TECHNICAL SPECIFICATION FOR
EFFLUENT TRANSFER SYSTEM
2X800 MW TELAGANA STPP PHASE-I (SG PACKAGE)

VOLUME – II B & III

TECHNICAL SPECIFICATION
FOR
EFFLUENT TRANSFER SYSTEM

SPECIFICATION NO.: PE-TS-424-673-A001 R0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

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PROJECT INFORMATION

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TELANGANA STPP PHASE-I (2X800 MW)

1.00.00 BACKGROUND

Ramagundam Super Thermal Power Project (RSTPP) in District Karimnagar of Telangana was conceived as a coal based super thermal power plant for implementation by NTPC. RSTPP is presently operating with 2600 MW (3x200 MW + 4x500 MW) installed capacity and are under commercial operation.

As per A.P. Re-organisation Act 2014, NTPC has been mandated to set up 4000 MW Coal fired thermal power plant for Telangana State.

A meeting of NTPC Senior management team with the Hon'ble Chief Minister of Telangana was held on 8th July 2014. Thereafter, a multi-disciplinary team from NTPC made a site visit along with Singareni Collieries Company Limited (SCCL) officials on 7th & 8th August 2014 to explore the land availability around Ramagundam STPS and SCCL area for locating 4000 MW power plant.

Based on the team visit, NTPC informed Principal Secretary to Hon'ble Chief Minister, Govt. of Telangana vide dated 22.08.2014 confirming that NTPC is planning to set up 2 units of 800 MW under the name Telangana STPP Phase-I within NTPC's existing Ramagundam Station and 3 units of 800 MW under Phase-II of the project. After examining the various areas surveyed with M/s SCCL officials, it is found that the Phase-II can be set up in the land where M/s BPL Project was to come up at nearby areas (presently under sub-judice) only. Considering the location and optimization of available space at both locations to accommodate 4000 MW, 800 MW units have been proposed.

2.00.00 PROJECT HIGHLIGHTS

2.01.00 Location

Telangana Super Thermal Power Project (TnSTPP), Phase-I has been located within the MGR unloading bulb of NTPC's Ramagundam Super Thermal Power Station and situated at 18° 44' 47" (N) to 18° 45' 30" (N) and longitude 79° 28' 06" (E) East to 79° 28' 36" (E).

TnSTPP is located at about 51 km from district headquarter Karimnagar and at about 1 km near Ramagundam village. The site is well connected through NH-07 and NH-16 through (Hyderabad-Mancherial Road popularly known as Rajiv Rahadari). Nearest railway station Ramagundam is about 5 km from the plant which lies on the main Kazipet-Balarshah Broad Gauge line of South Central Railway. The nearest commercial airport Hyderabad is at a distance of about 210 km.

Vicinity Plan of the proposed project is placed at **Annexure -I**.

3.00.00 BASIC INPUTS

3.01.00 Land

The proposed two units of 800 MW capacity will be set up in the available land (about 250 acre) in MGR unloading bulb area within existing premises of RSTPP.

For ash disposal land at two different locations has been identified. First location is 662 acre plot (one of three plots allotted to M/s BPL power plant. However, all the three plots have been taken back by State Govt. due non development and are sub-judice) / Govt. land to

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the tune of 600 acre being offered by State Govt. and the second is Medipally mine void of M/s SCCL.

The initial disposal area (662 acre plot earlier allotted to M/s BPL) is located at about 10 km from the plant. The alternate Govt. land (600 acre) is located at about 12 km. Both Bottom ash and fly ash will be disposed-off to above area till the Medipally mine void made available for disposal. Subsequently, fly ash will be disposed-off in mine void, located about 10 km from the plant, while bottom ash will continue to be disposed-off in first location (662 acre plot) / the alternate Govt. land (600 acre).

3.02.00 Water

The expected source of water for the project is from Yellampally Barrage, on Godavari River, at a distance of about 12 km from the proposed plant. Special Chief Secretary (Energy) have assured that water shall be made available for the proposed power plant.

Make up water requirement for this project would be about 4600 cum/hr (about 45 Cusecs) with ash water recirculation system and about 5900 cum/hr (about 58 Cusecs) with once through ash water system.

Re-circulating type CW system with Induced draft cooling towers have been envisaged for the project.

3.03.00 FUEL

3.03.01 Coal Requirement, Availability and Linkage

Coal requirement for the project is estimated about 6.73 million tonne/annum (about 18430 T/day) corresponding to 90% PLF considering station heat rate of 2247.97 kcal/kWh. Presently coal is received from SCCL and the same is transported through MGR system.

Govt. of Telangana has conveyed in-Principal approval for transfer of coal linkage accorded to erstwhile BPL plant for 600 MW (3.5 MTPA) to NTPC for the project vide letter from Govt. of Telangana dated 13.10.2014.

Further, Govt. of Telangana has requested Ministry of coal (MoC), Govt. of India vide letter dated 04.10.2014 to allot 8 MTPA coal for Telangana STPP Phase-I (2x800 MW) starting from 01.04.2018 and 12 MTPA for Telangana STPP Phase-II (3x800 MW) effective from 01.04.2019.

Considering the limitation in coal availability from SCCL, coal may be received either from SCCL or other sources i.e. MCL & SECL through Indian railways.

The primary fuel for the main steam generator shall be coal. The domestic coal quality parameters are indicated in Annexure-IV-2 and imported coal parameters are indicated in Annexure-IV-4.

3.03.02 Coal Transportation

Coal is envisaged to be transported to site through Indian Railway System.

3.03.03 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 oil (LDO) having the characteristics given at Annexure-IV-1 and HSD Oil characteristics given at Annexure-IV-3.

4.00.00 CAPACITY

Telangana STPP, Phase-I : 2x800 MW - Present proposal

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Telangana STPP, Phase-II : 3x800 MW - Future

5.00.00 MODE OF OPERATION

Base Load

6.00.00 BENEFICIARY STATES

It is proposed that 100% power will be allocated to Telangana State subject to approval by Ministry of Power.

7.00.00 METEOROLOGICAL DATA

The meteorological data from nearest observatory (Ramagundam) is placed at **Annexure-II.**

8.00.00 Plant Water Scheme

The Plant water scheme is included in Part-E of Technical Specification.

8.01.00 **Condenser Cooling (CW) Water System**

It is proposed to provide re-circulating type CW system with cooling towers. For the re-circulating type CW system it is proposed to supply clarified water as make up. Clarified water shall be pumped to the cold water channel of CW system. CW system shall be operated at a design minimum cycle of concentration (C.O.C) of about 5. Chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) may be employed in addition to blow down of CW water to control the CW system chemistry. The expected circulating water analysis is given in this sub-section. CW blowdown shall be drawn from the discharge of CW pumps and the same shall be led to fire water tank, ash water tank, CHP and dust suppression system. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with CW pump, condenser and cooling towers, steel pipes would be used. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity.

8.02.00 **Equipment Cooling Water (ECW) System (Unit Auxiliaries)**

The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralized (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a secondary circuit. The station auxiliaries such as Air compressors, Compressors of ash handling plant, compressor of mill reject system etc. shall also be cooled by Demineralized (DM) water in a closed circuit .The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.

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8.03.00 **Ash Water System**

(a) It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be re-circulated. During re-circulation mode, the make up to the ash water system (to compensate for the ash water blow down and evaporation loss in ash dyke) shall be supplied from CW blow down.

(b) During initial stage when decanted ash water is not available, the ash water system shall be operated in once through mode and make up water to ash water system shall be given from CW blow down as well as raw water system.

8.04.00 **Other Miscellaneous Water Systems**

(a) CW system blow down water shall be used for meeting the Fly ash and bottom ash system requirement etc.

(b) The service water shall be taken from clarified water tank of Pretreatment plant. Service water (plant effluent) collected from various areas shall be treated using oil skimmer, tube settlers, coal settling pits etc. as per requirement and treated water from effluent treatment plant shall be recycled back to the service water system for re-use.

(b) The drinking water requirement of the plant shall be provided from water treatment plant.

(c) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water shall be provided from demineralising plant.

(d) The quality of Cooling Water & DM Water is enclosed with this sub-section as **Annexure-III**.

(e) Effluent from various areas in TG & SG system shall be collected in respective pits in their areas and pumped to a common terminal point as shown in plant water scheme.

Pits in respective areas along with pumps (2x100%) in each pit along with drives, piping, valves, fittings etc. shall be in bidder's scope.

9.00.00 **Criteria for Earthquake Resistant Design of Structures and Equipment**

All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Part-B of this section**.**

10.00.00 **Criteria for Wind Resistant Design of Structures and Equipment**

All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in Part-B of this section.

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11.00.00 **PARAMETERS FOR DESIGN / SIZING / GUARANTEES / OPERATING CAPABILITIES**

Tentative parameters to be used for design, sizing, guarantees and operating capabilities of Steam Generator(s) and other equipments /systems/auxiliaries etc. are given at Annexure-V-1 and Annexure-V-2 of this Sub-Section. These parameters are tentative and are for tender purpose only. Final parameters shall be intimated to the successful Bidder after finalization of Turbine Generator Island Package and hence the bidder shall keep provision for minor variation in these parameters. Annexure-V-1 gives Steam and feed water parameters under "Boiler Maximum Continuous Rating" (BMCR) conditions. Annexure-V-2 provides steam and feed water parameters under guarantee conditions i.e Valve Wide Open (VWO) 105% Turbine Maximum Continuous Rating (TMCR) & 100% TMCR load and pure sliding pressure operation of the unit at 100% TMCR, 80%TMCR, 60%TMCR & 50%TMCR. Further, Annexure-V-2 also gives Steam and feed water parameters at 800 MW load condition with both stream of HPHs out of service. All stipulated design and operating capabilities of steam generators and other equipments/systems/auxiliaries under SG Package shall be achievable under pure sliding pressure operation of the unit, without violating any design/sizing/selection stipulation or exceeding any design/safety limits. All quoted guarantees etc. shall be with reference to parameters indicated for VWO (105%TMCR) and 100% TMCR conditions in this Table.

12.00.00 Capability of boiler while firing upto 30% imported coal blend

Steam Generator and its auxiliaries shall also be capable of obtaining maximum continuous rating as specified when firing upto 30% imported coal blended with Indian coal as specified in Annexure-V-1. Typical imported coal parameters are enclosed as Annexure-IV-4 for information of bidder. System redundancies/ margins on equipment/ auxiliary sizing need not be available under such fuel firing condition unless specifically mentioned otherwise. However, equipments/ systems shall not exceed their safety limits under such firing, and shall not transgress in to factors of safety as per specification/ codes.

SECTION – I
SPECIFIC TECHNICAL REQUIREMENTS
SECTION – IA - SPECIFIC TECHNICAL REQUIREMENTS – MECHANICAL
SECTION – IB - SPECIFIC TECHNICAL REQUIREMENTS – ELECTRICAL
SECTION – IC - SPECIFIC TECHNICAL REQUIREMENTS – CONTROL & INSTRUMENTATION

SUB-SECTION IA
SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)

1.0 GENERAL

This specification is intended to cover design (i.e. Preparation and submission of drawing/ documents including " As Built " drawings and O&M Manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables (excluding chemicals), mandatory spares along with spares for erection, start up and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling, transportation & storage at site, in site transportation, assembly, minor civil works, erection & commissioning, trial run at site, preparation of drawings in 3D and carrying out Demonstration tests at site , training of customer/ client O&M staff & final handing over to end customer in flawless condition for project and package specified above complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification no. PE-TS-424-673-A001 for **2X800 MW TELAGANA STPP PHASE-I (SG PACKAGE)**

2.0 REFERENCE DOCUMENTS

A. PE-DG-424-673-A001 : P & ID FOR EFFLUENT COLLECTION AND TRANSFER SYSTEM
B. DATASHEET – A :DATASHEET – A FOR EFFLUENT TRANSFER SYSTEM
C. PE-DG-424-100-M001 :PLOT PLAN (With Indicating Pit locations and suggestive pipe routing)

3.0 SCOPE OF SUPPLY (MECHANICAL)

Following are in bidder's scope of supply:

3.1.1 Following sumps/Tanks are included in Effluent Transfer System. For Quantity and capacity of following sumps and tanks, P&ID and Data sheet of Effluent Transfer System attached in the specification may be referred. These sumps/Tanks shall be of RCC and shall be constructed by BHEL, based on inputs provide by successful bidder during contract stage.

1. Boiler Area Wash Water Sump (Unit#1)
2. ESP Area ASH Laden Wash Water Sump (Unit#1)
3. Boiler Area Wash Water Sump (Unit#2)
4. ESP Area ASH Laden Wash Water Sump (Unit#2)

Any mechanical, Electrical and control & Instrumentation work or structural work (other than civil construction work) required for these tanks & sumps shall be carried out by successful bidder at site.

3.1.2 Necessary piping, valves, fitting, instruments etc. as per P&ID for Effluent Transfer System enclosed with this technical specification. Transfer of Effluent from respective generation source and further transfer to designated area as per P&ID along with necessary valve, fitting & flanges shall be in bidder scope.

3.1.3 The scope shall also include all interconnecting piping, fittings, supports, valves, instruments etc. For detailed C&I and Electrical refer the respective portion of the specification and P&ID.

3.1.4 Pumps with details as below shall be supplied complete with all instrumentation, valves, piping, motor, etc. Pumps shall be fixed type pump with guide pipe withdrawal arrangement. Slings & Lifting lugs shall be provided in pump.

S.NO	PUMPS TYPE WITH CAPACITY (EACH)	NUMBER OF PUMPS REQUIRED (FOR STATION)	HEAD(MWC)	REMARKS
1	Submersible Pump (200 m^3/h)	4	As required	Please refer DATASHEET-A for further details.
2	Submersible Pump (75 m^3/h)	4	As required	

3.1.5 Effluent transfer pumps installed in various effluent pits shall be controlled through DCS as per requirement spelled in Section-IC (SPECIFIC TECHNICAL REQUIRMENT- C&I).

3.1.6 Broad scope of work of this package includes all equipment and accessories. Please also refer Mechanical

data sheet, P&ID and the respective section of Electrical and C&I sections for respective scopes.

3.1.7 Bidder to take care the length of piping as indicated in plot plan/elsewhere in specification of Effluent Transfer System. Pipe routing shall be decided during detailed engineering; however, bidder will consider 12 m total static head + 10% margin (or as per grade level of respective **Effluent Transfer System sump location as indicated in the attached drg in tender specs**) during pump selection.

3.1.8 All Pipes shall be MS ERW as per IS1239 heavy grade. The pipe shall be preferably run on pipe pedestals. All auxiliary steel structures (u-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder. From Sump to main pipe rack and from pipe rack to unloading point, all structural support for pipe shall be in bidder scope.

3.1.9 All auxiliary item required to support/fix the pumps and pipes shall be in bidder scope. All steel inserts plates with lugs, rungs, ladder, puddle pipes, bolts, edge angle in desired shape, nuts, sleeves, and all other embedding components etc. as required to grout in BHEL civil works and to support/hold the equipment being supplied under this specification shall be in bidder's scope.

3.1.10 The Bidder's scope includes all the first fill and one year's topping, requirements of consumables such as oils, lubricants including grease, servo fluids, gases, etc. Consumption of all these consumables during the initial operation or carrying out performance guarantee test of bidder's supplied equipment (whichever is later) and final filling after the initial operation OR carrying out performance guarantee test at site (As applicable) of bidder's supplied equipment (whichever is later) shall also be included in the scope of the Bidder. Bidder shall also supply a quantity not less than 10% of the full charge of each variety of lubricants, servo fluids, gases, etc. used which is expected to be utilized during the first year of operation. This additional quantity shall be supplied in separate Containers. The variety of lubricants shall be kept to a minimum possible.

3.1.11 The pipe sizes shall be selected based on the specification requirement and shall be subject to BHEL / customer approval during detailing engineering.

3.1.12 All necessary drains, vents and sampling points with valves as specified and as required are in bidder's scope.

3.1.13 Monitoring gadgets, instruments and equipment required for maintenance (till carrying out Demonstration test at site (As applicable) & plant handover.

3.1.14 Valves Indicated in P & ID of Effluent Transfer System are bare minimum requirement, however bidder has to provide complete system for trouble free operation meeting technical specification requirement.

3.1.15 PIPING

a) Complete piping indicated in P & ID of Effluent Transfer System is in bidder's scope of supply and erection. In addition, any additional piping required to make the system complete shall be in bidder's scope. Pipe length has to be considered by bidder in his scope as per approved equipment layout and piping layout during detailed engineering. The below indicated pipes shall be designed, supplied, erected, laid and tested by the bidder. Elbows, tees, flanges, counter flanges, Hangers and supports, embedment plates with lugs etc. required for the below given piping shall also be provided by the bidder.

b) Pipe distances from Effluent Transfer system pits to Header/Terminal Points are given below:

SL. NO.	Pipe Details			Distance (In meters)
	WASTE WATER PIPES			
	From	**TO**	Minimum Pipe Size	Distance (In meters)
1.	Boiler Area Wash Water Sump (Unit#1)	Ash slurry sump	As Calculated	600
2.	ESP Area ASH Laden Wash Water Sump (Unit#1)	Ash slurry sump		300
3.	Boiler Area Wash Water Sump (Unit#2)	Ash slurry sump		600
4.	ESP Area ASH Laden Wash Water Sump (Unit#2)	Ash slurry sump		300

* Pump head shall be selected based on pumping till Ash Slurry Sump. Please refer to the plot plan attached with specification for Ash Slurry Sump distance. Pipe size variation due to varied flow from different operating pumps shall be considered by bidder.

Bidder to note that no commercial settlement / adjustment shall be entertained for variation up to +/- 10% of pipe lengths tabulated above during detailed engineering.

Layout and routing shall be finalized during detailed engineering. However, system shall be designed to take care of any increase or decrease in length of piping. Pipe size shall be finalized during detail engineering.

c) In addition, any additional piping and associated accessories required to complete the system shall be in bidder's scope.
d) Service water shall be provided at TP by BHEL. Further piping and isolation valve from TP required for jetting arrangement for slurry pump if applicable shall be in bidder scope.

3.1.16 Mandatory spares as per attached Annexure-V of Section IA to this technical specification.

3.1.17 Special tools and tackles as required for the system in permanent box.

3.1.18 Finish paints for touch-up painting of equipment after erection at site in sealed container.

3.1.19 Start-up and commissioning spares as required.

3.1.20 For scope of Electrical and Control & Instrumentation, section-IB & section-IC may be referred.

4.0 SCOPE OF SUPPLY FOR ELECTRICAL

The scope of electrical works, equipment and services shall be as Section IB included in specification.

5.0 SCOPE OF SUPPLY CONTROL AND INSTRUMENTATION

Minimum instrumentation as per PE-DG-424-673-A001, however bidder will provide all necessary instrumentation for safe and trouble free operation. The scope of control and instrumentation, design and services shall be as Section IC included in specification

6.0 SCOPE OF CIVIL

The CIVIL works is excluded from the bidder's scope. Sump Pits for boiler and ESP areas have already constructed as per attached drawings.

7.0 QUALITY ASSURANCE PLANS AND SUB VENDOR LIST

1) The quality assurance plan is enclosed as **QUALITY PLAN FOR Effluent Transfer System IN Annexure-1, Section IA.** However requirement of detailed QP, inspection checklist, certificate of conformance etc. for each equipment and sub-vendor shall be finalized during detailed engineering stage; decision of BHEL/customer shall be binding on vendor in this regard. Any changes/additional tests insisted upon by Owner during approval of QAP's shall be accepted by bidder without any commercial and delivery implication to BHEL/Customer. Bidder shall submit the quality plans in BHEL format during detailed engineering stage. Bidder to note further that during detailed engineering all the QAP's/check lists etc. shall be submitted to Customer/BHEL for approval. All inspection & testing etc. shall be carried out accordingly.

2) The sub vendor list enclosed in Annexure-II, Section-IA is indicative only and is subject to approval / acceptance by customer (NTPC). Bidder to propose his sub vendor list with back up documents (experience list, end user certificate as applicable) etc. The same shall subject to BHEL and Customer approval during detailed engineering stage without any technical, commercial & delivery implication to BHEL.

8.0 PAINTING

Painting shall be as specified in "Surface Preparation & Painting" Annexure-V, Section-IA of this technical specification. Bidder to note that paint shed shall be finalized during detailed engineering as per customer & BHEL requirement and any variation in the painting schedule as finally approved by customer shall be taken care by bidder without any commercial and delivery implication. Internal painting of the equipment shall be suitable for withstanding effect of effluent quality. Outer painting shall be as per technical specifications. Supporting documents shall be furnished in support of suitability of the lining offered for the duty conditions by bidder during detailed engineering.

9.0 SCOPE OF SERVICE

The bidder's scope also includes following services for scope under this specification:

9.1 Erection and commissioning unloading, storage and handling at site.

9.2 Arrangement of all instruments, monitoring gadgets for monitoring to carry out, pre-commissioning, trial run, commissioning and Demonstration test.

9.3 Complete grouting for equipment, fixing and any concreting inside the sump.

9.4 All personnel required during maintenance, Commissioning and Demonstration test.

9.5 Trial run for requisite period.

9.6 Demonstration test.

9.7 Final touch up paint at site.

10.0 EXCLUSIONS

10.1 Service air up to the terminal point.

10.2 Instrument air up to the terminal point.

10.3 Service water up to terminal point.

10.4 Firefighting facilities.

10.5 All chemicals.

10.6 All civil works including excavation, backfilling & foundation of equipment. However complete grouting

for equipment, fixing and any concreting inside vessels and lining shall be in the scope of the bidder.

11.0 DESIGN /CONSTRUCTION

In addition to the requirements of Section I & II the following shall also be complied under scope of this specification.
The P&ID for Effluent Transfer System (Dwg.No.- PE-DG-424-673-A001) is enclosed herein in this section for bidder's compliance.

The material of construction specified in data sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

12.0 PIPING

All piping within the Effluent Transfer System shall be in bidder's scope. Piping and valves shall be sized and rated based on flows and pressures at full-capacity operation. Piping conveying high levels of suspended solids shall be sized to maintain a minimum velocity of 0.6 m/s at the minimum flow rate to prevent solids from settling in the piping.

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

Pipe line under gravity flow shall be restricted to a flow velocity of 1 m/sec generally. Channels under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec.

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.

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

Based on the inside dia. so established, thickness calculation shall be made as per ANSI B 31.1 OD and 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 B 36.19 as the case may be.

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

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.

Pressure drops in pipes will be based on Hazen Williams's formula.

Pumps will be sized based on the following:

Capacity: System requirement + 10% margin
Head: System requirement + 10% margin on friction losses.

13.0 OPERATION AND CONTROL PHILOSOPHY

Control of effluent transfer pumps shall be in line with C&I specification Section-IC (Bidder scope).

14.0 LAYOUT

Space requirement has been indicated in plot plan, attached with specification. All the equipment will be open to sky except control panel, hence bidder has to take care that all the equipment will be whether and dust proof. Control panel will be located in industrial shed in Effluent Transfer system area.

15.0 DRAWING/DOCUMENTS REQUIREMENT (PL REFER ELECTRICAL & C&I PORTION ALSO): -

For the Drawings/Documents submission schedule, please refer Annexure-III, Section-IA**.**

For the Drawings/Documents Submission Procedure/distribution schedule, please refer Annexure-III, Section-IA. The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

16.0 SPARES

1. All the spares for the equipment under the contract provided by the vendor will strictly conform to the specifications and documents and will be identical to the corresponding main equipment/components supplied under the contract.

2. The quality plan and the inspection requirement finalized for the main equipment will also be applicable to the corresponding spares.

3. The list of mandatory spares considered essential by the BHEL & Customer is indicated in Annexure IV, Section-IA. The bidder shall indicate the prices in the 'Schedule of mandatory Spares' whether or not he considers it necessary for the BHEL & Customer 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. Whenever the quantity is mentioned in "sets" the bidder has to give the item details and prices of each item.

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

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 equipment.

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

4. Start-up and commissioning spares are in bidder's scope of supply.

   Start-up and Commissioning spares are those which would be required during equipment or system testing, start-up and commissioning. All spares used until the plant is finally handed over by the bidder to the customer come under this category. All start-up and commissioning spares as required shall be provided by the bidder without any additional cost to the BHEL and customer.

   Bidder shall be responsible for the ready and timely availability for all the startup and commissioning spares as required during various stages of testing, cleaning and commissioning up to handing over of each unit of the total plant.

   An adequate stock of start-up spares shall be available at the site such that the start-up and commissioning of the equipment/systems, Performance guarantee test and handing over the equipment/ systems to the customer will be carried out without hindrance and delay. All start-up spares which remain unused after the taking over of the plant shall remain the property of the customer.

5. In addition to the spare parts mentioned above, the Bidder shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and unit prices in Price Schedules. This list shall take into consideration the mandatory spares specified Annexure IV, Section-IA and should be independent of the list of the mandatory spares. The BHEL 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.

   Price of recommended spares 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. However, the Bidder shall be liable to provide necessary justification for the quoted prices for these spares as desired by BHEL.

   The vendor warrants:

   (i) That all spares supplied will be new and in accordance with the contract document and will be free from defects in design, material and workmanship and shall further guarantee as under:

   (ii) In case of any failure in the original component/equipments due to faulty designs, materials and workmanship, the corresponding spare parts if any, supplied will be replaced without any extra cost to the BHEL and customer unless a joint examination and analysis by BHEL and/or customer of such spare parts prove that the defect found in the original part that failed can safely be assured not to be present in spare parts.

   (iii) The long term availability of spares to the BHEL and the customer for the full life of the equipment covered under the contract and that before going out of production of spare parts of the equipment covered under the contract, vendor and his sub-vendors shall give the BHEL and the customer at least 24 (Twenty-Four) months advance notice so that the latter may order his bulk requirements of spares, if he so desires. The same provision will also be applicable to the sub-vendors. Further, in case of discontinuance of manufacture of any spares by the vendors or his sub-vendors the vendors and his sub-

vendors, will provide the BHEL and the customer, 2 (two) years in advance, with full manufacturing drawings, material specifications and technical information required by the BHEL and the customer for the purpose of manufacture of such items and also the right to manufacture such spares for their own requirements.

(iv) Further in case of discontinuance of supply of spares by the vendors or his sub-vendors, the vendor will provide the BHEL and the customer with full information for replacement of such spares with other equivalent makes, if so required by the BHEL and the customer.

(v) Notwithstanding the above, the vendor shall be responsible for supply of spares for the lifetime of the package at reasonable prices. The prices of all future requirements of spares shall be derived from the corresponding ex-works price at which the orders for such spares have been placed by the BHEL and the customer as a part of the mandatory or long term or any other kind of spares. The base indices for calculating ex-works price shall be commissioning of last equipment under main contract.

6. The vendor will indicate the delivery period of the spares, which the BHEL and the customer may procure in accordance with this clause.

7. In case of emergency requirements of spares, the vendor would make every effort to expedite the manufacture and delivery of such spares on the basis of mutually agreed time schedule.

8. In case the vendor fails to supply the mandatory or long term or any other kind of spares on the terms stipulated above, the BHEL and the customer shall be entitled to purchase the same from the alternate sources at the risk and the cost of the vendor and recover from the vendor, the excess amount paid by the BHEL and the customer over the rates as per the contract. In the event of such risk purchase by the BHEL or the customer, the purchases will be as per the works and procurement policy of the BHEL and the customer prevalent at the time of such purchases and BHEL & the customer at his option may include a representative from the vendor in finalizing the purchases.

9. It is expressly understood that the final settlement between the parties in terms of relevant clauses of the tender document shall not relieve the vendor of any of his obligations under the provision of long term availability of spares and such provisions shall continue to be enforced till the expiry of 30 (thirty) years period reckoned from the scheduled date of completion of trial operation of the last equipment unless otherwise discharged expressly in writing by the BHEL or the customer.

17.0 ADDITIONAL REQUIREMENT

17.1 Bidder to provide the detailed BOQ shall be derived during detail engineering. Bidder to consider 10% margin over and above the BOQ requirement of all the fittings.

17.2 Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

17.3 In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

17.4 Successful bidder shall furnish detailed erection manual for each of the equipment as well as complete system supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

17.5 Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule.

17.6 Insert plates and its fixing with anchor fasteners for installation/laying cables and pipes shall be provided by

bidder as per system requirement. Pump fixing with bottom slab of sump with anchor fasteners and supporting structure if required shall be in bidder' scope.

17.7 Instrument hook up material shall be in bidder's scope.

17.8 Any item/work either supply of equipment or erection material which have not been specifically mentioned in the specification but are necessary to complete the woks for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification and shall be in bidder's scope without any commercial, technical and delivery implication to BHEL.

17.9 All other items are also included in scope of supply as specified in other part of the specification.

1. Vendor to attend regular engineering meeting with BHEL and customer fortnightly in BHEL or customer office as decided during detail engineering. Vendor will depute all his concerned engineering representative along with the project manager for discussion and approval. Meeting can be held at site also.

2. Space available for Effluent Transfer System is indicated/attached, elsewhere in this specification. Bidder to accommodate their equipment within the space provided.

3. Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL / customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be review by BHEL.

4. Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.

5. Relevant requirements as per GTR, GCC, ECC & SCC.

6. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.

7. Latest version of all codes and standards to be followed.

18.0 SITE VISIT BEFORE SUBMISSION OF OFFER.

Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details w.r.t existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.

ANNEXURE-I,SECTION-IA

QUALITY PLAN

CLAUSE NO.	QUALITY ASSURANCE

PIPES, FITTINGS, BENDS, VALVES, COATING-WRAPPING, STRAINERS EXPANSION, JOINTS, LINING,PUMPS, VENTILATION SYSTEM ETC.

	Tests/Check / Items / Components	Material Test	DPT/MPI / RT	Ultrasonic Test	WPS/ WQS/PQR	Hydraulic / Water Fill Test	Pneumatic Test	Assembly Fit up	Dimensions	Functional/operational Test	Other Tests	All Tests as per relevant Std	BALANCING	Performance test	REMARKS
1	Pipes & Fittings and Mitre Bends (if Any)	Y[a]	Y[b]		Y	Y			Y		Y[15]				
2	Diaphragm Valves	Y[a]				Y[5]			Y		Y[6]				
3A	Cast Butterfly Valves (Low Pressure)					Y		Y	Y	Y	Y[7]	Y			
	Body	Y[a]	Y[b]												
	Disc	Y[a]	Y[b]												
	Shaft	Y[a]	Y	Y[c]											
3B	Fabricated Butterfly Valves	**REFER NOTE 14**													
4	Gate/ Globe/Swing Check / Ball Valves/ Air release Valve	Y[a]	Y[b]	Y[c]		Y[5]	Y	Y	Y	Y	Y[8]				
5	Dual Plate Check Valves	Y[a]	Y[b]	Y[c]		Y	Y	Y	Y	Y	Y[4]				
6	Rolled & Welded Pipes (IF APPLICABLE)	Y[a]	Y[3]		Y[3]	Y[1]			Y		Y[3]				
7	Coating & Wrapping of Pipes	Y[2]									Y[2]				
8	Strainers	Y[a]	Y[b]		Y#	Y					Y[11]				#For Fabricated Strainer.
9	Rubber Expansion Joints	Y[a]				Y[12]		Y	Y		Y[13]				
10	Internal Lining of Pipes	Y[a]							Y		Y[9]				
11	Submersible Pump	Y[a]				Y						Y	Y	Y	
12	Horizontal Centrifugal pump / Sump Pump	Y[a]	Y[b]	Y[c]		Y		Y	Y			Y	Y	Y	
13	Electric Hoist	Y[a]	Y[b]	Y[c]				Y	Y			Y[16]		Y	
14	Ventilation System														
	1) Fans	Y[a]	Y[b]	Y[c]				Y	Y	Y	Y[17]	Y[18]	Y	Y	
	II) Filters	Y[a]						Y	Y			Y[19]			
13	Site Welding		Y[10]		Y	Y								Y	

	NOTES (MEANING OF SUPERSCRIPTS)
a	One per heat/heat treatment batch/lot.
b	On machined surfaces only for castings and on butt welds.

c	For shaft/spindles > or = 50 mm	
1	Weld Joints not subjected to hydraulic test shall be subjected to 100% RT.	
2	Spark Test, Adhesion Test and Material Test for primer and enameled & Coal Tar Tapes as per AWWA-C-203-91/ IS-10221/IS 15337 as applicable.	
3	Followings are the testing requirements for fabrication of pipes at site	
	TESTS	**QUANTUM OF CHECKS**
	WPS, PQR, Welder Qualification Test	100%
	DPT on root run	100% for pipes up to 1200 mm diameter
	DPT after back gauging	100% for pipes above 1200 mm diameter
	RT (For insitu field joints)	5% (For pipes diameter ≥ 1200mm)
	DPT on finished butt weld joints	10%
	Hydraulic Test	100%, 1.5 times the design pressure or 2 times the working-pressure whichever is higher.
4	Dry Cycle Test on Dual Plate Check valve spring for one lakh Cycles shall be carried out as a type test.	
5	Seat Leakage Test for Actuator Operated Valves, shall be done with by closing the valves with actuator.	
6	Tests on rubber parts per batch of rubber mix such as hardness, adhesion, spark test, bleed test and flex test on diaphragm, type test for diaphragm for 50,000 cycles.	
7	Hydraulic Test of Body, Seat and disc-strength shall be carried out in accordance with governing design standard in presence of owner's representatives. Actuator operated valves shall be checked for Seat Leakage by closing the valves with actuator. Seat Leakage Test shall be carried out in both directions. For Proof of Design Test refer respective chapters of engineering portion in the technical specification	
8	Blue matching, wear travel for gates, valves, pneumatic seat leakage, and reduced pressure test for check valves shall be done as per relevant standard. Maximum allowable vacuum loss is 0.5 mm of Hg abs. for valves to be tested for vacuum operation for internal pressure 25 mm of Hg abs. for a period of 15 minutes. Fire safe test for ball valve shall be done wherever specified. Valves shall be offered for hydro test in unpainted condition.	
9	Tensile, Elongation, Hardness, Specific Gravity, Lining Thickness, Humidity Check, Pipe temperature check, Adhesion Test and Holiday Detection Test etc as per applicable standard shall be done for all lining material and application.	
10	10% of welds (Root and finished welds) shall be subjected to DPT.	
11	Pressure drop across the strainer for each type and size as a special test shall be carried out. In case of already carried out, the test report shall be submitted for review and acceptance by NTPC Engineering.	
12	During hydraulic and vacuum tests at 25mm Hg abs in 3 positions, the change in the circumference of arch should not be more than 1.5%. 24 hrs after the test permanent set in dimension should not exceed 0.5%.	
13	Tests on rubber for tensile, elongation, hardness, hydraulic stability check as per ASTM D 471, ozone resistance test as per ASTM D 1149 aging test and adhesion strength of rubber to fabric, rubber to metal adhesion shall be carried out.	

14	In addition of all tests as indicated for Cast Butter Fly valve being applicable for fabricated butterfly valves, following test shall be done for Fabricated Butter Fly Valve: a. UT as per ASTM A-435 on plate material for body and disc shall be carried out for plate thickness 20mm and above. b. 100% RT and DPT as per ASTM, Section-VIII, Division-I, on butt joins of body and disc. 10% DPT on other welds shall be done. c. Post weld heat treatment as per ASME, Section-VIII, Division-I on butt joints of body and disc. d. Welders and WPS shall be qualified as per ASME- section IX
15	Segmental Flanges exceeding 37.5 mm thickness shall be stress relieved after welding. All butt weld joints in segmental flange shall be examined by Radiographic Test. Maximum number of segments shall be 4 only.
16	All Electric Hoist shall be tested as per IS- 3938 and Chain Pulley Block shall be tested as per IS- 3832.
17	All fans shall be subjected to run test for such time till temperature stabilizes. Vibration, noise, temperature rise, and current drawn shall be measured during the run test.
18	Performance test of one fan of each type and size shall be carried out as per applicable standard for air flow, static pressure, speed. Efficiency, power consumption, noise, vibration and temperature rise.
19	a) Routine test shall be carried out on all pre / fine filters as per the requirements of BS 6540 / ASHRAE 52-76 for dust arrestance And pressure drop Vs flow.

ANNEXURE II, SECTION-IA

SUB-VENDOR LIST

Suggestive Sub-Vendor List for Submersible Slurry Pump

Description	Approval Category	Suggestive Sub-Vendor	Remarks
Submersible Slurry Pump	I/II	Darling Pumps Pvt. Ltd, Aqua Machineries Pvt. Ltd. Flowmore LTD., WPIL LIMITED, JASCO PUMP PVT. LTD., Mody Pumps (India), Private Limited, SU MOTORS PVT. LTD., VARAT PUMP and MACHINERY PVT. LTD.	Subjected to Customer Approval

PROJECT: PATRATU 3 X 800MW			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL			DOC. NO.					
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MAIN CONTRACTOR : BHEL						Date	11/07/19				
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
[A]	MECHANICAL:										
1	PRESSURE VESSELS > = 10 BAR	I				BELCO	GR. NOIDA	A			
						MURTHAL TANKS & VESSELS	SONEPAT	A			
						S V FABRICATORS	NAVI MUMBAI	A			
						SYSCON ENGINEERS	AMBERNATH	A			
						JASMINO POLYMERTECH	TALOJA	A			
						ISHAN EQUIPMENTS	VADODARA	A			
						RISHI INDUSTRIES	SONEPAT	A			
						TITAN ENGG	DURGAPUR	A			
						UNIVERSAL HEAT EXCHANGER	COIMBTORE	A			
						CHEM PROCESS	SANAND	A			
						GLOBAL STRUCTURE AND COMPOSITE	THANE	A			
2	PRESSURE VESSELS / ATMOSPHERIC TANKS< 10 BAR	III				BHEL APPROVED SOURCES ACCEPTABLE					
3	VERTICAL & HORIZONTAL CENTRIFUGAL PUMPS	II				KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A			
						WILO MATHER & PLATT PUMPS PVT LIMITED	PUNE	A			
						WILO MATHER & PLATT PUMPS PVT LIMITED	KOLHAPUR	A			
						SAM TURBO	COIMBATORE	A			UP TO 1500 CUM/HR ONLY
						FLOWMORE	GHAZIABAD	A			
						FLOWMORE	GHAZIABAD	A			
						BEST AND CROMPTON	CHENNAI	A			
						JYOTI LTD	VADODARA	A			
						WPIL LTD	GHAZIABAD	A			
						KISHORE PUMPS	PUNE	A	UPTO 500M3/HR ONLY . RUBBERLINED PUMPS ALSO		
						GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	A	HORIZONTAL UP TO 30 KW ONLY AND VERTICAL UP TO 45 KW ONLY (FOR APPLICATIONS WHERE NPSH IS NOT REQUIRED)		
						SINTECH PRECISION	GHAZIABAD	A	HORIZONTAL UP TO 400 KW MOTOR RATING AND VERTICAL UP TO 30 KW MOTOR RATING		
						KSB	PUNE	A			
						KSB	NASHIK	A			
						FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A	HOIZONTAL CENTRIFUGAL PUMP UP TO 75 KW ONLY		

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PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)		Revision No.	0
MAIN CONTRACTOR : BHEL		Date	11/07/19
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
						SU MOTOR	MUMBAI	A	HORIZONATL UPTO 500M3/HR & VERTICAL CENTRIFUGAL PUMPS UP TO 100CMH ONLY. RUBBERLINED PUMPS ALSO.		
4	VERTICAL TURBINE PUMPS -UP TO 300KW	II				M/S FLOWMORE LTD	SAHIBABAD	A			
						M/S FLOWMORE LTD	GHAZIABAD	A			
						KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A			
						WPIL LTD	KOLKATA	A			
						WPIL LTD	GHAZIABAD	A			
						JYOTI LTD	VADODARA	A			
						XYLEM WATER SOLUTIONS INDIA PVT LTD	VADODARA	A			
						FLOWSERVE INDIA CONTROLS PVT LTD	COIMBATORE	A			
						SINTECH PRECISION	GHAZIABAD	A	UP TO 30 KW		
						WILO MATHER & PLATT PUMPS PVT LIMITED	PUNE	A			
5	SUBMERSIBLE PUMPS < 30 KW	II				BHEL APPROVED SOURCES ACCEPTABLE					
6	SUBMERSIBLE PUMPS = >30 KW	I				KSB	NASHIK	A	130 KW		
						KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A			
						AQUA MACHINERY	AHMEDABAD	A	UP TO 235 KW		
						WPIL LTD	GHAZIABAD	A			
						WPIL LTD	THANE	A	UP TO 40 HP		
						MBH	AHMEDABAD	DR			
7	DUAL PLATE CHECK VALVE UPTO 600 MM & UPTO CLASS 300 #	II				BHEL APPROVED SOURCES ACCEPTABLE					
8	VALVE-DUAL PLATE CHECK > 600MM OR CLASS > 300	I				ADVANCE VALVE PVT LTD	GR. NOIDA	A	DUAL PLATE CHECK VALVES CI UPTO 1000 NB CLASS 125, DUPLEX SS UP TO 600NB CLASS 600.		
						LEADER	JALANDHAR	A	UP TO 900MM CLASS 150 , SS 200NB CLASS#300		
						R & D MULTIPLE	VALSAD	A	CI/ CS UP TO 800NB PN 10		
9	BALL VALVE UPTO 100 MM & UPTO CLASS 800#	II				BHEL APPROVED SOURCES ACCEPTABLE					
10	VALVE-BALL > 100 MM OR CLASS > 800	I				WEIR BDK	HUBLI	A	SS Ball valves up to 500MM and class #600, CS Ball Valves up to 250 MM and class# 900, CS/ SS Ball valves up to 100 MM and class # 1500.		
						MICRO FINISH VALVES PVT. LTD.	HUBLI	A	400NB CLASS#600 AND UP TO 600NB CLASS#300		
						FLOW CHEM INDUSTRIES	KALOL	A	100NB CLASS#600,200NB CLASS#300, 50 NB CLASS#800		
						L&T VALVES LIMITED	COIMBATORE	A	UPTO 150NB, CLASS #150/300, AND UPTO 50NB, CLASS #800		

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PROJECT: PATRATU 3 X 800MW							DOC. NO.					
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				Revision No.	0				
MAIN CONTRACTOR : BHEL							Date	11/07/19				
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status				Remark
1	2	3	4	5	6	7	8	9	10		11	12
						PRECISSION ENGG CO VALVES PVT LTD	NASIK	A	FCS UP TO 50NB CLASS 800, CCS UP TO 400NB CLASS 150.			
						BELGAUM AQUA VALVE PVT LTD	BELGAON	A	FCS UP TO 50NB CLASS 800, CCS UP TO 200NB CLASS 150.			
						G M ENGINEERING PRIVATE LTD	RAJKOT	A	UP T0 400 NB AND CLASS #600			
11	BUTTERFLY VALVE >600MM OR CLASS >150#	I				INTERVALVE POONAWALA LTD	PUNE	A	SGI / CI / D2 1400MM PN10, SGI / CI 1000MM PN16,CS/SS 500MM PN16, SS 400MM CLASS#300, MS FABRICATED UPTO 2800NB, PN 6			
						WEIR BDK	HUBLI	A	CI/ DI butterfly valve up to 1000MM and PN16 AND up to 1800MM and PN10,CCS UP TO 1050MM CLASS 150 AND up to 1800MM and PN16 SS - UP TO 400NB PN-16 ,FABRICATED 800MM CLASS#150.			
						PENTAIR VALVES	HALOL	A	FOR SS UP TO 500 NB PN-10, CI- UP TO 900NB PN-10, UP TO 500NB PN-16, 450MM CLASS#300., MS FABRICATED UPTO 2800NB, PN6.			
						FOURES S ENGINEERING (INDIA) LIMITED	BANGALORE	A	CAST SGI/CI/ MS FABRICATED- UP TO 1200 PN-10, UP TO 350 PN-16 ,2400 MM PN6/CLASS150 SS - UP TO 300NB PN-10,MS FABRICATED UPTO 2700NB CLASS # 75			
						KIRLOSKAR BROS LTD.	KONDHAPURI	A	CAST SGI/CI/CS 1400 MM PN16 , SS 300 MM PN16 , 1800MM CLASS 150, MS FABRICATED 900 NB PN40,MS FABRICATED 2800NB, PN6.			
						R & D MULTIPLE	VALSAD	A	CAST SGI/CI/MS FABRICATED- UP TO 1800 MM PN-10/CLASS # 75, ,1100MM PN25,1400MM CLASS#150 ,MS FABRICATED UPTO 2800NB CLASS # 75			
						ADVANCE	GREATER NOIDA	A	METAL SEATED, TRIPLE ECCENTRIC, SS BFV OF SIZE UPTO 100NB, AND PRESSURE RATING UPTO CLASS #300.			
						BRAY CONTROLS (ZHEJIANG) CO. LTD	CHINA	A	UP TO 400 NB CLASS#600			
						INSTRUMENTATION LTD.	PALAKKAD	A	UPTO 2200NB CLASS # 75			
						HAWA ENGINEERS	AHMEDABAD	A	CI/ CS & FABRICATED UPTO 1200MM, CLASS #150, SS UPTO 250MM, CLASS#150			
						STAFFORD	CHENNAI	DR				
						DELVALVE	SATARA	A	UPTO1000MM, PN10			
						GM ENGINEERING	AHMADABAD	DR				
						L&T	COIMBATORE	A	UPTO 900MM ,CLASS 150			
						BRAY INDIA	KANCHIPURAM	A	UP TO 450MM AND CLASS #600			
12	VALVE-BUTTERFLY UP TO 600MM & CLASS 150 #	II (FOR INDIGENOUS SUPPLIER) /III (FOREIGN SUPPLIER)				BHEL APPROVED SOURCES ACCEPTABLE						
13	VALVE- CONVENTIONAL GATE, GLOBE & CHECK VALVES UPTO 600NB & UPTO CLASS 300#	III				BHEL APPROVED SOURCES ACCEPTABLE						

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MAIN CONTRACTOR : BHEL						Date	11/07/19				
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
14	VALVE-CONVENTIONAL GATE / GLOBE / CHECK > 600NB OR CLASS > 300	II				LEADER	JALANDHAR	A	CS GATE 600MM CLASS#600, SS GLOBE 600MM CLASS#600, CS CHECK 600MM AND CLASS#600		
						HAWA ENGINEERS	AHMEDABAD	A	FCS / FSS 50 NB CLASS 800.		
						FOURESS	THANE	A	400NB CLASS 600 AND 50NB CLASS 800.		
						BHEL IVP	GOINDWAL	A	GATE UP TO 300 NB CLASS 600. GLOBE 250 NB CLASS 400, CHECK 150NB CLASS 600.		
						HITECH ENGG PVT LTD	AHEMDABAD	A	50 NB CLASS 800.		
						KSB PUMPS LTD	COIMBATORE	A	300NB CLASS 2500.		
						NITON VALVES INDIA PVT LTD	NAVI MUMBAI / AURANGABAD	A	CS GATE 900 NB CLASS 600, CHECK 300 NB CLASS 600.		
						L&T VALVES LIMITED	COIMBATORE	A	650 MM CLASS 600, 50 NB CLASS 800.		
						WEIR BDK	HUBLI	A	Conventional CCS Gate / Globe / Check Valves up to 600MM and Class # 1500, CSS Gate/ Globe/ Check Valves up to 200MM and Class # 600, FCS Gate / Globe / Check Valves up to 50MM and Class # 2500.		
15	SLUICE GATE/ ISOLATION GATE	II				BHEL APPROVED SOURCES ACCEPTABLE					
16	DIAPHRAGM VALVES	I				CRANE PROCESS FLOW	SATARA	A	UP TO 300NB PN10		
						WEIR BDK	HUBLI	A	UPTO 250 NB - PN 10, 350MM PN6		
						PROCON ENGINEERS	MUMBAI	A	UPTO 200 NB - PN 10 ,CCS Diaphragm Valves up to 200NB & Rating-PN10/ CLASS#150		
						SIGMA INDUSTRIES	NAVI MUMBAI	DR			
						A V VALVES	AGRA	DR			
						MAJESTIC VALVES(LABLINE)	MP	DR			
17	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES & FITTINGS	II				BHEL APPROVED SOURCES ACCEPTABLE					
18	PP & PTFE/ TEFLON LINING	III				BHEL APPROVED SOURCES ACCEPTABLE					PIPES FROM ALREADY IDENTIFIED SUB-VENDORS
19	MS PIPES (BLACK/ GI) IS:1239 & IS:3589 UPTO 1000 NB	II				BHEL APPROVED SOURCES ACCEPTABLE					BIS MARKED MANUFACTURERS WITH VALID BIS LICENCES
						SAIL	ROURKELA	A	CO-RELATED MTC SHALL BE REVIEWED.		
						WELSPUN	ANJAR	A	SAW UPTO 2600 NB		

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PROJECT: PATRATU 3 X 800MW			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL			DOC. NO.					
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)						Revision No.		0			
MAIN CONTRACTOR : BHEL						Date		11/07/19			
CONTRACT NO : 9585-001											
						PAGE		5 of 10			
Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
20	MS PIPES (BLACK/ GI) IS:1239 & IS:3589 > 1000 NB	I				WELSPUN	BHARUCH	A	SAW UPTO 1300 NB		BIS MARKED MANUFACTURERS WITH VALID BIS LICENCES
						MAN INDUSTRIES	INDORE	A	SAW UPTO 1400 NB		
						SAMSHI PIPE INDUSTRIES LTD	VADODARA	A	SAW 450 TO 2540 NB		
						MUKAT TANKS & VESSELS	TARAPUR	A	SAW 200 TO 1200 NB		
						MUKAT PIPES	RAJPURA	A	SAW UPTO 1800 NB		
						LALIT PIPES AND PIPES LTD	THANE	A	SAW 350 TO 1400 NB		
						RATNAMANI	CHATRAL	A	SAW 600 TO 2600 NB		
						RATNAMANI	KUTCH	A	SAW 400 TO 3600 NB		
						PSL HOLDINGS LIMITED	DAMAN	A	SAW 450 TO 1600 NB		
						PSL INTERNATIONAL LTD.	CHENNAI	A	SAW 450 TO 3000 NB		
						PSL LIMITED	KUTCH	A	SAW 700 TO 2200 NB		
						PSL LIMITED	VISAKHAPATNAM	A	SAW UP TO 3200 NB		
						JCO PIPES	CHHINDWARA	A	SAW UPTO 1600 NB		
						M/s Surya Roshni Limited	ANJAR	A	SAW UP TO 2300 NB		
						CAPACITE STRUCURES PVT LTD (EARLIER PRATIBHA PIPES & STRUCTURES PVT. LTD.)	THANE	A	ROLLERD & WELDED 406.4 MM TO 3874 MM		
21	VALVE-PR./ VACCUUM RELIEF /SAFETY RELIEF /ARV/ FLOAT VALVE	III				BHEL APPROVED SOURCES ACCEPTABLE					
						REMI	TARAPUR	A	ERW UPTO 400 NB		
						RATNAMANI	MEHSANA	A	ERW UPTO 500 NB, SEAMLESS UPTO 50 NB ONLY		II (FOR INDIGENOUS SUPPLIER) /III (FOREIGN SUPPLIER)
						RATNAMANI	KUTCH	A	ERW UPTO 400 NB, SEAMLESS UPTO 50 NB ONLY, ARC WELDED UP TO 450NB		

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PROJECT: PATRATU 3 X 800MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL	DOC. NO.	
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)		Revision No.	0
MAIN CONTRACTOR : BHEL		Date	11/07/19
CONTRACT NO : 9585-001		PAGE	6 of 10

Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
22	SS PIPE ASTM A 312	II (III FOR FOREIGN VENDORS)				SUMITOMO	JAPAN	A			
						SOSTA	GERMANY	A			
						OUTO KOMPU	SWEDEN	A			
						PRAKASH STEELAGE	VALSAD	A	ONLY FOR SEAMLESS UPTO 50NB AND ERW UP TO 400NB		
						BHANDARI FOILS & TUBES LIMITED	DEWAS	A	ERW UP TO 300NB		
						APEX	BEHRORE	A	ERW UPTO 400 NB, SEAMLESS UPTO 50 NB.		
23	AIR BLOWERS (LOBE TYPE) => 5 KW	I				SWAM PNEUMATIC	NOIDA	A			
						EVEREST BLOWERS PVT LTD	BAHADURGARH	A	UP TO 40 HP (APPROX 1600 CUM/HR)		
						KAY INTERNATIONAL	SONEPAT	A	UP TO 500 CUM/HR		
						KULKARNI POWER TOOLS	SHIROL	A	UP TO 2500CUM/HR		
						USHA COMPRESSORS	AHMEDABAD	A	UP TO 60 HP (APPROX 2000CUM/HR)		
24	AIR BLOWERS (LOBE TYPE) < 5 KW	II				BHEL APPROVED SOURCES ACCEPTABLE					
25	PUMP - METERING / DOSING	II				BHEL APPROVED SOURCES ACCEPTABLE					
26	ELECTRIC HOIST/EOT CRANE / CHAIN PULLEY BLOCK UPTO 5 TONS	III				BHEL APPROVED SOURCES ACCEPTABLE					
27	ELECTRIC HOIST/EOT CRANE / CHAIN PULLEY BLOCK > 5 UPTO 10 TONS	III				TRACTEL TIRFOR	PALWAL	A	UPTO 20 TON		
						LIFTING EQUIPMENT	DELHI	A	UPTO 12 TON		
						ARMSEL	BANGALORE	A	UPTO 5 TON		
						HERCULES HOIST	RAIGAD	A	UPTO 15 TON		
						REVA INDUSTRIES	FARIDABAD	A	UP TO 25T		
						EDDY CRANE	PUNE	A	UPTO 10 TON		
						CONSOLIDATED HOIST	SATARA /PUNE *	A	*PUNE FOR ELECTRIC HOIST UPTO 15 TONS		
						ELECTROTHERAPHY	RISHRA	A	UPTO 15 TON FOR ELECTRIC HOIST ONLY		
						TUBRO FERGUSSON	KOLKATA	A	UPTO 5 TON FOR ELECTRIC HOIST		
						PRAYAS ENGG (PBL)	V V NAGAR	A	UPTO 10 TON FOR ELECTRIC HOIST ONLY		

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PROJECT: PATRATU 3 X 800MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL	DOC. NO.	
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DIOXIDE PLANT)		Revision No.	0
MAIN CONTRACTOR : BHEL		Date	11/07/19
CONTRACT NO : 3585-001			
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
						CRANEX	GHAZIABAD	A	UP TO 35 T CAPACITY EOT CRANE ONLY. GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.		
						ALPHA SERVICES	ALWAR	A	SINGLE GIRDER EOT CRANE & ELECTRIC HOIST UPTO 15 TON ONLY. GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.		
						CENTURY CRANE ENGINEERS PVT. LTD	BALLABHGARH	A	UP TO 25T,GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.		
						MILLARS INDIA	KARAMSAD	A	UP TO 25T		
						AVON CRANES	GURGAON	A	UP TO 25T		
						GRIP ENGINEERS	HYDERABAD	A	GEARBOX FROM NTPC APPROVED SOURCES FOR EOT CRANE.		
						GRIP ENGINEERS	FARIDABAD	A	UPTO 20 TON ELECTRIC HOIST ONLY		
28	FILTER/ STRAINER Y TYPE/ BASKET TYPE	III				BHEL APPROVED SOURCES ACCEPTABLE					
29	PLUG VALVE UPTO 100 MM & UPTO CLASS 800#	II				BHEL APPROVED SOURCES ACCEPTABLE					
30	VALVE-PLUG > 100 MM OR CLASS > 800	I				WEIR BDK	HUBLI	A	SOFT SEATED 400MM AND CLASS #150, 300NB CLASS#300		
						FLOWSERVE INDIA CONTROLS PVT LTD	CHENNAI	A	METALLIC SEATED 400NB CLASS#150, 300NB CLASS #300, 50NB CLASS #800		
31	AGITATORS	III				BHEL APPROVED SOURCES ACCEPTABLE					
32	FITTINGS/ FLANGES (MS-SS-CS)	III				BHEL APPROVED SOURCES ACCEPTABLE					
33	PVC/CPVC/HDPE /PVDF PIPES, VALVES, FITTINGS & TANKS	III				BHEL APPROVED SOURCES ACCEPTABLE					
34	MICRON CARTRIDGE FILTER AND ITS HOUSING	III				BHEL APPROVED SOURCES ACCEPTABLE					
35	AIR BLOWERS (CENTRIFUGAL) = >5KW	I				PATEL AIR FLOW LIMITED	AHMEDABAD	A	UP TO 4000CUM/HR		
						C B DOCTOR	AHMEDABAD	A	UP TO 4000CUM/HR		
						UNIVERSAL	MUMBAI	DR			
						KULKARNI POWER TOOLS	SANGALI	DR			
36	AIR BLOWERS (CENTRIFUGAL) < 5KW	II				BHEL APPROVED SOURCES ACCEPTABLE					
37	ION EXCHANGE RESIN (DM PLANT)	III				BHEL APPROVED SOURCES ACCEPTABLE					

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PROJECT: PATRATU 3 X 800MW

PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)

MAIN CONTRACTOR : BHEL

CONTRACT NO : 9585-001

LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL

DOC. NO.

Revision No. 0

Date 11/07/19

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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
38	PRESSURE REDUCING VALVE, VESSEL INTERNALS, , RASCHING RINGS, VALVES FOR INSTRUMENT ISOLATION , HANDRAILS & PLATFORMS, STRUCTURAL STEEL (ANGLES, CHENNELS, FLATES, ROUNDS, GRATINGS FOR SUPPORT AND PLATFORMS), LADDERS, PUDDLE PIPES (MS), INSERT / EMBEDMENT PLATES, MEDIA FOR MBBR TANK, SLUDGE TROLLEY, FASTENER, GASKET, OIL & GREASE, PAINTS, PP FILTER NOZZLE, EYE FOUTAIN,GI FITTINGS, DAMPNER, CALIBERATION POT, SELF CLEANING STRAINER, OIL DRUM, DEGASSED TOWER, U CLAMP,NEEDLE VALVE,NAME PLATE,FASTENERS,SIGHT GLASS,RUPTURE DISC,FOUNDATION BOLTS,CATION COLUMN,SAMPLE COOLER,SITE FLOW INDICATOR.	III				BHEL APPROVED SOURCES ACCEPTABLE					
39	MISCELLENIOUS ITEMS - OVERFLOW SEAL POT, HOSES, FILTER MEDIA (SAND/GRAVEL), FMR MEDIA, FUME ABSORBER, MOISTURE ABSORBER, CO2 ABSORBER, BREATHER, FRV TANKS , RESIN TRAP, OPEN TRAP, DIFFUSERS, STATIC MIXER, PALL RINGS, DISSOLVING BASKET, MEDIA TRAPS, MIXING TEE, PP STARINER, PP BALLS, BAR SCREEN, EJECTORS, VENTURI MIXERS, RO SKID/ UF SKID & OTHER SKIDS FABRICATION, SAFETY SHOWER, SAFETY EQUIPMENTS, CENTRIFUGE, FOOT/FLOAT VALVE, OIL WATER SEPARATOR & OIL SKIMMER, WEIGHING SCALE, ACTIVATED CARBON, ANTHRACITE, RO SAMPLING PANEL & SNAP ACTION VALVE,	III				BHEL APPROVED SOURCES ACCEPTABLE					
40	PIPING FABRICATION - HIGH PRESSURE >300 PSI	II				BHEL APPROVED SOURCES ACCEPTABLE					
41	PIPING FABRICATION - LOW PRESSURE UPTO 300 PSI	III				BHEL APPROVED SOURCES ACCEPTABLE					
42	PIPE-CS SEAMLESS ASTM A 106	II				ISMT	AHMADNAGAR	A	UPTO 150NB &		
						ISMT	BARAMATI	A	UPTO 200 NB		
						REMI	BHARUCH	A	UPTO 177.8 MM OD, HOT FINISHED		
						MAHARASHTRA SEEMLESS	RAIGAD	A	CS SEAMLESS PIPESUPTO 500 NB		
						DALMINE-	ITALY	A			
						KAWASAKAI STEEL COMPANY	JAPAN	A			

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PROJECT: PATRATU 3 X 800MW	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL	DOC. NO.	
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)		Revision No.	0
MAIN CONTRACTOR : BHEL		Date	11/07/19
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Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status			Remark
1	2	3	4	5	6	7	8	9	10	11	12
		III				MANNESMAN & VALLOURAC	GERMANY	A			
						SUMITOMO METAL	JAPAN	A			
						S.C.PETROTUBE SA	ROMANIA	A			
						NKK	JAPAN	A			
						ARCELAR MITTAL	ROMANIA	A			
43	PUMP- PP ACID/ ALKALI UNLOADING PUMP (NON METTALIC PUMPS)	II				BHEL APPROVED SOURCES ACCEPTABLE					
44	SCREW PUMPS	II				BHEL APPROVED SOURCES ACCEPTABLE					
45	REACTOR CLARIFIER/ CLARIFLOCCULATOR / SLUDGE THICKNER ASSEMBLY- FABRICATION	III				BHEL APPROVED SOURCES ACCEPTABLE					
46	LAMELLA CLARIFIER - FABRICATION	III				BHEL APPROVED SOURCES ACCEPTABLE					
47	PLATES-FRP FOR LAMELLA CLARIFIER	III				BHEL APPROVED SOURCES ACCEPTABLE					
48	TUBE SETTLER/PLATE SETTLER	III				BHEL APPROVED SOURCES ACCEPTABLE					
49	FRP VESSELS AND TANKS	III				BHEL APPROVED SOURCES ACCEPTABLE					
50	PIPES AND FITTINGS - GRP	I				EPP COMPOSITES PVT LTD	RAJKOT	A	UP TO 900 mm DN PR RATING PN-15, STIFFNES 248 KPA		
						GRAPHITE INDIA	NASIK	A	UP TO 1100 mm DN PR RATING PN-15,STIFFNES 5000 N/m2		
						SHRIRAM SEPL COMPOSITES LTD	CHENNAI	A	UP TO 1100 mm DN PR RATING PN-15, STIFFNES 5000 N/m2		
						BALAJI FIBER REINFORCE PVT LIMITED	VADODARA	A	up to 650 NB PR RATING PN-6, STIFFNES 248 KPA		
						MEGHA FIBRE GLASS INDUSTRIES PVT LTD	MEDAK	A	UP TO 900 mm DN PR RATING PN-15, STIFFNES 248 KPA		
51	PIPES AND FITTINGS - CI	II				BHEL APPROVED SOURCES ACCEPTABLE					
52	RO MEMBRANE	III				BHEL APPROVED SOURCES ACCEPTABLE					
53	RO PRESSURE TUBE	II				BHEL APPROVED SOURCES ACCEPTABLE					
54	TUBE SETTLER MEDIA	II				BHEL APPROVED SOURCES ACCEPTABLE					
55	VALVE - GUN METAL	III				BHEL APPROVED SOURCES ACCEPTABLE					
56	NRV FLAP TYPE	III				BHEL APPROVED SOURCES ACCEPTABLE					
57	UF MEMBRANE	III				BHEL APPROVED SOURCES ACCEPTABLE					
58	MS / SS PLATES	III				MAIN STEEL PRODUCERS (SAIL/TISCI/ESSAR/ISPAT STEEL/JINDAL STEEL/LLOYDS/JSW/RINL)		A			BHEL SHALL SUBMIT CO-RELATED MANUFACTURER TC FOR NTPC/PVUN REVIEW.

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PROJECT: PATRATU 3 X 800MW			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO.					
PACKAGE : WATER TREATMENT PLANT (DM PLANT,PT PLANT, ET PLANT, ST PLANT, CW TREATMENT & CHLORINE DI OXIDE PLANT)							Revision No.	0				
MAIN CONTRACTOR : BHEL							Date	11/07/19				
CONTRACT NO : 9585-001												
							PAGE	10 of 10				
Sr. No	Item	QP/ INSP CAT	QP NO			PROPOSED SUB SUPLIER	Place	SUB SUPPLIER APPL. Status				Remark
1	2	3	4	5	6	7	8	9	10		11	12
59	LABORATORY GLASSWARES AND EQUIPMENTS	III				BHEL APPROVED SOURCES ACCEPTABLE						
60	ATMOSPHERIC TANKS - SITE FABRICATED	SHALL BE COVERED IN FQP				BHEL APPROVED SOURCES ACCEPTABLE						
61	CHLORINE DI OXIDE GENERATOR	I				CHEMBOND WATER TECHNOLOGIES LIMITED	VADODARA/ MUMBAI	DR				

NOTE- For Mandatory Spares, the Tests/ Checks shall be same, as applicable in the approved QP of the Main Equipment for the respective spare Item. Spares, not covered in the QP of the Main Equipment, shall be treated as Inspection Category-III. For all Spares, BHEL shall submit the Interchangeability Certificate & COC for the purpose of Dispatch Clearance by NTPC/PVUN.

A - FOR THESE ITEMS PROPOSED VENDOR IS ACCEPTABLE TONTPC/PVUN. DR : FOR THESE ITEMS DETAILS ARE REQUIRED FORNTPC/PVUN REVIEW.

2. QP / INSPECTION CATEGORY:

CAT I: For these items the quality plans are approved by NTPC/PVUN. and the final acceptance will be on physical inspection witness by NTPC/PVUN.

CAT II: For these items the quality plans are approved byNTPC/PVUN.. However no physical inspection shall be done by NTPC/PVUN. The final acceptance by NTPC/PVUN shall be on the basis of review of document as per approved QP.

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 Multy units/works.

Vishal 11.07.19 VISHVESH KUMAR BHEL

11/07/19 (Kamlesh Singh) PVUNL

NTPC	PROJECT : TELANGANA STPP (2 x 800 MW)	LIST OF ITEMS REQUIRING QP	REF. NO : 9591-101-2
	PACKAGE : Steam Generator (SG) PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
22	Electronic transmitters (pressure, DP)	III				EMERSON (Rosemount)	USA/ Pawane	A			
		III				FUJI ELECTRIC	China	A			
		III				YOKOGAWA	JAPAN	A			Testing and Calibration at M/s YIL, Bangalore is also acceptable.
		II				ABB	Bangalore	A			Model - 2600 T
		III				ABB	GERMANY / Italy	A			Model - 2600 T
		III				Siemens	France / India	A			
		III				Honeywell	Pune	A			
		*				ENDRESS & HOUSER	Aurangabad/ Germany	DR			
23	Thermocouples, RTD & Thermowell	III				HERAUS SENSOR	GERMANY	A			
		III				WISE Control	Korea	A			
		II				Tempsens	Udaipur	A			
		II				Pyroelectric	Goa	A			
		II				Detriv Instrumentation & Electronics Ltd	Mumbai	A			
		III				Minco	USA	A			
		III				OKAZAKI corporation	JAPAN	A			
		III				Yamari	JAPAN	A			
		III				Yamari	Singapore	A			For RTD Reference list and Performance feedback is to be submitted.
		III				ABB(SENSYCON)	Germany	A			
		III				EMERSON (Rosemount)	Germany	A			
		II				EMERSON (Rosemount)	Pawane	A			Imported from Emerson, Germany (make)
		II				Thermal Instruments(GIC)	Savantwadi	A			
		II				Techno Instruments	Ahamadabad	A			
		II				GOA Instrument Industries	GOA	A			For Thermowell only
		*				GOA Instrument Industries	GOA	DR			M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				WIKA	Pune	DR			
		*				Toshniwal Industries	Ajmer	DR			
		*				E & H	Aurangabad	DR			

NTPC	PROJECT : TELANGANA STPP (2 x 800 MW)	LIST OF ITEMS REQUIRING QP	REF. NO : 9591-101-2
	PACKAGE : Steam Generator (SG) PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				Nesstech	Vapi	DR			
		*				Baumer	Vapi	DR			
24	Ultrasonic type level Transmitter	III				E & H	Aurangabad/ Germany	A			
		III				EMERSON	Pawane	A			
		III				SIEMENS MILTRONICS	CANADA	A			
		III				Nivelco	Hungery	A			
		*				Vega	Germany	DR			
		*				Khrone	France / USA / Pune	DR			M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Yokogawa	Bangalore	DR			
		*				Honeywell	India	DR			
		*				Magnetrol	Belgium	DR			
		*				ABB	Germany / India	DR			
25	Orifice plate assembly	III				Instrumentation Limited	Palghat	A			
		III				Microprecision	Faridabad	A			
		III				Starmech	Pune	A			
		III				Flow Star	Faridabad	A			
		III				SEIKO	Austria	A			
		III				MINCO (GIC)	GOA	A			
		III				WISE Control	Korea	A			
		III				T M Technomatic	Italy	A			
		*				IEPL	Hyderabad	DR			
		*				Engg. Specialities	Kolkata	DR			
		*				BALIGA	CHENNAI	DR			
		*				Pyroelectric	Mumbai	DR			
		*				Hydropneumatics	Mapusa	DR			
26	Pressure, DP Gauge	III				BUDENBERG	UK	A			
		III				ASHCROFT	USA/Germany/ India	A			
		III				Wika	GERMANY	A			
		III				WISE Control	Korea	A			
		III				Nagano KEIKI	Japan	A			
		III				H.Guru South India	Bangalore	A			Not for MS & FW application
		III				A.N. Instruments	Kolakatta	A			Not for MS & FW application
		III				Gauge Bourdon(GIC)	Panvel	A			

NTPC	PROJECT : TELANGANA STPP (2 x 800 MW)	LIST OF ITEMS REQUIRING QP	REF. NO : 9591-101-2
	PACKAGE : Steam Generator (SG) PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		III				Goa Thermostatic	GOA	A			Not for MS & FW application
		III				Wika	Pune	A			DR for MS & FW application
		III				Baumer	Vapi	A			DR for MS & FW application
		III				Ashcroft (Mass Brand)	Gandhinagar	A			Not for MS & FW application
		III				H Guru	Rishra/Muzaffarpu	A			Not for MS & FW application
		*				US Gauge	USA	DR			
		*				Winters	USA	DR			
		III				Forbes Marshall	Hyderabad	A			
		*				Manometer	Mumbai	DR*			
		III				Walchandnagar Industries Ltd.	Dharwad	A			
		*				Nesstech	Vapi	DR			
		*				Gauges Bourdon	UK	DR			
27	Level gauge (Transperent & Reflex, Tubular type)	III				Nihon Klingage Co.,Ltd	Japan	NOTED			
		III				Bunkabokei Kogyo Co., Ltd	Japan	NOTED			
		III				tokyo keiso	Japan	NOTED			
		III				Chemtrol Samil (I) Pvt. Ltd.	Mumbai	NOTED			
		III				Levcon	Kolkatta	NOTED			
		III				Sigma	Mumbai	NOTED			Up to 40 Kg/cm2
		III				SBEM	Pune	NOTED			Up to 40 Kg/cm3
		III				Chemtrol	GOA	NOTED			Up to 40 Kg/cm4
		III				ASIAN INDUSTRIAL VALVES	CHENNAI	NOTED			Up to 40 Kg/cm5
		III				D.K.Instruments	Kolkotta	NOTED			Up to 40 Kg/cm2
		III				Flow Star	Faridabad	NOTED			Up to 40 Kg/cm2
		III				V-Automat	NewDelhi	NOTED			
		III				DEMPER KOGYO	JAPAN	NOTED			
		III				Kubler	Germany	NOTED			
		III				WIKA	PUNE	NOTED			Up to 40 Kg/cm2
		III				WAREE	VAPI	NOTED			Up to 40 Kg/cm2
		III				Gauges Bourdon (GIC)	Panvel	NOTED			
		III				Magnetrol	Belgium	NOTED			
		III				Khrone	Germany	NOTED			
		III				PUNE TECHTROL	Pune	NOTED			
		III				E & H	Aurangabad	NOTED			
28	Press, DP, Vaccum Switch	III				SOR	USA	A			
		III				DRESSOR (ASHCROFT)	USA/Germany	A			

NTPC	PROJECT : TELANGANA STPP (2 x 800 MW)	LIST OF ITEMS REQUIRING QP	REF. NO : 9591-101-2
	PACKAGE : Steam Generator (SG) PACKAGE	APPROVAL & ACCEPTABLE	REVISION NO : 00
	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
33	Conduits lead coated (Flexible)	III				Plica	Ghaziabad	A			Main contractor can propose additional vendor for this item
		*				Bansal labortories	BHOPAL	DR			
34	Intelligent Battery charger 24V DC & DCDB /BHMS	II				Chabbi Electricals	Jalgaon	A			Modules from EMERSON
		II				Eltech	Gurgaon	A			Modules from ELTEK
		II				MasTech	Jalgaon	A			Modules from ELTEK
		II				Emerson	India	A			M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				HBL Power Systems	India	DR			
		*				Dubas	India	DR			
		*				Chabbi Electricals (Chabbi Modules)	Jalgaon	DR			
		*				MasTech (Setek Modules)	Jalgaon	DR			
		*				Hitachi Hi Rel	Gandhinagar	DR			
		*				Statcon Power Controls Pvt. Ltd.	Noida	DR			
		*				Chloride Power Systems (caldyne)	India	DR			
		*				Amararaja	Tirupati	DR			
		*				Keltron Power Electronics	Trivendram	DR			
		*				Universal Instrument manufacturing co P Ltd	India	DR			
		*				Hind Rectifier Ltd	India	DR			
35	Battery Health Monitoring System	III				Emerson	Mumbai	A			
		III				Eltek SGS Pvt Ltd	Gurgaon	A			
		*				B Tech Inc	USA	DR			
		III				Hitachi Hi Rel	Gandhinagar	A			
		*				Hopeckee	Germany	DR			
		*				Hitachi Hi Rel	Gandhinagar	DR			
36	Battery(Ni-cd)	I				AMCO SAFT	Bangalore	A			
		II				SAFT	France/Sweeden	A			
		I				HBL POWER	Hyderabad	A			
		II				Hopekee	Germany	A			
37	Socket weld fittings	III				Main Contractor Approved Sources		NOTED			
38	Impulse pipe & tubes	II				Mahrashtra Seamless	Raigarh	A			Carbon steel only

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	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		II				Sumitomo/kawasaki/Nippon	Japan	A			
		II				TPS TECHNITUBE	Germany	A			
		II				Veluric & manessmann	Germany	A			
		II				BHEL	Trichy	A			
		II				Trouvay and Cauvin	France	A			Makes shall be as per apprvoed list (Sr. No. 41)
		II				ISMT	Ahamadnagar	A			Carbon steel only.
		II				Sandvik		A			For SS only.
		*				TUBACES	Spain	DR			
		*				Salzgitter Mannesmann International	Germany	DR			
		*				Jindal saw	India	DR			
		II				Ratanamani Metal and Tubes	Ahamadabad	A			SS only
		II				Heavy metals and Tubes	Ahamadabad	A			SS and CS only.
		*				Shubhalaxmi Metal and Tubes	Mumbai	DR			
39	Compression fittings	III				Parker	USA	A			
		III				Precision	Mumbai	A			
		III				Astech	Mumbai	A			
		III				Fluid control Pvt. Ltd.	Pune	A			
		III				HP Valves and fittings	CHENNAI	A			Ferruleas are to be hardned at Exim Holand for pressure above 9000 psi.
		III				Excel hydro	Mumbai	A			Ferruleas are to be hardned at Exim Holand for pressure above 9000 psi.
		III				Swagelock	USA	A			
		III				Panam	Mumbai	A			
		*				Parker Hannifin India Pvt. Ltd.		DR			
		*				Prime Engineers		DR			
		*				Arya Craft		DR			
40	Instrument valves	III				BHEL	Trichy	A			
		II				Excel Hydro	Mumbai	A			
		II				Instrumentation Ltd.,	Palghat	A			
		III				Swagelok	USA	A			
		III				Parker	USA	A			
		II				HP Valves and fittings	CHENNAI	A			

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	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		II				Fluid control Pvt. Ltd.	Pune	A			
		II				Baldota	Mumbai	A			
41	Valve manifolds	III				Excel hydro	Mumbai	A			
		III				SCHNEIDER	Germany	A			
		III				Anderson Greenwood	USA	A			
		III				Astech	Mumbai	A			
		III				HP Valves and fittings	CHENNAI	A			
		III				Fluid control Pvt. Ltd.	Pune	A			
		III				Microprecision	Faridabad	A			
		III				Parker	USA	A			
		III				Swagelock	USA	A			
		III				Baldota	Mumbai	A			
		*				Metpress Engg. works	Kolkata	DR			
42	Local Instrument Enclosure/Rack	I				Pyrotech	Udaipur	A			
		I				Instrumentation Limited	Kota	A			
		I				Sajas electrical	Trichurapalli	A			
		I				Prammen	Puddukottai	A			
		I				Chemin	Pondicherry	A			
		*				Forbes Marshall	Pune	DR			
		*				Positronics	Vadodara	DR			
		*				Procon	Chennai	DR			
43	Instrument Cables	I				Paramount	Khuskhera	A			PVC,FRLS type,RQP
		I				Polycab	Daman	A			PVC,FRLS type,RQP
		I				Delton	Faridabad	A			PVC,FRLS type,RQP
		I				KEI	Bhiwadi	A			PVC,FRLS type
		I				Elkey Telelinks	Faridabad	A			PVC,FRLS type
		I				CORDS	Chopanki	A			PVC,FRLS type,RQP
		I				CORDS	Kaharani	A			PVC,FRLS type,RQP
		I				Nicco	Kolkata	A			PVC,FRLS type
		II				TEW & C	USA	A			
		II				Habia cables	Sweeden	A			
		II				Kerpen cables	Germany	A			
		II				Lapp cables	Germany	A			
		II				Thermo elecrta Bv	Netherland	A			
		I				Universal Cable	Satna	A			PVC,FRLS type

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	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		I				Thermocables	Hyderabad	A			
		I				Finolex Cable	Pune	DR *			
		I				Incab	Pune	DR *			
		I				Gupta Power Infrastructure Ltd.	Khurdha	A			
		*				Lapp cables	India	DR			M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		*				Lioni cable	Pune	DR			
		*				RR Kabel	Silvasa	DR			
		*				Gemscab	Bhiwadi	DR			
		*				KEC International	Mysore	DR			
		*				Advance cable Technologies	Bangalore	DR			
		*				Suyog Electricals Ltd.	Vadodara	DR			
		*				Special Cable	India	DR			
		*				CMI	Faridabad	DR			
44	Electrical actuator	III				Auma	Germany	A			
		III				Limitorqe	USA	A			
		III				Rotorq	UK	A			
		II				Limitorque	Faridabad	A			
		II				Rotork	Chennai/ Bangalore	A			
		III				Nippon gear	Japan	A			
		II				Auma	Bangalore	A			
		III				Harold Beck	USA	A			
		III				Drehmo	Germany	A			
		*				Lindco	USA	DR			
		*				Siemens	Germany	DR			
45	Electrical actuator for ID/FD/PA Blade pitch and Guide vane control	III				Harold Beck	USA	A			
		III				SIPOS Aktrorik GmbH	Germany	A			
		*				ABB	Germany	DR			
46	Flow nozzle / Vernturi assembly	II				Mcroprecision	Faridabad	A			
		II				SEIKO	Austria	A			
		II				TECHNOMATIC	Italy	A			
		II				Instrumentation Limited	Palghat	A			
		II				Starmech	Pune	A			DR for P-91 Material
		II				WISE Control	Korea	A			

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	CONTRACTOR : BHEL - PEM, HYD, Trichy, PC, EDN, ISG	VENDOR AS APPROVED BY	DATE : 06/05/2015
	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				SAMIL	Korea	DR			
		*				MINCO	GOA	DR			
		*				Engg. Specialities	Kolkata	DR			
		*				Pyroelectric	Mumbai	DR			
		*				Hydropneumatics	Mapusa / GOA	DR			
		*				ASIAN INDUSTRIAL VALVES	Chennai	DR			
47	HIGH Temp. cable (PTFE/FEP)	II				Habia cables	Sweden	A			
		II				Lapp cables	Germany	A			
		II				Kerpen cables	Germany	A			
		II				TEW & C	USA	A			
		II				Thermo-Electra Bv	Netherland	A			
		II				Habia cables	China	A			
		II				Thermocables	Hyderabad	A			
		*				Tempsens	Udaipur	DR			
		*				Delton Cables	Faridabad	DR			
		*				RJ Cables	Roorkee	DR			
48	Fiber optic cable	II				HFCL	Goa	A			
		II				R&M	Switzerland	A			
		II				Aksh Fibre	Bhiwadi	A			
		II				Finolex	Pune/Goa	A			
		II				Birla Ericson	Rewa	A			
		II				Molex	UK	A			
		II				Corning	USA	A			
		II				Schneider	GOA	Noted			Previously known as D Link / Smarlink, Goa
		*				RPG Cables	India	DR			
		*				Uniflex Cables	India	DR			
49	Pneumatic Actuator (Power Cylinder e. g. FOR SADC)	II				Dong Woo Valve Control Co. LTD	Korea	A			
		II				Shin Hwa Engineering Co. LTD	Korea	A			
		I				Instrumentation Limited	Palghat	A			
		I				Kelton	Cochin(Alleppy)	A			
		I				SMC Pneumatics	Noida	A			**Up to 12 inch only**
		I				Rotex	Mumbai	A			Conditional
		*				Emerson Process Management	Chennai	DR			
		*				MIL Controls	Alwaye	DR			

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	CONTRACT NO : 9591-101-2		

No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				Festo	Bangalore	DR			
		*				IMI Norgen	Noida	DR			
50	Level switch capacitance type	III				ENDRESS & HOUSER	Aurangabad	A			
		III				MAGNETROL	BELGIUM	A			
		III				SBEM	PUNE	A			
		III				PUNE TECHTROL	PUNE	A			
		III				LEVCON	KOLKATA	A			
		III				Nivo Controls	Indore	A			
		*				V AUTOMAT	New Delhi	DR			
		*				D K Instrument	Kolkata	DR			
		*				Siemens	Germany	DR			
		*				ABB	Korea	DR			
		*				Rosemount	Korea	DR			
51	Transducer	II				AE	Mumbai	A			
		II				Southern Transducer	Chennai	A			
		II				Elster	Mumbai	A			
		III				Camilie Bauer	Germany	A			
		III				Metrawat	Germany	A			
		II				Rishab	Nasik	A			
		*				Pyrotech	Udaipur	DR			
		*				Masibus	Gandhinagar	DR			
		*				SIEMENS	Germany	DR			
52	Mini UPS up to 3.5 KVA	III				EMERSON	Mumbai	A			
		III				EMERSON	Pune	A			
		III				Hitachi Hi- Rel	Gandhinagar	A			
		III				APC	Bangalore	A			
		III				APLAB	Mumbai	A			
		III				Delta	Gurgaon	A			
		*				Powertronix	Bangalore	DR			Submit one proposal only
		*				Schneider	Bangalore	DR			
53	Level switch- cond type	III				EMERSON (Solartron mobrey)	UK	A			
		II				Hi Tech	Kolkata	A			Levelstate, UK System
		III				Yarway	USA	A			
		III				LEVELSTATE	UK	A			
		II				Raman Instruments	Delhi	A			Emerson (Mobrey) System
		*				BHEL	Trichy	DR			

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		*				IGEMA	Germany	DR			
54	Level switch - Float/Displacer Type	III				ENDRESS & HOUSER	AURANGABAD	A			
		III				MAGNETROL	BELGIUM	A			
		III				LEVCON	KOLKATA	A			
		III				SBEM	PUNE	A			
		III				Chemtrols samil	Mubmai	A			
		III				NAKATIYA	JAPAN	A			
		III				Sigma Industries	Mubmai	A			
		III				D K Instrument	KOLKATA	A			
		III				PUNE TECHTROL	PUNE	A			
		III				V AUTOMAT	NEW DELHI	A			
		*				WAREE	WAPI	DR			
		III				LEVELSTATE	UK	A			
		III				Gauges Bourdon (GIC)	Panvel	A			
55	Air filter regulator	III				Fairchild	USA	A			
		III				Shavo Norgen	Mumbai	A			
		III				SMC Pneumatics	NOIDA	A			
		III				Emerson (Asco)	Chennai	A			
		III				Festo	Bangalore	A			
		III				Placka	Chennai	A			
56	Copper tubing/Brass connectors	III				MAIN SUPPLIER APPROVED SOURCES		NOTED			
57	Coupling / Interposing relays	III				PARAMOUNT	BANGALORE	A			QP
		III				OMRON		A			
		III				OEN		A			
		III				Jyoti	Baroda	A			
		III				ELSTA	SWITZERLAND	A			
		*				Schneider	Germany	DR			
		*				Siemens	Germany	DR			
		*				Phoenix	Germany	DR			
		*				Finder		DR			
58	Solenoid valve	III				Rotex	Vadodara	A			
		III				Avcon	Mumabi	A			
		III				Herion	Germany	A			
		III				IMI NORGEN	GERMANY	A			

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		III				A.N. Instruments	Kolakatta	A			
		III				NUOVA FIMA	ITALY	A			
		III				Goa Thermostatic	Goa	A			
		III				Goa Instrument Industries	Goa	A			
		III				Baumer	Vapi	A			
		III				Ashcroft	Gandhinagar	A			
		III				H Guru	Rishra/Muzaffarpu	A			
		III				Baumer	Vapi	A			
		III				Forbes Marshall	Hyderabad	A			M/s BHEL will forward only two proposals after details review of NTPC Technical specification requirements.
		III				Gauges Bourdon (GIC)	Panvel	A			
		*				Konics	Korea	DR			
		*				Pyroelectric	GOA	DR			
		*				Winters Gauge	USA	DR			
		*				Walchandnagar Industries Ltd.	Dharwad	DR			
		*				Nesstech	Vapi	DR			
		*				US Gauge	USA	DR			
63	Furniture for computer	III				OTS office tech.	India	NOTED			
	{Chair, Almirah, Lock etc.}	III				Godrej boyce		NOTED			
		III				Fetherlite		NOTED			
		III				PAN Office		NOTED			
		III				Pyrotech		NOTED			
64	Terminal Block (Cage and Clamp type)	III				Weidmuller	Germany	A			
		III				Phoenix	Germany / India	A			
		III				Wago	Germany / India	A			
		III				Elmex	Vadodara	A			CE Mark only
65	FRP Junction Box					**Refer Electrical List**					
66	PLC System (If applicable)	I				GE Intellegent plateforms	Bangalore	A			
		I				ABB	Bangalore	A			
		I				Schneider	Nasik	A			
		I				Rockwell	Sahibabad	A			
		I				Siemens	Nasik	A			
		I				HONEYWELL	Pune	A			
67	SMART POSITIONER	#				ABB		N			# - To be covered in Control Valve QP.
		#				Masolenien		N			

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		III				Gossen / Metrowatt / Camille Bauer	Germany	A			
		III				Siemens	Germany	A			
		III				Chino	Japan	A			
		III				Weigell Messgerate	Germany	A			
		III				Pyrotech	Udaipur	A			For Non mosaic mounting
		*				Chino Corporation	Mumbai	DR			For Non mosaic mounting and submit only two proposals
		*				Yokogawa	Bangalore	DR			
		*				Lektrotek	Pune	DR			
		*				Teletherm	Chennai	DR			
79	Dust Emision Monitor	III				Land Combustion	UK	A			
		III				Durag	Germany	A			
		III				Sick Maihak	Germany	A			
		III				Emerson Process Management	Ireland	A			
		III				Codel	UK	A			
		II				Forbes Marshall	Pune	A			Main kit from M/s Codel, UK
80	Electrical Indicating Instruments (Mosaic Compatible)	III				Siemens	Germany	A			
		III				Gossen / Metrowatt / Camille Bauer	Germany	A			
		III				Ganz	Germany	A			
		III				Weigell Messgerate	Germany	A			
81	Flue Gas Analyser (CO)	III				Codel	UK	A			
		III				Emerson Process Management	Pawane	A			Analyser from M/s Emerson, Germany / USA.
		III				Land Combustion	UK	A			
		III				Sick Maihak	Germany	A			
		III				Siemens	Germany	A			
82	Flue Gas Analyser (CO2)	*				Codel	UK	DR			
		*				Sick Maihak	Germany	DR			
		*				Kitiwake Procal Ltd.		DR			
83	Flue Gas Analyser (SO2 and Nox)	III				Sick Maihak	Germany	A			
		III				Emerson Process Management	Pawane	A			Analyser from M/s Emerson, Germany / USA.
		III				Siemens	Germany	A			

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No.	Major Equipment	QP Inspection Category	QP No. 9582 001-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		*				BHEL		DR			

LEGENDS :

1.0 SYSTEM SUPPLIER / SUB SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

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

DR - For those items "Detailed Required" for NTPC review. To be identified with letter "DR" in the list.

DR* - For those item "Detail Required by NTPC for record updation only

NOTED : For these items vendors are approved by Main Suppleir and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED"

2.0 QP INSPECTION CATEGORY :

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

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

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

*** - Inspection category will be decided during vendor evaluation.**

NOTE - 1 : EMPTY CABINETS, COMPUTERS, SIGNAL ISOLATOR/ MULTIPLIER, MCB, TB, POWER SUPPLY ETC. SHALL ALSO BE ACCEPTABLE FROM INDEGENEOUS SOURCES AGREED BY NTPC IN QP. IF THE TOTAL INTEGRATED PANEL AND FAT IS CONDUCTED INDEGENEOUSLY ITEM TO BE TREATED AS CAT - I.

NOTE - 2 : NIL

NOTE - 3 : For the items not appearing in the preaward list, bidder and NTPC will mutually discussed in future.

NOTE - 4 : The items which are appearing under Schedule - I (To be supplied from overseas vendor), for those items, Indegeneous approved vendors stands cancelled / Withdrawn.

NOTE - 5 : For Imported Items like Skid mount, FAN, Motor, Pump etc., specific instruments shall be supplied as per OEM standard practice / approved sources.

FORMAT NO. : QS-01-QAI-P-1/F3-R0 Engg. Div/QA&I

Makes of various instruments / devices for Local control panel shall be as given below table:

SL. NO.	INSTRUMENTS / DEVICES	MAKEs
1.	Alarm Annunciators	Procon / IIC
2.	Ammeters	AEP / IMP
3.	Control / Selector Switches	Alsthom / Kaycee / Siemens / L&T
4.	Push Buttons / Indicating Lamps	Siemens / L&T / Teknic / Alsthom
5.	Auxiliary Relays	Jyoti / Siemens / L&T / OEN
6.	MCBs	S&S Power Engg. / Indo Asian / MDS
7.	Terminal Blocks	Jyoti / Elmex

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
1	LT Switchgear (description of items as per sub-section B-06, section VI of the technical specification)	I	1			L&T	Mumbai / Coimbatore/ Ahmednagar	A@		@- Subject to Sub-QR clearance from NTPC Engg. BOIs preferably with VDE/CE/UL/CSA marked or BIS approved with valid CML no.
						GE	Bangalore	A@		@- Subject to Sub-QR clearance from NTPC Engg . BOIs preferably with VDE/CE/UL/CSA marked or BIS approved with valid CML no.
						Siemens	Mumbai	A@		@- Subject to Sub-QR clearance from NTPC Engg. BOIs preferably with VDE/CE/UL/CSA marked or BIS approved with valid CML no.
						C&S Electric	Noida /	A@		@- Subject to Sub-QR clearance from

Apadav

![NTPC]	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101– QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
							Hardwar			NTPC Engg. BOIs preferably with VDE/CE/UL/CSA marked or BIS approved with valid CML no.
						Schneider	Nasik	A@		ACB from Schneider, France. @- Subject to Sub-QR clearance from NTPC Engg. BOIs preferably with VDE/CE/UL/CSA marked or BIS approved with valid CML no.
						ABB	Bangalore	DR@		@- Subject to Sub-QR clearance from NTPC Engg.
4	ACB	(part of LT Swgr MQP)				C&S Electric	Noida	A		
						L&T	Mumbai	A		
						GE	Bangalore	A		
						Siemens	Germany	A		

2+3 – NIL

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
						Schneider	France	A		
						ABB	Bangalore	DR		
5	LT Busduct (air insulated non phase segregated type)	I	4			C&S Electric	G.Noida	A		
						C&S Electric	Hardwar	A		
						Unilec	Gurgaon	A		Upto 3200 A
						KGS Engg Ltd	Chennai	A		
						Spaceage Swgr Ltd	Bawal	A		
						REEP	Chennai	A		
						Enpro	Chennai	A		
						Jasper Engg Ltd	Noida	A		Conditions apply
6	LT Busduct (insulated sandwitched type)	I	5			C&S Electric	Haridwar	A		
						Jasper Engg Ltd	Noida	DR		
						Henikwon	Malaysia	A		
						Schneider	Baroda	DR		
7	IEC 61850 Compliant Numerical	(part of				SEL	Pullman, USA	A@		A@- Subject to Sub-QR clearance form NTPC Engg

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
	Relays	Swgr MQP)								
						ALSTOM T&D	Stafford, UK	A@		P14X, P34X, P44X, P64X, P74X models only. A@- Subject to Sub-QR clearance form NTPC Engg
						ALSTOM T&D	Chennai	A@		P14X, P34X, P44X, P64X, P74X models only. A@- Subject to Sub-QR clearance form NTPC Engg
						GE Multilin	Zamudio, Vizcaya, Spain/ Markham, Ontario, Canada	A@		F 650 only A@- Subject to Sub-QR clearance form NTPC Engg
						Schneider	Stone, UK	A@		PX30 & PX40 models only. A@- Subject to Sub-QR clearance form NTPC Engg
						ABB	Finland	A@		A@- Subject to Sub-QR clearance form NTPC Engg
						ABB	Baroda	A@		For 6XX Series A@- Subject to Sub-QR clearance form NTPC Engg

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
						Siemens	Goa	A@		7SR2X series only A@- Subject to Sub-QR clearance form NTPC Engg
						Siemens	Germany	A@		7SX Series only A@- Subject to Sub-QR clearance form NTPC Engg
8	NIL									
9	FQP for LT Switchgear	I	G-01							
10	FQP for LT Busduct	I	G-02							

NB:
Under Sub Supplier approval status as per NTPC column:
A: mean that vendor for this item is acceptable to NTPC.
Under QP / INSPN CATEGORY column:
CAT-I : For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection & witness by NTPC
CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on basis of verification of documents as per approved QP

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT Switchgear & LT Busduct CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS

CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.

General Notes:

Vendor list & category of the mandatory spares shall be as mentioned above.

For item not appearing in the above list, main contractor to approach NTPC for acceptable vendors & inspection categorization of the same.

NTPC Approval conditions to above identified vendors shall be adhered to. Vendor's approval conditions will be informed on specific request of Main Contractor.

Note-1- VDE / CE / UL / CSA MARKING CERTIFICATION PREFERABLY FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER SHALL BE SUBMITTED FOR NTPC's VERIFICATION /INFORMATION

~~**Note-2- Out of the identified vendors in "DR" for Fixed type outdoor LT Switchgear Panel, maximum two vendors to be proposed to NTPC for review.**~~

Agadaw - 14/6/16
AMITYA
Dy. Mgr. / MCTG.
BHEL

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
1.	GI cable trays, fitting & accessories including bends	1	1			Inar Profiles Ltd	Enkapalli	A		
						Vatco	Mumbai	A		Galvanization at Sigma Mumbai
						Indiana cable trays	Mumbai	A		Galvanization at Karamtara galvaniser
						Industrial Perforation	Kolkata	A		
						Ratan Engineering	Kolkata	A		Galvanization at B.P. Projects
						India Electric Syndicate	Kolkata	A		Galvanization at BMW Industries/B.P Projects
						Steelite engg.	Mumbai	A		
						Premier Power Products	Kolkata	A		Galvanising at Neha Galvaniser
						Indiana Gratings	Pune	A		Galvanization at Poona Galvanizer/ Anand Yeknow Aids Engg
						M.J. Engineering	Okhla/ Bhiwadi	A		
						Jamna Metal	Delhi/ Kundli	A		
						T.R.G	Chennai	A		Galvanization at TM Radhakrishna Chetty & Co
						Amtech	Pune	A		Galvanization at B.G. Shirke - Pune
						Kannade Anand Udyog	Mumbai	A		Fabrication at their units: Plot No. 42, Moriv District Thane & Plot No.: D-35 Anand Nagar MIDC, Addl. Ambernath , Dist.Thane Galvanization and offer the galvanized cable trays for inspection at D-34 Anand Nagar MIDC, Addl. Ambernath, Dist.Thane.
						Rukmani	Raipur	A		Ladder type cable trays only
						Passive Infra	Hasangarh	A		

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
							(Rohtak)			
						Unitech Fabricators & Engineers	Howrah/ Hoogly (Kolkata)	A		
						Patny System	Hyderabad	A		
						Rabi Engg	Kolkata	A		Galvanizing from NTPC approved sources
						Maheswari Electricals	Noida	DR		
2.	Cable tray flexible support system (GI)	I	2			Vatco	Mumbai	A		Galvanising at Sigma Mumbai
						Inar profiles	Enkapalli	A		
						Industrial perforations	Kolkata	A		
						Premier power products	Kolkata	A		Galvanising at Neha Galvaniser
						Steelite engg.	Mumbai	A		
						Indiana gratings	Pune	A		Galvanising at Poona Galvaniser
						Amtech	Pune	A		Galvanising at B.G. Shirke
						Ratan Projects	Kolkata	A		Galvanization at NTPC approved sources
						Indmark Fortech	Pune	A		
3.	Lead coated steel flexible conduits	III				M/s PLICA	Ghaziabad	A		
						M/s Lapp	Germany	DR		
						M/s Bansal Labs	Bhopal	A		
4.	Junction boxes / Link Boxes/ Test Link Box/ Adopter box,	III				Main contractor approved sources with galvanization from		Noted		

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

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	Switch Boxes, Pull Boxes (Hot Dip Galvanized)					NTPC approved sources (Note-2)				
5.	FRP Junction boxes	II	3			Main Contractor approved sources		Noted		
6.	Cable termination kits & straight through jointing kit	I	4			M/s 3M Electro & Communication	Pune	A		up to 33 KV
						Raychem	Mumbai	A		Heat shrinkable type up to 33 KV
						Hari Consolidated Pvt Ltd	Delhi	A		Heat shrinkable type Upto 11 KV with conditions
						Yamunapower	Yamunanagar	DR		
						Venelec	Bhiwadi	DR		
7.	Cable glands	III				Main contractor approved sources		Noted		
8.	Cable lugs	III				M/s Dowell	Mumbai	A		
						M/s Billets Elektro Werke Ltd. (3 D)	Umbergaon	A		
						M/s Chetna	Nasik	A		
						Additionally Any make's model with		Noted		

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						VDE or CE or UL or CSA marking or BIS approved with CML no. Refer Note-3 .				
9.	Lighting fixtures with accessories	I	5			M/s Crompton	Mumbai	A#		#- "A"- for filament type and " DR" for LED Type
						M/s Bajaj Electricals	Mumbai	A		
						M/s Philips	Noida	A#		
						M/s Wipro	Mumbai	A		
						M/s Surya Rosini	Kashipur	A		
10.	Lamps	III				M/s Crompton	Mumbai	A#		#- "A"- for filament type and " DR" for LED Type
						M/s Bajaj Electricals	Mumbai	A		
						M/s Philips	Noida	A#		
						M/ s Wipro	Mumbai	A		
						M/s Surya Rosini	Kashipur	A		
11.	Lighting Panels	I	6			Please refer seriel no- 3 as identified in LT Switchgear & LT Busduct sub package list				
12.	Industrial /welding receptacles & boxes	III				Schneider	Nasik	A		
						M/s BCH	Faridabad	A		
						M/s Ajmera	Mumbai	A		
						M/s. Sakthi & Crown	Chennai	A		
						Additionally Any	.	Refer		

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101- QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						make's model with VDE or CE or UL or CSA marking or BIS approved with CML no		Note-3		
13.	Lighting mast with raise & lower type lantern carriage	I	7			M/s Bajaj	Pune	A		
						M/s Skipper	Howrah	A		
						M/s B.P.Projects	Hoogly	A		
14.	Lighting pole / steel tubular pole	I	8			BIS licensee as per IS 2713 with valid CMLnumber		A		
15.	Lighting poles polygonal type	I	8			M/s Bajaj	Pune	A		
						M/s B.P. Projects	Hoogly	A		
16.	PVC conduit/hume pipe/lighting wire/GI pipes/HDPE pipe/Structural Steel	III				BIS licensee / ISI marked with valid CML number		A		
17.	GI steel rigid conduit/ epoxy conduit	III				BIS licensee with valid CML number		A		
18.	Trefoil clamps/Earthing &	III						Noted		

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS
	Lighting Protection Material/Sheet Steel/ FRP cable trench cover/drum lifting jack/Earth wire/ FRP/Aluminum Ladder/Dimmer & Passive Infrared Sensors					Main Contractor Approved Sources				
19.	FAN with regulators & Exhaust Fan	III				M/s Crompton		Noted.		
						M/s Orient				
						M/s Khaitan				
						M/s Polar				
						M/s GEC				
						M/s Havells				
						M/s Bajaj				
20.	FQP of Cables & Accessories	I	G-02							
21.	FQP of Earthing	I	G-03							
22.	FQP of Station Lighting	I	G-04							

Approved

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS

NB:
Under Sub Supplier approval status as per NTPC column:
A: mean that vendor for this item is acceptable to NTPC.
Under QP / INSPN CATEGORY column:

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

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on basis of verification of documents as per approved QP
CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.
@ : Vendors acceptance is subject to sub-QR clearance.
Note-1- Approval conditions attached to above identified vendors, as applicable shall be adhered to.
Note-2 – List of NTPC acceptable galvanizers

एनटीपीसी NTPC	**PROJECT : TELENGANA STPP, STAGE-I (2X800MW)** **PACAKGE : STEAM GENERATOR ISLAND PACKAGE** **Sub Package: Electrical Equipment Supply & Erection** **CONTRACTOR : M/S BHEL** **CONT. NO. CS-9591-101-2**	**LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL**	**REF NO : 9591-101-QOE-R-01** **REVISION NO. 00** **DATE 17-05-2016**

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SCAPPL SCHEDULE	REMARKS

1. M/s M J Engg,Delhi 2. M/s Jamna Metal,Delhi 3. M/s A.V. Engg, Kolkata 4. M/s Inar Profiles, Vishakapatnam 5. M/s Anand Udyog, Mumbai 6. M/s Techno Engg,Chandigarh 7. M/S Steelite Engg, Mumbai	8. M/s National Galvanizer, Kolkata 9. M/s Unistar Galvanizer, Kolkata 10. M/s B.P. Project. Kolkata 11. M/s Bajaj Pune 12. M/s Electrocare Industries, Mumbai 13. M/s B.G. Shirke, Pune 14. M/s Gurpreet Galvanizer, Hyderabad 15. M/s Sigma, Mumbai	16. M/s Radhakrishnan Shetty, Chennai 17. Karamtara Mumbai 18.Poona Galvanizers Pune 19. Neha Galvanizer- Kolkata 20. Unitech galvanizers- Hoogly 21. Gurpreet galvanizers- Hyderabad 22- DMP Projects- Kolkata 23- Patny Systems- Medhak 24Passive Infra- Hasangarh 25 Bramhapuri – Jaipur 26 Indmark Formtek- Pune	*Additional galvanizer/s , if any , proposed by manufacturer through main contractor during detailed engineering shall be reviewed & assessed by NTPC as per the merits of the case.*

Note-3 : VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: SELF CERTIFICATION/VALID CERTIFICATION FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC's INFORMATION

Afadav.
AMIT YADAV
Dy. Mgr. / MKTG.
BHEL

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Solar CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17.05.2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	SC DETAIL SUB SCH	REMARKS
1.	SPV module	I	1			BHEL	Bangalore	A@			@- Subject to Sub-QR clearance from NTPC Engg
						Photon Energy	Hyderabad	A@			
						Waree	Surat	A@			
						Emmvee	Bangalore	A@			
						Vikram Solar	Kolkatta	A@			
						Lanco Solar	Chattisgarh	A@			
						REIL	Jaipur	A@			
						Tata power Solar	Bangalore	A@			
						Moserbaer	Greater Noida	A@			
						Shan Solar	AP	A@			
						Titan Energy Systems	Hyderabad	A@			
						Jain Irrigation System Ltd,	Jalgaon	A@			
						Green Brilliance Energy Pvt Ltd,	Vadodara	A@			
						Topsun	Gandhinagar	DR@			
2.	Power Conditioning Unit	I	2			SCHNEIDER	BANGALORE	A			Conditions apply
						ABB	BANGALORE	A			Conditions apply
						BONGFIGLIOLI	GERMANY	A			Conditions apply
						FECON	GERMANY	A			Conditions apply

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Solar CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17.05.2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	SC DETAIL SUB SCH	REMARKS
						AEG	BANGALORE	A			Conditions apply
						Hitachi-Hirel	Gandhinagar	A			Conditions apply
						Shanghai Chint Power	China	DR			
						SMA	Germany	DR			
						Refusol	Germany	DR			
						Danfoss	Germany	DR			
3.	String Monitoring Box /Array Junction Box	II	3			Trinity Touch	Palwal	A			Conditions apply
						ABB	Bangalore	A			Conditions apply
						Hensel	USA	A			Conditions apply
						AEG	Bangalore	A			Conditions apply
4	DC Cable (Interconnecting SPV Modules, SPV Module to AJB) As per TUV specification 2 Pfg 1169/08.2007	I	4			Siechem	Pondicherry	A			
						Lapp	Korea	A			

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: Solar CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17.05.2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	SC DETAIL SUB SCH	REMARKS
						Leoni	Switzerland	A			

Under Sub Supplier approval status as per NTPC column:

A: mean that manufacturer proposed main contractor for this items is acceptable to NTPC.

CA: mean that manufacturer proposed by main contractor is acceptable to NTPC with certain conditions

DR-mean that manufacturer proposed by main contractor for the items will be assessed by NTPC. Main contractor is obliged to procure the item from "DR" category manufacturer only after written approval from NTPC

NOTED- For these items vendoors are approved by Main Supplier & accepted by NTPC without specific vendor approval from NTPC.

Under QP / INSPN CATEGORY column:

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

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

CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.

General Notes:

1) Vendor list & category of the mandatory spares shall be as mentioned above.

2) For item not appearing in the above list, main contractor to approach NTPC for acceptable vendors & inspection categorization of the same.

3) NTPC Approval conditions to above identified vendors shall be adhered to. Vendor's approval conditions will be informed on specific request of Main Contractor.

Agadaw 14/6/16
AMIT YADAV
Dy. Mgr. / MEPG.
BHEL

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT power cables, Control Cables CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
1	1.1 KV Power cable (PVC & XLPE)	I	Q-01			Universal Cable Ltd.	Satna	A		
						NICCO	Shamnagar , Kolkata	A		
						Torrent Cable Ltd	Nadiad	A		
						Incab	Pune	A		
						Hindustan Vidyut Products Ltd	Faridabad	A		
						KEI Industries	Bhiwadi	A		
						Delton Cable Ltd	Faridabad	A		A)Unarmoured cable all sizes. B) Armoured cable up to 3.5 x 240 sq. Mm with GI strip armour and 1CX70 sq mm with al strip armour
						Paramount Cable	Khushkhera	A		
						Polycab Wires Pvt. Ltd	Daman	A		
						Gemscabs Industries	Bhiwadi	A		
						Cords Cables	Bhiwadi	A		
						Havells India Ltd.	Alwar	A		
						Sri ram Cables	Bhiwadi	A		
						Ravin Cables	Pune	A		
						Thermocables	Hyderabad	A		
						Sbee Cables	Bangalore	A		
						Suyog Cables	Vadodara	A		
						Gupta Power Cables	Bhubaneswar	A		
						Finolex	Pune	A		
						Scot Innovation wires & cables	Baddi	A		
						Anhui Hualing	China	A		

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT power cables, Control Cables CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						LS Cable	Korea	A		
						Radiant Cables	Hyderabad	A		
						KEC International	Vadodara	DR		**Out of the identified "DR"vendors , BHEL shall propose maximum 5 no. of vendors for NTPC review**
						Manisfield cables	G.Noida	DR		
						Diamond Power	Vadodara	DR		
						Crystal Cable	Kolkata	DR		
						Apar Industries	Vadodara	DR		
						Krishna Electricals	Gwalior	DR		
						Special Cables	New Delhi	DR		
						Govind Cables	Kolkata	DR		
						Tirupati Plastomatics	Jaipur	A		
						Sam Cables & Conductors	Rudrapur	DR		
						CMI Cables	Faridabad	DR		
						N.C. Cables	New Delhi	DR		
2	1.1 KV Control cable	I	Q-02			NICCO	Shamnagar , Kolkata	A		
						Torrent Cable Ltd	Nadiad	A		
						Incab	Pune	A		
						Polycab WiresPvt. Ltd	Daman	A		
						Hindustan Vidyut Products Ltd	Faridabad	A		
						KEI Industries	Bhiwadi	A		
						Delton Cable Ltd	Faridabad	A		
						Paramount Cable	Khushkhera	A		
						Gemscabs Industries	Bhiwadi	A		
						Cords Cables	Bhiwadi	A		

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT power cables, Control Cables CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						SPM Cables	Hyderabad	A		
						Elkay Telelink	Faridabad	A		
						Havells India Ltd.	Alwar	A		
						R.R. Kabel	Silvasa	A		
						Ravin Cables	Pune	A		
						Gupta Power cable	Bhubaneswar	A		
						Thermocables	Hyderabad	A		
						Finolex	Pune	A		
						Sbee Cables	Bangalore	A		
						Suyog Cables	Vadodara	A		
						Universal Cables	Satna	A		
						Scot Innovation wires & cables	Baddi	A		
						Anhui Hualing	China	A		
						LS Cable	Korea	A		
						Radiant Cables	Hyderabad	A		
						KEC International	Vadodara	DR		**Out of the identified "DR"vendors , BHEL shall propose maximum 5 no. of vendors for NTPC review**
						Manisfield cables	G.Noida	DR		
						Diamond Power	Vadodara	DR		
						Crystal Cable	Kolkata	DR		
						Apar Industries	Vadodara	DR		
						Krishna Electricals	Gwalior	DR		
						Special Cables	New Delhi	DR		
						Govind Cables	Kolkata	DR		
						Incom	Delhi	DR		
						Sam Cables	Rudrapur	DR		
						Advance Cables	Bangalore	DR		
						CMI	Faridabad	DR		
						Tirupati Plastomatics	Jaipur	A		
						Fortners Wire &	Secunderabad	DR		

एनटीपीसी NTPC	PROJECT : TELENGANA STPP, STAGE-I (2X800MW) PACAKGE : STEAM GENERATOR ISLAND PACKAGE Sub Package: LT power cables, Control Cables CONTRACTOR : M/S BHEL CONT. NO. CS-9591-101-2	LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR AS PROPOSED BY M/S BHEL	REF NO : 9591-101-QOE-R-01 REVISION NO. 00 DATE 17-05-2016

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9591-101-QVE-	QP SUB. SCH.	QP APPL SCHEDULE	SUB-SUPPLIERS PROPOSED BY M/S BHEL	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHEDULE	REMARKS
						cable				
						N.C. Cables	New Delhi	DR		
4	FQP of Cables & Accessories	I	G-01							SFQP no. -000-999-QOE-I-004 will be applicable

Note 1 : Approval conditions attached to sub- vendors shall be adhered to.

Note 2 : Abbreviations

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."

1. 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.

Agadow 14/6/16
AMIT YADAV
Dy. Mgr. / MKTG.
BHEL

एनटीपीसी NTPC	PROJECT: TELANGANA (2X800 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL PACKAGE	REF. NO.: 9591-101-02-RPT
	PACKAGE: STEAM GENERATOR ISLAND		REV. NO.: 00
	CONTRACTOR: BHEL	SUB-SYSTEM: BHEL RANIPET, ISG	
	CONTRACT NO.: CS-9591-101-02		DATE: 06.05.2015

SL. NO.	ITEM	QP/ INSP. CAT.	QP. NO.	QP. SUBMISSION SCHEDULE	QP APPL. SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL/ STATUS/ CAT	SS DETAIL SUB SCHEDULE	SC APPL. SCHEDULE	REMARKS
11	LT MOTORS (REFER NOTE 1)	I				KEC	BANGALORE/HUBLI	A			HUBLI UPTO 90 KW, RQP
		I				SIEMENS	MUMBAI	A			RQP
		I				CGL	AHMEDNAGAR	A			RQP
		I				MARATHON	KOLKATA	A			RQP
		I				BBL	MUMBAI	A			RQP
		I				ABB	FARIDABAD/ BANGALORE	A			FARIDABAD UPTO 55 KW, BANGALORE ABOVE 55 KW, RQP
		I				JYOTI	VADODARA	A			
		I				LHP	SOLAPUR	A			
						NGEF	HUBLI	A			UPTO 15 KW
11	XLPE/ PVC INSULATED LT POWER CABLES					REFER SEPARATE LIST					
12	PVC INSULATED LT CONTROL CABLES					REFER SEPARATE LIST					
13	SCREENED (INSTRUMENT) CABLES	I				POLYCAB	DAMAN	A			
		I				ELKAY TELELINKS	FARIDABAD	A			
		I				ADVANCE CABLES	BANGALOR E	DR			
		I				PARAMOUNT	KHUSKHERA	A			
		I				UNIVERSAL	SATNA	A			
		I				NICCO	KOLKATA	A			
		I				DELTON	FARIDABAD	A			
		I				INCAB	PUNE	A			

ENGINEERING DIV/ QA&I

SL. NO.	ITEM	QP/ INSP. CAT.	QP. NO.	QP. SUBMISSION SCHEDULE	QP APPL. SCHEDULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL/ STATUS/ CAT	SS DETAIL SUB SCHEDULE	SC APPL. SCHEDULE	REMARKS
		I				THERMO CABLES	HYDERABAD	A			
		I				KEI	BHIWADI	A			
		I				CORDS	BHIWADI	A			
		I				GUPTA POWER INFRASTRUCTURE LTD.	KHURDA	A			
		@				CMI	BHIWADI	DR			
		@				SPECIAL CABLES	RUDRAPUR	DR			
		@				KEC	MYSORE	DR			
14	RTD AND THERMOCOUPLE ALONG WITH THERMOWELL	II				THERMAL INSTRUMENT INDIA PVT. LTD	MUMBAI/ SAVANTWADI	A			
		II				TEMPSENS INSTRUMENT (I) PVT. LTD.	UDAIPUR	A			
		II				DETRIV INST & ELEC LTD	MUMBAI	A			
		II				PYRO ELECTRIC INSTRUMENT (GOA) PVT. LTD.	GOA	A			
		II				TECHNO INSTRUMENT	AHMEDABAD	A			
		@				GOA INSTRUMENT PVT. LTD.	GOA	DR			
		@				TOSHNIWAL INDUSTRIAL PVT. LTD.	AJMER	DR			
		@				BAUMER TECHNOLOGIES INDIA PVT. LTD.	VAPI	DR			
15	AUXILIARY CONTROL PANEL/ LTMSB					REFER SEPARATE LIST					
16	ELECTRICAL ACTUATOR (WITH GEAR BOX	II				DREHMO	GERMANY	A			

DRAWING/DOCUMENTS DISTRIBUTION SCHEDULE

ANNEXURE III, SECTION-IA

DRAWING/DOCUMENTS REQUIRMENT & DISTRIBUTION SCHEDULE

After award of LOI, the drawing documents listed in MDL are minimum drawing/ documents, which shall be submitted by the bidder for BHEL and Customer approval. However, any additional drawing/ document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Every revised submission incorporating BHEL/Customer comments shall be resubmitted within 7 days by bidder.

Bidder to further note that the submitted drawings/ revised drawing, should be complete in all respects. 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's / Customer's office for across the table discussions/ finalizations/ submissions of drawings.

- (a) List and schedule of drawings/documents to be submitted after award of contract shall be as per MDL.

- Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.
  - Internet explorer version – Minimum Internet Explorer 7
  - Internet speed – 2 mbps (Minimum preferred)
  - Pop ups from our external DMS IP (124.124.36.198) should not be blocked
  - Vendor's internal proxy setting should not block DMS application's link
    - (http://124.124.36.198/wrenchwebaccess/login.aspx)
  - DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
  - For quick access bidder may refer the link http://bhelpem.com/DMSManuals/DMSManuals.html

- Bidder shall submit soft copy/hard copy/CD ROMs of all the finally approved drawings and O&M Manuals as required by Customer/Customer consultant/BHEL-site/BHEL-PEM. The exact number of hard copies/CD ROMs of these documents to be submitted shall be notified to the bidder at the time of detailed engineering and bidder shall submit the same without any commercial/delivery implications to BHEL/Customer.

- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.

- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval.

- Editable copy of all the drawings and documents shall be provided.

- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copes whichever is later.

- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.

- Vendor to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.

- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.

- Bidder to also furnish the auto cad copy/MS-Excel/MS-word (as applicable) of the following documents after award of contract. However, any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL and customer will also be submitted by the bidder without any delivery and commercial implication to BHEL and customer.

  - P&IDs.
  - Equipment lay out.
  - Equipment Cable tray layout.
  - Piping layout drawing.

MASTER DRAWING LIST OF EFFLUENT TRANSFER SYSTEM

Sl No	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE	SCHEDULE OF SUBMISSION FROM LOI	SIZE
	MECHANICAL			
1.	PE-V6-424-164-A001	P&ID FOR EFFLUENT TRANSFER SYSTEM	4	A0
2.	PE-V6-424-164-A002	LAYOUT OF EFFLUENT TRANSFER SYSTEM	4	A0
3.	PE-V6-424-164-A003	PROCESS DESIGN & SIZING CALCULATIONS, PRESSURE DROP CALCULATIONS AND WATER BALANCE DIAGRAM OR ETS	4	A4
4.	PE-V6-424-164-A004	SUB VENDOR LIST AND INSPECTION CRITERIA	6	A4
5.	PE-V6-424-164-A005	TECHNICAL DATA SHEET AND GA DRG OF PUMPS ALONG WITH MOTOR	8	A4
6.	PE-V6-424-164-A006	DATASHEET AND GA DRG OF VALVE	10	A4
7.	PE-V6-424-164-A007	YARD PIPING LAYOUT ALONG WITH DETAILS OF SUPPORTS	16	A0
8.	PE-V6-424-164-A008	O& M MANUAL	20	A4
	ELECTRICAL			
9.	PE-V6-424-164-A101	ELECTRICAL LOAD LIST	8	A4
10.	PE-V6-424-164-A102	CABLE TRAY/TRENCH & CONDUIT ROUTING DIAGRAM INCLUDING JB LOCATION OF Effluent Transfer System	12	A0

11.	PE-V6-424-164-A103	GA and Data sheet of MCC/Switch gear of Effluent Transfer System	12	A0
	CONTROL AND INSTRUMENTATION			
12.	PE-V6-424-164-A201	DATASHEET OF LOCAL INSTRUMENTS	10	A4
13.	PE-V6-424-164-A202	CABLE SCHEDULE AND INTERCONNECTION DIAGRAM	12	A4
	QAP			
14.	PE-V6-424-164-A301	QAP FOR PUMP	9	A4
15.	PE-V6-424-164-A302	QAP FOR VALVE	9	A4
16.	PE-V6-424-164-A303	QAP FOR MOTOR	9	A4
17.	PE-V6-424-164-A304	QAP FOR MCC/SWITCH GEAR	9	A4
18.	PE-V6-424-164-A305	QAP FOR CABLE		
	MANDATORY SPARE			
19.	PE-V6-424-164-A401	MANDATORY SPARES LIST FOR MECHNICAL, ELECTRICAL & CONTROL AND INSTRUMENTATION ITEMS	14	A4

*BASIC ENGINEERING DOCUMENTS

DRAWING/DOCUMENTS DISTRIBUTION SCHEDULE

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/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)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	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)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk
6	Performance and Functional Guarantee Test Report i) First Submission	2 sets	--
	ii) Approved Copies (Direct to Site)	4 sets	2
7	Project Completion Report (Directly to site)	6 sets	2
8	QA programme including Organisation for implementation and QA system manual(with revisions)	1	--
9	Vendor details in respect of proposed vendors including contractor's evaluation report.	2	--
10	Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment	1	--
	ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)	4	2
11	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment	1 set	--
	ii) Approved copies (Direct to Site)	4 sets	2
12	QA Documentation Package for items / equipment manufactured and despatched to site	2 sets	2
13	QA Documentation Package for field activities on equipment/systems at site	2 sets	2

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/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)	4	-
	▪ Other Drawings/Documents (A0&A1 sizes)	2	-
	▪ P&ID (All sizes)	4	-
	a) Final drawings/documents (Directly to site)	6	2
	b) "As Built" Drawing/Documents (Directly to site)	6	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)	4 sets	2
3	Operation & Maintenance manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2
4	Plant Hand Book i) First Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	4 sets	2

S.No	Description of Drgs/Docs	No of Prints	No of CD ROMs/DVDs/Portable Hard Disk
6	Performance and Functional Guarantee Test Report i) First Submission	2 sets	--
	ii) Approved Copies (Direct to Site)	4 sets	2
7	Project Completion Report (Directly to site)	6 sets	2
8	QA programme including Organisation for implementation and QA system manual(with revisions)	1	--
9	Vendor details in respect of proposed vendors including contractor's evaluation report.	2	--
10	Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment	1	--
	ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)	4	2
11	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment	1 set	--
	ii) Approved copies (Direct to Site)	4 sets	2
12	QA Documentation Package for items / equipment manufactured and despatched to site	2 sets	2
13	QA Documentation Package for field activities on equipment/systems at site	2 sets	2

DRAWINGS

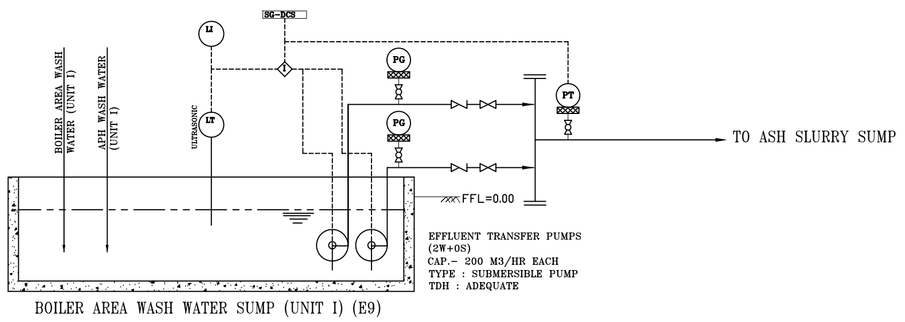
COMPUTER FILE NAME : TAL5

DRAWING No. PE-DG-424-164-A001

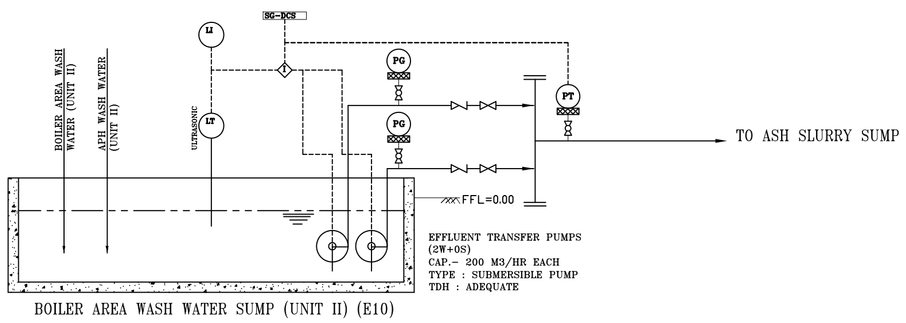
CUSTOMER'S DRAWING No.

FIRST ANGLE PROJECTION

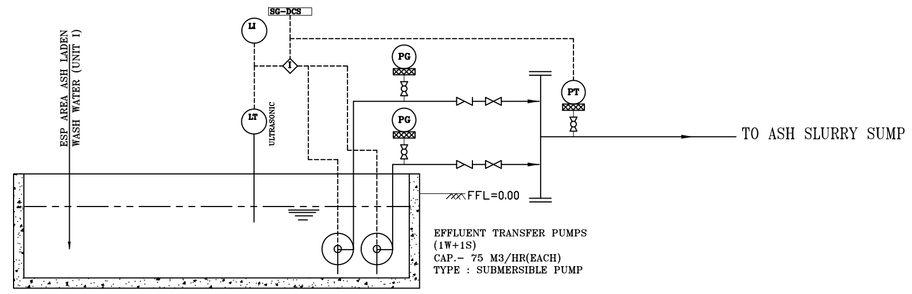
ALL DIMENSIONS ARE IN MM



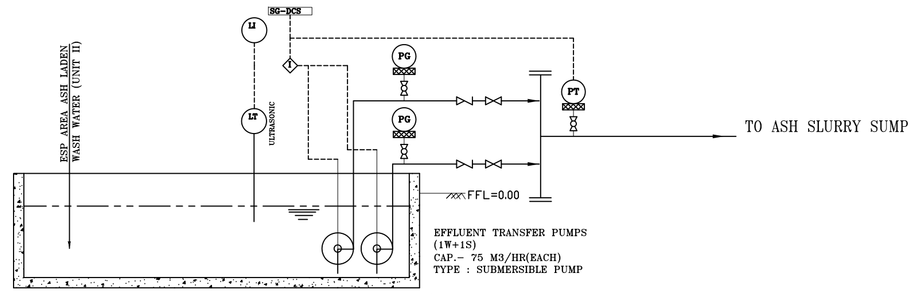
BOILER AREA WASH WATER SUMP (UNIT I) (E9)



BOILER AREA WASH WATER SUMP (UNIT II) (E10)



ESP AREA ASH LADEN WASH WATER SUMP (UNIT I) (E11)



ESP AREA ASH LADEN WASH WATER SUMP (UNIT II) (E12)

LEGEND-

- NON RETURN VALVE
- GATE VALVE
- 3 WAY GAUGE COCK
- BALL VALVE
- DIAPHRAGM SEAL

VERTICAL SUMP PUMP

INSTRUMENT LEGEND-

- FIELD INSTRUMENT
- LI LEVEL INDICATOR
- LT LEVEL TRANSMITTER
- PG PRESSURE GAUGE
- I INTERLOCK
- A ALARM
- LI ELECTRONIC TYPE LEVEL INDICATOR

NOTES:

1. MECH. DESIGN TEMPERATURE: 60 deg C
2. MATERIALS OF CONSTRUCTION(PIPEWORK):
   a) PIPING LESS THAN EQUAL TO 150NB SHALL BE CARBON STEEL,ERW CONFORMING TO IS:1239(HEAVY GRADE).
   b) PIPING MORE THAN 150NB SHALL BE CARBON STEEL, ERW CONFORMING TO IS:3589.
3. EXTERNAL SURFACE - OVERGROUND PIPING
   a) SURFACE CLEANING BY WIRE BRUSH.
   b) APPLICATION OF ONE COAT OF RED LEAD PRIMER FOLLOWED BY ADEQUATE NO. OF FINISH COATS OF SYNTHETIC ENAMEL PAINT TO ACHIEVE TOTAL DFT OF 125 TO 150 MICRONS.
4. a) BOILER & ESP AREA DRIVES SHALL BE CONTROLLED FROM SG-AHP CONTROL OF RESPECTIVE UNIT. FURTHER ALL THE INSTRUMENTS/TRANSMITTERS RELATED TO ABOVE CITED DRIVES SHALL BE CONNECTED TO SG-AHP CONTROLS OF RESPECTIVE UNIT.
   b) CONTROL OF BALANCE DRIVES SHALL BE TAKEN CARE IN RESPECTIVE PACKAGES.
5. ONE NO. JB SHALL BE PROVIDED AT EACH SUMP LOCATION FOR INSTRUMENT / CONTROL CABLE. SUPPLY & LAYING OF CABLE FROM INSTRUMENTS UPTO JB SHALL BE IN BHEL SCOPE. CABLE TERMINATION AT JB AND DCS END ALONG WITH HARDWARE SHALL ALSO BE IN BHEL SCOPE.
6. POWER CABLE SHALL BE TERMINATED BY BHEL AT MOTOR END. CABLE GLAND AND LUGS REQUIRED AT PUMP END TERMINAL SHALL BE PROVIDED BY BHEL. SUPPLY OF POWER CABLE AND LAYING UPTO MOTOR IS IN BHEL SCOPE.
7. BHEL SHALL IMPLEMENT ALL LOGICS, GRAPHIC SCREENS, ALARMS RELATED TO THESE DRIVES IN RESPECTIVE CONTROL SYSTEMS.
8. HANDLING ARRANGEMENT FOR PUMPS AND MOTOR SHALL TAKE CARE BY NTPC, IF REQUIRED.
9. MAIN CABLE TRAY AND BRANCH CABLE TRAY SHALL BE IN BHEL SCOPE
10. ALL THE PUMPS INDICATED IN SCHEME ARE INTERMITTENT IN OPERATION.
11. ESP AREA AND BOILER AREA WASH WATER PUMPS SHALL NOT OPERATE WHEN BOTTOM & ECO ASH EVACUATION IS TAKING PLACE TO PREVENT THE FLOODING OF ASH SLURRY SUMP. OPERATOR SHALL DECIDE THE MANUAL SEQUENCING OF PUMPS AS PER SYSTEM REQUIREMENT

JOB No. 424

PROPOSAL

DISTRIBUTION

	DATE	ALTD	CHD	APPD
STATUS	25.11.20	VKB	RN	RN

TO No.OFF REV 1

OWNER: एन टी पी सी NTPC — **NTPC Limited** (A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 2X800 MW TELANGANA STPP PHASE-1 (SG PACKAGE)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
A	DRN	DK		21.01.2023
	DESN	RN		21.01.2023
	CHD	JP		21.01.2023
	APPD	SB		21.01.2023

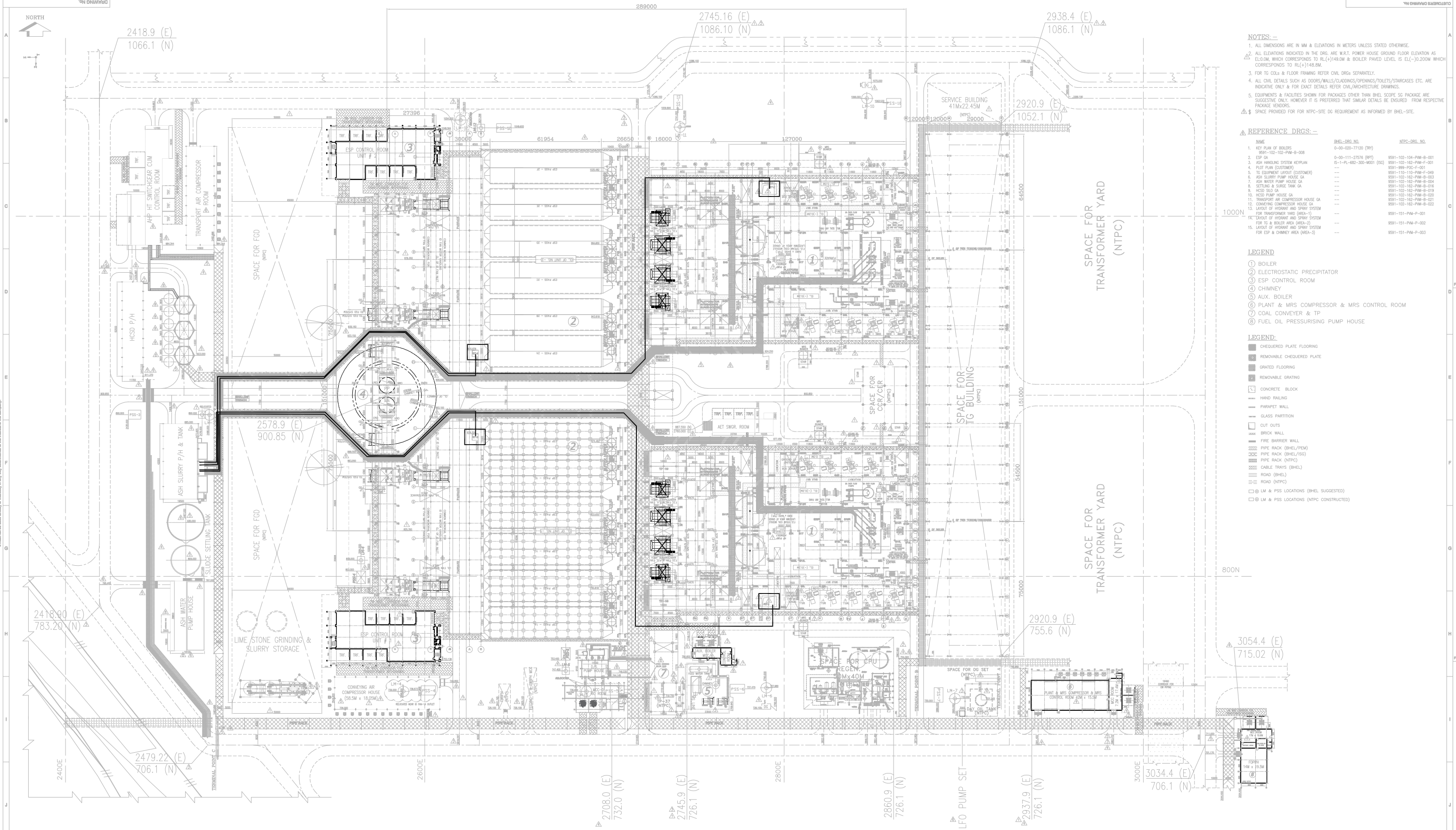
TITLE: P&I DIAGRAM FOR EFFLUENT TRANSFER SYSTEM SG (UNIT I AND II)

MPL	C	MSE	I	MAX	E	DEPT.	SCALE
						SIGN	
						DATE	

DRAWING No. PE-DG-424-164-A001

1 OF 1 REV 0

SIZE-A1



NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS INDICATED IN THE DRG. ARE W.R.T. POWER HOUSE GROUND FLOOR ELEVATION AS EL:0.0M, WHICH CORRESPONDS TO RL(+)149.0M & BOILER PAVED LEVEL IS EL(–)0.200M WHICH CORRESPONDS TO RL(+)148.8M.
3. FOR TG COLs & FLOOR FRAMING REFER CIVIL DRGs SEPARATELY.
4. ALL CIVIL DETAILS SUCH AS DOORS/WALLS/CLADDINGS/OPENINGS/TOILETS/STAIRCASES ETC. ARE INDICATIVE ONLY & FOR EXACT DETAILS REFER CIVIL/ARCHITECTURE DRAWINGS.
5. EQUIPMENTS & FACILITIES SHOWN FOR PACKAGES OTHER THAN BHEL SCOPE SG PACKAGE ARE SUGGESTIVE ONLY. HOWEVER IT IS PREFERRED THAT SIMILAR DETAILS BE ENSURED FROM RESPECTIVE PACKAGE VENDORS.
6. $ SPACE PROVIDED FOR FOR NTPC–SITE DG REQUIREMENT AS INFORMED BY BHEL–SITE.

REFERENCE DRGS:–

	NAME	BHEL–DRG NO.	NTPC–DRG. NO.
1.	KEY PLAN OF BOILERS	0–00–020–77120 (TRY)	
	9591–102–102–PVM–B–008		
2.	ESP GA	0–00–111–27576 (RPT)	9591–102–104–PVM–B–001
3.	ASH HANDLING SYSTEM KEYPLAN	IS–1–PL–682–300–M001 (ISG)	9591–102–162–PVM–F–001
4.	PLOT PLAN (CUSTOMER)	---	9591–999–POC–F–001
5.	TG EQUIPMENT LAYOUT (CUSTOMER)	---	9591–110–110–PVM–F–049
6.	ASH SLURRY PUMP HOUSE GA	---	9591–102–162–PVM–B–003
7.	ASH WATER PUMP HOUSE GA	---	9591–102–162–PVM–B–004
8.	SETTLING & SURGE TANK GA	---	9591–102–162–PVM–B–016
9.	HCSD SILO GA	---	9591–102–162–PVM–B–019
10.	HCSD PUMP HOUSE GA	---	9591–102–162–PVM–B–020
11.	TRANSPORT AIR COMPRESSOR HOUSE GA	---	9591–102–162–PVM–B–021
12.	CONVEYING COMPRESSOR HOUSE GA	---	9591–102–162–PVM–B–022
13.	LAYOUT OF HYDRANT AND SPRAY SYSTEM FOR TRANSFORMER YARD (AREA–1)	---	9591–151–PVM–P–001
14.	LAYOUT OF HYDRANT AND SPRAY SYSTEM FOR TG & BOILER AREA (AREA–2)	---	9591–151–PVM–P–002
15.	LAYOUT OF HYDRANT AND SPRAY SYSTEM FOR ESP & CHIMNEY AREA (AREA–3)	---	9591–151–PVM–P–003

LEGEND

1. BOILER
2. ELECTROSTATIC PRECIPITATOR
3. ESP CONTROL ROOM
4. CHIMNEY
5. AUX. BOILER
6. PLANT & MRS COMPRESSOR & MRS CONTROL ROOM
7. COAL CONVEYER & TP
8. FUEL OIL PRESSURISING PUMP HOUSE

LEGEND:

- CHEQUERED PLATE FLOORING
- REMOVABLE CHEQUERED PLATE
- GRATED FLOORING
- REMOVABLE GRATING
- CONCRETE BLOCK
- HAND RAILING
- PARAPET WALL
- GLASS PARTITION
- CUT OUTS
- BRICK WALL
- FIRE BARRIER WALL
- PIPE RACK (BHEL/PEM)
- PIPE RACK (BHEL/TSG)
- PIPE RACK (NTPC)
- CABLE TRAYS (BHEL)
- ROAD (BHEL)
- ROAD (NTPC)
- LM & PSS LOCATIONS (BHEL SUGGESTED)
- LM & PSS LOCATIONS (NTPC CONSTRUCTED)

Location of effluent Pits and suggestive pipes Routing from Effluent Pit to Ash Slurry Sump

REV.	DATE	ALTD	CHD	APPD
08	11.12.2020	DK	DK/KK	BKA
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. DRAWING UPDATED INLINE WITH BHEL–ISG INPUTS. 3. ACCESS ROAD TO CONVEYING AIR COMPR. HOUSE UPDATED. 4. ROAD COORDINATES UPDATED. 5. SOIL WATER TANK AND PUMPS INCORPORATED IN BOILER (F). 6. D/S PUMP HOUSE LAYOUT UPDATED. 7. ALL PIPE RACKS ROAD CROSSING NEAR TP–37 UPDATED. 8. FUEL OIL PRESSURISING PUMP HOUSE. 9. EFFLUENT COLLECTION PIT UPDATED AS PER PE–EQ–424–100–M007. 10. OTHER CHANGES AS MARKED.				
07	20.07.2019	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. DRAWING UPDATED INLINE WITH PEM–ISG DRAWING. 3. DRAWING UPDATED INLINE WITH BHEL–HSD INPUTS. 4. ACCESS ROAD TO CONVEYING AIR COMPR. HOUSE AREA. 5. CONVEYING AIR COMP. HOUSE UPDATED AS PER ISG INPUT. 6. LAD SHIFTED TOWARDS WEST BY 5M AS PER NTPC MAIL 7. ROAD COORDINATES UPDATED. 8. OTHER CHANGES AS MARKED.				
06	26.11.2018	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. DRAWING UPDATED INLINE WITH CHP/AHP INPUT FROM BHEL/ISG. 3. AET SWGR. ROOM RELOCATED AS PER BHEL/ISG REQUIREMENT. 4. ROAD COORDINATES UPDATED. 5. BHEL/ISG ASH HANDLING FACILITIES UPDATED AS PER LATEST INPUT. 6. PWD/Fr & AOC RELOCATED AS PER NTPC/Fr. INPUT. 7. OTHER CHANGES AS MARKED.				
05	30.03.2018	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. DRAWING UPDATED INLINE WITH CHP/AHP INPUT FROM BHEL/ISG. 3. AHP SWGR. ROOM RELOCATED AS PER BHEL/ISG REQUIREMENT. 4. ROAD COORDINATES UPDATED. 5. OTHER CHANGES AS MARKED.				
04	24.01.2018	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. COMPRESSOR HOUSE LAYOUT UPDATED. 3. ESP CR UNIT(F) REVISED AS PER PEM/ISG. INPUT. 4. ASH HANDLING FACILITIES UPDATED AS PER LATEST INPUT FROM BHEL/ISG. 5. INCORPORATED FOPPH AS PER BHEL/PEM INPUT. 6. INCORPORATED AOC ROOM & OFFR FOR FOPPH, AUX. BOILER & MAIN PLANT AS PER BHEL/PEM INPUT. 7. D/A OF AUX. BOILER UPDATED AS PER BHEL INPUT. 8. ROAD COORDINATES UPDATED. 9. OTHER CHANGES AS MARKED.				
03	23.05.2017	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. COMPRESSOR HOUSE AREA UPDATED. 3. ESP CR UNIT(F) REVISED AS PER PEM/ISG. INPUT. 4. ASH HANDLING FACILITIES UPDATED AS PER LATEST INPUT FROM BHEL/ISG. 5. INCORPORATED FOPPH AS PER BHEL/PEM INPUT. 6. INCORPORATED AOC ROOM & OFFR FOR FOPPH, AUX. BOILER & MAIN PLANT AS PER BHEL/PEM INPUT. 7. D/A OF AUX. BOILER UPDATED AS PER BHEL INPUT. 8. ROAD COORDINATES UPDATED. 9. OTHER CHANGES AS MARKED.				
02	28.02.2017	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. DRAWING UPDATED INLINE WITH LATEST KEY PLAN OF BOILERS FROM BHEL/PEM. 3. DRAWING UPDATED INLINE WITH CHP/AHP INPUT FROM BHEL/ISG. 4. ROAD COORDINATES UPDATED. 5. OTHER CHANGES AS MARKED.				
01	15.11.2016	DEEPAK	BKA	JJ
1. DRAWING REVISED INLINE WITH CUSTOMER COMMENTS. 2. CABLE ROUTING INCORPORATED AS PER ELECTRICAL INPUT. 3. ROAD COORDINATES UPDATED. 4. OTHER CHANGES AS MARKED.				

CUSTOMER DRAWING NO. 9591–102–102–PVM–B–111K

NATIONAL THERMAL POWER CORPORATION LTD.
2x800MW TELANGANA SUPER THERMAL POWER PROJECT
(SG–ISLAND PACKAGE)

JOB NO. 424
STATUS CONTRACT
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT		NAME	SIGN	DATE
DDBE	DRN	WS	Sd/–	25.07.2016
M	DESN	DEEPAK	Sd/–	25.07.2016
	CHD	BKA	Sd/–	25.07.2016
	APPD	JJ	Sd/–	25.07.2016

TITLE
MAIN EQUIPMENT PLAN

DEPT. SIGN | SCALE 1:400 | DRAWING NO. PE–DG–424–100–M002 | SHEET 1 OF 1 | REV. 08

SIZE–A0

COMPUTER FILE NAME: 424_100_M002_R08.DWG

ANNEXURE-IV , SECTION-IA

MANDATORY SPARES

S. N.	DESCRIPTION	UNIT
1	**MEASURING INSTRUMENTS** (for all systems including Auxiliary Boiler, FOPH, Dosing System, ECW, Air compressor system etc.)	
1.	Electronic Transmitters	
1.1	Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or 1 no. of each type and model, which ever is more
1.2	Level Transmitters (Ultrasonic/ radar type)	50% of each type and length, including sensors
2.	Local Indicators like temperature gauges, pressure gauges, differential pressure gauges, flow gauges, flow meters etc.,	5% or 1 no. of each make, model and type whichever is more (to be divided to various ranges in proportion to main of all make, model, type population)
5.	Any other instrument (If applicable)	10 % or 1 no. of each type and model whichever is more
2	**INSTRUMENTATION CABLE, INTERNAL WIRING & ELECTRICAL FIELD**	
1.	Pre fabricated cable of each type.	10% of installed quantity
2.	Pre fabricated cable connector of each type	10% or 1 no. of each type and model, whichever is more.
3.	Other cables	5% of each type, pair and size of actual installed quantity.
	LIST OF MANDATORY SPARES FOR PIPING	
1	Valves all sizes (Population= All Units)	5% of the total population of each type, size and class OR minimum 2 nos. of each type size & class whichever is more
NOTE	1. If there is one no valve only of particular type , class and size then only one no is required	
	2. Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied	

Note:

1. Refer Section IIA (Mandatory Spares) for general requirements and interpretation of various terms and conditions.
2. In case the main population of any item is only one no., then the spare quantity shall also be one no.
3. Wherever the quantity is given only in percentage, the spare quantity shall be distributed into various ranges/size/rating/type (as the case may be) in the same proportion of the main population. For the quantities coming less than 1, shall be treated as 1 only.

1. Identification: Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents 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 purpose of identification.
2. If there is one no valve only of particular type, class and size then only one no is required
4. Wherever valves are specified as mandatory spare, complete valve along with actuator and all other accessories which are the part of original supply shall also be supplied.

Annexure -V, Section-IA

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..

1.05.0 **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 manuacturer'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 - Aluminium paint to IS 2339.

PS9* - Heat resistant Aluminium paint to IS-13183 Gr.-1

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=40.0(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-06 (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

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.

1.06.10 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)		
		Within TG building	SP4*	-do-	1	35	PS18	1	35	a))Epoxy coat b)Final coat of paint PS17	2 1	25 30	150	
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	
3	All surfaces with temperature 95°C or less and which are uninsulated		SP3/SP4	PS 5	2	30	-	-	-	PS 4	2	20	100	

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 SYSTEMS

1	All Pipes, fittings / components, valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Colour shade/ coding scheme
2a	Inside condensate storage tank	Solvent free epoxy coating(minimum two coats) of total DFT 200microns											
2b	outside condensate storage tank	Epoxy paint(2 coats of primer followed by 3 coats of epoxy paint), minimum DFT 100 Micron.											
3	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
4	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.											
		Surface Preparation	**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)**	**Min. Total DFT (Microns)**	
D) Fire Detection & Protection System, Compressed air system, and Air-conditioning & 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-10 Compressed air system. For Air Conditioning System and 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-08, Air Conditioning 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, Water monitors, etc. should be as per the Part-B, Sub Section-A-09, Fire Detection & Protection System.												
E) ESP													
1	All surfaces with surface temperature 95°C or less (with or without insulation)	SP3/SP 4	PS3/ PS3*	1	25	-	-	-	PS 4	1	30	55	

2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP 4	PS5	2	30	-	-	-	-	-	-	60

DATASHEET–A

DATASHEET–A

Sl. No.					
1.0	**EFFLUENT SUMPS**				
1.1	**Description**	**Boiler Unit-1 Pit**	**Boiler Unit-2 Pit**	**ESP Unit 1 Pit**	**ESP Unit 2 Pit**
i)	Effective Pit Capacity, m^3	196	196	50.0	50.0
ii)	MOC	RCC (**Under BHEL scope of construction**)			
iii)	Type	Underground, Rectangular with Flat bottom			
iv)	Fluid Handled	Oily effluent from Boiler/ESP Area (floor wash to be considered)			
v)	Oil Skimmers	Oil skimmers to be provided for Each Sump			
2.0	**EFFLUENT TRANSFER PUMPS**				
2.1	**Description**	**Boiler Unit 1 Waste Water pumps**	**Boiler Unit-2 Waste Water pumps**	**ESP Unit-1 Waste Water pumps**	**ESP Unit-2 Waste Water pumps**
i)	Number required	Two (2W+0S)	Two (2W+0S)	Two (1W+1S)	Two (1W+1S)
ii)	Rated capacity, m^3/ hr	200	200	75	75
iii)	Type	Submersible type Slurry Pump			
iv)	Location	Outdoor			
i)	Fluid to be handled	Ash laden Effluent from Boiler/ESP area			
ii)	Duty	Intermittent			
iii)	Pump Speed, RPM	1500			
iv)	Minimum Head to be developed at rated capacity, MLC	As per System Requirements			
v)	Material of Construction	Impeller: High Chrome, Ni-Hard, Hardened SS Shaft: SS 316 Casing: 2-2.5 % Ni-CI , High Chrome, Ni-Hard Wear Plate: High Chrome, Ni-Hard Agitator: High Chrome, Ni-Hard			
vi)	Pump handling	Pumps shall be with guide pipe withdrawal arrangement. Slings & Lifting lugs shall be provided along with pump.			

For piping and valves specification bidder to refer specification of LP PIPING, VALVES & SPECIALITIES Included under section I-A mechanical of this technical specification. For Data Sheet of Electrical and Control & Instrumentation, its respective specification should be referred.

SECTION-IB

SPECIFIC TECHNICAL REQUIREMENT OF EFFLUENT TRANSFER SYSTEM (ELECTRICAL)

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

a) Services and equipment as per "Electrical Scope between BHEL and Vendor".
b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
d) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed technical specification.
e) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
f) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
g) All equipments like Motor, LT switchgear,cables, cabling, earthing etc shall meet minimum requirement of technical specification.
h) LT SWGR Extension panel of adequate rating shall be provided by vendor to feed all equipment supplied by vendor as part of contract to integrate the same with the existing 415V PMCC/MCC.
i) Adequate size of cable (power, control & instrumentation) shall be supplied in the form of cable listing to feed drives from LT extension panel. Present location of extension panel is ESP control building.

a. EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer "Electrical Scope between BHEL and Vendor".

2.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

2.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

2.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

2.3 Enclosed quality plans of various packages are tentative and subject to approval of NTPC/BHEL during detailed engineering with out any commercial implication to BHEL.

3.0 LIST OF ENCLOSURES :

a. Electrical scope between BHEL & vendor (Annexure –I)

b. Technical specification for Motors. (Annexure –II)
   - i) Motor specification
   - ii) Data sheet-A
   - iii) Data sheet-C
   - iv) Quality plan for motors below 55kw
   - v) Quality plan for motors above 55kw
   - vi) NTPC motor tests/check

c. Technical specification for LT power, control and instrumentation cable (Annexure – III)
   - i) LT power cable specification and approved data sheet
   - ii) LT control cable specification and approved data sheet
   - iii) Instrumentation cable specification and approved data sheet

d. Technical specification for cabling and earthing. (Annexure –IV)
   - i) Cable erection philosphy
   - ii) Reference drawing

e. Technical specification for LT Switchgear. (Annexure –V)
   - i) Switchgear specification
   - ii) Approved datasheet/GA drawing of LPBS
   - iii) Approved schematic drawing for unidirectional motor feeders
   - iv) Approved component chart
   - v) Approved Quality plan

f. Lay out drawing for reference. (Annexure –VI)

ELECTRICAL SCOPE BETWEEN

BHEL AND VENDOR

(ANNEXURE-I)

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGES: ETP (SPECIAL REQUIREMENT)

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2X800MW KARIMNAGAR TPP (SG ISLAND)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	Vendor	Vendor	Extension panel of adequate rating shall be provided by vendor to feed all equipment supplied by vendor as part of contract to integrate the same with the existing 415V PMCC/MCC. Rating of existing PMCC is 415V,3ph, 4W, 3200A.
2	Local Push Button Station (for motors)	Vendor	Vendor	Located near the motor.
3	Power cables, control cables and screened control cables	Vendor	Vendor	1. Sizes of cables required shall be informed by vendor at contract stage (based on lay out inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at Vendor equipment terminals by Vendor.
4	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
5	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	Vendor Vendor	Vendor Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
6	Cable glands, lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
7	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Equipment grounding (including electronic earthing) &	Vendor	Vendor	Refer note no. 4 for electronic earthing
10	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
11	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGES: ETP (SPECIAL REQUIREMENT)

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2X800MW KARIMNAGAR TPP (SG ISLAND)

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract without any commercial implications.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

TECHNICAL SPECIFICATION

FOR MOTOR

(ANNEXURE-II)

MOTORS

MOTORS

1.00.00 GENERAL REQUIREMENTS

1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.

1.02.00 All equipment's shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.

1.03.00 Contactor shall provide fully compatible electrical system, equipment's, accessories and services.

1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.

1.05.00 The auxiliary AC voltage supply arrangement shall have 11kV, 3.3 kV and 415V systems and DC voltage shall be 220 V. It shall be designed to limit voltage variations as given below under worst operating condition :

(a)	11kV, 3.3 kV	+/- 6%
(b)	415/240V	+/- 10%
(c)	220 V DC	-15% to +10%. However the nominal continuous DC power supply shall be 240V.

1.06.00 The voltage level for motors shall be as follows :-

a) Upto 0.2KW : Single phase 240V AC / 3 phase 415V AC

b) Above 0.2KW and upto 200KW : 3 phase 415V AC

c) Above 200KW and upto 1500 KW: 3.3 kV

d) Above 1500 KW : 11 kV

1.07.00 A.C. motors shall be fed from bus at above specified voltage level and fault level of 50 kA RMS (Max.) for 1 second. The 415V system shall be solidly grounded and 220 VDC system shall be isolated type.

1.08.00 Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.

1.09.00 The responsibility of coordination with electrical agencies and obtaining all necessary clearances for Contactors equipment and systems shall be under the Contactor scope.

1.10.00 Degree of Protection

Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :-

i)	Indoor motors	-	IP 54
ii)	Outdoor motors	-	IP 55
iii)	Cable box-indoor area	-	IP 54
iv)	Cable box-Outdoor area	-	IP 55

2.00.00 CODES AND STANDARDS

1)	Three phase induction motors	:	IS:325, IEC:60034
2)	Single phase AC motors	:	IS:996, IEC:60034
3)	Crane duty motors	:	IS:3177, IEC:60034
4)	DC motors/generators	:	IS:4722, IEC:60034
5)	Energy Efficient motors	:	IS 12615, IEC:60034-30

3.00.00 TYPE

3.01.00 **AC Motors:**

a) Squirrel cage induction motor suitable for direct-on-line starting.

b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be **Premium Efficiency class-IE3**, conforming to IS 12615, or IEC:60034-30.

c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.

3.02.00 DC Motors Shunt wound.

4.00.00 RATING

(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.

(b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

5.00.00	**TEMPERATURE RISE**
	Air cooled motors
	70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.
	Water cooled
	80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.
6.00.00	**OPERATIONAL REQUIREMENTS**
6.01.00	**Starting Time**
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.
6.02.00	**Torque Requirements**
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
6.03.00	**Starting voltage requirement**
	(a) Up to 85% of rated voltage for ratings below 110 KW
	(b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
	(c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW
	(d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW

(e) Up to 75 % of rated voltage for ratings above 4000KW

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

7.00.00 DESIGN AND CONSTRUCTIONAL FEATURES

7.01.00 Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.

7.02.00 All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below

(a) Fuel oil area : Group – IIB

(b) Hydrogen generation :Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)

7.03.00 Winding and Insulation

(a) Type : Non-hygroscopic, oil resistant, flame resistant

(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature.

(c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation.
The winding insulation process shall be total Vacuum Presure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15.

(d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better

7.04.00 Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.

7.05.00 Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.

7.06.00 Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations

	produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.
7.11.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.15.00	The size and number of cables (for HT motors) to be intimated to the successful Contactor during detailed engineering and the Contactor shall provide terminal box suitable for the same.
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor. (a) Below 110KW : 10.0 (b) From 110 KW & upto 200 KW : 9.0 (c) Above 200 KW & upto 1000KW : 10.0 (d) From 1001KW & upto 4000KW : 9.0

(e) Above 4000KW : 6 to 6.5

10.00.00 TYPE TEST

10.01.00 **HT MOTORS**

10.01.01 The Contactor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The Contactor shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Employer's engineer.

10.01.02 The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the Contactor. The Contactor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set–up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.

10.01.03 In case the Contactor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Employer for waival of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The Employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the Contactor.

10.01.04 Further the Contactor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the Contactor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.

10.01.05 **LIST OF TYPE TESTS TO BE CONDUCTED**

The following type tests shall be conducted on each type and rating of HT motor

(a) No load saturation and loss curves upto approximately 115% of rated voltage

(b) Measurement of noise at no load.

(c) Momentary excess torque test (subject to test bed constraint).

(d) Full load test(subject to test bed constraint)

(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp.,coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load,

specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.

10.01.06 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of HT motor

(a) Degree of protection test for the enclosure followed by IR, HV and no load run test.

(b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.

(c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15

(d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

10.02.00 **LT Motors**

10.02.01 LT Motors supplied shall be of type tested design. During detailed engineering, the Contactor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last *ten* years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

10.02.02 However if the Contactor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the Contactor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.

10.02.03 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only

1. Measurement of resistance of windings of stator and wound rotor.
2. No load test at rated voltage to determine input current power and speed
3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
4. Full load test to determine efficiency power factor and slip .
5. Temperature rise test .
6. Momentary excess torque test.
7. High voltage test .
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Overspeed test.
12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

10.03.00 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

10.04.00 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW of	**Minimum distance between centre stud and gland plate in mm**
UP to 3 KW	**As per manufacturer's practice.**
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	**Clearance**
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

SPECIFIC ELECTRICAL REQUIREMENT FOR ETP

DATA SHEET-A

SL.NO.	PARAMETERS	UNIT	
	MOTOR		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, ± 10%
3	FREQUENCY WITH VARIATION	Hz	50(+ 3% to - 5%)
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10% (absolute)
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	(Upto) 200 KW
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	50kA for 1sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION	110kW & Above (Breaker controlled)	50kA for 1sec
		Below 110kW (SFU+ Contactor controlled)	50 KA, 0.2 sec
8	LV SYSTEM GROUNDING		SOLIDLY
9	CLASS OF INSULATION & TEMPETURE RISE		THERMAL CLASS B or better (Refer clause 5.00.00 of technical spec for temperture rise)
10	MIN. STARTING VOLTAGE		85% below 110KW 80% from 110KW to 200 KW
11	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.2 kW & Below
12	RATIO OF LOCKED ROTOR KVA at rared voltage to RATED KW		10 for below 110kW & 9 for 110 kW to 200kW
13	ACCEPTABLE NOISE LEVEL	DB	85dB(A)
14	TYPE OF STARTER PROVIDED IN MCC		DOL
15	DOP OF ENCLOSURE		IP-55 & IP-54 for outdoor & indoor respectively as per IS 4691 & IEC 60034-05.
16	SPACE HEATER REQUIREMENT	>30kW	30KW & ABOVE
17	PAINT SHADE		RAL - 5012 (blue)
18	SPECIAL REQUIREMENT		TYPE TEST REPORTS MORE THAN 10 YEARS OLD FROM THE DATE OF BID OPENING ARE NOT ACCEPTABLE.
19	ENERGY EFFICIENT		Continuous duty LT motors upto160kW output rating (at 50 deg C) shall be Premium Efficiency class – IE3 conforming to IS 12615 / IEC 60034-305

	TITLE	SPECIFICATION NO.
	MOTOR	**VOLUME II B**
		SECTION D
	DATA SHEET - C	**REV NO. 00 DATE**
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	**General**	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	**Design and Performance Data**	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a Voltage	
6	b Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	**Constructional Features**	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	**Characteristic curves/ drawings** (To be enclosed for motors of rating ≥ 55KW)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	STANDARD QUALITY PLAN		SPEC. NO :	DATE:
	CUSTOMER :		QP NO.: PE-QP-999-Q-006, REV-02	DATE: 17.04.2020
	PROJECT:		PO NO.:	DATE:
	ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))	SYSTEM:	SECTION: II	SHEET 1 of 2

S. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY **			REMARKS
1	2	3	4	5	6		7	8	9	D	M	C	N	
					M	C/ N								
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	-	MFG. SPEC.	MFG. SPEC.	LOG BOOK		P	-	-	
		2.DIMENSIONS	MA	VISUAL	100%	-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	LOG BOOK		P	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	-	MFG.SPEC./	MFG.SPEC.	LOG BOOK		P	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	MFG. SPEC/ APPROVED DATASHEET	LOG BOOK	✓	P	V	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST	MA	VISUAL	100%	-	IS-325 / IS-12615/ APPROVED DATA SHEET	IS-325 / IS-12615/ APPROVED DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	-	APPROVED DRG/ DATA SHEET	APPROVED DRG/ DATA SHEET	TEST/ INSPN. REPORT	✓	P	V *	-	* NOTE -1 & NOTE-2

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI		
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

		3.NAMEPLATE DETAILS	MA	VISUAL	100%	-	IS-325 / IS-12615 / APPROVED DATA SHEET	SAME AS COL. 7	TEST/ INSPN. REPORT	✓	P	V	-	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / (#)	AS PER MFG. STANDARD / (#).	INSPC. REPORT	✓	P	W	-	(#) REFER NOTE-8

NOTES:
1. Routine tests on 100% motors shall be done by the vendor. However, BHEL/ Customer shall witness routine tests on random samples. The sampling plan shall be mutually agreed upon.
2. For exhaust/ventilation fan motors of rating up to 1.5 KW, only routine test certificates shall be furnished for scrutiny.
3. In case test certificates for these tests on similar type, size and design of motor from independent laboratory are available, the same is valid for 5 years.
4. BHEL reserves the right to perform repeat test, if required.
5. After packing and prior to issue MDCC, photographs of items to be despatched shall be sent to BHEL for review.
6. In case of any changes in QP commented by customer at contract stage, same shall be carried out by bidder without any implication to BHEL/ Customer.
7. Project specific QP to be developed based on customer requirement.
8. For export job, BHEL technical specification for seaworthy packing to be followed.
9. Packing shall be suitable for storage at site in tropical climate conditions.
10. Latest revision/ year of issue of all the standards (IS/ ASME/ IEC etc.) indicated in QP shall be referred.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **C**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR**, CR:** CRITICAL
D: DOCUMENTATION

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	HEMA KUSHWAHA	HEMA KUSHWAHA	Checked by:		KUNAL GANDHI
Reviewed by:	PRAVEEN DUTTA	PRAVEEN DUTTA	Reviewed by:	RITESH KUMAR JAISWAL	RITESH KUMAR JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

ENDORSEMENT SHEET FOR QP
REFERENCE / *STANDARD* / FIELD QUALITY PLAN (RQP ~~/ SQP/RFQP/SFQP~~)

TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		To be filled in by NTPC
PROJECT NAME		***REVIEW & ENDORSEMENT BY NTPC*** **PROJECT SPECIFIC QP NUMBER ALLOTTED**
CONTRACT NO.:	9915	**QP NO.:** 9915-371-110-PEM-QVE-Q-160
MAIN SUPPLIER	**BHARAT HEAVY ELECTRICAL LIMITED**	**REV. NO.:** 00 **DATE:** 03.12.2021
MANUFACTURER WORKS & ADDRESS		** The **RQP/~~SQP/RFQP/SFQP~~** once endorsed for a particular contract shall remain valid even though the original QP may have expired or revised, unless / otherwise mutually agreed with the supplier. ①
ITEM /EQUIPMENT / SYSTEM/ SUB-SYSTEM DETAILS i.e. MODEL TYPE / SIZE /RATING etc.	**MOTOR FOR CONDENSATE TRANSFER PUMP – 55 KW / 4 PL HORIZONTAL (2 NOS.)**	
APPROVED QP NO.: RQP/~~SQP/RFQP/SFQP~~	**000-999-QVE-P-44 REV-04 DTD 20 – 06 - 2012**	
Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)		*(TICK APPLICABLE)*
√I. That the item/ component is identical to that considered for QP approval. **OR.**		**The QP is endorsed for this project without any change** ✓
II. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same do not affect the contents of QP. **OR**		
III. That there are minor changes in the item/ component with respect to that considered for QP approval, however the same affect the QP slightly, as indicated below / in attached sheet.		**The QP is endorsed for this project with changes as indicated.**
.		***DISTRIBUTION OF ENDORSEMENT OF*** **A) RQP/SQP:** ***1. MAIN SUPPLIER (WITH A COPY OF QP)*** ***2. MANUFACTURER*** ***3. RIO*** ***4. CQA-SPL*** ***5. CQA-O/C*** **B) RFQP/SFQP:** ***1. MAIN SUPPLIER (with a copy of QP)*** ***2. MANUFACTURER*** ***3. NTPC FQA (with a copy of QP)*** ***4. NTPC Erection (with a copy of QP)*** ***5. CQA-SPL*** ***6. CQA-O/C***

Mohit Kumar
Digitally signed by Mohit Kumar
DN: cn=Mohit Kumar, o=PEM, ou=BHEL, email=mohitk@bhel.in, c=IN
Date: 2021.12.03 12:03:02 +05'30'

RITESH KUMAR JAISWAL
Digitally signed by RITESH KUMAR JAISWAL
DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=POWER SECTOR-PROJECT ENGINEERING MANAGEMENT (PS-PEM), postalCode=201301, st=UTTAR PRADESH, 2.5.4.20=16692a281523bf78b46a8e18c5cd0bb189777532609b5349ee8d7191a9e51174, pseudonym=FA07E4CDEC357D8D213433A2A76385AD8F1F58ED, serialNumber=8CFADDF00184875A8803A31B000E93FF205304F62C650E6D5F9D99B0E098C448, cn=RITESH KUMAR JAISWAL
Date: 2021.12.03 12:40:10 +05'30'

REFERENCE QUALITY PLAN

Item /equipment : LT INDUCTION MOTORS (50KW TO 200 KW)	QP No.: NTPC-RQP 1 Rev. No.:'4' Date:- PAGE : Page 1 of 5	SIGN OF MANUFACTURER MIQ	QP No.: 0000-999-QVE-P-044 Rev. No.: 4 Date :-20-6-12 Valid upto:19-06-15

To be filled in by NTPC

Reviewed by: V SHRIVASTAV, RAJIV GARG, P K BASU

Approved By: अनुमोदित Approved AK GARG.....

Sr. No.	ITEM	Characteristics	Class	Type of Check	Quantum of check M	Quantum of check C/N	Reference Documents	Acceptance Norms	Format of Record	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
A. INCOMING INSPECTION: RAW MATERIAL / COMPONENT														
1	COPPER WIRE dual coated enameled round copper wire	1.Dimension	MA	Measurement	1 Sample / lot	1 Sample/lot	MSA-091-02-R0	MSA-091-02R0	Inspn. Record		P	V	–	
		2.Elongation	MA	Mechanical	-do-	-do-	-do-	-do-	-do-		P	V	–	
		3.Mandrel Winding Test	MA	Visual	-do-	-do-	-do-	-do-	-do-		P	V	–	
		4.Peel Test	MA	Test	-do-	-do-	-do-	-do-	-do-		P	V	–	
		5.BD Voltage Test	CR	Electrical	-do-	-do-	-do-	-do-	-do-		P	V	V	
		6.Cut Through Test	MA	Electrical	-do-	-do-	-do-	-do-	-do-		P	V	–	
		7.Heat Shock Test	MA	Test	-do-	-do-	-do-	-do-	-do-		P	V	–	
		8.Resistance	MA	Electrical	-do-	-do-	-do-	-do-	-do-		P	V	–	
		9.Springiness	MA	Mechanical	-do-	-do-	-do-	-do-	-do-		P	V	–	
		10.Abrasion Test	MA	Performance	-do-	-do-	-do-	-do-	-do-		P	V	–	
		11.Continuity Test	MI	Electrical	-do-	-do-	-do-	-do-	-do-		P	V	–	
		12.Tan Delta bending Point test	MA	Thermal	Each supplier once a month	-do-	-do-	-do-	-do-		V	V	V	
2	STEEL SHAFT Straightened steel bar in black finish	1.Dimension – OD	MA	Measurement	1 Sample/lot/heat	-do-	MSA-072-01R0	MSA-072-01R0	Supp. TC	√	V	V	–	
		2.Hardness	MA	Measurement	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	–	
		3.Chemical comp.	MI	Chemical	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	–	
		4.Tensile strength	MA	Mechanical	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	V	
		5.Yield strength	MA	Mechanical	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	V	
		6.% Elongation	MA	Mechanical	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	–	
		7.Ultrasonic test	MA	Mechanical	100%	-do-	-do-	-do-	-do-	√	V	V	–	
		8.Metallographic test	MA	Chemical	1 Sample/lot/heat	-do-	-do-	-do-	-do-	√	V	V	V	
		9 Normalizing	MA	Mechanical	100%	-do-	-do-	-do-	-do-	√	V	V	V	
3	AL INGOTS EC GRADE PURITY 99.5%	Chem. Comp.	MA		1 Sample/Lot	–	IS4026:1992	IS4026:1992	Supp. TC		V	–	–	

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AS APPROPRIATE CHP: NTPC SHALL BE INDICATED IN COLUMN 'N' AS 'W'

Note:# *NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection*

REFERENCE QUALITY PLAN

NTPC

To be filled in by NTPC

Item /equipment : LT INDUCTION MOTORS (50KW TO 200 KW)	QP No.: NTPC-RQP 1 Rev. No.:'4' Date:- PAGE : Page 2 of 5	SIGN OF MANUFACTURER MiQ
sub-system :		

QP No.: 0000-999-QVE-P-044 Rev. No.: 4 Date :-20-6-12	Reviewed by: V SHRIVASTAV RAJIV GARG P K BASU	Approved By: M. GARG
Valid upto:19-06-15		

Sr. No.	ITEM	Characteristics	Class	Type of Check	Quantum of check M	Quantum of check C/N	Reference Documents	Acceptance Norms	Format of Record	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
A. INCOMING INSPECTION: RAW MATERIAL / COMPONENT														
4	CI CASTING (Body, End Shields, T.Box, Bearing Covers)	1.Surface defects	MA	Visual	100%	100%	MSA-02-01	No defect	Inspn. Rec		P	V	–	
		2.Dimn. Conformity	MA	Measurement	1 Sample / heat	–	Comp. Drg.	Comp. Drg.	-do-		P	–	–	
		3.Hardness	MA	Mechanical	1 Sample / lot	1 Sample / lot	IS 210:1993	IS 210:1993	Supp. TC		V	V	–	
		4.Tensile strength	MA	Verification	-do-	-do-	-do-	-do-	-do-		V	V	–	
		5.Chemical comp.	MA	Verification	-do-	-do-	-do-	-do-	-do-		V	V	–	
5	ALUMINUM FAN	1.Dimension	MA	Measurement	1Sample/size/lot	–	Fan Drg.	Fan Drg.	Inspn Rec.		P	–	–	
		2.Protective paint	MA	Visual	-do-	–	-do-	-do-	-do-		P	–	–	
6	VARNISH & THINNER	1.Viscosity	MA	Ford cup	1 Sample/ lot	–	MFGR's	MFGR's	Inspn. Rec.		v	–	–	
		2.Shelf life	MA	Verification	-do-	–	Catalogue	Catalogue	Label		v	–	–	
7	Bearing	ID / OD / WIDTH	MA	Measurement	1 Sample / lot	–	MFGR's Catalogue	MFGR's Catalogue	Inspn. Rec.	√	V	–	–	Surveillance verification By NTPC
8	BRAZING ALLOYS	Chemical comp.	MA	Chemical	1 Sample / lot	–	MSA-203-01R0	MSA-203-01R0	-do-		V	–	–	
9	TERMINAL BLOCK (DMC)	1.Dimension	MA	Measurement	1 Sample / lot	–	As per drg	As per drg	Supp. TC		P	–	–	
		2.Chem. Comp.	MA	Chemical	-do-	1 Sample / lot	-do-	-do-	-do-		V	–	–	
		3.Comparative Tracking Index	MA	Electrical	-do-	–	MSA-086-01	MSA-086-01			V	V	–	
10	PAINT	Viscosity at 32 Deg C	MA	Measurement	-do-		MFGR's Catalogue	MFGR's Catalogue	Inspn. Record		P	–	–	
11	SPACE HEATER	1.IR value & HV	MA	Electrical	100%	1sample/Rating/lot	MSA-023-01R0	MSA-023-02R0	Inspn Report		P	–	-	
		2.Resistance	MA	-do-	100%	-do-	-do-	-do-	-do-		P	–	-	
12	STAMPINGS	1.Thickness	MA	Measurement	1 Sample / lot	-do-	Stamping.drg.	Comp. drg.	Supp.TC		V	V	V	
		2.Waviness	MA	Visual	-do-	-do-	MSA-060-01R0	MSA-060-01R0	-do-		V	V	V	
		3.Burr height	MA	Measurement	-do-	-do-	-do-	<50 micron.	-do-		V	V	V	
		4.Coating Thickness	MA	Mechanical	-do-	-do-	-do-	MSA-060-01	-do-		V	V	V	
		5.Permeability	MA	Electrical	-do-	-do-	-do-	-do-	-do-		V	V	V	
		6.Specific core loss	MA	Electrical	-do-	-do-	-do-	-do-	-do-		V	V	V	
		7.IR	MA	Electrical	-do-	-do-	-do-	-do-	-do-		V	V	V-	

LEGENDS:* RECORDS IDENTIFIED WITH " TICK" √ SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION ** M: MANUFACTURER/ SUB-SUPPLIER C: MAIN SUPPLIER, N : NTPC, P: PERFORM, W : WITNESS, V: VERIFICATION AS APPROPRIATE CHP: NTPC SHALL BE INDICATED IN COLUMN 'N' AS 'W'

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

REFERENCE QUALITY PLAN

Item /equipment : LT INDUCTION MOTORS (50KW TO 200 KW)	QP No.: NTPC-RQP 1 Rev. No.:'4' Date:- PAGE : Page 3 of 5	SIGN OF MANUFACTURER MiQ	QP No.: 0000-999-QVE-P-044 Rev. No.: 4 Date :-20-6-12 Valid upto:19-06-15

NTPC

To be filled in by NTPC

Reviewed by: V SHRIVASTAV, RAJIV GARG, P K BASU

Approved By: AK GARG

अनुमोदित Approved

sub-system :

Sr. No.	ITEM	Characteristics	Class	Type of Check	Quantum of check		Reference Documents	Acceptance Norms	Format of Record	Agency				Remarks
					M	C/N				D*	M	C	N	
1	2	3	4	5	6		7	8	9	10				11
13	STATOR CORE PACK	1.Dimn. Conformity (core length. & Dia.)	MA	Measurement	1 Sample / lot	--	MSA-060-02R0	MSA-060-02R0	Inspn. Report		P	--	--	
		2.Alignment of slot	MA	Visual	-do-	--	-do-	-do-	-do-		P	--	--	
		3.Deburring and cleanliness	MA	Visual	-do-	--	-do-	-do-	-do-		P	--	--	
14	SLOT INSULATION (Class 'F')	1.Tensile Strength	MA	Mechanical	1 Sample/lot	--	MSA-088-09R0	MSA-088-09R0	Supp.TC		V	--	--	
		2.Elongation at break	MA	-do-	-do-	--	-do-	-do-	-do-		V	--	--	
		3.BDV as recd. & after ageing	CR	Electrical	-do-	1 Sample / lot	-do-	-do-	-do-		V	V	--	
		4.IR Value	MA	Electrical	-do-	--	-do-	-do-	-do-		V	--	--	
15	VARNISH FG SLEEVE (Class 'F')	1.Dimn. - Bore dia Thickness	MA	Measurement	1 Sample/lot	--	MSA-088-07R0	MSA-088-07R0	Supp.TC		P	--	--	
		2.BDV as recd. &after ageing	CR	Electrical	-do-		-do-	-do-	-do-		P	--	--	
		3.IRValue	MA	-do-	-do-		-do-	-do-	-do-		P	--	--	
		4. Glass content conformity	MA	Chemical	1 Sample/lot	--	MSA-088-07R0	MSA-088-07R0	Supp. TC		V	--	--	
		5. Varnish compatibility	MA	Chemical	-do-	--	-do-	-do-	-do-		V	--	--	
		6. Bending before and after aging	MA	Mechanical	-do-	--	-do-	-do-	-do-		V	--	--	
		7. Voltage proof test in air at room temp & at 150C	MA	Electrical	-do-	--	-do-	-do-	-do-		V	--	--	
		8. Stability of coating	MA	Chemical	-do-	--	-do-	-do-	-do-		V	--	--	
		9. Self extinguishing	MA	Chemical	-do-	--	-do-	-do-	-do-		V	--	--	
16	GASKET	1.Shore hardness	MA	Mechanical	1 Sample/lot	--	MSA 162-01R0	MSA 162-01R0	Inspn Record		P	--	--	
		2.Ageing test	MA	Thermal	-do-	--	-do-	-do-	Supp.TC		V	--	--	
		3.Flame test	MA	Chemical	-do-	1 Sample / lot	-do-	-do-	-do-		V	V	V	
		4.Neoprene conformity	MA	Chemical	-do-	-do-	-do-	-do-	-do-		V	V	V	
		5.Dimn.	MA	Mechanical	1 Sample /lot	--	Gasket Drg	Gasket Drg	Inspn Record		P	--	--	

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Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

REFERENCE QUALITY PLAN	NTPC	To be filled in by NTPC
Item /equipment : LT INDUCTION MOTORS (50KW TO 200 KW) sub-system :	QP No.: NTPC-RQP 1 Rev. No.:'4' Date:- PAGE : Page 4 of 5	SIGN OF MANUFACTURER MiQ
QP No.: 0000-999-QVE-P-044 Rev. No.: 4 Date :-20-6-12 *Valid upto:19-06-15*	Reviewed by: V SHRIVASTAV RAJIV GARG P K BASU	Approved By: AK GARG

Sr. No.	ITEM	Characteristics	Class	Type of Check	Quantum Of check M	Quantum Of check C/N	Reference Documents	Acceptance Norms	Format of Record	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
B	IN PROCESS INSPN. :													
1	MACHINED CASTINGS (BODY, END SHIELDS, T.BOX, BEARING Covers	1.Dimn.	CR	Measurement	100%		Comp.Drg.	Comp.Drg.	Inspn Record		P	–	–	No blow -holes on machined surface of castings & no welding on casting permitted
		2.Concentricity/ Perpendicularity of machined surface	MA	Mechanical	10%		-do-	-do-	-do-		P	–	–	
		3.Blow holes	MA	Visual	100%	–	No blow hole	No blowhole	-do-		P	–	–	
		4. Pressure testing [4] (For Flameproof Motors only)	MA	Mechanical	100%	100%	MSA-02-02R0	MSA-02-02R0	Inspn Record		P	V	V	
2	COIL FORMING	1. Conductor dia	MA	Measurement	100%	–	Winding MO.	Winding MO.	-do-		P	–	–	
		2. No. of turns	MA	Visual	100%		-do-	-do-	-do-		P			
3	WOUND STATOR	1.Resistance	MA	Electrical	100%	–	-do-	-do-	-do-		P	–	–	
		2.HV Test	MA	-do-	-do-	–	-do-	-do-	-do-		P	–	–	
		3.Interturn (Surge Test)	MA	-do-	-do-	–	-do-	-do-	-do-		P	–	–	
		4.Polarity	MA	-do-	-do-	–	-do-	-do-	-do-		P	–	–	
		5. Impregnation : VPI	MA	Mechanical	100%	1/RATING/LOT	SP05	SP05	Inspn. Record		P	V	V	
		6.Workmanship (joints, Slot Wedges, tightness & connections)	MA	Visual	100%	–	-do-	-do-	-do-		P	–	–	
4	MACHINED SHAFT	1.Dimn.Conformity	CR	Mechanical	100%	–	Shaft Drg.	Shaft Drg.	Inspn. Record		P		–	
		2.Concentricity of Shaft	MA	-do-	-do-	–	-do-	-do-	-do-		P	–	–	
		3.M/cing finish, radius, chamfer	MA	Visual	-do-	–	-do-	-do-	-do-		P	–	–	
5	DIE CAST ROTOR	1. Core length	MA	Measurement	100%	–	M.O.	M.O.	Inspn. Record		P		–	
		2.Free from blow-holes, cracks	MA	Visual	100%	–	-do-	-do-	-do-		P	–	–	
6	MACHINED ROTOR	1.Dimn. - OD	CR	Measurement	100%	1 Sample / lot	-do-	-do-	Inspn. Record		P	–	–	
		2.Concentricity w.r.t. Bearing seat	MA	Mechanical	10%	-do-	-do-	-do-	-do-		P	–	–	
7	ROTOR	Dynamic balancing of Rotors at rated speed . [4]	MA	Mechanical	100%	100 %	A18 R0 & TS A16 R1	ISO: 1940 Grade- G 2.5	Inspn. Record	√	P	V	V	
8	FAN	Fan Balancing	MA	Mechanical	100%	100%	TS-A19-R0	ISO: 1940 Grade -G2.5	Inspn.Record	√	P	V	V	
9	ASSEMBLED MOTOR	Name Plate data, T. box location,	MA	Visual	100%	1 Sample / lot	TS: A20R5	TS: A20 R5	Inspn. Record		P	V	V	
		Flame path joint Gap for Flame proof motors [4]	MA	Mechanical	100%	100%	IS2148	IS2148	Inspn. Record		P	V	V	

LEGENDS:* RECORDS IDENTIFIED WITH " TICK" SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION **
M: MANUFACTURER/ SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC, P: PERFORM, W: WITNESS, V: VERIFICATION
AS APPROPRIATE CHP: NTPC SHALL BE INDICATED IN COLUMN 'N' AS 'W'

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

REFERENCE QUALITY PLAN

Item /equipment : LT INDUCTION MOTORS (50KW TO 200 KW)	QP No.: NTPC-RQP 1 Rev. No.:'4' Date:- PAGE : Page 5 of 5	SIGN OF MANUFACTURER MiQ	To be filled in by NTPC: QP No.: 0000-999-QVE-P-044 Rev. No.: 4 Date :-20-6-12 Valid upto:19-06-15
sub-system :			Reviewed by: V SHRIVASTAV, RAJIV GARG, P K BASU; Approved By: AK GARG

Sr. No.	ITEM	Characteristics	Class	Type of Check	Quantum of check M	Quantum of check C/N	Reference Documents	Acceptance Norms	Format of Record	Agency D*	Agency M	Agency C	Agency N	Remarks
1	2	3	4	5	6		7	8	9	10				11
		VERIFICATION OF TYPE TEST CLEARANCE FROM NTPC ENGG												
C.	FINAL INSPECTION:	1. Marking on the Name Plate	MA	Visual	100%	100%	IS:325/ NTPC Specn/	IS:325/ NTPC Specn/	TC	√	P	W	W	
	ROUTINE TEST	2. a) Paint Shade	MA	Mechanical	-do-	-do-	Appd D/S,&Drg	Appd D/S,&Drg	TC	√	P	W	W	
		b) Paint Thickness (On casting surface) 4	MA	Mechanical	1 sample /Lot	1 sample /Lot	-do-	Min 100 microns	TC	√	P	W	W	
		c) Scratch Test	MA	Mechanical	-do-	-do-	-do-	No Peel-off						
		3.Location of T.Box.	MA	Visual	100%	100%	Appd D/S	Appd D/S	TC	√	P	W	W	
		4.IR test before & after HV on Main wdg. & Sp.Heater.	MA	Electrical	-do-	-do-	IS-325	IS-325	TC	√	P	W	W	
		5.HV on Main Wdg. & Space Heaters	MA	-do-	-do-	-do-	-do-	-do-	TC	√	P	W	W	
		6.Measurement of Wdg. Res.	MA	-do-	-do-	-do-	-do-	CGL-TS-35	TC	√	P	W	W	
		7.No Load Test	MA	-do-	-do-	-do-	-do-	Appd D/S,&Drg	TC	√	P	W	W	
		8.Locked Rotor Test at reduced voltage	MA	-do-	-do-	-do-	-do-	CGL-TS-35	TC	√	P	W	W	
		9.Reduced voltage running in both directions (1/^3 Un)	MA	-do-	-do-	-do-	-do-	IS325	TC	√	P	W	W	
		10.Overspeed test (120% of rated speed) for 2 min.	MA	Mechanical	-do-	-do-	-do-	-do-	TC	√	P	W	W	
		11. Vibration Test at rated speed & voltage	MA	Mechanical	-do-	-do-	IS12075	IS12075	TC	√	P	W	W	
		12.Degree of Protection By insertion of 1 mm thick wire	MA	Mechanical	-do-	-do-	-do-	IS:325/IS:4029	TC	√	P	W	W	
		13.Mounting & overall dimension	MA	Measurement	-do-	1Sample/rating/Lot	-do-	As per D/S & Drg	TC	√	P	W	W	
D.	DISPATCH INSPECT-IONS	Case Marking.	MA	Visual	100%	--	Manufacturing Order	Manufacturing Order	Manufacturing Order		P	–	–	

LEGENDS:* RECORDS IDENTIFIED WITH * TICK* √ SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION ** M: MANUFACTURER/ SUB-SUPPLIER, C: MAIN SUPPLIER, N : NTPC, P: PERFORM, W : WITNESS, V: VERIFICATION. AS APPROPRIATE CHP: NTPC SHALL BE INDICATED IN COLUMN 'N' AS 'W'

Note:# NTPC Inspection Engineer to check, approval date/ revision no. of reference documents at the time of Inspection

MOTOR

TESTS/CHECKS / TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y Y		Y Y		Y				Y
Shaft	Y	Y Y		Y	Y Y				Y
Magnetic Material	Y	Y	Y	Y			Y		
Rotor Copper/Aluminium	Y Y		Y Y				Y		Y
Stator copper	Y Y		Y Y				Y		Y
SC Ring	Y Y		Y Y		Y		Y Y		Y
Insulating Material	Y	Y		Y	Y				
Tubes, for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y Y		Y Y		Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y Y		Y Y		Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y
Wound stator	Y	Y			Y			Y	
Wound Exciter	Y	Y			Y			Y	
Rotor complete	Y	Y			Y				
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y			Y				
Accessories, RTD, BTD,CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y						
Complete Motor	Y	Y	Y						

Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard

3. Makes of major bought out items for HT motors will be subject to NTPC approval.

Y1 = for HT Motor / Machines only.

MOTOR

TESTS/CHECKS / ITEMS/COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS-9283/IS 2148/IEC60034\IEC 60079-I	vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material	Y		Y							
Rotor Copper/Aluminium										
Stator copper	Y									
SC Ring										
Insulating Material	Y									
Tubes for Cooler		Y								
Sleeve Bearing	Y									
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete	Y				Y					
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, , Space heater, antifriction bearing, gaskets etc.										
Complete Motor						Y	Y	Y	Y1	Y

Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW.

2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard

3. Makes of major bought out items for HT motors will be subject to NTPC approval.

Y1 = for HT Motor / Machines only.

TECHNICAL SPECIFICATION

FOR CABLES

(ANNEXURE-III)

LT POWER CABLES

1.00.00 **CODES & STANDARDS**

1.01.00 All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS: codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:

IS :1554 - I	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.
IS : 3961	Recommended current ratings for cables
IS : 3975	Low carbon galvanised steel wires, formed wires and tapes for armouring of cables.
IS : 5831	PVC insulation and sheath of electrical cables.
IS:7098 (Part -I)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
IS : 8130	Conductors for insulated electrical cables and flexible cords.
IS : 10418	Specification for drums for electric cables.
IS : 10810	Methods of tests for cables.
ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.
IEC-754 (Part-I)	Tests on gases evolved during combustion of electric cables.
IEC-332	Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).

2.00.00 **TECHNICAL REQUIREMENTS**

2.01.00 The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water.

2.02.00 All cables including EPR cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses developed under steady state and transient operating conditions as specified elsewhere in this specification.

2.03.00 Aluminium conductor used in power cables shall have tensile strength of more than 100 N/ sq.mm. Conductors shall be stranded.

2.04.00 XLPE insulation shall be suitable for a continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 deg C. PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.

2.05.00 The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS : 5831.

2.06.00 For single core armoured cables, armouring shall be of aluminium wires/ formed wires. For multicore armoured cables, armouring shall be of galvanised steel as follows :

Calculated nominal dia. of cable under armour	Size and Type of armour
Upto 13 mm	1.4mm dia GS wire
Above 13 & upto 25mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire
Above 25 & upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire
Above 40 & upto 55mm	1.4 mm thick GS formed wire /2.5mm dia GS wire
Above 55 & upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire
Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire

2.06.01 The aluminium used for armouring shall be of H4 grade as per IS: 8130 with maximum resistivity of 0.028264 ohm mm^2 per meter at 20 deg C. The sizes of aluminium armouring shall be same as indicated above for galvanized steel.

2.06.02 The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface of G.S.wire/ formed wire.

2.07.00 Outer sheath shall be of PVC as per IS: 5831 & black in colour. In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties.

(a.) Oxygen index of min. 29 (as per IS 10810 Part-58).

(b.) Acid gas emission of max. 20% (as per IEC-754-I).

(c.) Smoke density rating shall not be more than 60 % (as per ASTMD-2843).

2.08.00 Cores of the cables shall be identified by colouring of insulation. Following colour scheme shall be adopted:

1 core - Red, Black, Yellow or Blue

2 core - Red & Black

3 core - Red, Yellow & Blue

4 core - Red, Yellow, Blue and Black

2.09.00 For reduced neutral conductors, the core shall be black.

2.10.00 In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath.

(a.) Cable size and voltage grade - To be embossed

(b.) Word 'FRLS' at every 5 metre - To be embossed

(c.) Sequential marking of length of the cable in metres at every one metre -To be embossed / printed

The embossing shall be progressive, automatic, in line and marking shall be legible and indelible. For EPR cables identification shall be printed on outer sheath.

2.11.00 All cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part-3.

2.12.00 Allowable tolerances on the overall diameter of the cables shall be +\-2 mm maximum, over the declared value in the technical data sheets.

2.13.00 In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.

2.14.00 Cable selection & sizing

2.14.01 Cables shall be sized based on the following considerations:

(a) Rated current of the equipment

(b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage

(c) Short circuit withstand capability

This will depend on the feeder type. For a fuse protected circuit, cable should be sized to withstand the letout energy of the fuse. For breaker controlled feeder, cable shall be capable of withstanding the system fault current level for total breaker tripping time inclusive of relay pickup time.

2.14.02	Derating Factors Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes: a) Variation in ambient temperature for cables laid in air b) Grouping of cables c) Variation in ground temperature and soil resistivity for buried cables.
2.14.03	Cable lengths shall be considered in such a way that straight through cable joints are avoided.
2.14.04	Cables shall be armoured type if laid directly buried.
2.14.05	All LT power cables of sizes more than 120 sq.mm. shall be XLPE insulated and preferable sizes are 1Cx150, 1Cx300, 1Cx630, 3Cx150 & 3Cx240 sq.mm. However for cable sizes upto 120 sq.mm. both XLPE insulated & PVC insulated LT power cables are acceptable
3.00.00	**CONSTRUCTIONAL FEATURES**
3.01.00	1.1 KV Grade Power Cables (a) 1.1 KV grade XLPE power cables shall have compacted aluminium conductor, XLPE insulated, PVC inner-sheathed (as applicable), armoured/ unarmoured, PVC outer-sheathed conforming to IS:7098. (Part-I). (b) 1.1KV grade PVC power cables shall have aluminium conductor(compacted type for sizes above 10 sq.mm), PVC Insulated, PVC inner sheathed (as applicable) armoured/ unarmoured, PVC outer-sheathed conforming to IS:1554 (Part-I). (c) 1.1 KV grade Trailing cables shall have tinned copper(class 5)conductor, insulated with heat resistant elastomeric compound based on Ethylene Propyline Rubber(EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250deg C during short circuit, inner-sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968.
4.00.00	**CABLE DRUMS** (a) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS: 10418. (b) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled. (c.) The standard drum length for power cables shall not be 1000 metres; however for cable sizes of 1C X 630mm2, 3C X 150mm2 and 3C X 240mm2 (sizes if

applicable) standard drum length shall be 750 meters. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drums with shorter lengths.

5.00.00 TESTS

1.0 All equipments to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

2.0 However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client /Employers representative and submit the reports for approval.

3.0 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

4.0 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

5.01.00 **Type Tests**

5.01.01 The reports for the following type tests shall be submitted for one size each of LT XLPE and LT PVC Power cables. Size shall be decided by the employer during detailed engineering:

S.No.	Type test	Remarks
	For Conductor	
1.	Resistance test	
2.	Tensile test	For circular non-compacted conductors only
3.	Wrapping test	For circular non-compacted only
	For Armour Wires/ Formed Wires	
4.	Measurement of Dimensions	
5.	Tensile Test	
6.	Elongation test	
7.	Torsion test	For round wires only
8.	Wrapping test	For aluminium wires / formed wires only.

9.	Resistance test	
10(a)	Mass of zinc coating test	For GS Formed wires/wires only
10(b)	Uniformity of zinc coating	For GS Formed wires /wires only
11.	Adhesion test	For GS Formed wires/wires only
	For PVC/XLPE insulation & PVC Sheath	
12.	Test for thickness	
13.	Tensile strength & elongation tests	before ageing and after ageing
14.	Ageing in air oven	
15.	Loss of mass test	For PVC insulation and sheath only
16.	Hot deformation test	For PVC insulation and sheath only
17.	Heat shock test	For PVC insulation and sheath only
18.	Shrinkage test	
19.	Thermal stability test	For PVC insulation and sheath only
20.	Hot set test	For XLPE insulation only
21.	Water absorption test	For XLPE insulation only
22.	Oxygen index test	For outer sheath only
23.	Smoke density test	For outer sheath only
24.	Acid gas generation test	For outer sheath only
	For completed cables	
25.	Insulation resistance test (Volume resistivity method)	
26.	High voltage test	
27.	Flammability test as per IEC-332 Part-3 (Category-B)	

Indicative list of tests/checks, Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of LT power cables enclosed.

LT CONTROL CABLES

1.00.00 **CODES & STANDARDS**

1.01.00 All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS : codes, standards, etc.) referred to herein, the former shall prevail. All the cables shall conform to the requirements of the following standards and codes:

IS :1554 - I	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.
IS : 3961	Recommended current ratings for cables
IS : 3975	Low carbon galvanised steel wires, formed wires and tapes for armouring of cables.
IS : 5831	PVC insulation and sheath of electrical cables.
IS : 8130	Conductors for insulated electrical cables and flexible cords.
IS : 10418	Specification for drums for electric cables.
IS : 10810	Methods of tests for cables.
ASTM-D –2843	Standard test method for density of smoke from the burning or decomposition of plastics.
IEC-754 (Part-I)	Tests on gases evolved during combustion of electric cables.
IEC-332	Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).

2.00.00 **TECHNICAL REQUIREMENTS**

2.01.00 The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water.

2.02.00 All cables including EPR cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions as specified elsewhere in this specification.

2.03.00 Conductor of control cables shall be made of stranded, plain annealed copper.

2.04.00 PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.

2.05.00 The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS: 5831.

2.06.00 For multicore armoured cables, the armouring shall be of galvanised steel as follows:

Calculated nominal dia of cable under armour	Size and Type of armour
Upto 13 mm	1.4mm dia GS wire
Above 13 upto 25 mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire
Above 25 upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire
Above 40 upto 55mm	1.4 mm thick GS formed wire/2.5mm dia GS wire
Above 55 upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire
Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire

The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface.

2.07.00 Outer sheath shall be of PVC as per IS: 5831 and grey in colour. In addition to meeting all the requirements of Indian Standards referred to, outer sheath of all the cables shall have the following FRLS properties.

(a.) Oxygen index of min. 29. (As per IS 10810 Part-58)

(b.) Acid gas emission of max. 20% (As per IEC-754-I)

(c.) Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTMD-2843.

2.08.00 Cores of the cables of upto 5 cores shall be identified by colouring of insulation. Following colour scheme shall be adopted.

1 core - Red, Black, Yellow or Blue

2 core - Red & Black

3 core - Red, Yellow & Blue

4 core - Red, Yellow, Blue and Black

5 core - Red, Yellow, Blue, Black and Grey

2.09.00 For cables having more than 5 cores, core identification shall be done by numbering the insulation of cores sequentially, starting by number 1 in the inner layer (e.g. say for 10 core cable, core numbering shall be from 1 to 10). The number shall be printed in Hindu-Arabic numerals on the outer surfaces of the cores. All the numbers shall be of the same colour, which shall contrast with the colour of insulation. The colour of insulation for all the cores shall be grey only. The numerals shall be legible and indelible. The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. When the number is a single numeral, a dash shall be placed

underneath it. If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. The spacing between consecutive numbers shall not exceed 50 mm.

2.10.00 In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath:

(a.) Cable size and voltage grade - To be embossed

(b.) Word 'FRLS' at every 5 metre - To be embossed

(c.) Sequential marking of length of the cable in metres at every one metre - To be embossed / printed.

The embossing / printing shall be progressive, automatic, in line and marking shall be legible and indelible. For EPR cables identification shall be printed on outer sheath.

2.11.00 All cables shall meet the fire resistance requirement as per Category-B of IEC-332 Part-3.

2.12.00 Allowable tolerances on the overall diameter of the cables shall be +\-2 mm maximum over the declared value in the technical data sheets.

2.13.00 In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.

2.14.00 Cable selection & sizing

Control cables shall be sized based on the following considerations:
(a) The minimum conductor cross-section shall be 1.5 sq.mm.

(b) The minimum number of spare cores in control cables shall be as follows:

No. of cores in cable	Min. No. of spare cores
2C, 3C	NIL
5C	1
7C-12C	2
14C & above	3

2.14.01 Cable lengths shall be considered in such a way that straight through cable joints are avoided.

2.14.02 Cables shall be armoured type if laid directly buried.

3.00.00 CONSTRUCTIONAL FEATURES

3.01.00 1.1 KV Grade Control Cables shall have stranded copper conductor and shall be multicore PVC insulated, PVC inner sheathed, armoured / unarmoured, FRLS PVC outer sheathed conforming to IS: 1554. (Part-I).

3.02.00 1.1 KV grade Trailing cables shall have tinned copper(class 5)conductor, insulated with heat resistant elastomeric compound based on Ethylene Propyline Rubber(EPR) suitable for withstanding 90 deg.C continuous conductor temperature and 250deg C during short circuit, inner-sheathed with heat resistant elastomeric compound, nylon cord reinforced, outer-

sheathed with heat resistant, oil resistant and flame retardant heavy duty elastomeric compound conforming to IS 9968. Minimum conductor size shall be 2.5 sqmm.

4.00.00 CABLE DRUMS

(a.) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS: 10418.

(b.) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stenciled on both the sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.

(c.) The standard drum length for control cables shall not be less than 1000 metres. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drums with shorter lengths.

5.00.00 TESTS

All equipments to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.

However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Employer either at third party lab or in presence of client /Employers representative and submit the reports for approval.

All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price

The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.

5.01.00 **TYPE TESTS**

5.01.01 The reports for the following type tests shall be submitted for one size of control cables. Size shall be decided by the employer during detailed engineering

S. No.	Type Test	Remarks
	For Conductor	
1.	Resistance test	
	For Armour Wires / Formed Wires (If applicable)	
2.	Measurement of Dimensions	
3.	Tensile Test	
4.	Elongation test	
5.	Torsion test	For round wire only
6.	Wrapping test	For aluminium wires / formed wires only.
7.	Resistance test	
8(a).	Mass of zinc Coating test	For GS wires/formed wires only
8(b).	Uniformity of zinc coating	For GS wires/formed wires only
9.	Adhesion test	For GS wires/formed wires only
	For PVC insulation & PVC Sheath	
10.	Test for thickness	
11.	Tensile strength and elongation test	before ageing and after ageing
12.	Ageing in air oven	
13.	Loss of mass test	For PVC insulation and sheath only
14.	Hot deformation test	For PVC insulation and sheath only
15.	Heat shock test	For PVC insulation and sheath only
16.	Shrinkage test	
17.	Thermal stability test	For PVC insulation and sheath only
18.	Oxygen index test	For outer sheath only

S. No.	Type Test	Remarks
19.	Smoke density test	For outer sheath only
20.	Acid gas generation test	For outer sheath only
	For completed cables	
21.	Insulation resistance test(Volume resistivity method)	
22.	High voltage test	
23.	Flammability test as per IEC-332 Part-3 (Category-B)	

5.02.00 Indicative list of tests/checks, Routine and Acceptance tests shall be as per Quality Assurance & Inspection table of Control Cables enclosed.

INSTRUMENTATION AND POWER SUPPLY CABLES

1.00.00 **INSTRUMENTATION CABLE, CONTROL & POWER SUPPLY CABLE, INTERNAL WIRING AND ELECTRICAL FIELD CONSTRUCTION MATERIAL (CABLE SUB-TRAYs ETC)**

1.01.00 **General requirements**

1.01.01 All cables including special cables, internal wiring and electrical field construction material shall conform to this specification, Employer approved detail engineering drawings & documents and the latest edition of the relevant standards & guidelines. The Bidder shall furnish all material and services required for the completeness of the work identified in his scope as per this specification.

1.01.02 The Contractor shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/devices/systems included under Contractor's scope and ensuring completeness of the control system.

1.01.03 Any other application where it is felt that instrumentation cables are required due to system/operating condition requirements, are also to be provided by Contractor.

1.01.04 Other type of cables like fiber optic/co-axial cables for system bus, cables for connection of peripherals etc. (under Contractor's scope) are also to be furnished by the Contractor.

1.01.05 Contractor shall supply all cable erection and laying hardware from the main trunk routes like branch cable trays/sub-trays, supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems covered under this specification.

1.01.06 Wherever the quantity has been defined as on as required basis, the same are to be furnished by contractor on as required basis within his quoted lump sump price without any further cost implication to the Employer.

2.00.00 **SPECIFICATION OF INSTRUMENTATION CABLE**

2.01.00 **Common Requirements**

S. No.	Property	Requirement
1	Opearting Voltage	225 V (peak value)
2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.
3.	Continuous operation suitability	At 70 deg. C for all types of cables, and at 205 Deg C for Type-C cables.

S. No.	Property	Requirement
4.	Marking :- a.*Progressive automatic on-line sequential marking of length in meters to be provided at every one meter on outer sheath.* *b.*Marking to read 'FRLS' to be provided at every 5 meters on outer sheath except for Type-C cable c.Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided on outer sheath.	
5.	Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet
6.	Variation in diameter	Not more than 1.0 mm throughout the length of cable.
7.	Ovality at any cross-section	Not more than 1.0 mm
8.	CAGE-CLAMP suitability	To be provided
9.	Color	The outer sheath shall be of blue color.
10.	Others	Repaired cables shall not be acceptable.

2.02.00 **Specific Requirements**

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
A. CONDUCTORS				
Cross section area	0.5 sq. mm			
Conductor material	ANSI type KX	ANSI type SX	Annealed bare copper	ANSI type KX
Colour code	Yellow-Red	Black-Red	As per VDE-815	Yellow-Red
Conductor Grade	As per ANSI MC 96.1		Electrolytic	As per ANSI MC 96.1
No & dia of strands	7x0.3 mm (nom)			
No. of Pairs	2	2	2/4/8/12/16/24/48	2
Max. conductor loop resistance per Km (in ohm) at 20 deg. C	As per ANSI MC 96.1		73.4	As per ANSI MC 96.1

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
Reference Standard	As per ANSI MC 96.1		VDE : 0815	As per ANSI MC 96.1
B. INSULATION				
Material	Extruded PVC type YI 3			Teflon (i.e. extruded FEP)
Thickness in mm (Min/Max)	0.25/0.35			0.4 / 0.50 (nominal)
Volume Resistivity (Min) in ohm-cm	1 x 10^{14} at 20 deg. C & 1x10^{11} at 70 deg. C.			2.8x 10^{14} at 20 deg. C & 2x10^{11} at 205 deg. C.
C. PAIRING & TWISTING				
Max. lay of pairs (mm)	50			
Single layer of binder tape on each pair provided	Each core printed with number or Numbered binder tape to provided on each pair		Yes	Each core printed with number or Numbered binder tape to be provided on each pair
Bunch (Unit Formation) for more than 4P	N.A		To be provided	N.A
Conductor /pair identification as per VDE0815	N.A.		To be provided	N.A.
D. SHIELDING				
Type of shielding	Al-Mylar tape			
Individual pair shielding	No		To be provided for F-type cable	No
Minimum thickness of Individual pair shielding	No		0.028mm (28 micron)	No
Overall cable assembly shielding	To be provided			
Minimum thickness of Overall cable	0.055 mm (55 micron)			

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
assembly shielding				
Coverage Overlapping	20%			
Drain wire provided for individual shield	N.A.		Yes (for F-type) Size- 0.5 sqmm No of strands-7 Dia of strands- 0.3mm Annealed Tin coated copper	N.A.
Drain wire provided for overall shield	Yes, Size- 0.5 sqmm, No of strands-7,Dia of strands-0.3mm,Annealed Tin coated copper			
E. FILLERS (if applicable)				
Non-hygroscopic, flame retardant	To be provided			
F. OUTER SHEATH				
Material	Extruded PVC compound YM1 with FRLS properties			Teflon (i.e. extruded FRP)
Minimum Thickness at any point	1.8 mm			0.4 mm
Nominal Thickness at any point	>1.8 mm			0.5 mm
Resistant to water, fungus, termite & rodent attack	Required			
Minimum Oxygen index as per ASTMD-2863	29 %			N.A.
Minimum Temperature index as per ASTMD-2863	250 deg.C			N.A.
Maximum Acid gas generation by weight as per IEC-60754-1	20%			N.A.
Maximum Smoke Density Rating as per	60%			N.A.

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
ASTMD-2843	(defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTMD-2843)			
Reference standard	VDE207 Part 5,VDE-816			VDE207 Part 6 ASTM D2116
G. Electrical Parameters				
Mutual Capacitance Between Conductors At 0.8 KHz (Max.)	200 nF/km		120 nF/km for F type 100 nF/km for G-type	200 nF/km
Insulation Resistance (Min.)	100 M Ohm/Km			
Cross Talk Figure (Min.) At 0.8 KHz	60 dB		60 dB	60dB
Characteristic Impedance (Max) At 1 KHz	N.A.		320 OHM FOR F-TYPE 340 OHM FOR G-TYPE	N.A.
Attenuation Figure At 1 KHz (Max)	N.A.		1.2 db/km	N.A.
H. COMPLETE CABLE				
Complete Cable assembly	Shall pass Swedish Chimney test as per SEN-SS 4241475 class F3.			N.A.
Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification			As per manufacturer's standard subject to employer's approval
I. CABLE DRUM				
Type	Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative			

Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
	applied to entire drum) or steel drum.			
Length	1000 m ± 5% for up to & including 12 pairs 500 m ± 5% for above12 pairs			

3.00.00 SPECIFICATION OF OPTICAL FIBER CABLES (OFC)

3.01.00 Optic Fiber cable shall be 4/8/12 core, Electrolytically chrome plated corrugated steel taped (ECCST), fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacture, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.

3.02.00 The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Dielectric central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum & crush resistance 4000 N minimum. The operating temperature shall be – 20 Deg. C to 70 Deg.C

3.03.00 All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.

3.04.00 Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fiber cables.

3.05.00 Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.

3.06.00 Spliced / Repaired cables are not acceptable.

3.07.00 Penetration of water resistance and impact resistance shall be as per IEC standard.

4.00.00 SPCIFICATION OF CONTROL & POWER SUPPLY CABLES

Refer Electrical sub-sections.

5.00.00 INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY

The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A.

TABLE A: CABLE TERMINATION TO BE FOLLOWED

Application		Type Of Termination		Type Of Cable
FROM (A)	**TO (B)**	**END A**	**END B**	
Valves/dampers drives (Integral Junction box)	Marshalling / Marshalling – cum Termination Cubicle / local group JB	Plug in connector	Post mount cage clamp type.	G
Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G
RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F
Thermocouple	Local junction box / CJC box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A, B, C*
Other Field mounted Instrument	Local JB / Group JB	Plug in connector	Cage clamp (Rail mount) type.	F,G
RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F
Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A, B, C*
Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ Group JB / MCC/SWGR	Marshalling / Marshalling – cum Termination Cubicle	Cage clamp (Rail mount) type.	Cage clamp (Post mounted) type.	F,G
Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp (Post mounted) type.	Plug-in connector / other system as per Mfr.'s Standard	Internal wiring

Application		Type Of Termination		Type Of Cable
FROM (A)	**TO (B)**	**END A**	**END B**	
Marshalling/ Termination System Cabinets	UCD mounted equipments	Cage clamp (Post mounted) type.	Plug in connector / Cage clamp type (rail mounted).	F,G (with plug-in connector at one end)
DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard

Notes
1 Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs, except for pre-fabricated cables which shall be as per manufacturer's standard.

2 For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided.

3 * For high temperature applications only.

6.00.00 TERMINAL BLOCKS

6.01.00 All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.

6.02.00 All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, transparent covers, support brackets, distance sleeves, warning label, marking, etc.

6.03.00 The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.

6.04.00 For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.

6.05.00 The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.