doors and access doors shall be loose-hinged type with quick-opening jamb bar fasteners and gaskets enclosed and retained in the door. Access doors shall be 1.5X1.5m minimum.

1.00.00 PNEUMATIC CONVEYING SYSTEM

1.01.00 PIPING, VALVES, STRAINERS AND FITTINGS

(a) All pipes and fittings shall be tested as per applicable code.

(b) All valves shall be hydraulically tested for body, seat and back seat (if applicable) as per relevant Standard. Check valves shall also be tested for leak tightness test at 25% of the specified seat test pressure. Valves shall be offered in unpainted condition only.

(c) Functional checks of the valves for smooth opening and closing shall also be done.

(d) Strainer body shall be hydraulically tested. One of each type and size of Strainer shall be tested for Pressure drop v/s flow rate, if not tested earlier.

1.02.00 PRESSURE AND STORAGE VESSELS:

(a) Atmospheric Tank

(i) All weld joints shall be DP tested and complete tanks shall be water fill tested.

(ii) All atmospheric storage tanks fabricated and erected at site shall be subjected to all tests (Hydro, NDT and Vacuum) according to design code as applicable.

(b) Pressure Vessel

(1) NDT on weld joint shall be as per respective code requirements or the minimum as specified as below:

(i) 100% DPT on root run of butt weld, nozzle welds and finished fillet welds.

(ii) 100% DPT on all finished butt welds

(iii) 10% RT (covering all 'T'/cross joints) of butt welds

(2) Butt Welds of dished ends shall be stress relieved and subjected to 100% RT.

(3) Each finished vessels shall be hydraulically tested to 150% of the design pressure for a duration of 30 minutes.

1.03.00 PACKAGE AIR COMPRESSOR

In addition to Hydraulic tests of pressure parts, performance test of the compressor shall be done for FAD, pressure, power consumption, as per relevant code. Noise and vibration shall also be measure.

1.04.00 BAG FILTERS:

1.04.01 Leakage test shall be carried out for casing and other pressure parts

1.04.02 Pulsing and sequential test on bag filter cages shall be done.

1.05.00 MONORAIL HOIST/CHAIN PULLEY BLOCKS:

1.05.01 Chain pulley blocks shall be tested as per IS:3832

1.05.02 UT & MPI/DPT shall be done on gear blank, pinion shaft, axles.

1.05.03 Proof Load Test on hooks shall be carried out followed by DPT.

1.05.04 100% Radiography on weld joints under tension and 10% radiography on compression butt joints followed by 100% DPT shall be done for rope drum, girder, end carriage etc.

1.05.05 Complete hoists shall be tested for load and overload test as per IS:3938

1.06.00 VENTILATION SYSTEM:

1.06.01 Shop Run Test for all Centrifugal Fans to check noise, temp. rise & vibration.

1.06.02 Performance test on one fan of each type for capacity, pressure, efficiency and power consumption.

D-1-12(D)

Annexure- (D)

CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Annexure – I for site specific information.

Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.

Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.

Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than "5" and/or if the fundamental frequency of the structure is less than 1 Hz.

Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.

It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

a) Welded steel structures : 1.0%

b) Bolted steel structures/ RCC structures : 2.0%

c) Prestressed concrete structures : 1.6%

d) Steel stacks : As per IS: 6533 & CICIND Model Code whichever is more critical.

ANNEXURE-I

SITE SPECIFIC DESIGN PARAMETERS

The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows:

a) The basic wind speed "V_b" at ten metres above the mean ground level : 44 metres/second

b) The risk coefficient "K_1" : 1.07

c) Category of terrain : Category-2

D-1-12(E)

Annexure-(E)

CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT

All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments.

A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I.

Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values.

The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4).

Damping in Structures

The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:

a)	Steel structures	:	2%
b)	Reinforced Concrete structures	:	5%
c)	Reinforced Concrete Stacks	:	3%
d)	Steel stacks	:	2%

Method of Analysis

Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1).

In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1).

The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve.

For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\overline{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\overline{V}_B$/ V_B. However, no reduction is permitted if $\overline{V}_B$ is less than V_B.

Design/Detailing for Ductility for Structures

The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.

APPENDIX – I

SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT

The various site specific seismic parameters for the project site shall be as follows:

1) Peak ground horizontal acceleration (MCE) : 0.16g

2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra

a) For special moment resisting steel frames designed and detailed as per IS:800 : 0.04

b) For special concentrically braced steel frames designed and detailed as per IS:800 : 0.03

c) for special moment resisting RC frames designed and detailed as per IS:456 and IS:13920 : 0.024

d) for RCC chimney, RCC Natural Draft Cooling Tower :0.08

e) For Liquid retaining tanks :0.048

f) for Steel chimney, Absorber tower, Vessels : 0.06

g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below, in general (excluding special structure/ configuration/materials) : 0.04

3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted : 0.08

Note: g = Acceleration due to gravity

The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.

APPENDIX – I

HORIZONTAL SEISMIC ACCELERATION SPECTRA COEFFICIENTS (In units of 'g')

Time Period	Damping Factor (as a percentage of critical damping)		
(Sec)	2%	3%	5%
0.000	1.000	1.000	1.000
0.030	1.000	1.000	1.000
0.031	1.032	1.025	1.021
0.050	1.646	1.480	1.379
0.060	1.966	1.702	1.546
0.070	2.284	1.915	1.704
0.080	2.602	2.122	1.853
0.086	2.792	2.243	1.940
0.088	2.855	2.283	1.968
0.090	2.919	2.322	1.996
0.095	3.077	2.421	2.065
0.098	3.171	2.479	2.106
0.100	3.234	2.518	2.133
0.103	3.329	2.576	2.173
0.108	3.487	2.671	2.238
0.110	3.549	2.709	2.264
0.112	3.612	2.747	2.290
0.115	3.707	2.803	2.328
0.118	3.801	2.859	2.366
0.121	3.895	2.914	2.404
0.122	3.927	2.933	2.417
0.125	4.021	2.988	2.454
0.127	4.083	3.025	2.478
0.129	4.146	3.061	2.503
0.130	4.177	3.079	2.515
0.131	4.210	3.097	2.527
0.134	4.210	3.152	2.564

APPENDIX – I

HORIZONTAL SEISMIC ACCELERATION SPECTRA COEFFICIENTS (In units of 'g')

Time Period	Damping Factor (as a percentage of critical damping)		
(Sec)	2%	3%	5%
0.140	4.210	3.259	2.635
0.141	4.210	3.260	2.647
0.150	4.210	3.260	2.750
0.200	4.210	3.260	2.750
0.250	4.210	3.260	2.750
0.300	4.210	3.260	2.750
0.350	4.210	3.260	2.750
0.400	4.210	3.260	2.750
0.431	4.210	3.260	2.750
0.442	4.210	3.260	2.750
0.450	4.210	3.260	2.750
0.470	4.210	3.260	2.750
0.492	4.108	3.260	2.750
0.500	4.042	3.260	2.750
0.517	3.909	3.153	2.660
0.525	3.850	3.105	2.619
0.542	3.729	3.007	2.537
0.550	3.675	2.964	2.500
0.562	3.596	2.900	2.447
0.576	3.509	2.830	2.387
0.588	3.437	2.772	2.338
0.597	3.385	2.730	2.303
0.603	3.352	2.703	2.280
0.609	3.319	2.677	2.258
0.615	3.286	2.650	2.236
0.625	3.234	2.608	2.200
0.640	3.158	2.547	2.148
0.658	3.071	2.477	2.090
0.667	3.030	2.444	2.061
0.690	2.929	2.362	1.993
0.700	2.887	2.329	1.964
0.750	2.695	2.173	1.833

APPENDIX – I

HORIZONTAL SEISMIC ACCELERATION SPECTRA COEFFICIENTS (In units of 'g')

Time Period	Damping Factor (as a percentage of critical damping)		
(Sec)	2%	3%	5%
0.755	2.677	2.159	1.821
0.800	2.526	2.038	1.719
0.850	2.378	1.918	1.618
0.900	2.246	1.811	1.528
0.950	2.127	1.716	1.447
1.000	2.021	1.630	1.375
1.050	1.925	1.552	1.310
1.100	1.837	1.482	1.250
1.150	1.757	1.417	1.196
1.200	1.684	1.358	1.146
1.250	1.617	1.304	1.100
1.300	1.555	1.254	1.058
1.350	1.497	1.207	1.019
1.400	1.444	1.164	0.982
1.450	1.394	1.124	0.948
1.500	1.347	1.087	0.917
1.550	1.304	1.052	0.887
1.600	1.263	1.019	0.859
1.650	1.225	0.988	0.833
1.700	1.189	0.959	0.809
1.750	1.155	0.931	0.786
1.800	1.123	0.906	0.764
1.850	1.092	0.881	0.743
1.900	1.064	0.858	0.724
1.950	1.036	0.836	0.705
2.000	1.011	0.815	0.688
2.050	0.986	0.795	0.671
2.100	0.962	0.776	0.655
2.150	0.940	0.758	0.640
2.200	0.919	0.741	0.625
2.250	0.898	0.724	0.611
2.300	0.879	0.709	0.598

APPENDIX – I

HORIZONTAL SEISMIC ACCELERATION SPECTRA COEFFICIENTS (In units of 'g')

Time Period	Damping Factor (as a percentage of critical damping)		
(Sec)	2%	3%	5%
2.350	0.860	0.694	0.585
2.400	0.842	0.679	0.573
2.450	0.825	0.665	0.561
2.500	0.808	0.652	0.550
2.550	0.793	0.639	0.539
2.600	0.777	0.627	0.529
2.650	0.763	0.615	0.519
2.700	0.749	0.604	0.509
2.750	0.735	0.593	0.500
2.800	0.722	0.582	0.491
2.850	0.709	0.572	0.482
2.900	0.697	0.562	0.474
2.950	0.685	0.553	0.466
3.000	0.674	0.543	0.458
3.050	0.663	0.534	0.451
3.100	0.652	0.526	0.444
3.150	0.642	0.517	0.437
3.200	0.632	0.509	0.430
3.250	0.622	0.502	0.423
3.300	0.612	0.494	0.417
3.350	0.603	0.487	0.410
3.400	0.594	0.479	0.404
3.450	0.586	0.472	0.399
3.500	0.577	0.466	0.393
3.550	0.569	0.459	0.387
3.600	0.561	0.453	0.382
3.650	0.554	0.447	0.377
3.700	0.546	0.441	0.372
3.760	0.538	0.434	0.366
3.800	0.532	0.429	0.362
3.850	0.518	0.423	0.357
3.900	0.505	0.418	0.353

APPENDIX – I

HORIZONTAL SEISMIC ACCELERATION SPECTRA COEFFICIENTS (In units of 'g')

Time Period	Damping Factor (as a percentage of critical damping)		
(Sec)	2%	3%	5%
3.950	0.492	0.413	0.348
4.000	0.480	0.408	0.344

LOW PRESSURE PIPING

1.00.00 **EQUIPMENT SIZING CRITERIA**

1.01.00 All the piping systems and equipment supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of 30 years, and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

1.02.00 For all Low-Pressure piping systems covered under this specification, sizing and system design shall be to the requirements of relevant codes and standard indicated. In addition to this, requirements of any statutory code as applicable shall also be taken into consideration.

1.03.00 Inside diameters of piping shall be calculated for the flow requirements of various systems. The velocities for calculating the inside diameters shall be limited to the following:

a) **Water Application**

	Pipe Size	Water Velocity in m/sec Below 50 mm	50-150 mm	200 mm & above
(a)	Pump suction	------	1.2-1.5	1.2-1.8
(b)	Pump discharge and recirculation	1.2-1.8	1.8-2.4	2.1-2.5
(c)	Header	------	1.5-2.4	2.1-2.4

Pipeline under gravity flow shall be restricted to a flow velocity of 1 m/sec generally.

WILLIAM & HAZEN formula shall be used for calculating the friction loss in piping systems with the following "C" value:

(i)	Carbon steel pipe	100
(ii)	Ductile Iron.	140
(iii)	Rubber lined steel pipe	120
(iv)	Stainless steel pipe	100

For calculating the required pump head for pump selection, at least 10% margin shall be taken over the pipe friction losses and static head shall be calculated from the minimum water level of the tank/ sump/ reservoir from which the pumps draw water.

(b) **Compressed Air Application**

Compressed air 15.0 m/sec.

1.04.00 The pipes shall be sized for the worst (i.e. maximum flow, temp. and pressure values) operating conditions.

1.05.00 Based on the inside diameter so established, minimum thickness calculation shall be made as per ANSI B 31.1 OD. Manufacturing allowance shall be added to minimum calculated thickness and next higher standard thickness of pipes shall than be selected as per ANSI B 36.10/IS-1239 Heavy grade/IS-3589/ASTM-A-53/API-5L/ANSI B36.19 as the case may be. Alternatively, manufacturers standard thickness can also be accepted subject to that such thickness shall be equal to or more than the minimum calculated thickness after considering manufacturing allowance. Selected thickness then shall be checked for vacuum loading criterion as per the guidelines given in AWWA-M-11. However, in no case, the selected Thickness for various pipe sizes shall be less than the following for indicated Pipe Sizes as below:

200 NB - 6mm	600 NB- 6mm
250 NB – 6 mm	700 NB- 7mm
300 NB - 6 mm	800 NB- 8 mm
350 NB- 6mm	900 Nb – 10 mm
400 NB- 6 mm	1000 Nb – 10 mm
450 NB- 6 mm	1100 Nb – 10mm
500 NB- 6 mm	1200 Nb – 12 mm

1.06.00 Corrosion allowance of 1.6 mm will be added to the calculated thickness being considered (except stainless steel piping).

1.07.00 Bend thinning allowance/manufacturing allowance etc. shall be as per the requirement of the design code provision.

1.08.00 Material of construction for pipes carrying various fluids shall be as specified elsewhere.

1.09.00 Compressed air pipe work shall be adequately drained to prevent internal moisture accumulation and moisture traps shall be provided at strategic locations in the piping systems.

1.10.00 Depending upon the size and system pressure, joints in compressed air pipe work shall be screwed or flanged. The flange shall be welded with the parent pipe at shop and shall be hot dip galvanized before dispatch to site. Alternatively, the flanges on GI pipes may be screwed-on flanges also.

1.11.00 Threaded joints shall be provided with Teflon sealant tapes.

1.12.00 Following types of valves shall be used for the system/service indicated.

SYSTEM	**TYPES OF VALVES**					
	Butterfly	Gate	Globe	Check	Ball	Plug
Water	x	x	x	x	x	
Air		x	x	x	x	
Drains & vents		x	x	x		
Fuel oil (if any)		x	x	x	x	x

1.13.00 Recirculation pipes along with valves, breakdown orifices etc. shall be provided for important pumping systems as indicated in respective process and instrumentation diagrams

	(P&IDs). The recirculation pipe shall be sized for minimum 30%design flow of single pump operation or the recommended flow of the pump manufacturer whichever is higher.
2.00.00	**TECHNICAL SPECIFICATION**
2.01.00	**GENERAL**
	Specific technical requirements of low-pressure piping, fittings, supports, valves, specialties and tanks etc. have been covered under this Sub-section. It includes details pertaining to design and material of construction for piping, fittings, valves, equipment, etc. cleaning/surface preparation application of primer and painting on over ground piping. It also includes detailed technical requirement of laying underground/buried piping including water proofing/anti corrosive protection. It also covers design, engineering, manufacturing, fabrication, technical details of piping, valves, specialties, piping hangers / supports, tanks etc.
2.02.00	**Pipes and fittings**
2.02.01	All low-pressure piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. However, the minimum thickness as specified in the following clauses and or respective codes for pipes and fittings shall be adhered to. The bidder shall furnish the pipe sizing/ thickness calculation as per the criteria mentioned above under LP piping equipment sizing criteria of this Technical Specification.
2.02.02	Piping and fittings coming under the purview of IBR shall be designed satisfying the requirements of IBR as a minimum.
2.02.03	Supporting arrangement of piping systems shall be properly designed for systems where hydraulic shocks and pressure surges may arise in the system during operation. Bidder should provide necessary protective arrangement like anchor blocks/anchor bolt etc. for the safeguard of the piping systems under above mentioned conditions. The requirement will be, however, worked out by the contractor and he will submit the detailed drawings for thrust/anchor block to the Employer. External, and internal, attachments to piping shall be designed so as not to cause flattening of pipes and excessive localized bending stresses.
2.02.04	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).
2.02.05	Wherever Bidder'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 piping on equipment terminal point shall be within limits to be approved by the Employer.
2.02.06	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.
2.02.07	Piping and fittings shall be manufactured by an approved manufacturer of repute. They should be truly cylindrical of clear internal diameter, of uniform thickness, smooth and strong, free from dents, cracks and holes and other defects.
2.02.08	For rubber lined ERW pipes, beads shall be removed for pipe size 80 NB and above.

2.02.09 Inspection holes shall be provided at suitable locations for pipes 800 Nb and above as required for periodic observations and inspection purposes.

2.02.10 At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.

2.02.11 For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided as dictated by the system requirement and operation philosophy & tripping conditions of pumping system. 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.
Transient analysis /surge analysis wherever specified and required shall be conducted in order to determine the location, number and size of the Air-Release valve on certain long distance/high volume piping systems, if applicable within the scope of work of the package.

2.03.00 **Material**

2.03.01 Alternate materials offered by Bidder against those specified. shall either be equal to or superior to those specified. The responsibility for establishing equality or superiority of the alternate materials offered rests entirely with the Bidder and any standard code required for establishing the same shall be in English language.

2.03.02 No extra credit would be given to offers containing materials superior to those specified. Likewise, no extra credit would be given to offers containing pipe thickness more than specified.

2.03.03 All materials shall be new and procured directly from the manufacturers. Materials procured from traders or stockists are not acceptable.

2.03.04 All materials shall be certified by proper material test certificates. All material test certificates shall carry proper heat number or other acceptable references to enable identification of the certificate that certifies the material.

2.03.05 Material of construction for pipes carrying various fluids shall be as follows:

Sl No	Type of Fluid	Material
1.	i) Ordinary Water (Raw Water, Clarified Water, etc.) ii) Equipment cooling water including Both primary & secondary circuit (DMCW pH corrected & ACW drain water)	IS-2062 Gr.-E-250B/ASTM A-36/ASTM A-53 type 'E' Gr. B/IS-3589 Gr. 410 /IS-1239 Heavy.
2.	i) Demineralised water, ii)Alkaline solution (ECW system chemical dosing)	Stainless Steel to ASTM A312, Gr. 304 welded for sizes 65 mm NB and above. Stainless steel to ASTM A312, Gr. 304 sch.40s seamless for sizes 50mm and below
3.	i) Drinking (potable) water ii)Compressed air (Instrument & service air)	ASTM A-53 type E Gr. B galvanized/ IS 1239 Gr heavy galvanized/IS 3589 Gr 410 galvanized. Galvanized shall be to IS- 4736 or equivalent.
4.	(Condensate) spill water	ASTM A 106 Gr. B
5.	Effluents from Neutralization pit	MSRL

2.03.06	In water lines, pipes up to 150mm Nb shall conform to ANSI B36.10/ASTM-A-53, Type-E Gr. B /IS:1239 Gr. Heavy and minimum selected thickness shall not be less than IS:1239 Grade Heavy except for demineralised water, drinking water and condensate spill lines.
2.03.07	Pipes of above 150mm Nb shall be to AWWA-C200/ANSI B 36.10/ASTM A-53/IS 3589 Gr.410. Pipe to be fabricated by the bidder shall be rolled and butt welded from plates conforming to ASTM A-53 type 'E' Gr. B/IS 2062 Gr. E-250B/ASTM-A-36. However, larger pipes, i.e. 1000mm Nb and above shall be made from plates conforming to ASTM A 36/IS 2062 Gr. E-250B and shall meet the requirements of AWWA-M-11 (for deflection & buckling criteria considering water filled pipe as well as vacuum condition that may prevail during transient/surge conditions, truck-load, rail-load and weight density for compacted soil or any other load as the case may be).
2.03.08	In demineralised water service, the pipes up to 50 Nb shall be of stainless-steel ASTM A 312, Gr. 304 sch. 40 Seamless. The size for these pipes shall be to ANSI B 36.19. These shall be socket welded. The material for pipe from 65mm NB up to and including 400 NB shall be to ASTM A 312, Gr. 304 (welded). In no case the thickness of fittings shall be less than parent pipe thickness. Bidder/Contractor shall note that pipes offered as per a particular code shall conform to that code in all respects i.e. Dimension, tolerances, manufacturing methods, material, heat treatment, testing requirements, etc. unless otherwise mentioned elsewhere in the specification.
2.03.09	Instrument air, Plant (service) air lines and Drinking water lines shall be to ASTM A 53 type E grade B/ANSI B 36. 10/IS 3589, Gr. 410 / IS: 1239 Heavy (in case thickness calculated is more than gr. Heavy, ANSI B 36.10 Schedule numbers shall be followed) and galvanized to IS 4736 or any equivalent internationally reputed standard. The material of the pipes shall be to ASTM A 53 type 'E' Gr. B / IS: 3589, Gr. 410 / IS: 1239 Gr. Heavy. The fittings shall be of either same as parent material or malleable iron to IS-1879 (galvanized).
2.03.10	Spiral welded pipes as per API-5L/IS-3589 are also acceptable for pipe of size above 150 NB. However minimum thickness of the pipes shall be as elaborated in above clauses.
2.03.11	Condensate lines shall be to ASTM A 106 Gr. B and dimension to ANSI B 36.10 schedule "standard" as minimum to be maintained.
2.03.12	If carbon steel plates of thickness more than 12 mm are used for manufacture of pipes, fittings and other appurtenances, then the same shall be control-cooled or normalized as the case may be following the guidelines of the governing code.
2.04.00	**Field routed pipes:**
2.04.01	Pipelines of NB 50 size and below are regarded as field run piping. It is Bidder's responsibility to plan suitable layouts for these system insitu. Bidder shall prepare drawings indicating the layout of field run pipe work. These drawings shall be approved by Project Manager to the installation of the field run pipe work. Based on these approved layouts the Bidder shall prepare the BOQ of field run pipes and submit to Employer for approval.
2.05.00	**Slope/Drains and Vents**
2.05.01	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. As per the system requirement low points in the pipelines shall be provided with suitable draining arrangement and 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. 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 up to 150mm, not less than 20mm up to 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes. Material for drain and vent lines shall be compatible with that of the parent pipe material.

2.05.02 Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.

2.06.00 **Pipe Joints**

In general, all water lines 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 and 50mm and below by socket welding unless mentioned otherwise specifically. All air lines shall be of screwed connection and rubber lined pipes of flanged connections.

2.06.01 **Screwed Joints**

(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. Threads shall be to ANSI B 2.1 (taper) NPT / ANSI B1.20.1 (taper) NPT / IS: 554 unless specified otherwise.

(b) Galvanized 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. Galvanized pipes shall not be field joined by welding for protection of Galvanising Zinc layer. 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 galvanized, or in case match pipes and fittings are already galvanized before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & outside) after welding, along with 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 100 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 galvanized. All the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges 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 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.

2.06.02 **Welded Joints**

(a) 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 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.

2.06.03 **Flanged Joints**

(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. Rubber lined pipes shall be flange joined only.

(b) All flanged valves intended for installation on steel piping system, shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class stated in their respective piping material specification.

(c) Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.

2.07.00 **Bends / elbows / mitre bends / Tees / Reducers & other fittings**

2.07.01 For pipe fittings such as elbows (long radius), reducers, tees, etc. the material shall be to ASTM-A-234 Gr. WPB/ASTM-105 up to 300 NB. For pipe fittings 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/ 16.11. Further branching in pipes for sizes 65nb and above is also acceptable (ANSI B 31.1).

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.

2.07.02 For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. However, mitre bends are also acceptable for rubber lined pipes above 1200 NB. The bend radius shall be 1½ times the nominal pipe diameter. 90 deg. bends (mitre) shall be in 4 pieces (3 cuts) and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534.

2.07.03 For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.

2.07.04 Stainless steel fittings shall conform to either ASTM-A-182 Gr. 304 or ASTM-A-403 Grade WP. 304 Class-S, for sizes up to 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 Gr. WP 304 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403.

2.07.07 In no case, the thickness of fittings shall be less than the thickness of parent pipe, irrespective of material of construction.

2.08.00 **Flanges**

2.08.01 Flanges shall be slip on type or weld neck type. Welding of flanges in tension is not permitted.

2.08.02 All flanges and-flanged drilling shall be to ANSI B 16.5/BS EN-1092 / AWWA C-207 of relevant pressure/temperature class. Flanges shall be fabricated from steel plates conforming to ASTM A 105/IS 2062 Gr. E-250B. However stainless-steel flanges shall be fabricated from SS plates to ASTM-A-240, Gr. 304 or equivalent.

2.09.00 **Specific technical requirement of laying buried pipe with anti-corrosive treatment**

The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.

2.09.01 **Trenching**

(a) The trench shall be cut true to the line and level and shall follow the gradient of the pipeline. The width of the trench shall be sufficient to give free working space on each side of the pipe. Trenches shall conform to IS 5822 or any international standard.

2.09.02 **Preparation and cleaning of piping**

(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand or grit blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Certain inaccessible portions of the pipeline (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary with specific permission of the Project Manager.

(b) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.

2.09.03 **Coating and wrapping/ Anti corrosive Protection Coal tar tape**

a. Buried piping shall be coated and wrapped, as per specification, after completion of welded and/or flanged connections, and after completion and approval of Hydro testing. Materials to be used for coating and wrapping of underground pipelines are:

(1) Coating primer (coal tar primer)

(2) Coating enamel (coal tar enamel)

(3) Wrapping materials.

All primer/coating/wrapping materials and methods of application shall conform to IS: 10221 except asphalt/bitumen material. Materials (primer/coating/wrapping) as per AWWA-C-203 are also acceptable.

Protective coating shall consist of coal tar primer, coal tar enamel coating, glass fiber, tissue inner wrap followed by glass fiber or coal tar impregnated Kraft outer wrap or finish coat.
Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221. Number of. Coats and wraps shall be decided based on soil corrosivity / resistivity as indicated in IS-10221. Soil data-for this purpose shall be made available.

Total thickness of completed coating and wrapping shall not be less than 4.0 mm.

b. Alternatively, the anti-corrosive protection for buried pipes can consist of anti-corrosive protection Coal-tar tapes. Material and application of tapes shall conform to IS 15337 or equivalent. These-tapes shall be applied hot over the cold coal tar primer in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. The total nominal thickness of the finished protective coating shall be 4.0 mm.

2.09.04 **Trench bed preparation and back filling**

Prior to lowering and laying pipe in any excavated trench, the bottom of the trench may require to be back filled and compacted (or as the case may be) to provide an acceptable bed for placing the pipe. Bed preparation in general shall be as per IS: 5822.

2.09.05 **Laying of galvanized steel (GI) pipes**

All the joints shall be screwed with socket or flanged. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing Threaded portion on either side of the socket joint shall be applied with Zinc silicate paste.

All the provisions for trenching' bed preparation' laying the pipe application of primer' coating' wrapping with tapes and back filling etc. as indicated for "laying of buried piping" and " anti-corrosive protection for buried piping" are applicable for buried galvanized steel (GI) pipes also.

2.10.00 **Cleaning and flushing**

2.10.01 All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.

2.10.02 Before erection all pipe work, assemblies, sub-assemblies, fittings, and components, etc. shall be thoroughly cleaned internally and externally by blast cleaning or by power driven wire brushes and followed by air-blowing. However, for pipe sizes below 100nb the pipes may be cleaned internally by compressed air blowing as an alternative to internal blast cleaning. The brushes shall be of the same or similar material as the metal being cleaned. Cleaning of Galvanized pipes shall be done by air blowing only.

2.10.03 After erection, all water lines shall be mass flushed with water. The cleaning velocities in water lines shall be 1.2-1.5 times the operating velocities in the pipelines.

2.10.04 All compressed air pipe work shall be cleaned by blowing compressed air.

2.11.00 **Specification for hangers and supports**

2.11.01 All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.

2.11.02 The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.

2.11.03 At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.

2.12.00 **Design/Construction/Material Particulars of Gate/ Globe /Check /Butterfly / Ball / Air release /Float valves / Moisture Traps.**

2.12.01 **GENERAL**

(a) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.

(b) 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.

(c) The valves coming in vacuum lines shall be of extended gland type and/or water sealed.

(d) 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.

(e) Valves coming under the purview of IBR shall meet IBR requirements.

(f) All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.

(g) Wherever required valves shall be provided with chain operator, extension spindles and floor stands or any other arrangement approved by employer so that they can be operated with ease from the nearest operating floor. Wherever necessary for safety purpose locking device shall be provided. Further, necessary small platforms for facilitating easy valve operation shall be provided by the contractor wherever necessary in consultation with project manager within the bid price at no extra cost to employer

2.12.02 **VALVE BODY MATERIAL**

Valve body material for various services shall be as follows:

Valve body material for water application like Secondary circuit auxiliary cooling water of ECW system, Raw water, Ash water make-up, service water, clarified water, DM cooling water (pH corrected) , drinking water etc. shall be cast iron for sizes 65NB and above; gun-metal for sizes 50 Nb and below.

For compressed air application, valve body material shall be cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.

DM water: SS body and disc along with SS internals. However, for butterfly valves, Cast Iron /Ductile Iron/SG iron/carbon steel body and disc with elastomer lining are also acceptable.

Condensate: Cast Carbon Steel / Forged Carbon Steel.

2.12.03 The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Valves in general shall conform to the requirements of the following standards.

Standards and Codes

AWWA-C-504	Rubber seated butterfly valves.
BS-5155/EN-593	Cast iron and steel body butterfly valves for general purpose.
IS-778	Gun-metal gate, globe and check valves for general purpose.
BS-5154	Copper alloy globe/globe stop and check and gate valves for general purpose.
IS-780	Sluice valves for water works purpose (50-300 mm size)
IS-2906	Sluice valves for water works purpose (350-1200 mm size)
IS-5150	Cast iron wedge and double disc gate for general purpose.
BS-5152	Specification for cast iron globe valves.
BS-5153	Cast iron check valves for general purpose.
IS-5312	Swing check type reflux (non-return) valves.
ANSI B 16.34	Standard for valves.
API-594	Standard for Dual-check valves.
API-600	Steel gate valves.
ANSI-B-16.10	Valves face to face and other relevant dimension.
API-598	Valves inspection test.

2.12.04 **End Connections**

The end connections, shall comply with the following:

Socket welding (SW) - ANSI B 16.11

Butt Welding (BW) - ANSI B 16.25.

Threaded (SC) - ANSI B 2.1

Flanged (FL) - ANSI B 16.5& AWWA-C-207 (steel flanges), ANSI B 16.1 (Cast Iron flanges).

2.13.00 **Gate/Globe/Check Valves**

(a) All cast iron body valves (gate, globe and non-return) shall have flanged end connections; (screwed ends for Ductile D.2NI body valves are not acceptable).

(b) All steel and stainless-steel body valves of sizes 65 mm and above shall have flanged or butt-welding ends. Valves of sizes below 65mm shall have flanged 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.

(c) All gun metal body valves shall have screwed ends.

(d) All flanged end valves / specialties shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.

(e) Gate/sluice valves shall be used for isolation of flow. All gate valves shall be of the full-way type, and when in the fully 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. Gate valves shall be provided with the following accessories in addition to other standard items:

(1) Hand wheel

(2) Position indicator (for above 50 mm NB valve size)

(3) Draining arrangement wherever required.

(f) Globe valves shall be used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction. Preferably, the valves shall be of the vertical stem type. Globe valves shall preferably have reduced or spherical seating and discs shall be free to revolve on the spindle.

The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided (i) no possibility exists that flow from above the disc can remove either the disc from stem or component from disc (ii) 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 pressurized before the globe valve is opened.

(g) 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. In long distance pipes lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring-controlled opening /closing of flaps/doors against flow reversals. However, dual plate check valves shall not be used for sizes more than 600mm NB.

(h) 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);

(i) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position.

(j) All gate and globe valves shall be provided with back seating arrangement to enable online changing of gland packing. The valves shall be preferably outside screw & yoke type.

(k) All gate and globe valves shall 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. Stop-gap arrangement in this respect is not acceptable.

(l) All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore.

(m) For CI gate, globe and check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.

2.13.01 **MATERIAL OF CONSTRUCTION (GATE/GLOBE/CHECK VALVE)**

(a) The materials shall generally comply with the following:

(1) **Cast Steel Valves**

Body & bonnet	ASTM A 216 Gr. WCB/ ASTM A 105
Disc for non-return Valves	ASTM A 216 Gr. WCB/ ASTM A 105
Trim.	ASTM A 182 Gr. F6 or Equivalent

(2) **Stainless steel valves**

Body & Bonnet	SS 304
Disc	-do-
Trim.	SS 316

(3) **Cast iron valves**

Body & bonnet	BS 1452 Gr. 14/ IS-210 Gr. FG 260
Seating surfaces and rings	13% chromium steel/ 13% Chrome overlay
Disc for non-return valves	BS 1452 Gr. 14/IS-210 Gr FG 260
Hinge pin for non-return valves	AISI 316
Stem for gate globe valves	13% chromium steel or Equivalent
Back seat	13 % chromium steel / 13% Chrome overlay

(4) **Gun Metal valves**

Body and bonnet	IS 318 Gr. 2/ Equivalent Standard
Trim.	-do-

(b) Cast iron body valves shall have high alloy steel stem and seat.

(c) Material for counter flanges shall be the same as for the piping.

(d) Forged carbon steel & Forged stainless-steel valves are also acceptable in place of Gun metal valves.

2.14.00 **Air Release Valve**

(a) The air release valves shall be of automatic double air valve with two orifices and two floats. The float shall not close the valve at higher air velocities. The orifice contact joint with the float shall be leak tight joint.

(b) The valve shall efficiently discharge the displaced air automatically from ducts/pipes while filling them and admit air automatically into the ducts/pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/pipes during operation at the normal working pressure.

(c) Body material of automatic air release valves shall comply generally with BS 1452 Gr. 14/IS: 210 Gr. FG 260. and spindle shall conform to high tensile brass.

(d) 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.

2.15.00 **Butterfly valves**

2.15.01 **Design/Construction**

(a) The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition. Fabricated steel (IS: 2062 GR. E-250B) butterfly valves instead of cast iron body valves are also acceptable for size above 300 mm Nb diameter.

(b) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However, for sizes 600 NB and below the valves of Wafer construction are also acceptable

(c) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.

(d) Valves-200Nb and above shall also be provided with gear operator arrangement as a standard practice suitable for manual operation. Manual operation of valve shall be through gear arrangement having totally enclosed gearing with hand wheel 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. Adjustable stops shall be provided to prevent over travel in either direction.

Limit and torque switches (if applicable) shall be enclosed in watertight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

2.15.02 **Material of Construction (Butterfly Valves)**

Materials and other design details shall be as indicated below:

(a) **Cast Iron Butterfly Valves**

	Body & Disc	ASTM A48, Gr. 40 with 2% Ni / IS: 210. Gr. FG-260, with 2% Ni / SG iron BSEN 1563, Gr EN GJS-400-15 with 2%Ni and epoxy coated
	Shaft	BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.
	Seat ring	18-8 Stainless steel
	SEAL	NITRILE RUBBER

(b) **Stainless Steel Butterfly Valves**

Body & Disc	SS 304
Shaft	SS 316
Seat Rings	EPT/BUNA-N/Neoprene

(c) **Carbon steel Butterfly Valves**

Body & Disc	ASTM A 216, Gr. WCB
Shaft	SS 304
Disc & Seat Rings	EPT/BUNA-N/Neoprene

(d) **Elstomer lined Butterfly Valves**

Body & Disc	ASTM A48, Gr. 40 / IS: 210. Gr. FG-260 / SG Iron (ductile iron) IS 1865 Gr 400-15 or BSEN 1563, Gr EN GJS-400-15 / ASTM A 216, Gr. WCB with elastomer lining.
Shaft	SS 316

2.15.03 **Proof of Design Test (Type Test) for Butterfly Valves**

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 him, in the absence of which actual P.O.D. test shall be conducted by the bidder.

All valves that are designed and manufactured as per AWWA-C-504 / AWWA-C-516 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504/AWWA-C-516. 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 requirements of P.O.D. test of AWWA-C-504/AWWA-C-516.

2.16.00 **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
The following design and construction feature of the valve shall be the minimum acceptable.
(c) Valves shall be right-angled or globe pattern.
(d) Valves shall be balance piston type with float ball.
(e) Leather liner shall not be provided.
(f) 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.
(g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec.
(h) The valves shall have flanged connections.

2.17.00 **Tanks and Accessories**

2.17.01 The designer and manufacturer of storage tanks shall comply with and obtain approval of all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The tanks shall conform to IS 803/IS804/IS 805/ IS 2825/ API 650/ IS 4049/ IS 4682 (part-I) and IS 4864 to 4870/ ASME B & PV code Sec.-VIII as the case may be.

2.17.02 **DESIGN AND CONSTRUCTION**

(a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650.

(b) Design of all horizontal atmospheric storage tanks containing water, acid, alkali and other chemicals shall generally conform to IS:2825 as regards to fabrication and general construction taking care of combined bending, shear & hoop stresses developed due to supporting arrangement.

(c) Tank shall be made from mild steel plates to BS 4360/IS-2062 Gr.E-250B (or equivalent) for ordinary wafer application when it is not corrosive in nature.

(f) Tank shall be provided with suitable supporting joints. All vessels shall be provided with lifting lugs, eye bolts etc. for effective handling during erection.

(j) Tanks shall be provided with float operated level indicators / level gauges / level transmitters and level switches, as required, with complete assembly. Suitable flanged pads for level switches mounting shall also be provided. The level indicator can be top or side mounted as the case may be.

(k) In addition to inlet and outlet nozzles, the tanks shall be provided with vents, overflow, drain nozzles complete for various connections on tanks. Overflow lines from storage tanks is to be routed to the nearest surface drains. For tanks containing DM water, alkaline water or power cycle water the vent to atmosphere shall be through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals.

(l) Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes / inspection cover as required and also platform suitably located.

(m) Tank supporting arrangement as approved by Employer shall be provided with all plates/angles/joints/flats and supporting attachment including lugs, saddles, legs etc.

(o) Tank fabrication drawing and design calculations shall be approved by the Project Manager.

2.17.03 **Corrosion protection**

(a) A corrosion allowance, applicable to surface in contact with corrosive media, when required after thorough cleaning by blast cleaning preceded by wire brushing shall be taken into consideration.

(b) Manholes shall be provided for easy access into the vessels. The size shall be minimum 500 mm and will be with cover plate, nuts bolts, etc. to ensure leak tightness at the test pressure.

(c) Each tank shall be provided with drilled cleats welded to the tank for electrical grounding. Material of cleats shall be same as that of the shell.

Sl. No.	Description	Tech. Particulars
1.00	**CONDENSATE STORAGE TANKS**	
1.01	Number required	one for each unit
1.02	Capacity of each tank (Effective)	450 Cu. m (for 800 MW units)
1.03	Size (Dia. & Height)/Plate Thickness	8.6mX7.2m minimum, Shell & Roof plate Thickness 8mm and Base plate thickness 10mm
1.04	Type and pressure class	Vertical, cylindrical, atmospheric
1.05	Material of construction	MS- (IS-2062 Gr. B or equivalent) as per specified code, 8mm thickness (minimum)
1.06	Location	Outdoor
1.07	Overflow, drain, vent and Sample connection (piping &valve)	required
1.08	Level Indicator	
	a) Number	One for each tank
	b) Type	Mechanical float type with dial type indicator (Guide wire, Float and Housing of Stainless steel - 316 Gr. construction)
1.09	Manhole (minimum 500mm size)	Two (2)-one on shell and the other on roof
1.10	Special Fittings	
	a) Hydraulic Seal of Overflow/Drain	Required

b)	Additional nozzle Connection	number and size to be indicated to successful Bidder
c)	Nozzle connection for Instrument/spare	Three (3) nos. for each tank
d)	CO2 Absorber for vent (not to be kept on roof of tank, but to be kept on ground level)	required
e)	Outside stair case (spiral)	required
f)	Inside Ladder	Required
g)	Draw off sump	required
h)	Root valve for level Transmitter	Root valves for two (2) nos. level transmitter for each tank Required

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2.18.00 **RUBBER EXPANSION JOINTS**

2.18.01 All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition.

2.18.02 The expansion joints shall be single bellow rubber expansion joints. The arches of the expansion joints shall be filled with soft rubber.

2.18.03 The tube (i.e. inner cover) and the cover (outer) shall be made of natural or synthetic rubber of adequate hardness. The shore hardness shall not be less than 60 deg. A for outer and 50 deg. A for inner cover.

2.18.04 The carcass between the tube and the cover shall be made of high quality cotton duck, preferably, square woven to provide equal strength in both directions of the weave. The fabric plies shall be impregnated with age resistant rubber or synthetic compound and laminated into a unit.

2.18.05 Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.

2.18.06 Expansion joints shall be complete with stretcher bolt assembly. The expansion joints shall be suitable to absorb piping movements and accommodate mismatch between pipe lines.

2.18.07 The expansion joints shall be of heavy duty construction made of high grade abrasion-resistant natural or synthetic rubber compound. The basic fabric for the' duck' shall be either a superior quality braided cotton or synthetic fiber having maximum flexibility and non-set characteristic.

2.18.08 The expansion joints shall be adequately reinforced, with solid steel rings, to meet the service conditions under which they are to operate.

2.18.09	All expansion joints shall be provided with stainless steel retaining rings for DM water application and IS 2062 Gr E-250B galvanized steel retaining rings for ordinary water for use on the inner face of the rubber flanges, to prevent any possibility of damage to the rubber when the bolts are tightened. These rings shall be split and beveled type for easy installation and replacement and shall be drilled to match the drilling on the end rubber flanges and shall be in two or more pieces.
2.18.10	The expansion joints shall have integral fabric reinforced full-face rubber flanges. The bolt on one flange shall have no eccentricity in relation to the corresponding bolt hole on the flange on the other face. The end rubber flanges shall be drilled to suit the companion pipe flanges. The flanges shall be as per ANSI B 16.5. For higher sizes, not covered under ANSI B 16.5, the same shall be as per AWWA.
2.18.11	All exposed surfaces of the expansion joint shall be given a 3 mm thick coating of neoprene. This surface shall be reasonably uniform and free from any blisters, porosity and other surface defects.
2.18.12	Each control unit shall consist of two (2) numbers of triangular stretcher bolt plates, a stretcher bolt with washers, nuts, and lock nuts. Each plate shall be drilled with three holes, two for fixing the plate on to the companion steel flange and the third for fixing the stretcher bolt.
2.18.13	Each joint shall have a permanently attached brass or stainless-steel metal tag indicating the tag numbers and other salient design features.
2.18.14	Bidder to note that any metallic part which comes in contact with DM /corrosive water shall be of Stainless-Steel material.
2.18.15	**Life cycle test for RE Joints of Condenser CW Inlet Outlet lines:** Life cycle test certificates shall be furnished by the bidder for each type and size of RE joints supplied by the Bidder, in the absence of which actual Life cycle test shall be conducted on one rubber expansion joint of each type and size.
2.19.00	**STRAINERS**
2.19.01	**Simplex type** The strainers shall be basket type and of simplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipelines. The strainer element shall be 20 mesh. Pressure drop across the strainers in new condition shall not exceed 1.5 MCW at full flow. 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. The material of construction of various parts shall be as follows: (a) Body — IS: 318, Gr. 2 up to 50 mm Nb, and IS: 210 Gr. FG 260 above 50 mm Nb. (For DM water/ -Body: AISI 316 or equivalent) (b) Strainer Element — Stainless steel (AISI 316) (c) End connection — Screwed up to 50 mm Nb, and Flanged above 50 mm Nb
2.19.02	**Duplex type**

(a) The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow.

(b) Wire mesh (if applicable) of the strainers shall be suitably reinforced. The material of construction of various parts shall be as follows.

Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS:210, Gr. FG 260 or ASTM-A-515 Gr. 75/IS-2062 Gr. E-250B and internally epoxy-painted above 50 mm NB.
Strainer element	Stainless steel (AISI 316)
End connection	Screwed up to 50mm Nb, and Flanged above 50 mm Nb. Gasket shall be of full-face type

(c) 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.

(d) The size of the strainer and the flow direction will be indicated on the strainer body casting.

(e) 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.

QUALITY ASSURANCE

QUALITY PLANS, INSPECTION & TESTING PROCEDURE

The following Quality plans/ Check lists of mechanical items are attached for ready reference of supplier.

a) Local Panel
b) Pyrite Hopper
c) Terminal Box
d) Bunker Discharge Gate
e) Pressure Relief Valve
f) Chain Pulley Block
g) Bag Filter
h) Expansion bellow
i) Knife Gate Valves
j) Sump Pumps
k) Pipes
l) Plates & Structures
m) Rupture Disc

The inspection requirements indicated in the above QP's / CL's shall be adhered to as a minimum. However, manufacturer specific changes shall be suitably reflected for customer / client consideration. Inspection requirement of some of the items are also elaborated in the technical specification under Sec-D. The QP's for above items as well as other items not listed above but required, as part of the system shall be prepared by the successful bidder in project specific format to be finalised with the successful bidder after award of contract.

Standard Quality Plans of few instruments & motors are enclosed elsewhere in the specification, for compliance by the bidder.

All QP's/CL's shall be submitted by the bidder for Customer/Consultant's review and approval. All comments made by customer / consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

	S/Contactor : Mfgr:- Works:-	Manufacturing Quality Plan Item :-Local Panels QAP No. LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Materials**												
	CRCA Sheet	Visual	Major	Visual	100%	Appr. Drg / IS: 513	Appr. Drg / IS: 513	IR	-	P	-	-	
		Chem. & Physical.	Major	Chem.& Physical.	100%	Do	Do	TC	√	V	V	V	
		Thickness	Major	Measurement	100%	App. Drawing	App. Drawing	IR/TC	√	V	V	V	
2	**Bought outs**												
	Verification of type, size & Make of FLV unit, PG, PS, SV	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Approved Drawing / Data Sheet	IR/TC	√	V	V	V	
3	**Painting**												
	Pre Treatment 7 tank process	Physical	Major	DFT / Shade / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR/TC	√	V	V	V	
4	**Final Inspection**												
		Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	**W**	V	
		Dimension	Major	Measurement	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	**W**	V	
		Check for Pneumatic Circuit	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	**W**	V	
		Check for Wiring / Mountings / Terminations	Major	Visual / Continuity	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	**W**	V	
		Functional Check for Solenoid Valve	Major	Functional	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	**W**	V	
5	**QA Documents**	Review	Major	verification	100%	-	-	-					

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N ->CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:-	**Document. No.:**
SIGNATURES			Name & Signature of Approving Authority with Seal	

	S/Contactor : Mfgr:- Works:-	Manufacturing Quality Plan Item :- Pyrite Hopper QAP No. LOI Nos Contractor :- M/s BHEL	Project: Package :- Mill Rejects System Client :-

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS Standard	Sheet / IS	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat		Standard	MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
1.2	Spray Nozzle	Surface Defects	Major	Visual	100%	Mfr's Drg. / IS Standard	Mfr's Drg. / IS Standard	-	-	P	-	-	
		Chemical Check		Chemical Comp.	1/Lot			MTC	√	P/V	V	V	
		Dimensions		Measurement	100%			IR	√	P	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL
		Welding Defects		DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
				DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	**W**	**W**	
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	**W***	**W***	* -> Witness10%
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	**W**	-	Painting shall be Heat Resistance
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> Client **P->Perform, V-> Verification, W-> Witness**	For Client Use:-	**Document No.:-**
SIGNATURES			Name & Signature of Approving Authority with Seal	

	S/Contactor :-.	Manufacturing Quality Plan	Project:-
बी एच ई एल BHEL	Mfgr:-	Item :- Terminal Box QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Package :- Mill Rejects System Client :- Consultant :- .

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS Standard	Sheet / IS	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat		Standard	MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
2	**In - Process Insp.**												
2.1	Welders Qualification & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / KPCL
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	**W**	V	
2.2	Flange Machining and Drilling	Dimensions	Major	Measurement	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	–	P	-	-	
2.3	Connection -pipe to flange, pipe to body	Fit up	Major	Joint set up, PCD, Orientation	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	–	P	-	-	If Applicable
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	**W**	**W**	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	**W**	-	Painting before disp.
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:-
SIGNATURES			Name & Signature of Approving Authority with Seal

Document No.:-

	S/Contactor :-. Mfgr:- Works:-			Manufacturing Quality Plan Item :- Bunker Sector Gate QAP No. :- LOI Nos:- Contractor :- M/s BHEL				Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data	App. Drg. / Data	-	-	P	-	-	
		Surface Defects		Visual	100%	Sheet / IS Standard	Sheet / IS Standard	-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
1.2	Shaft	Physical Check	Major	TS & Elongation	1/Heat	do	do	TC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			TC	√	P/V	V	V	
		UT If Dia > 50 mm		Internal defect	100%			IR	√	P/V	V	V	
1.3	Cylinder / Actuator	Visual / Specification	Major	Visual	100%	do	do	Mfr's TC	√	V	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / CLIENT
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	**W**	V	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	**W**	**W**	
3.2	Operation with job / shop actuator	Opening & Closing of Gate	Major	Visual	100%	Proper Working	Smooth Operation	IR	√	P/V	**W**	**W**	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	**W**	-	Painting before disp.
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation.TC -Test Certificate,IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- **Document No.:-** Name & Signature of Approving Authority with Seal
SIGNATURES			

	S/Contactor :- Mfgr:- Works:-	Manufacturing Quality Plan Item :- Pressure Relief Valve QAP No. : LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- . Consultant :-

Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	**Raw Materials**												
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-	-	P	-	-	
		Surface Defects		Visual	100%			-	-	P	-	-	
		Physical Check		TS & Elongation	1/Heat			MTC	√	P/V	V	V	
		Chemical Check		Chemical Comp.	1/Heat			MTC	√	P/V	V	V	
2	**In - Process Insp.**												
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR	√	P/V	V	V	Welders to be approved by BHEL / KPCL
		Welding Defects	Major	DPT on Root run	100%	ASTM E-165	ASTM E-165	IR	√	P/V	V	V	
			Major	DPT on Final run	10%	ASTM E-165	ASTM E-165	IR	√	P/V	**W**	V	
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	
3	**Final Inspection**												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	**W**	**W**	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	–	P/V	**W**	-	Painting before disp.
4	**QA Documentation**												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		–	P/V	V	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:-	**Document No.:-**
SIGNATURES			Name & Signature of Approving Authority with Seal	

	S/Contactor :-	Manufacturing Quality Plan	Project:-
	Manufacturer :-	Item:- CHAIN PULLY BLOCK QAP No. :- LOI Nos:-	Package :- Mill Rejects System Client :-
		Contractor :- M/s BHEL	Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Materials**												
->	Load Chain	Mech. Properties Breaking Load Test, Proof Load test	Major	Review of Mfr's Test Certificate	1 per Lot	IS:6216 /Appr. Drg / Appr. Data sheet	IS:6216 /Appr. Drg / Appr. Data sheet	MTC	√	P/V	V	V	
->	Load Sheave	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:1865 /Appr. Drg / Data sheet	IS:1865 /Appr. Drg / Data sheet	MTC	√	P/V	V	V	
->	Gear & Pinion	Chemical Composition	Major	Lab Analysis	1 per Heat	IS:4432/Appr. Drg / Data sheet	IS:4432/Appr. Drg / Data sheet	MTC	√	P/V	V	V	
->	Hook	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:8610 / IS:1875 /Appr. Drg / Data sheet	IS:8610 / IS:1875 /Appr. Drg / Data sheet	MTC	√	P/V	V	V	
2	**In Process**												
->	Hook	Proof Load Test	Major	Load Test	100%	IS:8610 /Appr. Drg / Appr. Data sheet	IS:8610 /Appr. Drg / Appr. Data sheet	MTC / IR	√	P	V	V	
		DPT after Load Test	Major	DPT	100%	ASTM E-165	ASTM E-165 / No Defects	IR	√	P	V	V	
3	**Final Inspection**												
->	Assembly	Operation Check	Major	Visual	100%	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	Smooth Operation / IS 3832 Appr. Drg / App. Data Sheet	IR	√	P	**W**	V	
		Functional Test	Major	Visual	100%			IR	√	P	**W**	V	
		Load Test & Over Load Test	Major	Load Test	100%			IR	√	P	**W**	V	
		Overall Dimensions	Major	Measurement	100%			IR	√	P	**W**	V	
		Visual (After Load Test)	Major	Visual	100%	IS 3832	IS 3832	IR	√	P	**W**	V	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- Name & Signature of Approving Authority with Seal
SIGNATURES			**Document No.:-**

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Materials**												
1.1	Manifold Body / Casings (MS Plate / Sheet / Pipe)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS: 1239 Class Med.	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS : 1239 Class Med.	MTC	√	V	V	V	
1.2	Bag Cages (Inserts)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	MTC	√	V	V	V	
1.3	Solenoid Valves	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.4	Sequence Controller	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.5	Filter Bags (Make :- Charminar / Supreme)	Physical	Major	Visual / Measurement	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
2	**In Process**												
2.1	Manifold	Dimensional & Visual	Minor	Dimensional & Visual	100%	As per Mfr's Drg.	As per Mfr's Drg.	IR	√	P	V	V	** -> DPT & Hydro - Test of Manifold to be witnessed by M/s MBPL
2.2		Welding	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	IR	√	P	V**	V	
2.3		Hydro Test for 30 Minutes	Major	Leakage	100%	Appr. Data sheet	No Leakage	IR	√	P	V**	V	

Document No.:-

	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :-EXPANSION BELLOW QAP No. :- LOI Nos:- - Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-)

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Raw Material**												
1.1	Bellows	physical & Chemical	Major	Lab Analysis	1 per Heat	AS204 TP304/ Approved Drg.	AS204 TP304/ Approved Drg.	MTC	√	V	V	V	
1.2	Fianges/ End Pipe	physical & Chemical	Major	Lab Analysis	1 per lot	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	MTC	√	V	V	V	
2	**In - Process Inspection**												
2.1	Bellows & Pipe	Dimension	Major	Measurement	100%	Approved Drg.	Approved Drg.	IR	√	P	V	V	
	** For Bellows	Soundness Of Weld of L-Seam	major	DPT **(Before & After Forming)	100%	ASTM E- 165	No Cracks/ Linear Indication	IR		P	V	V	
3	**Final Inspection**												
3.1	Assembly	DP Test of Fillet Weld of Bellows to Pipe & Pipe to Fiange	Major	visual	100%	ASTM E-165	No Crack / Linear Inication	IR	√	P	**W**	V	
3.2	Testing	Dimensions	Major	Measurement	100%	Approved Drg	Approved Drg	IR	√	P	**W**	**W**	
		pressure	Critical	Hydraulic	100%	EJMA D.3.2.1/ Data sheet	EJMA D.3.2.1/ Approved Drg.	IR	√	P	**W**	**W**	
		Spring Rate Test (Axial)	Critical	Stiffness Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	IR	√	P	**W**	**W**	
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA/Data Sheet	IR	√	p	**W**	**W**	
3.30	Painting	Visual/ Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	IR	√	p	–	–	

		LEGENDS:-	For Client Use:-
		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report	**Document No.:-**
Manufacturer / Sub Vendor	Contractor	M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :- Knife Gate Valve [Manual / Pneumatic] QAP No. : LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Raw Material / Bought Out's**												
1.1	Body	Chemical & Mechanical	Major	Foundary TC	1 per Heat	Relevent IS / Appr. Drg / Data Sheet	Relevent IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	√	P/V	V	V	
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	√	P/V	V	V	
1.4	Pneumatic Cylinder (For Pneu. Valve)	Visual & Functional	Major	Mfr's TC Review	100%	Smooth Operation	Smooth Operation	Mfr's TC	√	P/V	V	V	
2	**In - Process Inspection**												
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-		P	V	V	**# -> Test Pressure as per Data Sheet**
2.2	Body Shell Test	Leak Tightness	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	V	V	
3	**Final Inspection**												
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	**W**	**W**	**BHEL / MBPL/CLIENT to Witness 10 % of Quantity.**
3.2	do	Function	Major	Operation	100%	Smooth Opertaion	Smooth Opertaion	IR	√	P	**W**	**W**	
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	**W**	**W**	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-**	For Client Use:-	**Document No.:-**
		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report		
		M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT		
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal	

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	S/Contactor :-	Manufacturing Quality Plan		Project:-
	Manufacturer :-	Item :- Sump Pump		Package :- Mill Rejects System
		QAP No. :-		Client -
		LOI Nos:-		
		Contractor :- M/s BHEL		Consultant :- .

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	**Raw Material / Bought Out's**												
1.1	Casing	Chemical, Mechanical, Hardness, Surface Defect	Major	Chem. Comp. Mechanical Hardness Visual	1 per Heat 1 per Heat 1 Per Heat 100 %	Relevent IS / Appr. Drg / Data Sheet	Relevent IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Impeller	do	Major	do	do	do	do	do	√	P/V	V	V	
1.3	Shaft	Chemical, Mechanical, Surface Defect	Major	Chem. Comp. Mechanical Visual & UT if Dia >50 mm	1 per Heat 1 per Heat 100 %	Relevent IS / Appr. Drg / Data Sheet / ASTM E 388 for UT	Relevent IS / Appr. Drg / Data Sheet / ASTM E 388	do	√	P/V	V	V	
1.4	Shaft Sleeve	Chemical Hardness	Major	Chem. Comp. Hardness	do	do	do	do	√	P/V	V	V	
2	**In - Process Inspection**												
2.1	Casing	Soundness of Casting / Leakage	Major	Hydro Static Test	100%	Appr drg. / Data Sheet / IS 5120	No Leakage	IR	√	P	V	V	Hyd. Test at 200% of pump rated head or 150% of Shut off head which ever is higher for 30 min.
2.2	Impeller	Residual unbalance	Major	Dyanamic / Static Balancing	100%	Approved Drg / Data Sheet / ISO 1940 Gr. 6.3	ISO 1940 Gr. 6.3	IR	√	P	V	V	

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
3	**Final Inspection**												
3.3	Performance Test with Calibrated Test Lab Motor	Q Vs Head, Power & Efficiency, Noise & Vibration	Major	Measurement & Curves	100%	Approved Drg / Data Sheet / HIS	Approved Drg / Data Sheet / HIS	IR	√	P	**W**	**W**	Noise - 85 db max. & Vibration - 50 microns max.
3.2	Pump strip test in case of doubt due to abnormal sound	Undue Wear	Major	Visual / Strip Test	100%	Mfr's Standard	No Undue Wear	IR	√	P	**W**	**W**	
3.3	Painting	Visual & Measurement	Major	Visual & Measurement	100%	As per approved Painting Schedule	As per approved Painting	IR	–	P	-	-	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	For Client Use:- **Document No.:-** Name & Signature of Approving Authority with Seal
SIGNATURES			

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
3	**Final Inspection**												
3.1	Assembly	Dimensional	Major	Measurement	100%	Appr. Drawing	Appr. Drawing	IR	√	P	**W**	V	**Pressure Drop across Filter Bags & Emission Level at Filter outlet shall be checked at Site**
	$-> Pneumatic Test at 1.1 times W/Pressure	Pne. test $of Manifold in Assly.	Major	Leakage by soap solution	100%	Appr. Data Sheet	No Leakage	IR	√	P	**W**	V	
		Functional Test of Pulsing System	Major	Pulse Sequence	100%	Appr. Data sheet / Testing Procedure	Appr. Data sheet / Testing Procedure	IR	√	P	**W**	V	
4	**Painting**	Measurement & Visual	Major	DFT / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR	√	P	-	-	

TESTING PROCEDURE TO BAG FILTER

1-> Functional test through compressed air , Sequential pulsing through valves and sequential controller on **No - Load Condition** to be conducted.

2-> The Soenoid valve shall be connected to the sequential timer and suitable electric supply shall be provided. Air header to be connected to supply of compressed air. The Timer is set and Sequential operation of Solenoid operated valve is observed.

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	For Client Use:-
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal

Document No.:-

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contactor :- **Manufacturer :-**			**Manufacturing Quality Plan** **Item :- MS GI ERW Pipes (IS:1239/IS3589)** **QAP No. :-** **LOI Nos:-** **Contractor :- M/s BHEL**			**Project:-** **Package :- Mill Rejects System** **Client :-** **Consultant :-**					
Sl. No.	**Components / Operations**	**Characteristics**	**Classification**	**Type of Check**	**Quantum of Check**	**Reference Documents**	**Acceptance Norms**	**Format of Records**		**Agency for Checking**			**Remarks**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**10**			**11**
								TYPE	**D**	**M**	**C**	**N**	
1	Final Inspection of Finished Pipes	Physical	Major	Visual	100%	IS:1239 / IS:3589 / Approved Data Sheet	IS:1239 / IS:3589 / Approved Data Sheet	IR	-	P	W*	V	* -> Random 5% of offered lot irrespective of size
		Dimensional	Major	Measurement	100%			IR	√	P	W*	W*	
		Mechanical Properties	Major	Tensile, elon-gation, Bend or Flattening	IS: 4711			IR / TC	√	P / V	V	V	
		Chemical	Major	Chemical Analysis	1 per heat			TC	√	P / V	V	V	
		Hydro Test	Major	Pressure Testing	100%			IR / TC	√	P	W *	W*	
2	Galvanising (For GI Pipes	Uniformity & mass of Zinc Coating, Adhesion test, Free bore test	Major	As per IS:4736	As per IS:4736	As per IS:4736 / Approved Data Sheet	As per IS:4736 / Approved Data Sheet	IR	√	P	W #	V	# one sample for each size
3	Identification	Verification of Batch No. / Mfg stamp / Heat No.	Major	Visual	100%	Mfgr Practise / IS 1239 / IS 3589	Mfgr Practise / IS 1239 / IS 3589	IR	√	P	W	V	
4	Review of QA Documents	----------	----------	----------	----------	As per QAP	As per QAP	----------	√	V	V	V	

NOTES :-

For SAIL Pipes verification of reports for the tests mentioned in Sl. No. 1 & 2 by BHEL & KPCL.
For GI Pipes, Galvanising Check as per relevant standard shall be done.
All material shall be as per approved data sheet in case of ambiguity in QAP, material as data sheet shall be final.

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-** Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT	For Client Use:- **Document No.:-**
SIGNATURES		**P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

	Manufacturer's Name & Address :		MANUFACTURING QUALITY PLAN				Project :						
	SAIL / TISCO		Item : MS Plates & Structures		QP No. :		BHEL Ref. :						
			Sub-System :		Rev. No. : 0 Date : Page No.: 11 of 1		Contract No.: Contractor : BHEL SUB-CONTRACTOR-						
Sl. No.	Components & Operations	Characteristic/Item	Class	Type/method of check	Extent of Check	Reference Document	Acceptance	Format of Record		Agency			Remarks
										P	W	V	
1	2	3	4	5	6	7	8	9	D	10			11
	RAW MATERIAL												
1	Steel Plates	Chemical composition and Mechanical test	Major	Review of corelated MTC	One/heat	IS:2062	IS:2062	Mfgr. TC	√	3		2,1	Refer Note Below
2		Visual and dimensional Check	Major	Visual and measurement	100%	Mfgr. TC	Mfgr. TC IS 1852	Mfgr. TC	√	3	2,1		
3		Identification / Marking	Major	Co-relation establish	100%	AS per manufacturing practice	AS per manufacturing practice IS 2062	Mfgr. TC	√	3	2	1	
			LEGEND :					BHEL Doc. No. PE-QP-279-166-A801					Rev. 0
			1 - BHEL / CUSTOMER 2 - VENDOR 3 - Manufacturer		P - Agency Performing the Test W - Agency Witnessing the Test V - Agency Verifying the Test								
MANUFACTURER/ SUBCONTRACTOR		CONTRACTOR	CR - Critical Characteristics MA - Major Characteristics MI - Minor Characteristics										
SIGNATURE								REVIEWED BY		NAME & SIGNATURE OF APPROVING AUTHORITY			

Notes:

1 In case material is despatched directly from SAIL/TISCO plant/stockyard or procured from dealer against co-related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of SAIL/TISCO.

2 In case material is procured from dealer and co- related TC's are not available, check on 100% quantity of plates will be performed on sample drawn from each plate at NABL certified/ approved laboratory or any govt approved laboratory for chemical & physical properties, However dimensional check shall be witnessed by BHEL.

3 There will not be any inspection by CUSTOMER.

	S/Contactor :- Manufacturer :-	Manufacturing Quality Plan Item :- Rupture Disc QAP No. :- LOI Nos:- Contractor :- M/s BHEL	Project:- Package :- Mill Rejects System Client :- Consultant :-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	U	
1 ->	**Materials** Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 Type - 304 / Appved Data Sheet / Drg.	ASTM A240 Type - 304 / Appved Data Sheet	MTC	√	V	V	V	
2 -> ->	**Final Inspection** Dimension Burst Test of Rupture Disc	Measurement Functional	Major Major	Mesurement Burst Test @ 200 Degree Centigrade	100% 1 per lot offered	App. Drawing Approved drawing / Datasheet	App. Drawing Min 0.4 bar (g) @ 200 degree C Max 0.6 bar (g) @ 200 degree C / App. Data Sheet	IR IR / Burst Test Certificate	√ √	P P	W W	W W	

Manufacturer / Sub Vendor	Contractor	**LEGENDS:-**	For Client Use:-	**Document No.:-**
SIGNATURES		Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT **P->Perform, V-> Verification, W-> Witness**	Name & Signature of Approving Authority with Seal	

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

ANNEXURE- I

SUB VENDOR LIST FOR MILL REJECT HANDLING SYSTEM (CONVEYOR TYPE)

Sl. No.	DESCRIPTION	MAKE	WORKS	INSPECTION CATEGORY	REMARKS
A	**SELF MANUFACTURED**				
1	Conveyor Assembly	QLAR		I / II	Refer Note-3
		DEMECH			
		ENVIIRO			
		TSUBAKI			
2	Pyrite Hopper	Self-Manufactured	Supplier's works	I / II	
3	Bunker Discharge Gate (Sector Gate)				
4	Pressure Relief Valve				
B	**BOUGHTOUT ITEMS (ELECTRICAL)**				
1	Air Filter/Lubricator/Regulator	SHAVONORGAN	MUMBAI/BANGLORE	III	
		PLACKA	CHENNAI		
2	Pulse Jet Valves	ASCO	CHENNAI	III	
		MANIK	PUNE		
		SIEMENS	NEW DELHI		
		JAIBALAJI	NEWDELHI		
		PHEONIX	DELHI		
3	ZERO SPEED SWITCHES	JAYSHREE	PUNE	III	
		PROTOCONTROL	PUNE		
		P&F	BANGALORE		
4	GEARED MOTOR	PBL	ANAND - V.V NAGAR	III	
		PREMIUM	PUNE		
		BONFIGLIOLI	CHENNAI		
		SEW	Germany		
		IC	AURANGABAD		
5	SOLENOID VALVE	Rotex	Baroda	III	
		Avcon	Mumbai		
		Asco	Chennai		
		SMC	Noida		
		Nucon	Hyderabad		
6	VFD	Schenider	INDIA	III	
		Allen Bradelly	INDIA		
		ABB	INDIA		
		YASKAWA	INDIA		
		Toshiba	INDIA		
		Siemens	INDIA		
7	VFD PANEL	POWERTECH	SONEPAT	I	Upto 55 KW with following conditions: i) VFD from Schneider- France, upto 415V, 50KW. ii) Enclosure & bought out items shall be from NTPC acceptable makes & iii) Engineering support for integration will be provided

					by Schneider/ Authorized integrator of Schneider
		DANFOSS	ORAGADAM		(upto 690V, 1200kW), VFD drives with VFD sourced from Danfoss-enMARk/USA and Panelsourced from Rittal
		YASAKAWA	Japan		VFD from Yasakawa- Japan, Upto 415V, 132KW
		ROCKWELL AUTOMATION	SAHIBABAD		VFD from Rockwell(Allen Bradley)- USA, (Upto 415 V, 600 KW)
		ABB	BANGALURU		VFD from ABB-Finland, Upto 690V, 750 KW
		SIEMENS	NASIK		VFD from SIEMENS-Germany, Upto 690V,900KW
		SEIPL	Navi Mumbai		LT VFD upto 315KW, 415V
		AMTECH	GANDHINAGAR		UP TO 75KW RATING
		VACON	BANGALORE		VFD(NXP model) from VACON Finland, upto 400KW,415V and upto 900KW, 690V
8	LEVEL SWITCH	DK Instruments	Kolkata	III	
		Levcon	Kolkata		
		Sigma	Mumbai		
		V-Automat	New Delhi		
		SBEM	Pune		
		Flow Star	Faridabad		
9	LIMIT SWITCH	BCH	NEW DELHI	III	
		SIEMENS	NEW DELHI		
		JAIBALAJI	NEWDELHI		
10	SELECTOR SWITCH	Schenider	INDIA	III	
		Siemens	INDIA		
		L&T	INDIA		
		Kaycee	INDIA		
C	**BOUGHTOUT ITEM (MECHANICAL)**				
1	BUCKET ELEVATOR COMPLETE	HEKO GMBH		II	
		Rud			
		Aumund			
2	BUCKET ELEVATOR CHAIN	HEKO GMBH	GERMANY	II	
		Rud	GERMANY		
3	BUCKET ELEVATOR SPROCKETS	HEKO GMBH	GERMANY	II	
		Rud	GERMANY		
4	Knife Gate Valve	GALAXY CONTROLS PVT LTD	CHENNAI	II	Upto size 26
		ORBINOX	COIMBATORE		Upto size 30
		BRAY CONTROLS	CHENNAI		Upto size 28

		JAASH	INDORE		Upto size 30
5	Ball Valve	Precision Engg	Nasik	I	
		Microfinish Valves Ltd	Hubli		upto 50NB 800 class
		Weir BDK engg Industries	NEW DELHI		
		Flow chem. Industries	Ahmedabad		
		Audco	Chennai		(1) BALL VALVES: FCS/FSS - 1/2" to 2" #800 & CCS/CSS - 2.1/2" to 4" # 150 (2) BALL VALVES: GUN METAL VALVES SIZE 15 NB TO 80 NB - UPTO PN16.0
		Akay India	Hubli		
		A V Valves	Agra		Size up to 2" & #800 with MOC as FCS & FSS and for size from 65 NB to 150 NB & #150 with MOC as CCS and CSS.
		Asian Industrial valves & Instruments Ltd.	Chennai		Steel ball Valves upto 50NB, #800 and 65NB to 150NB. #150
		ATAM Valves	Jalandhar		
		GM ENGINEERING	Rajkot		CAST STEEL UPTO 200 MM,CLASS 150/300.
		Hawa Valves (India) Pvt. Ltd.	Navi Mumbai		
		INTERVALVE (INDIA) LTD.	Pune		FOR CARBON STEEL/STAINLESS STEEL UPTO SIZE 200NB.
		NILON VALVES PRIVATE LIMITED	Ahmedabad		
		LEADER VALVES LTD.	Jalandhar		FORGED CARBON & ALLOY STEEL BALL VALVES ,SCREWED TYPE BALL VALVES RATING 800 , SIZES UPTO 50 & CC& ALLOY STEEL BALL VALVES RATING 150 , SIZES 65 TO 200 FLANGED TYPE.
		DEMBLA VALVES LTD.	Thane		
		SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai		
		UNIFLOW	Chennai		
		VALTECH INDUSTRIES	Mumbai		
		VAAS	NEW DELHI		

		AUTOMATION			
		Belgaum Aqua Valve	Belgaum		
6	Metallic Expansion Bellow(Metallic)	METALLIC BELLOWS	CHENNAI	II	
		SUR INDUSTRIES	KOLKATA		NTPC APPROVED SOURCE
		LONE STAR	CHENNAI		NTPC APPROVED SOURCE
		Flexatherm			UPTO 20 TONNES
7	Rupture Disc	BS & B SAFETY SYSTEM	CHENNAI	II	
8	Electric Hoist	ARMSEL MHE PVT. LTD	Bangalore	II	CAPACITY UPTO 10 TONS. BOIs BHEL APP.SUB-VENDORS.
		Alpha Services	Bhiwadi		
		CONSOLIDATED HOISTS PVT LTD	Pune		
		CENTURY CRANE ENGINEERS PVT. LTD.	Faridabad		
		EDDY CRANES PVT. LTD.	Mumbai		
		Grip Engineers Pvt. Ltd.,	Faridabad		
		GLOBAL TECHNOLOGIES	Hyderabad		
		HERCULES HOISTS LTD.	Khalapur		UPTO 25.0 T CAPACITY.
		LIFTING EQUIPMENTS and ACCESSORIES	Delhi		
		Mangla Hoists Pvt Ltd	Delhi		
		MEEKA MACHINERY PVT. LTD.	Ahmedabad		UPTO 15 TONNES.
		REVA INDUSTRIES LTD.	Faridabad		
		ROCKWELL HOISTO CRANES PVT. LTD.	Bahadurgarh		
		SAFEX ENERGY PVT. LTD.	Ahmedabad		
		TUOBRO FURGUSON (INDIA) PVT LTD	Kolkata		
		TECHNO INDUSTRIES	Ahmedabad		
9	Mono Rail Hoist / Chain Pulley Block	HERCULES (INDEF)	MUMBAI	II	
		LEAP	NEW DELHI		
		TRACTEL	FARIDABAD		
		LIFTING EQUIPMENTS & ACESSORIES	DELHI		
10	Horziontal/Vertical Centrifugal Pump	KBL	Kirolskarwadi	I	
		M&P	Pune		

		Flowmore	Ghaziabad		
		Sulzer pumps india ltd.	Navi mumbai		
		Worthington	Ghaziabad		
		Bharat pumps & compressors ltd	Allahabad		
		Flowserve India Controls Pvt. Ltd.	Coimbatore		
		Jyoti ltd.	Vadodara		
	Vertical Centrifugal Pump	Kishore Pump	Pune		
		Sam Turbo	Coimbatore		
		KSB	Pune		
		Best and Crompton	Chennai		
		Voltas	Mumbai		
		V-Flo Pumps & Systems Co. Ltd.,	Beijing, China		
11	Pneumatic Actuator/Cylinder(Metallic)	SCHRADDER	MUMBAI	II	
		NUCON	HYDERABAD		
		Rotex	MUMBAI		
		VAAS	CHENNAI		
12	Fittings	M.S. Fittings	Kolkata	II	
		Metal lloyds	Mumbai		
		True Forge	Faridabad		
		Tube Products	Baroda		
		NL Hazra	Kolkata		
		Gujrat Infra Pipes	Baroda		
		Edwards	USA		
		Pipefit Engineers	Baroda		
		Siddarth & Gautam	Faridabad		
		EBY	Mumbai		Upto 400 NB ERW Pipes as per IS 3589 and SAW as per IS 3589
13	MS/GI ERW Pipes	SAIL	Rourkela	II	NTPC approved sub-vendors and BHEL list
		Jindal	Ghazibad/Hissar	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Surya Roshni	Bahadurgarh	I	Upto 400 NB ERW Pipes as per IS 1239/3589 and SAW as per IS 3589
		TATA Tube	Jamshedpur	II	Upto 150 NB ERW Pipes as per IS 1239
		PSL	Chennai/Vizag/Kutch/Daman	I	Spiral Weld SAW as per IS 3589
		Lalit Profile	Thane	I	Spiral Weld SAW as per IS 3589
		Samshi Pipes Industries	Vadodara	I	Spiral Weld SAW as per IS 3589
		Mukut Pipes	Rajpura	I	Longitudinal SAW (Single side weld) as per IS 3589

		Indus Tubes	G B Nagar	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Mann Ind	Indore	I	Spiral Weld SAW as per IS 3589
		Surendra Engg	Rajpura	I	Spiral Weld SAW as per IS 3589
		Pratibha Pipes & Structure Pvt Ltd	Thane	I	Spiral Weld SAW as per IS 3589
		JCO Gas Pipe	Chindwara	I	Spiral Weld SAW as per IS 3589
		Nukat Tanks and Vessels	Tarapur		Longitudinal SAW (Single side weld) as per IS 3589
		DADU Pipes	Sikandrabad	I	Upto 300 NB ERW Pipes as per IS 1239/3589
		Good Luck Tubes	Sikandrabad	I	
		Advance Steel Tubes	Sahibabad	I	
		Bihar Tubes	Sikandrabad	I	
		Hi Tech Pipes	Sikandrabad	I	
		Ratnamani	Kutch/Ahmedabad/Chhatral	I	Upto 400 NB ERW Pipes as per IS 3589 and SAW as per IS 3589
		Maharashtra Seamless	Raigad	I	200-500 NB ERW Pipes as per IS 3589
		Welspun	Anjar/Bharuch		Upto 400 NB ERW Pipes as per IS 1239/3589 and SAW as per IS 3589
14	Seamless Pipes	ISMT	Ahmednagar/Baramati	III	
		Maharashtra Seamless	Raigad		
15	S.S. Pipes (For small Quantity 500 m)	REMI	Mumbai	III	
		Ratmani	Ahmedabad		
		Apex Tubes	Behror		
		Choksi	Ahmedabad		
16	Steel Plate, Structural Steel and section for Fire water storage tank	SAIL	ANY PLANT	III	For small quantity: Authorised stockist/ dealer of approved listed makes for which TCs/IRs will be furnished
		Essar Steel			
		TISCO			
		RINL			
		Jindal			
		Lloyd			
		Ispat			
		Indian Iron & Steel Co. Ltd			
17	BAG FILTER / SILO VENT FILTER	ORIENT FAN (FORMERLY - ACCO)	KOLKATA	II	
		THERMAX	PUNE		
		RIECO	PUNE		

		MELCO	FARIDABAD		
		MACAWBER BEEKAY	KESHWANA		
		TAP ENGINEERING	KANCHEEPURAM		
18	CI Gate/ Globe/NRV/SRV	H.Sarkar	Howrah	III	SIZE UPTO 300NB & PR.CL.
		A.V. VALVES LTD	Agra		
		Leader	Jalandhar		
		SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai		FOR GV UPTO 450NB,GLV UPTO 300NB AND CHECK VALVES UPTO 350NB.
		ATAM VALVES PVT. LTD.	JALANDHAR		(1) CARBON IRON GATE VALVES: 65 NB TO 450 NB (UPTO PN-16.0) (2) CARBON IRON GLOBE VALVES & NON RETURN VALVES: 65 NB TO 150 NB (UPTO PN-16.0)
		FLUIDLINE VALVES COMPANY PVT.LTD.	Mumbai		1. CI Gate- CL125 & up to 900 NB, 2. CI Globe- CL125 & up to 450 NB, 3. CI SCNRV- CL125 & up to 600 NB.
		G.M. DALUI AND SONS PVT.LTD.	Howrah		
		KBL	Kondhapuri		Additionally approved for FM approved Gate valve 50-250 NB
		Bankim	Kolkata		
		VENUS PUMPS AND ENGG. WORKS	Kolkata		1) CI GATE VALVE SIZES 65NB-800NB ,2) CI GLOBE VALVE FOR SIZES 65NB-400 NB AND 3) CI SCNRV FOR SIZES 65 NB -600 NB.
19	GM valve	A.V. VALVES LTD	Agra	III	
		ATAM VALVES PVT. LTD.	Mumbai		GUN METAL GATE/GLOBE/NRV: 15 NB TO 50 NB (UPTO PN-16.0) & 15 NB TO 50 NB (UPTO #150)
		Leader	Jalandhar		
		VALTECH INDUSTRIES			GUN METAL SCREWED END TYPE , SCREWED IN BONNET , OUT SIDE SCREW & YOKE TPE , PN 16 , SIZES UPTO 50.
		SANT VALVES PVT. LTD.	Jalandhar		UP TO SIZE 100-NB ONLY.
20	GEAR BOX	PBL	ANAND - V.V NAGAR	III	
		SHANTHI	COIMBATORE		
		PREMIUM	PUNE		
		BONFIGLIOLI	CHENNAI		

		IC	AURANGABAD		
		FLENDER			
21	COUPLINGS	ELECON	ANAND - V.V NAGAR	III	
		FENNER	CHENNAI		
		FLUIDOMAT	KOLKATA		
22	BEARINGS	FAG	INDIA	III	
		SKF	INDIA		
		NTN	INDIA		
23	BEARINGS (B/E BOOT SECTION)	HEKO	GERMANY	III	
24	Paint	Asian Paints (I) Ltd.	Mumbai	III	
		Berger Paints India Ltd	Delhi		
		Goodlass Nerolac	Mumbai		
		Jenson & Nicholson (I) Ltd	Gurgaon		
		CDC carboline (I) Ltd.	Delhi		
		ShaliMAR Paints Ltd.	Gurgaon		
		Addison Paints Ltd	Chennai		
		Grand Polycoat	Mumbai		
		Bombay Paints	Mumbai		
		Jotun Paints	Pune		
		Hemple Paints	Singapore		
25	PLUMMER BLOCKS	WINCO	BANGALORE	III	
		MASTA	AHMEDABAD		
		COSMO	MUMBAI		
26	TRANSIMISSION CHAIN	RENOLD	KARUR	III	
27	MAINTENANCE TOOLS BOX	REPUTED		III	

INSPECTION CATEGORY TYPE`	
CAT-I	The QAP for these items shall be approved by NTPC and joint inspection shall be done by NTPC & BHEL as per approved QAP.
CAT-II	The QAP/Check List for these items shall be approved by BHEL and inspection shall be done by BHEL as per approved QAP/Check List. Approved QAP/Check list shall be given for Information to NTPC.
CAT-III	These shall be COC (Certificate of Compliance) items. Only verification Test Certificates shall be done by BHEL.
NOTE	
1)	Bidder to note that Make of various items and inspection category indicated against each item is tentative and shall subject to approval of BHEL / NTPC during detail engineering stage without any commercial implication at contract stage
2)	In case of imported components, makes of BOI shall be subject to BHEL/ NTPC approval during detail engineering stage without any commercial implication at contract stage.
3)	In case any bidder gets qualified as a supplier (based on the make of chain conveyor supplied in the reference credentials furnished to BHEL to established PQR compliance), they will procure chain conveyor as per make defined in the list above without any commercial implication to BHEL
4)	Bidder to propose sub vendor within 4 weeks of placement of LOI thereafter no request for additional sub-vendor shall be entertained.

ANNEXURE- VII

INDICATIVE SUB-VENDOR LIST
SINGRAULI SUPER THERMAL POWER PROJECT
STAGE-III (2x800 MW)

ITEM/SERVICE DESCRIPTION	SL NO.	VENDOR NAME	ADDRESS	PHONE	REMARKS
LT MOTOR	1	ABB	FARIDABAD		UPTO 55KW
	2	ABB	BANGALORE		
	3	JYOTI LTD.	VADODARA		
	4	TIPM	JAPAN		UPTO 15 KW (NON FLAME PROOF)
	5	HYOSUNG	SOUTH KOREA		
	6	WEG	BRAZIL		
	7	HYUNDAI	SOUTH KOREA		
	8	LHP	SOLAPUR		
	9	CGL	AHMEDNAGAR		RQP, FOR FLAME PROOF MOTOR
	10	TMEIC	JAPAN (NAGASAKHI)		
	11	NGEF	BANGALORE		UPTO 15 KW
	12	BHARAT BIJLEE	MUMBAI		RQP, FOR FLAME PROOF ALSO
	13	KEC	BANGALORE/ HUBLI*		*UPTO 90KW, RQP, FOR FLAME PROOF ALSO
	14	MARATHON	KOLKATA		RQP (UPTO 690V & 600 KW) FOR FLAME PROOF ALSO
	15	ABB	SWEDEN		UPTO 55KW
	16	HAVELL	NEEMRANA		UP TO 90KW
	17	KAWAMATA	JAPAN		UP TO 75 KW
	18	TIPS	JAPAN		UP TO 45KW
	19	HEM INDUSTRIES	DAMAN		UP TO 30kW
GI CONDUITS	BIS APPROVED MAKE				
GI CONDUIT (EPOXY PAINTED)	BIS APPROVED MAKE				
FLEXIBLE CONDUITS (LEAD COATED)	1	PLICA INDIA PVT. LTD.	V.P.AGARWAL MANAGING DIRECTOR, PLICA INDIA PVT. LTD. 149, MODEL TOWN EAST GHAZIABAD - 201009	M - 9810052131 / 0120-4563979 / 9810557567 Mail: agr@plicaindia.com	
FLEXIBLE CONDUIT (PVC COATED)	REPUTED MAKE				
CABLE GLANDS	1	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594 +(91)-(11)-23287156 vijay_mohansood@yahoo.com	
CABLE GLANDS	2	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	
CABLE GLANDS	3	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
CABLE GLANDS	4	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
CABLE GLANDS	5	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE GLANDS	6	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
CABLE GLANDS	7	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
CABLE LUGS	1	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE LUGS	2	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	

CAT-I For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer
CAT-II For those items the Quality Plans are approved by Customer. However, no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis of review of documents.
CAT-III For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

SUB VENDOR LIST

FOR C&I ITEMS

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : SINGRAULI STPP STAGE-III (2X800 MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :					LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :10.07.2023 SUB SECTION: C&I	
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		I				Hi-Tech Systems & Services Ltd (As a system Integrator of M/S Bonnenberg + Drescher GmbH, Germany)	Kolkata	A			1.All critical components are to be procured from M/S Bonnenberg + Drescher GmbH, Germany 2.Standard indiginious components like Solenoid valve (Asco make) ,matching flange ,printer & monitor table shall be supplied by M/S Hi- Tech
		II				Scientific Environment Instrument Inc (SEI)	USA	A			1.PCU ,Acoustic sensor ,Preamplifier mapping software shall be from SEI USA . 2. Enclousure ,OWS ,Waveguide ,Tube box etc shall be from SEI approved sources to be tiedup in MQP. 3.Pl refer Note-07
		II				Bonnenberg + Drescher GmbH,	Germany	A			
		II				STOCK Equipment Co	USA	A			
3	Addressable Detector (Multisensor , Photo & Heat Detectors Type), Interface units & Manual call points										
		II				Honeywell Life Safety-HIIPL	Gurugram	A			Notifier Brand (Detector, Interface Module only)
		II				Schrack	Austria	A			
		II				Autronica	Norway	A			
		II				Edwards	Mexico	A			
		II				Notifier	USA	A			
		II				Sheld Fire safety	UK	A			
		II				Jhonson Controls	USA	A			Simplex Brand
4	Battery for 24VDC charger & UPS										
		Note-4				Hoppecke Batterien GmbH & Co Kg	Germany	A			For Lead Acid- Plante
		Note-4				Exide	Kolkata	A			For Lead Acid- Plante
		Note-4				SAFT India Ltd	Bengaluru	A			For Ni-Cd
		Note-4				HBL Power	Hyderabad	A			For Ni-Cd ,Upto 990AH (H type)
		Note-4				SAFT	France/Sweeden	A			For Ni-Cd
		Note-4				Hoppecke Batterien GmbH & Co Kg	Germany	A			For Ni-Cd
5	Blank Panels / Cabinets										
		III				Pyrotech Electronics Pvt. Ltd	Udaipur	A			
		III				Rittal India Private Ltd	Bengaluru	A			
		III				Hoffman	Bengaluru	A			
		III				BHEL	Bengaluru	A			
		III				BCH ELECTRIC LIMITED	Faridabad	A			
6	Boiler tube leak detection system (ASLD)										
		III				HI Tech System & services Ltd (System Integrator of Acoustic Monitoring International Inc. USA)	Kolkata	A			1.M/S Acoustic Monitoring International Inc. USA Make system Conditional as per approval letter 01/CQA/9573-102/Hi-tech-AMI dated 11.04.2013 2.Pl refer Note-07

एनटीपीसी NTPC एक महारत्न कम्पनी	PROJECT : SINGRAULI STPP STAGE-III (2X800 MW) PACKAGE : EPC PACKAGES CONTRACTOR: CONTRACT NO :						LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB SUPPLIER APPROVAL				REVISION NO : 00 DATE :10.07.2023 SUB SECTION: C&I	
Sr No	**Item Description**	**QP Inspection Category**	**QP No**	**QP submission SCH**	**QP approval SCH**	**Proposed Sub Supplier**	**Country**	**SS Approval_Status (Note-1)**	**SS Detail Sub.SCH**	**SS Approval SCH**	**Remark**
		III				Codel	UK	A			For In Situ type /Optical Transreceiver type
		III				Durag Industrie Elektronik GmbH & Co KG	Germany	A			For In Situ type /Optical Transreceiver type & Extractive Type
		III				Emerson Process Management	Ireland	A			For In Situ type /Optical Transreceiver type
		III				SICK AG	Germany	A			For In Situ type /Optical Transreceiver type & Extractive Type
		III				ENEVA	UK	A			For Extractive Type Dust density analyser
12	Electrical Actuators										
12-A	Electrical Actuator (With gear box if applicable)										
		II				Antrieb Technik Pvt Ltd	Chennai	A			For low torque applications only
		II				Auma	Bengaluru	A			
		II				Limitorque	Faridabad	A			Model no L120,SMB,LY series, Gear Box T, HBC Series
		II				Rotork	Bengaluru	A			For low torque app (Up to 1000 Nm)
		II				Rotork Controls (India) Private Ltd	Chennai	A			For low torque app (Up to 1000 Nm) & High torque 4000 to 7000 Nm With integral starter for non critical applications
		III				Auma	Germany	A			
		III				Limitorque	USA	A			
		III				Rotork	UK	A			For low torque app (Up to 1000 Nm)
		III				Nippon gear	Japan	A			
		III				Drehmo GMBH	Germany	A			C Matic Series (DMC/DMCR)
12-B	Electrical Actuator- Non-Intrusive (With gear box if applicable)										
		I				Auma India Pvt Ltd	Bengaluru	A			Also acceptable for Field Bus based applicable
		I				Rotork Control	Chennai	A			Upto 630Nm
		III				Flowserve	USA	A			Also acceptable for Field Bus based applicable
		III				Bernard Controls	France	A			
12-C	Electrical actuator for ID/FD/PA Blade pitch ,IGV &SCOOP										
		III				Harold Beck & Sons Inc	USA	A			
		III				SIPOS Aktrorik GmbH	Germany	A			
13	Electronics Transmitter (Pressure , DP and DP based Flow/Level)										
13-A	Electronics Transmitter (Pressure , DP and DP based Flow/Level)										
		III				ABB Ltd	Bengaluru	A			2600T & critical item from ABB Italy/ Their approved source;
		III				Emerson Process Management Ltd	Pawane	A			
		III				Siemens Ltd	Thane	A			Model:-SITRANS P
		III				Honeywell Automation India Ltd	Pune	A			

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		III				Baldota Control and Equipment Pvt Ltd	Navi Mumbai	A			PT & DPT of LD 301 Series (SMAR)
		III				Yokogawa India Limited	Bengaluru	A			EJA-E 110,430,530 SERIES & all raw material and BOI under knocked down condotion (sensor assembly as a single unit) shall be sourced from M/S Yokogawa Japan
		III				M/s Endress + Hauser India Automation Instrument Pvt Ltd	Aurangabad	A			
		III				Emerson (Rosemount)	USA	A			
		III				Yokogawa	Japan	A			
		III				ABB	Germany / Italy	A			2600T & critical item from ABB Italy/ Their approved source;
		III				Siemens	France	A			Sitrans P DSIII Series
		III				Fuji Electric	France	A			FCX -AIII SERIES
		III				Fuji	Japan	A			
13-B	Electronics Transmitter -Field Bus Based (Pressure , DP and DP based Flow/Level)										
		I				ABB India Ltd	Bengaluru	A			One no of Transmitter will be sent at DDCMIS supplier for function testing of field bus communication with DDCMIS during FAT
		I				Yokogawa India Limited	Bengaluru	A			EJA-E 110,430,530 SERIES & all raw material and BOI under knocked down condotion (sensor assembly as a single unit) shall be sourced from M/S Yokogawa Japan
14	EQMS										
		I				SWAN	Hyderabad	A			1. Conductivity analyser, pH analyser and Temperature Transmitter will be of M/s ABB, UK make . 2. TSS analyser will be of M/s Daeyoon, South Korea make . 3. Oil in water analyser will be of M/s TriOs, Germany make. 4. Online BOD/COD analyser will be of M/s Shimadzu, Japan make . 5. Flow meter will be of M/s Khrone Marshall, Maharashtra make. 6. Data Aquisition System will be procured from Knowledge Lens, Karnataka.
15	Fiber optic cable										
		Note-3				U M Cables Ltd	Silvassa (Daman)	A			
		Note-3				KEC International Ltd	Mysore	A			
		Note-3				Apar Industries Limited	Valsad (Gujrat)	A			
		Note-3				HFCL	Goa	A			
		Note-3				Aksh Fibre	Bhiwadi (Raj)	A			

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		I				Adage Automation Pvt. ltd	Goa	A			1.M/s Siemens, Garmany (Calomat 6) Make analyser 2. Pl refer Note-07
		I				Yokogawa India ltd	Bengaluru	A			M/s Yokogawa Japan (Gas Densitybased) Make analyser
		I				SIEMENS	Gurugram	A			M/s Siemens, Garmany (Calomat 6) Make analyser
		III				GE Sensing EMEA	Ireland	A			Conductivity based
		III				ABB	UK	A			
		III				Emerson (Rosemount)	USA	A			
		III				Environment One Corporation	USA	A			Conductivity based
26	HEA ignitor										
		I				Durag India Instrumentation Pvt Ltd	Bengaluru	A			M/S Durag Germany make HEA Ignitor
		I				Hindustan Thermometers	Ambala	A			Condtional as per approval ref no 01/CQA/0270-102 dated 17.09.2012.Spark tip of their own make is also acceptable
		I				Fives combustion System Pvt Ltd	Vadodara	A			
		I				Boiler control Pvt Ltd	Puddukottai (Tamilnadu)	A			Approved for Aux Boiler package only
		III				Unison Industries	USA	A			
		III				Durag GmbH	Germany	A			
		III				Ignition system INC	USA	A			
		III				Tesi SPA	Italy	A			
27	High Temp. cable (PTFE/FEP)										
		II				Thermocables	Hyderabad	A			
		II				Tempsens	Udaipur	A			
		II				Habia cables	Sweden	A			
		II				Thermo Electrica BV	Netherland	A			
		II				Lapp cables	Germany	A			
		II				Kerpen cables	Germany	A			
		II				TEW & C	USA	A			
28	Impulse Pipes/Tubes										
		II				Mahrashtra Seamless	Raigarh	A			For CS Pipes only
		II				Ratnamani Metals and Tubes	Gandhinagar	A			For SS only.
		II				Heavy Metals and Tubes	Gandhinagar	A			For SS & CS only.
		II				ISMT	Ahamadnagar	A			For CS/ AS upto Gr 22 Pipes only
		II				Nippon Steel & Sumitomo Metals corporation	Japan	A			
		II				TPS Tecnitube	Germany	A			
		II				Veluric & Manessmann	Germany	A			
		II				Trouvay and Cauvin	France	A			
		II				Sandvik	Sweden	A			For SS only
		II				REMI Edelstahl Tubulars Ltd	Palghar	A			
29	Instrument Cables (F,G & T/C Cables)										
		Note-2				Goyolene Fibers (India) Pvt Ltd	Silvassa	A			F&G Type Cable
		Note-2				Temsens Instruments Ind Pvt Ltd	Udaipur	A			
		Note-2				Havells India	Alwar	A			F Type Cable

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33	Local Instrument Enclosure/Rack										
		I				Pyrotech Electronics Pvt. Ltd	Udaipur	A			BOI from LOA approved sources
		I				Sajas electrical	Trichurapalli (Tamilnadu)	A			BOI from LOA approved sources
		I				Prammen	Puddukottai (Tamilnadu)	A			BOI from LOA approved sources
		I				Chemin C&I Pvt Limited	Puducherry	A			1- BOI from LOA approved sources 2.Fabrication at M/s LUFT tech India 3- Painting at M/s Supreame Coater & Fabricator
34	Master Slave Clock System										
		I				Signals and Systems Pvt. Ltd. (SANDS)	Chennai	A			
		I				Masibus	Gandhinagar	A			
		I				Sertel Electronics Pvt. Ltd.	Chennai	A			
		II				Hopf Electronik GmbH	Germany	A			
		II				Hathway	USA	A			
		II				Mein Berg	Germany	A			
		II				Moser Baer AG	Switzerland	A			
35	Mercury Analyser										
		I				Analyser Instrument Co. Pvt Ltd (AIC)	Kota	A			1. Mercury Analyzer from PS Analytical UK 2.System integration & supply of components like, Enclosure with AC, calibration cylinders, PC will be done by M/s Analyser Instrument Co. Pvt Ltd (AIC) Kota . 3.Pl refer Note-07
		III				Environment SA India Pvt Ltd	Navi Mumbai	A			1-Mercury analyzer with accessories will be from Mercury instruments GmbH Germany . 2- Other components like, sample line between probe to mercury analyzer will be supplied by M/s Environment SA India Pvt Ltd .
		III				Thermo Fisher Scientific India Pvt Ltd	Pune	A			1. Mercury Analyser shall be from Thermofisher USA 2. Other approval conditions are as per approved letter ref no 01/CQA/9578-001/Thermofisher dated 09/12/2016
		III				Durag India Instrumentation Pvt Ltd	Bengaluru	A			Analyser from M/s Verewa Umwelt Germany
		III				Mercury Instruments GmbH	Germany	A			
		III				SICK AG	Germany	A			
		III				Themofisher	USA	A			
		III				Lumax	Russia	A			For AAQMS System
36	PA System (IP Based)										
		III				BNA Technology Consulting Ltd.	Bengaluru	A			BOI shall be from LOA approved sources.
		III				Armtel	Russia	A			

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		I				Vision Comptel	Kolkata	A			For M/s Emerson make system
		I				Adaptive Engineering Private Limited	Ahmedabad	A			For M/s Schneider make system
		I				Greenwave Solutions Private Limited	Kolkata	A			For M/s Rockwell make system
		I				Dreamz Automation	Ghaziabad	A			For M/s SIEMENS make system
		I				Creative Robotics	Ghaziabad	A			For M/s Honeywell make system
		I				Kruti Techno Engineer Pvt Ltd	Chhapraula (GB Nagar	A			For M/s SIEMENS make system
		I				EDS Instruments & Systems Pvt Ltd	Chennai	A			For M/s Honeywell make system
		I				Delsys Automation Technologies Pvt Ltd	Chennai	A			For M/s Emerson make system
		I				Hindustan Controols and Equipment Ltd	Kolkata	A			For M/s Emerson make system
		I				Vollkraft Engineering And Consultant (P) Ltd	Kolkata	A			For M/s Emerson make system
		I				SSM Infotech Solutions Pvt Ltd	Surat	A			For M/s Schneider make system
		I				Sun Industrial Automation & Solutions	CHENNAI	A			For M/s Schneider make system
		I				ARTEE FLOW CONTROL PVT LTD	ANKLESHWAR	A			For M/s Honeywell make system
		I				CSS AUTOMATION PVT. LTD	KOLKATA	A			For M/s Emerson make system
		I				ARMAX AUTOMATION PVT LTD	BANGALORE	A			For M/s ABB make system
		I				KAIZEN AUTOMATION	AHEMDABAD	A			For M/s Schneider make system
		I				ELECON PERIPHERALS LIMITED	ANAND	A			For M/s ABB make system
38	Pneumatic Actuator Regulating (Power Cylinder HAD,CAD SADC & Burner Tilt)										
		I				Instrumentation Limited	Palakkad (Kerala)	A			
		I				Kelton	Cochin (Alleppy)	A			
		I				SMC Corporation India Private Ltd	Noida	A			Up to Bore size 12 inches
		I				IMI Norgren Herion Pvt ltd	Noida	A			
		I				NELES INDIA PRIVATE LIMITED	Dombivli	A			
		II				Dong Woo Valve Control Co. Ltd	S.Korea	A			
		II				Shin Hwa Engineering Co. Ltd	S.Korea	A			
39	Radar type level transmitter										
		III				Limaco	Russia	A			High Frequency Type
		III				Emerson Process Management Ltd	Pawane	A			For M/s Emerson Singapore make
		III				Endress & Houser	Aurangabad	A			
		III				SIEMENS	Canada	A			
		III				B M Technology	Italy	A			For Non Contact type
		III				Magnetrol	Belgium	A			

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		III				ABB	USA	A			K-Tech Brand
		III				Endress & Houser	Germany	A			
		III				Saab Rosemeount	Sweden	A			
		III				Emerson Process Management	Singapore	A			Rosemount 3300 series for GW Radar & 5600 Series for Non-Contact type
		III				Endress & Houser	Germany	A			
		III				Vega Grieshaber KG	Germany	A			
40	Short Term Fire Proof cable										
		III				nVent Solutions limited	UK	A			
		III				Wrexham Mineral	UK	A			
		III				KME	Italy	A			
41	SWAS (Sampling Handling System and Dry Panel)										
		I				Emerson Process Management Ltd	Navi Mumbai	A			Analysers and Other BOI Componets from LOA agreed source
		I				Forbes Marshall	Pune	A			Analysers and Other BOI Componets from LOA agreed source
		I				SEPL	Pune	A			Analysers and Other BOI Componets from LOA agreed source
		I				YOKOGAWA INDIA LTD	Bangalore	A			Analysers and Other BOI Componets from LOA agreed source
42	Water Analyser (Chloride, Conductivity, Dissolved Oxygen,pH, Hydrazine, Concentration , Phosphate, Silica, Soldium,Turbidity, Total Iron, Degassed Cation Conductivity)										
		III				Emerson Process Management Pvt Ltd	Pawane	A			For Conductivity,pH, Dissloved Oxygen, Turbidity
		III				Mettlet Toledo India Pvt Ltd	Vasai	A			For pH Analyser (1. PH analyser from M/S Mettler Toledo GmbH Switzerland 2. Other components like, Housing, Panel mounting kit, Tubing's & easy clean mechanism will be supplied by M/s Mettler Toledo India Pvt Ltd)
		III				Endress Hauser India Pvt. Limited	Mumbai	A			For pH Analyser (1. pH sensor with cable , analyser ,retract & cleaning assembly , electrolyte reservoir (As applicable) will be supplied from Principals of M/S Endress Hauser India Pvt. Limited. 2. Other components like, Flow through assembly shall be supplied from M/S Endress Hauser India Pvt. Limited approved sources.)
		III				Thermo Fisher Scientific	USA	A			For Chloride,Dissloved Oxygen,Hydrazine
		III				ABB	UK	A			For Chloride,Dissloved Oxygen,Hydrazine, Phosphate, Silica,Sodium,Turbidity
		III				Hach	USA	A			For Conductivity, pH,Concentration, Phosphate, Silica,Turbidity

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		III				ABB	USA	A			For Conductivity, pH
		III				Yokogawa	Japan	A			For Conductivity
		III				Hach	Switzerland	A			For Dissloved oxygen, Hydrazine, Silica,Sodium
		III				Yokogawa	Japan	A			For pH
		III				Eutech Instrument PTE Ltd	Singapore	A			For Silica
		III				Orion	USA	A			For Sodium
		III				SWAN Analytische Instrumente AG	Hinwil /Switzerland	A			For pH Analyzer , Conductivity analyser ,Dissolve Oxygen analyser , silica Analyzer , Sodium Analyzer , Hydrazine analyser , Turbidity analyser
		I				Forbes Marshall Pvt Ltd	Pune	A			For Conductivity & pH analyser
		I				METTLER TOLEDO INDIA PVT LTD	Mumbai	A			For Chloride Analyser
43	Temp Transmitter										
43-A	Temp Transmitter										
		III				Endress & Houser	Aurangabad	A			
		III				Emerson Process Management Ltd	Pawane	A			For M/s Emerson Singapore make
		III				Yokogawa	Bengaluru	A			Make Yokogawa japan and caliberation at Yokogawa Banglore
		III				ABB	Bengaluru	A			For M/s ABB Germany make
		III				WIKA Instruments India Pvt Ltd	Pune	A			For M/s WIKA Germany make Model no T-32
		III				Honeywell Automation India Ltd	Pune	A			
		III				Yokogawa	Japan	A			
		III				Moore	USA	A			
		III				M System co Ltd	Japan	A			Model No-B3HU-0
		III				Emerson	U.S.A/Singapore/ Germany	A			
		III				ABB	Germany	A			
		III				Emerson Process Management	Germany	A			
43-B	Temp Transmitter -Field Bus based Single/Dual Input										
		I				ABB India Ltd	Bengaluru	A			One no of TT will be available at DCS supplier for function testing of field bus communication with DCS during FAT
44	Turbine supervisiory Instruments along with vibration analysis system.										
		I				GE	Pune	A			For GE Bentlly ,USA make system
		I				Meggitt India Pvt ltd	Bengaluru	A			For Meggitt (Vibrometer) Switzerland make system
		I				Forbes Marshall	Pune	A			For Shinkawa ,Japan make system
		II				GE BENTLY	USA	A			
		II				SHINKAWA	JAPAN	A			
		II				MEGGITT	Switzerland	A			
45	Ultrasonic Type Flow Meter (for Stack)										
		III				Sick India Pvt ltd	Mumbai	A			For Sick AG Germany make
		III				Sick AG	Germany	A			

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		III				Durag	Germany	A			
		III				Teledyne	USA	A			
46	Ultrasonic type level Transmitter										
		III				EIP Enviro	Noida	A			1-Ultrasonic level Tx shall be BM Technology Italy make 2-Required mounting arrangement , Testing, Calibration shall be carried out at M/s EIP Works.
		III				E & H	Aurangabad	A			
		III				Emerson Process Management Ltd	Pawane	A			Complete Intrument Transmitter & Probe to be procured from Mobrey UK , only intergration & configuration at Pawane works
		III				BM Technology	Italy	A			
		III				Siemens Miltronics	Canada	A			
		III				Nivelco Process Control	Hungary	A			
		III				E & H	Germany	A			
		III				HAWK Measurement PTY Ltd	Australia	A			
47	UPS With ACDB										
		Note-5				Vertive Energy Pvt Ltd	Pune	A			Upto 125 KVA for 1 phase and 300 KVA for 3 Phase
		Note-5				Vertive Energy Pvt Ltd	Mumbai	A			Upto 160 KVA
		Note-5				Hitachi Hirel Power Electronics Pvt Ltd	Gandhinagar	A			Upto 200 KVA,
		Note-5				Fuji Electric Consul Neowatt Private Limited	Pune	A			Up to 100 KVA single phase
		Note-5				KELTRON	Trivendrum	A			
		Note-5				Merlin & Gerin	France	A			
		Note-5				Gutor	Switzerland	A			
		Note-5				AEG	Germany	A			
		Note-5				Fuji Electric	Japan	A			
48	Vibration Monitoring System										
		II				Sensonics Technology India	Kundli	A			For Sensonic UK system
		II				BHEL	Bengaluru	A			1. Imported items like Vibration Monitors, Cross Connection Cables, Buffered Output Modules, and Piezoelectric Vibration Sensors, Eddy Current type Proximity Probe, Extension Cable and Signal Conditioner will be procured from Valmet Automation, Finland. 2.Indigenous items like Communication cables, networking components, blank panels, TB, OWS will be procured from NTPC approved sources.
		II				IRD Mechanlysis Ltd	Thane	A			Vibration sensors will be sourced from M/s Hansford UK ,however brand name of IRD and its logo is acceptable with suitable tracebility of M/s Hansford ,UK.

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MC-125	SMS gateway	III				Main Contractor Approved Sources					
MC-126	Storage Device (SAN/NAS/DAS) of 100 TB each	III				Main Contractor Approved Sources					
MC-127	Traffic Light	III				Main Contractor Approved Sources					
MC-128	Turnstile - half height	III				Main Contractor Approved Sources					
MC-129	SPIKE BARRIER	III				Main Contractor Approved Sources					
MC-130	CHAIN LINK FENCE	III				Main Contractor Approved Sources					
MC-131	X-ray Baggage Scanner	III				Main Contractor Approved Sources					
MC-132	Static Radio Set	III				Main Contractor Approved Sources					
MC-133	EPABX equipments	III				Main Contractor Approved Sources					

LEGENDS :

1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY

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

2.0 QP INSPECTION CATEGORY :

CAT - I : For those items the Quality Plans are approved by Customer and final acceptance will be on physical inspection witness by Customer

CAT - II : For those items the Quality Plans are approved by Customer. However no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis of review of documents.

CAT - III :For these items Quality control to be exercised as per Main contractor Quality Assurance System. The final acceptance by NTPC shall be on the basis of Certificate of Conformance (COC) by Main Contractor.

UNITS/WORKS : Place of manufacturing- Place of main supplier of multi units/works.

NOTE - 1 : A: Vendors to submit project specific documents as per Sub-QR requirements in case the Vendor is approved under collaboration agreement.
B: In case approved sub vendor is offering product with latest model/series apart from earlier approved, vendors to submit project specific documents as per Sub-QR requirements.

NOTE - 2 : For Insrument cable <= 1 KM inspection category CAT - III, For > 1 KM to <= 10 KM Inspecton category CAT - II COC & FOR> 10 KM Inspection category CAT-I

NOTE -3 : For Fiber Optic cable <=10KM inspection category CAT - III & for > 10KM Inspection category CAT-II

NOTE-4 : Batteries for UPS <= 10 KVA and batteries for intelligent battery charger 24 V DC <= 40 Amp inspection category CAT-III & for Batteries for UPS> 10KVA and batteries for intelligent battery charger 24 V DC > 40 Amp rating

NOTE-5 UPS <= 10 KVA rating inspection category CAT-III & for > 10KVA rating inspection category CAT-I

NOTE - 7 - EMPTY CABINETS, COMPUTERS, SIGNAL ISOLATOR/ MULTIPLIER and TB SHALL ALSO BE ACCEPTABLE FROM OWNER ACCPETED IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENEOUSLY

NOTE-8 : For the C & I instrumnts mounted on the skid of the main item or supplied as a integral part of the main item, instrument to be supplied as per proven practice of the manufacturer meeting the Customer technical specification

NOTE-9- This item is a bought out componenet of main equipments like DDCMIS ,PLC,TSI,CCTV ,PA system etc

NOTE-10- For these controlled items, vendor shall be proposed for owner accpetance with-in the agreed contract schedule of the package

NOTE-11 - Major Bought-Out-Items are to be procured from LOA approved sources & the same shall be finalized during the finalization of Manufacturing Quality Plan . MQP shall be duly vetted by OEM with their project specific authorisation letter .

NOTE-12 : Main contractor apporved sub vendors are acceptable those are evaluated / assesesed as per Main contractor Quality Management System for vendor approval. Main contractor to inform the finaly selected vendor to NTPC as soon as PO is placed for these items. In case of sub-QR Note-1 is also applicable.

ANNEXURE-II

Mandatory spares of MRS

1.00.00 SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spares is given below:-

1.01.00 **MANDATORY SPARES**

(a) The list of mandatory spares considered essential by the Employer is indicated in this chapter. The bidder shall indicate the prices for each and every item in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms and Price Schedules. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.

(b) The Employer reserves the right to buy any or all the mandatory spares parts.

(c) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes.

(d) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.

(e) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.

1.02.00 **RECOMMENDED SPARES**

(a) In addition to the spare parts mentioned above, the contractor shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices in relevant schedule of the Bid Form and Price Schedules. This list shall take into consideration the mandatory spares specified in this Section-VI, Part-A and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment.

(b) Price of recommended spars will not be used for evaluation of the bids. The price of these spares will remain valid upto 6 months after placement of Notification of Award for the main equipment. However, the Contractor shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.

1.03.00 **START-UP & COMMISSIONING SPARES**

	Start-up and commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.
1.04.00	The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares and recommended spares and indicate these in the relevant schedules of the Bid Form and Price Schedules. The general requirements pertaining to the supply of these spars is given below.
2.00.00	The Contractor shall indicate the service expectancy period for the spares parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.
3.00.00	All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.
4.00.00	All the spares (both recommended and mandatory) shall be manufactured alongwith the main equipment components as a continuous operation as per same specification and quality plan.
5.00.00	The contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalise order for recommended spares.
6.00.00	Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.
7.00.00	All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.
8.00.00	The contractor will provide the Employer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the Employer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
9.00.00	The Contractor shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.

10.00.00	In addition to the recommended spares listed by the contractor, if the employer further identifies certain particular items of spares, the contractor shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the Employer and placement of order for additional spares if the Employer so desires.
11.00.00	The Contractor shall guarantee the long term availability of spares to the Employer for the full life of the equipment covered under the contract. The Contractor shall guarantee that before going out of production of spares parts of the equipment covered under the Contract, he shall give the Employer atleast 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his sub contractors, Contractor will provide the Employers, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/ procurement of such items.
12.00.00	Material Codification The bidder to provide datasheets/ assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which mandatory spares to be supplied can be uniquely identified. This would facilitate the Employer to assign a unique code to each of the mandatory spare as brought out in GCC. The bidder shall extend all necessary assistance in this regard.
13.00.00	Bidder shall not indicate “Not Applicable” against any of the spare (except for those items for which “if applicable” is specified). In case of not applicability, functionally equivalent spare to be mentioned with price in the relevant price schedules. Bidder shall not mention any remark other than price value in relevant price schedule.

Sl. No.	DESCRIPTION	Unit /Quantity
1	**Mechanical**	
(A)	**DRAG CHAIN CONVEYORS / METALLIC CONVEYOR**	
1	Chain link with Flight assy (if applicable)-	20 Nos each type
2	Metallic Pan assy (Meshed with Belt) (if applicable)	1 Set each type
3	Chain Pin & Circlip (if applicable)-	20 Nos each type
4	Sprocket (if applicable)-	1 No each type
5	Drive & Non-drive Pulleys (if applicable)	1 No each type
6	Carrying and return Idler assy (if applicable)	5 Nos each type
7	Bearings	2 Nos each type
8	Conveyor Geared Motor/Gear Box	1 No each type
9	Shear Pin of Conveyor (if applicable)	10 Nos each type
10	Coupling (if applicable)	1 No each type
(B)	**Vibrating Feeder assy (if applicable)**	2 Nos
(C)	**Bucket Elevator**	
1	Chain link	10 Nos
2	Shackle	10 Nos
3	Bearings	2 Nos of each type
4	Elevator Geared Motor/Gear box	1 No
5	Coupling (If applicable)	1 No of each type
6	Buckets	5 Nos
(D)	**Other Items**	
1	Complete assembly of Valves at Pyrite Hopper inlet, outlet, emergency outlet	2 No of each type, size and rating
2	Rupture Disc	5 Nos
3	Metallic Expansion Bellow	5 Nos.
(E')	**C&I Items**	
1	Measuring Instruments	
a	Transmitters of all type, range and model no. (For the measurement of Pressure, differential pressure flow, level, temperature etc.)	10% or 1 no. of each and model whichever is more
b	Temperature elements	
i	RTD's	10% of each type and length

ii	Thermocouples	10% of each type and length
iii	Thermo well	10% of each type and length
c	Pressure, Differential Pressure, Flow, Level and temperature switches	20% of the total population or minimum 2 nos. of each type/rating/model
d	Pressure, Differential Pressure, Flow, level and temperature gauges	20% of the total population or minimum 2 nos. of each type/rating/model
2	INSTRUMENTATION CABLE, INTERNAL WIRING	
i	Pre-fabricated cable with connector of each type (other than DDCMIS application) (if applicable)	2 nos. of each type
ii	Other cables (Instrumentation and Control cable)	5% or 500 mtrs whichever is more for each type, pair and size of actual supplied quantity.
3	PROCESS CONNECTION PIPING (FOR IMPULSE PIPING/TUBING, SAMPLING PIPING/TUBING AND AIR SUPPLY PIPING AS APPLICABLE)	
i	Valves of all types	20 Nos. of each type and model
ii	2 way, 3 way, 5 way valve manifolds	10 Nos. of each type, class, size and model
iii	Fittings	100 Nos. of each type
iv	Purge meters	20 Nos. of each type and model
v	Filter regulators	20 Nos. of each type and model 6.00.00
4	Electrical Actuators	
i	Actuators	1 no. of each type and rating
ii	Power unit for modulating actuator	2 nos. of each type
iii	DC-DC unit / Power Units	2 nos. of each type
iv	Electronic cards	2 nos. of each type
v	Position feedback transmitters	2 nos. of each type
vi	Control Unit	2 nos. of each type
vii	Torque And limit switch assembly of each unit	2 nos. of each type
viii	Electronic PCB of all types	10% of each type & model
ix	Absolute Encoder (replaceable part)	5% of each type & model
x	Electronic Torque sensor	5% of each type & model

ANNEXURE- III

SUB-SECTION–A-12

SURFACE PREPARATION & PAINTING

1.00.00 **Specification of surface preparation & painting**

1.01.00 Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.

1.02.00 All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.

1.03.00 Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.

1.04.00 All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.

1.05.00 **SURFACE PREPARATION**

1.05.01 All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.

1.05.02 The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer.

SP1	Solvent cleaning
SP2	Application of rust converter (Ruskil or equivalent grade)
SP3	Power tool cleaning
SP4	Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer)
SP4*	Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns
SP5	Shot blasting/ abrasive blasting.
SP6	Emery sheet cleaning/Manual wire brush cleaning.

1.06.00 **APPLICATION OF PRIMER/PAINT**

1.06.01 The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.

1.06.02 Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.

1.06.03 Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.

1.06.04 Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.

1.06.05 Following are the Primer/painting schemes envisaged herein:

PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104.

PS3* - Zinc Chrome primer (Alkyd base) by dip coat.

PS4 - Synthetic Enamel (long oil alkyd) to IS2932.

PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744

PS9 - Aluminum paint to IS 2339.

PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC)

PS13 - Rust preventive fluid by spray, dip or brush.

PS14 - Weldable primer-Deoxaluminate or equivalent.

PS16 - High Build Epoxy CDC mastic `15'.

PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.)

PS18 - Epoxy based TiO2 pigmented coat

PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.)

PS-20 - Epoxy based finish paint

1.06.06 All weld edge preparation for site welding shall be applied with one coat of wieldable primer.

1.06.07 For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.

1.06.08 SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

1.06.09 a) All un-insulated equipments, pipes, valves etc covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron.

The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner:

- Primer coat – Epoxy based zinc phosphate
- Intermediate - Epoxy based TiO2 pigmented coat
- Finish coat - Epoxy based finish coat/Two pack polyurethane coat

b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron.

c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard

1.06.10 A) Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows:

Primer : One coat of unmodified epoxy resin along with polymide 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.

B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows:

i) For Indoor vessel, tanks, piping, valves & other equipments:

(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 vessel, tanks, piping, valves & other equipments:

(a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard.

(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.

1.06.11 Primer/Painting Schedule

Sl. No	Description		Surface Preparation	Primer Coat			Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade
				Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping														As per NTPC Colour shade/ coding scheme
1.	All insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.		SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
2.	All un-insulated Pipings, fittings/ components, Pipe clamps, Vessels/Tanks, Equipment etc.	Design temperature < or equal to 60^0C	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3 **$**	35 **$**	155 **$**	
		Design temperature above 60^0C-200^0C	SP3/SP4	PS 9*	1	20	-	-	-	PS9*	1	20	40	
		Design temperature > 200^0C	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)		SP4*	PS19	1	40	-	-	-	PS17	1	30	70	
4	Piping hangers / supports (other than (3) above. (un-insulated)		SP3/SP5	PS5	2	25	-	-	-	PS4	2	25	100	

	Valves												
5.	Cast/Forged	Design temperature < or equal to 60 degC #	SP3/SP5	PS5	2	35	-	-	-	PS4	2	25	120
		Design temperature above 60 degC	SP3/SP5	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	SP4*	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a) Epoxy coat b) Final coat of paint PS17	2 1	35 30	250
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150
7.	Weld Edges		SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25

1. **$ -** The first 2 finished coats (total min.DFT of 70 microns) shall be done at shop and the 3rd finish coat (min.DFT 35 Microns) shall be applied at site.
2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.
3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable.
4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content> 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme.
5. For corrosion protection, all inner parts of the hangers (CLH/VLH) shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.
6. # - For Cast/forged valves upto & including design temperature 60Deg.C, Aluminium painting as per IS-13183 Gr-3 or better with total DFT 40Micron is also acceptable.

B) Steam Generator & Auxiliaries:

1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	PS 4	2 **$**	20 **$**	100 **$**
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40

Note: **1)** SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) Painting specification for all other exposed steel surfaces not covered above shall be same as that given in Civil Sub-section, Part-B, Section VI for corrosion protection of steel structures.

C) LOW PRESSURE PIPING													
1	All Piping, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Color shade/ coding scheme.
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											
D) Fire Detection & Protection System, Compressed air system and Air-conditioning & Ventilation System													
For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System. For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Ventilation System. For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section--A-16 compressed air system.												
E) ESP													
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55	
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	60	

General Notes (Applicable for all above points A to E)

i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.

ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System

(i) Surface preparation shall be blast cleaned conforming *to* Sa *2-1/2* Swiss Standard.

(ii) Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.

(iii) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.

(iv) 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.

ANNEXURE-IV
MAINTENANCE TOOLS & TACKLES

SL. NO.	Constituent	Unit	Value
1.	Complete spanner sets	2	Nos.
2.	Grease gun	2	Nos.
3.	Multi meter	2	Nos.
4.	Pneumatic spanner (suitable for all sizes of fasteners)	2	Nos.
5.	Any other item specific to offered d5esign by bidder	1	lot

ERECTION & COMMISSIONING SPARES

S. No.	Particulars description	UNIT	QTY
1.0	Conveyor		
i)	Chain links & flight or equivalent for main conveyor	Pitch	12
ii)	Chain connecting pin & circlips or equivalent for main conveyor	Nos.	12
iii)	Chain links & flight or equivalent for transverse conveyor	Pitch	12
iv)	Chain connecting pin & circlips or equivalent for transverse conveyor	Nos.	12
2.0	Bucket elevator		
i)	Bucket	Nos.	12
ii)	Connector	Nos.	12
3.0	Solenoid assembly for valve	Nos.	16
4.0	Limit switches	Nos.	16
5.0	Level transmitters	Nos.	2
6.0	Temperature Transmitters	Nos.	6
7.0	Level switches	Nos.	6
8.0	ZSS	Nos.	2
9.0	Push button	Nos. of each type	2
10.0	Bearing	Sets of each type & size	2
11.0	Plummer blocks/ bearing house	Sets of each type & size	1
12.0	Coupling	Sets of each type & size	1
13.0	MCB	Nos. of each type & size	10% of total quantity
14.0	Motors/geared motor	Nos. of each type & rating	1

ANNEXURE – V

DRAWINGS / DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information

S.N.	BHEL DRG NO	Drg Title	Schedule week no. after date of LOI
BASIC ENGINEERING DRAWINGS/ DOCUMENTS			
1	PE-V0-512-160-A101	DESIGN PHILOSPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM (CONVEYOR TYPE)	3
2	PE-V0-512-160-A105	Flow diagram/P&ID of MILL REJECT SYSTEM (CONVEYOR TYPE)	3
3	PE-V0-512-160-A109	MRHS Layout drawing including air and water piping layout	5
4	PE-V0-512-160-A110	Sub-vendor list along with inspection category for MILL REJECT SYSTEM (CONVEYOR TYPE)	3
5	PE-V0-512-160-A120	GA drawing of chain conveyor with Data Sheet and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	4
6	PE-V0-512-160-A125	GAD of Bucket elevator with DS & civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	4
7	PE-V0-512-160-A122	GAD for Silo (G.A with tentative location) with DS and civil load data & foundation location details for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
BALANCE ENGINEERING DRAWINGS/ DOCUMENTS			
8	PE-V0-512-160-A102	GA drawing of Pressure relief valve for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
9	PE-V0-512-160-A103	GA of Bag Filter along with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
10	PE-V0-512-160-A104	Electrical Load List for MILL REJECT SYSTEM (CONVEYOR TYPE)	3
11	PE-V0-512-160-A106	Instrument Schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
12	PE-V0-512-160-A108	PG Test Procedure for MILL REJECT SYSTEM (CONVEYOR TYPE)	16
13	PE-V0-512-160-A111	WELDING PROCEDURE SPECIFICATION for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
14	PE-V0-512-160-A112	QAP OF STRUCTURAL STEEL / PLATES for MILL REJECT SYSTEM (CONVEYOR TYPE)	4
15	PE-V0-512-160-A113	QAP OF PYRITE HOPPER, TERMINAL BOX for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
16	PE-V0-512-160-A114	QAP OF CHAIN AND CHAIN CONVEYOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
17	PE-V0-512-160-A115	QAP OF BUCKET ELEVATOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
18	PE-V0-512-160-A116	QAP of LOCAL CONTROL PANEL for MILL REJECT SYSTEM (CONVEYOR TYPE)	6
19	PE-V0-512-160-A117	GA drawing for Pyrite Hopper with Data Sheet and civil load data & foundation location details for MILL REJECT	4

		SYSTEM (CONVEYOR TYPE)	
20	PE-V0-512-160-A118	QAP OF SECTOR GATE for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
21	PE-V0-512-160-A119	QAP OF KNIFE GATE for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
22	PE-V0-512-160-A121	QAP OF RUPTURE DISC for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
23	PE-V0-512-160-A123	QAP OF EXPANSION BELLOW for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
24	PE-V0-512-160-A124	QAP OF BAG FILTER for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
25	PE-V0-512-160-A126	QAP OF GEARED MOTOR for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
26	PE-V0-512-160-A130	QAP OF VALVES for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
27	PE-V0-512-160-A132	GA drawing for Sector Gate with Data Sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
28	PE-V0-512-160-A133	QAP OF INSTRUMENTS for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
29	PE-V0-512-160-A135	GA drawing for Knife gate valve along with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
30	PE-V0-512-160-A138	GA of Metallic Expansion Bellow with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
31	PE-V0-512-160-A139	GA of Rupture Disc with data sheet for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
32	PE-V0-512-160-A141	Block Logic Diagram/Control Scheme of the MRHS with HMI screen for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
33	PE-V0-512-160-A142	GA and data sheet of C&I Instruments for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
34	PE-V0-512-160-A143	Data sheet of Geared Motor (For All Motors) for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
35	PE-V0-512-160-A144	Technical data sheet of cable tray for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
36	PE-V0-512-160-A146	GA & interconnection wiring details for Pyrite Hopper LCP, Drag Link Chain Conveyor, Bucket Elevator, Silo LCP. for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
37	PE-V0-512-160-A148	Painting Schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	8
38	PE-V0-512-160-A149	Pipe and valve schedule for MILL REJECT SYSTEM (CONVEYOR TYPE)	10
39	PE-V0-512-160-A150	Cable Schedule - Signal and Control for MILL REJECT SYSTEM (CONVEYOR TYPE)	12
40	PE-V0-512-160-A151	O & M for MILL REJECT SYSTEM (CONVEYOR TYPE)	24
41	PE-V0-512-160-A152	QAP OF PIPES for MILL REJECT SYSTEM (CONVEYOR TYPE)	10

Electrical equipment and cable tray layout drawing, Electrical equipment GA, Cable Schedule & Cable Interconnection drawings (as applicable) shall also be submitted.

Notes: 1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.

Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.

1. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
2. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:-

a) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

b) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.

c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.

d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C… etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3 ….etc.

f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.

g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.

h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.

i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

j) Bidder to follow the following the drawing submission schedule:

k) 1st submission of drawings from date of LOI as per the submission schedule.

l) Every revised submission incorporating comments – within 10 days.

m) Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

n) BHEL /Customer Comment/Approval on subsequent revision shall be provided within 18 days of vendor's submission.

ANNEXURE- VI

FUNCTIONAL GUARANTEE

FUNCTIONAL GUARANTEES, LIQUIDATED DAMAGES FOR SHORTFALL IN PERFORMANCE AND GUARANTEE TESTS

The term "Performance Guarantees" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Functional Guarantees". Similarly the term "Performance Tests" wherever appears in this Sub-Section shall have the same meaning and shall be synonymous to "Guarantee Test(s)".

The term “BMCR” (Boiler Maximum Continuous Rating) appearing in the Technical Specification shall mean the maximum continuous steam output of Steam Generator (as defined Cl. No. 1.02.00 Sub-section A-01, Part-B) at super heater outlet at rated parameters.

The term “TMCR” (Turbine maximum continuous rating) appearing in the technical specification shall mean 800 MW electrical power output at generator terminals (power at generator terminals as per clause indicated in this sub-section) under rated steam parameters, 0% cycle make-up and 77 mmHg (abs) condenser pressure unless used in conjunction with a different cycle make-up and/or a different condenser pressure and /or a different throttle steam pressure.

1.00.00 **PERFORMANCE GUARANTEES**

1.00.01 **General Requirements**

a) The Contractor shall guarantee that the equipment offered shall meet the ratings and performance requirements stipulated for various equipment covered in these specifications.

b) The guaranteed performance parameters indicated/furnished by the bidder in his offer, shall be without any tolerance values whatsoever and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.

c) The Contractor shall conduct performance test and demonstrate all the guarantees covered herein, during performance guarantee/acceptance test. The various tests which are to be carried out during performance guarantee/acceptance test are listed in this Sub-section. The guarantee tests shall be conducted by the Contractor at site in presence of Employer on each unit individually.

d) All costs associated with the tests including cost associated with the supply, calibration shall be included in the bid price.

e) It is the responsibility of the contractor to perform the Performance Guarantee/ Acceptance test as specified in this subsection. At all times during the Performance Tests the emissions and effluents from the Plant shall not exceed the Guaranteed Emission and Effluent Limits.

f) The Contractor shall make the plant ready for the performance guarantee tests before start of Initial Operation.

All CAT-1 Performance Guarantee tests shall be conducted along with initial operation except following

a) Coal Pulverisor Wear Parts Warranty
b) Particulate Emission/ESP Efficiency, FGD.
c) Auxiliary power consumption for Station Auxiliaries (PG Test for Station Auxiliary Power Consumption to be done along with unit#2 initial operation)
d) "PG test of Cooling Tower (NDCT) shall be carried out by the contractor within one year of successful completion of trial operation of the cooling tower and at a time when the atmospheric conditions are within limits of deviation from the design conditions as specified, preferably in the period from May to September.

If Unit trial operation falls in these months then PG test of NDCT can be clubbed with Unit trial operation.

e) PG test of A/C System (for aux. power consumption under station auxiliaries) shall be carried out by the contractor within one year of successful completion of trial operation of the respective A/C system during summer in the months of May-August. If unit#2 trial operation falls in these months then PG test of A/C system can be clubbed with unit#2 trial operation.

g) Instruments for PG test and instruments for process control of similar applications are envisaged to be of same make and model having same accuracy level. However, instruments for PG test are also acceptable as per standard and proven practice of the contractor/OEM and in such case, instruments for process control shall be as per requirements specified in Part-B of technical specifications. Instruments to be used for PG test shall be additionally supplied over and above the instruments shown in tender P&IDs. PG test equipment being supplied, installed and commissioned for each unit, shall be retained by employer after completion of PG test.

Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation.

All PG test process parameters shall be made available in DDCMIS.

h) Tools and tackles, instruments/devices including flow devices, matching flanges, impulse piping & valves etc. and any special equipment, required for the successful completion of the tests, shall be provided by the contractor free of cost.

i) The Performance / Acceptance test shall be carried out as per the standard procedure included in the specification. For some of the PG tests, standard PG test procedures have not been included in the specification. PG test procedure for such PG tests shall be submitted, as per latest International codes / standard meeting the specification requirements along with sample calculations & detailed activity plan of preparation (including test instrumentation), conductance and evaluation of Guarantees, within 90 days of the date of Notification of Award and finalization of the PG test procedure shall be done within 180 days from the date of Notification of Award.

1. For Cat-I Performance / Acceptance tests to be conducted along with the initial operation: After the conductance of Performance test, the test results shall be calculated in Contractor's PG test program/ software. The correction curves shall be fed/inbuilt in the PG test program/software. Provision of manual entry of offline data which cannot be captured online (such as Relative humidity, atmospheric pressure, Coal analysis, Unburnt carbon in fly ash and bottom ash, Bottom ash / fly ash collection at various hoppers, Flue gas analysis (grid result) etc.) and necessary for calculation of PG Test result shall also be provided. The contractor shall submit the detailed test evaluation report of Performance test results to Employer promptly but not later than 7 days from the date of conductance of Performance test.

2. For Performance / Acceptance tests other than those identified at 1 above: After the conductance of Performance test, the contractor shall submit the test evaluation report of Performance test results to Employer promptly but not later than 7 (seven) days from the date of conductance of Performance test. However, preliminary test reports shall be submitted to the Employer after completing each test run.

j) The contractor shall submit for Employer's approval the detailed Performance Test procedure (except for the guarantee tests for which the standard PG test procedure is identified in technical specification) containing the following:

i. Object of the test.
ii. Various guaranteed parameters & tests as per contract.
iii. Method of conductance of test and test code.
iv. Duration of test, frequency of readings & number of test runs.
v. Method of calculation.
vi. Correction curves and respective equations for graphs to be fed for the online computation.
vii. Instrument list consisting of range, accuracy, least count, and location of instruments along with reference approved P&IDs.
viii. Scheme showing measurement points.
ix. Sample calculation.
x. Acceptance criteria.
xi. Any other information required for conducting the test.

k) In case during performance guarantee tests it is found that the equipment/system has failed to meet the guarantees, the Contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent. However, if the specified performance guarantee(s) are still not met even after the above modifications/replacements within ninety (90) days or a reasonable period allowed by the Employer, after the tests have been completed Employer will have the right to the following:

i) For Category-I Guarantees

Accept the equipment/system/plant after levying Liquidated Damages as specified hereunder. The liquidated damages, for shortfall in performance indicated in clause 1.01.02 for this sub-section are on per unit basis and shall be levied separately for each unit, except for the rate indicated for auxiliary power consumption for station auxiliaries which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies. The performance guarantees coming under this category shall be called 'Category - I' Guarantees.

ii) For Category-II Guarantees

In case the performance guarantee(s) are not met by the Contractor during demonstration test, the Contractor shall carry out all necessary modifications and/or replacements to comply with the guaranteed requirements at no extra cost to the Employer and re-conduct the performance guarantee test(s) with Employer's consent.

If, however, the demonstrated guarantee(s) are not met even after the above modifications / replacements within ninety (90) days, it will be concluded that, the equipment has failed to meet the guarantee(s).

In such a case, Employer shall Reject the equipment/plant/system and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category - II ' Guarantees. Conformance to the performance requirements under Category -II is mandatory.

iii) For Category-III Guarantees

Accept the equipment/system after assessing the deficiency in respect of the

various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the EMPLOYER. Such damages shall, however be limited to the cost of replacement of the equipment(s) / system(s) replacement of which shall remove the deficiency so as to achieve the guarantee performance. These parameters/capacities shall be termed as category - III, guarantees.

1.01.00 **GUARANTEES UNDER CATEGORY - I**

x) Auxiliary Power Consumption for Station Auxiliaries

Station auxiliary power consumption comprising of all station Auxiliaries required for continuous station operation at 2 x 800 MW (i.e. 100% rated load of all the units) under rated steam conditions and at condenser pressure of 77 mm Hg (abs) with 0% make-up with design coal shall be guaranteed in line with the requirements stipulated in clause 1.01.07.02 of this sub section.

Notes:

(a) Power consumption of each of the pump/fan/compressors/ Conveyors etc. wherever mentioned shall be measured with its own drive at the switchgear end.

1.01.02 **AMOUNT OF LIQUIDATED DAMAGES APPLICABLE FOR CATEGORY-I GUARANTEES**

If the performance guarantee(s) are not met by the Contractor during PG Test, it will be concluded that, the equipment has failed to meet the guarantee(s) and action shall be taken

as per the Contract Requirement. If the performance guarantee(s) specified at clause 1.01.01 are not met by the Contractor even after the modifications and/or replacements mentioned at clause 1.00.01 of this Sub-section, Employer will accept the equipment/system only after levying liquidated damages against the Contractor, at the rates listed herein, and such liquidated damages shall be deducted from the Contract Price:

S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value

S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value
(xi)	For increase in Station auxiliary power consumption comprising of all station Auxiliaries required for continuous station operation at 2 x 800 MW (i.e. 100% rated load of all the units).	**US $ 4,350** (US Dollar Four Thousand Three Hundred Fifty only) per 1 kW increase in Station Auxiliary Power Consumption.	Not more than **21275** KW

S. No	Guarantee	Rate of Liquidated Damages (LD)	Limiting Value

NOTE:

i) Each of the liquidated damages specified above shall be independent and these liquidated damages shall be levied concurrently as applicable.

ii) if the contract currency is other than US dollars, then the liquidated damages shall be in equivalent amount in contract currency based on Bill selling exchange rate of State Bank of India prevailing on the date of award of contract.

iii) All these liquidated damages for short fall in performance shall be deducted from the contract price as detailed in accompanying General Conditions of Contract (GCC)/ Special Conditions of Contract (SCC).

iv) Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed Fifteen percent (15%) of the Contract Price.

v) The LD values are applicable on per unit basis except for the value indicated for auxiliary power consumption for station auxiliaries, which is on station basis. The liquidated damages shall be prorated for the fractional parts of the deficiencies.

vi) Bidder not confirming about meeting the limiting values as specified for various guarantees shall not be considered and their bids shall be rejected.

1

GUARANTEES UNDER CATEGORY - II

1.02.00 Noise

All the plant, equipment and systems covered under this specification shall perform continuously without exceeding the noise level over the entire range of output and operating frequency specified in General Technical Requirement, Part-C Section-VI of the technical specifications.

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 61672-1 & 2 (latest edition)

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. Additional measurement points shall be considered based on the applicable standards and the size of the equipment. The measurement shall be done with slow response on the A - weighting scale. The average of A-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. Corrections for background noise shall be considered in line with the applicable standards. All the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests.

1.03.08	**Mill Reject System** Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage in the system.

APPENDIX-II

PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY CONTRACTOR

1. Deputation of team to site to associate with the Guarantee tests,
2. Calibration of belt weigher scales and accuracy of same to be demonstrated to NTPC.
3. Arrangement of wattmeters / energymeters calibrated and sealed from approved Govt. test house or NTPC site laboratory. Arrangement of any other instrument/ accessory for the test.
4. Proper adjustment of skirt boards and belt cleaners prior to the start of tests.
5. Arrangement of calibrated equipments for measurement of vibration & noise levels.
6. Protection Relays of LT/HT switchgears and all motor feeders shall be checked.
7. Belt protection switches, local push buttons, hooters, brakes/rail clamps to be in working order.
8. Free rotation of idlers and pulleys.
9. Protection relays of LT/HT switchgears and all motors/transformer feeders to be checked.
10. Sufficient illumination.

ANNEXURE – IIA

FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE

Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	NTPC comments on the tests proposed by vendor

APPENDIX-IV

GUARANTEE TEST PROFORMA

POWER MEASUREMENT

Project :

Package :

Date :

1. Equipment/Stream Composition :
2. Motor Description :
3. Sr. No. of meters used :
4. Date of Calibration of instrument and name of test house :
5. Multiplying factor (M.F.) of the wattmeter :
6. Wattmeter Readings (to be taken at 1 minute intervals) :

Sl. No.	Measurement Terminal Location	Time	Voltage (Volts)	Current (amps)	kw Reading M.F.		Total (W1+W2) MF kw	Remarks
					W1	W2		

APPENDIX-IV

7. **Energy meter Readings**

Sl.	Equip-Ment	Time Duration		Energy meter Readings kwHr		Equipment kw (R2-R1)/ (t2-t1)	Remarks*
		Initial	Final	Initial	Final		

*Reason and duration for system trip/stop may be recorded in remarks column.

NTPC **Contractor**

APPENDIX-V

GUARANTEE TEST PROFORMA

VIBRATION LEVEL MEASUREMENTS

Project :

Package :

Date :

Time :

Details of vibration Level Meter

1. Make

2. Model & Sl.No.

3. Date of calibration with name of Test House

Sl.No.	Equipment	Pick *Point	Vibration level Amplitude/Velocity		
			Horizontal Micron/ mm/ sec.	Vertical micron/ mm/sec.	Axial Micron / mm/sec.

* Reading shall be taken at all the bearings of motor, gear box and driven equipment. In case of conveyor galleries, vibrations shall be measured at min. three locations, at midpoint of stringer between two short supports.

NTPC **Contractor**

APPENDIX-VI

GUARANTEE TEST PROFORMA

NOISE LEVEL MEASUREMENT

Project :

Package :

Date :

Details of Sound Level Meter

1. Make

2. Model

3. Date of calibration with name of Test House

Sl.No.	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks

NTPC **Contractor**

* For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.

ANNEXURE- VII

GENERAL TECHNICAL REQUIREMENT

1.00.00 **INTRODUCTION**

This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out in Section-VI, the Technical Specification and the Technical Data Sheets.

2.00.00 **BRAND NAME**

Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.

3.00.00 **NOT USED**

4.00.00 **COMPLETENESS OF FACILITIES**

4.01.00 Bidders may note that this is a EPC Package contract. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure a completely engineered plant shall be provided.

4.02.00 All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All same standard components/ parts of same equipment provided, shall be interchangeable with one another.

4.03.00 For the C&I systems, the Contractor shall be required to provide regular information about future upgrades and migration paths to the Employer.

5.00.00 **CODES & STANDARDS**

5.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following :

a) Indian Electricity Act

b) Indian Electricity Rules

c) Indian Explosives Act

d) Indian Factories Act and State Factories Act

e) Indian Boiler Regulations (IBR)

f) Regulations of the Central Pollution Control Board, India

g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India

h) Pollution Control Regulations of Department of Environment, Government of India

i) State Pollution Control Board.

(j) Rules for Electrical installation by Tariff Advisory Committee (TAC).

(k) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996

(l) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998

(m) Explosive Rules, 1983

(n) Petroleum Act, 1984

(o) Petroleum Rules, 1976,

(p) Gas Cylinder Rules, 1981

(q) Static and Mobile Pressure Vessels (Unified) Rules, 1981

(r) Workmen's Compensation Act, 1923

(s) Workmen's Compensation Rules, 1924

(t) NTPC Safety Rules for Construction and Erection

(u) NTPC Safety Policy

(v) CERC (Indian Electricity Grid Code) Regulations, 2023

(w) CEA (Flexible Operation of Coal Based Thermal Power Generating Units) Regulations, 2023

(x) Any other statutory codes / standards / regulations, as may be applicable.

5.02.00 Unless covered otherwise in the specifications, the latest editions (as applicable at the date fifteen (15) days prior to the date of bid submission), of the codes and standards given below shall also apply:

a) Bureau of Indian standards (BIS)

b) Japanese Industrial Standards (JIS)

c) American National Standards Institute (ANSI)

d) American Society of Testing and Materials (ASTM)

e) American Society of Mechanical Engineers (ASME)

f) American Petroleum Institute (API)

g) Standards of the Hydraulic Institute, U.S.A.

h) International Organization for Standardization (ISO)

i) Tubular Exchanger Manufacturer's Association (TEMA)

j) American Welding Society (AWS)

k) National Electrical Manufacturers Association (NEMA)

l) National Fire Protection Association (NFPA)

m) International Electro-Technical Commission (IEC)/ European Norm (EN)

n) Expansion Joint Manufacturers Association (EJMA)

o) Heat Exchange Institute (HEI)

p) IEEE standard

q) JEC standard

5.03.00	Other International/ National standards such as DIN, VDI, BS, GOST etc. shall also be accepted for only material codes and manufacturing standards, subject to the Employer's approval, for which the Bidder shall furnish, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned elsewhere in the specification together with the complete word to word translation of the standard that is normally not published in English.
5.04.00	As regards highly standardized equipments such as Steam Turbine and Generator, National /International standards such as JIS, DIN, VDI, ISO, SEL, SEW, VDE, IEC & VGB shall also be considered as far as applicable for Design, Manufacturing and Testing of the respective equipment. However, for those of the above equipment not covered by these National / International standards, established and proven standards of manufacturers shall also be considered.
5.05.00	In the event of any conflict between the codes and standards referred to in the above clauses and the requirement of this specification, the requirement of Technical Specification shall govern.
5.06.00	Two (2) English language copies of all national and international codes and/or standards used in the design of the plant and equipment shall be provided by the Contractor to the Employer within two calendar months from the date of the Notification of Award.
5.07.00	In case of any change in codes, standards & regulations between the date fifteen (15) days prior to the date of bid submission and the date when vendors proceed with fabrication and the date when vendors proceed with fabrication, the Employer shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Contractor to bring to the notice of the Employer such changes and advise Employer of the resulting effect.
5.08.00	A detailed list of standards apart from those mentioned in the respective detailed specifications in other parts of Section-VI to which all equipment/systems/civil works should conform as indicated in this Part C and elsewhere in the specification.
6.00.00	**EQUIPMENT FUNCTIONAL GUARANTEE**
6.01.00	The functional guarantees of the equipment under the scope of the Contract is given in Section-VI Part - A & B of Technical Specifications. These guarantees shall supplement the general functional guarantee provisions covered under Defect liabilities Section-IV, General Conditions of Contract.
6.02.00	Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.

7.00.00 **DESIGN OF FACILITIES/ MAINTENANCE & AVAILABILITY CONSIDERATIONS**

7.01.00 **DESIGN OF FACILITIES**

All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.

The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.

7.02.00 **MAINTENANCE AND AVILABILITY CONSIDERATIONS**

Equipment/works offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/ availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants stated in his experience list.

Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the furnace, inspection of the entire hot gas path, turbine & equipments, inspection of the steam path and the minor and major overhauls shall be specified in terms of fired hours, clearly defining the spare parts and man-hour requirement for each stage.

Lifting devices i.e. hoists and chain pulley jacks, etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.

Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification.

8.00.00 **DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR**

8.01.00 Bidders may note that this is an **EPC Package contract**. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required to ensure a completely engineered plant shall be provided in respect of mechanical, electrical and power systems, control & instrumentation, civil & structural works as per the scope.

Each main and auxiliary equipment/item of the plant including instruments shall be assigned a unique tag number. The assignment of tag numbers shall be in accordance with KKS system. In all drawings/documents/data sheet etc. KKS tag number of the equipment/item/instrument etc. shall be indicated.

The Contractor shall furnish engineering data /drawings in accordance with the schedule of information as specified in Technical Data Sheets and Technical Specification.

A comprehensive engineering and quality coordination procedure shall be finalized with the successful bidder covering salient features as described in this section of specifications.

8.02.00 The number of copies/prints/CD-ROMs/manuals to be furnished for various types of document is given in **Annexure-VI** to this Part-C, Section-VI of the Technical Specification.

8.03.00 The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following:

8.03.01 A) **BASIC ENGINEERING DOCUMENTATION**

Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum:

i) System description of all the mechanical, electrical, control & instrumentation & civil systems.

ii) Technology scan for each system / sub-system & equipment.

iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options.

iv) Optimization studies including thermal cycle optimization.

v) Sizing criteria of all the systems, sub-systems/ equipments/ structures/ equipment foundations alongwith all calculations justifying and identifying the sizing and the design margins.

vi) Schemes and Process & Instrumentation diagrams for the various systems/ sub-system with functional write-ups.

vii) Water Balance diagram.

viii) Operation Philosophy and the control philosophy of the Main Plant and other plants.

ix) General Layout plan of the power station incorporating all facilities in Bidder's as well as those in the Employer's scope. This drawing shall also be furnished in the form of CD-ROMs to the Employer for engineering of areas not included in bidder's scope.

x) Basic layouts and cross sections of the main plant building (various floor elevations), boiler, fuel oil area, transformer yard, switchyard and other areas included in the scope of the bidder.

xi) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.

The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed & finalised with the Employer.

B) **DETAILED ENGINEERING DOCUMENTS**

i) General layout plan of the station.

ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant.

iii) Flow diagram, Process and Instrumentation diagrams along with write up and system description.

iv) Start-up curves for boiler and both turbines and boiler combined together as a unit for various start-ups, viz. Cold, Warm and Hot start up.

v) Piping isometric, composite layout and fabrication drawings, design philosophy & design parameter selection for each piping system, Pressure drop calculation & flash tank sizing calculation.

vi) Piping engineering diagrams, pipe and fittings schedules, System-wise or P&ID wise prepared pipe schedule, valve schedule, insulation schedule, hanger and support schedule and Piping isometric / fabrication isometric drawings for pipe size 65mm NB and above with BOM, Painting schedule. Hanger / support arrangement drawing with BOM, Valve GA drawings, Layout drawings for site routed piping (i.e. for pipe sizes below 65NB) along with BOM (and submission of the same to the employer / project manager before start of work) and System wise stress analysis / dynamic analysis report (including input) along with stress isometric drawing / sketch marked with node points. Also As-Built drawing for information & Records: (i) Piping fabrication isometric drawing (ii) composite piping layout drawing (iii) Hanger / Support arrangement drawing.

vii) Technical data sheets for all bought out and manufactured items. Contractor shall use the Employer's specifications as a base for placement of orders on their sub vendors.

viii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like Mills, Fans, BFPs, CEPs, Heaters/ Deaerators, Water cooled Condensers, Vacuum pumps etc.

ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier.

x) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable & input and output data alongwith stress analysis isometrics showing nodes.

xi) Thermal cycle information (heat balance diagrams, boiler performance calculations, condenser, design ramp rates of SG and TG and heat exchanger thermal calculations etc.).

xii) Characteristic Curves/ Performance Correction Curves. Hydraulic & Mechanical design calculations for condensers & heaters.

xiii) Comprehensive list of all Terminal Points which interface with Employer's facilities, giving details of location, terminal pressure, temperature, fluid handled & end connection details, forces, moments etc.

xiv) Power supply single line diagram, block logics, control schematics, electrical schematics, etc.

xv) Protection system diagrams and relay settings.

xvi) Cables schedules and interconnection diagrams.

xvii) Cable routing plan.

xviii) Instrument schedule, measuring point list, I/O list, Interconnection & wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc.

xix) Alarm and annunciation/ Sequence of Event (SOE) list and alarms & trip set points.

xx) Sequence and protection interlock schemes.

xxi) Type test reports, insulation co-ordination study report and power system stability study report.

xxii) Control system configuration diagrams and card circuit diagrams and maintenance details.

xxiii) Detailed DDCMIS system manuals.

xxiv) Detailed flow chart for digital control system.

xv) Mimic diagram layout, Assignment for other application engg.

xxvi) Civil and Structural works drawings and documents for all structures, facilities, architectural works, foundations underground and overground works and super-structural works as included in the scope of the bidder civil calculation sheets including structural analysis and design alongwith output results.

xxvii) Underground facilities, levelling, sanitary, land scaping drawings.

xxviii) Geotechnical investigation and site survey reports (if and as applicable).

xxix) Model study reports wherever applicable.

xxx) Functional & guarantee test procedures and test reports.

xxxi) Documentation in respect of Quality Assurance System, and Documentation in respect of Commissioning, as listed out elsewhere in this specification.

xxxii) BOP documents such as P&IDs, Sizing calculations for various equipment's, performance curves, datasheet etc. (For CHP, AHP, PU, Water System etc.) shall be as per MDL.

xxxiii) Bidder shall submit all tabulated design calculations/ data (e.g. Pipe schedule, valve schedule, etc.), in both EXCEL format as well as in PDF format to enable NTPC for fast review /approval.

8.03.02 **INSTRUCTION MANUALS**

The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in **Annexure-IV.** The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following.

A) ERECTION MANUALS

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of a particular equipment/system. The erection manual should contain the following as a minimum.

a) Erection strategy.

b) Sequence of erection.

c) Erection instructions.

d) Critical checks and permissible deviation/tolerances.

e) List of tools, tackles, heavy equipments like cranes, dozers, etc.

f) Bill of Materials

g) Procedure for erection and General Safety procedures to followed during erection/installation.

h) Procedure for initial checking after erection.

i) Procedure for testing and acceptance norms.

j) Procedure / Check list for pre-commissioning activities.

k) Procedure / Check list for commissioning of the system.

l) Safety precautions to be followed in electrical supply distribution during erection.

B) OPERATION & MAINTENANCE MANUALS

a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side.

b) The arrangement and contents of O & M manuals shall be as follows:

1) Chapter 1 - Plant Description: To contain the following sections specific to the equipment/system supplied

(a) Description of operating principle of equipment / system with schematic drawing / layouts.

(b) Functional description of associated accessories / controls. Control interlock protection write up.

(c) Integrated operation of the equipment alongwith the intended system. (This to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers).

(d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries.

(e) Design data against which the plant performance will be compared.

(f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets.

(g) Identification system adopted for the various components, (it will be of a simple process linked tagging system).

(h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume).

2) Chapter 2.0 - Plant Operation: To contain the following sections specific to the equipment supplied

(a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc.

(b) Limiting values of all protection settings.

(c) Various settings of annunciation/interlocks provided.

(d) Startup and shut down procedure for equipment alongwith the associated systems in step mode.

(e) Do's and Don'ts related to operation of the equipment.

(f) Safety precautions to be taken during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions.

(g) Parameters to be monitored with normal value and limiting values.

(h) Equipment isolating procedures.

(i) Trouble shooting with causes and remedial measures.

(j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing.

(k) Routine Operational Checks, Recommended Logs and Records

(l) Change over schedule if more than one auxiliary for the same purpose is given.

(m) Preservation procedure on long shut down.

(n) System/plant commissioning procedure.

3) Chapter 3.0 - Plant Maintenance- To contain the following sections specific to the equipment supplied.

(a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population.

(b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment.

(c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc.

(d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc.

(e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out.

(f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done.

(g) Long term maintenance schedules

(h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling.

(i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at longer intervals to ensure trouble free operation and quantity required for complete replacement.

(j) Tolerance for fitment of various components.

(k) Details of sub vendors with their part no. in case of bought out items.

(l) List of spare parts with their Part No, total population, life expectancy & their interchangeability with already supplied spares to NTPC.

(m) List of mandatory and recommended spare list along with manufacturing drawings, material specification & quality plan for fast moving consumable spares.

(n) Lead time required for ordering of spares from the equipment supplier, instructions for storage and preservation of spares.

(o) General information on the equipment such as modification carried out in the equipment from its inception, equipment population in the country / foreign country and list of utilities where similar equipments have been supplied.

8.03.03 After finalization and approval of the Employer, the O & M Manuals shall be submitted as indicated in Annexure-VI. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals (both erection and O & M manuals have been supplied to the Employer.

If after the commissioning and initial operation of the plant, the instruction manuals (Erection and /or O &M manuals) require modifications/additions/ changes, the same shall be incorporated and the updated final instruction manuals shall be submitted by the Contractor to the Employer for records and number of copies shall be as mentioned in Annexure-VI.

8.03.03 **PLANT HANDBOOK AND PROJECT COMPLETION REPORT**

8.03.03.01 **PLANT HANDBOOK**

The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including

i) Design and performance data.

ii) Process & Instrumentation diagrams.

iii) Single line diagrams.

iv) Sequence & Protection Interlock Schemes.

v) Alarm and trip values.

vi) Performance Curves.

vii) General layout plan and layout of main plant building and auxiliary buildings

viii) Important Do's & Don't's

The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.

8.03.03.02 **PROJECT COMPLETION REPORT**

The Contractor shall submit a Project Completion Report at the time of handing over the plant.

8.03.04 **DRAWINGS**

a) i) All the plant layouts shall be made in computerized 3D modelling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.

ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per **Annexure-VI** of Part-C. The soft copies shall be uploaded by the vendors in C-folders, a Web-based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC.

Similarly, the vendor can download the drawings/documents, approved/ commented by NTPC, through above site.

The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.

iii) Final copies of the approved drawings along with requisite number of hard copies shall be submitted as per **Annexure-VI** of Part-C.

iv) Contractor shall prepare the model of all the facilities located within plant boundary covering facilities in Main Plant Block area and Balance of plant (BOP) area in an integrated & intelligent 3D software solution. Main Plant Block area shall include Transformer Yard, TG building (including all facilities), Boiler area, ESP area, chimney area, FGD area and any other facility located in main plant block. BOP area shall include all facilities pertaining to AHP, CHP, LHP, GHP, DM PT plant, pipe & cable racks and any other facility located within plant boundary.

All piping layouts, equipment layouts, floor plans, ducting layout (Air/flue gas, A/C, Ventilation etc.), General Arrangement drawings and RCC layout of major buildings and structural arrangement drawings shall necessarily be extracted from the aforesaid 3D model and submitted for employer’s review along with the 3D review model to enable NTPC to review and approve these drawings.

Contractor shall prepare and provide 3D design review model (network ready, which shall include visual interference check, walk-through

animation, video simulation for major equipment placement and removal, visual effect, photo realism etc.), which is extracted from intelligent 3D model and shall make a presentation of the same every 3 months from LOA to enable NTPC to review the progress of engineering or as & when required by employer.

Observations of NTPC during the 3D model review to be incorporated and revised editable model to be submitted to NTPC within 2 weeks.

The complete 3D data (editable model) which shall be utilised for all future detailed engineering related to maintenance, operation, R&M, efficiency improvement of the project etc. Complete 3D model along with as built GADs, layout, isometrics, reports extracted and 3D models for all disciplines , with any other document generated from 3D model and naming conventions with as-built updates along with complete reference databases, component catalogues for all the size range shall be handed over to owner. Apart from the 3D Model, all drawings like GADs, Isometrics etc. extracted from the model shall also be submitted by the Contractor in Electronic form. 3D model along with complete Project databases shall be submitted at each model review stage and as final as-built. The contractor shall also submit all the configuration files, customization files, templates and all referenced databases.

All input files of software used for design of Equipments / Piping like CAESAR2 files, input files for Pressure vessel design, datasheets etc., shall be handed over to NTPC as per NTPC specifications for handover of Engineering Information.

Further, two Licenses of the used 3D Modelling Software (One for Engineering View and One for Site View) shall be provided along with compatible Hardware for possible review and study of the Model Files being submitted by the Bidder Time to time.

All software and hardware shall be supplied by bidder within 3 months of NOA. The 3D modelling software shall preferably be the same software bidder will be using for preparation of 3D model or it shall have all editable features to edit the model supplied by bidder on time to time basis.

All software provided shall necessarily include cost for perpetual license(s) for use on all the machines and an Annual maintenance contract (AMC) which shall include software upgrades as & when released by the software agency for a period of three years after warranty/guarantee period .

Handover Plan: There shall be continuous handover of documents and data at various stages of the project including rules and trigger points for handover of data to NTPC shall be at 30%, 60% and 90 % of 3D model stage.

Database backup shall be taken every month and handed over to NTPC.

b) All documents/text information shall be in latest version of MS Office/MS Excel/PDF format as applicable.

c) All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.

d) Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

e) The drawings submitted by the Contractor (or their subvendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.

Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION" prior to submission **in line with suggestive MDL**.

Further, space shall be identified on each drawing for Approval stamp and electronic signature.

f) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external

connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer/ Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.

g) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.

h) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment /system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.

i) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority/ representative of Employer based on requirements of such piping indicated in approved/ finalised Flow Scheme/ Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.

Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.

j) As Built Drawings

After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to “as built” conditions and submit no. of copies as per **Annexure VI**.

k) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to

submission to the Employer. In case drawings are found to be submitted without proper checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data/ drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

l) The Contractor shall submit adequate prints of drawing / data / document as per Annexure-VI. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule.

m) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.

8.03.05 **e-Learning Package:**

e-learning packages shall be supplied for the equipment / system for the following Steam Turbine Generator & auxiliaries and Steam Generator & auxiliaries along with associated electrical and C&I system.

8.03.05.01 Steam Turbine Generator & Auxiliaries

Steam Turbine including stop valves, control valves, overload valves and cross over piping. Steam Turbine Auxiliary Systems including Quick Closing and Ordinary NRVs, Turbine gland sealing system, Lubricating oil system and its purification system, Centralized oil storage and its purification system, Control fluid and its purification system, governing and protection system, exhaust hood spray cooling system, drainage and vent system, turbine preservation system, HP/LP Bypass system.

Generator and Auxiliary System including Generator, complete hydrogen cooling, carbon dioxide and nitrogen gas systems as applicable, complete seal oil system, complete water cooling system where applicable and complete excitation system.

Condensing Plant including Condenser, Condenser air evacuation system and Condenser on load tube cleaning system as applicable etc.

Drip Pump along with all accessories as applicable, Condensate Extraction Pumps along with all accessories, Deaerator level Control Station, Feed Water Heating Plant including Drain Cooler, low pressure heaters, deaerator and feed storage tank, high pressure heaters and associated accessories, Boiler Feed Pumps along with all accessories, Drive Turbine for Boiler Feed Pump along with all accessories, Feed regulating station, Make up system to Condenser, Gland Steam Condenser Recirculation System, Turbine Hall EOT Cranes and EOT Crane for Boiler Feed Pump as applicable.

8.03.05.02 **Steam Generator & Auxiliaries**

Furnace/evaporator, separator & drain collection vessel, superheater, reheater, economiser, startup recirculation & drain system, desuperheating spray system, safety valves, soot blowing system, draft plant including FD & ID fans, PA fan, air preheaters, SCAPH, coal preparation and firing system including raw coal feeder and pulverisers, coal burners, fuel oil system and oil burners, Electrostatic precipitator, NOx control system and Flue gas desulphurisation system, Aux. PRDS system.

8.03.05.03 These packages shall be installed on the Learning Management Server (LMS) of Power Management Institute (PMI), NTPC located at Noida. The Project Manager / Engineer- In-Charge (EIC) for the e-learning modules shall be from PMI.

1. The objective of the e-Learning package consisting of courses for erection, commissioning, operation and maintenance of equipment / system as specified above is to facilitate the employees to have first hand information / requirement with respect to above activities for the supplied equipment / system .

2. The bidder shall submit e-learning courses each for erection, commissioning, operation and maintenance of each of the equipment / system supplied as above.

a. The erection course(s) should include instructions on pre-checks, prerequisites, erection strategy, erection procedure etc.

b. The commissioning course(s) should include instructions on pre-commissioning, commissioning, initial operation etc.

c. The operation course(s) should include instructions on the permissive, interlocks, physical check-ups, start-up, shutdown and protections etc.

d. The maintenance course(s) should include instructions on predictive, preventive, breakdown and overhauling.

Depth of coverage of above courses shall be as specified for **"Instruction Manuals"** in above clauses. A literature on caution / safety while handling equipment / system for the above modules shall follow the description of the said equipment /system.

3. The e-Learning packages on equipment / system shall be installed by the vendor and shall be successfully test run in the presence of Project Manager / EIC or representative before acceptance by NTPC. The vendor will also give the master copy in form of Flash Drive/CD/DVD. The respective module for erection & commissioning shall be delivered and successfully test run at least three months before the scheduled start of the corresponding activity at site.

The respective module for operation & maintenance shall be delivered and successfully test run at least three months before scheduled first synchronization of first unit.

4. e-Learning course broad requirements:

a. The courses shall be web based and mobile based Application type. It shall run on all possible versions of web browser like Internet Explorer, Google Chrome, Firefox etc. on Laptop/Desktop and shall be Smartphone/Tablet/Mobile responsive. The Mobile responsive courses shall run on Android, Windows Mobile, Blackberry, iOS etc.

b. The courses shall support liquid/fluid page layout so that the entire screen gets adjusted to PC, Laptop, Smartphone/Mobile, Tablet and any other display devices.

c. Course content text shall be in English language and be associated with a voiceover in English language with Indian accent.

d. Courses shall be SCORM (Sharable Content Object Reference Model) compliant, version 1.2 which is compatible with LMS at PMI.

e. Each course shall have every physical and functional detail of the equipment / system supplied.

f. Each of the e-Learning course shall be based on multiple web pages and mobile pages with multiple modules.

g. There shall be option for self-assessment test after every course. In case the user doesn’t opt for self-assessment test the user shall be able to go to the next course. There shall be no restriction in no. of times for repeating the assessments. All correct answers along with the answers marked by the users shall be displayed at the end of test/quiz.

h. If Java and Flash, as applicable are not available in the system to run the package, then there shall be a prompt message for updation of the same.

i. Each course shall have a self-running interactive content with navigation buttons containing forward, backward, pause, bookmark and menu options in the course window.

j. The course shall contain chapter titled 'Introduction/overview' that explains the purpose of the course.

k. The course content shall contain descriptive text shall be factual, specific, terse, clearly worded, and simply illustrative, so that the user can understand it.

l. The system shall provide the user with the ability to select the information with a Cursor.

m. The course menu should contain table of content linked to concerned pages. The user shall be given the capability to access all of the functions available on the system through a menu system. This shall consist of active buttons, which shall control a hierarchy of pull down/pop-up menus. Menu shall appear quickly and exist only while a selection is being made. The user shall be given the capability to position the cursor or pointer on the menu item and use pointer device such as mouse to activate the function.

n. Every course shall contain the 3D design/drawing/exploded view/360^0 turn around view of the equipment/system, textual description of the equipment/system and its functionality with video (as applicable), animation and audio.

o. The users shall be able to control audio sound level associated with the courses.

p. Drawings / text in the courses shall be scalable (Zoom In/ Out).

q. The user shall have the capability to record a **bookmark** to mark displayed information for later recall, whenever he accesses the same course next time.

Notes:

1. e-learning Package of an equipment / system shall include e-learning courses for each of erection, commissioning, operation and maintenance of that equipment / system.
2. e-learning courses on erection, commissioning, operation and maintenance of an equipment / system shall include e-learning lessons/chapters/modules (as required) for erection, commissioning, operation and maintenance respectively of that equipment / system.
3. The vendor shall get the approval of one sample course from Project Manager / EIC before proceeding for further courses.

8.04.00 Provision for Fail Safe operation of vital Equipments

All the Plant and equipments / Systems supplied under the contract shall be designed following “Fail Safe” concept. In case of failure of Power supply like Electric power, Hydraulic pressure, Pneumatic pressure, Vacuum etc. the system should be designed in such a way that the equipment/Valves/dampers etc. shall always move/remains (as applicable) to safest position as per system requirement to ensure safety of Man and Machinery.

8.05.00 Engineering Co-ordination Procedure

8.05.01 The following principal coordinators will be identified by respective organizations after award of contract:

NTPC Engineering Coordinator (NTPC EC):

Name :

Designation :

Address :

a) Postal :

b) Telegraphic / e-Mail :

c) FAX : TELEPHONE :

Contractor's/ Vendor's Engineering Coordinator (VENDOR EC):

Name :

Designation :

Address :

a) Postal :

b) Telegraphic / e-Mail :

c) FAX : TELEPHONE :

8.05.02 All engineering correspondence shall be in the name of above coordinators on behalf of the respective organizations.

8.05.03 Contractor's/Vendor's Drawing Submission and Approval Procedure:

a) All data/information furnished by Vendor in the form of drawings/ documents/catalogues or in any other form for NTPC's information/ interface and or review and approval are referred by the general term "drawings".

b) Not used

c) All drawings (including those of subvendor's) shall bear at the right hand bottom corner the 'title plate' with all relevant information duly filled in. The Contractor shall furnish this format to his sub-vendor along with his purchase order for sub-vendor's compliance.

d) Not used

e) The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

f) **Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper endorsement for checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission.**

g) The Contractor shall submit drawing / data / document for Employer's review and approval. The drawings submitted by the Contractor/vendor shall be reviewed by NTPC and their comments shall be forwarded within three (3) weeks of receipt of drawings. Upon review of each drawing, depending on the correctness and completeness of the drawing, the same will be categorized and approval accorded in one of the following categories:

CATEGORY- I: Approved

CATEGORY- II Approved, subject to incorporation of comments/ modification as noted. Resubmit revised drawing incorporating the comments.

CATEGORY –III Not approved. Resubmit revised drawings for approval after incorporating comments/ modification as noted.

CATEGORY -IV For information and records.

h) After Rev 0 comments, the drawing will be locked in the system. Contractor will review the Rev 0 comments within 7 days & furnish the Comment Reply Sheet (CRS) to NTPC as an agenda point for TCM. TCM shall be conducted with Contractor on non-agreed comments of CRS. System will not allow Contractor to submit approval category drawings before the scheduled submission date. However, documents may be unlocked on case to case basis. Based on resolution of all comments and agreements, the document will be approved in TCM itself. The contractor will revise the document based on the resolutions and certify that all the resolutions has been taken care of.

Based on this certification, the document will be opened and submitted by contractor in the system for approval as Rev 01 within 10 days of TCM.

i) In case, the Contractor/ Vendor does not agree with any specific comment, he shall furnish the explanation for the same to NTPC for consideration. In all such cases the Contractor shall necessarily enclose explanations along with the revised drawing (taking care of balance comments) to avoid any delay and/or duplication in review work.

j) It is responsibility of the Contractor/ Vendor to get all the drawings approved in the Category I & IV (as the case may be) and complete engineering activities within the agreed schedule. Any delay arising out of submission and modification of drawings shall not alter the contract completion schedule.

k) If Contractor/ Vendor fails to resubmit the drawings as per the schedule, construction work at site will not be held up and work will be carried out on the basis of comments furnished on previous issues of the drawing.

l) These comments will be taken care by the contractor while submitting the revised drawing.

The contractor shall use a single transmittal for drawings. Submission. This shall include transmittal numbers and date, number of copies being sent, names of the agencies to whom copies being sent, drawing number and titles, remarks or special notes if any etc.

8.06.00 **ENGINEERING PROGRESS AND EXCEPTION REPORT**

8.06.01 The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including

a) A list of drawings/engineering information which remains unapproved for more than four (4) weeks after the date of first submission

b) Drawings which were not submitted as per agreed schedule.

8.06.02 The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the contract, which shall then be discussed and finalised with the Employer.

9.00.00 **TECHNICAL CO-ORDINATION MEETING**

9.01.00 The Contractor shall be called upon to organise and attend monthly Design/ Technical Co-ordination Meetings (TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of contract. The Contractor shall attend such meetings at his own cost at NEW DELHI / NOIDA /

	HYDERABAD / PROJECT SITE or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.
9.02.00	The Contractor should note that Time is the essence of the contract. In order to expedite the early completion of engineering activities, the comments of the Employer shall be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.
9.02.01	The Contractor shall ensure availability of the concerned experts / consultants/ personnel who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.
9.02.02	Should any drawing remain unapproved for more than four (4) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.
9.03.0	Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.
10.00.00	**DESIGN IMPROVEMENTS** The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly. If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.
11.00.00	**EQUIPMENT BASES** A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.
12.00.00	**PROTECTIVE GUARDS**

Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.

13.00.00 **LUBRICANTS, SERVO FLUIDS AND CHEMICALS**

13.01.00 All the first fill and one year's topping requirement of consumables such as greases, oils, lubricants, servo fluids / control fluids, gases (excluding H_2, CO_2 and N_2 for Generator) etc. which will be required to put the equipment covered under the scope of specifications into successful commissioning/initial operation and to establish completion of facilities shall be supplied by the contractor. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

Bidder scope shall include supply of H_2, CO_2 and N_2 as applicable for the Generator till successful commissioning of Generator.

Bidder shall supply a quantity not less than 10% of the full charge or one (1) year topping requirement mentioned above (Whichever is higher) of each variety of lubricants, servo fluids, gases etc. (as detailed above) used which is expected to be utilized during the first year of operation. This additional quantity shall be supplied in separate containers.

13.02.00 As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible. However, the lube oil for Main Turbine, Drive Turbine, TDBFP and MDBFP shall be kept same in view of ease of operation and maintenance.

Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer alongwith lubrication requirements.

14.00.00 **LUBRICATION**

14.01.00 Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.

15.00.00 **MATERIAL OF CONSTRUCTION**

15.01.00 All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilised for various components shall be those which have established themselves for use in such applications.

16.00.00	**RATING PLATES, NAME PLATES & LABELS**
16.01.00	Each main and auxiliary item of plant shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.
16.02.00	Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.
16.03.00	Such nameplates or labels shall be of white non-hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back.
16.04.00	Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel. The name plates for valves shall be marked in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum.
16.05.00	Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support.
16.06.00	Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non-pressure parts such as the yoke by a stainless steel wire. The direction of flow shall also be marked on the body.
16.07.00	Safety and relief valves shall be provided with the following: a) Manufacturer's identification. b) Nominal inlet and outlet sizes in mm. c) Set pressure in Kg/cm^2 (abs). d) Blowdown and accumulation as percentage of set pressure. e) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute.

16.08.00 All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.

16.09.00 All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.

17.00.00 **TOOLS AND TACKLES**

The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required and other instruments for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder alongwith the offer.

The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and initial operation. For this period the Contractor should bring his own tools and tackles. All the tools and tackles shall be of reputed make acceptable to the Employer.

18.00.00 **WELDING**

18.01.00 If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be performed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.

19.00.00 **COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES**

19.01.00 All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.

20.00.00 **PROTECTION AND PRESERVATIVE SHOP COATING**

20.01.00 **PROTECTION**

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a non-metallic protection device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground environment as the case may be.

The requirements for painting specification shall be complied with as detailed out in Part-A & B of the Technical Specification.

20.02.00 **PRESERVATIVE SHOP COATING**

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirements covered in the relevant part of the Technical Specification.

Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.

20.03.00 Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.

20.04.00 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Employer.

20.05.00 All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.

20.06.00 Painting for Civil structures and equipment/system covered under this package shall be done as specified under technical requirements on civil works in relevant part of this specifications.

21.00.00 **QUALITY ASSURANCE PROGRAMME**

21.01.00 To ensure that the equipment and services under the scope of contract whether manufactured or performed within the Contractor’s works or at his sub-contractor’s premises or at the Employer’s site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be shall be finalized during detailed engineering with employer / authorized representative after discussion. The QA programme shall be generally in line with ISO-9001/IS-14001. A quality assurance

programme of the contractor shall generally cover the following:

a) His organisation structure for the management and implementation of the proposed quality assurance programme

b) Quality System Manual

c) Design Control System

d) Documentation Control System

e) Qualification data for Bidder's key Personnel.

f) The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, verification of materials purchased etc.

g) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.

h) Control of non-conforming items and system for corrective actions.

i) Inspection and test procedure both for manufacture and field activities.

j) Control of calibration and testing of measuring testing equipments.

k) System for Quality Audits.

l) System for indication and appraisal of inspection status.

m) System for authorising release of manufactured product to the Employer.

n) System for handling storage and delivery.

o) System for maintenance of records, and

p) Furnishing of quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment/component. Format for the same is attached as Annexure VIII.

22.00.00 **GENERAL REQUIREMENTS - QUALITY ASSURANCE**

22.01.00 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of

	inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities shall be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalization of such quality plans shall be finalized during details engineering as per attached Annexure-VIII and format No. QS-01-QAI-P-1/F3. Monthly progress report shall be furnished.
22.02.00	Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted on electronic media through C-folders, a web based system of NTPC ERP, for review and approval.
22.03.00	Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's "Site Quality Control Organisation", during various stages of site activities starting from receipt of materials/equipment at site.
22.04.00	The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer shall not proceed. These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorised representative and beyond which the work will not proceed without consent of Employer in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.
22.05.00	The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the format enclosed at **Annexure-V.** The field welding schedule shall be submitted to the Employer along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site.
22.06.00	The contractor shall have suitable Field Quality Organization with adequate manpower at Employer's site, to effectively implement the Field Quality Plan (FQP) and Field Quality Management System for site activities. The contractor shall submit

	the details of proposed FQA setup (organizational structure and manpower) for employer's approval. The FQA setup shall be in place at least one month before the start of site activities.
22.07.00	No material shall be dispatched from the manufacturer's works before the same is accepted by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of Material Dispatch Clearance Certificate (MDCC / CHP Clearance).
22.08.00	All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties; chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details
22.09.00	All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer. All welding/brazing procedures shall be submitted to the Employer or its authorized representative prior to carrying out the welding/brazing.
22.10.00	All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer. All welding / brazing procedures qualified / used at shop, will be made available to NTPC during audit / inspection. Procedures to be qualified at site will be submitted to NTPC.
22.11.00	Not Used.
22.12.00	For all IBR pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. However, other piping shall be as per relevant code. Similarly, any other statutory requirements for the equipment/systems shall also be complied with. On all back-gauged welds MPI/LPI shall be carried before seal welding
22.13.00	All the heat treatment results shall be recorded on time temperature charts and verified with recommended regimes.
22.14.00	No welding shall be carried out on cast iron components for repair.
22.15.00	Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.
22.16.00	All non-destructive examination shall be performed in accordance with written procedures as per International Standards, The NDT operator shall be qualified as

per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report, which includes details of methods and equipment used, result/evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.

In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 40 mm shall be Ultrasonically tested.

22.17.00 The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI).

All the sub-vendors proposed by the Main contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval on enclosed format as Annexure-III.

List of NTPC approved sub vendors against similar Pkg/items is attached as Section-VI, Part-B ,Chapter E-60 Indicative sub-vendor list.

The contractor's proposal for any new sub vendor for any of the items identified in indicative sub-vendor list shall necessarily be furnished in the sub vendor questionnaire & main Contractor Evaluation report format attached as Annexure- VII with all relevant documents and main contractor's own physical assessment report assessed as per their quality management system for NTPC review and acceptance.

New sub vendor proposal will only be considered for NTPC review, provided the proposal is received sufficiently in time: 90 days prior to ordering date of a Bought-Out Items/Start of Manufacturing so as not to impede the progress of the contract.
Main contractor shall submit the documentation as mentioned below:

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i. Duly Filled Main supplier Evaluation Report.
ii. Duly Filled Sub-Supplier Questionnaire.
iii. Factory Registration Certificate.
iv. Overall Organization Chart with Manpower details (Design, Manufacturing, Quality etc.)
v. Supply reference list of the Sub-Supplier indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning.
vi. List of Manufacturing Equipment available with sub vendor.
vii. List of Testing Equipment available with sub vendor.
viii. Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any.
ix. Details of Outsourced Manufacturing Processes, if any.
x. Quality control exercised during receipt, in-process & final inspection.
xi. Compliance of Statutory requirements (As applicable)

After first submission of proposal to NTPC, in absence of relevant documents/ Incompleteness of the proposal, The main contractor will be given a period of maximum 07 days to submit the compliance of the NTPC comments. In case of noncompliance, it will be presumed that main contractor is not serious about pursuing the proposal & the proposal will be foreclosed.

Major checks and quality requirements as mentioned below shall necessarily be assessed by main contractor and complied with documentary support in case the same is not the part of their Quality management system

The proposed Sub vendor will be assessed broadly on following mandatory criteria

i) Quality Management System Compliance including raw material/BOI control, traceability & control over outsources process
ii) Design Capabilities (As applicable)
iii) Manufacturing, Testing & Storage Facility
iv) Processing Capabilities
v) Supply Experience indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning
vi) Safety Aspect

In case of major observations or non-compliance observed during sub vendor works visit (Jointly with the main contractor) with respect to the submitted documents, proposed sub vendor will not be considered for acceptance and Main contractor will be solely responsible in such cases.

Monthly progress reports on sub-vendor detail. Submission / approval shall be furnished preferably on enclosed format at Annexure-IV. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.

22.18.00 For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the sub-contractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and sub-contractor. Within two (2) weeks of the release of the purchase orders /contracts for such bought out items /components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer on the monthly basis by the Contractor along with a report of the Purchase Order placed so far for the contract.

22.19.00 Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-contractor's quality management and control activities. The contractor shall provide all necessary

	assistance to enable the Employer carry out such audit and surveillance.
22.20.00	The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his subcontractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipment conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.
22.21.00	Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.
22.22.00	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.
22.23.00	Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorised representative.
22.24.00	**Environmental Stress Screening** Environmental stress screening test process / procedure for eliminating infant mortile components for DDCMIS / PLC based system & for other systems having substantial electronics components (as determined by employer) like Electronic transmitter, CCTV components, PA systems etc. shall be furnished for NTPC acceptance
22.25.00	The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine & acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.
22.26.00	**Software Reliability / Quality Certification** Certification from OEM's authorized signatory that software offered with DDCMIS, PLC, CCTV, PA, Pyrometer, CEMS, AAQMS, EQMS, BHMS etc. declaring that the all the offered software(s) had gone through the established software quality test and offered software is not of β-version and offered software is also free from all known bugs as on date of approval of systems documents by NTPC as a part of quality documentation review and approval process during detail engineering.

23.00.00	**QUALITY ASSURANCE DOCUMENTS**
23.01.00	The Contractor shall be required to submit the QA Documentation in soft copies, as identified in respective quality plan with tick (✓)mark.
23.01.01	Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document. The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing. The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However, **soft copies will be furnished** not later than two (2) weeks.
23.02.00	Typical contents of QA Documentation is as below:- (a.) Quality Plan (b.) Material mill test reports on components as specified by the specification and approved Quality Plans. (c.) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans. (d.) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment. (e.) Heat Treatment Certificate/Record (Time- temperature Chart) (f.) All the accepted Non-conformance Reports (Major/Minor)/deviation, including complete technical details / repair procedure). (g.) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points. (h.) Certificate of Conformance (COC) wherever applicable. (i.) MDCC
23.03.00	Similarly, the contractor shall be required to submit soft copies containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.
23.04.00	Before despatch / commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased

deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.

(a.) If the result of the review carried out by the Inspector is satisfactory, the Inspector shall stamp the quality document (or applicable section) for release.

(b.) If the quality document is unsatisfactory, the Supplier shall endeavor to correct the incompleteness, thus allowing to finalize the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.

(c.) If a decision is made for despatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions & submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than two (2) weeks after the despatch of equipment.

23.05.00 **TRANSMISSION OF QA DOCUMENTATION**

On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Project Site of Employer.

For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than two (2) weeks after the date of the last delivery of equipment.

24.00.00 **PROJECT MANAGER'S SUPERVISION**

24.01.00 To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Settlement of Disputes' clause in Section GCC, the Contractor shall proceed to comply with the Project Manager's decision.

24.02.00 The work shall be performed under the supervision of the Project Manager.

The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:

(a.) Interpretation of all the terms and conditions of these documents and specifications

(b.) Review and interpretation of all the Contractor's drawing, engineering data, etc.

(c.) Witness or his authorised representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract

(d.) Inspect, accept or reject any equipment, material and work under the contract

(e.) Issue certificate of acceptance and/or progressive payment and final payment certificates

(f.) Review and suggest modifications and improvement in completion schedules from time to time, and

(g.) Supervise Quality Assurance Programme implementation at all stages of the works.

25.00.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

25.01.00 The word 'Inspector' shall mean the Project Manager and/or his authorised representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.

25.02.00 The Project Manager or his duly authorised representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.

25.03.00 The Contractor shall give the Project Manager/Inspector (15 days for domestic) / (45

	days for foreign) written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived and confirmed in writing, will attend such tests within (15 days for domestic) / (45 days for foreign) of the date on which the equipment is noticed as being ready for test/inspection failing which the contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.
25.04.00	The Project Manager or Inspector shall within 15 days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.
25.05.00	When the factory tests have been completed at the Contractor's or subcontractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Failure on the part of Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.
25.06.00	In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorised representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorised representative to accomplish testing.
25.07.00	The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.
25.08.00	To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no. 25.03.00 - of this chapter, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be

	made for each three consecutive months and shall be furnished before beginning of each calendar month.
25.09.00	All inspection, measuring and test equipment used by contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument identification and shall produce the same for inspection by NTPC. Wherever asked specifically, the contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.
25.10.00	**ASSOCIATED DOCUMENT FOR QUALITY ASSURANCE PROGRAMME**
25.10.01	List of items requiring quality plan and sub supplier approval. Format No.: QS-01-QAI-P-01/F3-R0 **(Annexure-III).**
25.10.02	Status of items requiring Quality Plan and sub supplier approval. Format enclosed at **Annexure-IV.**
25.10.03	Field Welding Schedule Format enclosed at **Annexure-V.**
25.10.04	Main contractor evaluation report (MCER) and Sub vendor Questionnaire enclosed at **Annexure VII.**
25.10.05	QA&I modalities and QA Co-ordination procedure (QACP) enclosed at **Annexure-VIII.**
25.11.00	**TESTING OF MAJOR DESIGN FEATURES:** The major design features of the system shall be demonstrated by the Contractor at the Contractor's works, or any other place mutually agreed within Six months from the date of Sub-QR/Provenness approval. These are the system function tests, which have a major impact on the detailed system design & finalization of important engineering documents like configuration, functional grouping, BOM etc., but do not require a fully engineered system for conductance. Bidder shall identify these features & include detailed test procedures in the Sub-QR/Provenness proposal, which shall be finalized during discussions with the bidder. The developments and any augmentation of standard features undertaken by the Bidder to fulfill the various specification requirements, shall also be tested during these major design tests. This shall include but not be limited to the following. a) System accuracy tests of DDCMIS for the various type of inputs identified in Part-B. b) Loop reaction time for sample loops/ logics. c) SOE functionality tests.

d) Server changeover.

e) Various response times, having serious implication on operation & maintenance philosophy.

f) Duty cycle of controller/ HMIPIS with simulated load, representative of the final engineered load.

g) Connectivity of Switchgear DDCMIS with Switchgear Relay Network.

The results of the above tests, after its acceptance by the Employer, shall be properly documented and submitted to Employer.

If any of the envisaged tests have been carried out by Bidder in a previous NTPC project, then the same need not be specifically conducted by the Bidder for this project, provided it is clearly established by the Bidder & accepted by the Employer that there is no difference between the system offered for this project & the previous NTPC project with respect to the test. However, even in such a case, test report of the previous project shall be submitted by the Bidder as a part of MDFT (Major Design Feature Test) test report.

25.12.00 **DEMONSTRATION OF APPLICATION ENGINEERING**

25.12.01 Contractor shall prepare and submit typical implemented scheme in their system (Control system & HMI) on sample basis. The typical cases to be covered shall include but not be limited to the following.

(i) Logics/Loops:

a) Drive logics implementation for each type of binary drive along with its display in HMI.

b) Sequence implementation along with its display in HMI.

c) Single non-cascade controller implementation.

d) Cascade loop implementation.

e) Master slave implementation with different slave combination.

f) Temperature & pressure compensation for flow signals & pressure compensation for level signals as applicable.

(ii) HMI Functions:

a) LVS Annunciation.

b) Graphics.

c) HSR

d) Logs/Reports.

e) Calculations (Basic & Performance Calculations).

25.12.02 The above typical cases shall be finalized with the Employer through Technical Co-ordination meetings.

After review and finalization of the typical cases, the implementation of each logic & control loop shall be carried out by the Contractor. After implementation of these logics & loops, the Contractor shall test each logic /loop and record the observations and demonstrate to Employer at Employer premises during engineering finalization. Any modifications as a result of the demonstration shall be done and documented as part of the test report along with the final scheme. Similarly, HMI functions shall also be demonstrated by the Contractor at Employer premises & the results shall be documented as part of test report.

25.12.03 During the integrated testing at the Contractor's works, only sample checks shall be done by the Employer for the items covered in above application engineering demonstration.

26.00.00 **PRE-COMMISSIONING AND COMMISSIONING FACILITIES**

26.01.00 (a) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-up at Site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the Contractor's quality assurance programme as well as those included in Part-D, Section-VI and elsewhere in the Technical Specifications.

(b) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant.

(c) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures

to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness.

(d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.

(e) The check outs during the pre-commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed schedule to be agreed by Employer.

(f) The Contractor during initial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable.

26.01.00 Contractor shall furnish the commissioning organization chart for review & acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should contain:

(1.) Biodata including experience of the Commissioning Engineers.
(2.) Role and responsibilities of the Commissioning Organisation members.
(3.) Expected duration of posting of the above Commissioning Engineers at site.

26.02.00 **Initial Operation**

(a) On completion of all pre-commissioning activities/ tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.

(b) The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the contractor shall conduct the trial run as per clause 26.05.00 to demonstrate the compliance to the requirements as stipulated in the CERC (Indian Electricity Grid Code) Regulations, 2023.

The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.

The Contractor shall intimate the Employer about the commencement of initial operation and shall furnish adequate notice to the Employer in this respect.

(c) Any loss of generation due to constraints attributable to the Employer shall be construed as Deemed Generation.

(d) An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during initial operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with- holding the aforesaid permission.

26.03.00 **Guarantee Tests**

a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. To conduct such tests, the contractor's Commissioning, start-up Engineer shall make the unit ready (including tuning and all other enabling activities as required for PG tests) before start of initial operation. Such test shall be conducted along with the Initial Operations.

b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee.

c) For performance/ demonstration tests instrumentations, of accuracy class shall be as per specified test codes. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points.

d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost.

e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail elsewhere in the specifications.

26.04.00 Before start of commissioning of critical equipment, Commissioning Clearance Certificate (CCC) to be submitted by Main contractor. List of the critical equipments **and CCC format will be provided along with QA Coordination procedure.**

26.05.00 Trial Run:

Trial run shall be conducted during the initial operation of the unit(s). Definition and provisions related to "trial run" shall be governed by CERC (Indian Electricity Grid Code) Regulations, 2023.

a. Contractor shall demonstrate the following as per the requirements of CERC (Indian Electricity Grid Code) Regulations, 2023:

i) Operation at a load of fifty-five (55) percent of MCR as per the CEA Technical Standards for Construction for a sustained period of four (4) hours.

ii) Ramp-up from fifty-five (55) percent of MCR to MCR at a ramp rate of at least one (1) percent of MCR per minute, in one step or two steps (with stabilization period of 30 minutes between two steps), and sustained operation at MCR for one (1) hour.

iii) Demonstrate overload capability with the valve wide open as per the CEA Technical Standards for Construction and sustained operation at that level for atleast five (5) minutes.

iv) Ramp-down from MCR to fifty-five (55) percent of MCR at a ramp rate of at least one (1) percent of MCR per minute, in one or two steps (with stabilization period of 30 minutes between two steps).

v) Primary response through injecting a frequency test signal with a step change of ± 0.1 Hz at 55%, 60%, 75% and 100% load. Provision of injecting external frequency test signal in control system for primary frequency response testing shall be in the contractor's scope.

vi) Reactive power capability as per the generator capability curve as provided by OEM considering over-excitation and under-excitation limiter settings and prevailing grid condition. These are the minimum test to be carried out as per the Indian Electricity Grid Code Regulations, 2023. Any other relevant clauses related to system performance or tests specified elsewhere in the specifications shall also be applicable.

b. The contractor shall demonstrate the continuous operation capability of the Unit(s) at MCR as per regulations 22 of CERC (Indian Electricity Grid Code) Regulations, 2023.

26.07.00 'Date of Commercial Operation' or 'COD' shall have the same meaning as specified under regulation 27 of Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations 2023, as amended from time to time.

27.00.00 **TAKING OVER**

Upon successful completion of Initial Operations and all the tests conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be withheld nor will the Employer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.

28.00.00 **TRAINING OF EMPLOYER'S PERSONNEL**

28.01.00

The scope of service under training of Employer's engineers shall include a training module covering the areas of Operation & Maintenance.

Such training should cover the following areas as a minimum in order to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Employer:

(a) Training for Steam Generator & ESP Equipment, TG & Auxiliaries and related equipments.

(b) Training for Electric Systems including VFD and Electric power supply system.

(c) Training for other SG/TG related C&I systems/equipments including training on Flame Monitoring System, Furnace and Flame Viewing System , Turbine Supervisory System (TSS) including vibration analyzer, vibration monitoring system axial shift, eccentricity measurements etc. for Main Turbine, BFP Turbine etc. Burner management study, control loop study, misc. system for SG C&I, EHTC, Turbine stress control system, Turbine protection system, ATRS, instrumentation etc.

c1: Training on Engineering, Model building,pre-testing, Post -test fine tuning of Advance process control systems with faculty having experience of atleast 5 years in Model Process Control.

(d) Training for special packages specified elsewhere in Technical Specification, Section-VI.

(e) Training for various C&I systems/equipment supplied includes the following:

i) DDCMIS - Human Machine Interface – Hardware & Operating System

ii) DDCMIS-Human Machine Interface System Engineering & Application Software.

iii) DDCMIS – Control System Hardware and Control system Application Software.

iv) DDCMIS – Operator Training : Use of the system at Works + at site.

v) DDCMIS – Specialized Network security.

(f) Training for power cycle piping/critical piping.

(g) Training for UPS systems Annunciation system, SWAS, PA system, flue gas analyzers, CCTV and 24 VDC system.

(h) Training on following aspects of fieldbus (i) Hardware & Software features (ii) System design, diagnostic and testing (iii) maintenance, troubleshooting and fault analysis.

(i) Training on Non-Intrusive hardwired Electric Actuator and Fieldbus based Electric Actuator along with detail training on Foundation Fieldbus/ Profibus interface used in actuator

(k) Training for numerical relays & networking systems supplied under MV & LT switchgear system.

(l) Training courses on offered PLC system in the following areas:

(a.) Operator training

(b.) Hardware Maintenance training

(c.) Software training

(d.) Any other specialized training as required for system operation and maintenance.

(m) Training for Ash Handling System & Coal Handling Plant Equipment and Auxiliaries

Area	Topics	Mandays
Ash Handling Plant	Product design - Basic design features - Theory & principle of operation - Latest technological trends in Ash handling plant and design Plant Visit - Operational feedback - O&M history/problems related to Ash handling plant Visit to Manufacturer's Work - Manufacturing process of Ash handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization	300
Coal Handling Plant	Product design - Basic design features - Theory & principle of operation - Latest technological trends in Coal handling plant and design Plant Visit - Operational feedback - O&M history/problems related to Coal handling plant Visit to Manufacturer's Work	150

	- Manufacturing process of Coal handling equipments - Testing facilities Operation & Maintenance of Plant - Trouble shooting and fault analysis - Familiarization of special maintenance techniques - Special tool and tackles familiarization	

n) Training for UF Membranes, RO membranes, Zero Liquid Discharge (ZLD) Chlorine Di-Oxide (ClO_2) generation & dosing system, Condensate Polishing Plant (CPU) and CW Treatment System.

Area	Topics	MANDAYS
UF Membranes	**Product design** -Basic design features -Theory & principle of operation -Latest technological trends in Ultrafiltration membranes and design -CIP & CEB of UF system **Plant Visit** -Operational feedback -O&M history/problems related to UF membranes **Visit to Manufacturer's Work** -Manufacturing process of UF membranes and equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	**7**

Area	Topics	MANDAYS
RO membranes	**Product design**	**7**

	-Basic design features -Theory & principle of operation -Latest technological trends in RO membranes and design -Failure analysis, types of failures, causes & its evaluation, remedies -CIP of RO system **Plant Visit** -Operational feedback -O&M history/problems related to RO membranes **Visit to Manufacturer's Work** -Manufacturing process of RO membranes and equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	
Zero Liquid Discharge (ZLD)	**System Design** - Plant water optimization and Scheme to achieve the ZLD - Basic design features - Latest technological trends for ZLD in Thermal Power Plant **Plant Visit** - Operational feedback - O&M history/problems related to plant	**5**
Chlorine Di-Oxide (ClO_2) generation & dosing system	**System/Product Design** - Basic design features - Theory & principle of operation - Latest technological trends in Chlorine Di-Oxide (ClO2) generation & dosing system and design aspects & Selection criteria. **Plant Visit** - Operational feedback - O&M history/ problems related to ClO2 plant	**5**

	Performance Test of generator - Generator capacity performance testing. **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	
Condensate Polishing Plant (CPU)	**System/Product Design** - Basic design features including Pre-filters - Theory & principle of operation - Latest technological trends in CPU & Pre-filters and design aspects & Selection criteria. **Plant Visit** - Operational feedback - O&M history / problems related to CPU plant **Visit to Manufacturer's Work** -Manufacturing process of pre-filters and major equipment -Testing facilities **Operation & Maintenance of Plant** -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization	**3**
CW Treatment System	**System/Product Design** - Basic design features - Theory & principle of operation - Latest technological trends and design aspects & Selection criteria. **Operation & Maintenance of Plant** - Operational feedback - O&M history / problems related to plant - Trouble shooting and fault analysis Familiarization of special maintenance techniques - Special tool and tackles familiarization	**3**

Note: One week shall constitute of five (5) man days.

(o) Training for Electrical System

Area	Topics	MANDAYS
Generator	Product design -Design aspects of associated auxiliary systems - Familiarisation with cooling medium and arrangements, winding and core support systems Plant Visit -Operational feedback -O&M history/problems related to Insulation system Visit to Manufacturer's Work -Manufacturing process of core, winding bars, Assembly -Testing facilities Operation & Maintenance (Site) -Trouble shooting and fault analysis - Storage and Familiarization of special maintenance techniques -Special tool and tackles familiarization	60 (15+15+30)

Excitation systems including AVR	System Design - Design features of various sub systems, Exciter PMG - Excitation transformers, Controllers and different limiters - PSS and associated system studies Plant Visit - Operational feedback - O&M history/problems related to Excitation systems - Familiarization with various equipment functioning at reference plant Visit to Manufacturer's Work -Manufacturing process for various equipment of excitation systems -Testing facilities Operation & Maintenance (At site) -Trouble shooting and fault analysis -Familiarization of special maintenance techniques -Special tool and tackles familiarization Performance Test of generator - Generator capacity performance testing.	60 (15+15+30)
MV VFD (If applicable)	System/Product Design - Basic design features - Theory & principle of operation Plant Visit - Operational feedback - O&M history/ problems related to VFD - Familiarization with various equipment functioning at reference plant Operation & Maintenance (At Site) -Trouble shooting and fault analysis - Familiarization of special maintenance techniques -Special tool and tackles familiarization	90(15+15+60)
MV and LT switchgear	System/Product Design - Basic design features. - Relay configurations and hands on practices of logics and settings preparation - Preparation of CID/ICD/SCD files through	150 (45+15+90).

	relay software tools and Goose configurations. - Interfacing/communication of relay with software. - Secondary injection testing of protection functions. - Familiarisation of IMCC and Interface with DCS Plant Visit - Operational feedback - O&M history / problems Visit to Manufacturer's Work -Manufacturing process of equipment -Testing facilities Operation & Maintenance (At site) -Trouble shooting and fault analysis -Familiarization of Switchgear, IMCC and interface with DCS, relays and interfacing software. -Special tool and tackles familiarization	
MDBFP, CW and BMCP Motors	System/Product Design - Basic design features of stator core and rotor core, winding insulation and cooling arrangements - Theory & principle of operation - Study of forces and Vibration. - Diagnostic and testing Plant Visit - Operational feedback - O&M history / problems Visit to Manufacturer's Work -Manufacturing process of equipment -Testing facilities Operation & Maintenance (At site) - O&M practices Familiarization of special maintenance techniques - Special tool and tackles familiarization	45 (15+15+15)

Relays and Substation Automation System	System/Product Design - Basic design features. - Relay configurations and hands on practices of logics and settings preparation - Preparation of CID/ICD/SCD files through relay software tools and Goose configurations. - Interfacing/communication of relay with software. - Secondary injection/ Sampled value testing of protection functions. - Familiarisation of SAS and Cyber security Features. Plant Visit - Operational feedback - O&M history / problems Operation & Maintenance (At site) -Trouble shooting and fault analysis -Familiarization of relay configuration, settings and interfacing software. -Familiarization of SAS Hardware, software and Application software. - Secondary injection/ Sampled value testing of protection functions. - Familiarisation of cyber security features	75 (30+15+30)
AIS and bay equipment's	Operation & Maintenance (At site) -Erection, Storage and handling of bay equipment -Familiarization of special maintenance techniques -Special tool and tackles familiarization	30 (0+15+15)
Note: One week shall constitute of five (5) man days.		

(p) Training on Erection methodologies for all the Sub-packages, System and Equipments associated with the EPC Package, including a visit to power plant construction site.

The exact details, extent and schedule for training shall be as finalized during detailed engineering and shall be subject to Employer's approval.

28.03.00	The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering entire scope for the package. This shall cover all disciplines viz, Mechanical, Electrical, C&I , QA etc. and shall include all the related areas like Design familiarization, training on product design features and product design software of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing erection, welding etc.
28.04.00	Contractor shall also arrange for training of Employer's personnel in respect of fire detection and protection systems and other Balance of Plant equipments.
28.05.00	Contractor shall provide training on application of PAUT (Phased array ultrasonic testing) and TOFD (Time of flight diffraction) techniques for two weeks (at least 80 Hours). The training shall be arranged at least six months prior to the start of erection works of SG & TG works.
28.06.00	Exact details, extent of training and the training schedule shall be finalized based on the Bidder's proposal within two (2) months from placement of award.
28.07.00	In all the above cases, the lodging and boarding of the Employer's personnel shall be at the cost of Bidder. The Bidder shall make all necessary arrangements towards the same.
28.08.00	Take off prices (product wise) should be indicated by the Bidder in the Bid Proposal Sheets. Employer reserves the right to include or exclude these item(s) during placement of Award. **Note**: 1. For training purposes, one (1) man month implies 30 working days (excluding all intervening holidays) per person. 2. The total man months in each area shall be divided into suitable number of modules which shall be discussed and finalized during post award stage. 3. Duration of each module shall not be less than 10 (ten) working days out of which 20 % shall be for plant/manufacturers' works visits and 80% shall be classroom training. 4. A) Location of classroom training for engineering shall be at Design/Engineering office. B) Classroom training for erection/O&M shall be at location of Manufacturers' works.

28.09.00 **TRAINING REQUIRED IN MAN MONTH**

Area	Engineering (Man months)	Erection (Man months)	O&M (Man months)
Steam Turbine Generator and its Auxiliaries	5.5	8.0	21
Steam Generator and its Auxiliaries	5.5	8.0	20.5
Station C&I (Control and Instrumentation)	3.5	5.5	10
Ash Handling Plant	2.0	3.0	5.0
Coal Handling Plant	1.0	1.5	2.5
UF Membranes, RO Membranes, ZLD, Chlorine Di Oxide (ClO2) generation & dosing system, Condensate Polishing Plant (CPU), CW Treatment System	0.2	0.3	0.5
Electrical systems consisting of generators, Excitation systems, VFD, Motors, MV/LV switchgears, relays, SAS and Switchyard	4.5	3.5	9
Total	**22.2**	**29.8**	**68.5**

29.00.00 **SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION**

In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:

i) Working platforms should be fenced and shall have means of access.

ii) Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.

30.00.00 **NOISE LEVEL**

The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) meter horizontally from the nearest surface of any equipment/machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for

i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA-115 dBA.

ii) Regulating drain valves in which case it shall be limited to 90 dBA-115 dBA.

iii) Mill noise which will be limited to 85-90 dBA.

iv) TG unit in which case it shall not exceed 90 dBA.

v) For HP-LP bypass valves and other intermittently operating control valves, the noise level shall be within the limit of 90 dBA.

vi) For BFP Motor Noise level shall be within the limit of 90 dBA.

31.00.00 **PACKAGING, TRANSPORTATION AND STORAGE**

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage at site due to improper packing and presevation. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.

In addition to above, the contractor shall take all necessary measures for storage of all electronic equipment / systems at site in a dust free Air conditioned space ensuring proper temperature & humidity.

32.00.00 **ELECTRICAL EQUIPMENTS/ENCLOSURES**

32.01.00 All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified elsewhere in the specifications.

33.00.00 **INSTRUMENTATION AND CONTROL**

All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.

33.01.00 All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.

All scales and charts shall be calibrated and printed in Metric Units as follows:

1 Temperature	-	Degree centigrade (deg C)
2. Pressure	-	Kilograms per square centimetre (Kg/cm^2). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.
3. Draught	-	Millimetres of water column (mm wc).
4. Vacuum	-	Millimeters of mercury gauge (mm Hg) or water column (mm Wcl).
5. Flow (Gas)	-	Tonnes/ hour
6. Flow (Steam)	-	Tonnes/ hour
7. Flow (Liquid)	-	Tonnes / hour
8. Flow base	-	760 mm Hg. 15 deg.C
9. Density	-	Grams per cubic centimetre.

33.02.00 All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plan-in connection at rear.

34.00.00 **ELECTRICAL NOISE CONTROL**

The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be protected against ESD as per IEC-61000-2. Radio Frequency interference (RFI) and Electro Magnetic Interference (EMI) protection against hardware damage and control system mal-operations/errors shall be provided for all systems as per EN-50082-2 (1995).

35.00.00 **SURGE PROTECTION FOR SOLID STATE EQUIPMENT**

All solid state systems /equipment shall be able to withstand the electrical noise and surge as encountered in actual service conditions and inherent in a power plant and shall meet the requirements of surge protection as defined in ANSI C37.90.1-1989 on its suitable equivalent class of IEC 254-4. Details of the features incorporated and relevant tests carried out. The test certificates. etc. shall be submitted by the Bidder.

36.00.00 **INSTRUMENT AIR SYSTEM**

The instrument air supply system as supplied by the Bidder for various pneumatic control & instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc.

Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve.

37.00.00 **TAPPING POINTS FOR MEASUREMENTS**

Tapping points shall include probes, wherever applicable, for analytical measurements and sampling.

For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted.

The following shall be provided on equipment by the Bidder. The standard which is to be adopted, will be intimated to the Contractor.

i) Temperature test pockets with stub and thermowell

ii) Pressure test pockets

38.00.00 **SYSTEM DOCUMENTATION**

The Bidder shall provide drawings, system overview & description, hardware/ software details, technical literature, functional & hardware schemes, bill of material, parts list, interconnection diagrams, data sheets, erection/ installation/ commissioning procedures, instruction/ operating manuals, etc. for each of the C& I system / sub-systems/ equipment supplied under this package. The documentation shall include complete details of the C&I systems/ sub-systems/ equipment to enable review by Employer during detailed engineering stage and to provide information to plant personnel for operation & Maintenance (including quick diagnostics & trouble shooting) of these C&I systems/ sub-systems/ equipment at site. The minimum documentation requirements for C&I systems shall be as stipulated under C&I "Techncial Data Sheets" Part of specifications. In addition to this, system documentation for DDCMIS shall include as a minimum to that specified elsewhere in the Technical Specification.

The exact format, submission schedule and contents of various documents shall be as finalised during detailed engineering stage.

38.01.00 Bill of material (instrument list) for all C&I equipment/ devices shall be furnished by the bidder in standard formats as approved by the Employer.

39.00.00 **MAINTENANCE MANUALS OF ELECTRONIC MODULES**

The Contractor shall have to furnish two (2) sets of all maintenance manual of each and every electronic card/module as employed on the various systems and equipment including peripherals etc., offered by him. The Contractor will also have to furnish the data regarding the expected failure rate of various modules and other system components. Further, the contractor shall furnish a set of operating manuals which should include block diagrams, make, model/type, details wiring and external connection drawings etc. as required to do the testing and maintenance of the electronic modules.

Backup & Restoration Procedures of DDCMIS, Station LAN & Advance Process Control shall be provided.

40.00.00 **MAKE IN INDIA REQUIREMENTS**

a) The bidder shall follow Indian laws, regulations and standards. There shall not be any restriction in terms of compliance to codes & standards of foreign origin only. The compliance to equivalent/better Indian as well as other codes & standards, wherever available, shall also be acceptable.

b)	The technologies/ products offered shall be environmentally friendly, consuming less energy, and safe, energy efficient, durable and long lasting under the prescribed operational conditions.
c)	The bidder/its sub vendor/supplier shall ensure supply of spares, materials and technological support for the entire life of the project.
d)	The bidder shall list out the products and components producing Toxic E-waste and other waste as specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled/ disposed of by the contractor and for this, the bidder has to establish recycling/disposal unit as specified. Bidder shall also comply with Plastic Waste Management Rules, 2016, as amended from time to time, and facilitate EPR (Extended Producer Responsibility) registration of Employer before import of plastic packaging product or products with plastic packaging or carry bags or multi-layered packaging or plastic sheets or like.
e)	The equipment/ material sourced from foreign companies will be tested in accredited labs in India before acceptance wherever such facilities are available. The testing shall be carried out in accordance with MOP extant order/guidelines.
f)	The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.
g)	All applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.
h)	Wherever required, the foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of Employer.
i)	To protect the security, integrity and reliability of equipment in this package, it is essential to remove vulnerabilities arising out of the possibility of cyber-attack through malware/ Trojans etc. embedded in imported equipments. This requirement shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in this package. Contractor shall comply all the requirements of Order No 25-11/6/2018-PG, dated 02/07/2020 (attached as **Appendix-I**), issued by Ministry of Power, Government of India and its subsequent amendments/revisions. Contractor shall furnish declaration of compliance of MOP order dated 02/07/2020 requirements with dispatch of equipment/ item. Further, Contractor shall furnish back up testing certificates, whenever Employer asks the same.
j)	All equipment/materials/parts/items required in this package which are domestically manufactured with sufficient domestic capacity as identified in Annexure-I of MOP order dated 16/11/2021 including its subsequent revisions (copy attached as **Appendix-II**) shall necessarily be sourced from the class-I local suppliers only as per the extant provisions of the Public Procurement (Preference to Make in India) Orders issued by DPIIT and MoP.

Any violation w.r.t Make in India and minimum local content (MLC) requirements as specified shall be sole responsibility of the Bidder.

Appendix-I

No.25-11/6/2018-PG
Government of India
Ministry of Power
Shram Shakti Bhawan, Rafi Marg, New Delhi – 110001
Tele Fax: 011-23730264
*****

Dated 02/07/2020

ORDER

Power Supply System is a sensitive and critical infrastructure that supports not only our **national defence**, **vital emergency services** including health, disaster response, **critical national infrastructure** including classified data & communication services, defence installations and manufacturing establishments, logistics services but also the **entire economy** and the **day-to-day life** of the citizens of the country. Any danger or threat to Power Supply System can have catastrophic effects and has the potential to cripple the entire country. Therefore, the Power Sector is **a strategic and critical sector.**

The vulnerabilities in the Power Supply System & Network mainly arise out of the possibilities of cyber attacks through malware / Trojans etc. embedded in imported equipment. Hence, **to protect the security, integrity and reliability of the strategically important and critical Power Supply System & Network** in the country, the following directions are hereby issued :-

(1) All equipment, components, and parts imported for use in the Power Supply System and Network shall be tested in the country to check for any kind of embedded malware/trojans/cyber threat and for adherence to Indian Standards.

(2) All such testings shall be done in certified laboratories that will be designated by the Ministry of Power (MoP).

(3) Any import of equipment/components/parts from "prior reference" countries as specified or by persons owned by, controlled by, or subject to the jurisdiction or the directions of these "prior reference" countries will require prior permission of the Government of India.

(4) Where the equipment/components/parts are imported from "prior reference" countries, with special permission, the protocol for testing in certified and designated laboratories shall be approved by the Ministry of Power (MoP).

This order shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used in power supply system or any activity directly or indirectly related to power supply system.

This issues with the approval of Hon'ble Minister of State for Power and New & Renewable Energy (Independent Charge).

(Goutam Ghosh)
Director
Tel: 011-23716674

To:
1. All Ministries/Departments of Government of India (As per list)
2. Secretary (Coordination),Cabinet Secretariat
3. Vice Chairman, NITI Aayog
4. Comptroller and Auditor General of India
5. Chairperson, CEA
6. CMDs of CPSEs/Chairman of DVC & BBMB/MD, EESL/DG,NPTI/DG,CPRI/DG,BEE/
7. All ASs/JSs/EA, MoP

Copy:
1. PS to Hon'ble PM, Prime Minister's Office
2. PS to Hon'ble MOS(IC) for Power and NRE
3. Sr. PPS to Secretary(Power)

Appendix-II

No. A-1/2021-FSC-Part(5)
Government of India
Ministry of Power
Shram Shakti Bhawan, New Delhi
Dated: 16th November, 2021

ORDER

Subject: Public Procurement (Preference to Make in India) to provide for Purchase Preference (linked with local content) in respect of Power Sector.

Reference: Department for Promotion of Industry and Internal Trade (DPIIT) Notification No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

The Government of India, Department for Promotion of Industry and Internal Trade (DPIIT) issued Public Procurement (Preference to Make in India), Order 2017, for encouraging 'Make in India' and promoting manufacturing and production of goods and services in India with a view to enhancing income and employment. Subsequently, DPIIT vide order No. P-45021/2/2017-PP (BE-II) dated 4th June, 2020 and further vide order dated 16th September, 2020 have issued the revised Public Procurement (Preference to Make in India) Order 2017.

2. In light of the Public Procurement (Preference to Make in India) Order 2017, this Ministry had notified purchase preference (linked with local content) for Hydro and Transmission sectors vide Order No. 11/05/2018-Coord dated 20.12.2018, for Thermal sector vide Order dated 28.12.2018 and for Distribution sector vide Order dated 17.03.2020. Further, a combined order dated 04.04.2020 was also issued in supersession of all previous orders to indicate equipment/material/components for which there was sufficient local capacity and competition and also to indicate conditions for including suitably in the tenders to be issued by the procurers. In furtherance of Para 19 of the DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 04.06.2020, Ministry of Power (MoP) issued a revised comprehensive Order dated 28.07.2020 (Annexure-I amended by order dated 17.09.2020).

3. DPIIT Notification No. P-45021/2/2017-PP(BE-II) dated 16.09.2020 has further revised its order dated 04.06.2020. Therefore, in supersession of all the aforementioned orders including order No.10/1/2019-St.Th. (Part-II) dated 20.03.2020 issued by this Ministry, the following has been decided:

i. For the purpose of this order, the definitions of various terms used in the order, and provisions relating to (i) Eligibility of 'Class-I local supplier'/'Class-II local supplier'/'Non-local suppliers' for different types of procurement, (ii) purchase preference (iii) exemption to small purchases and (iv) margin of purchase preference shall be the same as in DPIIT order dated 16.09.2020, referred to above and extracts of the same is given at **Appendix**.

ii. In procurement of all goods and services or works in respect of which there is sufficient local capacity and local competition as in **Annexure-I**, only "Class-I local supplier" shall be eligible to bid irrespective of purchase value. 'Class-I local supplier' is a supplier or service provider whose goods, services or works offered for procurement meets the Minimum Local Content (MLC) as prescribed in Annexure-I of this order. "Class-II local supplier" means a

supplier, as defined by DPIIT in its Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020.

iii. In the procurement of all goods and services or works other than those listed in Annexure-I, only "Class-I local supplier" and "Class-II local supplier" as defined in the order of this Ministry herewith shall be eligible to bid in procurement undertaken by procuring entities, except when Global Tender Enquiry has been issued. In Global tender enquiries, "Non-local suppliers" shall also be eligible to bid along with "Class-I local suppliers" and "Class-II local suppliers". In procurement of all goods, services or works not covered by sub-para 3(ii) above, and with estimated value of purchases less than Rs. 200 crores, in accordance with Rule 161(iv) of GFR, 2017, Global Tender Enquiry(GTE) shall not be issued except with the approval of the competent authority as designated by Department of Expenditure.

iv. For the purpose of this order, 'Works' means all works as per Rule 130 of GFR- 2017, and will also include *'turnkey works'*, Engineering, Procurement and Construction (EPC) contracts and service contracts including System Integrator (SI) contracts.

4. The list of items, in respect of which, local capacity with sufficient competition exists as per **Annexure-I,** will be reviewed at regular intervals with a view to increase number of items in this list and also to increase the MLC for each item, wherever it is less than 100%.

5. Purchase preference shall be given to local suppliers in accordance with **para 3A** of DPIIT Order dated 16.09.2020, and extracts of the same are given at **Appendix**.

6. Further, it has been decided to constitute a committee for independent verification of self-declarations and auditor's / accountant's certificates on random basis and in the case of complaints. The composition of the committee is given below:

Member (Planning), Central Electricity Authority (CEA)	Chairperson
Chief Engineer (PSETD), CEA	Member
Chief Engineer (HETD), CEA	Member
Chief Engineer (TETD), CEA	Member
Chief Engineer (DP&R), CEA	Member
As may be co-opted by CEA	External Expert
Chief Engineer (R&D), CEA	Convener

7. Further, it has also been decided to constitute a committee to examine the grievances in consultation with stakeholders and recommend appropriate actions to the Competent Authority in MoP. The composition of the Committee is given below:

Chairperson, CEA	Chairperson
Member (Hydro), CEA	Member

Member (Power System), CEA	Member
Member (Thermal), CEA	Convener

8. The complaint fee of Rs. 2 Lakhs or 1% of the value of the local item being procured (subject to maximum of Rs. 5 Lakhs), whichever is higher, shall be paid in the form of Demand Draft, drawn in favour of **PAO, CEA, New Delhi.** In case the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, the deposited fee of the complainant would be refunded without any interest.

9. All other conditions, not stipulated in this order, shall be as laid down in the DPIIT's order No. P-45021/2/2017-PP (BE-II) dated 16.09.2020.

10. This order shall be applicable in respect of the procurement made by all attached or subordinate offices or autonomous bodies under the Government of India including Government Companies as defined in the Companies Act, and /or the States and Local Bodies making procurement under all Central Schemes/ Central Sector Schemes where the Scheme is fully or partially funded by the Government of India. The aforesaid orders shall also be applicable in respect of projects wherein funding of goods, services or works is by Power Finance Corporation (PFC) /Rural Electrification Corporation (REC) and any Financial Institution in which Government of India/ State Government share exists. This order shall be applicable to Tariff Based Competitive Bidding (TBCB) projects also. Procuring entities as defined in the DPIIT's Order dated 16.09.2020 are advised to revise their tender documents to fully comply with the said DPIIT's Order and the subsequent Orders that would be issued in this regard by DPIIT/ this Ministry from time to time.

11. All tenders for procurement by Central Government Agencies or the States and Local Bodies, as the case may be, have to be certified for compliance of the Public Procurement (Preference to Make in India) 'PPP-MII' Order by the concerned procurement officer of the Government Organization before uploading the same on the portal.

12. Exemption from meeting the stipulated local content is allowed as per clause 13 and 13A of PPP-MII Order dated 16.09.2020, if the manufacturer declares that the item is manufactured in India under a License from a foreign Manufacturer who holds Intellectual Property Rights (IPRs) and there is Transfer of Technology (ToT) with phasing to increase Minimum Local Content. For such items, if any CPSE under the administration of Ministry of Power requests exemption for any item, it shall be considered by Ministry of Power, on case to case basis.

13. In order to further encourage Make in India initiatives and promote manufacturing and production of goods and services in India, general guidelines as enclosed at **Annexure-II** may be adopted in an appropriate manner according to the circumstances by the procuring entities in their tendering process.

14. The procurers may specify the higher values of MLC than those specified in this Order in respect of goods, services or works covered in their tenders and award the weightage to the product of higher MLC for which they have to specify the criteria beforehand in their tender. The values given in Annexure-I are the minimum prescribed values for becoming a class-I local supplier for the products indicated therein.

15. This issues with the approval of Hon'ble Minister for Power and New & Renewable Energy.

(S. Majumdar)
Under Secretary to the Government of India
Tele No. 011- 23356938

To:

1. Secretary to Government of India (All Ministries/ Departments of Government of India) (As per list)
2. Secretary (Coordination), Cabinet Secretariat
3. CEO, NITI Aayog
4. Chief Secretaries of all States/ UTs
5. Comptroller and Auditor General of India
6. Secretary, DPIIT, Chairman of Standing Committee for implementation of Public Procurement Order, 2017
7. Director General, Bureau of Indian Standards (BIS)
8. Joint Secretary, DPIIT, Member-Convener of Standing Committee for implementation of Public Procurement Order, 2017
9. Chairperson, CEA
10. CMDs of CPSEs, CMD NLC, Chairman of DVC/ BBMB/ EESL, DGs of BEE/ CPRI/ NPTI
11. All Additional Secretaries/ JSs/ EA/ CE, Ministry of Power

Copy to:

Director (Technical), NIC with a request to publish the Order on the website of Ministry of Power

APPENDIX

Extracts of important provisions contained in DPIIT Order No. P-45021/2/2017-PP (BE-II) dated 16-09-2020

1. **Definitions** *(Para 2 of DPIIT order)*:
   'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

   'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under this Order.

   'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for "Class-I Local supplier" under this Order.

   'Non-Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than that prescribed for 'Class-II local supplier' under this Order.

   'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

   'Margin of purchase preference' means the maximum extent to which the price quoted by a 'Class-I local supplier' may be above the L1 for the purpose of purchase preference.

   'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

   'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

   'Works' means all works as per Rule 130 of GFR- 2017, and will also include *'turnkey works'*.

2. **Eligibility of 'Class-I local supplier'/ 'Class-II local supplier'/ 'Non-local suppliers' for different types of procurement** *(Para 3 of DPIIT order)*
   (a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', as defined under the Order, shall be eligible to bid irrespective of purchase value.

   (b) Only 'Class-I local supplier' and 'Class-II local supplier', as defined under the Order, shall be eligible to bid in procurements undertaken by procuring entities, except when Global tender enquiry has been issued. In global tender enquiries, 'Non-local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'. In procurement of all goods, services or works, not covered by 3(a)above, and with estimated value of purchases less than Rs 200 crores, in accordance with Rule 161(iv) of GFR, 2017 Global tender enquiry shall not

be issued except with the approval of competent authority as designated by Department of Expenditure.

(c) For the purpose of this Order, works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.

3. **Purchase Preference** *(Para 3A of DPIIT order)*

(a) Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to 'Class-I local supplier' in procurements undertaken by procuring entities in the manner specified here under.

(b) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are divisible in nature, the " Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

i. Among all qualified bids, the lowest bid will be termed as L1 If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1.

ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.

(c) In the procurements of goods or works, which are covered by para 3(b) of DPIIT Order No. P-45021/2/2017-PP(BE-II) dated 16-09-2021 and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

iii. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract will be awarded to L1,

iv. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.

v. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.

(d) "Class-II local supplier" will not get purchase preference in any procurement, undertaken by procuring entities.

4. **Applicability in tenders where contract is to be awarded to multiple bidders** *(Para 3B of DPIIT order)*-
In tenders where contract is to be awarded to multiple bidders subject to matching of L1 rates or otherwise, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:
a) In case there is sufficient local capacity and competition for the items to be procured, as notified by the Nodal Ministry, only 'Class-I local supplier' shall be eligible to bid. As such, the multiple supplier who would be awarded the contract, should be all and only 'Class-I local suppliers'.

   b) In other cases, 'Class-II local suppliers' and 'Non-Local suppliers' may also participate in the bidding process along with 'Class-I local supplier' as per provisions of this order.

   c) If 'Class-I local supplier' qualify for award of contract for at least 50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class-I local supplier' do not qualify for award of the contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class-I local supplier' over 'Class-II local supplier'/'Non-local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class-I local suppliers' taken in totality or considered for award of contract for at least 50% of the tendered quantity.

   d) First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference subject to its meeting the prescribed criteria for award of contract as also the constraints of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of aforesaid constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier' falling within 20% margin of purchase preference, and so on.

   e) To avoid any ambiguity during bid evaluation process, the procuring entities may stipulate its own tender specific criteria for award of contract amongst different bidders including the procedure for purchase preference to 'Class-I local supplier' within the broad policy guidelines stipulate in sub-paras above.

5. **Exemption of small purchases** *(Para 4 in DPIIT order)*: Procurements where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.

6. **Minimum Local Content** *(Para 5 in DPIIT order)*: The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the local content requirement is minimum 20%. Nodal Ministry/Department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier'/'Class-II local supplier'. For the item for which Nodal Ministry/Department has not prescribed higher minimum local content notification under the order, it shall be 50% and 20% for 'Class-I local supplier'/'Class-II local supplier' respectively.

7. Vide DPIIT OM No. P-45021/102/2019-BE-IIPart(1) (E-50310) dated 4.03.2021 services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. shall not be considered as local value addition. Bidders offering imported products will fall under the category of Non- local suppliers. They can't claim themselves as Class-I local suppliers/Class-II local suppliers by claiming the services such as transportation, insurance, installation, commissioning, training and after sales service support like AMC/CMC etc. as local value addition.

8. **Margin of Purchase Preference** *(Para 6 of DPIIT order)*: The margin of purchase preference shall be 20%.

9. **Specifications in Tenders and other procurement solicitations** *(Para 10 of DPIIT order)*:
   a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.
   b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of 'Class-I local supplier'/ 'Class-II local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.
   c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to sub-paragraphs 'a' and 'b' above.
   d. **Reciprocity Clause:**
      i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of baring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc, it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action.
      ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all the items related to that nodal Ministry/Department, except for the list of items published by the Ministry/Department permitting their participation.
      iii. The stipulation in (ii) above shall be part of all tenders invited by the Central Government procuring entities stated in (i) above. All purchase on GeM shall also necessarily have the above provisions for items identified by nodal Ministry/Department.
      iv. State Governments should be encouraged to incorporate similar provisions in their respective tenders.
      v. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.
   e. Specifying foreign certification/ unreasonable technical specifications/ brands/ models in the bid document is restrictive and discriminatory practice against local

suppliers. If foreign certification is required to be stipulated because of non-availability of Indian Standards and/ or for any other reason, the same shall be done only after written approval of Secretary of Department concerned or any other authority having been designated such power by the Secretary of the Department concerned.

f. "All administrative Ministries/Departments whose procurement exceeds Rs. 1000 Crore per annum shall notify/ update their procurement projections every year, including those of PSEs/PSUs, for the next 5 years on their respective website."

Annexure-I

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
	(A) Common items for Transmission, Distribution and Generation Sector	
1	Power Transformers (up to 765 kV, including Generator transformers)	60
2	Instrument Transformer (up to 765 kV)	60
3	Transformer Oil Dry Out System (TODOS)	60
4	Reactors up to 765 kV	60
5	Oil Impregnated Bushing (up to 400 kV)	60
6	Resin Insultated Paper (RIP) bushings (up to 145 kV)	50
7	Circuit Breakers (up to 765 kV AC - Alternating Current)	60
8	Disconnectors/Isolators (up to 765 kV AC)	60
9	Wave trap (up to 765 kV AC)	60
10	Oil Filled Distribution Transformers up to & Including 33 kV [Cold Rolled Grain Oriented (CRGO)/Amorphous, Aluminium/Copper wound]	60
11	Dry Type Distribution Transformer upto and including 33 kV (CRGO/Amorphous, Aluminium/Copper wound)	60
12	Conventional Conductor	60
13	Accessories for Conventional conductors	60
14	High Temperature/High Temperature Low Sag (HTLS) conductors (such as Composite core, GAP, ACSS, INVAR, AL59) and Accessories	60
15	Optical ground wire (OPGW) – all designs	60
16	Fiber OpticTerminal Equipment (FOTE) for OPGW	50
17	OPGW related Hardware and Accessories	60
18	Remote Terminal Unit (RTU)	50
19	Power Cables and accessories up to 33 kV	60
20	Control cables including accessories	60
21	XLPE Cables up to 220 kV	60
22	Substation Structures	60
23	Transmission Line Towers	60
24	Porcelain (Disc/Long Rod) Insulators	60
25	Bus Post Insulators (Porcelain)	60
26	Porcelain Disc Insulators with Room Temperature Vulcanisation (RTV) coating	50
27	Porcelain Longrod Insulators withRoom Temperature Vulcanisation (RTV) coating	50
28	Hardware Fittings for Porcelain Insulators	60
29	Composite/Polymeric Long Rod Insulators	60
30	Hardware Fittings for Polymer Insulators	60
31	Bird Flight Diverter (BFD)	60
32	Power Line Carrier Communication (PLCC) System (up to 800 kV)	60
33	Gas Insulated Switchgear (up to 400 kV AC)	60
34	Gas Insulated Switchgear (above 400 kV AC)	50
35	Surge/Lightning Arrester (up to 765 kV AC)	60
36	Power Capacitors	60
37	Packaged Sub-station (6.6 kV to 33 kV)	60
38	Ring Main Unit (RMU) (up to 33 kV)	60
39	Medium Voltage (MV) GIS Panels (up to 33 kV)	60
40	Automation and Control System/Supervisory Control and data Acquisition (SCADA) System in Power System	50
41	Control and Relay Panel (including Digital/Numerical Relays)	50
42	Electrical Motors 0.37 kW to 1 MW	60
43	Energy Meters excluding smart meters	50
44	Control & power cables and Accessories (up to 1.1 kV)	60
45	Diesel Generating (DG) set	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
46	DC system (DC Battery & Battery Charger)	60
47	AC & DC Distribution Board	60
48	Indoor Air Insulated Switchgear (AIS) upto 33 kV	60
49	Poles (PCC, PSCC, Rolled Steel Joist, Rail Pole, Spun, Steel Tubular)	60
50	Material for Grounding/earthing system	60
51	Illumination system	60
52	Overhead Fault Sensing Indicator (FSI)	50
53	Power Quality Meters	50
54	Auxilliary Relays	50
55	Load Break Switch	50
	(B) Hydro Sector	
56	Hydro Turbine & Associated equipment	
	a) Francis Turbine	60
	b) Kaplan Turbine	60
	c) Pelton Turbine	50
57	Main Inlet Valve & Associated Equipment	60
58	Penstock Protection Valve and Associated Equipment	60
59	Governing system & Accessories	60
60	Generator for Hydro Project & Associated Equipment	60
61	Static Excitation System	60
62	Workshop Equipment	60
63	Cooling Water System	60
64	Compressed Air System	60
65	Drainage/Dewatering System	60
66	Fire Protection System	60
67	Heating, Ventilation & Air Conditioning System (HVAC)	60
68	Oil Handling System	60
69	Mechanical Balance of Plant (BOP) Items	60
	(C) Thermal Sector	
	Boiler Auxiliaries	
70	Air Pre-Heater	60
71	Steam Coil Air Pre Heater (SCAPH)	60
72	Steam soot blowers [wall blowers & Long Retractable Soot Blower (LRSB)]	60
73	Auxiliary Steam Pressure Reducing & Desuperheating (PRDS)	60
74	Fuel oil system	60
75	Seal air Fan	60
76	Ducts and dampers	60
77	Duct expansion joints	60
78	Blowdown tanks	60
79	Coal burners and oil burners	60
80	Coal mills	60
81	Gear Box of Coal Mill	50
82	Coal feeders	60
83	Primary Air Fans	60
84	Forced Draft Fans	60
85	Induced Draft Fans	60
86	Forced Draft (FD)/Induced Draft (ID)/ Primary Air (PA) Fan Servo Motor Assembly	50
87	Tubes (Carbon Steel)	50
88	Steam pipes (Carbon Steel)	50
89	Steam drum	50
90	Separator	50
91	Selective Catalytic Reduction (SCR)	50

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
	Electro-Static Precipitators (ESPs)	
92	Casing	60
93	Electrodes	60
94	Rapping System	60
95	Hopper Heaters	60
96	Transformer Rectifiers	60
97	Insulators	60
	Turbine & Auxiliaries	
98	Turbine (High Pressure/Intermediate Pressure/Low Pressure)	50
99	Condensate Extraction Pumps	60
100	Condenser On line Tube Cleaning System (COLTC)	60
101	Debris filters	60
102	Deaerator	60
103	Drain Cooler and Flash Tank	60
104	ECW Pump	50
105	Plate Heat Exchanger	50
106	Self- cleaning filters	50
107	Condensate Polishing Units (CPUs)	60
108	Chemical Dosing System	60
109	Oil Filter	60
110	Gland Steam Condenser	60
111	Oil Purifying Centrifuge	50
112	Water Cooled Condenser	50
113	Boiler Feed Pumps (BFPs)	50
	Generator and Auxillieries	
114	Generator (including Seal Oil System, Hydrogen Cooling System, Stator water cooling system)	60
	Electrical Works	
115	Control and metering equipment	60
	Control & Instrumentation System (C&I System)	
116	Thermocouples	50
117	Measuring instruments [Resistance Temperature Detectors (RTDs)], Local gauges	50
118	Actuators (Pneumatic and conventional electric)	50
119	Interplant Communication/ Public Address (PA) system except IP based	50
	Coal Handling Plant	
120	Conveyors	60
121	Wagon Tippler	60
122	Side Arm Charger	60
123	Paddle feeder	60
124	Crushers & Screens	60
125	Dust suppression (dry fog & plain water) system	60
126	Air Compressors	50
127	Magnetic separators & metal detectors	50
128	Coal Sampling System	60
129	Stacker cum reclaimer	60
130	Belt weighing & monitoring system	60
131	Wheel & axle assembly (without bearings) for Bottom Opening Bottom Release (BOBR) Wagons	60
	Ash Handling System	
132	Clinker grinder	60
133	Water jet ejectors	60
134	Scrapper chain conveyor	60
135	Dry fly ash vacuum extraction system	60
136	Pressure pneumatic conveying system	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
137	Ash water & ash slurry pumps	60
138	Compressors, air dryers & air receivers	50
139	Ash water recovery system	60
	Raw Water Intake & Supply System	
140	Travelling water screens	60
141	Raw water supply pumps	60
142	Valves, RE joints etc.	60
	Water Treatment System and Effluent Treatment System	
143	Clarification plant	60
144	Filtration plant	60
145	Ultra filtration plant	50
146	Reverse Osmosis (RO) plant and its membrane	55
147	De-Mineralised water plant (DM Plant)	60
148	Chlorination plant	60
149	Chemical dosing system	60
150	Effluent Treatment Plant	60
	Circulationg Water (CW) & Auxiliary Circulating Water (ACW) System	
151	CW & ACW Pumps	60
152	Butter Fly (BF) valves, Non-return Valves (NRVs) etc.	60
153	Rubber Expansion (RE) joints	60
154	Air release valves	60
	Cooling Towers (NDCT/ IDCT)-Natural-Draft and Induced Draft Cooling Tower	
155	Water Distribution System	60
156	Spray nozzles	60
157	Packing	60
158	Drift eliminators	60
159	Cooling Tower (CT) Fans (for Induced Draft Cooling Towers IDCT)	60
160	Gear boxes, shafts & motors (for IDCT)	60
	Air Conditioning & Ventilation System	
161	Split & window air conditioners	60
162	Chilling/ condensing unit [upto 500 ton of refrigeration(TR)]	55
163	Air Handling Unit (AHU) and Fresh air unit	60
164	Cooling Towers	60
165	Air Washing Units (AWUs), axial fans, roof extractors	60
166	Ducts, louvers & dampers	60
	Flue Gas Desulphurization (FGD)	
167	Spray Nozzles,	50
168	Spray header	50
169	Oxidation Blowers	50
170	Limestone wet Ball Mill	50
171	Slurry Handling Pumps for FGD system	50
172	Booster Fans for FGD system	50
173	Carbon Steel Ducts and Dampers for FGD	60
174	Storage Tanks and Silcs	60
175	Process Water Pump for FGD system	50
	(D) Other Common Items	
	Fire protection and detection system	
176	Motor driven fire water pumps	60
177	Diesel engine driven fire water pumps	60
178	Hydrant system for the power plant.	60
179	High velocity water spray system	60
180	Medium velocity water spray system	60
181	Foam protection system	60
182	Inert gas flooding system	60

Sl. No.	Electrical Equipment for Generation, Transmission and Distribution sectors with sufficent local capacity and competition	Class-I Local Supplier (Minimum Local Content (%)
183	Fire tenders	60
184	Portable fire-extinguishers	60
185	Cranes, EOT cranes, gantry crane & chain pulley blocks etc.	60
186	Elevator	60

(E) Minimum Local Content percentages in Engineering, Procurement & Construction (EPC) / Turnkey project

In case the contract is awarded through the EPC route, the contractor should comply with the requirement of MLC for individual items as listed in Annexure-I and should purchase these items only from Class-I Local supplier. In addition, MLC for complete EPC project may also be prescribed as below:

	(1) Package Based Works	Minimum Local Content (%)
1	Boiler	60
2	TG System (Water Cooled Condenser)	60
3	Ash Handling Plant	60
4	Coal Handling Plant	60
5	Electro-static Precipitator (ESP)	60
6	Circulating Water (CW) System	60
7	Cooling Tower	60
8	Water Treatment System	60
9	Air Conditioning System (below 500TR)	60
10	Flue Gas Desusphurisation (FGD) System	60
11	Station Control & Instrumentation (C&I)	50
12	Hydro Power Projects (Electro-Mechanical Works)	60
	Gas based generation	
	Overall Gas Turbine Package (on finished Product basis)	
13	< 44 MW	60
14	44 –145 MW	50
	Overall Combined Cycle Gas Turbine (CCGT) Package (on finished Product basis)	
15	< 44 MW	60
16	44 – 145 MW	60
17	> 150 MW	60
	(2) Project as a whole	
1	Works and service contracts in Power Sector	60
2	Transmission Line with Conventional conductors (ACSR, AAAC, AL-59 etc.)	60
3	Transmission Line with High temperature Low Sag (HTLS) conductors	60
4	HVAC Substation Air Insulated (AIS)	60
5	HVAC Substation Gas Insulated (GIS)	60
6	HVDC Substation	60
7	Distribution Sector	60

Annexure-II

General guidelines to be adopted selectively in an appropriate manner by the procuring entities in their tender documents.

1. The bidder shall have to be an entity registered in India in accordance with law.
2. The bids shall be in the language as prescribed by the tenderer/procurer.
3. The bids shall be in Indian Rupees (INR) (in respect of local content only).
4. Indian subsidiaries of foreign bidders shall have to meet the qualifying criteria in terms of capability, competency, financial position, past performance etc.
5. The bidder shall follow Indian laws, regulations and standards.
6. To be eligible for participation in the bid, foreign bidders shall compulsorily set up their manufacturing units on a long term basis in India as may be specified by the tenderer/ procurer.
7. Similar or better technology than the technology offered in respect of material, equipment and process involved shall be transferred to India. Along with the transfer of technology, adequate training in the respective field shall also be provided.
8. Country of origin of the equipment/material shall be provided in the bid.
9. For supply of equipment / material from the country of origin other than India, the bidder shall submit performance certificate in support of satisfactory operation in India or a country other than the country of origin having climatic and operational conditions including ambient temperature similar to that of India for more than _____ years (to be specified by the procurer).
10. The technologies/ products offered shall be environmental friendly, consuming less energy, safe, energy efficient, durable and long lasting under the prescribed operational conditions.
11. The supplier shall ensure supply of spares, materials and technological support for the entire life of the project.
12. The manufacturers/ supplier shall list out the products and components producing Toxic E-waste and other waste as may be specified. It shall have an Extended Producers Responsibility (EPR) so that after the completion of the lifecycle, the materials are safely recycled / disposed of by the Manufacturer/ supplier and for this, the Manufacturer/supplier along with procurer has to establish recycling / disposal unit **or** as may be specified.
13. Minimum Local Content requirement for goods, services or works shall be in accordance with the conditions laid down in respective Order(s) of the sectors on Public Procurement (Preference to Make in India) to provide for purchase preference (linked with local content).

14. The equipment/ material sourced from foreign companies may be tested in accredited labs in India before acceptance wherever such facilities are available.
15. The Tender fee and the Bank Guarantee (BG) shall be in Indian Rupees only.
16. The bidder shall have to furnish a certificate regarding cyber security/safety of the equipment/process to be supplied/services to be rendered as safe to connect.
17. Applicable safety requirements shall be met. Regular safety audit shall be carried out by the manufacturer/ supplier.
18. Statutory laws/regulations including the labour and environmental laws shall be strictly complied with during supply, storage, erection, commissioning and operation process. A regular compliance report shall be submitted to the procurer/appropriate Authorities.
19. Formation of new joint venture in India shall be permitted only with the Indian companies.
20. Tendering by the agent shall not be accepted.
21. In case local testing is not considered necessary by the procurer, theoriginal test report in the language prescribed by the procurer may be accepted. The translated test report shall not be accepted unless it is notarised.
22. Certification/compliance as per the Indian Standards/ International Standards/ Indian Regulations/ specified Standards shall be mandatory, where ever applicable.
23. Quality assurance of the product shall be carried out by the procurer or an independent third party agency appointed by the procurer. Manufacturing Quality Plan as approved by the procurer shall be followed by the manufacturer/supplier.
24. Wherever required by the procurer, foreign supplier shall establish fully functional service centers in India and shall keep spares/material locally for future needs of utilities.
25. Arbitration proceedings shall be instituted in India only and all disputes shall be settled as per applicable Indian Laws.

LIST OF CODES AND STANDARDS

Indian Standards	Title	International and Internationally recognised standards
IS:277	Galvanised steel sheets (plain or corrugated)	
IS:655	Specification for metal air duct	
IS:800	Code of practice for use of structural steel in general building construction	BS 449:1969 BS 5950 ASA A57, 1-1952
IS:807	Code of practice for design, manufacture, erection and testing (Structural portion) of cranes and hoists 6588 (Issued by Standards Association of Australia). DIN 120:1936 (Sheet 1) DIN 120:1936 (Sheet 2) 327 part-I, 1951 BS 466 part-II, 1960 BS 644:1960 BS 1757:1951 BS 2573:part-I:1960	Draft Revision of A.S. NO. CS.2 SAA Crane and Hoist code Doc:No. BU/4 Rev
IS:875	Code of practice for design loads (other than earthquake) for buildings and structures Leading standards (issued by Canadian Standard) DIN-1055-1955 (Issued by ASA)	National Building code of Canada (1953)-Part-IV Design section 4.1

IS:1239 Part-I	Mild steel tubes	(ISO/R 65-1957) (ISO/R-64-1958) (ISO/R-65-1958) (BS 1387 : 1957)
IS:1239 Part-II	Mild steel tubulars and other wrought steel pipe fittings	BS 1387 : 1967 BS 1387 :1967 BS 1740 :1965
IS:2825	Code for unfired vessels	
IS:1520	Horizontal centrifugal pumps for clear cold and fresh water	
IS:1600	Code for practice for performance of constant speed IC Engines for general purpose	
IS:1601	Specification for perform-ance of constant speed IC Engines for general Purpose	
IS:1893	Criteria for earthquake resistant design of structures	
IS1978-1971	Line Pipe April 1969.	API Standards 5L
IS:2254-1970	Dimensions of vertical shaft motor for pumps	IEC Pub 72-1 part I NEMA Pub MG 1 1954
IS:2266	Steel wire ropes for general engineering purposes	BS :302 : 1968
IS:2312	Propellant type Ventilation fans	
IS:2365	Steel wire suspension ropes for lifts and hoists	BS : 1957

IS:3346	Method for the determination of thermal conductivity of thermal insulation materials (two slab guarded hot plate method)	DIN 52612 (Deutscher Normenausschuss) ASTM C 163-1964 (American Society of Testing and materials) ASTM C 167-1974 ASTM C 177-1963
IS:3354	Outline dimensions for electric lifts.	
IS:3401	Silica gel	
IS:3588	Specification for electrical axial flow fans	
IS:3589	Electrically welded steel pipes for water, gas and sewage (200mm to 2000 mm Nominal Diametre)	
IS:3677	Unbonded rock and slag wool for thermal insulation	
IS:3815	Point hook with shank for general engineering purposes	BS 482 - 1968 Doc.:67/3 1284 (Revision of BS 2903) (Issued BS)
IS:3895	Specification for monocrystallines semiconductor rectifier cells and stacks	
IS:3963	Roof extractor unit	
IS:3975	Mild steel wires, strips and tapes for armouring cables	
IS:4503	Shell and tube type heat Exchanger	

IS:4540	Specification for monory-stallines rectifire assembly equipment	
IS:4671	Expanded polystyrene for thermal insulation purpose	
IS:4736	Hot dip zinc coating on steel tubes	
IS:4894	Centrifugal fans	
IS:5456	Code of practice for testing of positive displacement type air compressors and exhauster (For Test Tolerance Only)	
IS:5749	Forged ramshorn hooks	Entwurf DIN 15402 Blett 1 Entwurf DIN 15402 BS 3017-1958
IS:6392	Steel pipe flanges	BS 4504 : 1969
IS:6524 Part-I	Code of practice for design of tower cranes Static and rail mounted	BS 2799 : 1956
IS:7098	Cross linked Polyethylene insulated PVC sheathed cables	Standard No. 1 to IPCEA (USA) Pub. No. 5-66-524
IS:7373	Specification for wrought aluminium and aluminium sheet and strips	
IS:7938	Air receivers for compressed air installation	
ISO:1217	Displacement compressor-Acceplance test	
ASHRAE-33 and air heating coils.	Methods of testing for rating of forced circulation air cooling	
ASHRAE-52-76 particle matter.	Air cleaning device used in general ventilation for removing	

ASHRAE-22-72	Method of testing for rating of water cooled refrigerant condensers.
ASHRAE 23-67	Methods of testing for rating of positive displacement refrigerant compressors.
ARI-450-6	Standard for water cooled refrigerant condensers.
ARI-550	Standard for centrifugal water chilling packages.
ARI-410	Standard for forced circulation air cooling and air heating coils
ARI-430/435 BS:848 (Part-1,2)	Central station AHU/Application of Central Station AHU Fans
BS:400	Low carbon steel cylinders for the storage & transport of permanent gases.
BS:401	Low carbon steel cylinders for the storage & transport of liquified gases.
CTI Code ACT-105	Acceptance test code for Water Cooling Tower.
ANSI-31.5	Refrigerant piping
ASME-PTC- 23-1958	Atmospheric Water Cooling Equipment
AMCA A-21C	Test Code for air moving devices
API:618	Reciprocating Compressor for general refinary services.

HYDRAULIC INSTITUTE STANDARDS.

HYDRANT SYSTEM MANUALS OF TAC.

TAC MANUALS OF SPRAY SYSTEM

NFPA USA/ NSC UK/ UL USA/ FM USA STANDARDS.

INDIAN EXPLOSIVES ACT.

INDIAN FACTORIES ACT.

STANDARD OF TUBULAR EXCHANGER MANUFACTURER'S ASSOCIATION.

CODE AND STANDARD FOR CIVIL WORKS

Some of the applicable Standards, Codes and references are as follows:

Excavation & Filling

IS: 2720 (Part-II, IV TO VIII, XIV, XXI, XXIII, XXIV, XXVII TO XXIX, XL) Methods of test for soils-determination for water content etc.

IS: 4701 Code of practice for earth work on canals.

IS: 9758 Guidelines for Dewatering during construction.

IS: 10379 Code of practice for field control of moisture and compaction of soils for embankment and sub-grade.

Properties, Storage and Handling of Common Building Materials

IS: 269 Specification for ordinary Portland cement, 33 grade.

IS: 383 Specification for coarse and fine aggregates from natural sources for concrete.

IS: 432 Specification for mild steel and (Parts 1&2) medium tensile steel bars and hard-drawn steel wires for concrete reinforcement.

IS: 455 Specification for Portland slag cement.

IS: 702 Specification for Industrial bitumen.

IS: 712 Specification for building limes.

IS: 808 Rolled steel Beam channel and angle sections.

IS: 1077 Specification for common burnt clay building bricks.

IS: 1161 Specification of steel tubes for structural purposes.

IS: 1363 Hexagon head Bolts, Screws and nuts of production grade C.

IS: 1364 Hexagon head Bolts, Screws and Nuts of Production grade A & B.

IS: 1367 Technical supply conditions for Threaded fasteners.

IS: 1489	Specification for Portland-pozzolana cement:
(Part-I)	Fly ash based.
(Part-II)	Calcined clay based.
IS: 1542	Specification for sand for plaster.
IS: 1566	Specification for hard-drawn steel wire fabric for concrete reinforcement.
IS: 1786	Specification for high strength deformed bars for concrete reinforcement.
IS: 2062	Specification for steel for general structural purposes.
IS: 2116	Specification for sand for masonry mortars.
IS: 2386 (Parts-I to VIII)	Testing of aggregates for concrete.
IS: 3150	Hexagonal wire netting for general purpose.
IS: 3495 (Parts-I to IV)	Methods of tests of burnt clay building bricks.
IS: 3812	Specification for fly ash, for use as pozzolana and admixture.
IS: 4031	Methods of physical tests for hydraulic cement.
IS: 4032	Methods of chemical analysis of hydraulic cement.
IS: 4082	Recommendations on stacking and storage of construction materials at site.
IS: 8112	Specification for 43 grade ordinary portland cement.
IS: 8500	Medium and high strength structural steel.
IS: 12269	53 grade ordinary portland cement.
IS: 12894	Specification for Fly ash lime bricks.

Cast-In-Situ Concrete and Allied Works

IS: 280	Specification for mild steel wire for general engineering purposes.
IS: 456	Code of practice for plain and reinforced concrete.
IS: 457	Code of practice for general construction of plain & reinforced concrete for dams & other massive structures.
IS: 516	Method of test for strength of concrete.
IS: 650	Specification for standard sand for testing of cement.
IS: 1199	Methods of sampling and analysis of concrete.
IS: 1791	General requirements for batch type concrete mixers.
IS: 1838 (Part-I)	Specification for preformed fillers for expansion joints in concrete pavements and structures (non-extruding and resilient type).
IS: 2204	Code of practice for construction of reinforced concrete shell roof.
IS: 2210	Criteria for the design of reinforced concrete shell structures and folded plates.
IS: 2438	Specification for roller pan mixer.
IS: 2502	Code of practice for bending and fixing of bars for concrete reinforcement.
IS: 2505	General requirements for concrete vibrators, immersion type.
IS: 2506	General requirements for concrete vibrators, screed board type.
IS: 2514	Specification for concrete vibrating tables.
IS: 2645	Specification for Integral cement water proofing compounds.
IS: 2722	Specification for portable swing weigh batches for concrete. (single and double bucket type)
IS: 2750	Specification for Steel scaffolding.

	IS: 2751	Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction.
	IS: 3025	Methods of sampling and test waste water.
	IS: 3366	Specification for Pan vibrators.
	IS: 3370 (Part I to IV)	Code of practice for concrete structures for the storage of liquids.
	IS: 3414	Code of practice for design and installation of joints in buildings.
	IS: 3550	Methods of test for routine control for water used in industry.
	IS: 3558	Code of practice for use of immersion vibrators for consolidating concrete.
	IS: 4014 (Parts I & II)	Code of practice for steel tubular scaffolding.
	IS: 4326	Code of practice for earthquake resistant design and construction of buildings.
	IS: 4461	Code of practice for joints in surface hydro-electric power stations.
	IS: 4656	Specification for form vibrators for concrete.
	IS: 4925	Specification for batching and mixing plant.
	IS: 4990	Specification for plywood for concrete shuttering work.
	IS: 4995 (Parts I & II)	Criteria for design of reinforced concrete bins for the storage of granular and powdery materials.
	IS: 5256	Code or practice for sealing joints in concrete lining on canals.
	IS: 5525	Recommendations for detailing of reinforcement in reinforced concrete work.
	IS: 5624	Specification for foundation bolts.
	IS: 6461	Glossary of terms relating to cement concrete.

IS: 6494	Code of practice for water proofing of underground water reservoirs and swimming pools.
IS: 6509	Code of practice for installation of joints in concrete pavements.
IS: 7861	Code of practice for extreme weather concreting. (Parts I & II)
IS: 9012	Recommended practice for shot concreting.
IS: 9103	Specification for admixtures for concrete.
IS: 9417	Recommendations for welding cold worked steel bars for reinforced concrete construction.
IS: 10262	Recommended guidelines for concrete mix design.
IS: 11384	Code of practice for composite construction in structural steel and concrete.
IS: 11504	Criteria for structural design of reinforced concrete natural draught cooling towers.
IS: 12118	Specification for two-parts poly sulphide.
IS: 12200	Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.
IS: 13311	Method of non-destructive testing of concrete.
Part-1	Ultrasonic pulse velocity.
Part-2	Rebound hammer.
SP:23	Handbook of concrete mixes
SP: 24	Explanatory Handbook on IS: 456-1978
SP: 34	Handbook on concrete reinforcement and detailing.

Precast Concrete Works

SP: 7(PartVI/	National Building Code- Structural design of prefabrication and Sec.7) systems building.

IS: 10297	Code of practice for design and construction of floors and roofs using precast reinforced/prestressed concrete ribbed or cored slab units.
IS: 10505	Code of practice for construction of floors and roofs using pre-cast reinforced concrete units.

Masonary and Allied Works

IS: 1905	Code of Practice for Structural Safety of Buildings-Masonry walls.
IS: 2212	Code of Practice for Brickwork.
IS: 2250	Code of Practice for Preparation and use of Masonry Mortar.
SP: 20	Explanatory handbook on masonry code.

Sheeting Works

IS:277	Galvanised steel sheets (plain or corrugated).
IS: 459	Unreinforced corrugated and semi-corrugated asbestos cement sheets.
IS: 513	Cold-rolled carbon steel sheets.
IS: 730	Specification for fixing accessories for corrugated sheet roofing.
IS: 1626	Specification for Asbestos cement building pipes and pipe fittings, gutters and gutter fittings and roofing fittings.
IS: 2527	Code of practice for fixing rain water gutters and down pipe for roof drainage.
IS: 3007	Code of practice for laying of asbestos cement sheets.
IS: 5913	Methods of test for asbestos cement products.
IS: 7178	Technical supply conditions for tapping screw.
IS: 8183	Bonded mineral wool.

	IS: 8869	Washers for corrugated sheet roofing.
	IS: 12093	Code of practice for laying and fixing of sloped roof covering using plain and corrugated galvanised steel sheets.
	IS: 12866	Plastic translucent sheets made from thermosetting polyester resin (glass fibre reinforced).
	IS: 14246	Specification for continuously pre-painted galvanised steel sheets and coils.
	Fabrication and Erection of Structural Steel Work	
	IS: 2016	Specification for plain washers.
	IS: 814	Specification for covered Electrodes for Metal Arc Welding for weld steel.
	IS: 1852	Specification for Rolling and Cutting Tolerances for Hot rolled steel products.
	IS: 3502	Specifications for chequered plate.
	IS: 6911	Specification for stainless steel plate, sheet and strip.
	IS: 3757	Specification for high strength structural bolts
	IS: 6623	Specification for high strength structural nuts.
	IS: 6649	High Tensile friction grip washers.
	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.
	IS: 4000	Code of practice for assembly of structural joints using high tensile friction grip fasteners.
	IS: 9595	Code of procedure of Manual Metal Arc Welding of Mild Steel.
	IS: 817	Code of practice for Training and Testing of Metal Arc Welders.

	IS: 1811	Qualifying tests for Metal Arc Welders (engaged in welding structures other than pipes).
	IS: 9178	Criteria for Design of steel bins for storage of Bulk Materials.
	IS: 9006	Recommended Practice for Welding of Clad Steel.
	IS: 7215	Tolerances for fabrication steel structures.
	IS: 12843	Tolerance for erection of structural steel.
	IS: 4353	Recommendations for submerged arc welding of mild steel and low alloy steels.
	SP: 6 (Part 1 to 7)	ISI Handbook for structural Engineers.
	IS: 1608	Method of Tensile Testing of Steel products other than sheets, strip, wire and tube.
	IS: 1599	Method of Bend Tests for Steel products other than sheet, strip, wire and tube
	IS : 228	Methods of chemical Analysis of pig iron, cast iron and plain carbon and low alloy steel.
	IS : 2595	Code of Practice for Radio graphic testing.
	IS : 1182	Recommended practice for Radiographic Examination of fusion welded butt joints in steel plates.
	IS : 3664	Code of practice for Ultra sonic Testing by pulse echo method.
	IS : 3613	Acceptance tests for wire flux combination for submerged Arc Welding.
	IS : 3658	Code of practice for Liquid penetrant Flaw Detection.
	IS : 5334	Code of practice for Magnetic Particle Flaw Detection of Welds.

Plastering and Allied Works

IS : 1635	Code of practice for field slaking of Building lime and preparation of putty.
IS : 1661	Application of cement and cement lime plaster finishes.
IS : 2333	Plaster-of-paris.
IS : 2402	Code of practice for external rendered finishes.
IS : 2547	Gypsum building plaster.
IS : 3150	Hexagonal wire netting for general purpose.

Acid and Alkali Resistant Lining

IS : 158	Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali & heat resisting.
IS : 412	Specification for expanded metal steel sheets for general purpose.
IS : 4441	Code of practice for use of silicate type chemical resistant mortars.
IS : 4443	Code of practice for use of resin type chemical resistant mortars.
IS : 4456	Method of test for chemical resistant tiles. (Part I & II)
IS : 4457	Specification for ceramic unglazed vitreous acid resistant tiles.
IS : 4832	Specification for chemical resistant mortars.
	Part I Silicate type
	Part II Resin type
	Part III Sulphur type
IS : 4860	Specification for acid resistant bricks.
IS : 9510	Specification for bitumasitc, Acid resisting grade.

Water Supply, Drainage and Sanitation

IS : 458	Specification for concrete pipes.
IS : 554	Dimensions for pipe threads, where pressure tight joints are made on thread.
IS : 651	Specification for salt glazed stoneware pipes.
IS : 774	Flushing cisterns for water closets and urinals.
IS : 775	Cast iron brackets and supports for wash basins and sinks.
IS : 778	Copper alloy gate, globe and check valves for water works purposes.
IS : 781	Cast copper alloy screw down bib taps and stop valves for water services.
IS : 782	Caulking lead.
IS : 783	Code of practice for laying of concrete pipes.
IS : 1172	Basic requirements for water supply, drainage and sanitation.
IS : 1230	Cast iron rain water pipes and fittings.
IS : 1239	Mild steel tubes, tubulars and other wrought steel fittings.
IS : 1536	Centrifugally cast (Spun) iron pressure pipes for water, gas and sewage.
IS : 1537	Vertically cast iron pressure pipes for water, gas and sewage.
IS : 1538	Cast iron fittings for pressure pipe for water, gas and sewage.
IS : 1703	Ball valves (horizontal plunger type) including float for water supply purposes.
IS : 1726	Cast iron manhole covers and frames.
IS : 1729	Sand cast iron spigot and socket, soil, water and ventilating pipes, fittings and accessories.

	IS : 1742	Code of practice for building drainage.
	IS : 1795	Pillar taps for water supply purposes.
	IS : 1879	Malleable cast iron pipe fittings.
	IS : 2064	Code of practice for selection, installation and maintenance of sanitary appliances.
	IS : 2065	Code of practice for water supply in building.
	IS : 2326	Automatic flushing cisterns for urinals.
	IS : 2470 (Part-I & II)	Code of practice for installation of septic tanks.
	IS : 2501	Copper tubes for general engineering purposes.
	IS : 2548	Plastic seat and cover for water-closets.
	IS : 2556 (Part 1 to 15)	Vitreous sanitary appliances (vitreous china).
	IS : 2963	Non-ferrous waste fittings for wash basins and sinks.
	IS : 3114	Code of practice for laying of cast iron pipes.
	IS : 3311	Waste plug and its accessories for sinks and wash basins.
	IS : 3438	Silvered glass mirrors for general purposes.
	IS : 3486	Cast iron spigot and socket drain pipes.
	IS : 3589	Electrically welded steel pipes for water, gas and sewage (200mm to 2000mm nominal diameter).
	IS : 3989	Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
	IS : 4111 (Part I to IV)	Code of practice for ancillary structure in sewerage system.
	IS : 4127	Code of practice for laying of glazed stone-ware pipes.

IS : 4764	Tolerance limits for sewage effluents discharged into inland-surface waters.
IS : 4827	Electro plated coating of nickel and chromium on copper and copper alloys.
IS : 5329	Code of practice for sanitary pipe work above ground for buildings.
IS : 5382	Rubber sealing rings for gas mains, water mains and sewers.
IS : 5822	Code of practice for laying of welded steel pipes for water supply.
IS : 5961	Cast iron grating for drainage purpose.
IS : 7740	Code of practice for road gullies.
IS : 8931	Cast copper alloy fancy bib taps and stop valves for water services.
IS : 8934	Cast copper alloy fancy pillar taps for water services.
IS : 9762	Polyethylene floats for ball valves.
IS : 10446	Glossary of terms for water supply and sanitation.
IS : 10592	Industrial emergency showers, eye and face fountains and combination units.
IS : 12592	Specification for precast concrete manhole covers and frames.
IS : 12701	Rotational moulded polyethylene water storage tanks.
SP: 35	Handbook on water supply and drainage.
-	Manual on Sewerage and sewage treatment (Published by CPH & EEO) As updated.

Doors, Windows and Allied Works

IS : 204	Tower Bolts
Part-I	Ferrous metals.
Part-II	Nonferrous metals.

	IS : 208	Door Handles.
	IS : 281	Mild steel sliding door bolts for use with padlocks.
	IS : 362	Parliament Hinges.
	IS : 420	Specification for putty, for use on metal frames.
	IS : 1003 Part-I door	Specification for timber panelled and glazed shutters- (Part-I) shutters.
	IS : 1038	Steel doors, windows and ventilators.
	IS : 1081	Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
	IS : 1341	Steel butt hinges.
	IS : 1361	Steel windows for industrial buildings.
	IS : 1823	Floor door stoppers.
	IS : 1868	Anodic coatings on Aluminium and its alloys.
	IS : 2202 (Part-II)	Specification for wooden flush door shutters (solid core type); particle board face panels and hard board face panels
	IS:2209	Mortice locks (vertical type).
	IS:2553	Safety glass
	IS:2835	Flat transparent sheet glass.
	IS:3548	Code of practice for glazing in buildings.
	IS:3564	Door closers (Hydraulically regulated).
	IS : 3614	Fire check doors; plate, metal covered and rolling type.
	IS:4351	Steel door frames.
	IS:5187	Flush bolts.
	IS:5437	Wired and figured glass

	IS:6248	Metal rolling shutters and rolling grills.
	IS:6315	Floor springs (hydraulically regulated) for heavy doors.
	IS:7196	Hold fasts.
	IS:7452	Hot rolled steel sections for doors, windows and ventilators.
	IS:10019	Mild steel stays and fasteners.
	IS:10451	Steel sliding shutters (top hung type).
	IS:10521	Collapsible gates.
	Roof Water Proofing and Allied Works	
	IS:1203	Methods of testing tar and bitumen.
	IS:1322	Specification for bitumen felts for water proofing and damp proofing.
	IS:1346	Code of practice for water proofing of roofs with bitumen felts.
	IS:1580	Specification for bituminous compound for water proofing and caulking purposes.
	IS:3067	Code of practice for general design details and preparatory work for damp proofing and water proofing of buildings.
	IS:3384	Specification for bitumen primer for use in water proofing and damp proofing.
	Floor Finishes and Allied Works	
	IS:1237	Specification for cement concrete flooring tiles.
	IS:1443	Code of practice for laying and finishing of cement concrete flooring tiles.
	IS:2114	Code of practice for laying in-situ terrazzo floor finish.
	IS:2571	Code of practice for laying in-situ cement concrete flooring.
	IS:3462	Specification for unbacked flexible PVC flooring.
	IS:4971	Recommendations for selection of industrial floor finishes.

IS:5318	Code of practice for laying of flexible PVC sheet and tile flooring.
IS:8042	Specification for white portland cement.
IS:13801	Specification for chequered cement concrete flooring tiles.
Painting and Allied Works	
IS:162	Specification for fire resisting silicate type, brushing, for use on wood, colour as required.
IS:1477	Code of practice for painting of ferrous metals in buildings.
Part-I	Pretreatment.
Part-II	Painting.
IS:1650	Specification for colours for building and decorative finishes.
IS:2074	Specification for red oxide-zinc chrome, priming, ready mixed paint air drying.
IS:2338	Code of practice for finishing of wood and wood based materials.
Part-I	Operations and workmanship
Part-II	Schedules
IS:2395	Code of practice for painting concrete, masonry and plaster surfaces.
Part-I	Operations and workmanship.
Part-II	Schedule.
IS:2524	Code of practice for painting of nonferrous metals in buildings.
Part-I	Pretreatment.
Part-II	Painting.
IS:2932	Specification of synthetic enamel paint, exterior, under-coating and finishing.
IS:2933	Specification enamel paint, under coating and finishing.
IS:4759	Code of practice for hot dip zinc coating on structural steel and other allied products.
IS:5410	Specification for cement paint

IS:5411 (Part-I)	Specification for plastic emulsion paint-for exterior use
IS:6278	Code of practices for white washing and colour washing.
IS:10403	Glossary of terms relating to building finishes.
Piling and Foundation	
IS:1080	Code of practice for design and construction of simple spread foundations.
IS:1904	Code of practice for design and construction of foundations in Soils; General Requirements.
IS:2911	Code of practice for designs and construction of Pile foundations (Relevant Parts).
IS:2950 (Part-I)	Code of practice for designs and construction of Raft foundation.
IS:2974 (Part-I TO V)	Code of practice for design and construction of machine foundations.
IS:6403	Code of practice for determination of Allowable Bearing pressure on Shallow foundation.
IS:8009	Code of practice for calculation of settlement of foundation subjected to symmetrical vertical loads.
Part-I	Shallow foundations.
Part-II	Deep foundations.
IS:12070	Code of practice for design and construction of shallow foundations on rocks.
DIN:4024	Flexible supporting structures for machines with rotating machines.
VDI:2056	Criteria for assessing mechanical vibrations of machines.
VDI:2060	Criteria for assessing rotating imbalances in machines.
Stop Log and Trash Rack	
IS:4622	Recommendations for fixed - wheel gates structural design.
IS:5620	Recommendations for structural design criteria for low head slide gates.
IS:11388	Recommendations for design of trash rack for intakes.
IS:11855	General requirements for rubber seals for hydraulic gates.
Roads	

	IRC:5	Standard specifications and Code of practice for road bridges, section-I general Features of Design.
	IRC:14	Recommended practice of 2cm thick bitumen and tar carpets.
	IRC:16	Specification for priming of base course with bituminous primers.
	IRC:19	Standard specifications and code of practice for water bound macadam.
	IRC:21	Standard specifications and Code of practice for road bridges, section-III - Cement concrete (plain and reinforced).
	IRC:34	Recommendations for road construction in waterlogged areas.
	IRC:36	Recommended practice for the construction of earth embankments for road works.
	IRC:37	Guidelines for the Design of flexible pavements.
	IRC:56	Recommended practice for treatment of embankment slopes for erosion control.
	IRC:73	Geometric design standards for rural (non-urban) highways.
	IRC:86	Geometric Design standards for urban roads in plains.
	IRC:SP:13	Guidelines for the design of small bridges & culverts.
	IRC - Public-	Ministry of Surface Transport (Roads Wing), Specifications
	ation	for road and bridge works.
	IS:73	Specification for paving bitumen
	Loadings	
	IS:875	Code of practice for design loads other than earthquake) for
	(Pt. I to V)	buildings and structures.
	IS:1893	Criteria for earthquake resistant design of structures.
	IS:4091	Code of Practice for design and construction of foundation for transmission line towers & poles.
	IRC:6	Standard specifications & code of practice for road bridges, Section-II Loads and stresses.
	M.O.T.	Deptt. of railways Bridge Rules.
	Safety	
	IS:3696	Safety code for scaffolds and ladders.
	(Part I & II)	

IS:3764	Safety code for excavation work.
IS:4081	Safety code for blasting and related drilling operations.
IS:4130	Safety code for demolition of buildings.
IS:5121	Safety code for piling and other deep foundations.
IS:5916	Safety code for construction involving use of hot bituminous materials.
IS:7205	Safety code for erection on structural steelwork.
IS:7293	Safety code for working with construction machinery.
IS:7969	Safety code for handling and storage of building materials
IS:11769	Guidelines for safe use of products containing asbestos.

- Indian Explosives Act. 1940 as updated.

Architectural design of buildings

SP:7	National Building Code of India
SP:41	Handbook on functional requirements of buildings (other than industrial buildings)

Miscellaneous

IS:802	Code of practice for use of structural steel in
(Relevant parts)	overhead transmission line towers.
IS:803	Code of practice for design, fabrication and erection of vertical mild steel cylindrically welded in storage tanks.
IS:10430	Creteria for design of lined canals and liner for selection of type of lining.
IS:11592	Code of practice for selection and design of belt conveyors.
IS:12867	PVC handrails covers.
CIRIA	Design and construction of buried thin-wall pipes.
Publication	

REFERENCE CODES AND STANDARDS FOR CONTROL AND INSTRUMENTATION

The design, manufacture, inspection, testing & installation of all equipment and system covered under this specification shall conform to the latest editions of codes and standards mentioned below and all other applicable VDE, IEEE, ANSI, ASME, NEC, NEMA, ISA AND Indian Standards and their equivalents.

Temperature Measurements

1. Instrument and apparatus for temperature measurement - ASME PTC 19.3 (1974).
2. Temperature measurement - Thermocouples ANSI MC 96.1 - 1982.
3. Temperature measuremnet by electrical Resistance thermometers - IS:2806.
4. Thermometer - element - Platinum resistance - IS:2848.

Pressure Measurements

1. a) Instruments and apparatus for pressure measurement - ASME PTC 19.2 (1964).

   b) Electonic transmitters BS:6447.
2. Bourdon tube pressure and vacuum gauges - IS:3624 - 1966.
3. Process operated switch devices (Pr. Switch) BS-6134.

Flow Measurements

Instruments and apparatus for flow measurements - ASME PTC 19.5 (1972) Interim supplement, Part-II.

Measurement of fluid flow in closed conduits - BS-1042.

Electronic Measuring Instrument & Control Hardware/ Software

1. Automatic null balancing electrical measuring instruments - ANSI C 39.4 (Rev. 1973): IS:9319.
2. Safety requirements for electrical and electronic measuring and controling instrument - ANSI C 39.5 - 1974.
3. Compatability of analog signals for electronic industrial process instruments - ISA - S 50.1 (1982) ANSI MC 12.1 - 1975.
4. Dynamic response testing of process control instrumentation ISA - S 26 (1968).

5. Surge Withstand Capability (SWC) tests - ANSI C 37.90 a/IEEE-472 or suitable class of IEC-255-4 equivalent to ANSI C37.90a/IEEE-472.

6. Printed circuit boards - IPC TM - 650, IEC 326 C.

7. General requirement and tests for printed wiring boards - IS 7405 (Part-I) 1973.

8. Edge socket connectors - IEC 130-11.

9. Requirements and methods of testing of wire wrap terminations DIN 41611 Part-2.

10. Dimensions of attachment plugs & receptacles - ANSI C 73 - 1973 (Supplement ANSI C 73 a - 1980).

11. Direct acting electrical indicating instrument - IS:1248 - 1968 (R).

12. Standard Digital Interface for Programmable Instrumentation - IEEE-488.2 - 1990.

13. Information Processing Systems - Local Area Networks - Part 2 : Logical Link Control - IEEE-802.2 - 1989.

14. Standard for Local Area Networks : Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1985.

15. Supplements A, B, C and E to Carrier Sense Multiple Access with Collision Detection - IEEE-802.3 - 1988.

16. Standard for Local Area Networks : Token - Passing Bus Access Method - IEEE-802.4 - 1985.

17. Standard for Local Area Networks : Token - Ring Access Method and Physical Layer Specification - IEEE-802.5 - 1985.

18. IEEE Guide to Software Requirements Specifications - IEEE-830 - 1984.

19. Hardware Testing of Digital Process Computers - ISA RP55.1 - 1983.

20. Electromagnetic Susceptibility of Process Control Instrumentation - SAMA PMC 33.1 - 1978.

21. Interface Between the Data Terminal Equipment and Data Circuit - Terminating Equipment Employing Serial Binary Data Interchange - EIA-232-D-1987.

22. Electromagnetic Compatibility for Industrial Process Measurement and Control Equipment, Part 3 : Radiated Electromagnetic Field Requirements - IEC 801-3-1984.

Instrument Switches and Contact

1. Contact rating - AC services NEMA ICS 2 - 1978 (with revision through May 1983), Part - 2-125, A6000.
2. Contact rating - DC services NEMA ICS 2-1978 Part-2 125, N600.

Enclosures

1. Type of Enclosures - NEMA ICS Part - 6 - 1978 (with Rev. 1 4/80) through 110.22 (Type 4 to 13).
2. Racks, panels and associated equipment - EIA : RS - 310 C- 1983 (ANSI C 83.9 - 1972).
3. Protection class for Enclosures, cabinets, control panels & desks - IS:2147 - 1962.

Apparatus, enclosures and installation practices in hazardous area

1. Classification of hazardous area - NFPA 70 - 1984, Article 500.
2. Electrical Instruments in hazardous dust location - ISA - 512.11, 1973.
3. Instrinsically safe apparatus - NFPA 493 1978.
4. Purged and pressurised enclosure for electrical equipment in hazardous location - NFPA 496-1982.
5. Enclosures for Industrial Controls and Systems - NEMA IS 1.1 - 1977.

Sampling System

1. Stainless steel material of tubing and valves for sampling system - ASTMA 296-82, Grade 7 P 316.
2. Submerged helical coil heat exchangers for sample coolers ASTM D11 92-1977.
3. Water and steam in power cycle - ASME PTC 19.11.
4. Standard methods of sampling system - ASTM D 1066-99.

Annunciators

1. Specifications and guides for the use of general purpose annunciators - ISA S 19.1, 1979.
2. Surge withstand capability tests - ANSI C 37.90a - 1989/IEEE-472 or suitable class of IEC 255-4 equivalent to ANSI C37.90a 1989/IEEE-472
3. Damp heat cycling test - IS:2106

4. Specification for Electromagnetic Susceptibility - SAMA DMC 33, 1/78

Protections

1. Relays and relay system associated with electric power apparatus. ANSI C 37.90, 1 - 1989.
2. General requirements & tests for switching devices for control and auxiliary circuits including contactor relays - IS:6875 (Part-I) - 1973.
3. Turbine water damage prevention - ASME TDP-1-1980.
4. Boiler safety interlocks - NFPA Section 85 B - 1984, 85 C - 1991.

UPS System

1. Practices and requirements for semi-conductor power rectifiers - ANSI C 34.2, 1973.
2. Relays and relays system associated with electrical power apparatus - ANSI C 3.90 - 1983.
3. Surge withstand capability test - ANSI C 37.90 1 -1989.
4. Performance testing of UPS - IEC 146.
5. Stationary cells & Batteries Lead Acid type (with tubular positive plates) specification IS-1651-1991.
6. Recommended practice for sizing large lead storage batteries for generating stations & sub-stations - IEEE-485-1985.
7. Printed Circuit Board - IPC TM 650, IEC 326C.
8. General Requirements & tests for printed wiring boards, IS:7405 (Part-I) 1973.

Control Valves

1. Control valve sizing - Compressible & Incompressible fluids - ISA S 75.01-1985.
2. Face to face dimensions of control valves - ANSI B 16.00 - 1973.
3. ISA Hand Book of Control Valves - (ISBN : B: 1047-087664-234-2).
4. Codes for pressure piping - ANSI B 31.1
5. Control Valve leak class - ISA RP 39.6

Process Connection & Piping

1. Codes for pressure piping "power piping" - ANSI B 31.1.
2. Seamless carbon steel pipe ASTM - A - 106.
3. Forged & Rolled Alloy steel pipe flanges, forged fittings and valves and parts - ASTM - A - 182.
4. Material for socket welded fittings - ASTM - A - 105.
5. Seamless ferritic alloy steep pipe - ASTM - A - 335.
6. Pipe fittings of wrought carbon steel and alloy steel - ASTM - A - 234.
7. Composition bronze of ounce metal castings - ASTM - B - 62.
8. Seamless Copper tube, bright annealed - ASTM - B - 168.
9. Seamless copper tube - ASTM - B - 75.
10. Dimension of fittings - ANSI - B - 16.11.
11. Valves flanged and butt welding ends - ANSI - B - 16.34.

Instrument Tubing

1. Seamless carbon steel pipe - ASTM - A 106.
2. Material of socketweld fittings - ASTM - A105.
3. Dimensions of fittings - ANSI - B - 16.11.
4. Code for pressure piping, welding, hydrostatic testing - ANSI B 31.1.

Cables

1. Thermocouples extension wires/cables - ANSI MC 96.1 - 1992.
2. Requirements for copper conductor-Wiring cables for telecommunications & information processing system - VDE:0815.
3. Colour coding of single or multi-pair cables - ICEA - S - 61-402 (third edition) NEMA WCS - 1979 with revisions thorugh 2/83.
4. Insulation & Sheathing compounds for cables : VDE 0207 (Part-4, 5 & 6).
5. Guide design and installation of cable systems in power generating stations (insulation, jacket materials) - IEEE Std. 422-1977.
6. Rules for Testing insulated cables and flexible cables : VVDE - 0472
7. Requirements of vertical flame propagation test - IEEE 383 - 1974 (R 1980)

8. Standard specification for tinned soft or annealed copper wire for electrical purpose - ASTM B-33-81.

9. Oxygen index and temperature index test - ASTM D - 2863.

10. Smoke density measurement test - ASTMD - 2843.

11. Acid gas generation test - IEC - 754 - 1.

12. Swedish Chimney test - SEN - 4241475 (F3).

13. Teflon (FEP) insulation & sheath test - ASTMD - 2116.

14. Thermocouple compensating cables - Testing requirements & sampling plan IS:8784.

15. PVC insulated electric cables for working voltage upto and including 1100 V - IS:1554 (Part-I).

Cable Trays, Conduits

1. Guide for design and installation of cable systems in power generating staiton (Cable trays, support systems, conduits) - IEEE Std. 422, 1977, NEMA VE-1 1979, NFPA 70-1984.

2. -do- Test Standards. NEMA VE-1-1979.

3. Zinc coating "hot dip" on assembled products for galvanising of carbon steel cable trays - ASTMA - 386-78.

Public Address System

1. Specifications for lod speakers - IS:7741 (Part-I, II and III)

2. Code of safety requirement for electric mains operated audio amplifiers - IS:1301

3. Specification for Public Address Amplifiers - IS:10426.

4. Code of practice for outdoor installation of PA system - IS:1982.

5. Code of practice for installation for indoor amplifying and sound distribution system - IS:1881.

6. Basic environmental testing procedures for electronic and electrical items - IS:9000.

7. Characteristics and methods of measurements for sound system equipment - IS:9302

8. Code of practice of electrical wiring installations (System voltage not exceeding 650 volts) - IS:732

9. Rigid steel conduits for electric wiring - IS:9537 (Part-I and II)

10. Fittings for rigid steel conduits for electrical wiring - IS:2667

11. Degree of protection provided by enclosure for low voltage switchgear and control gear - IS:2147.

Vibration Monitoring System

1. API 670 - 1994

2. BS : 4675 Part-2

ANNEXURE-III

एनटीपीसी NTPC	Project : Stage :: Package : Supplier : Contractor No. :	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB-SYSTEM :	DOC. NO.: REV. NO.: DATE : PAGE : OF

S. N.	Item	QP/ Insp. Cat.	QP No.	QP Sub. Schedule	QP approval schedule	Proposed sub-supplier	Place	Sub-suppliers approval status / category	Sub-supplier Details submission schedule	Remarks

LEGENDS

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 alongwith the condition of approval, if any.**

DR – **For these 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.'**

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 QP.**

CAT-III **: For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.**

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

FORMAT NO.: QS-01-QAI-P-1/F3-R0 1/1 Engg. Div. / QA&I

ANNEXURE-IV

एनटीपीसी NTPC	Project : Stage :: Package : Contractor : Contractor No. :	STATUS OF ITEM REQUIRING QP& SUB-SUPPLIER APPROVAL	DOC. NO.: REV. NO.: DATE : PAGE : OF

S. N.	Item / Service	QP/ Insp. Cat.	QP Sub. Schedule Approval schedule	Date of sub-mission	Date of commt Appl.	Status Code C/II/I	Proposed Sub-suppliers	Place of manufacturing works	Approval Status	Sub-supplier detail submission schedule	Remarks

FORMAT 1/1 Engg. Div. / QA&I

ANNEXURE-V

एनटीपीसी NTPC	Project : Stage : Contractor : Contractor No. : System :	**FIELD WELDING SCHEDULE** **(To be raised by the contractor)** **Welding Code: ……**	**DOC. NO.:** **REV. NO.:** **DATE :** **PAGE : OF**

Sl. No.	DRG No. for Weld Location and Identification mark	Description of parts to welded	Matl. Spec.	Dimensions		Process of welding	Type of Weld	Electrode filler spec.	WPS. No.	Min. pre-heat	Heat treatment		NDT method/ Quantum	REF		Remarks
											Temp.	Holding time		Spec. No.	ACC Norm Ref.	

NOTES:

SIGNATURE

FORMAT	1/1	**Engg. Div. / QA&I**

S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	3	-
	▪ Other Drawings/Documents (A0 & A1 sizes)	3	-
	▪ P&ID (All sizes)	3	-
	a) Final drawings/documents (Directly to site)	3	2
	b) "As Built" Drawing/Documents (Directly to site)	3	2
	c) Analysis reports of Equipments / piping / structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	3 sets	2
3	Operation & Maintenance manual i) First Submission	0	--
	ii) Final Submission (Directly to site)	3 sets	2
4	Plant Hand Book i) Final Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	3 sets	2

S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
6	Performance and Functional Guarantee Test Report i) First Submission	1 sets	–
	ii) Approved Copies (Direct to Site)	3 sets	2
7	Project Completion Report (Directly to site)	3 sets	2

MILL REJECT HANDLING SYSTEM

We, hereby furnish the data on provenness criteria for manufacturer/supplier of Mill reject handling system and have previous experience of manufacturing/got manufactured and supplying metallic belt conveyor type or chain flight conveyor type rejects handling systems of capacity 1.5 MTPH or higher for any industrial installations unit which are in successful operation in at least one (1) plant for a period not less than one (1) year as per clause no. 4.13 of Sub-section-I, Part-A of Section-VI.
The details of type and minimum equipment rating of such equipment are given below :

S.No.	Item Description	Station-I
(i)	Name of the station and its location	
(ii)	Client name and its address, Fax No. & Tel. No.	
	– e-mail id	
	– website address	
iii)	Name and Designation of the responsible person in client's organisation	
(iv)	Name of manufacturer/supplier & address	
(v)	Contract No. & Date	
(vi)	Capacity in MW of each Unit	
(vii)	Starting date of work	
(viii)	Scheduled date of completion	
(ix)	Actual date of completion	
(x)	Date of Commissioning of system/Package	
(xi)	Whether the Mill Reject Handling System has been in successful operation for a period not less than one (1) year.	*Yes/*No

Signature of authorized signatory.....

S.No.	Item Description	Station-I
(xii)	Brief Technical Particulars of the system/Package/equipment :	
	- Type of system:	Metallic belt conveyor/chain flight conveyor
	- Mill rejects conveying rate (MTPH)	.....

***Strike off whichever is not applicable.**

Date :

(Signature).....

Place :

(Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....

CORPORATE QUALITY ASSURANCE/ कॉरपोरेट गुणवत्ता आश्वासन

MAIN CONTRACTOR'S PROPOSAL CUM EVALUATION REPORT

मुख्य संविदाकार प्रस्ताव सह मुल्यांकन रिपोर्ट ANNEXURE-VII

Ref No: संदर्भ सं.:			***Date:*** तिथिः		
i.	***Main Contractor*** मुख्य संविदाकार				
ii.	***Project*** परियोजना				
iii.	***Package Name*** पैकेज का नाम		***Package No*** पैकेज सं.		
iv.	***Proposed Item/Scope of Sub-contracting*** उप-संविदा(अनुबंध) का प्रस्तावित मद/ दायरा				
v.	***Item covered under*** *निम्नलिखित के अंतर्गत शामिल मद*	***Schedule-1*** */अनुसूची- 1*		***As per contract clause No-*** *अनुबंध के अनुसार खंड सं.-- -*	
		Schedule-2 *अनुसूची- -2*			
vi.	***If item is Schedule-1 and proposed sub-vendor is indigenous, Main Contractor to explain how the contractual provisions will be fulfilled*** /यदि मद अनुसूची -**1** है और प्रस्तावित उप-विक्रेता स्वदेशी है, तो मुख्य संविदाकार को स्पष्ट करना होगा कि संविदा/अनुबंध के प्रावधान कैसे पूरे किए जाएंगे				
vii.	***Name and Address of the proposed Sub-vendor's works*** /प्रस्तावित सब-वेंडर का नाम तथा पता				
viii.	***PO placement date/ Start of manufacturing (if self-manufactured) as per L2 network*** **पीओ नियोजन की तिथि / एल-** 2 **नेटवर्क के अनुसार विनिर्माण (यदि स्व-निर्मित है) की शुरुआत**				
ix.	***Item Description (Type/Size/Rating/Scope of Sub-Contracting)*** मद का विवरण (प्रकार / आकार / रेटिंग / उप-अनुबंध का दायरा)	***Total quantity of proposed item envisaged in this package (Nos/ Running Meters/ Kgs/ Tons etc)*** इस पैकेज में परिकल्पित प्रस्तावित मद की कुल मात्रा (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि)	***Quantity proposed to be procured from proposed sub-vendor (Nos/ Running Meters /Kgs /Tons etc)*** प्रस्तावित उप-विक्रेता (संख्या / क्रियाशील मीटर / किलोग्राम / टन आदि) से खरीदी जाने वाली मात्रा	***Timeline for quantity requirements as per project schedule & whether the proposed Sub-vendor equipped with adequate capacity to supply proposed order quantity in time*** / परियोजना समय सूची के अनुसार मात्रा आवश्यकताओं के लिए समय-सीमा और क्या प्रस्तावित उप-विक्रेता समय पर प्रस्तावित मांग की मात्रा की आपूर्ति करने में पूरी तरह से सक्षम है	
x.	***Supply experience of the proposed sub-vendor (including supplies to Main Contractor, if any) for similar item/scope of sub-contracting, for last 3 years (Note:- Only relevant experience details w.r.t. proposed item/scope of subcontracting to be brought out here)*** पिछले **3** वर्षों के लिए उप-अनुबंध के समान मद / दायरे के लिए प्रस्तावित सब-वेंडर (मुख्य संविदाकार हेतु				

आपूर्ति, यदि कोई हो, सहित) का आपूर्ति अनुभव (नोट: - उप-अनुबंध के प्रस्तावित मद / दायरे के संबंध में केवल प्रासंगिक अनुभव के विवरण का उल्लेख हो

Project/Package परियोजना/पैकेज	***Customer Name*** ग्राहक का नाम	***Supplied Item (Type/Rating/Model /Capacity/Size etc)*** आपूर्त्तित मद (प्रकार/रेटिंग /मॉडल /क्षमता/आकार आदि)	***PO ref no/date*** पीओ संदर्भ सं. /तिथि	***Supplied Quantity*** आपूर्ति की मात्रा	***Date of Supply*** आपूर्त्ति की तिथि

We confirm that as per our physical assessment, the proposed sub-vendor has requisite capabilities & supply experience and is suitable for supplying the proposed item/scope of sub-contracting/हम अपने **भौतिक** आकलन के अनुसार इस बात की पुष्टि करते हैं कि, प्रस्तावित उप-विक्रेता के पास अपेक्षित क्षमता और आपूर्ति करने का अनुभव है और उप-अनुबंध के दायरे /प्रस्तावित मद की आपूर्ति के लिए उपयुक्त है।

Name: नाम:		***Desig:*** पद:		***Contact No:*** दूरभाष सं.:		***Sign:*** हस्ताक्षर:		***Date:*** तिथि:	

Company's Seal/Stamp:- कंपनी का मुहर:-

1.0 *Sub-Contractors/ Sub-Vendors/ Sub-Suppliers:*

1.1 Any sub-vendor (in addition to Indicative Vendor List E-60 part of bid document) suggested by bidder except the sub-vendor from land border sharing countries shall be treated under DR (Details Required) category, if required. But the number of sub-vendors in DR category shall be decided on mutually agreed basis during post award discussions. For the approval of any new sub-vendor, please refer clause no.22.17.00.
For the proposal of sub-vendors from land border sharing countries, Bidder shall ensure the compliance of GOI circulars and shall submit such sub-vendor proposal to NTPC for review & acceptance. (Please refer GTR clause no 40.00.00).
In addition to above, for certain System/ Items covered in Technical Specifications, where Sub-QR (Qualifying requirements) are specified, bidder shall confirm that firm purchase order to the Sub Vendors selected/ shortlisted by them for these items/ systems, will only be placed after acceptance by NTPC of the concerned Sub Vendors meeting the specified qualifying requirements.

1.2 For the proposals where status of proposal is in "DR" category (details required), as NTPC does not have any past experience with them) in the above mentioned list, Bidder shall furnish the complete details of such proposals, in NTPC Formats , in time bound manner, so as not to impede the progress of the Project/ Works. For details please refer clause no 22.17.00.

1.3. Bidder shall furnish the required details, as detailed out in 2.3 above, of the proposed Manufacturer/ Sub-Vendor, along with their own detailed recommendations, in the NTPC-formats. proposals/ details shall be received only up to 3 months prior to ordering date of the concerned item (L-2 Network/ BOI Schedule), for NTPC review and assessment. Bidder may accordingly plan the submissions.

1.4 Bidder to confirm that the list of Items/ BOI includes all major Items/ BOIs required in their scope of work/ supply. If any Item/ BOI is left out or gets included during detailed engineering, Bidder shall propose the Manufacturers/Sub-Vendors, prior to initiating the procurement action. In such cases also, proposals, with details given in 2.3 above, shall be forwarded in time bound manner, within time limits given in 2.1 & 2.4 above.

1.5 It is understood that in terms of provisions of Cl. 19.1 of GCC (General Conditions of Contract), in case bidder opts for additional Sub - Vendor proposals, over & above the indicative sub vendor list herein (part of bid document), may be given, within sufficient time, so as not to impede the progress of the work. Accordingly, all such proposals along with required details (as given in 2.3 above), shall be received only up to 3 months prior to ordering date of the concerned item/ Scheduled start of the Manufacture of Self Manufactured Item, for NTPC review and assessment.

1.6 It is agreed that wherever "Main Contractor approved Sources" have been mentioned in the Indicative Vendor List (part of bid document), Bidder shall submit to NTPC, the copies of unpriced Purchase Order, on the specific Manufacturer, from whom supply is intended to be made, to enable NTPC to plan for Surveillance Audit of the manufacturer, if desired, prior to issue of Dispatch Clearance of the concerned item.

1.7 Bidder has to furnish System Supplier proposals for various Sub-Systems which are termed as Level-I Vendors. Further, Manufacturer/ Sub-vendor proposals for major items/ components under these systems, are not yet furnished, as the same would

depend on Level-I vendor shortlisted by bidder for such systems. It is agreed that sub vendor proposals for such items/ components (Level-II vendors) shall be made by bidder to NTPC with complete sub vendor details, in such a manner that the proposals can be finalised after award of contract by bidder on Level-I Vendor. It is understood that schedule of such Sub-vendor proposals shall be in accordance with the Project schedule (L-2 Network/ BOI Schedule) taking into consideration the time required for processing sub vendor approvals, by NTPC, enumerated above.

1.8 In the Indicative Sub Vendor List (part of the bid document), against each Item/ Sub-Vendor, the Category of Inspection is also indicated. NTPC reserves the right to conduct Surveillance Inspection/ Audit of the material, which are identified in Cat-II/ Cat-III, to verify the effectiveness of Quality System of bidder and conformance of the offered lot, to the applicable Standards/ requirements.

2.0 *Welding:*

Bidder to ensure that they will submit to NTPC, their approved List of Make/ Brand of Electrodes/ Welding Consumables, to be used during welding at Site.

3.0 Bidder to ensure that for Schedule-I/ Schedule-II supplies, orders shall be placed suitably on approved Sub-Vendors' manufacturing location (Foreign/ Indigenous), keeping the Contractual requirements in view.

4.0 Bidder to ensure the requirements of QA Documentation as per GTR clause no.23.00.00 for its completeness and only thereafter submit to NTPC.

5.0 Bidder shall furnish duly filled, below mention QA coordination procedure (QACP) during post award.

QACP (QA Coordination Procedure)

1. **SCOPE OF WORKS**:

   a) **QUALITY ASSURANCE:** Review of main contractor's (and their proposed major sub-contractor's) detailed quality plan (MQP and FQP) including customer hold points for inspection. Review of manufacturer's test /inspection report and test certificates as per approved QP.

   b) **INSPECTION SERVICES:** Witness of stage and final shop inspection /verification of documentation/ performance testing of major equipment as per approved QP and issuance of CHP and MDCC.

   c) **VENDOR/SUB-VENDOR APPROVAL**: Review and approval of major sub-contractors proposed by the Contractor shall be done by Employer QA&I Finalization of inspection category of items being manufactured and supplied by Main Contractor and sub-vendors shall be done by Employer QA&I

2. **SCOPE OF PROCEDURE:**

   a) The scope of this procedure is to explain and elaborate the scope of work of quality assurance & inspection, during the execution of service between employer (QA & Regional Inspection Offices), and bidder for project

   b) Items not covered in Quality Plan are CAT-III items. Such items & items identified as Cat-III in vendor list, shall be treated as non-inspection items and Certificate of Conformance (COC) shall be submitted to employer (QA & Regional Inspection Offices) for review.

3. **DOCUMENTATION TO BE PROVIDED BY bidder:**

   a) Master list of items requiring QP and Type test approval: shall be prepared by main contractor and approved by Employer QA&I Approved Drawings, Data-sheet, Specifications, etc. shall be provided to Employer QA&I by bidder for inspection purpose.

4. SUBMISSION OF QUALITY PLAN FOR REVIEW, COMMENTS AND APPROVAL:

a) Transmittal (In soft) shall indicate the following:

   i. Name of the item/equipment & QP/Document Number as per master list.
   ii. Remarks / Special notes along with reference documents and norms.
   iii. QPs shall be submitted in the prescribed formats of Employer QA&I

b) All correspondence and submission of Quality Plan, Field Quality Plan and other documents shall be submitted in soft form i.e. Adobe Acrobat file (pdf format) through Dreams 2.0 indicating the identical Name & Number of QP as per 'Master List of Documents' (MDL). Coordinator of Main Contractor shall arrange submission of Master list of QP documents (In Soft – Dreams 2.0) for various equipment, plant & systems to the Employer QA&I coordinator

c) On review/ comments / approval of QP, QA&I Coordinator shall forward in PDF form (soft) only, to bidder's coordinator in two weeks.

d) On review of each QP/document shall be categorized in one of the following:
   i. Category-I Approved

   ii. Category-II Approved subject to incorporation of comments and to be resubmitted after incorporation of comments.

   iii. Category-III Disapproved. See comments.

e) Considering the criticality of the project requirement, all out efforts shall be made to re-submit the QPs/documents as early as possible but not later than 2 (two) weeks from the date of receipt of commented QP/documents from Employer QA&I

f) For MQPs and FQPs approved in Cat-II, the work can be proceeded subject to taking care of comments furnished on documents. However, these comments will be taken care of by Main Contractor while submitting the revised QP/documents for final approval in Cat-I along with their explanation, if any (highlighting all the changes).

g) Final inspection & clearance shall only be issued on approved drawings, Data sheets & QP (in Category-I).

5. COORDINATORS FOR COMMUNICATION:

a) Bidder's Coordinator, & Employer QA&I Coordinator shall be the focal points for ensuring smooth execution and monitoring of the contract.

b) Bidder OVER ALL COORDINATOR:

	Main Coordinator	**Alternate Coordinator**
Name		
Designation		
Address		
Contact No		
Email		

c) Employer QA&I Coordinator:

	Main Coordinator	**Alternate Coordinator**
Name		
Designation		
Address		
Contact No		
Email		

6. EMPLOYER QA&I PROGRESS REPORTING: Bidder's coordinator shall furnish on or before 12th of every calendar month progress report, highlighting QA&I activities in the reporting month, which shall contain the summary of QP/ documents submission and approval status for QP/ documents under approval to Employer QA&I Coordinators for information. Major QA&I hold-ups shall be highlighted in the progress report.

7. CUSTOMER CO-ORDINATION MEETING:

a) To resolve and sort out various QA&I matters and outstanding issues structured contract co-ordination meeting (CCM) shall be held periodically as per notice of bidder /Employer QA&I

b) Bidder may arrange for the participation of his sub-vendors also, if required for the meeting to resolve their respective issues.

c) The venue for the meeting will be the office of Employer/Bidder as decided on case-to-case basis

d) Minutes of Meeting (MOM) will be drafted by the agency at whose office the meeting is held and the same will be finalized and signed by all parties before close of the meeting.

8. CORRESPONDENCE:

a) All correspondences related to this project shall be among coordinators of, QA&I & bidder as indicated in point no: 5.0.

b) **EMPLOYER QA&I CONSULTANT's Regional Inspection Offices:** The list of Inspection Offices along with names and contact / communication details of the Heads of RIOs and the areas of their jurisdiction is placed at. http://qains.ntpc.co.in/inspection/

9. DEVIATION / NON-CONFORMITY DISPOSITIONING:

a) If deviations are observed during inspection, same shall be recorded by Employer inspector in the CHP.

b) Classification of deviations: It would be required to classify a particular deviation as Major or Minor, which shall be done by Employer QA&I applying following criteria:

i) **MAJOR Non-conformities:** non-conformity is a "Major" non-conformity which prima-face is likely to have bearing on the Performance, Reliability, Safety, Interchangeability, Maintainability, Working life of the material, equipment or service.

ii) **MINOR Non-conformities:** A non-conformity not categorized as 'Major' is considered as "Minor", i.e. deviation is with respect to the applicable drawings/applicable standards.

c) Dispositioning of Deviation / Non-Conformity:

i) MAJOR:

Any deviation is characterized as "Major", the bidder to submit a justification as to why the same can be accepted with due corrective and preventive action plan. Such justification shall be submitted to the employer/, enabling it (Employer QA&I) to comment on the bidder's justification/proposal for acceptance/rework.

ii) MINOR:

Dispositioning of MINOR deviations shall be done by employer QA&I

Complete details of bidder design dispositioning of the deviation shall be sent by bidder to employer QA&I for proceeding further. QA&I would review the bidder design's dispositioning and either proceed further with acceptance decision or return the dispositioning to bidder for reclassifying it as Major for dispositioning by the CQA.

Format for "Non- Conformity Report for Manufacturing & Inspection Stages" is attached at Annexure VIII.

10. Type Tests (wherever applicable as per specification or approved QPs / Drawings): Bidder shall ensure that type tests (wherever applicable) are duly approved/accepted by NTPC Engg (Engg Consultant) before offering such item for inspection as per QP. Evidence of Type Test approval in such cases shall be furnished by bidder, while raising inspection call.

11. RESPONSIBILITY FOR ISSUING MDCC:

Employer QA&I shall issue MDCC in case of Cat-I and Cat-II items and for Cat-III items Employer QA&I shall issue MDCC directly based on COC of bidder. MDCC shall be issued after checking of vendor approval status, BBU approval, and Type Test (if applicable).

12. INSPECTION PROCEDURE: Inspection shall be carried out as detailed:

For Cat-I & II items: where physical inspection (Cat-I) and documents review (Cat-II) envisaged in approved QP by Employer QA&I:

a) INDIGENOUS SUPPLIES:

- For items under inspection Category Cat-I, the concerned Regional Inspection Office under whose jurisdiction the manufacturer is located. Inspecting Engineer or reviewing engineer (in case of waiver of presence of NTPC engineer) shall issue the MDCC/dispatch clearance.

- In case, only review of Vendor's inspection report / test certificates by NTPC has been envisaged as per approved QP (inspection Category Cat-II), such reports shall be submitted to the concerned NTPC-RIO, in whose jurisdiction manufacturer is located.

- In case where QP has not been envisaged (inspection category III), all such materials shall be cleared on the basis of Certificate of Conformity (COC) in attached format from bidder, which shall be submitted concerned NTPC-RIO, in whose jurisdiction vendor (main contractor) is located.

b) FOREIGN SUPPLIES:

- For items (inspection Category Cat-I) directly dispatchable to site from foreign manufacturer, the MDCC/dispatch clearance shall be issued by NTPC's inspecting engineer. In case of waiver of presence of NTPC engineer or Cat-II/III, the MDCC shall be issued by CQA Engineer on satisfactory review of test/inspection reports.

For items to be brought to Bidder's works from foreign manufacturer, before final dispatch to site, MDCC shall be issued by relevant Resident Inspector/RIO after satisfactory activities at works and on review of CHP report of NTPC's Inspecting Engineer for inspection at foreign manufacturer's works or on verifying acceptance report of CQA, in case of waiver of presence of NTPC Engineer for inspection at foreign source.

NOTE:

I. Material inspection by RIO-A at the works of sub-contractor in their respective jurisdiction and dispatched to the works of the other sub-contractor for assembly or otherwise in the jurisdiction of RIO-B before final dispatch to project site, shall be accorded dispatch clearance on a CHP clearance report by RIO-A and the CHP of the completed item / equipment will be issued by RIO-B.as per the approved BBU.

II. In case, only review of Vendor's inspection report / test certificates by Employer QA&I has been envisaged as per approved QP (inspection Category Cat-II), such reports shall be duly reviewed by employer (QA&I) for all documents as per approved QP

III. In case of items where QP has not been envisaged at all (inspection category Cat-III), such material shall be cleared and MDCC shall be issued by Employer QA&I -RIO/CQA (for foreign supplies) on the basis of Certificate of Conformity.

13. DOCUMENTATIONS / INPUTS BY Bidder: Bidder shall ensure availability of duly approved documents / inputs (e.g. Drawings / Data-Sheets, / Type Test Procedures / Type Test Approvals, Quality Plan, Routine Test Procedures, Reference documents
Codes, Standards, Specifications and Acceptance norms, etc.) at the place and time of inspection for reference of Inspection Engineers. Master list of Drawings, Datasheet, etc. shall also be made available.

a) **THREE MONTHLY ROLLING INSPECTION PLAN :**To facilitate advance planning of inspection of supplies, in addition to giving inspection notice at identified *CHP stages as per approved QP, Main Contractor Coordinator shall furnish three monthly rolling inspection program every month, indicating schedule dates of inspection at identified CHP stages. Such a program shall be updated each month. Such program shall be confirmed by specific inspection calls in accordance with Clause 12.

b) ***Definition of C.H.P.:** CHP "Customer Hold Point" ('W') is a stage identified by customer in Quality Plan, which is to be offered to customer or its authorized representative by the Vendors, Supplier / Sub-supplier Contractor for witnessing, verification or review, beyond

which work will not proceed without written consent of the Inspecting Authority. The report prepared by the Inspector is called "CHP Report".

Above three-monthly rolling inspections plan for Shop manufactured & BOIs shall be furnished directly to the respective Employer QA&I

c) **INSPECTION AT PACKAGE CONTRACTOR'S SUB-SUPPLIER: Bidder's** coordinator shall ensure that unpriced purchase order for the identified BOI where in Employer QA&I Inspection is required, as per the approved Quality Plan, the unpriced Purchase Order shall be suitably tied-up with their suppliers so that the suppliers offer the identified equipment for Employer QA&I inspection for identified tests / checks. Purchase Order, with detailed Purchase Specification, Delivery conditions QP & reference codes and standards shall be made available at the place of inspection.

d) **Inspection Calls:** Bidder shall give inspection call to the respective Employer QA&I RIO in Windsor-X system. For foreign inspection calls Main Contractor shall give inspection call to Employer QA&I (in Windsor-X system) Coordinators and through email as well, as per following schedule:-

i. Supplier of Indian origin : 15 working days
ii. Supplier of Foreign origin : Call will be raised in two stages
iii. Preliminary Inspection call : 45 days
iv. Final Inspection call : 15 days

Inspection call format is placed at website http://qains.ntpc.co.in/inspection/

e) **Inspection Call Entry on Employer QA&I Inspection Website on Internet:** Bidder can enter the call to the respective RIO on internet on Employer QA&I inspection website named as http://qains.ntpc.co.in/inspection/ through a user ID & password under the menu "Main Supplier". User ID and password has already been known to various Main Contractor units. Bidder will be allotted user ID and password.

f) **Co-ordination for Inspection Call:**

- Main Contractor shall raise inspection call mentioning all reference documents to the respective Employer QA&I and in Windsor-X system. For foreign inspection calls bidder shall give inspection call to QA&I (in Windsor-X system) Coordinators

- The list of various Employer QA&I RIOs and their address along with their area of jurisdiction is placed at http://qains.ntpc.co.in/inspection/ The call shall include copy of relevant approved QP and Data Sheet, internal test / inspection report, as applicable etc.

- Bidder representative / their authorized TPA (duly accepted to Employer QA&I) shall involve in inspection activity as per agreed documents.

14. Issue of Final CHP/MDCC/Inspection Report by Employer **QA&I:** The concerned Regional Inspection Office under whose jurisdiction the manufacturer is located, shall issue the Final CHP/MDCC after successful completion of testing / shop assembly including stage Inspection /Type tests, as required by the approved documents (approved Quality Plan, drawing / data sheet, as applicable), etc. at manufacturer's/ their sub-vendor's works.

METHODOLOGY FOR SAMPLING FOR TESTING OF REPAIRED WELD JOINTS :

Whenever the quantum of check in any NDT is other than 100%, the following guidelines for sampling/resampling procedure for NDT to be followed :

1) The group of welds for sampling shall be based on welding done by a welder in specified continuous time (say work done in a shift or in a day). For further analysis, acceptance or rejection, this group shall be treated as an entity.

2) From the above weld group, the selection of weld joint/weld spot shall be done by NTPC as per the quantum of check specified.

3) For acceptance of the weld group, all samples selected in this group should meet the acceptance norms. In case of any sample(s) beyond acceptance norms, the following actions shall be taken:

3.1: Rectification of defective welds and re-testing of the repair.

3.2 Re-sampling by NTPC from the same group of welds, with quantum of NDT being double the originally specified quantum (with minimum 2 welds for every defective weld). In case of RT on T-joints, if the defect is found on L-seam done at manufacturing works of pipe produced as per IS 3589, pipe defects shall be rectified, and no re-sampling is envisaged.

4) In case of any weld from the re-sample as per 3.2 above found beyond acceptable norms, the following action shall be taken:

4.1) NDT of all welds of the group which were not tested in first and second samples.

4.2) Repair and re-testing of all defective welds.

4.3) Necessary action on process control and on welder for preventing recurrence.

5) For the purpose of sampling, the weld group shall be defined as number of welds in case of smaller diameter of tubes/pipes (or small welds on structures) while for very large diameter pipes e.g., CW piping or for vessels/long welds, the length of weld may be taken as basic unit. Sampling shall also be accordingly in terms of number of weld joints or length of weld.

6) From the time of readiness of weld group, suitable time limits shall be prescribed for first sampling testing, re-sampling, repairing, re-testing etc. (normally not more than 1 day's backlog should be piled up at every step).

Illustration: Radiography of welds: Welding completed on Day-1 should be tested by Day-2 and repair and re-sampling, of the group should be done by Day-3 and further testing/repair should be done by Day-4.

7) Sampling and re-sampling procedure shall be applicable for all NDT viz RT,UT,DPT,MP.

Note: In case of RT of tube welds with double wall image (elliptical view), number of exposures shall be as per relevant code/ plant standard and will not be less than 2 exposures for each weld.

एनटीपीसी NTPC	**NON- CONFORMITY REPORT FOR MANUFACTURING & INSPECTION STAGES**	**FOR NTPC USE ONLY** **NC NO.(REFER NOTE 7):** **DATE:** **PAGE : 1 OF 2**

(This page to be filled in by Main Contractor)

CONTRACT NO :……

PACKAGE UNIT NO :……

MAIN CONTRACTOR :……

SUB-CONTRACTOR :……

PLACE OF MANUFACTURE:……

CATEGORY OF NON-CONFORMITY

(AS PER NOTE-2) **A** ☐ **B** ☐

DETAILS

ITEM DESCRIPTION: _____DENTIFICATION NO._____

RANGE/SIZE/TYPE: _____ QUALITY PLAN: _____ CHP **NO:** & CLAUSE NO.

☐

STAGE OF NON-CONFORMITY:
DESIGN (I) / RAW MATERIAL (II) / ASSEMBLY (III)/ IN PROCESS (IV)-(SPECIFY) _____
STORAGE (V) / HANDLING (VI) / TESTING (VII) / ANY OTHER (VIII)-(SPECIFY) _____

NON-CONFORMITY-DESCRIPTION WITH CAUSE (Attach Relevant Drgs/Details)

PROPOSED DISPOSITION WITH JUSTIFICATION - (FOR CORRECTION)
(Attach details including design calculation, recommendations of qualified designer, if required)

DISPOSITIONING CODE ☐

(AS PER NOTE-6)

STEPS TO PREVENT RECURRANCE-(FOR CORRECTIVE ACTION)

NAME & DESIGN SIG. OF MAIN CONTRACTOR DATE _____ (SEAL)

ENCL:

NOTES

1. Please read these notes carefully before filling up and attach separate sheet wherever required.

2. Category 'A' non-conformity is a major non-conformity which directly or indirectly adversely affects the performance, reliability, safety, interchangeability, erection, commissioning or working life of the items, equipment or system. All other non-conformities shall be treated as category 'B'.

3. Acceptance of dispositioned non-conformity is without prejudice to NTPC rights under the contract to claim commercial compensation and does not absolve main contractor from his contractual obligations.

4. Obtaining approval of statutory authority, if any, w.r.t. above non-conformity is the responsibility of main contractor.

5. Dispositioning of this non-conformity is for this specific case only and not to be regarded as a precedence.

6. The non-conformance shall be proposed main contractor (Give code at appropriate boxes) and is subjected to review & acceptance by NTPC.
   (01) NC-Rejected (02) NC-Conditionally accepted (specify condition) (03) NC-accepted as it is (04) NC-Accepted with repair

7. NC number - this NC no. shall be allotted by regional inspection office in such a way to have project, package, RIO code, followed by running serial no. of that contract.

Responsibilities of main contractor

1. Ascertain exact nature of non-conformity in consultation with qualified designer (if required) and supporting drawing/details with which non-conformity exists.
2. Identify the cause of non-conformity.
3. Decide on code of Dispositioning as per Note-6 above.
4. Ensure and certify that the product quality, performance, reliability and working life is not affected for minor non-conformities and quantify the extent to which it is affected in the case of category 'A' non-conformities.
5. Implement agreed corrective action in a time-bound program.

Responsibilities of RIO

1. Identify the product appropriately.
2. Finalize the cause of non-conformity and propose corrective action.
3. Interlink with the corresponding CHP.