

NTPC SAIL POWER CORPORATION LIMITED

1X250 MW ROURKELA PP-II EXPANSION

TECHNICAL SPECIFICATION FOR SELF CLEANING STRAINERS (SCS).

Specification No. : PE-TS- 427-165-N004 Rev 00



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BLDG., SEC-16A, PLOT NO. 25
NOIDA – 201301 (UP)**



TITLE:
**TECHNICAL SPECIFICATION
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION:

SUB-SECTION:

REV. NO. 0 DATE 01.03.2017

SHEET 1 OF 1

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SECTION - I

SPECIFIC TECHNICAL REQUIREMENTS

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SUB-SECTION – IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



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1.0 GENERAL

The Self Cleaning Strainer (SCS) complete with all accessories shall conform to the standard technical specifications (Section-II) and Data Sheet-A enclosed herewith. In addition the requirements of this section I including customer specification attached at Annexure-IV (as applicable) shall also be complied with. However, wherever the details given in Section-II and Data Sheet-A are different, the requirements of Data Sheet-A shall prevail. Similarly in the event of contradictions between Section-I/ customer specification (Annexure-IV) / Section-II/ Data Sheet-A, the same shall prevail in the order as: customer specification (Annexure-IV), Section-I, Datasheet-A, Section-II.

Section I consists of 4 Sub-Sections viz. Sub-Sec. IA, IB and IC for Mechanical, Electrical and C&I respectively and Sub-Section ID for Datasheet-A, the requirements of all 4 sub-sections shall be complied with.

2.0 DESCRIPTION OF EQUIPMENTS :

SELF CLEANING STRAINER (SCS).

The Self Cleaning Strainer (SCS) is intended to prevent accumulation of debris in ACW Pipeline. The water through the self cleaning strainers outlet shall be supplied to the Secondary side of Plate Heat Exchangers. The water analysis is indicated with Datasheet-A.

3.0 SCOPE OF SUPPLY UNDER THE SPECIFICATION IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINER (SCS).

3.1 The details of SCS with quantities, design parameters, size and MOC's as per Data Sheet-A.

3.2 SCOPE OF SUPPLY IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINER:

3.2.1 Each set of SCS shall comprise as following:

- a) Flushing pump with drive Motor (if required) - 1 No.
- b) Supply of complete interconnecting pipe (as applicable) and debris disposal pipe work including flanges/counter flanges, bends, fittings, supports, gaskets, fasteners etc. shall be in scope of Bidder. However bidder is to consider debris disposal pipe length and no. of bends as per the list of BOQ mentioned in Data-Sheet A to this Section. In case actual piping comes out to be less than the BOQ of Data sheet A, still bidder has to supply the same as minimum requirement. Bidder shall finalize the pipework to suit the layout at contract stage in such a way that minimum site welding is required for pipework by purchaser at site.
- c) Filter body/ housing Vent and drain connections along with their isolating valves.
- d) Length of Self Cleaning Strainer, complete with bolts, nuts and gaskets shall be as per Data sheet-A. Thickness of body flange shall be as per BS 4504/ equivalent standard.



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- e) Differential pressure measuring system for Self-Cleaning Strainer. DP measuring system shall comprise of 2 Nos. DPT + 1 No. DPG for each SCS and shall be with Remote seal arrangement. Stubs for DPT and DPG shall be independent.
 - f) The Electrical & C&I items/ accessories as specified in succeeding clause/ respective sections herein.
 - g) Starter Panel (Switch Gear Panel) shall be as follows:
 - (i) 2 Sets of Self Cleaning Strainer shall have one Common Starter Panel (Switch Gear Panel) for DCS based control system.
- Switch Gear Panel should have suitable arrangement like Bus Coupler for providing redundancy to incoming supply feeder (1Working + 1 Standby feeder).
- h) Power and Control cables between Starter Panel and various drives in bidder's scope of supply. Refer note at electrical scope between BHEL and Vendor in section IB.
 - i) All the field instruments stipulated in this specification shall be in Bidder's scope.
 - j) Set of commissioning spares, on "As required basis".
 - k) Set of mandatory spares as indicated in Data Sheet A.
 - l) Supporting arrangement complete with saddle support, foundation plates, anchor bolts, nuts, sleeves, inserts, all installation materials, fixing bolts, clamps and other accessories etc. for complete equipment supplied under this package
 - m) Finish paints for touch up painting of equipment after erection at site, in sealed containers.
 - n) Set of special tools and tackles if required for maintenance and erection of the equipment supplied.
 - o) Various drawings, data test reports/ certificates instruction manuals for erection operation and maintenance etc. as specified in Data Sheet-C and cables schedule indicating BOQ for power & control cables.
 - p) Panels & Instruments: Scope and Type as specified in C&I section wherever required.

Any item not specified but required to make SCS complete package shall also be in bidder's scope.

4.0 SCOPE OF SERVICES INCLUDED IN THE BIDDER'S SCOPE :

The bidder's scope also includes following services at site, for scope under this specification for Self-Cleaning Strainer:

- a) Installation checks (Erection in BHEL's scope).
- b) Commissioning of equipment.
- c) Trial run for requisite period



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d) Performance Guarantee Testing.

The trial run & PG Test of equipment shall be generally conducted immediately after commissioning. These activities for different units shall be timed separately.

- **For drawings/documents approval**

In the event of order all drawings / documents in soft as well as hard copy shall be submitted as per Cl. No. 10.0.

Further on receipt of Customer comments, if required bidder's engineer shall visit BHEL/ Customer along with soft copy to resolve all issues and incorporate comments in the soft copy for across the table finalization and Category-I approval.

- **Site Visits for installation check / commissioning/ trial run/PG Test:**

Two site visits for four days each for installation check / commissioning/ trial run/ PG Test of each unit in their base price for combined activities of erection checks and commissioning for SCS for both sets of equipment of one unit.

In case of non-completion of above activities in site visits stipulated above, for any reasons not attributable to vendor, vendor shall complete above activities in subsequent site visits for which cost shall be borne by BHEL on pro-rata basis.

5.0 EXCLUSIONS :

The following are excluded from the bidder's scope.

5.1 Civil foundation works required for installation

5.2 Erection of Equipment at site.

6.0 DESIGN CONSTRUCTION :

In addition to the requirements of Section-IIA the following shall also be complied.

6.1 Layout Piping Arrangement Drg. is enclosed in the specifications at Annexure-III of Datasheet-A.

6.2 Thickness of body flange and counter flange of SCS shall be as per BS 4504/ equivalent standard.

6.3 The materials of construction specified in Data Sheet-A are minimum requirements and materials of construction for other components not specified shall be similarly selected by the bidder for the intended duty which shall be subject to purchaser's approval during detailed engineering in the event of order.

6.4 Housing/ body of SCS shall be designed and manufactured as per the applicable codes for pressure vessels and to take care of force and moments as enclosed in the specification. However in no case thickness of housing/ body shall be less than connecting pipe thickness as specified in Data Sheet-A of Self Cleaning Strainer.

6.5 Adequate provision for future installation of Cathodic Protection for Self-Cleaning Strainer



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(Sacrificial type) shall be kept by the bidder in the equipment.

- 6.6** Velocity in the pipe work shall be less than 1.5 m/ sec for pump suction and less than 2.0 m/ sec. in other pipe work. All valves upto 150 NB shall be ball valves. For higher sizes, gate/ globe/ B.F. valves shall be provided. All instrument valves shall be needle valves.

7.0 Performance Guarantee for SCS.

Performance Guarantee Parameters shall be as under:

- Max. Pressure drop in Self-Cleaning Strainer in clean condition (Test to be conducted along with commissioning) – not exceeding 1.0 MWC. The Bids shall be technically rejected for pressure drop quoted higher than 1.0 MWC.

Any deviation to above pressure drop will not be accepted.

In case the successful bidder fails to demonstrate above parameter, he shall carry out modifications at his own cost, to purchaser's approval.

In case bidder fails to demonstrate above parameter to purchaser's satisfaction even after modification carried by him at site, the purchaser has the right to reject the equipment outrightly and bidder is liable to resupply the equipment meeting the contractual performance parameters within time period mutually agreed upon without any cost implication to BHEL/Customer.

8.0 SPARES :

8.1 Mandatory Spares

Mandatory Spares shall be as per Data Sheet-A or annexure enclosed with data sheet A.

9.0 Quality Plan

Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself. If BHEL or BHEL customer decides to witness the tests along with third party, the cost of travel of BHEL or BHEL customer shall be borne by BHEL or BHEL customer themselves.

10.0 DELIVERY & DRAWINGS/ DOCUMENTS DISTRIBUTION SCHEDULE :

a. Delivery of Equipment shall be as per NIT.

b. The drawings to be submitted by bidder in event of award of contract:

- Technical Data Sheets, P&ID, Installation Plan.
- GA drawings, Details of Flushing Skid (if any) and C& I Document (Part-I & II) of SCS as applicable.
- Quality Plan.
- O & M Manual.

c. Drawings submission schedule after the award of contract shall be as below:



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PACKAGE	BHEL DRG NO	DRG TITLE	Drg Sch for Vendors
SELF CLEAING STRAINER	Primary Documents:		
	PE-V4-427-165-N001	P&ID - OF SCS SYSTEM	R-0 within 20 days (for all except Installation plan, for Installation Plan 30 Days) from LOI/PO & subsequent revisions within 10 days of comments received from BHEL.
	PE-V4-427-165-N002	TECHNICAL DATA SHEET-SCS	
	PE-V4-427-165-N003	INSTALLATION PLAN- SCS	
	PE-V4-427-165-N004	GENERAL ARRANGEMENT OF SCS	
	PE-V4-427-165-N006	C&I Part-I, PANEL-TDS, I/O LIST, CABLE SCH AND CONTROL PHILOSPHY FOR SCS	
	PE-V4-427-165-N008	QP- SCS	
	PE-V4-427-165-N005	GA OF FLUSHING PUMP & FOUNDATION DETAILS OF FLUSHING PUMP AND SADDLE SUPPORT (If Applicable)	R-0 within 10 days from Cat-I(or)II approval of TDS & subsequent revisions within 10 days of comments received from BHEL.
	Secondary Documents:		
	PE-V4-427-165-N007	GA & WIRING DIAGRAM OF PANEL- SCS	R-0 within 30 days from Cat-I(or)II approval of C&I Part-I document & subsequent revisions within 10 days of comments received from BHEL
PE-V4-427-165-N009	O&M MANUAL-SCS	Within 30 days from MDCC	

- 11.0** The makes of various bought out items shall be subjected to approval of Customer/ BHEL in the event of order..
- 12.0** It is mandatory for the bidders to submit along with the bid the deviations if any whether major or minor in the schedule of deviations only. ***In the absence of deviations listed in the schedule of deviations the offer shall be deemed to be in full conformity with the specification "non-withstanding" anything else stated elsewhere in bidder's offer, data sheets etc. The implied/ indirect deviations in data sheets etc. Shall not be binding on the purchaser.***
- 13.0** The following documents shall be furnished by the bidder with his offer :



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- Compliance certificate duly signed and stamped (Enclosed at Section III).
- Guarantee schedule duly signed and stamped (Enclosed at Section III).
- GA drawings of following with empty/ filled-ups.
 - SCS body/ housing (as applicable).
 - Flushing Skid (if any).
 - Other equipment considered necessary for Layout/ Civil.
- Electrical Load Data (Enclosed at Section III).
- Schedule of Deviation (Enclosed in NIT).

The bidder to note that load requirement furnished and finalized during tender stage shall only be provided by BHEL and any changes or additional requirement of Electrical load by bidder during contract stage shall be provided by BHEL with cost repercussions to the bidder.

NOTE: Apart from above, no other drawing/ document/ data sheet etc. shall be submitted along with the offer. If any drawing/ document etc. is submitted with the offer, same shall be considered as for 'Reference' purpose only and shall not be reviewed/ commented upon and any deviation, exclusion to scope, etc. taken in documents but not highlighted in the deviation schedule shall not be taken cognizance of.

14.0 Self-Cleaning Strainer packing procedure before dispatch

The purpose of this procedure is to outline the requirements and procedures for protecting the equipment's during shipment and preserving during the storage.

14.1 Preparation for Packing:

- After hydro testing, operation, all fluids e.g. water etc., shall be completely drained from all SCS's parts, and the equipment blown dry.
- All material shall be cleaned internally and externally to remove, scale, rust fillings and any other foreign material.
- The SCS shall be placed on a strong wooden base & bolted to the wooden base using the foundation holes for further transportation up to site.
-

14.2 Protection of parts:

- SCS Shell shall be packed in properly in high grade bubble plastic wrap for transportation, and long storage at site.
- Actuators shall be packed in separate wooden box of proper sizes.
- SCS items (EXCEPT SCS Shell) shall be packed in proper sizes of wooden cases. High grade woods like Rubber woods, jungle wood, hard wood, mango wood, pine wood, etc. is used for packing.
- Loose material, & Electrical & Electronics items shall be packed in corrugated box and plastic bags with proper tagging and marking of handle with care in proper sizes



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of wooden cases

- All finished (or) machined (External C.S. Surfaces shall be protected against corrosion with corrosion resisting coating, which is easily removable (Compound shall be such that it will remain on the surface at temperature normally encountered during shipping & storage).
- All machined surfaces shall be protected from mechanical damage. All external unfinished carbon steel surfaces shall be sand blasted & shall be coated with rust preventive primer.
- Flanged opening if any shall be covered with blank flanges sealed with blank gasket of natural rubber or equivalent. Butt welded opening shall be closed with temporary closing covers. Internal threads shall be protected with metal plug sealed with Teflon tape (if applicable). External thread shall be protected with PVC sleeve.
- Wooden cases shall be covered with HDPE cloth from inside wooden box and the top. All the opening in plate heat exchanger shall be closed properly by suitably covering to prevent foreign material entering in plate heat exchanger.
- All fabricated wooden cases & crates conform to the requirement as per table given below:

Gross Weight [Kgs.]	Board Thickness	Batton / Rafter Thickness
2000 to 9000	Min. 30 mm	Min. 35 mm
9000 to 18000	Min. 50 mm	Min. 35 mm

- All the equipment shall be protected for entire period of dispatch, storage and erection against corrosion, incidental damage due to vermin, sunlight, rain, high temperature, humid atmosphere, rough handling in transit and storage. All MS parts which are not painted shall be provided with coating of grease.
- Clay Desiccant or such other moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

14.3 Preservation

The equipment's shall be stored under closed/open space in packed condition until installation. The packages containing loose plates and gaskets are to be protected from extreme climatic conditions.

14.4 Photographs

14.5

Bidder to take photographs of all parts like SCS Shell, Screen, pumps (if any), piping, valves, instruments, actuators, panel (inside & outside) and sent to engineering deptt along with all inspection reports before final dispatch.



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SUB-SECTION – IB

SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
SELF CLEANING STRAINER
1 x 250MW ROURKELA POWER PROJECT**

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**TECHNICAL SPECIFICATION
FOR
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(ELECTRICAL PORTION)**



TITLE : ELECTRICAL EQUIPMENT SPECIFICATION FOR SELF CLEANING STRAINER 1 x 250MW ROURKELA POWER PROJECT	SPECIFICATION NO.
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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) Electrical load requirement for SELF CLEANING STRAINER (all AC & DC loads at different voltage levels like 415V AC, 240 V AC, 220 V DC etc).
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) 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
- g) 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.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

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

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1 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.
- 3.2 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.



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4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor (Annexure –I)
- b) Technical specification for motors.
- c) Datasheets & quality plan for motors.
- d) Electrical Load data format (Annexure –II)
- e) BHEL cable listing format (Annexure –III)
- f) Electrical mandatory spares (Annexure IV) not ordered as on date.

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)**PACKAGES: SELF CLEANING STRAINER (SCS)****SCOPE OF VENDOR: SUPPLY****PROJECT:**

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC Starter cum control panel (if applicable)	BHEL Vendor	BHEL BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL Vendor BHEL	BHEL BHEL BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on 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. Cabling/ termination by BHEL.
4	Junction box for control & instrumentation cable	Vendor	BHEL	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	BHEL	Refer scope/ C&I portion of specification for scope of fibre Optical cables if used between PLC/ micro processor & DCS.
6	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
7	Cable glands and lugs for equipment supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty copper lugs for power & control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	BHEL	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	BHEL	BHEL	
10	Equipment grounding & lightning protection	BHEL	BHEL	
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to customer/ BHEL approval at contract stage.

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)**PACKAGES: SELF CLEANING STRAINER (SCS)****SCOPE OF VENDOR: SUPPLY****PROJECT:**

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	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	BHEL	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Equipment layout drawings	Vendor	-	For preparation of cabling layout drawings by BHEL, vendor shall furnish Electrical equipment layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling,
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

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.
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.

BASIC TECHNICAL FEATURES FOR HT / LT MOTORS (FOR BHEL-PEM SCOPE PACKAGES)

					CUSTOMER	 NTPC-SAIL POWER COMPANY PVT.LTD.								
REV.	DATE	ALTD	CHD	APPD	CONSULTANT	 MECON LIMITED								
02	30.09.2016	BKR	ABA/SBH	SL										
Revised in line with customer comments dated 21.09.2016					PROJECT	1X250 MW NSPCL ROURKELA TPP-III								
REV.	DATE	ALTD	CHD	APPD										
01	13.09.2016	-SD-	-SD-	-SD-										
Revised In line with customer comments dated 03.09.2016														
427					 BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	DEPT	DRN	NAME	SIGN	DATE				
CONTRACT						E	DSGN	BKR	-SD-	24.08.2016				
							CHD	ABA/SBH	-SD-	24.08.2016				
							APPD	SL	-SD-	24.08.2016				
					TITLE					DRAWING NO.				
					BASIC TECHNICAL FEATURES FOR HT / LT MOTORS (FOR BHEL-PEM SCOPE PACKAGES)					PE-DC-427-565-E003				
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1.0 This document covers the basic technical features of high tension (HT) and low tension (LT) squirrel cage induction AC motors employed for driving auxiliaries of BHEL-PEM scope packages in **1 x 250 MW ROURKELA POWER PROJECT.**

2.0 CODES AND STANDARDS

The motors shall generally conform to IS 325/IEC-60034. LT motors up to 160 kW with continuous duty (S1) shall be premium efficiency class IE3 conforming to IS-12615: 2011.

3.0 DESIGN REQUIREMENTS

3.1 General Requirements

The design ambient temperature shall be 50 deg C.

3.2 Supply system and rated voltage of motors

KW rating	Supply system	Rated voltage of motor
All motors of rating above 160 KW for CHP and above 200KW for remaining areas.	6.6 KV	6.6 KV
All motors of rating up to 160KW for CHP and up to 200KW for remaining areas.	415 V	415 V
Below 200W	240V	240V

3.2.1 Supply voltage & variations shall be as follows:-

Voltage variation (AC Supply) (+/-) 10%
Frequency variation (+) 5% to (-) 5%
Combined V & F variation 10% (sum of absolute values)

3.2.2 Motors shall be capable of running continuously at rated output for each of the conditions specified above.

3.3 Motor Rating

Motor ratings shall be adequate to meet the requirements of the drive equipment. Motors shall be continuously rated at the design ambient temperature of 50 degree C. Motor ratings shall have at least a 10% margin over the input power requirement of the driven equipment under entire operating range including voltage & frequency variation.

3.4 Starting Requirements

3.4.1 Motor shall start smoothly and rapidly. Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.

3.4.2 Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

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Minimum Starting Voltage requirement for motors as below:

1. 85 % of rated voltage for motor ratings below 110 kW.
2. 80 % of rated voltage for motor ratings form 110 kW to 200 kW.
3. 85 % of rated voltage for motor ratings form 201 kW to 1000 kW.
4. 80 % of rated voltage for motor ratings form 1001 kW to 4000 kW.
5. 75 % of rated voltage for motor ratings above 4000 kW.

2

3.4.3 The locked rotor current of the HT motors (except MDBFP motors for which locked rotor current shall be 450% FLC including IS tolerance) shall not exceed 600% of full load current excluding IS tolerance. For LT motors locked rotor current shall not exceed 720% of full load current including IS tolerance.

3.4.4 The following frequency of starts shall apply

- i) Three equally spaced starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature.
- ii) The motor shall be capable of two starts in succession with coasting to rest between starts and the motor initially at rated operating temperature.
- iii) Two hot starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.

3.4.5 Locked rotor withstand time of motors under hot condition at highest voltage limit shall be as follows:

- a) For motors with starting time up to 20 sec.
 - At least 2.5 sec. more than starting time.
- b) For motor with starting time above 20 secs and up to 45 secs.
 - At least 5.0 sec. more than starting time.
- c) For motors with starting time above 45 secs.
 - At least 10% more than starting time.

The starting time of the motor referred above is at minimum permissible voltage. For motors and in cases where the above requirements are not complied with, speed switches of approved make & type shall be provided to bypass the locked rotor protection for a pre-selected time during starting of motors. The speed switches shall have one NO & one NC contacts having maximum interrupting capacity of 5 Amps at 240V AC and 0.25 amps at 220 V DC.

2

3.4.6 Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with non-energized shaft rotating at 125% rated speed in reverse direction.

3.5 Running Requirements

3.5.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

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3.5.2 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as required for the driven equipment.

3.6 Stress during bus Transfer

3.6.1 Motors shall withstand the voltage and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.6.2 Motor windings shall be adequately braced to satisfactorily withstand the mech. Stresses during above condition.

3.6.3 Motors shall be capable of withstanding heavy in-rush transient current caused by bus transfer without damage.

3.6.4 Motor and driven eqpt. Shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.7 Noise level

The maximum noise level for all motors shall be 85 dB (A) except MDBFP motor for which the maximum limit shall be 90dB (A).

3.8 Vibration

The maximum vibration for motors shall be in line with IS: 12075 / IEC 60034-14. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads. Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.

4.0 CONSTRUCTIONAL FEATURES

4.1 Degree of Protection

4.1.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction rain canopy (Rain canopy provided for the outdoor HT motors shall be removable type) shall be provided for outdoor motors.

4.1.2 The stator laminations shall made from suitable silicon steel/magnetic steel sheet varnished on both sides and pressed to form a rigid core.

4.1.3 The rotor shall be of rigid cage construction with die cast aluminium / copper alloy / copper bars firmly wedged in bar slots and brazed to the end rings. The rotor cage shall be designed to operate satisfactorily under respective starting and load duty cycle.

4.1.4 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

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4.2 Enclosure and Cooling

- 4.2.1 Motors shall generally have totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) enclosures or Closed Air circuit Air (CACA) cooled type. However, motors rated 3000KW or above shall be Closed air circuit water cooled (CACW).
- 4.2.2 Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- 4.2.3 Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.

4.3 Class of Insulation

HT/LT motors shall have class F insulation. The temperature rise of all motors shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits, 10deg C rise above the temperature limits specified in IS: 325 shall be permissible.

- 4.3.1 Windings shall be impregnated to make them non-hygroscopic, flame resistant and oil resistant. The lightning Impulse & inter-turn insulation surge withstand level shall be as per IEC-60034 part-15.

4.4 Bearings

- 4.4.1 Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application.
- 4.4.2 Horizontally mounted motors shall have grease lubricated ball/roller or sleeve bearings. For HT motors, the bearings shall be regreasable type and for LV motors, these bearings can be either sealed life lubricated type or regreasable type as per manufacturer's standard.
- 4.4.3 The vertical motors shall have a combined thrust and guide bearing on top and guide bearing at bottom. If the ball or roller bearings can take vertical thrust, thrust and guide bearing need not be provided.

- 4.4.4 After taking all motor driven equipment loads and thrust (if any) into account, the bearings shall be suitable for min. 40,000 working hours. Re-greasable bearings shall be provided with grease nipples and relief holes for on-line re-greasing and shall be suitable for 8000 working hours without changing of the grease.

- 4.4.5 The bearings of solidly coupled motors shall be of the same type as those of the driven equipment.

- 4.4.6 NDE side bearings shall be insulated as required to prevent shaft current and resultant bearing damage.

4.5 Terminals and Terminal Boxes

- 4.5.1 Motors of rating ≥ 90 kW shall be controlled by air circuit breaker with numerical protection. For all motors of rating up to 90kW shall be provided with MCCBs. The terminal box of motors shall be designed for the maximum fault current for a duration of at least 0.25 secs.

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4.5.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

4.5.3 For HT motors, the main terminal box shall be of phase-segregated type with clamping arrangement for the terminals.

4.5.4 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A,C,B or V, W & U respectively.

4.5.5 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted **outside** terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.

4.5.6 Motor terminals and terminal leads shall be fully insulated with no bar live parts.

4.5.7 Separate terminal boxes shall be provided for space heaters and temp. Indicators. Detachable gland plates with double compression tinned brass glands shall be provided in terminal boxes.

4.5.8 Terminal box shall be capable of being turned 360 Deg. in steps of 90 Deg. However, in the case of rectangular type, Terminal Box shall be rotatable in steps of 180 Deg.

4.5.9 Cable glands and cable lugs as per selected cable sizes shall be provided in line with cable erection philosophy. For single core cable termination, gland plates shall be of non-magnetic material.

4.6 Grounding

Two separate earthing terminals suitable for connecting G.I. strip grounding conductor shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal. The cable terminal box shall have a separate grounding pad.

4.7 General

4.7.1 Motors provided for similar drives shall be interchangeable.

4.7.2 An arrow block shall be screwed on the body of the motors on the non-driving end to indicate the direction of rotation of the motors.

4.7.3 Motors for Fuel oil unloading and drain oil pumps located in hazardous areas shall be with flame-proof enclosures in accordance with IS 2148 / IEC 60079.

a) Fuel oil area: Group - IIB.

b) Hydrogen generation plant area: Group - IIC

5.0 ACCESSORIES

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5.1 SPACE HEATERS

All motors rated 30KW and above shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

The leads from space heaters of each motor shall be brought out to a separate terminal Box. Space heaters shall be mounted inside the motor in accessible places so that their removal and replacement is simple.

5.2 RESISTANCE TEMPERATURE DETECTORS (RTDs)

5.2.1 HT motors stator windings shall be provided with 12 nos. Simplex / 6 nos duplex 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of winding temperature. The leads from RTDs of each motor shall be brought out to a separate terminal Box.

5.2.2 For HT motors, each bearing shall be provided with **2 no. simplex / Duplex** 3 wire Platinum RTDs with 100 ohms resistance at 0 deg C for remote monitoring of bearing temperature. The leads from these RTDs shall be brought out to a separate terminal Box or the terminal box same as for winding RTDs.

5.3 DIAL TYPE TEMP. INDICATORS

5.3.1 For HT motors, each bearing shall be provided with dial type thermometer with adjustable alarm contact and resistance type temperature detector. The indicators shall have 2 nos. NO contacts rated for 5A, 240 V AC and 0.5 A, 220 V DC for alarm/trip purpose.

5.4 Vibration monitoring pads

5.4.1 Vibration monitors shall be provided for all HT motors and shall be suitably connected to the DCS.

6.0 NAME PLATE

Motors shall have stainless steel name plate with all particulars as per IS: 325. In addition following information shall be indicated.

- Temperature rise in Deg. C under rated condition and method of measurement.
- Degree of protection.
- Bearing identification no. and recommended lubricant.
- Location of insulated bearings.

7.0 PAINTING

Motor including fan shall be painted with corrosion proof paints of colour shade blue (RAL 5012).

8.0 TESTING.

8.1 TYPE TESTS

8.1.1 For HT motors, type test reports for type test as listed below, conducted on equipment similar to those proposed to be supplied and carried out within last ten years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

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LIST OF TESTS FOR HT MOTOR

(a) No load saturation and loss curves up to 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.

(e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., core 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.

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

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

8.1.2 For LT motors rated above 50 kW, type test reports for type test as listed below, conducted on equipment similar to those proposed to be supplied and carried out within last ten years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

LIST OF TESTS FOR LT MOTOR

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. Over speed test.

12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148/ IEC 60079-1

8.2 ROUTINE TESTS

All motors shall be subjected to routine tests as per IS: 325/ IS: 12615 / specification.

	TITLE LV MOTORS <u>DATA SHEET-A</u> 1 x 250MW ROURKELA POWER PROJECT	SPECIFICATION NO.	
		VOLUME	II B
		SECTION	D
		REV NO.	DATE
		SHEET 1	OF 2

ANNEXURE-III

1.0	Design ambient temperature	:	50 °C
2.0	Maximum acceptable kW rating of LV motor	:	200KW *
3.0	Installation (Indoors/ Outdoors)	:	As required
4.0	Details of supply system		
	a) Rated voltage (with variation)	:	415V ± 10%
	b) Rated frequency (with variation)	:	50 Hz + 5 % to - 5%
	c) Combined voltage & freq. variation	:	10% (sum of absolute values)
	d) System fault level at rated voltage	:	50 kA for 1 sec
	e) Short time rating for terminal boxes		
	o 90 kW and above (Breaker Controlled)	:	50 KA for 0.25 sec.
	o Below 90 kW (Contactor Controlled)	:	50 KA protected by HRC fuse
	f) LV System grounding	:	Solidly
5.0	Class of insulation	:	Class 'F', with temp rise limited to class B.
6.0	Minimum voltage for starting (As percentage of rated voltage)	:	85% for motor ratings below 110kW 80% for motor ratings from 110kW to 200kW.
7.0	Power cables data	:	Shall be given during detailed engg.
8.0	Earth Conductor Size & Material	:	Shall be given during detailed engg.
9.0	Space heater supply	:	240 V, 1ϕ, 50 Hz
10.0	Rating up to which Single phase motor	:	Acceptable below 0.2 kW
11.0	Locked rotor current		
	a) Limit as percentage of FLC	:	720% incl. of tolerance as per IS: 325
12.0	Flame-proof motor		
	a) Enclosure suitable (As per IS: 2148)	:	Group – IIB for Fuel Oil area Group – IIC for H2 Gen. plant area
	b) Classification of Hazardous area (As per IS: 5572 part-I)	:	As per requirement
13.0	Makes	:	BHEL/ Customer approval
14.0	Paint shade	:	Blue (RAL 5012) – Corrosion proof
15.0	Degree Of protection for motor/ terminal box	:	As per IS 4691

* LT motors of continuous duty shall be energy efficient IE3 class conforming to IS-12615



TITLE

LV MOTORS**DATA SHEET-A**

1 x 250MW ROURKELA POWER PROJECT

SPECIFICATION NO.

VOLUME II B

SECTION D

REV NO. DATE

SHEET 1 OF 2

16.0 TESTING**16.1 Type Tests**

For HT & LT Motors, type test reports for type tests as per IS: 325/ IS: 12615 conducted on equipment similar to those proposed to be supplied and carried out within last ten years shall be submitted. However, if such reports are not available, one motor of each type shall be subjected to type tests for free of cost.

16.2 Routine Tests

All motors shall be subjected to routine tests as per IS: 325/ IS: 12615 in the presence of customer or customer representative.

17.0 NAME PLATE

Motors shall have stainless steel name plate with all particulars as per IS: 325. In addition following information shall be indicated.

- a) Temperature rise in Deg. C under rated condition and method of measurement.
- b) Degree of protection.
- c) Bearing identification no. and recommended lubricant.
- d) Location of insulated bearings.

CABLE SCHEDULE FORMAT

ANNEXURE III

[illegible]



TITLE:
**TECHNICAL SPECIFICATION
SELF CLEANING STRAINER (SCS)**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **I**

SUB-SECTION: **IC**

REV. NO. **0** DATE **01.03.2017**

SHEET **1** OF **1**

SUB-SECTION – IC

SPECIFIC TECHNICAL REQUIREMENTS (C &I)

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
C&I SCOPE MATRIX FOR SCS		

C&I SCOPE MATRIX FOR SCS - 1X250 MW ROURKELA PROJECT

S.NO.	PROJECT	1X250 MW ROURKELA
1.00	SYSTEM	SCS
2.00	COMMON / PER UNIT	REFER NOTE -03
3.00	CONTROL SYSTEM	DCS (STN C&I)
3.10	PROCESSOR CONFIGURATION FOR PLC SYSTEM	NA
4.00	LOCATION OF CONTROL SYSTEM	CCR
4.10	CONTROL SYSTEM SCOPE (BIDDER/ BHEL/ CUSTOMER)	BHEL
5.00	HARDWIRED INTERFACE WITH DCS (Y/N)	NA
6.00	SOFTLINK TO DCS (Y/N)	NA
7.00	CONTROL FROM PB's ON LCP	Y
8.00	ACTUATOR WITH INTEGRAL STARTER (Y/N)	Y
9.00	ANNUNCIATION ON LCP (Y/N) -- IF Y, MIN NO. OF HARDWIRED ALARMS / INDICATIONS	NA
9.10	MIMIC ON LCP (Y/N)	NA
10.00	CONTROL FROM DCS IN CCR (Y/N)	Y
11.00	TYPE OF SOFTLINK (TP/OFC)	NA
12.00	SIZE OF OWS/ CRT OR LCD	NA
13.00	NO. OF PRINTER	NA
14.00	POWER SUPPLY AVAILABLE FOR BALL MONITOR (24V DC / 110 V AC UPS / 230 V AC UPS)	NA
14.10	REDUNDANT FEEDERS (R) / NON-REDUNDANT (NR) FEEDERS FOR POWER SUPPLY	R
15.00	PG/ DPG/ PS/ DPS/ PT/ DPT per SCS	DPT = 2 no, DPG= 1 no. (ACROSS EACH)
16.00	NOTES:	
	1. THE ABOVE SCOPE IS APPLICABLE FOR SCS (DCS CONTROLLED SYSTEMS).	
	2. BIDDER TO TERMINATE ALL INSTRUMENTATION AND CONTROL ELEMENTS IN JUNCTION BOXES FOR FURTHER CABLING TO DCS BY BHEL/CUSTOMER. BIDDER TO PROVIDE INPUT/OUTPUT LIST, DRIVES LIST, JUNCTION BOX SCHEDULE AND TERMINATION DETAILS, RECOMMENDED CONTROL LOGICS / WRITE-UP ETC. DURING DETAILED ENGINEERING.	
	3. FOR SCS - 2 SETS OF SCS SHALL HAVE ONE COMMON STARTER PANEL (SWITCH GEAR PANEL).	
	4. COLOUR OF STARTER PANEL SHALL BE AS PER IS-5 SHADE 631 OR EQUIVALENT.THIS SHALL BE DECIDED DURING DETAIL ENGINEERING.	
	5. INSTRUMENT RACK AND JUNCTION BOXES SHALL BE IN BIDDER'S SCOPE OF SUPPLY.	

C&I SCOPE MATRIX FOR SCS - 1X250 MW ROURKELA PROJECT

S.NO.	PROJECT	1X250 MW ROURKELA
	6. BIDDER TO FURNISH ELECTRICAL LOAD DATA DURING DETAILED ENGINEERING.	
	7. BIDIRECTIONAL VALVES ARE : INTERGRAL STARTER TYPE.	
	8. VENDOR SHALL FURNISH ALL C&I RELATED ENGINEERING DOCUMENTS MENTIONED IN THE SPECIFICATION DURING DETAIL ENGINEERING.REFER S.NO.18.00	
	9. THE SPECIFICATIONS FOR INSTRUMENTS MENTIONED IN THE SPECIFICATION ARE MINIMUM REQUIREMENTS. THE DETAIL SPECIFICATIONS SHALL BE FINALIZED DURING DETAIL ENGINEERING.	
	10. THE NUMBER OF INSTRUMENTS SHALL BE AS PER TENDER/ APPROVED PIDS. HOWEVER BIDDER TO PROVIDE ANY OTHER INSTRUMENT FOR COMPLETENESS OF THE SYSTEM.	
	11. THE BIDDERS SHALL SPECIFICALLY MENTION ANY DEVIATION THEY WOULD LIKE TO TAKE ON THE C&I SPECIFICATION. IN ABSENCE OF ANY DEVIATION IT WILL BE IMPLIED THEY FOLLOW THE SPECIFICATION WITHOUT DEVIATION.	
17.00	LEGEND:	
	DCS- DISTRIBUTED CONTROL SYSTEM	
18.00	STANDARD DELIVERABLES TO BE FURNISHED BY VENDOR FOR THE PACKAGES:	
	1. INSTRUMENT DATA SHEETS	
	2. INSTRUMENT QP / CHECK LIST	
	3. INPUT / OUTPUT LIST	
	4. CONTROL PHILOSOPHY	
	5. P&ID	
	6. JB TERMINATION DETAILS/ WIRING DIAGRAMS	

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
SPECIFICATION FOR MEASURING INSTRUMENTS (PRIMARY & SECONDARY), TRANSMITTERS, SWITCHES, GAUGES ETC. AND LOCAL CONTROL PANEL		

04.00.00 **MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)**

04.00.01 Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Owner's approval.

04.00.02 Every panel-mounted instrument requiring power supply shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.

04.00.03 All transmitters, sensors, and switches, Gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price. The Bidder shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Owner during detailed engineering.

04.00.04 The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.

04.00.05 For sea water applications, all instruments applications, they shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if proven ness experience of the proposed material for such applications is established by Bidder).

04.00.06 For coastal areas, all instruments shall be provided with durable epoxy coating for housings and all exposed surfaces of the instruments.

04.01.00 **Specification for Electronic Transmitter for Pressure, Differential Pressure and DP based Flow, Level Measurements**

ELECTRONIC TRANSMITTERS		
Sl.No.	Features	Essential/Minimum Requirements
1.	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible.

2.	Accuracy	$\pm 0.1\%$ of calibrated span (minimum) (upto turn down ratio of 10:1)
3.	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol)
4.	Turn down ratio	10:1 for vacuum/very low pressure applications.
		5:1 for very high pressure application.
		30:1 for other applications.
5.	Stability	$\pm 0.1\%$ of calibrated span for six months for Ranges up to and including 70 Kg/cm ² .
		$\pm 0.25\%$ of calibrated span for six months for Ranges more than 70 Kg/cm ² (g).
6.	Zero and span drift	+/- 0.015% per deg.C at max span.
		+/- 0.11% per deg.C at min. Span.
7.	Load impedance	500 ohm (min.)
8.	Housing	Weather proof as per IP-55 with durable corrosion resistant coating.
9.	Over Pressure	150% of max. Operating pressure
10.	Connection (Electrical)	Plug and socket type
11.	Process connection	1/2 inch NPT (F)
12.	Span and Zero	Continuous, tamper proof, Remote as well as adjustability manual from instrument with zero suppression and elevation facility.
13.	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition.
		-2 valve manifold for absolute & Gauge pressure transmitters, 3-valve manifold for vacuum pressure transmitters & where DP transmitters are being used for pressure measurement and 5 valve manifold for DP/Level/Flow applicable.
		-For hazardous area, explosions proof enclosure as described in NEC article 500.
14.	Diagnostics	Self Indicating feature
15.	Power supply	24V DC $\pm 10\%$.
16.	Adjustment/calibration/maintenance	From hand held calibrator/ centralized PC based system (as applicable).
Notes		

For air/flue gas applications, DP type transmitters shall be provided for pressure measurement.
LVDT type is not acceptable.
Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.

04.39.00 Limit switches

For offsite plant application Limit switches shall be gold plated with high conductivity and non corrosive type. Contact rating shall be sufficient to meet the requirement of DCS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55.

For main plant application limit switches are to be provided as per Bidder standard and proven practice.

04.40.00 Pressure Gauge and Level Gauge

S/no.	Features	Pressure Gauge	Level Gauge
1.	Sensing element	Bourdon	Tempered toughened borosilicate gauge glass steel armoured reflex or

			transparent type.
2.	Sensing element material	SS 316	SS 304
3.	Body material	Die-cast aluminium	SS 304
4.	Dial size	150 mm	Tubular covering entire range
5.	Accuracy	$\pm 1.0\%$ of span	$\pm 2.0\%$ of span
6.	Scale	Linear, 270o arc graduated in metric units	Linear vertical
7.	Process connection	½" NPT	AS per ASME PTC and drain/vent 15NB
7.	Range selection	Cover 125% max. of scale	Cover 125% max. of scale
8.	Over range test	150% of max. design pressure	150% of max. design pressure
9.	Housing protection	IP 65	SS 304 leak proof
10.	Zero/span adjustment	To be provided	--
11.	Other accessories	Blow out discs, siphon, snubber, pulsation dampner, chemical seal, gauge isolation valve, 3 way cock	Gasket for all KEL-F shield for transparent type vent and drain valves of SS as per alloy
12.	Tag plate	SS	SS

10.00.00 CONTROL PANELS AND DESK

10.01.00 General

- 10.01.01 All control desk, panels, LVS panel etc. shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, grounding, ventilation, space heating, anti-vibration pads, internal piping and accessories as required for completeness of the system.
- 10.01.02 All panels, desk, cabinets shall be free standing type and have bottom / top entry for cables to be application wise during detailed. The bottom of desk and cabinets shall be sealed with bottom plate, compression cable glands (double for field and single for inside rooms) and fire proof sealing material to prevent ingress of dust and propagation of fire.
- 10.01.03 All wiring shall be arranged to enable the removal of instruments / devices without unduly disturbing them.
- 10.01.04 Sufficient number of power receptacles with disconnect switches shall be installed within all panels / desk.
- 10.01.05 Bidder shall provide the control desk (CD), LVS panel, PC racks independent and dedicated for each of the units and other subsystems of DCS to be mounted in the respective Control Room.
- 10.01.06 All control Desk (CD), LVS panel, PC racks shall be properly grounded. The grounding scheme shall be as approved by Purchaser .
- 10.01.07 Two spray coats of inhibitive epoxy primer-surface shall be applied to all exterior and interior surfaces. A minimum of 2 spray coats of final finish colour shall be applied to all surfaces. Exterior steel surface shall be sand blasted, ground smooth, filled, primed, sanded and smooth enamel painted to give a good finish subject to minimum paint thickness of 65-75 microns for sheet thickness of 3 mm and 50 microns for sheet thickness of 2 mm. The Bidder shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory applied painted surface of each item of equipment. The touch up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.
- The finish colours for exterior and interior surfaces shall conform to following shades:
- Front & Rear-RAL 9002; End panel side- RAL 5012. Internal colour shall be same as external colour or brilliant white.
- 10.01.08 Due consideration shall be given to the ergonomics of control desk, LVS panel and the Control Room design. The design shall conform to the EN ISO 11064 (Ergonomically design of Control Room), part-1, 2 and 3.
- 10.01.09 The exact dimension, material, construction details etc. of Control Desk etc. shall be as per the actual requirement and shall be finalized during detailed engineering. The general arrangement of the desk / panel shall also be finalized during detailed engineering, subject to Purchaser 's approval.

10.01.10 The Bidder must pay particular attention in the positioning of desk mounted monitors in relation to Control Room lighting in order to minimize reflections. CPUs for OWS and LVS shall be kept separately at back of LVS Panels.

10.01.11 For control desk mounted instruments / devices etc., which are to be powered from UPS, all required conversion of interface equipments / accessories to make such devices compatible with UPS supply to be provided. All necessary hardware like input switches / fuse unit for each feeder as well as switch fuse unit for each instrument / device on the power supply line shall be provided. From UPS, redundant feeders shall be provided with suitably rated MCB and provision of fast auto changeover of UPS feeders. Power supply distribution scheme shall be as approved by Purchaser during detail engineering stage.

All the panels shall be provided with three point locking system with common master key for all panels. Panel lighting using CFL lamps with door switch and isolating switch shall be provided for the side(s) where equipments are mounted and require maintenance.

10.01.12 All work related to manufacture and assembly of control desk including their fabrication, painting, wiring, tubing installation with specified mounting accessories shall be completed and shall be fully tested prior to shipment to the project site. The manufacturing and testing of panel / desk as stated above shall be done in the manufacturing works of a qualified manufacturer acceptable to the Purchaser .

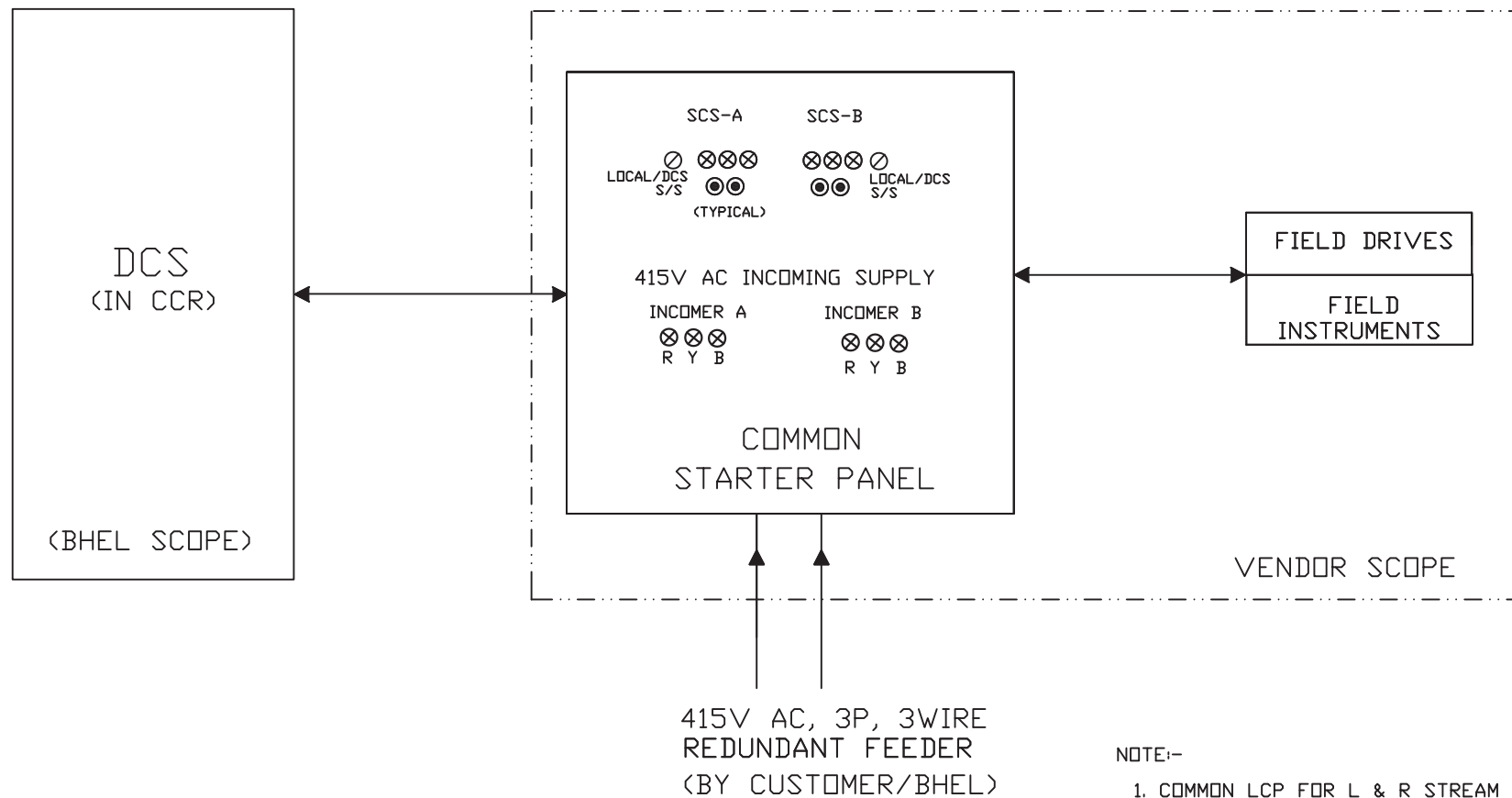
10.01.13 The Bidder shall complete all the internal wiring of the desk / panel at the shop as per the final drawings as approved by the Purchaser during detailed Engineering. However, if any further wiring modification is required at site as per system requirement; the Bidder shall do necessary modification at site within the quoted lump sum price.

10.02.00 Control Desk (CD)

Control desk shall be free standing table top type with doors at the back and shall be constructed of 2 mm thick CRCA steel plates. A 36mm thick MDF top shall be provided on the desk with proper finish of acrylic PVC / polyurethane paint. All operator monitors and mouse under the scope of the Bidder shall be mounted on this CD. Control desk shall consist of vertical, horizontal portions and supports with their coverings for work surface, keyboard trays, Mouse pads, Monitor self and concealed cable and wire way management, perforated trays with covers in both horizontal and vertical directions. PA system hand sets, telephone sets, very few PB stations and lamps (LEDs) shall be mounted on the control desk on mosaic grid structure and the same shall be decided during detailed engineering. The ASCII keyboard shall be capable of being pulled out through a tray. The CPU's of OWS etc. shall be located separately at the back of LVS panels. The desks shall be arranged in continuous arc shape. The exact profile of the desk, dimension and the radius of curvature shall be decided during detailed engineering stage.

To achieve durable and water resistant finish, a sheet of PVC membrane on the surface of control desks shall be provided. Final paint finish with proper smoothening is to be ensured. Final finish of CD should be inline with relevant International standards. For more durability, the membrane sheet of the Control Desk should extend 150 mm more into the underside of the Desk.

STANDARD BLOCK DIAGRAM FOR SCS PACKAGE WITH DCS



NOTE:-

1. COMMON LCP FOR L & R STREAM HOUSING PB , LAMPS ETC.
2. SIGNALS FOR FIELD INSTR. & FOR 'BID' DRIVES WITH INTEGRAL STARTER SHALL BE ROUTED TO DCS THROUGH STARTER PANEL.

07.00.09 FIELD MOUNTED LOCAL JUNCTION BOXES

(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.
(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).
(iii)	Type	Screwed at all four corners for door. Door gasket shall be of synthetic rubber.
(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.
(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.
(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.
(vii)	Grounding	To be provided.
(viii)	Color	RAL 7305.

Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
INSTRUMENT DATA SHEET (FOR DPT & DPG)		



DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE

SPECIFICATION NO.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1 OF 2	

Data Sheet No.: **PE-DC-999-145-I026-A**

TECHNICAL REQUIREMENTS FOR PRESSURE / DIFFERENTIAL
PRESSURE GAUGE

TO BE FILLED-UP /CONFIRMED
BY BIDDER

(TO BE FILLED BY PURCHASER)

GENERAL	MANUFACTURER		
	MODEL NUMBER		
TECHNICAL	SENSING ELEMENT	☐ BOURDON ☐ DIAPHRAGM (BOURDON FOR HIGH PRESS AND DIAPHRAGM FOR LOW PRESS APPLICATION)	
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – ☒ DIE CAST AL ☐ SS	
	ENCLOSURE	CLASS: ☒ IP-55 ☐ IP-65 ☐ EXPL PROOF PAINT: ☒ ENAMEL ☐ EPOXY	
	DIAL	SIZE: 150 MM COLOR: WHITE NUMERALS: BLACK SCALE: LINEAR, 270° ARC GRADUATED IN METRIC UNITS	
	CASE	COLOUR : BLACK	
	SPAN/ ZERO ADJUSTMENT	INT. MICRO SCREW	
	RANGE SELECTION	SHOULD COVER 125% OF OPERATING PARAMETER	
	OVER RANGE PROTECTION	1.5 TIMES OF FSD	
	BLOW OUT DISC	REQUIRED	
	SWITCHING FACILITY (IF APPLICABLE) NOT	REQUIRED	
	TYPE	☐ MICRO SWITCH ☐ OTHER	
	NO. / TYPE OF CONTACTS	2 NOS. SPDT	
CONTACT RATING	5A 230V AC, 0.25A 220V DC		
SETTING RANGE	FIELD ADJUSTABLE OVER FULL RANGE		
REPEATABILITY +	_ 1% OF FSR		
POWER SUPPLY	☐ 230V AC ☐ 110V AC		
PERFORMANCE	ACCURACY +	_ 1% OR BETTER OF FULL SCALE DEFLECTION	
CONNECTION	PROCESS	☐ M20 x 1.5 (M) ☒ 1/2" NPT (M) ☐ 1/2" NPT (F) ☐ OTHER	
	LOCATION	BOTTOM	
ACCESSORIES	NAME PLATE / METAL TAG	SS	
	OTHER	SIPHON FOR STEAM, SNUBBER FOR PUMP DISCHARGE, CHEMICAL SEAL DIAPHRAGM FOR CORROSSIVE, OIL SERVICES and SLURRY APPLICATION TO BE PROVIDED	
OTHER REQUIREMENT	INSTRUMENT LIST	INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED	
QUALITY REQUIREMENT	CHECK LIST FOR PG/DPG	REFER CHECK LIST NO PE-CL-999-145-I 026-0	

NOTE - Wherever capillary is applicable, length of the capillary shall be 5 metres.



DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 3

TAG No. Qty.....

Data Sheet No.: PES-145-01-DS1-A

Data Sheet A & B

DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL	MANUFACTURER		
	MODEL NUMBER		
TECHNICAL	TYPE	TRANSMITTER OF MICROPROCESSOR BASED 2 WIRE TYPE ,HART PROTOCOL COMPATIBLE	
	TRANSMITTER MEASUREMENT	☐ PRESSURE ☒ DIFF. PRESSURE	
	OUTPUT RANGE	SIGNAL 4-20MA DC (ANALOG) along WITH SUPERIMPOSED DIGITAL SIGNAL (BASED ON HART PROTOCOL)	
	TURN DOWN RATIO	10:1 FOR VACUUM /VERY LOW PRESSURE APPLICATION 30:1 FOR OTHER APPLICATION	
	ACCURACY	± 0.1% OF CALIBRATED SPAN(MINIMUM)	
	STABILITY	± 0.1% OF CALIBRATED SPAN FOR 6 MONTHS FOR RANGE UPTO AND INCLUDING 70 Kg/cm2 ± 0.25% OF CALIBRATED SPAN FOR 6 MONTHS FOR RANGE MORE THAN 70 Kg/cm2	
	LOAD IMPEDANCE	500 OHM (MIN)	
	RESPONSE TIME (TIME TAKEN FROM CHANGE IN PHYSICAL PARAMETER INPUT CHANGE TO TRANSMITTER , OUTPUT REACHING 63.2 % OF ITS TOTAL CHANGE INCLUDING THAT TIME)	100 ms OR BETTER	
	HOUSING	IP 55(with corrosion resistance epoxy coating)	
	OVER PRESSURE	150 % OF MAX OPERATING PRESSURE	
	CONNECTION (ELECTRICAL)	PLUG & SOCKET TYPE	
	PROCESS CONNECTION	1/2 inch NPT(F) / 1",150#RF	
	ZERO DRIFT & SPAN DRIFT	+/- 0.015 PER DEG C AT AT MAX SPAN +/- 0.11 PER DEG C AT AT MAX SPAN	
	SPAN & ZERO	CONTINUOUS TEMPER PROOF,REMOTE AS WELL AS ADJUSTABLY MANUAL FROM INSTRUMENT WITH ZERO SUPPRESSION & ELEVATION FACILITY	
	DAIGNOSTICS	SELF INDICATING FEATURE	
POWER SUPPLY	24 V DC ± 10%		

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER		SPECIFICATION NO.:	
			VOLUME	
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			REV. NO.	DATE:
			SHEET 2 OF 3	
TAG No. Qty.....		Data Sheet No.: PES-145-01-bs1- A		
Data Sheet A & B				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	ADJUSTMENT/CALIBRATION/MAINTENANCE	HAND HELD CALIBRATOR/HART .		
	ACCESSORIES	DIAPHRAGM SEAL,PULSATIONS DAMPENERS,SYPHON ETC AS REQUIRED BY SERVICE & OPERATING CONDITION, 2 VALVE MANIFOLD FOR ABSOLUTE PRESSURE TRANSMITTER (3 -VALVE MANIFOLD FOR GAUGE /VACUUM PRESSURE TRANSMITTER)AND 5 VALVE MANYFOLD FOR DP /LEVEL/FLOW TRANSMITTER		

NOTE - Wherever capillary is applicable, length of the capillary shall be 5 metres.

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
DATA SHEETS FOR MOTORISED VALVE ACTUATOR		



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

REV. NO. 00 DATE: 03.08.2016

SHEET 1 OF 4

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL*	* PROJECT	1 x 250 MW ROURKELA TPP	
	OFFER REFERENCE		
	* TAG NO. SERVICE		
	* DUTY	☐ ON / OFF ☐ INCHING	
	* LINE SIZE (inlet/outlet): MATERIAL		
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ BUTTERFLY	
	* OPENING / CLOSING TIME		
	* WORKING PRESSURE		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%	
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY	
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY	
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY	
CONSTRUCTION AND SIZING	CONSTRUCTION	Totally enclosed, dust tight, weather proof, suitable for outdoor use without canopy, IP:55.	
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL	
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.	
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.	
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE SIZING THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE -150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.	
HANDWHEEL	* REQUIRED	☒ YES ☐ NO	
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED	
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.		
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY	
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY	
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE	
	ACTUATOR APPLICABLE WIRING DIAGRAM	☒ ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ☒ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram	
	COLOUR SHADE	☒ BLUE (RAL 5012) ☐	
	PAINT TYPE (## Refer Notes)	☒ ENAMEL ☐ EPOXY ☐	
	SHAFT RPM	BIDDER TO SPECIFY	
	OLR SET VALUE	BIDDER TO SPECIFY	
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY	
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY	
	@ PWR SUPP TO MTR / STARTER	415V ,3PH, AC	
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☒ 110 V AC	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

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SHEET 2 OF 4

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

	@ ENCLOSURE CLASS OF MOTOR	■ IP 67 □ FLAME PROOF		
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B		
	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos., 1 IN EACH PHASE) □ -----		
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED		
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED □ NOT REQUIRED		
	TYPE OF SWITCHING DEVICE	■ CONTACTORS □ THYRISTORS		
	TYPE	■ CONVENTIONAL □ SMART (NON-INTRUSIVE)		
	IF SMART	(NOT APPLICABLE)		
	a) SERIAL LINK INTERFACE	□ INTEGRAL □ FIELD MOUNTED		
	b) SERIAL LINK PROTOCOL	□ FOUNDATION FIELD-BUS □ PROFI-BUS □ DEVICE NET □		
	c) SERIAL LINK MEDIA	□ TWISTED PAIR Cu-CBL □ CO-AXIAL Cu-CBL □ OFC		
	d) HAND HELD PROGRAMMER	□ REQUIRED □ NOT REQUIRED		
	e) TYPE OF HAND HELD PROGRAMMER	□ BLUETOOTH □ INFRARED □		
	f) MASTER STATION	□ REQUIRED □ NOT REQUIRED		
	g) MASTER STN INTRFACE WITH DCS	□ MODBUS □ TCP/IP		
	h) DETAILS OF SPECIAL CABLE	□ ENCLOSED □ NOT REQUIRED		
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED		
	OPEN / CLOSE PB	■ REQUIRED □ NOT REQUIRED		
	STOP PB	■ REQUIRED □ NOT REQUIRED		
	INDICATING LAMPS	■ REQUIRED □ NOT REQUIRED		
	LOCAL REMOTE S/S	■ REQUIRED □ NOT REQUIRED		
	STATUS CONTACTS FOR MONITORING	■ REQUIRED □ NOT REQUIRED		
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)		
	INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	■ INTERPOSING RELAY □ OPTO COUPLER □ EITHER	
QUANTITY		■ 2 Nos. □ 3 Nos.		
DRIVING VOLTAGE		■ 20.5 – 24V DC □ _____ V DC		
DRIVING CURRENT		■ 125mA MAX □ _____ mA MAX		
LOAD RESISTANCE		■ > 192 ohms - <25 k ohms □ > _____ ohms - < _____ ohms		
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY		
	OPEN / CLOSE	■ 1 No. □ 2Nos. / ■ 1 No. □ 2Nos		
	CONTACT TYPE	2 NO + 2 NC		
	RATING	5A 240V AC AND 0.5A 220V DC		
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE		
	ACCURACY +3%	OF SET VALUE		
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY		
	OPEN : INT : CLOSE	□ 1 No ■ 2 Nos.	2 nos intermediate (adjustable)	□ 1 No. ■ 2Nos.
	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC		



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

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Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty applications)	☒ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS POTENTIOMETER TYPE ,EXTERNAL 24 V DC OPERATED ,SUITABLE FOR STABILISED 4-20 mA SIGNAL	
	SUPPLY	☒ 24V DC ☐	
	OUTPUT	☒ 4-20mA	
	ACCURACY	$\pm 1\%$ FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC,1 PH.,50 Hz	
	@ POWER SUPPLY (INTEGRAL)	POWER SUPPLY DERIVED FROM MAIN POWER SUPPLY AVAILABLE AT ACTUATOR END.	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	☒ IP 68 @ ☐	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (FOR COMMD, LS/TS FEED BACK, PoT)	☒ REQUIRED ☐ NOT REQUIRED ☒ 2 NOS. PRE WIRED ☐	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE : LATER DURING DETAILED ENGINEERING	
	@ SPACE HEATER CABLE GLAND	SIZE:-----	
	OTHER CONTROL CABLE GLANDS-1	☐ 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	1 NO. CABLE GLAND SHOULD BE SUITABLE FOR Cable size 4Px.5mm2 & additional 1 NO. FOR CABLE SIZE 4 P X.5mm2 FOR INCHING DUTY ONLY.	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

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Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

WEIGHT

TOTAL WEIGHT (ACTUATOR +
ACCESSORIES)

BIDDER TO SPECIFY

_____ Kg.

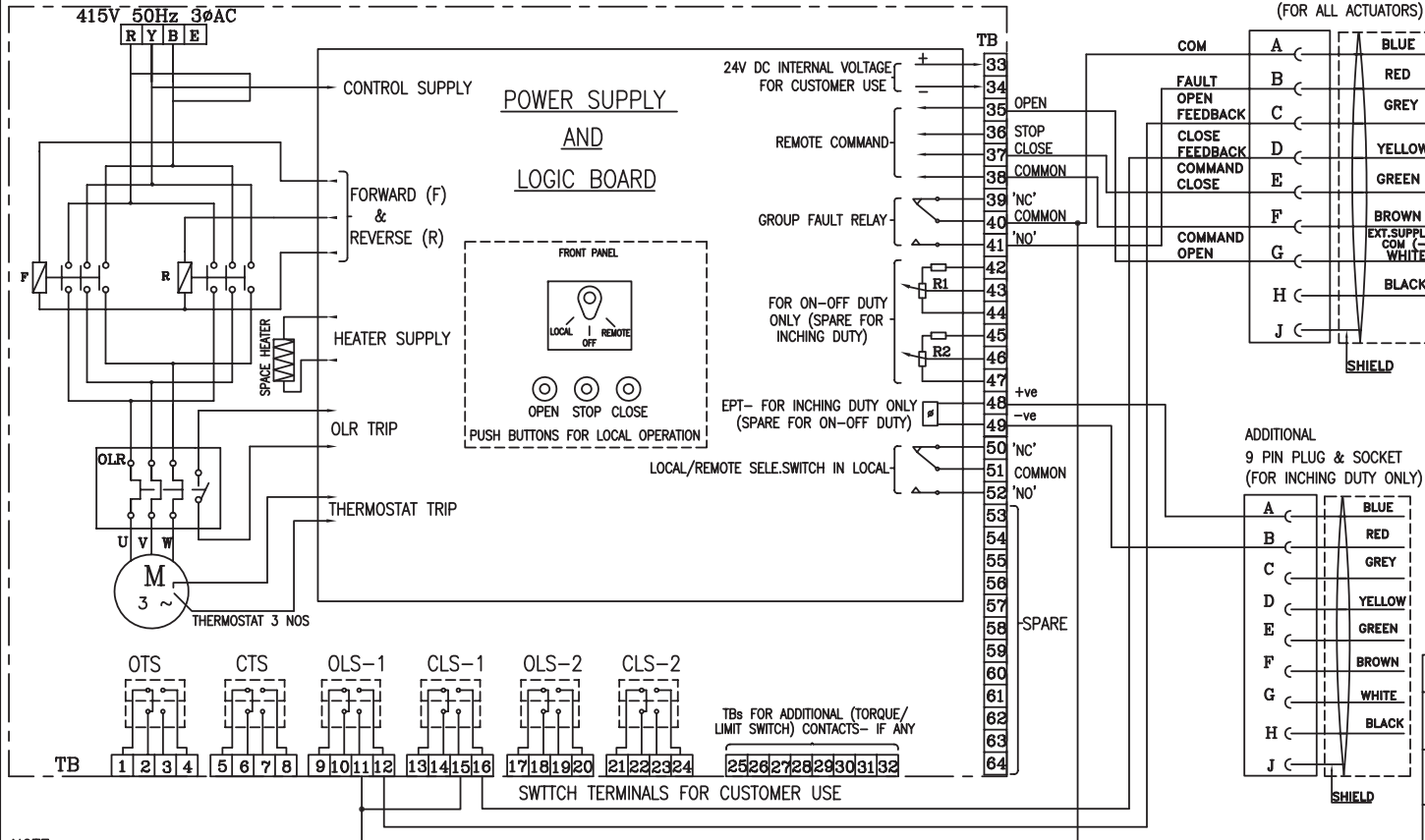
NOTES:

1. **SCOPE:** DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
 2. **CODES & STANDARDS:** DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
 3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
 4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
 5. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
 6. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
 7. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
- \$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.**
- ## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.**
8. It should be possible to operate the actuator locally. Lockable local/remote selection shall be provided on the actuator.
 9. Position indicator shall be provided for 0 to 100 % travel
 10. Wiring shall be suitable voltage grade copper wire 1.5 sq. mm.
 11. The motor shall be capable of starting at 85 percent of rated voltage and running at 80 percent of rated voltage at rated torque and 85 percent rated voltage at 33 percent excess rated torque for a period of 5 minutes each.
 12. Limit switches shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of control system subject to a minimum of 60 V, 6 VA rating. The limit switches shall be housed in Aluminum alloy LM6 (or cast iron) of robust construction having dust and oil tight enclosure conforming to IP 65. The normal travel end / intermediate position limit switches shall be 2-wire proximity type.
 13. Limit switch and disturbance signals shall be available to DCS even when the power supply to the actuators is not available

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ = TO BE FILLED BY ES

3-V-MISC-24283

DRAWING NO.



CONTACT DEVELOPMENT DIAGRAM

OTS	1-2	OPEN AT OVER TORQUE DURING OPENING TRAVEL
	3-4	CLOSE AT OVER TORQUE DURING OPENING TRAVEL
CTS	5-6	OPEN AT OVER TORQUE DURING CLOSING TRAVEL
	7-8	CLOSE AT OVER TORQUE DURING CLOSING TRAVEL
OLS-1	9-10	
	11-12	
CLS-1	13-14	
	15-16	
OLS-2	17-18	
	19-20	
CLS-2	21-22	
	23-24	
SWITCH	TERMINAL NO.	VALVE POSITION
	FULL OPEN	INTERMEDIATE FULL CLOSE
INDICATES CONTACT CLOSED		
INDICATES CONTACT OPEN		
CONTACT RATING: 5A AT 250V AC & 0.5A AT 220V DC		

SETTING PROCEDURE OF POSITION LIMIT AND TORQUE SWITCH

VALVES	OPEN		CLOSE	
	MAIN	BACK UP	MAIN	BACK UP
GATE VALVE OF 100 mm AND ABOVE IN 1500 CL AND ABOVE RATINGS	OLS	OTS *	CLS	CTS
ALL OTHER GATE & GLOBE VALVES	OLS	OTS *	CTS	#
# - CLS NOT TO BE CONNECTED IN TRIP CIRCUIT				
* - BYPASS OTS FOR INITIAL 5% OF TRAVEL (FOR GATE VALVES ONLY)				

NOTE:-

- ALL TORQUE AND LIMIT SWITCHES (OTS, CTS, OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS '1NO+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE.
- ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
- OTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
- OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
- CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
- EPT - ELECTRONIC POSITION TRANSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
- R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
- FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
- M - MOTOR 3 ϕ 415V 50 Hz AC SUPPLY
- TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

REV	DATE	ALTERED
		CHD & APPD

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT			ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS FOR NTPC PROJECTS (DRAWN FOR INTERMEDIATE POSITION OF VALVES)					
 BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014. 365-121			DRN	NAME N.P.ESWAR	SIGN N.P	DATE 17.03.05	NO.OF VAR.	
			CHD	D.DINAKARAN	D.D	17.03.05	-	
			APPD	K.ARUNACHALAM	K.A	17.03.05	-	
DEPT VL	-		SCALE NTS	WEIGHT (KG.) -	REFERENCE INFORMATION			NO. OF ITEMS -
CODE								
TITLE WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS				CARD CODE U 01	DRAWING NO. 3-V-MISC-24283			REV 0



TITLE:

**TECHNICAL SPECIFICATION
SELF CELAING STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **I**

SUB-SECTION: **ID**

REV. NO. **0** DATE **01.03.2017**

SHEET **1** OF **1**

SUB-SECTION – ID

DATASHEET-A



TITLE :

**DATA SHEET – A FOR
SELF CLEANIGN STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

Section : I

SUB SECTION: ID

REV. NO. 00 DATE -01.03.2017

Page 1 of 7

S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
1.0	GENERAL		
1.1	No. of Strainers/ Filters required for station	Nos.	Total 2 Sets viz. (1 Working + 1 Standby)
1.2	Liquid Handled	-	Clarified water (Refer enclosed water analysis at Annexure II)
1.3	Size of SCS Shell	NB	600
1.4	Length of SCS Shell	mm	Max 2250 mm (including counter Flanges)
1.5	Scope of Counter Flange of SCS Shell	-	In bidder's scope
1.6	BOQ for Debris Discharge Piping (For Clarified water).	-	1. Dia of pipe: To be decided by bidder 2. Length of pipe: 50 m pipe length 3. No. of bends: 5 Nos.
1.7	Filter type/ duty	-	On line / continuous
1.8	Location	-	ACW Pump Suction Header (Outdoor)
2.0	DESIGN DATA		
2.1	Operating pressure at SCS Inlet Flange	kg/cm2 (g)	2.0
2.2	Design pressure for SCS Shell	kg/cm2 (g)	7.5
2.3	Design Mechanical temperature	Deg. C	60
2.4	Flow rate through filter		
	a) Normal	Cub m/Hr	2200
	b) Maximum	Cub m/Hr	2640



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

Section : I

SUB SECTION: ID

REV. NO. 00 DATE -01.03.2017

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
2.5	Design differential pressure for filter section/ screen	Kg/cm ² (g)	1.5 (Min.)
2.6	Type of suspended matter likely to enter the filter	-	Typical debris encountered in closed circuit CW system with Cooling Tower
2.7	Differential pressure measuring system set pressure - For initiating flushing/ backwashing - For alarm/ annunciation	mbar mbar	110 160
2.8	Filter section/ screen perforation size	mm	2 mm (max)
2.9	Free flow area in the screen basket	-	Atleast 120 % of pipe inlet area
2.10	Debris discharge flow during flushing period	Cub m/ Hr.	Not to exceed 5% of total flow rate
3.0	GUARANTEED PERFORMANCE REQUIREMENT		
3.1	Pressure drop across the filter (i.e. between inlet and outlet connection) at normal flow	-	
	a) Clean condition	mbar	110
	b) Partially (50%) choked condition	mbar	160
4.0	MATERIALS OF CONSTRUCTION		
4.1	Filter body/ housing	-	Carbon Steel to IS -2062 Gr. B. with epoxy painted inside (with minimum housing thickness same as connecting pipe thickness)



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

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REV. NO. 00 DATE -01.03.2017

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
4.2	Connecting pipe (Inlet/ Outlet)	-	CS to IS 2062 Gr. B, rolled & butt welded, conforming to IS 3589
4.3	Filter screen/ section	-	SS 316
4.4	Shaft	-	SS 316
4.5	Supporting cage	-	SS 316
4.6	Differential measuring system	-	SS 316
4.7	Flushing/ backwashing unit	-	SS 316
4.8	Backwash rotor shoes	-	Neoprene
4.9	Any other internal hardware /pipes etc.	-	SS 316
4.10	Flushing Pump (If applicable)		
a)	Casing		CI to IS 210 FG 260
b)	Impeller		SS-316
c)	Shaft		SS-316
4.11	Valves	-	
4.11.1	Check Valves (65 NB & Above)		For sizes 65 NB and above-Swing check type or dual plate type. End connection shall be flanged type.



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

Section : I

SUB SECTION: ID

REV. NO. 00 DATE -01.03.2017

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
	a) Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.
	b) Disc for Check Valve		SS-316
	c) Stem		13% Cr Steel as per ASTM A-182 Gr. F6a
4.11.2	Check Valves (50 NB & Below)		For size 50 NB and below-Piston type End connection shall be socket welded type.
	a) Body & Bonnet		Carbon steel as per ASTM A-105
	b) Disc for Check Valve		SS-316
	c) Stem		13% Cr Steel as per ASTM A-182 Gr. F6a.
4.11.3	Gate/ Globe Valves 50 Nb & Below		End connection shall be socket welded type.
	Body & Bonnet		Carbon steel as per ASTM A-105
4.11.4	Gate/Globe Valves (65NB & above)		End connection shall be flanged type.
	➤ Body & Bonnet		Carbon Steel as per ASTM-A216-Gr. WCB.
	➤ Disc		SS-316
	➤ Stem		ASTM A-182 Gr. F6a
	C) Ball valves		
	i) Body		SA 351 CF8M
	ii) Ball		SA 351 CF8M
	iii) Stem		SS 316
4.12	Debris discharge/ Interconnecting Piping	-	
	Material		a) up to 150 NB - Carbon steel ERW, IS:1239 (Heavy Grade) b) 200 NB and above - CS to IS 2062 Gr. B, rolled & butt welded, conforming to IS 3589



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

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SUB SECTION: ID

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
4.13	Inspection hole	-	Required
5.0	COUNTER FLANGES FOR SCS SHELL		In Bidder's Scope
5.1	MATERIAL		
	a) Flanges		IS 2062, Gr. B, epoxy painted
	b) Fasteners		A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber
5.2	Drilling Standard		BS 4504 or equivalent
6.0	OTHER COUNTER FLANGES		
6.1	MATERIAL		
	a) Flanges		IS 2062, Gr. B, epoxy painted
	b) Fasteners		A 193 & A 194
	c) Gaskets		Min 4 mm thick rubber
7.0	Material of Other components not specified above		Suitable for intended duty & water quality
8.0	Connecting pipe size (OD x Thk)	mm x mm	610 X 7.92
9.0	PAINTING		
9.1	External Surface	-	



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

Section : I

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
	a) Surface preparation	-	SA 2.5 of Swedish Specification SIS 05.5900.197
	b) Primer		Two coats of HB chlorinated rubber based red oxide Zinc Phosphate, each 50 microns
	c) Final paint		Two coats of chlorinated rubber based finish paint each 30 microns. To achieve total DFT of 160 microns
9.2	Internal Surface		
	a) Surface preparation		SA 2.5 of Swedish Specification SIS 05.5900.197
	b) Primer		One coat of epoxy resin based primer
	c) Final paint		Applicable no. Of coats of coal tar epoxy paint to achieve total DFT of 200 to 250 microns
10.0	SHOP TEST		
10.1	Hydrostatic test		
	a) Test Pressure	bar (g)	1.5 times design pressure
	b) Test duration	min.	30
10.2	Leakage test		
	a) Test Pressure	bar (g)	Design Pressure
	b) Test duration	min.	30
11.0	Adequate provision for future installation of cathodic protection required		YES



TITLE :

**DATA SHEET – A FOR
SELF CLEANING STRAINER (SCS)**

SPECIFICATION NO. : PE-TS-427-165-N004

Section : I

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S. No.	DESCRIPTION	UNITS	1X250 MW ROURKELA PP-II EXPANSION
12.0	Whether automatic flushing/ back- washing operation effected by the following : i. Differential pressure ii. Adjustable timer iii. Push button		 YES YES YES
13.0	Whether provision for manual flushing / backwashing operation is made in the event of control system failure.		YES
14.0	Whether built in flushing arrangement complete with flushing pump, valves, and associated piping, is provided.		YES (if required)
15.0	MANDATORY SPARES - to be supplied under this specification –		Mechanical Spare- Nil, NIL

Annexure-I

Rourkela EPC Package (1x250 MW)

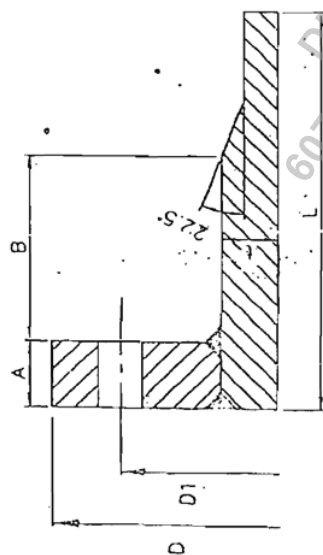
Water analysis report

S. No.	Parameter	Circulating water analysis considering COC 5
1	PH	7.5 – 8.0 (max.)
2	K (as such)	800 ppm
3	Turbidity (NTU)	50 NTU
4	Sio2 (as such)	105 ppm
5	P-alk	NT
6	M alk (as such)	340 ppm
7	TH (as CaCO3)	470 ppm
7.1	CO3 (as such)	10.40 ppm
7.2	HCO3 (as such)	826.15 ppm
8	CaH (as CaCO3)	300 ppm
9	MgH (as CaCO3)	170 ppm
10	EMA (as CaCO3)	170 ppm
11	CL- (as CaCO3)	150 ppm
12	SO4 (as CaCO3)	20 ppm
13	Fe (as such)	0.5 ppm
14	KMnO4	--
15	RCI2	TR
16	TDS	1924.2 ppm

Annexure-II

FIRST ANGULAR PROJECTION

DRAWING NO. PE-DG-999-141-M017



NOTES:-

Flange thicknesses listed are for Design pressure=5Kg/cm²(g) and Flange dimensions as given in the table. Final thickness of the flange is to be checked for actual OD/Bolting PCD/Neck dimensions.

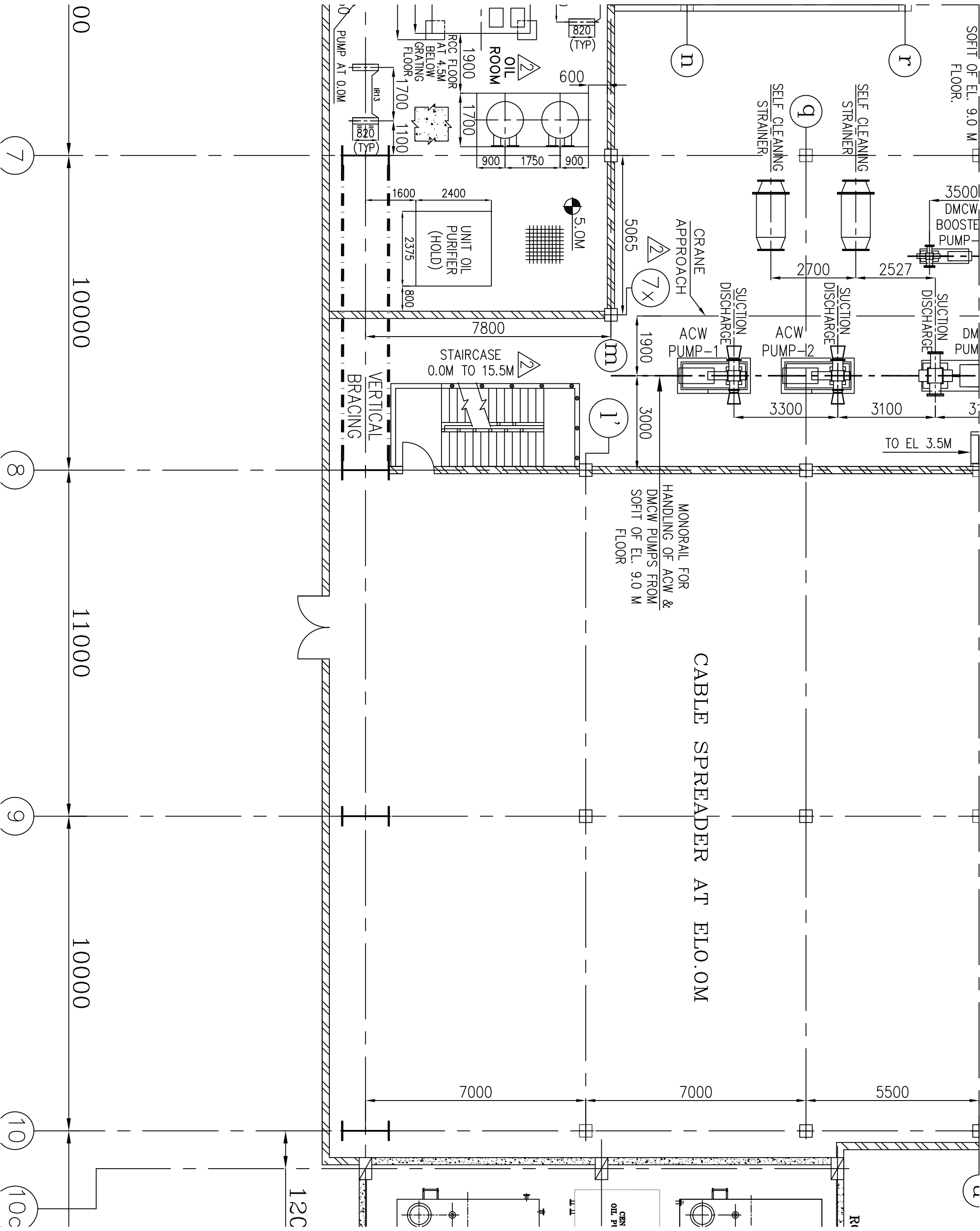
PIPE SIZE	PIPE THK.	FLANGE OD "D"	Bolt PCD "D1"	WELD NECK FLANGE			SLIP-ON FLANGE THICKNESS
				FLANGE THICK. "A"	NECK THK. "C"	NECK Length "D" Approx. Total Length "L"	
1200	10-12	1465	1380	40	24	70 200	90
1400	14	1675	1590	50	24	70 200	100
1600	14	1915	1920	60	32	80 220	110
1800	14-16	2115	2020	70	32	90 250	120
2200	18	2550	2420	80	36	100 300	140
2300	20			90	38	110 325	150
2500	20			90	38	110 325	150
2700	20			90	38	110 325	150

— TENTATIVE —

DRAWING FOR BAL' SEPARATOR COUNTER FLANGE

[illegible]

Annexure-III





TITLE:

**TECHNICAL SPECIFICATION
SELF CLEANIGN STRAINER**

SPECIFIC TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **II**

SUB-SECTION: **IIA**

REV. NO. **0** DATE **01.03.2017**

SHEET **1** OF **1**

SUB-SECTION - IIA

STANDARD TECHNICAL SPECIFICATION (MECHANICAL)

STANDARD TECHNICAL SPECIFICATION FOR SELF CLEAING STRAINER

STANDARD QUALITY PLAN

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
		REV. NO. 01	DATE : 20.06.2016
		SHEET 1	OF 8
1.00.00	<u>GENERAL</u> This specification covers the Design, Performance and Operational Requirements, Constructional Features, Manufacture, Assembly. Inspection and Testing at the Manufacturer's and/or his Sub-contractor's works and Painting for delivery of Self-Cleaning Strainer (Backwash Type) complete with all accessories as specified hereinafter.		
2.00.00	<u>CODES AND STANDARDS</u>		
2.01.00	The design, materials manufacture, inspection and testing of the Self Cleaning Strainer complete with all accessories, shall comply with the requirements of the latest revisions of the following appropriate codes and standards :		
2.01.01	IS/ BS/ DIN/ US Standards regarding pressure vessels, pipes, flanges and others as necessary.		
2.01.02	IS/ BS/ DIN/ ASTM Standards for materials specification and testing procedures.		
2.01.03	IS/ BS/ DIN/ AWWA Standards for valves and their testing.		
2.02.00	In case of any conflict between the above codes/ standards and this specification, the later shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Engineer shall be final and binding.		
3.00.00	<u>DESIGN AND CONSTRUCTION</u>		
3.01.00	<u>General Requirements</u>		
3.01.01	Unless otherwise necessary manufacturer's standard and proven models of the Self Cleaning Strainer shall be supplied.		
3.01.02	The Self Cleaning Strainer shall be capable of safe, proper and continuous operation. Vibration, noise, mechanical stresses shall be kept within allowable limits specified by relevant codes / standards, in design due attention shall be given to ease of maintenance, repair and cleaning.		
3.01.03	Suitable corrosion allowance shall be provided wherever necessary. Adequate provision for future installation of cathodic protection shall be provided.		
3.01.04	The Self Cleaning Strainer shall be designed to suit installation in on-line or off-line arrangement as specified in Data Sheet-A.		
	In the on-line arrangement, the inlet and outlet pipes of the Self Cleaning Strainer shall be in line with each other on the same axis without any off-set between the centre lines of inlet and outlet pipes. In the off-line arrangement, the Self Cleaning Strainer inlet and outlet pipes shall be at right angle (90°) to each other.		

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
		REV. NO. 01	DATE : 20.06.2016
		SHEET 2	OF 8

3.02.00

Performance Requirements

The Self Cleaning Strainer with all accessories shall be designed and guaranteed to meet the following requirements:-

3.02.01

The Self Cleaning Strainer shall perform satisfactorily under the flow and pressure conditions specified in Data Sheet -A and shall be capable of housing the various forms of debris / sludge i.e., suspended particles / matter, mussels, grass, leaves, wood pieces etc. The performance of the Self Cleaning strainer shall be continuous with minimum number of flushing/ backwashing operations.

3.02.02

The Self Cleaning Strainer shall be designed such that the pressure drop across the Self Cleaning Strainer (i.e., between inlet and outlet connections) under clean conditions and partially (50%) choked conditions shall not be more than those specified in Data Sheet -A.

3.02.03

Unless otherwise specified in Data Sheet -A, debris discharge / wash water flow rate during flushing/back washing operation shall be limited to 10% of the total flow rate and flushing / backwashing operation shall be completed within a period of maximum three (3) minutes. The pressure drop across the Self Cleaning strainer during flushing/ backwashing operation shall not be more than the pressure drop under partially (50%) choked condition.

3.02.04

The coarse particles and floating matter accumulating at the filter section/screen are flushed out of the system by the system by the debris flushing / backwash unit such that the pressure drop across the filter after flushing / backwashing, shall not be more than 1.1 times the pressure drop under clean conditions.

3.03.00

Operational Requirement

The Self Cleaning Strainer and other accessories shall be designed for the following flushing/backwashing operation modes:

3.03.01

Complete automatic flushing/backwashing operation effected by the following:-

- ◆ differential pressure measuring system at a pre-determined differential pressure across the filter screen.
- ◆ adjustable timer (0-24 hours)
- ◆ push button (for manual initiation of sequential flushing / backwashing)

3.03.02

Manual operation in the event of failure of control system.

3.04.00

Filter Housing/ Body

3.04.01

The Self Cleaning Strainer housing/body shall be designed and manufactured as per the applicable codes for pressure vessels. It shall house the filter section / screen assembly and shall have flanged inlet, outlet, flushing/ debris discharge openings and pressure measuring tappings etc.

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
		REV. NO. 01	DATE : 20.06.2016
		SHEET 3	OF 8
3.04.02	In design of SCS housing/ body due attention shall be given for easy removal and replacement of filter section / screen assembly.		
3.04.03	The Self Cleaning Strainer shall be provided with inspection hole with bolted cover.		
3.04.04	The SCS body / housing shall be provided with vent and drain connections with isolating valves. It shall be possible to drain unfiltered and filtered water.		
3.04.05	If specified in Data Sheet-A, filter body/housing shall be epoxy painted.		
3.05.00	<u>Filter Section / Screen assembly.</u>		
3.05.01	The Self Cleaning Strainer section/screen shall be designed for the maximum differential pressure across the filter and shall be securely positioned by a supporting cage and shall be securely mounted in the housing or body.		
3.05.02	The perforation/mesh size of the strainer section shall not be more than that specified in Data Sheet-A.		
3.05.03	The arrangement of the Strainer section shall be such that the forced accumulation of debris on the filter screen / section shall be minimum.		
3.06.00	<u>Differential Pressure Measuring System</u>		
3.06.01	The Self Cleaning Strainer shall be provided with a measuring system for differential pressure across the filter section/screen, to check debris accumulation and to initiate flushing/ backwashing operation. This shall consist of a differential pressure transmitter for automatic flushing operation, a differential pressure gauge for manual observation with adequate number of tapping with isolating valves and equalising valves.		
3.06.02	The contacts for differential pressure transmitter and for differential pressure gauge shall be independent so that in the event of failure of one, the other is available.		
3.06.03	The differential pressure measuring system shall be provided with D.P. transmitter & DPG of remote seal arrangement..		
3.07.00	<u>Flushing / Backwash Unit. :</u>		
3.07.01	The Self Cleaning Strainer shall be provided with suitable flushing/backwash unit (to be installed at ground floor) and debris discharge/ backwash outlet valve with associated actuator to flush out the accumulated debris/ sludge.		
3.07.02	The flushing pump shall be provided with mechanical seals to the extent possible. If gland packing is provided it should be of good quality to prevent leakage of water from pump glands.		

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
		REV. NO. 01	DATE : 20.06.2016
		SHEET 4	OF 8

3.07.03

The flushing arrangement shall be either fixed type with flushing valves or a rotating debris extractor.

3.07.04

If any water is to be injected for backwashing the filter section/screen, water shall be taken from down-stream side of the filter section/ screen. Necessary pump, valves and piping for water injection shall be supplied.

3.07.05

View glass to be provided in debris outlet pipe to monitor the flushing of debris.

3.08.00

Valves

The flushing valves (if any,) the debris discharge/backwash outlet valve, isolation, vent and drain valves shall conform to appropriate codes / standards.

3.09.00

Instrumentation and Control System

3.09.01

Complete instrumentation and control system for automatic flushing/backwashing operation, protection, interlocking, indication/ annunciation of high differential pressure and other malfunctions etc. shall be provided. This shall consist of adequate operational hardware, local control panel and interconnecting control and power cabling between the control panel and the Self Cleaning strainer and its associated electrical devices.

3.09.02

The control panel shall house all necessary instruments, indicating/ annunciation lamps, alarms, differential pressure indicator, timer, function selector switches, relays, protection and interlocking systems, start/stop push buttons, counter to register number of flushing operations etc., and shall be complete with internal wiring. In addition to the above, the control panel shall meet the requirements of the enclosed specification.

3.09.03

All instrumentation shall be of reputed make and shall meet the requirement of the enclosed specification.

3.10.00

Actuators :

The actuators for flushing arrangement and debris discharge valve shall be electric motor operated and shall meet the requirements of the enclosed specification. The actuators shall be provided with auxiliary hand-wheel for manual operation in the event of power failure.

3.11.00

Electric Motors :

The drive motors for differential pressure measuring system flushing pump and water injected pump (if applicable) shall confirm to the requirements of the enclosed specification.

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
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3..12.00

Other Accessories.

3.12.01

Counter flanges, complete with gaskets, bolts and nuts etc., shall be supplied for the filter inlet, outlet connections and all other terminal points. Fabrication, dimensions and drilling of the flanges shall conform to the codes/standards specified in Data Sheet-A/ Section -C.

3.12.02

Self Cleaning Filter shall be provided with suitable lifting arrangement for handling during erection and maintenance.

4.00.00

SHOP INSPECTION AND TESTS

4.01.00

General:

4.01.01

Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the Self Cleaning strainer and other accessories shall conform to the requirements of this specification and of the applicable codes/ standards.

4.01.02

All materials used for manufacture/fabrication of the Self Cleaning Strainer shall be of tested quality. Relevant test certificates for chemical analysis, mechanical tests and heat treatment shall be made available before the final shop inspection. In case the relevant test certificates are not available, the manufacturer shall arrange to carry out the necessary tests as per approved quality plan and applicable codes at his cost, for which samples shall be identified by BHEL's representative.

4.01.03

All shop tests shall be conducted in the presence of BHEL's representative and test certificates / reports for the same shall be furnished to BHEL for approval.

4.01.04

Qualification of welding procedures and welders shall be as per ASME B&PV Code, Section-IX / applicable codes.

4.02.00

Filter Housing / Body

4.02.01

Chemical analysis, mechanical tests shall be carried out on housing/body, strainer/ screen, strainer/ screen shaft and other appurtenances as per the applicable material specification standards.

4.02.02

All butt welded joints shall be subjected to radiographic / ultrasonic testing as per applicable codes. However all welded joints shall be subjected to 100% magnetic particle / penetrant testing to ensure freedom from defects.

4.03.00

Rubber Lining (as applicable)

Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.

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		SHEET 6	OF 8

4.04.00

Filter Section/Screen assembly

Supporting cage and filter section/screen materials shall be tested for chemical properties. Checks shall be carried out for perforation/mesh size, defects etc.

4.05.00

Flushing / Backwash Unit

4.05.01

Material of various components of the flushing/Backwash Unit shall be tested for chemical and mechanical properties.

4.05.02

Hollow shaft of backwash rotor shall be ultrasonically tested as per ASTM-A 388 for internal flaws. Penetrant test shall be carried out for surface flaws.

4.06.00

Valves

Inspection and testing of valves including leakage test shall be carried out as per the requirements of the applicable standards. Correlating test certificates for materials of the valve components shall be furnished.

4.07.00

Flanges

4.07.01

In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, section VIII, Division-1.

4.07.02

In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-A 388.

4.07.03

If the thickness of the plate used for flanged is 40mm or more the same shall be checked ultrasonically as per ASTM-A435 to demonstrate the absence of lamination and lack of fusion etc.

4.07.04

Chemical and mechanical test certificates shall be furnished for flange materials.

4.07.05

Flanges shall be checked for edge preparation, fit up and satisfactory working with matching parts.

4.08.00

All materials for various nozzles, seals, pipes, gaskets, nuts bolts etc., shall be of tested quality and correlating test certificates for chemical and mechanical properties shall be furnished.

4.09.00

Dimensional Checks

Dimensional checks of various components of the Self Cleaning Strainer shall be carried out as per the drawings approved by BHEL. Alignment and fit up of movable parts shall be checked.

	TITLE : STANDARD TECHNICAL SPECIFICATION SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : 2A	
		REV. NO. 01	DATE : 20.06.2016
		SHEET 7	OF 8

4.10.00

Hydrostatic Test

Hydrostatic test shall be conducted on the Self Cleaning Strainer housing/body at a pressure of 1.5 times the design pressure. The duration of the test shall be minimum 30 minutes.

4.11.00

Leakage Test

Leakage test shall be conducted at the design pressure to demonstrate that the filter assembly is leak tight and no water seepage shall take place at various nozzle and valve connections.

4.12.00

Functional Tests

The Self Cleaning Strainer assembly complete with valves, actuators and other accessories shall be subjected to functional tests and the following shall be checked:-

4.12.01

Smooth and free operation of all movable parts.

4.12.02

Interlocks and sequential operation.

4.12.03

Satisfactory operation of actuator torque switches, limit switches etc.

4.13.0

Performance Test:

Performance Test shall be conducted to ensure that the Self Cleaning Strainer meets the specified performance requirements.

5.00.00

TESTING AT SITE

After completion of installation at site, the Self Cleaning Strainer with complete accessories, will be tested to check that the filter performance meets the requirements of its specification, Rectification of all defects shall have to be done by the supplier at no extra cost to the Owner / Purchaser. However the Owner / Purchaser reserves the right to reject the equipment/ parts not meeting the requirement if the deficiency still persists.

6.00.00

QUALITY ASSURANCE & QUALITY PLAN

6.01.00

The Self Cleaning Strainer and other accessories to be supplied shall have assured quality and workmanship.

6.02.00

Typical quality plans are enclosed herewith this specification for bidder's guidance. The bidder shall comply with these minimum requirements and shall furnishing own quality plan based on materials and components of the filter being offered.



TITLE :
STANDARD TECHNICAL SPECIFICATION
SELF CLEANING STRAINER
(Backwash Type)

SPECIFICATION NO. PE-TS-XXX-165-N004

SECTION : II

SUB SECTION : 2A

REV. NO. 01

DATE : 20.06.2016

SHEET 8 OF 8

7.00.00 NAME PLATE AND TAG NUMBERS

7.01.00 The Self Cleaning Strainer shall be provided with a permanently attached brass or stainless steel plate indicating the following details:-

- a) Design and maximum flow rates
- b) Design and test pressures
- c) Design temperature
- d) Filter section/screen mesh size
- e) Empty and operating weights
- f) Revolving speed of backwash rotor

7.02.00 Each valve shall be provided with a name plate indicating the following:-

- a) Service
- b) Design and test pressures
- c) Maximum flow and flow direction
- d) Size
- e) Tag Number

Tag numbers will be indicated on the drawing submitted for approval during contract stage.

7.03.00 Each motor / actuator shall be provided with a name plate indicating the following details:

- a) Supply conditions.
- b) KW Rating
- c) Make

8.00.00 DRAWINGS, DATA & INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:

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

	TITLE : DATA SHEET - C SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : IIA	
		REV. NO. 01	DATE : 08.06.2016
		SHEET 1 OF 2	

1.00.00 DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT:

After the award of contract, the following drawings, data and information is to be submitted for review / approval of BHEL.

1.01.00 The drawings to be submitted by bidder in event of award of contract shall be as per NIT.

1.01.01 Data Sheet -B.

1.01.02 Final versions of the following drawings to enable BHEL to finalise the layout and to design foundations and structures.

a) General arrangement / Installation drawings of the Self Cleaning Strainer with all accessories, indicating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, withdrawal space and scope of supply etc.

b) Foundation arrangement drawings (wherever applicable) showing load data on supports, size and location of anchor bolts etc.

1.02.00 Within the stipulated time period as per vendor's drawing/document list, the following shall be submitted:

1.02.01 Cross-sectional/detailed drawings of filter housing/body, filter screen/section assembly, flushing / backwash unit, differential pressure measuring system, actuators, motors, control panel etc. indicating bill of quantities and materials of construction.

1.02.02 Flow and control logic diagrams for complete filter during normal and flushing operation and system write-up covering all modes of operation.

1.02.03 Final version of performance evaluation procedures at site.

1.02.04 Detailed schedule of valves indicating tag numbers, type, make, size, pressure & temperature ratings, materials etc.

1.02.05 Detailed schedule of power & control cable.

1.02.06 Detailed schedule of piping and fittings indicating sizes, materials, maximum working pressure & temperatures etc.

1.02.07 Control panel layout and list of instruments provided on control panel and internal wiring diagrams.

1.02.08 List of annunciations, protections and interlocks provided.

	TITLE : DATA SHEET - C SELF CLEANING STRAINER (Backwash Type)	SPECIFICATION NO. PE-TS-XXX-165-N004	
		SECTION : II	
		SUB SECTION : IIA	
		REV. NO. 01	DATE : 08.06.2016
		SHEET 2 OF 2	

- 1.02.09 Detailed drawings of flanges.
- 1.02.10 Quality Plan
- 1.02.11 Material test certificates.
- 1.02.12 Shop tests reports and certificates.
- 1.02.13 Write-up and instruction manuals for erection, operation and maintenance.
- 1.02.14 Storage instructions.
- 1.02.15 Vendor to send 3 sets of final documents (O&M Manual, GA drg, P&ID) direct to site under intimation to PEM.

		Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.: PE-V4-XXX-165-N08	
		P.O. No.		Item :	Vendor Q.P. NO.	PROJECT:	
				Self Cleaning Strainer	PACKAGE : SELF CLEANING STRAINER	CUSTOMER:	
				Date :	PURCHASER:		
				Page 01 of 12	CONSULTANT:		
		SL. NO.	DESCRIPTION	PAGE NOS.			
		1	SELF CLEANING STRAINER	2-4			
		2	BALL VALVES	5			
		3	BUTTERFLY VALVES	6			
		4	PRESSURE GAUGE, DP GAUGE, DP SWITCH DP TRANSMITTER	7			
		5	GEAR MOTOR DRIVE & WORM PLANETARY GEAR BOX	8			
		6	ACTUATORS	9			
		7	STARTER PANEL	10			
		8	FASTENERS	11			
		9	ALL COMPONENT / EQUIPMENT	12			
			ANNEXURES				
			DRY RUN TEST PROCEDURE	2			
			HYDRO TEST PROCEDURE	2			
			HYDRO STATIC LEAK TIGHTNESS TESTING PROCEDURE	2			
			PACKING PROCEDURE	1			
Note: Items not included in quality plan to be inspected as per Approved datasheet/drawings.							
		LEGEND					
		* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.					
		** M : Manufacturer/ Sub-contractor					
Manufacturer / Sub-Contractor		Contractor	C : CONTRACTOR	O: OWNER			
Signature			Indicate : "P" - Perform, "W" - Witness and "V" - Verification		Name & Sign. Of approving authority & Seal		

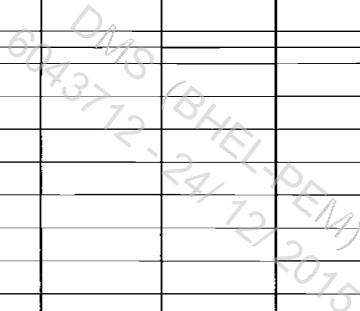
		Manufacturer's Name & Address		STANDARD QUALITY PLAN					BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.		Item :	Vendor Q.P. NO.	PACKAGE : SELF CLEANING STRAINER			PROJECT:				
				Self Cleaning Strainer					CUSTOMER:				
					Date :	Page 02 of 12			PURCHASER:				
									CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	M	C	O	11	
1.0.0	SELF CLEANING STRAINER								**	10			
1.1.0	Raw Material												
[a]	Housing Shell, Nozzle flanges & Main flanges/Counter Flange	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	All raw material identification as per manufacturer TC/Lab report by BHEL
		Physical properties	Major	Physical test	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface Defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate /lab test report /raw material flow sheet	-	P	V	V	
		Sub Surface Defects	Major	Ultrasonic Test	100%	ASME A 435/A609	ASME A 435/A609	Inspection report	*	P	V	V	Plates > 20mm Thk only
[b]	Nozzle Pipes	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Physical properties	Major	Physical test	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate /lab test report /raw material flow sheet	-	P	V	V	
		Leak tightness	Major	Hydrostatic test	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate /lab test report /raw material flow sheet	-	P	V	V	
[c]	Screen basket, Nozzle flanges	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Physical properties	Major	Physical test	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface Defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate /lab test report /raw material flow sheet	-	P	V	V	
		Sub-surface defects	Major	Ultrasonic test	100%	ASME A 745	ASME A 745	Inspection report	*	P	V	V	Plates > 20mm Thk only (UT full volume)
		Corrosion Resistance	Major	IGCI	One/Heat	ASTM A 262	Practice E of ASTM A 262	Test Report	*	P	V	V	
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Manufacturer / Sub-Contractor			Contractor						Name & Sign. Of approving authority & Seal				
Signature													

		Manufacturer's Name & Address			STANDARD QUALITY PLAN				BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.			Item :	Vendor Q.P. NO.		PROJECT:		CUSTOMER:			
					Self Cleaning Strainer	PACKAGE : SELF CLEANING STRAINER		PURCHASER:					
					Date :		CONSULTANT:						
					Page 03 of 12								
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	M	C	O	11	
[d]	Nozzle Pipes	Chemical properties	Major	Chemical Analysis	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Physical properties	Major	Physical test	One sample/cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate / lab test report / raw material flow sheet	*	P	V	V	
		Surface defects	Minor	Visual	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate/ Inspection Report	-	P	V	V	
		Leak tightness	Major	Hydrostatic test	100%	Approved drg/Data sheet	Approved drg/Data sheet	Mill Test Certificate/ Inspection Report	-	P	V	V	
1.2.0	Inprocess Quality Control												
1.2.1	Welding procedure specification	Correctness	Critical	Scrutiny	100%	ASME Sec. IX	ASME Sec. IX	QW 482 of ASME Sec.IX	-	P	V	V	Welders already qualified by BHEL/ LRQA / NTPC in the past shall be employed for this job.
1.2.2	Welding procedure qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 483 of ASME Sec.IX	-	P	V	V	Welding procedure already approved by BHEL/ LRQA / NTPC shall be followed.
1.2.3	Welder performance qualification	Weld soundness	Critical	Physical test	100%	ASME Sec. IX	ASME Sec. IX	QW 484 of ASME Sec.IX	-	P	V	V	Welders already qualified by BHEL/ LRQA / NTPC shall be employed for this job.
1.2.4	Fit-up of butt weld	Alignment, and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book	-	P	V	-	BHEL to witness >20mm thick butt joint.
1.2.5	Fit-up of shell flange and nozzle assembly to shell	Orientation, alignment and dimensions	Major	Template, visual	100%	Manufacturing Drawing	ASME Sec.VIII Div. I	Log book	-	P	-	-	
1.2.6	Weld quality for Pressure Parts												
[a]	Root run	Surface defects	Major	Penetrant test / Visual	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Operation Process Sheet		P	-	-	
[a]	Completed butt welds	1.Surface defects	Major	Penetrant test	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Inspection report	*	P	V	V	
		2.Sub-surface defects	Critical	Radiography test	10% of total weld length+ 100% T Joints.	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 4 / UW 52	Radiographs and inspection report	*	P	V	V	RT films will be reviewed by BHEL
[b]	Completed fillet welds	Surface defects	Major	Penetrant test	100%	ASME Sec.VIII Div. I / sec V	ASME Sec.VIII Div. I Appendix 8	Inspection report	*	P	V	V	
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Manufacturer / Sub-Contractor		Contractor								Name & Sign. Of approving authority & Seal			
Signature													

		Manufacturer's Name & Address		STANDARD QUALITY PLAN					BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.		Item :		Vendor Q.P. NO.		PROJECT:					
				Self Cleaning Strainer		PACKAGE : SELF CLEANING STRAINER		CUSTOMER:					
						Date :		PURCHASER:					
						Page 04 of 12		CONSULTANT:					
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	M	C	O	11	
1.2.8	Pickling and Passivation	Protection Layer	Major	Visual	100%	IS : 10117	IS : 10117	Log Book	--	P	-	-	
1.2.9	Fabricated Shell (Prior to sand blasting)	1.Dimensions, Orientation	Major	Measurement by visual	100%	Manufacturing Drawing	Manufacturing Drawing	Inspection report	*	P	V	V	
		2. Hydro test	Critical	Hydrostatic Pr. @ 1.5 times of design pr.(positive) [Duration 30 minutes]	100%	ASME Sec.VIII Div.1	ASME Sec.VIII Div.1	Inspection report	*	P	V	V	
1.3.0	Final tests (completed equipments) - After assembly	1.Dimensions, orientation, workmanship & finish	Major	Measurement by visual	100%	G.A.drawing	G.A.drawing	Inspection report	*	P	V	V	
		2. Leak tightness for assembly	Critical	Leak test @ design pr.(positive) [Duration minutes] 30	100%	ASME Sec.VIII Div.1	No leakage	Inspection report	*	P	W	V	
		3.Dry function test for Debris filter	Critical	Operational test	100%	Approved Procedure	Approved Procedure	Inspection report	*	P	W	V	
1.4.0	Rubber Lining (Shell)												
1.4.1	Rubber Formulation	Tensile, elongation & hardness	Major	Physical test	One per lot	Manufacturers procedure	BS 6374/Equivalent	Manufacturers Test certificate	*	P	V	V	
		Polymer Identification	Major	Flame test	One per lot	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to bum	For Semi Ebonite /Ebonite Polymer catches fire and on removal from fire continues to bum	Inspection report		P	V	V	
		% Change in weight after 24 hours of immersion in sea water at 70°	Major	Immersion test (bleeding test)	One per lot	ASTM D 471	+/- 1%	Inspection report		P	V	V	
1.4.2	Surface preparation of items to be lined	Free from rust, scale, dust & grease	Major	Visual	100%	SA 2.5	SA 2.5	Manufacturers Internal Inspection report		P	-	-	
1.4.3	Vulcanising	Temperature, Pressure & Time	Major	Process monitoring	100%	Manufacturer's procedure	Manufacturer Procedure	Process Procedure		P	-	-	
1.4.4	Vulcanised Rubber Lined items	[a] Chip test	Major	Chip test	One per lot	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
		[b] Adhesion, Visual defects, Thickness & Hardness	Major	Measurement, Visual Inspection	100% visual Thickness/ hardness at random	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
		[c] Spark test for Pin Holes at 5 kv/mm	Major	Spark test for Pin Holes	100%	Approved Drawing & BS 6374/Equivalent	BS 6374/Equivalent	Inspection report	*	P	V	V	
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : CONTRACTOR O: OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification													
Manufacturer / Sub-Contractor		Contractor		Name & Sign. Of approving authority & Seal									
Signature													

		Manufacturer's Name & Address		STANDARD QUALITY PLAN					BHEL Doc No.: PE-V4-XXX-165-N08			
		P.O. No.		Item :		Vendor Q.P. NO.		PROJECT:		CUSTOMER:		
				Ball Valves		PACKAGE : SELF CLEANING STRAINER		PURCHASER:		CONSULTANT:		
						Date :		Page 05 of 12				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
1	2	3	4	5	6	7	8	9	M	C	O	11
2.0.0	Ball valves											
2.1.0	Materials											
	Body and Tail end pieces	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
2.1.1	Ball	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
2.1.2	Stem	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
2.2.0	In-process inspection											
2.2.1	Ball	Hardness	Major	Hardness Testing	Random	Approved Drg. / Data Sheet	Approved Drg. / Data Sheet	Manufacturers TC	*	P	V	V
2.3.0	Assembly	a) Dimensions	Major	Measurement	100%	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		b) Opening / Closing	Major	Operation	100%	—	As per approved data sheet	—		P	—	V
2.4.0	Testing											
	(a) Body	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2	EN 12266-1&2 / Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	(b) Seat test	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2	EN 12266-1&2 / Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	(c) Seat	Leakage	Critical	Air test	100%	EN 12266-1&2	EN 12266-1&2 / Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
		LEGEND										
		* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.										
		** M : Manufacturer/ Sub-contractor										
Manufacturer / Sub-Contractor		Contractor		C : CONTRACTOR		O : OWNER						
Signature				Indicate "P" - Perform, "W" - Witness and "V" - Verification				Name & Sign. Of approving authority & Seal				

		Manufacturer's Name & Address		STANDARD QUALITY PLAN					BHEL Doc No.: PE-V4-XXX-165-N08			
		P.O. No.		Item :		Vendor Q.P. NO.		PROJECT:				
				Self Cleaning Strainer		PACKAGE : SELF CLEANING STRAINER		CUSTOMER:				
						Date : Page 06 of 12		PURCHASER:				
								CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
1	2	3	4	5	6	7	8	9	M	C	O	11
3.0.0	Butterfly valves											
3.1.0	Materials											
	Body and Disc	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.1	Shaft	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.2	Seal	-	Major	-	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.1.3	Stem	Chemical properties	Major	Chemical properties	One Sample/Cast / heat	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
		Physical properties	Major	Physical properties	One Sample/Cast / heat / batch	Approved drg/Data sheet	Approved drg/Data sheet	Manufacturer's T.C.	*	P	V	V
3.2.0	Assembly	a) Dimensions	Major	Measurement	100%	EN 17292/Appd data sheet	ISO EN ISO 17292/Appd data sheet	Manufacturer's T.C.	*	P	V	V
		b) Opening / Closing	Major	Operation	100%	-	As per approved data sheet	-	*	P	-	-
3.3.0	Testing											
	[a] Body	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API 598	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	[b] Seal test	Leakage	Critical	Hydraulic test	100%	EN 12266-1&2/API 598	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
	[c] Seat	Leakage	Critical	Air test	100%	EN 12266-1&2/API 598	EN 12266-1&2/API 598 & Appd. Data sheet	Manufacturer's T.C.	*	P	V	V
		LEGEND										
				* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.								
				** M : Manufacturer/ Sub-contractor								
Manufacturer / Sub-Contractor		Contractor		C : CONTRACTOR		O: OWNER						
Signature				Indicate : "P" - Perform, "W" - Witness and "V" - Verification								Name & Sign. Of approving authority & Seal

		Manufacturer's Name & Address		Manufacturing Quality Plan					BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.		Item : Pressure Gauge, DP Gauge, DP switch&DP Transmitter		Vendor Q.P. NO.			PROJECT:				
						PACKAGE : SELF CLEANING STRAINER			CUSTOMER:				
						Date : Page 07 of 12			PURCHASER:				
									CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	M	C	O	11	
4.0.0	In process quality control	Make, Range and Model	Critical	Visual	100%	Approved Sheet	Data	Approved Data Sheet	Manufacturer test certificate	*	P	V	V
		Calibration	Critical	Calibration test	100%	Approved Sheet	Data	Approved Data Sheet	Manufacturer test certificate	*	V	V	V
		Degree of protection	Critical	-	Type test certificate	Approved Sheet	Data	Approved Data Sheet	Manufacturer test certificate	*	V	V	V
													
Manufacturer / Sub-Contractor Signature			Contractor Signature			LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : CONTRACTOR O: OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification			Name & Sign. Of approving authority & Seal				

		Manufacturer's Name & Address		Manufacturing Quality Plan					BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.		Item : Geared Motor drive & Worm planetary Gear box		Vendor Q.P. NO.		PROJECT:					
						PACKAGE : SELF CLEANING STRAINER		CUSTOMER:					
						Date : Page 08 of 12		PURCHASER:					
								CONSULTANT:					
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	**	M	C	O	11
5.0.0	GEARED MOTOR DRIVE	Running Test	Critical	Functional Test	100%	Approved Data Sheet	Approved Data Sheet	Manufacturer's compliance certificate	*	P	V	V	
		No load	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet		*	P	V	V	
		Noise test	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet		*	P	V	V	
		Oil leakage test	Critical	Functional test	100%	Approved Data Sheet	Approved Data Sheet		*	P	V	V	
		Visual	Critical	-	100%	Approved Data Sheet	Approved Data Sheet		*	P	V	V	
		Name plate verification	Critical	-	100%	Approved Data Sheet	Approved Data Sheet		*	P	V	V	
5.1.0	Complete Unit of planetary gear	No Leak Test	Critical	Functional test	One Sample/lot	Approved Data Sheet	Supplier Catalogue	Manufacturer's compliance certificate	*	P	V	V	
		Noise Level	Minor	Functional test	One Sample/lot	Approved Data Sheet	Approved Data Sheet			P	V	V	
		Visual Name plate Verification	Minor	-	100%	Approved Data Sheet	Approved Data Sheet			P	V	V	
			LEGEND										
			* Records Identified with "STAR" shall be essentially included by contractor in QA Documentation.										
			** M : Manufacturer/ Sub-contractor										
			C : CONTRACTOR										
			O: OWNER										
Manufacturer / Sub-Contractor Signature			Contractor		Indicate : "P" - Perform, "W" - Witness and "V" - Verification		Name & Sign. Of approving authority & Seal						

		Manufacturer's Name & Address		Manufacturing Quality Plan					BHEL Doc No.: PE-V4-XXX-165-N08				
		P.O. No.		Item : Actuators		Vendor Q.P. NO.			PROJECT:				
				PACKAGE : SELF CLEANING STRAINER			CUSTOMER:						
				Date : Page 09 of 12			PURCHASER:						
									CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks	
1	2	3	4	5	6	7	8	9	M	C	O	11	
6.0.0	Actuators	Functional test	Major	Electrical test	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Test certificate	*	P	V	V	
		Make, Range, Model	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	-	P	-	-	
		Assembly check alongwith valves	Major	Visual	100%	Supplier catalogue/Appd data sheet	Supplier catalogue/Appd data sheet	Inspection Report	-	P	-	-	
		Functional Check along with settings / Auxiliary Contacts	Major	Visual	100%	Supplier catalogue	Supplier catalogue/Appd data sheet	Inspection Report	-	P	-	-	Review of TC's
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : CONTRACTOR O: OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification													
Manufacturer / Sub-Contractor		Contractor							Name & Sign. Of approving authority & Seal				
Signature													

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		Manufacturer's Name & Address			Manufacturing Quality Plan				BHEL Doc No.: PE-V4-XXX-165-N08			
		P.O. No.			Item : Fasteners		Vendor Q.P. NO.		PROJECT:			
					PACKAGE : SELF CLEANING STRAINER		CUSTOMER:					
					Date : Page 11 of 12		PURCHASER:					
								CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
1	2	3	4	5	6	7	8	9	M	C	O	11
8.1.0	Internal Fasteners - SS											
8.1.1	Stainless Steel Fasteners	Chemical properties	Major	Chemical analysis	1 Per heat/HT Batch	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	--	P	V	V
		Physical properties	Major	Physical test	1 per heat	Approved Drawing	Approved Drawing	Test certificate/Compliance certificate	--	P	V	V
		Visual Workmanship finish	Major	Visual	Sample	Approved Drawing	Approved Drawing	Inspection report	--	P	V	V
		Dimensions	Major	Measurement	Sample	Approved Drawing	Approved Drawing	Inspection report	--	P	V	V
8.2.0	Carbon steel fasteners	Visual	Major	Visual	Sample	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	--	P	V	V
		Dimensions	Major	Measurement	Sample	Approved Drawing	Approved Drawing	Manufacturer's certificate / Lab Report	--	P	V	V
		Physical properties	--	Physical test	1 sample per heat	IS : 1367	IS : 1367	Manufacturer's certificate / Lab Report	--	P	V	V
				a) Tensile								
				b) Yield								
				c) Elongation								
				d) Proof load								
			LEGEND									
			* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.									
			** M : Manufacturer/ Sub-contractor									
			C : CONTRACTOR									
			O : OWNER									
			Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor Signature			Contractor								Name & Sign. Of approving authority & Seal	

		Manufacturer's Name & Address		Manufacturing Quality Plan					BHEL Doc No.: PE-V4-XXX-165-N08			
		P.O. No.		Item : All components / Equipments		Vendor Q.P. NO.		PROJECT:				
						PACKAGE : SELF CLEANING STRAINER		CUSTOMER:				
						Date :		PURCHASER:				
						Page 12 of 12		CONSULTANT:				
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency			Remarks
1	2	3	4	5	6	7	8	9	M	C	O	11
9.0.0	All Components / Equipments	Painting Dry film thickness and	Major	Measurement	Random	Painting schedule	Painting schedule	Inspection report	P	V	V	
		Packing	Major	Measurement	100%	Packing Procedure	Packing Procedure	Inspection report	P	-	-	
			LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M : Manufacturer/ Sub-contractor C : CONTRACTOR O: OWNER Indicate : "P" - Perform, "W" - Witness and "V" - Verification									
Manufacturer / Sub-Contractor			Contractor						Name & Sign. Of approving authority & Seal			
Signature												



TITLE:

**TECHNICAL SPECIFICATION
SELF CLEANING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **II**

SUB-SECTION: **IIB**

REV. NO. **0** DATE **01.03.2017**

SHEET **1** OF **1**

SUB-SECTION - IIB

STANDARD TECHNICAL SPECIFICATION (ELECTRICAL)



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO. PE-SS-999-506-E101
VOLUME NO. : II-B
SECTION : D
REV NO. : 00 DATE : 29/08/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 1 OF 4

1.0

INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0

CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machnines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0

DESIGN REQUIREMENTS

3.1

Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2

Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3

Starting Requirements

3.3.1

Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2

Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 2 OF 4
The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.		
3.3.3 The following frequency of starts shall apply i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature. ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour) iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor		
3.4 Running Requirements		
3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.		
3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.		
3.5 Stress During bus Transfer		
3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.		
3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.		
3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.		
3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.		
4.0 CONSTRUCTIONAL FEATURES		
4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy		
4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362. Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled		
4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.		

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 3 OF 4
4.4.	Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.	
4.5	Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.	
4.6	In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.	
4.7	Terminals and Terminal Boxes	
4.7.1	Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A. Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".	
4.7.2	unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.	
4.7.3	Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W & V respectively.	
4.7.4	Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.	
4.7.5	Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.	
4.7.6	Degree of protection for terminal boxes shall be IP 55 as per IS 4691.	
4.7.7	Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.	
4.7.8.	Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.	
4.7.9	Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.	
4.8	Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.	
4.9	General	

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 4 OF 4
4.9.1 Motors provided for similar drives shall be interchangeable. 4.9.2 Suitable foundation bolts are to be supplied alongwith the motors. 4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above. 4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956. 4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz. 4.9.6 Name plate with all particulars as per IS: 325 shall be provided 4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions. 5.0 INSPECTION AND TESTING 5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied. 5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser. 5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan. 5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A. 6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT a) OGA drawing showing the position of terminal boxes, earthing connections etc. b) Arrangement drawing of terminal boxes. c) Characteristic curves: (To be given for motor above 55 kW unless otherwise specified in Data Sheet). i) Current vs. time at rated voltage and minimum starting voltage. ii) Speed vs. time at rated voltage and minimum starting voltage. iii) Torque vs. speed at rated voltage and minimum voltage. For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling. iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.		

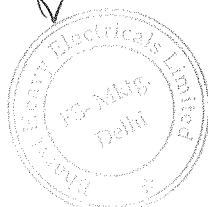


NTPC SAIL POWER COMPANY (P) LIMITED
1X250 MWT.P.P. AT ROURKELA
TECHNICAL SPECIFICATION FOR
POWER PLANT TURNKEY PACKAGE
VOLUME : I



E-48

MOTORS





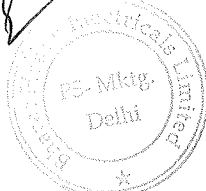
NTPC SAIL POWER COMPANY (P) LIMITED
1X250 MW T.P.P. AT ROURKELA
TECHNICAL SPECIFICATION FOR
POWER PLANT TURNKEY PACKAGE
VOLUME : I



QUALITY ASSURANCE

MOTOR

TESTS/CHECKS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
TEMS/COMPONENTS									
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 NSPCL approval. Y1 = for HT Motor / Machines only.									





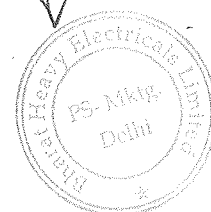
NTPC SAIL POWER COMPANY (P) LIMITED
1X250 MW T.P.P. AT ROURKELA
TECHNICAL SPECIFICATION FOR
POWER PLANT TURNKEY PACKAGE
VOLUME : I



QUALITY ASSURANCE

MOTOR

TESTS/CHECKS	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
ITEMS/COMPONENTS										
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material	Y		Y							
Rotor Copper/Aluminium			Y							
Stator copper										
SC Ring			Y							
Insulating Material		Y								
Tubes for Cooler		Y								
Sleeve Bearing										
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter				Y	Y					
Rotor complete										
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD, CT, , Space heater, antifriction bearing, gaskets etc.						Y	Y	Y	Y1	Y
Complete Motor										
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 NSPCL approval. Y1 = for HT Motor / Machines only.										



		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION :				
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION TITLE				
		SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6	7	8	9	10	P	W	V	11
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-		
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-		
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-		
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-		
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3	
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3	
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
		SHEET 2 OF 2		SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
NOTES: 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON 2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS		BIDDER/VENDOR				BIDDER'S/VENDORS COMPANY SEAL			
			NAME									
			SIGNATURE									
			DATE									

AS APPLICABLE

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW)	
	TECHNICAL SPECIFICATION FOR EPC PACKAGE	

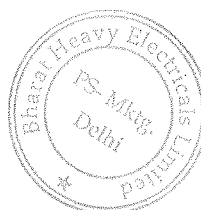
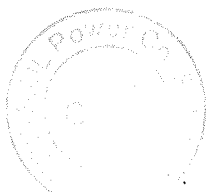
	SATARA/PUNE
	GRIP, FARIDABAD/HYDERABAD
	HERCULES HOIST, RAIGAD
	REVA INDUSTRIES, FARIDABAD
	ALPHA SERVICES, BHIWADI
	CENTURY CRANE, PALWAL

Elect. Aux.

Sl. No.	Item	SUB-SUPPLIERS PROPOSED
1.	HT MOTORS FOR ID FAN & BFP (SUB QR ITEM)	TECO, TAIWAN
		ASIR ROBICON, ITALY
		HYUDAI, KOREA
		BHEL, BHOPAL
		HYUDAI, KOREA
		WEG, BRAZIL
		WEG, HOSUR
		TMEIC, JAPAN
		SHANGHAI ELECTRIC, SHANGHAI
		CONVERTEAM, FRANCE
2.	OTHER HT MOTORS	VENDORS AT SR. NO 1 ARE ALSO ACCEPTABLE
		ABB, VADODARA
		CGL (D5 INDUSTRIAL AREA), MANDIDEEP
		MARATHON, KOLKATA
		IJLIN, KOREA
		LEZ, RUSSIA
		JYOTI, VADODARA
3.	LT MOTOR	ABB, FARIDABAD*/BANGALORE
		HYUDAI, KOREA
		WEG, BRAZIL
		JYOTI, VADODARA
		NGEF, BANGALORE
		HYOSUNG, KOREA
		SIEMENS, MUMBAI
		MARATHON, KOLKATA
		KEC, BANGALORE/HUBLI
		BHARAT BIJLEE, MUMBAI
		CGL, AHMEDNAGAR

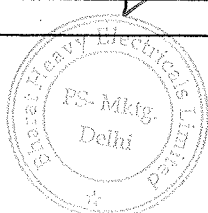
	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		TIPM, JAPAN
		KAWAMATA, JAPAN
		ABB, SWEDEN
		TMEIC, JAPAN (NAGAS HAKI)
		ABB, SHANGHAI
4.	ELEVATOR	KONE, CHENNAI
		ECE, GHAZIABAD
		OTIS, MUMBAI
		OMEGA ELEVATORS, AHMEDABAD
		SAMIL ELECT. KOREA
		TECHNO INDUSTRIES, AHMEDABAD
5.	HVR TRANSFORMER	HIND RECTIFIER, MUMBAI
		ADOR POWERTRON, PUNE
6.	EC PANEL	HIND RECTIFIER, MUMBAI
		ADOR POWERTRON, PUNE
7.	INSULATOR (BUSHING, SUPPORT & SHAFT)	BHEL EPD, BANGALORE
		ZHANGJIAKOU XUANHUA XINDI, CHINA
8.	DISCONNECTING SWITCH	WINCRAFT, KOLKATA
		NATIONAL ENGINEERS, KOLKATA
9.	PANEL TYPE HOPPER HEATER	THERMON, USA
		HOTFOIL EHS, USA
		HTD, USA
		HTD HEAT TRAC E (I) PVT LTD., HYDERABAD
10.	TUBULAR HEATER	ESCORTS, FARIDABAD
11.	GEARED MOTOR	PBL, V V NAGAR
		PTL, AURANGABAD
		NAW, KOLKATA
		INTERNAL COMBUSTION, AURANGABAD



	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP - III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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25.	GI PIPE	BIS LICENSEE
26.	STEEL CONDUIT/EXPOXY COATED CONDUIT	BIS LICENSEE
27.	LEAD COATED FLEXIBLE CONDUITS	M/S PLICA, GHAZIABAD
28.	JUNCTION BOXES/LINK BOXES TEST LINK BOX /ADAPTOR BOX	M/S POSITRONICS, VADODRA
		M/S PYROTECH, UDAIPUR
		M/S CONQUERENT CONTROL SYSTEM LTD, MANESAR
		M/S JAKSON, NOIDA
		M/S SWITCHING CIRCUIT, KOLKATA
		M/S SARVANA SWITCHGEAR, BANGALORE
		M/S AJMERA, MUMBAI
29.	JUNCTION BOXES-FRP/THERMOSETTING PLASTIC/THERMO PLASTIC	SUMIP COMPOSITES, AHMEDABAD
		KEMROCK, VADODARA
		AJMERA, MUMBAI
		TRINITY TOUCH, PALWAL
30.	LT CABLE STRAINGHT THROGH JOINTING KIT	M/S RAYCHEM, MUMBAI
		M/S 3M ELECTRO & COMMUNICATION., PUNE
31.	HT CABLE TERMINATION KITS & STRAIGHT THROUGH JOINTING KIT	M/S 3M ELECTRO & COMMUNICATION., PUNE
		RAYCHEM, MUMBAI
32.	CABLE GLAND	M/S SUNIL & CO. KOLKATA
		M/S ARUP ENGG. KOLKATA
		M/S COMET, MUMBAI
		M/S QUALITY PRECISION, KOLKATA
		M/S STANDARD METAL, MUMBAI
		M/S BRACO, MUMBAI
33.	CABLE LUGS/FERRULES	M/S DEWELL, MUMBAI
		3D, UMBERGAON
		CHETNA, NASIK
34.	TUBULAR POLE	BIS LICENSEE AS PER IS 2713 WITH VALID CML NO.
35.	LIGHTING FIXTURES WITH ACCESSORIES (FILAMENT TYPE)	M/S CGL, MUMBAI
		M/S BAJAJ ELECTRICALS, MUMBAI
		M/S PHILIPS, NOIDA
		M/S WIPRO, MUMBAI
38.	LAMPS (FILAMENT TYPE)	M/S CROMPTON, MUMBAI
		M/S BAJAJ ELECTRICALS, MUMBAI
		M/S PHILIPS, NOIDA



	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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	EXHAUST FANS	
		M/S ORIENT
		M/S KHAITAN
		M/S POLAR
		M/S GEC
		M/S HAVELLS
		M/S BAJAJ
45.	BATTERY FOR DG SET	M/S EXIDE, KOLKATA
46.	HUME PIPE	BIS LICENSEE
47.	PVC CONDUIT	BIS LICENSEE/ISI MARKED WITH VALID CML NUMBER
51.	FQP OF DG SET	
52.	FQP OF CABLE & ACCESSORIES	
53.	FQP OF EARTHING	
54.	FQP OF STATION LIGHTING	
57.	ERECTION AGENCY FOR THE SCOPE OF ERECTION	MAIN CONTRACTOR/MAIN CONTRACTOR APPROVED SOURCES

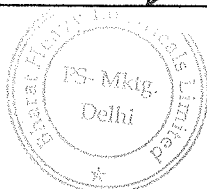


	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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Sl. No.	Item	SUB-SUPPLIERS PROPOSED
1.	SF6 CIRCUIT BREAKER (ITEM SUBJECT TO SUB QR APPROVAL)	ALSTOM, HOSUR SIEMENS, AURANABAD CGL, NASIK ABB, VADODARA
2.	ISOLATOR (HCB)/PANTOGRAPH/TANDEM (ITEM SUBJECT TO SUB QR APPROVAL)	GR POWER, HYDERABAD HIVELM, CHENNAI ELPRO (SIEMENS), HYDERABAD SWITCHGEAR AND STRUCTURALS, HYDERABAD
3.	CURRENT TRANSFORMER (ITEM SUBJECT TO SUB QR APPROVAL)	ALSTOM, HOSUR ABB, VADODARA MEHRU ELECT & MECH LTD, BHIWADI CGL, NASIK
4.	CAPACITOR VOLTAGE TRANSFORMER (ITEM SUBJECT TO SUB QR APPROVAL)	ALSTOM, HOSUR ABB, VADODARA MEHRU ELECT & MECH LTD, BHIWADI CGL, NASIK BHEL, JHANSI
5.	SURGE ARRESTOR (ITEM SUBJECT TO SUB QR APPROVAL)	LAMCO, HYDERABAD OBLUM, HYDERABAD CGL, NASIK
6.	WAVE TRAP	ALSTOM, HOSUR BPL, PALGHAT
7.	BUS POST INSULATOR	MODERN INSULATOR, ABU ROAD

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		IEC, BHOPAL BIRLA NGK (INDIAN RAYON), HALOL WSI, CHENNAI SARAVANA GLOBAL ENERGY, CUDDALORE
8.	CLAMPS & CONNECTORS & WELDING SLEEVES	KLEMMEN ENGG, CHENNAI MILIND, MUMBAI EMTT, KOLKATA NOOTAN ENGG., MUMBAI ITPL, MUMBAI RASHTRIYA UDYOG, KOLKATA PEE VEE ENGG., BANGALORE MEGHA ENGG, CHENNAI
9.	ACDB/DCDB (Fixed Type)	
10.	INSULATOR HARDWARE, CONDUCTOR ACCESSORIES & EARTHWIRE ACCESSORIES	RASHTRA UDYOG, KOLKATA IAC, KOLKATA ITPL, MUMBAI EMTT, KOLKATA EMI, MUMBAI
11.	BMK'S/JB'S (ALL TYPES)/LIGHTING PANELS	
12.	DISC INSULATOR	IEC, BHOPAL BIRLA NGK (INDIAN RAYON), HALOL WSI, CHENNAI MODERN INSULATOR, ABU ROAD

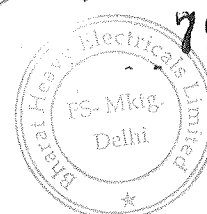


	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		BHEL, JHANSI
13.	GS FLAT/40MM DIA M.S.ROD/M.S EARTH RODS/U CLAMP/GI EARTH PIPE/GI PIPE /GI CONDUIT (INCLUDING BENDS)/PVC PIPES	MAIN CONTRACTOR APPROVED SOURCES
14.	ALUMINIUM TUBE	HINDALCO, RENUKUT INDALCO, ALUPURAM CENTURY EXTRUSIONS, KOLKATA JINDAL ALUMINUM TUBE, BANGALORE ALOM EXTRUSIONS, KOLKATA BALCO, KORBA
		SUDAL, NASIK
15.	CABLE TRAY, BENDS, COUPLER PLATES	
16.	ACSR CONDUCTOR	SMITHA, GHAZIABAD HINDUSTAN VIDYUT, FARIDABAD APAR INDUSTRIES, VADODARA/SILVASSA CABCON, HOWRAH HIRA CABLES, HIRAKUD SHARAVATHY CONDUCTORS, BANGALORE GALAXY TRANSMISSION, SANGLI
17.	GS EARTHWIRE/LIGHTING WIRE	MAIN CONTRACTOR APPROVED SOURCES
18.	CABLE GLANDS	
19.	1.1 KV GRADE POWER AND CONROL CABLES	
20.	CABLE LUGS	
21.	LIGHTING FIXTURES & LUMINARIES	
22.	LIGHTING POLE	BIS APPROVED VENDORS AS PER IS-2713*
23.	INDUSTRIAL RECEPTACLES	
24.	LEAKAGE CURRENT ANALYSER	ISA, ITALY

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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F	STATION HMI COMPUTER/OWS/EWS	IBM/ADVANTECH
G	LASER PRINTER	HP/CANON
H	DOT MATRIX PRINTER	TBSF/WIPRO/LIPI
I	LAN SWITCHES	CISCO/D-LINK/3-COM
J	FIBRE OPTIC CABLE	BIRLA ERICSSON, REVA FINOLEX, PUNE AKSH OPTIC FIBRE, BHIWARI
K	UPS FOR PC	DB/HIREL/3EL/APC, INDIA
L	LARGE VIDEO SCREEN	BARCO, GERMANY DELTA, CHINA
M	FURNITURE FOR HMI & PRINTER	MAIN CONTRACTOR APPROVED SOURCES
N	GATEWAY	DELL/IBM, USA
O	MODEMS	ALSTOM/NOMUS/ABB/BPL, INDIA
P	RELAY TEST KIT	OMICRON, USA/AUSTRALIA SCOPE T&M, PUNE
Q	TIME SYNCHRONISING EQPT.	SERTEL, MUMBAI SIEMENS, GERMANY HATHWAY, UK/USA HOPE, GERMANY ARBITER, USA
R	DISTURBANCE RECORDER	ABB, FINLAND ALSTOM, USA SIEMENS, GERMANY HATHWAY, UK
S	ETHERNET SWITCH	HIRSCHMANN, GERMANY GARETTCOM, USA RUGGEDCOM, CANADA
T	NUMERICAL RELAYS	ABB, FINLAND





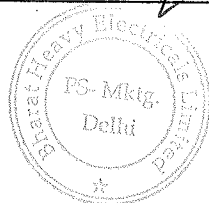
NTPC SAIL POWER COMPANY (P) LIMITED
ROURKELA POWER PROJECT
(PP - III : 1X250 MW)



TECHNICAL SPECIFICATION FOR
EPC PACKAGE

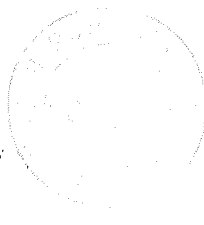
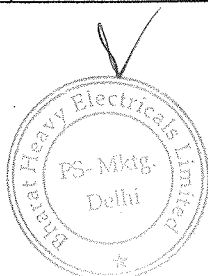
Sl. No.	Item	SUB-SUPPLIERS PROPOSED
1.	VVFD PANEL (UP TO 690V)	ABB, BANGALORE
		SIEMENS, NASIK
		ROCKWELL/ALLEN BRADLEY, SAHIBABAD
		SCHNEIDER, NASIK
		POWERTECH SWITCHGEAR, NARELA
		DANFOSS, CHENNAI
		L&T, MUMBAI
2.	LT TRANSFORMER (DRY TYPE). UP TO 2 MVA	VIJAY ELECTRICALS, HYDERABAD
		KEC, PUNE
		VLTAMP, SAVLI
		BHEL, JHANSI
3.	HT/LT EPR TRAILING CABLE	NICCO, SHYAMNAGAR
		UNIVERSAL CABLES, SATNA
		KEI, BHIWADI
4.	IN-LINE MAGNETIC SEPARATOR/SUSPENDED MAGNET	ELECTROMAG, MUMBAI
		MAGNETIC CORPORATION, BANGALORE
		ELECON EPC, SAVLI
		ELECTRO ZAVOD, KOLKATA
5.	METAL DETECTOR	ELECON EPC, SAVLI
		SIVA SYSTEMS, GOA
		ELECTROMAG, MUMBAI
		THERMO RAMSEY, AUSTRALIA
6.	ELECTROMAGNETIC (EM) BRAKE	ELECTROMAG, MUMBAI
		WITTON CRAMMER BROOK CROMPTON, UK
		STORM-CRAFT, MUMBAI
		BCH, FARIDABAD
7.	ELECTROHYDRO THRUSTER (EHT) BRAKE/EHT RAIL CLAMPS	PINTCH BUBNEZER, GERMANY
		ELECTROMAG, MUMBAI
		SIBRE, GERMANY
		RIMA SRL, ITALY
		WMI, MUMBAI
8.	ACTUATORS (WITHOUT INTEGRAL STARTER)	MMH, KOLKATA
		ONTINENTAL, FARIDABAD
		PREPEC, KOLKATA
		UNITED TECHNOMECH, MUMBAI
		LIMITORQUE, FARIDABAD

Power



	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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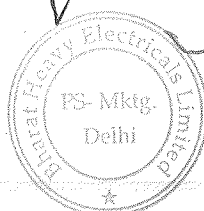
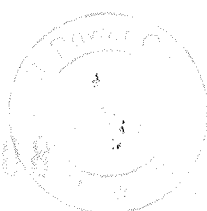
9.	GEARED MOTOR	PBL, VV NAGAR
		SEW EURODRIVE, GERMANY
		SIEMENS, GERMANY
		NAW, KOLKATA
		PREMTUM TRANSFORMATION, AURANGABAD
		INTERNAL COMBUSTION, AURANGABAD
10.	BELT WEIGHER	KISTLER MORSE, HYDERABAD
		THERMO RAMSEY, AUSTRALIA
		ELECON EPC, SAVALI
		AVERY INDIA, BALLABHGARH
11.	WEIGH BRIDGE	AVERY INDIA, BALLABHGARH
		RICE LAKE, SRIPEREMBUDDUR
12.	PULL CORD SWITCHES/BELT SWAY SWITCHESUNDER BELT SWITCHES	JAYASHREE, PUNE
		KAKKU, BHILAI
		PROTO CONTROL, PUNE
		AG SYSTEM, MUMBAI
13.	ELECTRONIC SPEED SWITCHES, ZERO SPEED SWITCHES, TILT SWITCHES, MAGNETIC SWITCHES, PROXIMITY SWITCHES	PG ELECTRONICS, MUMBAI
		PROTO CONTROL, PUNE
		JAYASHREE, PUNE
14.	HEAVY DUTY LIMIT SWITCHES, SCREW CAM LIMIT SWITCH.	JAI BALAJEE, CHENNAI
		KAKKU, BHILAI
		JAYASHREE, PUNE
		BCH, FARIDABAD
		AG SYSTEM, MUMBAI
		ELEKTROMAG, MUMBAI
15.	PULL CORD/BELT SWAY SWITCH POSITION INDICATION SYSTEM	PARAMETRIC, PUNE
		JAYASHREE, PUNE
		PROTO CONTROL, PUNE
16.	CABLE REELING DRUM	ELECON, V V NAGAR
		ELEKTROMAG, VAPI
		BENGAL TECHNOCRATS, KOLKATA
		ELECTROZAVOD, KOLKATA
17.	TRAVELLING TRIPPER POSITION INDICATING SYSTEM	JAYASHREE, PUNE
18.	AIR HEATER	ESCORT, FARIDABAD



	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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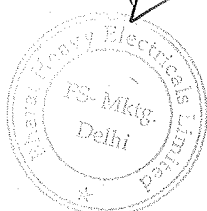
HT POWER CABLES , LT POWER CABLES,

Sl. No.	Item	SUB-SUPPLIERS PROPOSED
1.	HT CABLE UPTO 33KV (L-2 LEVEL VENDOR- REFER NOTE-4)	UNIVERSAL CABLE, LTD, SATNA
		TORRENT CABLE LTD, NADIAD
		POLYCAB WIRES PVT. LTD, DAMAN
		KEI INDUSTRIES, BHIWADI
		HAVELLS INDIA LTD, ALWAR
		FINOLEX, PUNE
		UNIFLEX, VALSAD
		NICCO, SHAMNAGAR KOLKATA
		INCAB, PUNE
		SRI RAM CABLES, BHIWADI
2.	1.1 KV POWER CABLE (PVC & EXPE) (L-2 LEVEL VENDOR- REFER NOTE-4)	UNIVERSAL CABLE, LTD, SATNA
		NICCO, SHAMNAGAR KOLKATA
		TORRENT CABLE LTD, NADIAD
		INCAB, PUNE
		HINDUSTAN VIDYUT PRODUCTS LTD, FARIDABAD
		KEI INDUSTRIES, BHIWADI
		DELTON CABLE LTD., FARIDABAD
		PARAMOUNT CABLE, KHUSHKHERA
		POLYCAB WIRES PVT. LTD, DAMAN
		GEMSCABLES, BHIWADI
		HAVELLS INDIA LTD, ALWAR
		SHRI RAM CABLES, BHIWADI
		RAVIN CABLES, PUNE
		THERMOCABLES, HYDERABAD
		SBEE CABLES, BANGALORE
		SUYOG CABLES, VADODARA
		GUPTA POWER CABLES, BHUBANESWAR
		FINOLEX, PUNE
3.	1.1 KV CONTROL CABLE (L-2 LEVEL VENDOR- REFER NOTE-4)	NICCO, SHAMNAGAR KOLKATA
		TORRENT CABLE LTD, NADIAD
		INCAB, PUNE
		POLYCAB WIRES PVT. LTD, DAMAN
		HINDUSTAN VIDYUT PRODUCTS LTD, FARIDABAD
		KEI INDUSTRIES, BHIWADI
		DELTON CABLE LTD., FARIDABAD



	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP - III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		PARAMOUNT CABLE, KHUSHKHERA
		GEMSCABS INDUSTRIES, BHIWADI
		CORDS CABLES, BHIWADI
		SPM CABLES, BHIWADI
		ELKAY TELELINK, FARIDABAD
		HAVELLS INDIA LTD, ALWAR
		R.R.CABLE, SILVASA
		RAVIN CABLES, PUNE
		GUPTA POWER CABLES, BHUBANESWAR
		THERMOCABLES, HYDERABAD
		FINOLEX, PUNE
		SBEE CABLES, BANGALORE
		SUYOG CABLES, VADODARA
		SUYOG CABLES, VADODARA
		UNIVERSAL CABLES, SATNA
4.	FQP OF CABLE & ACCESSORIES	
5.	ERECTION AGENCY FOR THE SCOPE OF ERECTION	MAIN CONTRACTOR/MAIN CONTRACTOR APPROVED SOURCES



COMPREHENSIVE & UPDATED LIST OF MAIN VENDORS FOR BoIs PROCURED BY ELECTRICAL, C&I, MPL & MSE TO BE USED AS APPROVED SUB-VENDORS FOR BoP/ BoI PACKAGES						
S. No.	Deptt.	Package	PMD Vendor/ Sub Vendor	Vendor Address	Remarks	COLTCS/SCF/DF/TBS
1	Electrical	LV MOTORS (NON FLAME PROOF)	ABB	14, MATHURA ROAD, FARIDABAD, HARYANA-121003	Sub vendor	YES
2	Electrical	LV MOTORS (NON FLAME PROOF)	BHARAT BIJLEE LTD.	BHARAT BIJLEE LIMITED, 1ST FLOOR, 7-B, RAJINDRA PARK, PUSA ROAD, NEW DELHI - 110 060.	Sub vendor	YES
3	Electrical	LV MOTORS (NON FLAME PROOF)	CROMPTON GREAVES	3RD FLOOR, EXPRESS BUILDING,9-10, BAHADUR SHAH ZAFAR MARG, NEAR ITO CROSSING,NEW DELHI-110002, INDIA	Sub vendor	YES
4	Electrical	LV MOTORS (NON FLAME PROOF)	GE-POWER	KAMAK TOWER, 3RD FLOOR, PLOT NO. 12-A, TVK INDUSTRIAL ESTATE, EKKADUTHANGAL, GUINDY, CHENNAI-600032	Sub vendor	YES
5	Electrical	LV MOTORS (NON FLAME PROOF)	KIRLOSKAR ELECTRIC CO LTD.	P.O. BOX 5555 , MALLESWARAM WEST ,BANGALORE 560055	Sub vendor	YES
6	Electrical	LV MOTORS (NON FLAME PROOF)	LAXMI HYDRAULICS PVT. LTD	129/130, INDUSTRIAL ESTATE PATIL NAGAR, HOTGI ROAD SOLAPUR-413003, MAHARASHTRA	Sub vendor	YES
7	Electrical	LV MOTORS (NON FLAME PROOF)	MARATHON	MARATHON ELECTRIC INDIA PRIVATE LTD.SECTOR - 11, MODEL TOWN, FARIDABAD - 121006	Sub vendor	YES
8	Electrical	LV MOTORS (NON FLAME PROOF)	NGEF	POCKET NO.10, FLAT NO. 37 & 38, EXPANDABLE DDA FLATS, NASIRPUR DWARKA, PHASE-I NEW DELHI-110 045	Sub vendor	YES
9	Electrical	LV MOTORS (NON FLAME PROOF)	RAJINDRA ELECT INDUSTRIES	14 SHAH IND.ESTATE VEERA DESAI RD,ANDHERI(W) MUMBAI-400053	Sub vendor	YES
10	Electrical	LV MOTORS (NON FLAME PROOF)	SIEMENS	RC-IN I S NR DEL AREA, JIL BUILDING, TOWER-B, PLOT NO. 78, SECTOR 18, GURGAON-122015, INDIA	Sub vendor	YES
11	Electrical	LV MOTORS (FLAME PROOF)	RAJINDRA ELECT INDUSTRIES	14 SHAH IND.ESTATE VEERA DESAI RD,ANDHERI(W) MUMBAI-400053	Sub vendor	YES
12	Electrical	JUNCTION BOXES (NON FLAME PROOF)	JASPER ENGINEERS PVT. LTD.	A-23, SECTOR - 8, NOIDA-201301	Sub vendor	YES
13	Electrical	JUNCTION BOXES (NON FLAME PROOF)	Electro Controls & Devices	M/S ELECTRO CONTROLS & DEVICES, F-41, SITE-C, SURAJPUR INDUSTRIAL AREA GREATER NOIDA, UTTAR PRADESH :201308	Sub vendor	YES
14	Electrical	JUNCTION BOXES (NON FLAME PROOF)	M/s Shrenik & Co.	39A/3, PANCHRATNA INDUSTRIAL ESTATE, SARKHEJ-BAVLA ROAD, CHANGODAR, AHMEDABAD – 382 213	Sub vendor	YES

15	Electrical	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Sub vendor	YES
16	Electrical	JUNCTION BOXES (NON FLAME PROOF)	Adroit Control Engineers Pvt.Ltd.	M/S ADROIT CONTROL ENGINEERS PVT.LTD. PLOT-3, KRISHNA INDL. AREA, SECTOR-25 FARIDABAD – 121004	Sub vendor	YES
17	Electrical	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Sub vendor	YES
18	Electrical	JUNCTION BOXES (NON FLAME PROOF)	MIKA ENGINEERS	BRANCH OFFICE : 'D'-101, DHEERAJ HERITAGE RESIDENCY II, SHASTRI NAGAR, SANTACRUZ (W), MUMBAI 400 054.	Sub vendor	YES
19	Electrical	JUNCTION BOXES (NON FLAME PROOF)	M/s PHOENIX MECANO LTD.,	388 BHARE, TALUKA MULSHI, POST GHOTAWADE, PIRANGOOT, INDUSTRIAL AREA, PUNE-412115	Sub vendor	YES
20	Electrical	JUNCTION BOXES (NON FLAME PROOF)	BAJAJ ELECTRICALS	BAJAJ ELECTRICALS LTD. ENGINEERING & PROJECTS BU (NORTH) 3rd FLOOR, GULMOHARHOUSE, COMMUNITY CENTRE 161/B-4, GAUTAM NAGAR, YUSUF SARAI NEW DELHI – 110049	Sub vendor	YES
21	Electrical	JUNCTION BOXES (NON FLAME PROOF)	AJMERA INDUSTRIES & ENGG. WORKS	AJMERA INDL. AND ENGG. WORKS. AJMERA HOUSE, A-61 / KHAIRANE MIDC. , TTC INDL. AREA, NAVI MUMBAI – 400705.	Sub vendor	YES
22	Electrical	JUNCTION BOXES (NON FLAME PROOF)	S.B. ELECTRICAL ENGINEERING CORPORATION	03, SARDAR GRIHA BUILDING, LOHAR CHAWAL, MUMBAI-400002	Sub vendor	YES
23	Electrical	JUNCTION BOXES (FLAME PROOF)	SUDHIR SWITCHGEAR	305/6, APEEJAY HOUSE, 130, BOMBAY SAMACHAR MARG, MUMBAI - 400 023. INDIA	Sub vendor	YES
24	Electrical	LT XLPE POWER CABLE	APAR INDUSTRIES LTD.	Mr. Vijay Kumar Bajaj 12/13,Jyoti Wire House,23-A,Shah Ind Est Off. Veera Desai Road, Andheri (West). Mumbai-Maharashtra-India, Phone- 022-26740001 Pincode : 400053 Email : info.cable@apar.com	PMD	YES
25	Electrical	LT XLPE POWER CABLE	CORDS CABLE INDUSTRIES LTD.	MR. NAVEEN SAWHNEY B-1/A-26, MOHAN CO-OPERATIVE INDUSTRIAL ESTATE, MATHURA ROAD, NEW DELHI-DELHI-INDIA Phone- 9818356799 Pincode : 110044 Email : sg@cordscable.com	PMD	YES
26	Electrical	LT XLPE POWER CABLE	CRYSTAL CABLE INDUSTRIES LTD.	Shri Vinod Kumar Gupta 32, GANESH CHANDRA AVENUE, KOLKATA-WEST BENGAL-INDIA Phone- 9339767435 Pincode : 700013 Email : cghosh@crystalcable.in	PMD	YES
27	Electrical	LT XLPE POWER CABLE	GEMSCAB INDUSTRIES LTD.	Sh. A. N. Pathak, (GM/Business Develop.) 40, Rajasthani Udyog Nagar, G.T. Karnal Road, NEW DELHI-Delhi-India Phone- 09212560974 Pincode : 110033, Email : sureshchandra@gemscab.com	PMD	YES
28	Electrical	LT XLPE POWER CABLE	Govind Cable Industries,	73/1, Cotton Street, Kolkata,-WB,-India, Phone- 9331055614, Pincode : 700007, Email : govindcable_kol@vsnl.net,	PMD	YES

29	Electrical	LT XLPE POWER CABLE	GUPTA POWER INFRASTRUCTURE LIMITED,	Mr. Gorav Atri,502, 5th Floor, K M Trade Tower,Radisson Blu Complex, Sector-14, Kaushambi Ghaziabad-Uttar Pradesh-India, Phone- 8130388991 Pincode : 201010 Email : gorav@guptapower.com,	PMD	YES
30	Electrical	LT XLPE POWER CABLE	HAVELLS INDIA LTD.	QIMAT RAI GUPTA QRG Towers, Plot 2D, Sector 126, Expressway NOIDA-U.P.-INDIA Phone- 95605 88484 Pincode : 201304 Email : marketing@havells.com	PMD	YES
31	Electrical	LT XLPE POWER CABLE	KEI INDUSTRIES LTD.	Mr. ANIL GUPTA D-90, OKHLA INDUSTRIAL AREA, PHASE-I, NEW DELHI-DELHI-INDIA Phone- 011-26818840 Pincode : 110020 Email : lalit.saxena@kei-ind.com	PMD	YES
32	Electrical	LT XLPE POWER CABLE	KEC INTERNATIONAL LIMITED	Mr. Radheshyam Singh CEAT MAHAL, 1ST FLOOR, 463, DR. ANNIE BESANT ROAD,WORLI, MUMBAI-MAHARASHTRA-INDIA Phone-9930980158 Pincode : 400 030 Email : singhrb@kecrpg.com;yudhister@kecrpg.com	PMD	YES
33	Electrical	LT XLPE POWER CABLE	MANSFIELD CABLES COMPANY LTD.	Mr. J.P.S. Chadha B-41, Sector-6, Noida-U.P.-India Phone- 0120-2422275 Pincode : 201301 Email : sales@mansfieldcable.com	PMD	YES
34	Electrical	LT XLPE POWER CABLE	PARAMOUNT COMMUNICATIONS LTD.	C-125, Naraina Industrial Area, Phase-I, NEW DELHI-DELHI-INDIA Phone-9958898025 Pincode : 110005 Email : jatan.singh@paramountcables.com	PMD	YES
35	Electrical	LT XLPE POWER CABLE	POLYCAB WIRES PVT. LTD.	HICO HOUSE, 1st FLOOR, 771, PANDIT SATWALEKAR MARG, MAHIM, MUMBAI-MAHARASHTRA-INDIA Phone-011-29841697 Pincode : 400016 Email : lnsingh@polycab.com	PMD	YES
36	Electrical	LT XLPE POWER CABLE	RAVIN CABLES LIMITED	MR.PRAKASH LAKHKAR 30,AKRUTI TRADE CENTRE, 3RD FL, ROAD NO.7 , MIDC ,MAROL,ANDHERI (E) MUMBAI-MAHARASHTRA-INDIA Phone-09324081733 Pincode : 400093 Email : surendra.rawat@ravingroup.com	PMD	YES
37	Electrical	LT XLPE POWER CABLE	SUYOG ELECTRICALS LTD.	Mr.Bimal Y.Desai/Mr. Haresh Hansoti 1, Madhuvan Apartment,24 Arunoday Society,Alkapuri VADODARA-GUJARAT-INDIA Phone- 9227192737 Pincode : 390 007 Email : suyog@sepcables.com	PMD	YES
38	Electrical	LT XLPE POWER CABLE	SPECIAL CABLES PVT. LTD.	MR. RAHUL KHANNA/MR. SANDEEP VERMA 6, COMMUNITY CENTRE, East of Kailash,opp.Sapna Cinema NEW DELHI-Delhi-INDIA Phone- 9310861167 Pincode : 110065 Email : sales@specialcables.co.in;	PMD	YES
39	Electrical	LT XLPE POWER CABLE	SRIRAM CABLES PVT. LTD.	Anil Garg / Sunil Garg Flat No. 102, A 8A Rama Road, Adarsh Nagar Delhi-Delhi-India Phone- 011-27670005 Pincode : 110033 Email : contact@sriramcables.com	PMD	YES
40	Electrical	LT XLPE POWER CABLE	THERMO CABLES LTD.	Ms.UMA GHURKA/N.SRINIVASA RAO 28, NAGARJUNA HILLS, PUNJAGUTTA HYDERABAD-TELANGANA-INDIA Phone- 9397803596 Pincode : 500082 Email : manojagarwal@thermocables.com	PMD	YES

41	Electrical	LT XLPE POWER CABLE	TIRUPATI PLASTOMATICS PVT. LTD.	Mr. Ravi Gemini B-141 A, Road No. 9D V.K.I. Area Jaipur-Rajasthan-India Phone- 0141-2330305 Pincode : 302013 Email : ravi.gemini@yahoo.com	PMD	YES
42	Electrical	LT PVC CONTROL CABLE	Advance Cable Technologies (P) Ltd.	Mr. Siddharth Jain G-1, Sunrise Serenity, No.1,40 Ft.Road, M.R. Garden,Geddalahalli, Aswathnagar, Bangalore-Karnataka-India Phone- 9845326881 Pincode : 560094 Email : dbhat@advancecable.in	PMD	YES
43	Electrical	LT PVC CONTROL CABLE	APAR INDUSTRIES LTD.	Mr. Vijay Kumar Bajaj 12/13,Jyoti Wire House,23-A,Shah Ind Est Off. Veera Desai Road, Andheri (West). Mumbai-Maharashtra-India, Phone- 022-26740001 Pincode : 400053 Email : info.cable@apar.com	PMD	YES
44	Electrical	LT PVC CONTROL CABLE	CMI LTD.	Mr.Amit Jain/V.K.Gupta PLOT NO-71, SECTOR-6, FARIDABAD,-Haryana-INDIA Phone- 9958533005 Pincode : 110092 Email : p.aggarwal@cmilimited.in	PMD	YES
45	Electrical	LT PVC CONTROL CABLE	CORDS CABLE INDUSTRIES LTD.	MR. NAVEEN SAWHNEY B-1/A-26, MOHAN CO-OPERATIVE INDUSTRIAL ESTATE, MATHURA ROAD, NEW DELHI-DELHI-INDIA Phone- 9818356799 Pincode : 110044 Email : sg@cordscable.com	PMD	YES
46	Electrical	LT PVC CONTROL CABLE	CRYSTAL CABLE INDUSTRIES LTD.	Shri Vinod Kumar Gupta 32, GANESH CHANDRA AVENUE, KOLKATA-WEST BENGAL-INDIA Phone- 9339767435 Pincode : 700013 Email : cghosh@crystalcable.in	PMD	YES
47	Electrical	LT PVC CONTROL CABLE	DELTON CABLES LTD.	MR. V.K. GUPTA 4801, BHARAT RAM ROAD, 24, DARYA GANJ, NEW DELHI-DELHI-INDIA Phone- 9560866060 Pincode : 110002 Email : shashikumar@deltoncables.com	PMD	YES
48	Electrical	LT PVC CONTROL CABLE	ELKAY TELELINKS LTD.	Mr. Vinod Dubey K.C.HOUSE,5/66, PADAM SINGH ROAD, KAROL BAGH, NEW DELHI-DELHI-INDIA Phone- 9899789830 Pincode : 110005 Email : projects@elkaygroup.net	PMD	YES
49	Electrical	LT PVC CONTROL CABLE	GEMSCAB INDUSTRIES LTD.	Sh. A. N. Pathak, (GM/Business Develop.) 40, Rajasthani Udyog Nagar, G.T. Karnal Road, NEW DELHI-Delhi-India Phone- 09212560974 Pincode : 110033, Email : sureshchandra@gemscab.com	PMD	YES
50	Electrical	LT PVC CONTROL CABLE	GOVIND CABLE INDUSTRIES	Mr. D.K.Dutta 73/1, COTTON STREET, KOLKATTA-West Bengal-INDIA Phone- 9331055614 Pincode : 700007 Email : govindcable_kol@vsnl.net	PMD	YES
51	Electrical	LT PVC CONTROL CABLE	GUPTA POWER INFRASTRUCTURE LIMITED,	Mr. Gorav Atri,502, 5th Floor, K M Trade Tower,Radisson Blu Complex, Sector-14, Kaushambi Ghaziabad-Uttar Pradesh-India, Phone- 8130388991 Pincode : 201010 Email : gorav@guptapower.com,	PMD	YES
52	Electrical	LT PVC CONTROL CABLE	HAVELLS INDIA LTD.	QIMAT RAI GUPTA QRG Towers, Plot 2D, Sector 126, Expressway NOIDA-U.P.-INDIA Phone- 95605 88484 Pincode : 201304 Email : marketing@havells.com	PMD	YES
53	Electrical	LT PVC CONTROL CABLE	Incom Cables (P) Ltd.,	A-90, Naraina Indl. Area, Phase-I, New Delhi,-New Delhi,-India, Phone- 9958992525, Pincode : 110028, Email : vinaik@incomcables.com,	PMD	YES

54	Electrical	LT PVC CONTROL CABLE	KEI INDUSTRIES LTD.	Mr. ANIL GUPTA D-90, OKHLA INDUSTRIAL AREA, PHASE-I, NEW DELHI-DELHI-INDIA Phone- 011-26818840 Pincode : 110020 Email : lalit.saxena@kei-ind.com	PMD	YES
55	Electrical	LT PVC CONTROL CABLE	KEC INTERNATIONAL LIMITED	Mr. Radheshyam Singh CEAT MAHAL, 1ST FLOOR, 463, DR. ANNIE BESANT ROAD,WORLI, MUMBAI-MAHARASHTRA-INDIA Phone-9930980158 Pincode : 400 030 Email : singhrb@kecrpg.com;yudhister@kecrpg.com	PMD	YES
56	Electrical	LT PVC CONTROL CABLE	MANSFIELD CABLES COMPANY LTD.	Mr. J.P.S. Chadha B-41, Sector-6, Noida-U.P.-India Phone- 0120-2422275 Pincode : 201301 Email : sales@mansfieldcable.com	PMD	YES
57	Electrical	LT PVC CONTROL CABLE	PARAMOUNT COMMUNICATIONS LTD.	C-125, Naraina Industrial Area, Phase-I, NEW DELHI-DELHI-INDIA Phone-9958898025 Pincode : 110005 Email : jatan.singh@paramountcables.com	PMD	YES
58	Electrical	LT PVC CONTROL CABLE	POLYCAB WIRES PVT. LTD.	HICO HOUSE, 1st FLOOR, 771, PANDIT SATWALEKAR MARG, MAHIM, MUMBAI-MAHARASHTRA-INDIA Phone-011-29841697 Pincode : 400016 Email : lnsingh@polycab.com	PMD	YES
59	Electrical	LT PVC CONTROL CABLE	RAVIN CABLES LIMITED	MR.PRAKASH LAKHKAR 30,AKRUTI TRADE CENTRE, 3RD FL, ROAD NO.7 , MIDC ,MAROL,ANDHERI (E) MUMBAI-MAHARASHTRA-INDIA Phone-09324081733 Pincode : 400093 Email : surendra.rawat@ravingroup.com	PMD	YES
60	Electrical	LT PVC CONTROL CABLE	SUYOG ELECTRICALS LTD.	Mr.Bimal Y.Desai/Mr. Hareesh Hansoti 1, Madhuvan Apartment,24 Arunoday Society,Alkapuri VADODARA-GUJARAT-INDIA Phone- 9227192737 Pincode : 390 007 Email : suyog@seplcables.com	PMD	YES
61	Electrical	LT PVC CONTROL CABLE	SPECIAL CABLES PVT. LTD.	MR. RAHUL KHANNA/MR. SANDEEP VERMA 6, COMMUNITY CENTRE, East of Kailash,opp.Sapna Cinema NEW DELHI-Delhi-INDIA Phone- 9310861167 Pincode : 110065 Email : sales@specialcables.co.in;	PMD	YES
62	Electrical	LT PVC CONTROL CABLE	SRIRAM CABLES PVT. LTD.	Anil Garg / Sunil Garg Flat No. 102, A 8A Rama Road, Adarsh Nagar Delhi-Delhi-India Phone- 011-27670005 Pincode : 110033 Email : contact@sriramcables.com	PMD	YES
63	Electrical	LT PVC CONTROL CABLE	Sam Cables & Conductors (P) Ltd.,	6th Km. Rudrapur-kichha Road, Post-Lalpur, Rudrapur, Distt. Udham Singh Nagar , Uttarakhand,-Uttarakhand,-India, Phone- 9837766444, Pincode : 263148, Email : manpreet@samcables.com,	PMD	YES
64	Electrical	LT PVC CONTROL CABLE	SPM POWER & TELECOM PVT. LTD,	Plot No. A-28/1/12, Road No. 15, I.D.A., Nacharam, Hyderabad,-Telangana-India Phone- 040-65893830, Pincode : 500076, Email : info@spm cables.in,	PMD	YES
65	Electrical	LT PVC CONTROL CABLE	THERMO CABLES LTD.	Ms.UMA GHURKA/N.SRINIVASA RAO 28, NAGARJUNA HILLS, PUNJAGUTTA HYDERABAD-TELANGANA-INDIA Phone- 9397803596 Pincode : 500082 Email : manojagarwal@thermocables.com	PMD	YES

66	Electrical	LT PVC CONTROL CABLE	TIRUPATI PLASTOMATICS PVT. LTD.	Mr. Ravi Gemini B-141 A, Road No. 9D V.K.I. Area Jaipur-Rajasthan-India Phone- 0141-2330305 Pincode : 302013 Email : ravi.gemini@yahoo.com	PMD	YES
67	Electrical	LT PVC CONTROL CABLE	UNIVERSAL CABLES LTD.	MR. Y.S. LODHA/MR. AMITAVA ABOSE P.O. BIRLA VIKAS, SATNA SATNA-MADHYA PRADESH-INDIA Phone- +91 9584968066 Pincode : 485005 Email : amsingh@unistar.co.in	PMD	YES
68	Electrical	SCREENED CONTROL CABLES	Advance Cable Technologies (P) Ltd.	Mr. Siddharth Jain G-1, Sunrise Serenity, No.1,40 Ft.Road, M.R. Garden,Geddalahalli, Aswathnagar, Bangalore-Karnataka-India Phone- 9845326881 Pincode : 560094 Email : dbhat@advancecable.in	PMD	YES
69	Electrical	SCREENED CONTROL CABLES	CMI LTD.	Mr.Amit Jain/V.K.Gupta PLOT NO-71, SECTOR-6, FARIDABAD,-Haryana-INDIA Phone- 9958533005 Pincode : 110092 Email : p.aggarwal@cmilimited.in	PMD	YES
70	Electrical	SCREENED CONTROL CABLES	CORDS CABLE INDUSTRIES LTD.	MR. NAVEEN SAWHNEY B-1/A-26, MOHAN CO-OPERATIVE INDUSTRIAL ESTATE, MATHURA ROAD, NEW DELHI-DELHI-INDIA Phone- 9818356799 Pincode : 110044 Email : sq@cordscable.com	PMD	YES
71	Electrical	SCREENED CONTROL CABLES	DELTON CABLES LTD.	MR. V.K. GUPTA 4801, BHARAT RAM ROAD, 24, DARYA GANJ, NEW DELHI-DELHI-INDIA Phone- 9560866060 Pincode : 110002 Email : shashnikumar@deltoncables.com	PMD	YES
72	Electrical	SCREENED CONTROL CABLES	ELKAY TELELINKS LTD.	Mr. Vinod Dubey K.C.HOUSE,5/66, PADAM SINGH ROAD, KAROL BAGH, NEW DELHI-DELHI-INDIA Phone- 9899789830 Pincode : 110005 Email : projects@elkaygroup.net	PMD	YES
73	Electrical	SCREENED CONTROL CABLES	GUPTA POWER INFRASTRUCTURE LIMITED,	Mr. Gorav Atri,502, 5th Floor, K M Trade Tower,Radisson Blu Complex, Sector-14, Kaushambi Ghaziabad-Uttar Pradesh-India, Phone- 8130388991 Pincode : 201010 Email : gorav@guptapower.com,	PMD	YES
74	Electrical	SCREENED CONTROL CABLES	KEI INDUSTRIES LTD.	Mr. ANIL GUPTA D-90, OKHLA INDUSTRIAL AREA, PHASE-I, NEW DELHI-DELHI-INDIA Phone- 011-26818840 Pincode : 110020 Email : lalit.saxena@kei-ind.com	PMD	YES
75	Electrical	SCREENED CONTROL CABLES	MANSFIELD CABLES COMPANY LTD.	Mr. J.P.S. Chadha B-41, Sector-6, Noida-U.P.-India Phone- 0120-2422275 Pincode : 201301 Email : sales@mansfieldcable.com	PMD	YES
76	Electrical	SCREENED CONTROL CABLES	PARAMOUNT COMMUNICATIONS LTD.	C-125, Naraina Industrial Area, Phase-I, NEW DELHI-DELHI-INDIA Phone- 9958898025 Pincode : 110005 Email : jatan.singh@paramountcables.com	PMD	YES
77	Electrical	SCREENED CONTROL CABLES	POLYCAB WIRES PVT. LTD.	HICO HOUSE, 1st FLOOR, 771, PANDIT SATWALEKAR MARG, MAHIM, MUMBAI-MAHARASHTRA-INDIA Phone- 011-29841697 Pincode : 400016 Email : lnsingh@polycab.com	PMD	YES
78	Electrical	SCREENED CONTROL CABLES	SUYOG ELECTRICALS LTD.	Mr.Bimal Y.Desai/Mr. Haresh Hansoti 1, Madhuvan Apartment,24 Arunoday Society,Alkapuri VADODARA-GUJARAT-INDIA Phone- 9227192737 Pincode : 390 007 Email : suyog@seplcables.com	PMD	YES



TITLE:

**TECHNICAL SPECIFICATION
SELF CLEANING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **II**

SUB-SECTION: **IIC**

REV. NO. **0** DATE **01.03.2017**

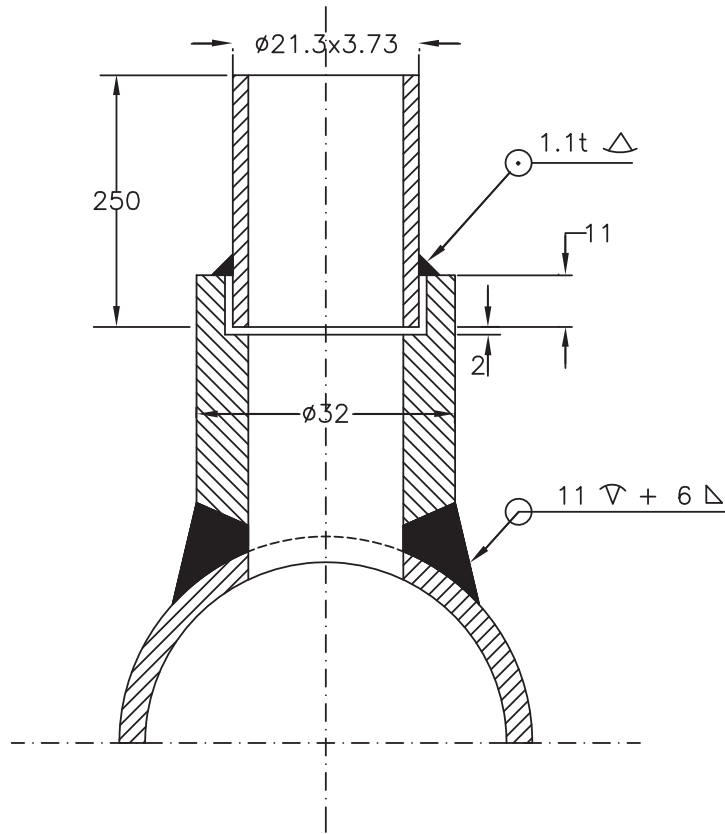
SHEET **1** OF **1**

SUB-SECTION - IIC

STANDARD TECHNICAL SPECIFICATION (C &I)

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
LIST OF DOCUMENTS/DELIVERABLES		

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
INSTRUMENT STUB DETAILS		



NOTE :

1. MATERIAL OF THE BOSS AND NIPPLE SHALL BE THE SAME AS THE PIPE INTO WHICH IT IS WELDED AND CONFORM TO ANSI B16.11.
2. THE LENGTH OF NIPPLE SHALL BE 250 MM.
3. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED
4. EDGE HOLE MUST BE CLEAN AND SQUARE OR ROUNDED SLIGHTLY ($1/64''$ RADIUS) FREE FROM BURRS, WIRE EDGES OR OTHER IRREGULARITIES
5. STUB LENGTH SHALL BE 64mm UPTO 200Nb PIPE, 45mm ABOVE 200Nb PIPE SIZE.



TITLE :
**INSTRUMENT STUB DETAILS
 FOR PRESSURE MEASUREMENT**

DRG. NO.
PE-DG-427-145-I101

REV. 00

(SYSTEM PRESS UPTO 40Kg/Cm², TEMP < 400 Deg C) SH. 04 OF 08 SHS.

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
INSTRUMENT INSTALLATION DRAWING		

NOTES :-

1. IMPULSE PIPES SHALL BE OF SEAMLESS AND ANNEALED CONFORMING TO ANSI B36.10 IN LINE WITH THE MAIN PIPE MATERIAL.
2. PIPE FITTINGS SHALL BE OF FORGED MATERIAL CONFORMING TO ANSI B16.11-1991.
3. SNUBBER SHALL BE PROVIDED FOR PUMP DISCHARGE PRESS MEASUREMENTS.
4. IN CASE OF STEAM SERVICE SYPHON SHALL BE MADE BY BENDING THE TUBE OR PIPE.
5. VALVE MANIFOLDS & SNUBBER SHALL BE OF FORGED SS-316.
6. FOR SEA WATER APPLICATION SS316L FITTINGS TO BE PROVIDED.
7. 25NB x 15NB WELDED REDUCER SHALL BE USED FOR ROOT VALVE OF 25NB SIZE.
8. ROOT VALVES SHALL BE AS FOLLOWS:
 - i) FOR PRESS <40 ATA & TEMP <425 DEG C, ONE(1) NO. 15Nb, ROOT VALVE OF SUITABLE CLASS SHALL BE USED.
 - ii) FOR PRESS >40 ATA & TEMP <425 DEG C, TWO(2) NO. 15Nb, ROOT VALVE OF SUITABLE CLASS SHALL BE USED.
 - iii) FOR PRESS >40 ATA & TEMP >425 DEG C, TWO(2) NO. 25Nb, ROOT VALVES OF SUITABLE CLASS SHALL BE USED.
9. HORIZONTAL PIPE RUNS SHOULD HAVE A SLOPE IN THE DIRECTION  SHOWN OF 1:20 AS MINIMUM.
10. FOR PRESSURISED STEAM & WATER SERVICE THE ASSOCIATED INSTRUMENT SHOULD BE MOUNTED BELOW THE TAPPING POINT. FOR VACUUM/AIR/GAS SERVICE, THE ASSOCIATED INSTRUMENT SHOULD BE MOUNTED ABOVE THE TAPPING POINT.
11. SEAMLESS PIPE/SEAMLESS TUBE/CAPILLARY LENGTH SHALL BE SUCH THAT THE GAUGES/TRANSMITTERS/SWITCHES ARE MOUNTED IN ACCESSIBLE AREA.

LEGEND :-

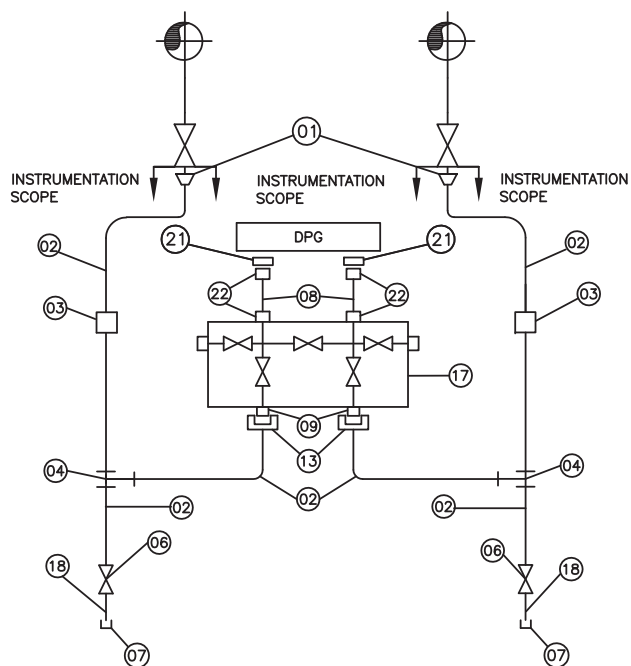
A/R - AS REQUIRED

NPTF - NATIONAL PIPE THREAD FEMALE

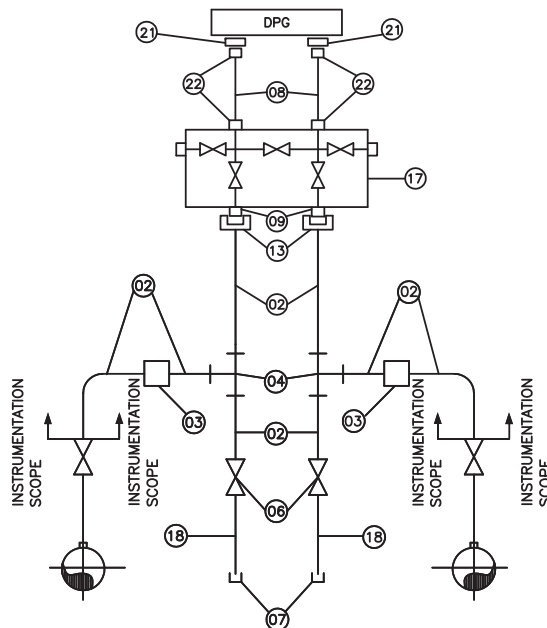
NPTM - NATIONAL PIPE THREAD MALE

SW - SOCKET WELD

	TITLE :-			
	INSTRUMENT INSTALLATION DIAGRAM			
	NOTES			
DRG. NO.	PE-DG-999-145-XXXX			
REV. NO.	00	DATE	05.11.13	
SHT	2	OF	9	



WATER SERVICE



AIR SERVICE

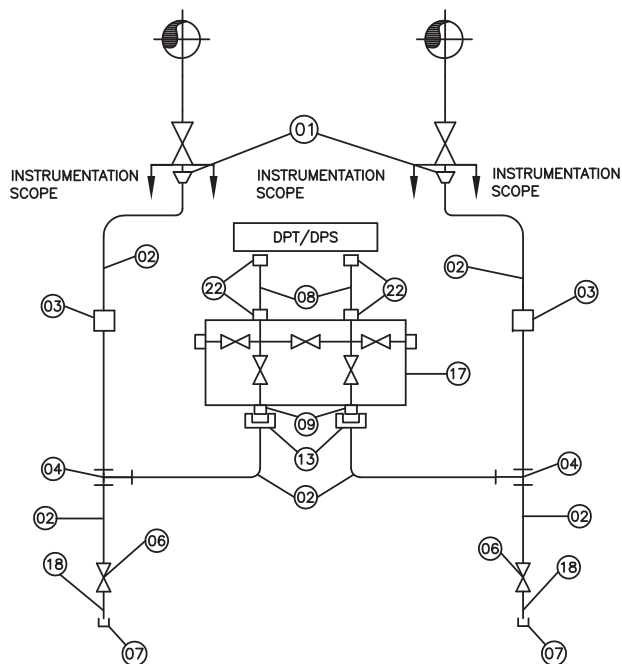
ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY	
				WATER	AIR
01	REDUCER (IF APPLICABLE)	SS316	1" X 1/2"SW	02	00
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R
04	FORGED TEE	SAME AS MAIN PIPE	1/2" SW	02	02
06	FORGED GLOBE VALVE	SAME AS MAIN PIPE	1/2" SW	02	02
07	CAP	SAME AS MAIN PIPE	1/2" NPTF	02	02
08	SEAMLESS TUBE	SS316	1/2" OD	A/R	A/R
09	ADAPTOR – M TO M	SS316	M20X1.5M X 1/2" NPTM	02	02
17	FIVE VALVE MANIFOLD WITH DRAIN PLUG	SS316	1/2" NPTF	01	01
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	02	02
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	02	02
22	TUBE FITTING DFDC	SS316	1/2" NPTM X 1/2"OD TUBE	04	04
21	CONNECTOR – F TO F	SS316	1/2" NPTF X 1/2" NPTF	02	02



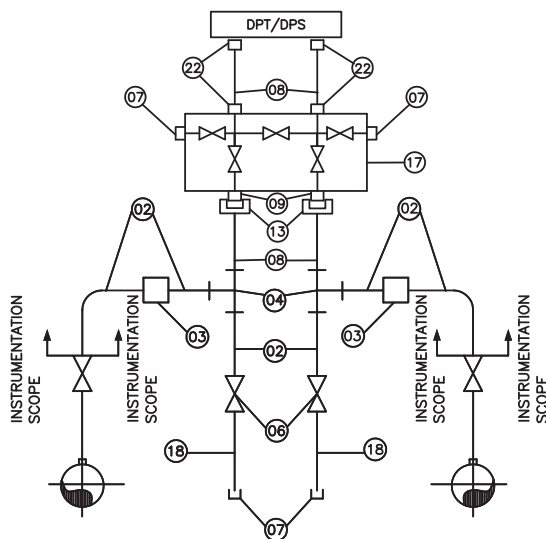
TITLE :-

INSTRUMENT INSTALLATION DIAGRAM DIFFERENTIAL PRESSURE GAUGES

DRG. NO.	PE-DG-999-145-IXXX		
REV. NO.	00	DATE	05.11.13
SHT	7	OF	9



WATER SERVICE



AIR SERVICE

ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY	
				WATER	AIR
01	REDUCER (IF APPLICABLE)	SS316	1" X 1/2"SW	02	00
02	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R
03	FORGED COUPLING	SAME AS MAIN PIPE	1/2" SW	A/R	A/R
04	FORGED TEE	SS316	1/2" SW	02	02
06	FORGED GLOBE VALVE	SS316	1/2" SW	02	02
07	CAP	CS	1/2" NPTF	02	02
08	SEAMLESS TUBE	SS316	1/2" OD	A/R	A/R
09	ADAPTER – M TO M	SS316	M20X1.5M X 1/2" NPTM	02	02
17	FIVE VALVE MANIFOLD WITH DRAIN PLUG	SS316	1/2" NPTF	01	01
16	CHEMICAL SEAL	SS316	1/2" NPTF X 1/2" NPTF	00	00
15	CONNECTOR – M TO M	SS316	1/2" NPTM X 1/2" NPTM	00	00
13	NUT & TAIL PIECE WITH ANNEALED COPPER/SS304 WASHER	SS316	NUT SIZE : M20 X 1.5 WITH 100MM TAIL	02	02
18	NIPPLE	SAME AS MAIN PIPE	1/2" NPTM X 1/2" SW	02	02
21	CONNECTOR – F TO F	SS316	1/2" NPTF X 1/2" NPTF	00	00
22	TUBE FITTING DFDC	SS316	1/2" NPTM X 1/2"OD TUBE	04	04

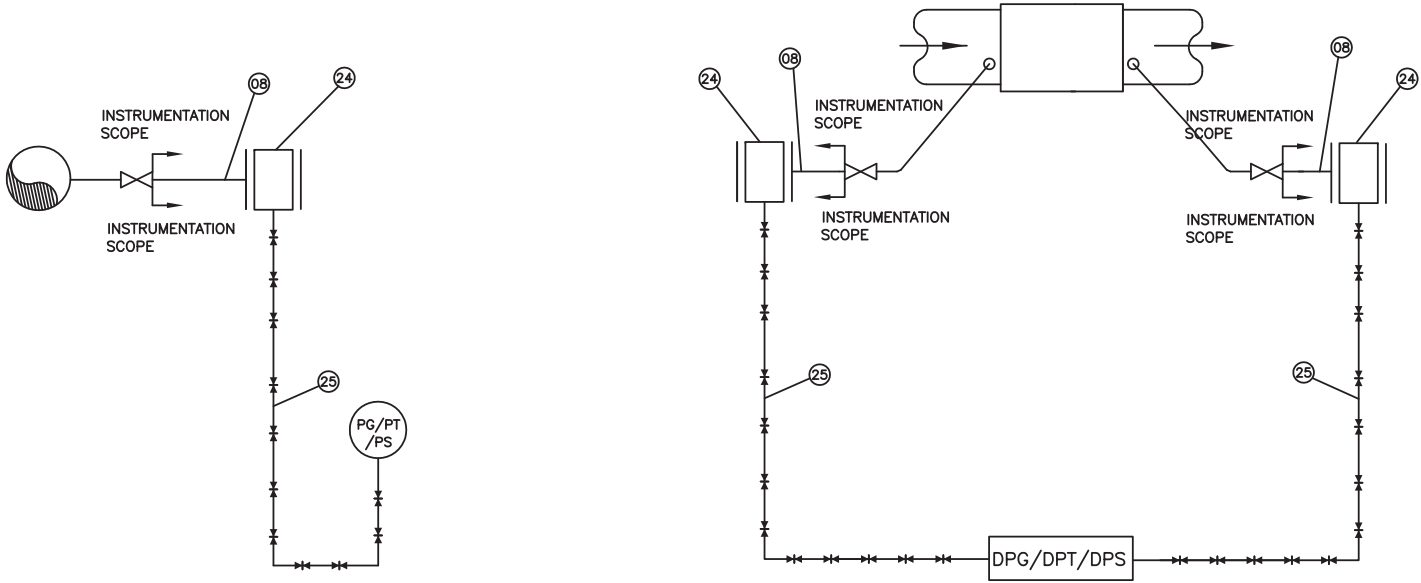


TITLE :-

INSTRUMENT INSTALLATION DIAGRAM
DIFFERENTIAL PRESSURE SWITCHES/TRANSMITTERS

DRG. NO.	PE-DG-999-145-IXXX		
REV. NO.	00	DATE	05.11.13
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ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY	
				PG/PS/PT	DPG/DPS/DPT
24	FLANGE SUPPLIED WITH PG/PS PT/DPG/DPS/DPT TO SUIT 1/2" OR 1" NB PIPE	SAME AS MAIN PIPE	1/2" SW	01	02
08	SEAMLESS PIPE	SAME AS MAIN PIPE	1/2"	A/R	A/R
25	SS ARMORED CAPILLARY TUBE (MINIMUM 5M IN LENGTH)	SS316	—	A/R	A/R



TITLE :-
INSTRUMENT INSTALLATION DIAGRAM
 WITH CAPILLARY TUBES

DRG. NO.	PE-DG-999-145-XXXX		
REV. NO.	00	DATE	05.11.13
SHT	9	OF	9

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
KKS TAGGING PHILOSOPHY		

STANDARD I/O LIST FOR SELF CLEANING STRAINER MAUX PACKAGE**(PE-DG-999-145-I275C)****BINARY I/O LIST**

SL NO	KKS TAG	DESCRIPTION	STATUS	SIG_TYPE	SET POINT	SOURCE	DESTINATION	REMARKS
1	PCA00EA001	SCS CONTROL SUPPLY	ON	PF	---	STRTR PNL	DDCMIS	
2	PCA01EA001	SCS-A SYSTEM OPRN SELECTED IN	LOCAL	PF	---	STRTR PNL	DDCMIS	
3	PCA01EA002	SCS-A SYSTEM OPRN SELECTED IN	REMOTE	PF	---	STRTR PNL	DDCMIS	
4	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A CMD	OPEN	24VDC PULSE	---	DDCMIS	ACTUATOR/STRTR PNL	ACTUATOR' TO BE USED IN CASE OF BID DRIVES WITH INTEGRAL STARTERS.
5	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A CMD	CLOSE	24VDC PULSE	---	DDCMIS	ACTUATOR/STRTR PNL	
6	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A	ACTUATOR DISTBD*/MCC DISTBD	PF	---	ACTUATOR/STRTR PNL	DDCMIS	
7	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A LIMIT SWITCH	OPEN FDBK	PF	---	ACTUATOR	DDCMIS	
8	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A LIMIT SWITCH	CLOSE FDBK	PF	---	ACTUATOR	DDCMIS	
9	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A TORQUE SWITCH	OPEN FDBK	PF	---	ACTUATOR	DDCMIS	
10	PCA01AA001	DEBRIS DISCH VLV FOR SCS-A TORQUE SWITCH	CLOSE FDBK	PF	---	ACTUATOR	DDCMIS	
11	PCA01AA002	GEARED MOTOR DRIVE FOR SCS-A CMD	ON CMD	24VDC PULSE	---	DDCMIS	STRTR PNL	
12	PCA01AA002	GEARED MOTOR DRIVE FOR SCS-A CMD	OFF CMD	24VDC PULSE	---	DDCMIS	STRTR PNL	
13	PCA01AA002	GEARED MOTOR DRIVE FOR SCS-A	ON FBK	PF	---	STRTR PNL	DDCMIS	
14	PCA01AA002	GEARED MOTOR DRIVE FOR SCS-A	OFF FBK	PF	---	STRTR PNL	DDCMIS	
15	PCA01AA002	GEARED MOTOR DRIVE FOR SCS-A	MCC DISTBD	PF	---	STRTR PNL	DDCMIS	
16	PCA01AP001	FLUSHING PUMP FOR SCS-A CMD	ON CMD	24VDC PULSE	---	DDCMIS	STRTR PNL	
17	PCA01AP001	FLUSHING PUMP FOR SCS-A CMD	OFF CMD	24VDC PULSE	---	DDCMIS	STRTR PNL	
18	PCA01AP001	FLUSHING PUMP FOR SCS-A	ON FBK	PF	---	STRTR PNL	DDCMIS	
19	PCA01AP001	FLUSHING PUMP FOR SCS-A	OFF FBK	PF	---	STRTR PNL	DDCMIS	
20	PCA01AP001	FLUSHING PUMP FOR SCS-A	MCC DISTBD	PF	---	STRTR PNL	DDCMIS	

ANALOG I/O LIST

1	PCA01CP011	DP TRANSMITTER ACROSS SCS-A	---	4-20 mA	---	FIELD	DDCMIS	
2	PCA01CP012	DP TRANSMITTER ACROSS SCS-A	---	4-20 mA	---	FIELD	DDCMIS	

NOTES :

1. SIGNALS LISTED HERE ARE AS PER GENERAL PRACTISE FOLLOWED. HOWEVER, DRIVE CONTROL PHILOSOPHY TO BE FOLLOWED IN CASE OF ANY SPECIFIC VARIATION W.R.T. PROJECT.
2. EACH UNIT HAS TWO SCS's. SAME I/O ALSO HOLDS TRUE FOR SCS-B WITH KKS 'PCA01' REPLACED WITH 'PCA02'.
3. ALL THE SIGNALS FOR FIELDS INSTRUMENTS & FOR BID DRIVES WITH INTEGRAL STARTER, SHALL BE ROUTED THROUGH STARTER PANEL TO DDCMIS.
4. FLUSHING PUMP DRIVE - NOT APPLICABLE FOR M/s MULTITEX

	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
QUALITY ASSURANCE FPR INSTRUMENTS		



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS			P	W	V	
6	EFFECT OF TEMP VARIATION ON ACCURACY			P	W	V	
7	SPAN / ZERO ADJUSTMENT	ONE / TYPE		P	W	V	
8	EFFECT OF SUPPLY VOLTAGE VARIATION			P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- When material corelation are not available manufacturer's compliance to be provided.
- Contractor to provide compliance certificate for tests/checks verifid by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST	P		W	V		
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE		P	W	V	
5	REVIEW OF TC FOR	FOR LOT		V	V	V	
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST	V	V	V		
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW	V	V	V		

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- When material correlation is not available, MFR's compliance to be provided
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.

11.00.00 **TYPE TEST REQUIREMENTS**

11.01.00 **General Requirements**

11.01.01 The Bidder shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. If the bidder proposes a different standard/code from that indicated at table 11.03.00, same is acceptable provided the equivalence of the proposed standard is established by the bidder. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.

- (a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Owner or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.
- (b) For the rest, submission of type test results and certificate shall be acceptable provided.
 - i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment.
 - i. There has been no change in the components from the offered equipment & tested equipment.
 - ii. The test has been carried out as per the latest standards along with amendments as on the date of Bid opening.
- (c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Owner on this account.

11.01.02 As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Owner.

11.01.03 The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.

11.01.04 For the type tests to be conducted, Bidder shall submit detailed test procedure for approval by Owner. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.

11.01.05 The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project.

The cost shall only be payable after conduction of the respective type test in presence of authorize representative of Owner. If a test is waived off, then the cost shall not be payable.

11.02.00 SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS

11.02.01 The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below:

- i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems
All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test.
 - ii) Dry Heat test as per IEC-68-2-2 or equivalent.
 - iii) Damp Heat test as per IEC-68-2-3 or equivalent.
 - iv) Vibration test as per IEC-68-2-6 or equivalent.
 - v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent.
 - vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent.
 - vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent.
- Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.

11.03.00

TYPE TEST REQUIREMENT FOR C&I SYSTEMS

Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NSPCL's Approval Req. On Test Certificate
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes
2	Transducers	As per standard (col 4)	IEC-60688, IS12784	No	Yes
3	Thermocouple	Degree of protection test	IS-13947	No	No
4	RTD	As per standard (col 4)	IEC-60751	No	No
5	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
6	E/P converter	As per standard (col 4)	Mfr. standard	No	Yes
7	Dust emission monitor	Degree of protection test	IS-13947	No	Yes
8	Instrumentation Cables Twisted & Shielded*				
	-Conductor	Resistance test	VDE-0815	No	Yes
		Diameter test	IS-10810	No	Yes
		Tin Coating test (Persulphate test)	IS-8130	No	Yes
	-Insulation	Loss of mass	VDE 0472	No	Yes
		Ageing in air ovens**	VDE 0472	No	Yes
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
		Heat shock	VDE 0472	No	Yes
		Hot deformation	VDE 0472	No	Yes
		Shrinkage	VDE 0472	No	Yes
		Bleeding & blooming	IS-10810	No	Yes

-Inner sheath***	Loss of mass	VDE 0472	No	Yes
	Heat shock	VDE 0472	No	Yes
	Cold bend/ cold impact test	VDE 0472	No	Yes
	Hot deformation	VDE 0472	No	Yes
	Shrinkage	VDE 0472	No	Yes
-Outer sheath	Loss of mass	VDE 0472	No	Yes
	Ageing in air ovens**	VDE 0472	No	Yes
	Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
	Heat shock	VDE 0472	No	Yes
	Hot deformation	VDE 0472	No	Yes
	Shrinkage	VDE 0472	No	Yes
	Bleeding & blooming	IS-10810	No	Yes
	Color fastness to water	IS-5831	No	Yes
	Cold bend/ cold impact test	VDE-0472	No	Yes
	Oxygen index test	ASTMD-2863	No	Yes
	Smoke Density Test	ASTMD-2843	No	Yes
	Acid gas generation test	IEC-60754-1	No	Yes
-fillers	Oxygen index test	ASTMD-2863	No	Yes
	Acid gas generation test	IEC-60754-1	No	Yes
-AL-MYLAR shield	Continuity test		No	Yes
	Shield thickness		No	Yes
	Overlap test		No	Yes
-Over all cable	Flammability Test	IEEE 383	No	Yes
	Swedish Chimney Test	SEN 4241475	No	Yes
	Noise interference	IEEE Transactions	No	Yes

	Dimensional checks	IS 10810	No	Yes
	Cross talk	VDE-0472	No	Yes
	Mutual capacitance	VDE-0472	No	Yes
	HV test	VDE-0815	No	Yes
	Drain wire continuity		No	Yes

NOTE:

1. All cables to be supplied shall be of type tested quality. The Bidder shall submit for Owner'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 tests 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. In case the Bidder is not able to submit report of the type test(s) conducted within last Ten years from the date of bid opening, or in case the type test report(s) are not found to be meeting the specification requirements, the Bidder shall conduct all such tests either in an independent laboratory or at manufacturer's works in presence of Owner's representative under this contract free of cost to the Owner and submit the reports for approval.

These tests shall be carried out as per VDE0207 Part 6 & ASTM D-2116 for TEFLON insulated & outer sheathed cables *Applicable for armored cables only.

9 DC Power Supply System (Applicable for each model and rating)

The Type Test reports for offered rectifier module and the controller module irrespective of the rectifier bank shall be acceptable.

Surge Withstand Capability(SWC)	ANSI 37.90.1/ IEEE-472, EN 61000-4-12	No	Yes
Dry Heat Test	IEC-68-2-2 or equivalent	No	Yes
Damp Heat test	IEC-68-2-3 or equivalent	No	Yes
Vibration test	IEC68-2-6 or equivalent	No	Yes
Electrostatic discharge test	EN 61000-4-2 or equivalent	No	Yes
Radio frequency immunity test	EN-61000-4-3 or equivalent	No	Yes
Electromagnetic field immunity	EN 61000-4-3 Or equivalent	No	Yes
Degree of Protection	IS-13947 or equivalent	No	Yes

10	Battery ##	As per standard (col 4)	IS-10918	No	Yes
11	NOT APPLICABLE				
12	UPS (Applicable for each model and rating) 1) Type Test reports of same series of UPS with similar PCB's cards and controllers as the target UPS system shall be acceptable. 2) For Dry heat, Damp heat and vibration, the tests conducted on individual PCB's shall be acceptable.				
	Surge Withstand Capability(SWC)	ANSI 37.90.1/ IEEE-472,EN 61000-4-12	No	Yes	
	Dry Heat Test	IEC-68-2-2 or equivalent	No	Yes	
	Damp Heat test	IEC-68-2-3 or equivalent	No	Yes	
	Vibration Test	IEC68-2-6 or equivalent	No	Yes	
	Electrostatic discharge test	EN 61000-4-2 or equivalent	No	Yes	
	Radio frequency immunity test	EN-61000-4-3 or equivalent	No	Yes	
	Electromagnetic field immunity	EN 61000-4-3 Or equivalent	No	Yes	
	Degree of protection test	IS-13947	No	Yes	
	Fuse Clearing Capability	Approved procedure	No	Yes	
	Short Circuit current capability	IEC 60146-2	No	Yes	
13	Voltage Stabilizers	Over Load Test	Over Load Test	No	Yes
	Temp rise test without redundant fans		Approved procedure	No	Yes
14	Public Address System				
	- Amplifiers	As per standard (col 4)	IS 9302, Part-II	No	Yes
	Microphones	As per standard (col 4)	IS 9302, Part-III	No	Yes
	Loudspeaker	As per standard (col 4)	IS 9302, Part-IV	No	Yes
15	LIE / LIR	Degree of protection test	IS-13947	No	Yes

16	Flue gas analyzers	Degree of protection test	IS-13947	No	Yes
17	Master Clock	Functional test	As per approved procedure	No	Yes
18	CJC Box	Degree Of protection test	IS-13947	No	Yes
19	Junction Box	Degree Of protection test	IS-13947	No	Yes
20	OPC Data Access Server, Data Exchange Server & Historical Data Access Server	OPC Compliance Testing		No	Yes (Self certification is also acceptable)
	Conductivity Type Level Switch	Degree of protection test	IS-2147	No	No
	Local Gauges	Degree of protection test	IS-2147	No	No
	Process actuated Switches	Degree of protection test	IS-2147	No	No
	Control Valves	CV test	ISA 75.02	No	Yes
	PLCs	As per standard (Col 4)	IEC 1131	No	No
	Flow Nozzle Orifice plates	Calibration	ASME PTC BS 1042	No	Yes

The Bidder shall submit for Owners approval the reports of all the type test as per latest IS-10918 carried out within last ten years from the date of Bid opening and the test(s) should have been either conducted at an independent laboratory or in presence / owners representative. The complete type test reports shall be for any rating of Battery in a particular group based on plate dimensions being manufactured by supplier.

Note:

Type Tests are to be conducted only for the items, which are being supplied as a part of this Package.



STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

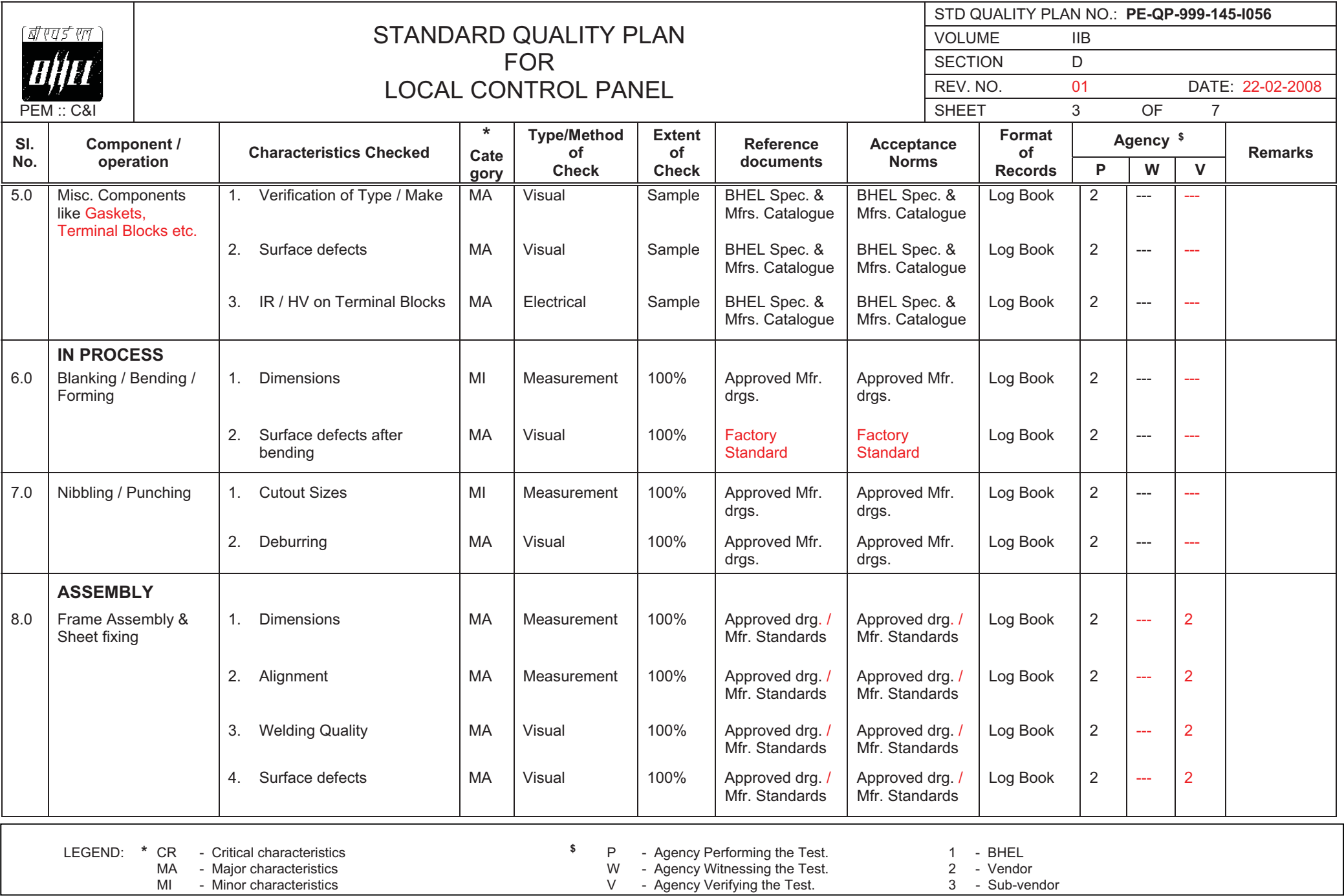
STD QUALITY PLAN NO.: PE-QP-999-145-I056		
VOLUME	IIB	
SECTION	D	
REV. NO.	01	DATE: 22-02-2008
SHEET	1	OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	IS:1079 IS:513	IS:1079 IS:513	Test Certificate	3	---	2	
		2. Bend Test	CR	Mech. test	Sample	IS:1079 IS:513	IS:1079 IS:513	Log Book	2	---	---	
		3. Surface finish	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		4. Waviness	MA	Visual	100%	Factory Standard	No Waviness	Log Book	2	---	---	
		5. Thickness	MA	Measurement	100%	BHEL Spec.	BHEL Spec.	Log Book	2	---	---	
		6. Mill marking	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	1	
2.0	Flats / Angles / Channels	1. Dimensions	MA	Measurement	Sample	IS:2062	IS:2062	Log Book	2	---	---	
		2. Surface Defects	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		3. Straightness	MA	Measurement	100%	Factory Std.	Factory Std.	Log Book	2	---	---	
		4. Mill marking	MA	Visual	100%	IS:2062	IS:2062	Log Book	2	---	1	
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	
		2. IR and HV	MA	Electrical	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

\$ P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor





STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

STD QUALITY PLAN NO.: **PE-QP-999-145-I056**

VOLUME

IIB

SECTION

D

REV. NO.

01

DATE: 22-02-2008

SHEET

4

OF

7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
9.0	Pre-treatment and Painting	1. Pretreatment Process	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		2. Process parameters like bath temp. concentration etc.	MA	Measurement	Periodic	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		3. Dipping / Removal Time	MA	Measurement	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		4. Surface quality after every dip	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		5. Primer after phosphating	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		6. Putty Application & Rubbing after primer	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		7. Paint first coat	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		8. Putty Application and Rubbing after first coat of paint	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

\$ P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL							STD QUALITY PLAN NO.: PE-QP-999-145-I056			
									VOLUME	IIB		
									SECTION	D		
									REV. NO.	01	DATE: 22-02-2008	
									SHEET	5	OF	7
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		3. Ferrule numbers	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		4. Colour of wiring	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
		5. Size of Conductor	MA	Measurement	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
		2. Fixing	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Final Inspection	1. Workmanship	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		3. Components identification Marking / Name plates	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	

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 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056					
								VOLUME		IIB			
								SECTION		D			
								REV. NO.		01		DATE: 22-02-2008	
								SHEET		6		OF 7	
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks	
									P	W	V		
		5. Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.	
		6. Door functioning	MA	Functional	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1		
		7. Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1		
		8. Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1		
		9. Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1		
		10. Wiring Layout	MA	Visual	100%	BHEL approved drg.	BHEL approved drg.	Inspection Report	2	1	1		
		11. Wire Termination	MA	Pulling manually	Sample	----	Firm termination	Inspection Report	2	1	1		
		12. Continuity	MA	Electrical	100%	----	Continuity OK	Inspection Report	2	1	1		

LEGEND:	* CR	- Critical characteristics	\$	P	- Agency Performing the Test.	1	- BHEL
	MA	- Major characteristics		W	- Agency Witnessing the Test.	2	- Vendor
	MI	- Minor characteristics		V	- Agency Verifying the Test.	3	- Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056					
								VOLUME		IIB			
								SECTION		D			
								REV. NO.		01		DATE: 22-02-2008	
								SHEET		7		OF 7	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks	
									P	W	V		
13.	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	Type Test Certificate	3	---	1		
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	BHEL approved spec., drg., BOM & relevant IS.	BHEL approved spec., drg., BOM & relevant IS.	Test Report	2	1	1		
15	FUCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1		
		2. Instrument Calibratio	CR	Electrical	10%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1		
		3. Temperature rise	CR	Electrical	100%	BHEL approved spec/drg. & relevant IS.	BHEL approved spec/drg & relevant IS.	Inspection Report	2	1	1		

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	ROURKELA PP-II EXPANSION (1x250 MW)	
	TECHNICAL SPECIFICATION (C&I) FOR SELF CLEANING STRAINER	
SUB VENDOR LIST		

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		EMERSON (FISHER), USA/France/JAPAN
		SEMPELL, GERMANY
		KOSO, JAPAN
21	CONTROL VALVE (OTHER THAN START UP CONTROL, BFP RC, FW FLOW CONTROL, SH/RH/SB CONTROL)	MIL, ALWAYS
		INSTRUMENTATION LIMITED, PALGHAT
		EMERSON, CHENNAI
		DRESSOR, COIMBATORE
		SPX COPES VULCAN, USA
		LESILIE, BANGALORE
		FLOW SERVE, BANGALORE
		KOSO, PALAKAD
		FORBES ARCA, PUNE
		CCI, INDIA
22	TURBINE SUPERVISORY INSTRUMENTS ALOG WITH VIBRATION ANALYSIS SYSTEM.	GE BENTLY, USA
	REFER NOTE -1	MEGGITT (VIBROMETER), SWITZERLAND
		SHINKAWA, JAPAN
23	TEMPERATURE TRANSMITTER	EMERSON, USA/ PAWANE / SINGAPRE
		YOKOGAWA, JAPAN
		MOORE, USA
		M SYSTGEM, JAPAN
		ABB, GERMANY / FARIDABAD
		ENDRESS & HOUSER, AURANGABAD
		P&F BANGALORE
24	CONDUITS / PIPE (G)	REFER ELECTRICAL LIST
25	ELECTRONIC TRANSMITTERS (PRESSURE, DP)	EMERSON (ROSEMOUNT), USA /PAWANE
		FUJI ELECTRIC, CHINA
		YOKOGAWA, JAPAN
		ABB, FARIDABAD
		ABB, GERMANY / ITALY

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		SIEMENS, FRANCE / INDIA
26	THERMOCOUPLES, RTD & THERMOWELL	HERAUS SENSOR, GERMANY
	REFER NOTE -2	WISE CONTROL, KOREA
		TEMPSENS, UDAIPUR
		PYROELECTRIC, GOA
		DETRIV INSTRUMENTATION & ELECTRONICS LTD., MUMBAI
		MINCO, USA
		OKAZAKI CORPORATION, JAPAN
		YAMARI, SINGAPORE
		AB (SENSYCON), GERMANY
		EMERSON (ROSEMOUNT), GERMANY
		EMERSON (ROSEMOUNT), PAWANE
		THERMAL INSTRUMENTS (GIC), SAVANTWADI
		TECHNO INSTRUMENTS, AHMEDABAD
27	ULTRASONIC TYPE LEVEL TRANSMITTER	E&H, AURANGABAD/GERMANY
		EMERSON, PAWANE
		SIEMENS MILTRONICS, CANADA
28	ORIFICE PLATE ASSEMBLY	INSTRUMENTATION LIMITED, PALGHAT
		MICROPRECISION, FARIDABAD
		STARMECH, PUNE
		FLOW STAR, FARIDABAD
		SEIKO, AUSTRIA
		MINCO, GIC, GOA
		WISE CONTROL, KOREA
		TM TECHNOLOGY, ITALY
29	PRESSURE, DP GAUGE	BUDENBERG, UK
		ASHCROFT, USA/GERMANY/INDIA
		WIKA, GERMANY
		WISE CONTROL, KOREA
		NAGANO KEIKI, JAPAN
		H GURU SOUTH INDIA, BANGALORE
		A N INSTRUMENTS, KOLKATA
		GAUGE BOURDON (GIC), PANVEL

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		METPRESS, CALCUTTA
		HP VALVES AND FITTINGS, CHENNAI
		MAIN CONTRACTOR APPROVED SOURCES
35	ELECTRIC TO PNEUMATIC CONVERTER	IM NORGEN, INDIA
		FAIR CHILD, USA
		ABB, INDIA
36	CONDUITS LEAD COATED (FLEXIBLE)	PLLCA, GH\AZIABAD
37	INTELLIGENT BATTERY CHARGER 24 V DC & DCDB / BHMS	CHABBI ELECTRICALS, JALGAON
		ELTECH, GURGAON
		MASTECH, JALGAON
38	BATTERY HEALTH MONITORING SYSTEM	EMERSON, MUMBAI
		ELTCK SGS PVT LTD., GURUGAON
39	BATTERY (NI-CD)	AMCO SAFT, BANGALORE
		SAFT, FRANCE / SWEENEN
		HBL POWER, HYDERABAD
40	SOCKET WELD FITTINGS	MAIN CONTRACTOR APPROVED SOURCES
41	IMPULSE PIPE & TUBES	MAHARASHTRA SEAMLESS, RAIGARH
		SUMITOMO / KAWASAKI / NIPPON, JAPA
		TPS TECHNITUBE, GERMANY
		VELURIC & MANESSMANN, GERMANY
		BHEL, TRICHY
		TROUVAY AND CAUVIN, FRANCE
		ISMT, AHAMADNAGAR
		SANDVIK
42	COMPRESSION FITTINGS	HAMLET, ISRAIL
		PARKER, USA
		PRECISION, MUMBAI
		DK TECH, KOREA
		HY LOK, KOREA
		ASTECH MUMBAI
		HYDAIR (FLUID CONTROL), MUMBAI
		HP VALVES AND FITTINGS, CHENNAI

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		EXCEL HYDRO, MUMBAI
		SWAGELOCK, USA
		PANAM, MUMBAI
43	INSTRUMENT VALVES	BHEL, TRICHY
		DK TECH, KOREA
		HAMLET, ISRAIL
		EXCEL HYDRO, MUMBAI
		INSTRUMENTATION LIMITED, PALGHAT
		SWAGELOCK, USA
		PARKER, USA
		HY LOK, KOREA
		HP VALVES AND FITTINGS, CHENNAI
		HYDAIR LONAVALA, LONAVALA
		BALDOTA, MUMBAI
44	VALVE MANIFOLDS	HAMLET, ISRAIL
		EXCEL HYDRO, MUMBAI
		SCHNEIDER, GERMANY
		HY LOK, KOREA
		DK TECH, KOREA
		ANDERSON GREENWOOD, USA
		ASTECH MUMBAI
		HP VALVES AND FITTINGS, CHENNAI
		HYD AIR, LONAVALA
		FLUID CONTROL, MUMBAI
		MICROPRECISION, FARIDABAD
		PARKER, USA
		SWAGELOCK, USA
		BALDOTA, MUMBAI
45	LOCAL INSTRUMENT ENCLOSURE / RACK	PYROTECH, UDAIPUR
		INSTRUMENTATION LIMITED, KOTA
		SAJAS ELECTRICAL, TRICHURAPALLI
		PRAMMEN, PUDDUKOTTAJ
		CHEMIN, PONDICHERY
46	INSTRUMENT CABLES	PARAMOUNT, KHUSKHERA
		POLYCAB, DAMAN
		DELTON, FARIDABAD

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		KEI, BHIWADI
		ELKEY TELELINKS, FARIDABAD
		CORDS, BHIWADI
		CORDS, KAHARANI
		NICCO, KOLKATA
		TEW & C, USA
		HABIB CABLES, SWEEDEN
		KERPEN CABLES, GERMANY
		LAPP CABLES, GERMANY
		THERMO ELECTRA BV, NETHERLAND
		UNIVERSAL CABLE, SATNA
		THERMOCABLES, HYDERABAD
47	ELECTRICAL ACTUATOR	AUMA, GERMANY
		LIMLTORGE, USA
		ROTORQ, UK
		LIMLTORGE, FARIDABAD
		ROTORK, CHENNAI / BANGALORE
		NIPPON, JAPAN
		AUMA, BANGALORE
		HAROLD BACK, USA
		DREHMO, GERMANY
47 A	ELECTRICAL ACTUATOR FOR ID/FD/PA BLADE PITCH AND GUIDE VANE CONTROL	HAROLD BACK, USA
		SIPOS AKTRORLK GMBH, GERMANY
48	FLOW NOZLE ASSEMBLY	MICROPRECISION, FARIDABAD
		SEIKO, AUSTRIA
		TECHNOMATIC, ITALY
		INSTRUMENTATION LIMITED, PALGHAT
		STARMECH, PUNE
		WISE CONTROL, KOREA
49	HIGH TEMP. CABLE (PTFE/FEP)	HABIB CABLES, SWEEDEN
		LAPP CABLES, GERMANY
		KERPEN CABLES, GERMANY
		TEW & C, USA
		THERMO ELECTRA BV, NETHERLAND

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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		YARWAY, USA
		LEVELSTATE, UK
56	SLEVEL SWITCH - FLOAT / DISPLACER TYPE	RAMAN INSTRUMENTS, DELHI
		ENDRESS & HOUSER, AURANGABAD
		MAGNETROL, BELGIUM
		LEVCON, KOLKATA
		SBEM, PUNE
		CHEMTROLS SAMIL, MUMBAI
		NAKATIYA, JAPAN
		SIGMA INDUSTRIES, MUMBAI
		DK INSTRUMENT, KOLKATA
		PUNE TECHTROL, PUNE
		V AUTOMAT, NEW DELHI
		LEVEL STATE, UK
		GAUGES BOURDON (GIC), PANVEL
57	AIR FILTER REGULATOR	FAIR CHILD, USA
		SHAVO NORGENT, MUMBAI
		SMC PNEUMATICS, NOIDA
		EMERSON (ASCO), CHENNAI
		FESTO, BANGALORE
		PLAKA, CHENNAI
58	COPPER TUBING / BRASS CONNECTORS	MAIN SUPPLIER APPROVED SOURCES
59	COUPLING / INTERPOSING RELAYS	PARAMOUNT, BANGALORE
		OMRON
		OEN
		JYOTI, BARODA
		ELSTA, SWITZERLAND
60	SOLENOID VALVE	ROTEX, VADODRA
		AVCON, MUMBAI
		HERION, GERMANY
		IMI NORGENT, GERMANY
		JAFFERSON, ARGENTINA
		ASCO, CHENNAI/USA
		FESTO, BANGALORE
		SMC PNEUMATICS, NOIDA

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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66	TERMINAL BLCOK (CAGE & CLAMP TYPE)	WELDMULLER, GERMANY
		PHONIX, GERMANY / INDIA
		WAGO, GERMANY / INDIA
		ELMEX, VADODARA
67	FRP JUNCTION BOX	REFER ELECTRICAL LIST
68	PLC SYSTEM (IF APPLICABLE)	ABB
		SCHNEIDER, NASIK
		ROCKWELL, SAHIBABAD
		SIEMENS, NASIK
69	SMART POSITIONER	ABB
		MASOLENIEN
		SIEMENS
		SAMR
		YOKOGAWA
		EMERSON (FISHER RESEMOUNT)
		MESTO
70	ROTAMETER	IEPL, HYDERABAD
		TRACE, HYDERABAD
		PLACKA, CHENNAI
		EUREKA, PUNE
		SCIENTIFIC DEVICES, MUMBAI
		FLOW STAR, FARIDABAD
		TOKYO KEISO, JAPAN
71	SINGLE AND MULTI POINT TEMPERATURE RECORDER (MICROPROCESSOR BASED)	YOKOGAWA INDIA, BANGALORE
		CHINO CORPORATION, JAPAN
		EUROTHERM, UK
		YOKOGAWA, JAPAN
		ABB, UK/GERMANY
		FUJI, JAPAN
		HONEYWELL, USA / NETHERLAND
72	RESERVE ROTATION INDICATOR (RRI)	GE BENTLY, USA
		SHINKAWA, JAPAN
		PROTOCONTROL, PUNE
73	INSTRUMENT TUBE FITTINGS (AIR)	MAIN SUPPLIER APPROVED SOURCES

	NTPC SAIL POWER COMPANY (P) LIMITED ROURKELA POWER PROJECT (PP – III : 1X250 MW) TECHNICAL SPECIFICATION FOR EPC PACKAGE	
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25.	GI PIPE	BIS LICENSEE
26.	STEEL CONDUIT/EXPOXY COATED CONDUIT	BIS LICENSEE
27.	LEAD COATED FLEXIBLE CONDUITS	M/S PLICA, GHAZIABAD
28.	JUNCTION BOXES/LINK BOXES TEST LINK BOX /ADAPTOR BOX	M/S POSITRONICS, VADODRA
		M/S PYROTECH, UDAIPUR
		M/S CONQUERENT CONTROL SYSTEM LTD, MANESAR
		M/S JAKSON, NOIDA
		M/S SWITCHING CIRCUIT, KOLKATA
		M/S SARVANA SWITCHGEAR, BANGALORE
		M/S AJMERA, MUMBAI
29.	JUNCTION BOXES-FRP/THERMOSETTING PLASTIC/THERMO PLASTIC	SUMIP COMPOSITES, AHMEDABAD
		KEMROCK, VADODARA
		AJMERA, MUMBAI
		TRINITY TOUCH, PALWAL
30.	LT CABLE STRAINGHT THROGH JOINTING KIT	M/S RAYCHEM, MUMBAI
		M/S 3M ELECTRO & COMMUNICATION., PUNE
31.	HT CABLE TERMINATION KITS & STRAIGHT THROUGH JOINTING KIT	M/S 3M ELECTRO & COMMUNICATION., PUNE
		RAYCHEM, MUMBAI
32.	CABLE GLAND	M/S SUNIL & CO. KOLKATA
		M/S ARUP ENGG. KOLKATA
		M/S COMET, MUMBAI
		M/S QUALITY PRECISION, KOLKATA
		M/S STANDARD METAL, MUMBAI
		M/S BRACO, MUMBAI
33.	CABLE LUGS/FERRULES	M/S DEWELL, MUMBAI
		3D, UMBERGAON
		CHETNA, NASIK
34.	TUBULAR POLE	BIS LICENSEE AS PER IS 2713 WITH VALID CML NO.
35.	LIGHTING FIXTURES WITH ACCESSORIES (FILAMENT TYPE)	M/S CGL, MUMBAI
		M/S BAJAJ ELECTRICALS, MUMBAI
		M/S PHILIPS, NOIDA
		M/S WIPRO, MUMBAI
38.	LAMPS (FILAMENT TYPE)	M/S CROMPTON, MUMBAI
		M/S BAJAJ ELECTRICALS, MUMBAI
		M/S PHILIPS, NOIDA

SUB VENDOR LIST FOR SCS PACKAGE (AS ON 01.03.2017)

SLNO	Package Name	Vendor Name	Vendor Address
1	INSTRUMENT FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA-UTTAR PRADESH-INDIA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
2	INSTRUMENT FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI-MAHARASHTRA-INDIA Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com
3	INSTRUMENT FITTINGS	HP VALVES & FITTINGS INDIA PVT. LTD.	S. Harichandran/P.S. Pandi B-11, Mugappair Industrial Estate, CHENNAI-Tamilnadu-INDIA Phone- 044 26252537 Pincode : 600037 Email : sales@hpvalvesindia.com
4	INSTRUMENT FITTINGS	Perfect Instrumentation Control (India) Pvt. Ltd.	MD Hussain Shaikh/Shahanawaz Khan Gala No. 168, Loheki Chwal,216/ 218, Maulana Azad Rd. Nagpada Junction Mumbai-Maharashtra-INDIA Phone- 91-9324383121 Pincode : 400008 Email : shahanawaz.khan@perfectinstrumentation.com
5	INSTRUMENT FITTINGS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai,-Maharashtra,-India, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,
6	INSTRUMENT FITTINGS	Comfit & Valve Pvt. Ltd.	Mr. Jeetu Jain/Mr. Vinay Sosa Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway Laxmipura, Nandasan-Gujarat-INDIA Phone- 02764-267036/37 Pincode : 382705 Email : marketing@com-fit.com
7	INSTRUMENT FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI-DELHI-INDIA Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com
8	INSTRUMENT FITTINGS	Arya Crafts & Engineering Pvt. Ltd.	Mr.Sanjay Brahman/Mr.Shyam Vazirani 102, Vora Industrial Estate No.4 Navghar, Vasai Road (E) Dist.Thane, Mumbai-Maharashtra-INDIA Phone- +91-250-2392246 Pincode : 401210 Email : arya@aryaengg.com
9	INSTRUMENT FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI-MAHARASHTRA-INDIA Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
10	INSTRUMENT FITTINGS	FLUIDFIT ENGINEERS PVT. LTD.	Mr. Abbas Bhola Potia Building No. 2, Office No. 3,292, Bellasis Road,Mumbai Central (East) Mumbai-Maharashtra-India Phone- 9920044113 Pincode : 400008 Email : ab@fluidfitengg.com
11	INSTRUMENTS PIPE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI-MAHARASHTRA-INDIA Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
12	INSTRUMENTS PIPE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI-DELHI-INDIA Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com
13	INSTRUMENTS PIPE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI-MAHARASHTRA-INDIA Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com
14	INSTRUMENTS PIPE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA-UTTAR PRADESH-INDIA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
15	INSTRUMENTS TUBE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA-UTTAR PRADESH-INDIA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
16	INSTRUMENTS TUBE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI-MAHARASHTRA-INDIA Phone- 022 42631700 Pincode : 400 062 Email : peiks@vsnl.com
17	INSTRUMENTS TUBE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI-DELHI-INDIA Phone- 9810182430 Pincode : 110048 Email : niraj@aurainc.com

18	INSTRUMENTS TUBE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI-MAHARASHTRA-INDIA Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
19	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.	Mr. Dineshbhai Zaveri C-1/ 27&37, GIDC, Kabilpore, Navsari-Gujarat-India Phone- 02637-265140,265003 Pincode : 396424 Email : flexpro@flexproltd.com
20	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	JIGNESH MAHENDRA AJMERA DENA BANK BLDG.,SHREE NAGESH INDL. ESTATE,STATION ROAD, MUMBAI-MAHARASHTRA-INDIA Phone- 022 67973578 Pincode : 400 088 Email : ajmera@ajmera.net, jmajmera@yahoo.com
21	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore-Karnataka-India Phone- 9880385770 Pincode : 560022 Email : sales1@ksinstruments.net
22	JUNCTION BOX	SUCHITRA INDUSTRIES	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE -- Phone- Pincode : Email : suchitra.industriesblr@gmail.com
23	JUNCTION BOX	Shrenik & Company,	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad-Gujarat-India Phone- 9825024921 Pincode : 382213 Email : sales@pustron.com, pulin@sumip.com
24	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI-Maharashtra-INDIA Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com
25	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai,-Maharashtra,-India, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com,
26	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHI-MINH SARANI, KOLKATA-WEST BENGAL-INDIA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mguru@vsnl.net
27	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE-KARNATAKA-www.hgurusouth.com Phone- 080-23370300, Pincode : 560022 Email : info@hgurusouth.com
28	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD-TELANGANA-INDIA Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com
29	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata-West Bengal-India Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebpi@gmail.com; bosepanda@vsnl.net
30	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol-Gujarat,-INDIA Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
31	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA-WEST BENGAL-INDIA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in
32	TRANSMITTERS	Honeywell Automation India Limited	Mr. Ritwij Kulkarni 917, INTERNATIONAL TRADE TOWER, NEHRU PLACE, NEW DELHI-DELHI-INDIA Phone- 9890200584 Pincode : 110019 Email : rajesh.chaudhary@honeywell.com
33	TRANSMITTERS	V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI-DELHI-INDIA Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com
34	TRANSMITTERS	TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer,-Rajasthan,-India, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com,
35	TRANSMITTERS	YOKOGAWA INDIA LIMITED,	PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, BANGALORE,-KARNATAKA,-INDIA, Phone- 080-41586000, Pincode : Email : uday.shankar@in.yokogawa.com,
36	TRANSMITTERS	SIEMENS LIMITED	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai-Maharashtra-INDIA Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com
37	TRANSMITTERS	EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	Mr. Amit Paithankar/Vikram Raj Singh 206-210,BALARAMA BUILDING 2ND FLR. BANDRA EAST MUMBAI-MAHARASHTRA-INDIA Phone- 9619121500 Pincode : 400051 Email : vikramraj.singh@emerson.com

38	TRANSMITTERS	SMART INSTRUMENTS LTD, BRAZIL	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI-MAHARASHTRA-INDIA Phone- 28208477 Pincode : 400093 Email : corp@delbby.rpgms.ems.vsnl.net.in
39	TRANSMITTERS	SBEM PVT. LTD.	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE,-MAHARASHTRA-INDIA Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in
40	TRANSMITTERS	Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune-Maharashtra-INDIA Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com
41	TRANSMITTERS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai,-Maharashtra,-India, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com,
42	TRANSMITTERS	NIVO CONTROLS PVT. LTD.	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore-M.P.-India Phone- 0731-4081305 Pincode : 452010 Email : sales@nivocontrols.com
43	TRANSMITTERS	Moore Industries International Inc.	Leonard.W. Moore/ Matt Moren 16650 Schoenborn St. North Hills-CALIFORNIA-USA Phone- +1 818 830 5548 Pincode : 91343 Email : mmoren@miinet.com
44	TRANSMITTERS	ABB LIMITED	MR. RAJIV GOVIL 14, MATHURA ROAD, FARIDABAD-HARYANA-INDIA Phone- 09971085678 Pincode : 121003 Email : vipin.swami@in.abb.com
45	TRANSMITTERS	Endress + Hauser (India) Pvt. Ltd.,	Mr. Prakash Vaghela 215-216, DLF Tower 'A', Jasola District Centre, New Delhi,-New Delhi,-India, Phone- 9717593001, Pincode : 110025, Email : prakash.vaghela@in.endress.com,

NOTE:

1. The above sub-vendor list is tentative & reference only. However Sub-Vendor List is subject to BHEL/ end user approval without any commercial/ delivery implication.
2. New Sub-Vendor if proposed by Vendor during contract stage shall subject to BHEL/ end user approval without any commercial/ delivery implication.



TITLE:

**TECHNICAL SPECIFICATION
SELF CLEANING STRAINER**

STANDARD TECHNICAL REQUIREMENTS

SPEC. NO.: **PE-TS-427-165-N004**

SECTION: **III**

SUB-SECTION:

REV. NO. 0 DATE 01.03.2017

SHEET 1 OF 1

SECTION III

DOCUMENTS TO BE SUBMITTED BY BIDDER



**TITLE : SCHEDULE OF PERFORMANCE GUARANTEES
FOR
SELF CLEANING STRAINER (SCS)**

TECHNICAL SPECIFICATION NO. PE-TS- 427-165-N004

SECTION : III

SUB SECTION : IIIA

Sheet 1 of 1 Date- 01.03.2017

S.NO.	DESCRIPTION	UNITS	1x250 MW ROURKELA PP-II EXPANSION
1.	Pressure drop across the SCS (i.e. between inlet & outlet nozzle) under clean condition and Normal flow condition	MWC	

PARTICULARS OF BIDDER/ AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	TITLE : COMPLIANCE CERTIFICATE FOR SELF CLEANING STRAINER	SPEC. NO.	SPEC. NO. PE-TS- 427-165- N004
		DATE: 0	1.03.2017
		SHEET :	1 OF 2

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions with regard to same.
- b) There are no other deviations w.r.t. specification other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ Customer/Customer's Consultant approval and customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. Charges for 3rd party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself.
- d) Any drawing/ document/ data-sheet/ calculation/ Quality plan/ Instrumentation etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification. For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' and to be supplied at the time of commissioning of SCS & prices for same included in the base price itself.
Prices for special tools & tackles, if any, shall also be included in the base price.
Recommended spares for 3 years shall be quoted separately with price indicated separately.
- g) Charges for Installation Checks, Commissioning of equipment, Trial run and Performance Testing at site shall be included by bidder in the base price itself.
- h) The main flanges for SCS shall be suitable for the forces and moments as per the specification.
- i) The hydrostatic test pressure shall be 1.5 times the design pressure.
- j) All sub-vendors shall be subject to BHEL/ Customer/Customer's Consultant approval in the event of order.
- k) The Performance guarantees of equipment shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer/Customer's Consultant.
- l) The orientation of piping around SCS shall be finalised during detailed Engg.
- m) Electrical/ C&I :
 - All selected motor ratings have minimum 15 % margin over maximum continuous demand of the driven equipment including voltage and frequency variations, temperature rise and other factors.
 - Supply of electrical viz. LT power cables, instrumentation and control cables, cable glands, lugs, cable trays etc. shall be as per specification. Their erection shall be done by BHEL

	TITLE : COMPLIANCE CERTIFICATE FOR SELF CLEANING STRAINER	SPEC. NO.	SPEC. NO. PE-TS- 427-165- N004
		DATE: 0	1.03.2017
		SHEET :	2 OF 2

- The junction boxes for termination of DPT/ D PS/ Actuator LS/ solenoid valves are included in bidder's scope. The instrumentation cable and cabling from instruments/ actuators to junction boxes is also included in bidder's scope.
- Valve actuators and controls shall be provided as specified in Data Sheet-A and Project specific requirements as specified in Section I-B & Section I-C.
- Alarms/ annunciations/ instruments shall be finalised during detailed engineering in the event of order which shall be subject to BHEL/ Customer/Customer's Consultant approval and shall be without any commercial implications to BHEL.
- Switch gear panel should have suitable arrangement like bus coupler for providing redundancy to incoming supply feeder.

[illegible]

	TITLE :	SPECIFICATION NO.
	DATA SHEET - B	VOLUME : III - B
	SELF - CLEANING FILTER	SECTION : B
	(Backwash Type)	REV. NO. 00 DATE :
		SHEET 1 OF 3

SL.NO.	DESCRIPTION	UNIT	DATA/ PARTICULARS
1.0	GENERAL		
1.1	No. of filters required	Nos.	
1.2	Inlet connection	mm Nb	
1.3	Outlet connection	mm Nb	
1.4	Filter type/ duty		
1.5	Location		
1.6	Liquid handled		
2.0	DESIGN DATA		
2.1	Operating pressure	Bar (g)	
2.2	Design pressure	Bar (g)	
2.3	Design temperature	Deg. C	
2.4	Flow rate through filter		
	a) Normal		
	b) Maximum		
2.5	Design differential pressure for filter section/ screen	Bar (g)	
2.6	Max. Size of solid particle likely to enter the filter	mm	
2.7	Type of suspended matter likely to enter the filter		
2.8	Differential pressure measuring system set pressure		
	• For initiating flushing/ backwashing	mbar	
	• For alarm/ annunciation	mbar	
2.9	Filter section/ screen perforation size	mm	
3.0	GUARANTEED PERFORMANCE REQUIREMENT		

	TITLE :	SPECIFICATION NO.
	DATA SHEET - B	VOLUME : III - B
	SELF - CLEANING FILTER	SECTION : B
	(Backwash Type)	REV. NO. 00 DATE :
		SHEET 2 OF 3

SL.NO.	DESCRIPTION	UNIT	DATA/ PARTICULARS
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3.1	Pressure drop across the filter (i.e. between inlet and outlet connection)	mbar	
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a) Clean condition

b) Partially (50%) choked condition

c) During flushing operation

d) After flushing operation

3.2	Debris discharge flow during flushing period		
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3.3	Flushing period	Minutes	
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3.4	Debris/ sludge removal capacity	m ³ /hr	
-----	---------------------------------	--------------------	--

4.0	MATERIALS OF CONSTRUCTION		
-----	----------------------------------	--	--

4.1	Filter body/ housing		
-----	----------------------	--	--

4.2	Filter screen/ section		
-----	------------------------	--	--

4.3	Supporting cage		
-----	-----------------	--	--

4.4	Differential measuring system		
-----	-------------------------------	--	--

4.5	Flushing/ backwashing unit		
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4.6	Backwash rotor shoes		
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4.7	Internal hardware		
-----	-------------------	--	--

4.8	Pipes		
-----	-------	--	--

4.9	Shaft		
-----	-------	--	--

5.0	COUNTER FLANGES		
-----	------------------------	--	--

5.1	Materials :		
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a) Flanges

b) Bolts & Nuts

c) Gaskets

5.2	Drilling Standard		
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	TITLE :	SPECIFICATION NO.
	DATA SHEET - B	VOLUME : III - B
	SELF - CLEANING FILTER	SECTION : B
	(Backwash Type)	REV. NO. 00 DATE :
		SHEET 3 OF 3

SL.NO.	DESCRIPTION	UNIT	DATA/ PARTICULARS
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6.0 PAINTING

6.1 External Surface

1. Surface preparation
2. Primer
3. Final paint

6.2 Internal Surface

- a) Surface preparation
- a) Primer
- b) Final paint

7.0 SHOP TEST

7.1 Hydrostatic test

- a) Test Pressure bar (g)
- b) Test duration min.

7.2 Leakage test

- a) Test Pressure bar (g)
- b) Test duration min.

	TITLE	SPECIFICATION NO.
	MOTORS	VOLUME II B
	DATA SHEET – C	SECTION D
	1 x 250MW ROURKELA POWER PROJECT	REV NO. 00 DATE 01.03.17
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor or 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	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTORS DATA SHEET – C 1 x 250MW ROURKELA POWER PROJECT	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 01.03.17
		SHEET 2 OF 2

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	Applied cable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Material in 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 $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			