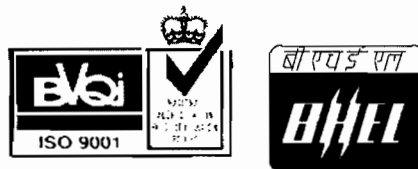


**2 x 800 MW NTPC GADARWARA STPP, STAGE-1**


**TECHNICAL SPECIFICATION  
FOR SELF CLEANING STRAINER (SCS).**

**Specification No. : PE-TS- 394-165-N002 (REV. 0)**

**VOLUME -IIB**



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

|   |  |                                      |                       |
|---|--|--------------------------------------|-----------------------|
|  | <b>TITLE : TECHNICAL SPECIFICATION<br/>FOR<br/>SELF CLEANING STRAINERS (SCS)</b> | <b>SPEC. NO. PE-TS- 394-165-N002</b> |                       |
|   | <b>PREAMBLE</b>  | <b>VOLUME : II B</b>                 |                       |
|   |  | <b>REV. NO. 0</b>                    | <b>DATE :30.06.14</b> |
|   |  | <b>SHEET1 OF 2</b>                   |                       |

1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

**1.1 Volume -I CONDITIONS OF CONTRACT**

This consists of four parts as below :

- Volume - I A : This part contains instructions to bidders for making bids to BHEL.
- Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.
- Volume - I C : This part contains special conditions of contract.
- Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

**1.2 Volume - II TECHNICAL SPECIFICATIONS**


Technical requirements are stipulated in Volume II which comprises of:

- Volume - II A : General Technical Conditions
- Volume - II B : Technical specification including drawings, if any

**1.2.1 Volume - II B :**

This volume is sub-divided into following sections:

- Section - A : This section outlines the scope of enquiry.
- Section - B : This section provides "Project Information"
- Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.
- Section - D : This section comprises of standard technical specifications of equipments complete with data sheet A, B & C.  
Data sheet-A specifies data and other requirements pertaining to the equipment.  
Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

|   |   |                                      |                       |
|---|---|--------------------------------------|-----------------------|
|  | <b>TITLE : TECHNICAL SPECIFICATION<br/>FOR<br/>SELF CLEANING STRAINERS (SCS)</b><br><br><b>PREAMBLE</b> | <b>SPEC. NO. PE-TS- 394-165-N002</b> |                       |
|   |   | <b>VOLUME : II B</b>                 |                       |
|   |   | <b>REV. NO. 0</b>                    | <b>DATE :30.06.14</b> |
|   |   | <b>SHEET2 OF 2</b>                   |                       |

**1.2.2 Volume - III TECHNICAL SCHEDULES**

- 1.0 This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per instructions given in Document No.PES-100-901 in Volume-III.
- 2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : II B**

**SECTION : A**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1 of 1**

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**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : II B**

**SECTION : A**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1**

**of 1**

**SECTION - A  
SCOPE OF ENQUIRY**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N003**

**VOLUME : II B**

**SECTION : A**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1 of 2**

**1.00.0 SCOPE**

This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works properly packed for delivery of the items as follows:

**1.01.0 Self Cleaning Strainers :**

Self Cleaning Strainers (SCS) complete with all accessories as per the requirements specified in different sections of this specification for NTPC 2 x 800 MW GADARWARA STPP STAGE-1.

The bidder's scope also includes installation checks, commissioning, trial runs & PG Testing at site of SCS.

**1.01.1 The bids shall be evaluated as per NIT.**

**2.00.0 GENERAL TECHNICAL INSTRUCTIONS:**

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

2.02.00 The omission of specific reference to any component/ accessory necessary for the proper performance of the equipments shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of the equipments at quoted prices.

2.03.00 In case of any deviation from this Technical specification (Vol. IIB) and General Technical Conditions (Vol. IIC), the same shall be indicated in the schedule of deviations enclosed in Volume-III, Part-A. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.

2.04.00 BHEL's/ Customer's representatives shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

2.05.00 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/ Customer

2.06.00 Un-priced copy of price bid shall be furnished alongwith the technical bid.



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : II B**

**SECTION : C**


**REV. NO. 0**

**DATE : 30.06.14**


**SHEET 1 of 1**

## **SECTION - B**


### **PROJECT INFORMATION**

| CLAUSE NO.   | PROJECT INFORMATION ANNEXURE-I   |                            |  |
|--|--|----------------------------|---|
| <p>1.00.00</p> <p>1.01.00</p> <p>1.02.00</p> <p>1.03.00</p> <p>1.04.00</p>   | <b>INTRODUCTION</b>  |                            |   |
|  | <p><b>BACKGROUND</b></p> <p>Gadarwara Thermal Power Project (Gadarwara TPP) is being set up as a regional power project for the benefit of States/UTs of Western Region. This project is being set up in two stages. Each stage shall comprise of two units of 800 MW.</p>   |                            |   |
|  | <p><b>Location and</b></p> <p>The site is located near villages Gangai &amp; Umaraiya (about 9 Kms from Gadarwara town in Narsingpur district of Madhya Pradesh. The major cities Bhopal &amp; Jabalpur are located at about 210 Kms &amp; about 140 kms respectively from proposed project site. The nearest BG Railway Station, Gadarwara, on Jabalpur- Itarsi Section on central railway main Line is about 9 Kms from proposed project site.</p> <p>The nearest commercial airport, Bhopal and Jabalpur are located about 240 Kms and about 155 Kms respectively from site. The plant latitude and longitude are 22° 51' 42" N and 78° 52' 08" respectively.</p> <p>Vicinity plan of the proposed project is placed at Annexure –A-I</p> |                            |   |
|  | <p><b>Land</b></p> <p>About 1844 acres of land (Private Land- about 1480 acres and Govt. Land- about 364 acres) has been envisaged for the project. In-principle land availability clearance has been obtained from Govt. of Madhya Pradesh vide letter dated 19.05.08.</p>  |                            |   |
| <p><b>Water</b></p> <p>The make-up water requirement is estimated as 4680 Cubic Meter/Hr with ash circulation system and about 5980 Cubic Meter/Hr with once through ash water system. The source of water for the Project is Narmada River at a distance of about 30 Kms from the project site.</p> <p>Govt. of Madhya Pradesh vide dated 19.05.08. has accorded water commitment from Narmada river for the project. CWC vide letter dated 27.07.12 have concurred water availability confirmation accorded by State Govt.</p> |  |                            |   |
| <p><b>Capacity</b></p> <p style="text-align: center;">2 x 800 MW      - Present proposal</p> <p style="text-align: center;">2 x 800 MW      - In Future</p>  |  |                            |   |
| <p>GADARWARA SUPER THERMAL POWER PROJECT<br/>(2X800 MW)<br/>STEAM TURBINE GENERATOR PACKAGE</p>  | <p>TECHNICAL SPECIFICATION<br/>SECTION-VI<br/>PART-A</p>   | <p>PROJECT INFORMATION</p> | <p>PAGE<br/>1 OF 9</p>  |




| CLAUSE NO.   | PROJECT INFORMATION ANNEXURE-I  |                     |                |  |
|--|---|---------------------|----------------|---|
| 1.05.00  | <b>Meteorological data</b><br><br>Important meteorological data from nearest observatory at Narsinghpur is placed at Annexure-A-II.   |                     |                |   |
| 1.06.00  | <b>Plant Water Scheme</b><br><br>The Plant water scheme is described below.   |                     |                |   |
| 1.06.01  | <b>Condenser Cooling (CW) Water System</b><br><br>It is proposed to provide recirculating type CW system with induced draft type cooling towers. For the recirculating type CW system it is proposed to supply clarified water as make up. Raw water from the make-up water pump house shall be pumped to a Water Pretreatment Plant (PT - CW system). The treated clarified water shall be led to the cold water channel of CW system. Designed Clarified Water Analysis is given in this subsection. CW system shall be operated at a C.O.C of about 4.0. Chemical treatment programme (using acid dosing and scale cum corrosion inhibitors dosing) may be employed in addition to blow down of CW water to control the CW system chemistry in case CW system is required to be operated beyond 4.0 COC. CW blow down shall be drawn from the discharge of CW pumps and the same shall be led to a Service water Tank. For carrying circulating water from CW pump house to TG-area and from TG area to cooling tower, steel lined concrete encased duct would be provided. For interconnecting CW duct with CW pump, condenser and cooling towers, steel pipes would be used. Cooled water from cooling tower will be led to CW pump house through the cold water channel by gravity. |                     |                |   |
| 1.06.02  | <b>Equipment Cooling Water (ECW) System (Unit Auxiliaries)</b><br><br>The plant auxiliaries of Steam Generator and Turbine Generator shall be cooled by Demineralised (DM) water in a closed circuit. The primary circuit DM water shall be cooled through plate type heat exchangers by Circulating Water tapped from CW system in a closed secondary circuit. The hot secondary circuit cooling water shall be cooled in the cooling towers and shall be returned back to the system. It is proposed to provide independent primary cooling water circuit for Steam Generator & auxiliaries and TG & its auxiliaries.   |                     |                |   |
| 1.06.03  | <b>Station Auxiliaries Cooling Water System</b><br><br>The station auxiliaries such as Air compressors, Compressors of ash handling plant, Cooling water circuit of Air Conditioning system, compressor of mill reject system etc. shall be cooled by separate cooling water System using separate set of pumps and cooling towers.   |                     |                |   |
| GADARWARA SUPER THERMAL POWER PROJECT<br>(2X800 MW)<br>STEAM TURBINE GENERATOR PACKAGE | TECHNICAL SPECIFICATION<br>SECTION-VI<br>PART-A   | PROJECT INFORMATION | PAGE<br>2 OF 9 |   |



| CLAUSE NO.   | PROJECT INFORMATION   |   | ANNEXURE-I          |  |
|--|---|---|---------------------|---|
| 1.06.04  | <p><b>Ash Water System</b></p> <p>It is proposed to operate ash water system in a closed circuit. The ash water from the ash dyke shall be recirculated after treating a part of the quantity in a side stream lime softening plant as the case may be. Make up to the ash water system (to compensate for the ash water system blow down and evaporation loss in ash dyke) shall be supplied from excess CW blow down water (Service water) and raw water supply from water source of the plant. In addition, provision shall be kept to supply treated water from Central Monitoring Basin of Liquid Effluent Treatment Plant.</p>  |   |                     |   |
| 1.06.05  | <p><b>Other Miscellaneous Water Systems</b></p> <p>a) CW system blow down water shall be used for the plant service water requirement, dust suppression system of coal handling plant, makeup to the Ventilation system, ash slurry pumps sealing, sealing of Vacuum pumps (if applicable) of Ash Handling plant, make-up to fire water storage tanks and cooling water requirement of hydrogen generation plant. The service (wash water) water collected from various areas shall be treated using oil water separators, tube settlers, coal settling pits etc. as per requirement and treated water from liquid effluent treatment plant shall be recycled back to the service water system for re-use. The excess service water shall be led to central monitoring basin for disposal.</p> <p>b) Separate water Pre-treatment plants are proposed for Circulating Water (PT-CW) system, Demineralisation Plant (PT-DM) plant and potable (PT-Pot) water systems.</p> <p>c) The drinking water requirement of the plant and colony shall be provided from the above mentioned Water (PT-Pot ) pretreatment plant.</p> <p>d) Steam Cycle make-up water, makeup to the primary circuit of ECW (unit auxiliaries) system, boiler fill water and makeup to the hydrogen generation plant shall be provided from Demineralising plant.</p> <p>e) The quality of clarified water &amp; DM water is given in this sub-section at <b>Annexure-A-III</b>.</p> |   |                     |   |
| 1.07.00  | <p><b>Criteria for Earthquake Resistant Design of Structures and Equipment</b></p> <p>All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed as per the criteria specified in sub-section-D1 of Section-VI (Part-A).</p>  |   |                     |   |
| GADARWARA SUPER THERMAL POWER PROJECT<br>(2X800 MW)<br>STEAM TURBINE GENERATOR PACKAGE |   | TECHNICAL SPECIFICATION<br>SECTION-VI<br>PART-A | PROJECT INFORMATION | PAGE<br>3 OF 9  |

✓

| CLAUSE NO.   | PROJECT INFORMATION ANNEXURE-I  |                     |  |
|--|---|---------------------|---|
| 1.08.00  | <p>In case the acceleration criteria considered by the Bidder for the design of anchorage bolts of Steam Turbine and Generator with TG Deck in his bid is different with respect to above criteria, he shall indicate the same in his bid. The same will be discussed with the Bidder and finalized considering the following:</p> <p>a) The earthquake design acceleration for the steam turbine and generator acting at the centre of gravity depends upon the layout/configuration/size of TG deck supporting columns and beams which are to be jointly decided by NTPC and the bidder.</p> <p>b) As the data regarding Foundation GA &amp; loading data to be furnished by Bidder may not be available at tender stage, the acceleration criteria proposed by the bidder can not be confirmed for acceptance at the award stage. The same can be confirmed after jointly finalizing the TG substructure arrangement by NTPC and Bidder.</p> <p>c) TG deck acceleration values will be limited to the design values adopted by Bidder by suitably increasing the size of the TG supporting columns/beams during detailed engineering.</p> <p>Accordingly Bidder has to make equipment/piping layout clearing the TG column/beams.</p> <p><b>Criteria for Wind Resistant Design of Structures and Equipment</b></p> <p>All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given as given in sub-section-D1 of Section-VI (Part-A).</p> <p style="text-align: center;"><i>2</i></p> |                     |   |
| GADARWARA SUPER THERMAL POWER PROJECT<br>(2X800 MW)<br>STEAM TURBINE GENERATOR PACKAGE | TECHNICAL SPECIFICATION<br>SECTION-VI<br>PART-A   | PROJECT INFORMATION | PAGE<br>4 OF 9  |

CLAUSE NO.

PROJECT INFORMATION

ANNEXURE-I



ANNEXURE-A-I



GADARWARA SUPER THERMAL POWER PROJECT  
(2X800 MW)  
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
PART-A

PROJECT INFORMATION

PAGE  
5 OF 9

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CLAUSE NO.

PROJECT INFORMATION

ANNEXURE-I



ANNEXURE-A-II  
PAGE 2 OF 2

STEAM TURBINE  
CLIMATOLOGICAL TABLE

| STATION : Gadwarwar | STATION : Gadwarwar | WIND               |                    | TEMPERATURE        |                    | HUMIDITY              |                                 | CLOUD                 |                                 | VISIBILITY            |                                 |
|---------------------|---------------------|--------------------|--------------------|--------------------|--------------------|-----------------------|---------------------------------|-----------------------|---------------------------------|-----------------------|---------------------------------|
|                     |                     | WIND SPEED (km/hr) | WIND DIRECTION (°) | WIND SPEED (km/hr) | WIND DIRECTION (°) | RELATIVE HUMIDITY (%) | WET BULB GLOBE TEMPERATURE (°C) | RELATIVE HUMIDITY (%) | WET BULB GLOBE TEMPERATURE (°C) | RELATIVE HUMIDITY (%) | WET BULB GLOBE TEMPERATURE (°C) |
| 1                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 2                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 3                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 4                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 5                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 6                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 7                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 8                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 9                   | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 10                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 11                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 12                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 13                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 14                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 15                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 16                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 17                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 18                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 19                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 20                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 21                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 22                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 23                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 24                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 25                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 26                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 27                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 28                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 29                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 30                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 31                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 32                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 33                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 34                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 35                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 36                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 37                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 38                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 39                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 40                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 41                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 42                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 43                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 44                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 45                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 46                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 47                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 48                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 49                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |
| 50                  | 12.0                | 0.0                | 0.0                | 27.0               | 100                | 27.0                  | 100                             | 100                   | 27.0                            | 100                   | 100                             |

GADARWARA SUPER THERMAL POWER PROJECT  
(2X800 MW)  
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
PART-A


PROJECT INFORMATION

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| CLAUSE NO.   | PROJECT INFORMATION   |                     | ANNEXURE-I            |
|--|---|---------------------|-----------------------|
|  | <b>DESIGN CLARIFIED WATER ANALYSIS</b>  |                     | <b>ANNEXURE-A-III</b> |
|  | Sl. No.   | Constituent         | as mg per litre       |
|  | 1.  | Calcium             | CaCO <sub>3</sub> 102 |
|  | 2.  | Magnesium           | CaCO <sub>3</sub> 41  |
|  | 3.  | Sodium              | CaCO <sub>3</sub> 35  |
|  | 4.  | Potassium           | CaCO <sub>3</sub> 3   |
|  | 5.  | Total Alkalinity    | CaCO <sub>3</sub> 113 |
|  | 6.  | P-Alkalinity        | CaCO <sub>3</sub> Nil |
|  | 7.  | Chloride            | CaCO <sub>3</sub> 43  |
|  | 8.  | Sulphate            | CaCO <sub>3</sub> 25  |
|  | 9.  | Silica (Reactive)   | SiO <sub>2</sub> 16   |
|  | 10.   | Iron                | Fe 0.3 mg/l           |
|  | 11.   | pH Value            | - 6.8 - 8.5           |
|  | 12.   | Turbidity           | NTU 10                |
|  | <b>Note- Clarified water shall be used as make up water for cooling water system.</b> |                     |                       |
| GADARWARA SUPER THERMAL POWER PROJECT<br>(2X800 MW)<br>STEAM TURBINE GENERATOR PACKAGE | TECHNICAL SPECIFICATION<br>SECTION-VI<br>PART-A                                       | PROJECT INFORMATION | PAGE<br>8 OF 8        |



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| CLAUSE NO.   | PROJECT INFORMATION   |  | ANNEXURE-I     |  |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
|--|---|--|----------------|---|--------|-----------------|-------|----|---------------|------------------------------|----|------------|-----|----|----------------|-----|----|----------|----------|----|--------------|--|
|  | <p style="text-align: right;">ANNEXURE - A-III</p> <p style="text-align: center;"><b>ANALYSIS OF DM WATER TO BE USED FOR<br/>MAKE-UP WATER TO CONDENSER</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sl.No.</th> <th style="text-align: left;">Characteristics</th> <th style="text-align: left;">Value</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Silica (Max.)</td> <td>0.01 ppm as SiO<sub>2</sub></td> </tr> <tr> <td>2.</td> <td>Iron as Fe</td> <td>Nil</td> </tr> <tr> <td>3.</td> <td>Total hardness</td> <td>Nil</td> </tr> <tr> <td>4.</td> <td>pH value</td> <td>6.8 -7.3</td> </tr> <tr> <td>5.</td> <td>Conductivity</td> <td>Not more than 0.1micro mho/cm<br/>excluding the effects of free CO<sub>2</sub></td> </tr> </tbody> </table> |  |                |   | Sl.No. | Characteristics | Value | 1. | Silica (Max.) | 0.01 ppm as SiO <sub>2</sub> | 2. | Iron as Fe | Nil | 3. | Total hardness | Nil | 4. | pH value | 6.8 -7.3 | 5. | Conductivity | Not more than 0.1micro mho/cm<br>excluding the effects of free CO <sub>2</sub> |
| Sl.No.   | Characteristics   | Value  |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| 1.   | Silica (Max.)   | 0.01 ppm as SiO <sub>2</sub>   |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| 2.   | Iron as Fe  | Nil  |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| 3.   | Total hardness  | Nil  |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| 4.   | pH value  | 6.8 -7.3   |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| 5.   | Conductivity  | Not more than 0.1micro mho/cm<br>excluding the effects of free CO <sub>2</sub> |                |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |
| GADARWARA SUPER THERMAL POWER PROJECT<br>(2X800 MW)<br>STEAM TURBINE GENERATOR PACKAGE | TECHNICAL SPECIFICATION<br>SECTION-VI<br>PART-A   | PROJECT INFORMATION  | PAGE<br>9 OF 9 |   |        |                 |       |    |               |                              |    |            |     |    |                |     |    |          |          |    |              |  |

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**ANNEXURE-WL( GADARWARA)**

**CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT**

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

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

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

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

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

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

**Damping in Structures**

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

- |                                   |  |
|-----------------------------------|--|
| a) Welded steel structures        | : 1.0%   |
| b) Bolted steel structures        | : 2.0%   |
| c) Reinforced concrete structures | : 1.6%   |
| d) Steel stacks                   | : As per IS:6533 & CICIND Model Code whichever is more critical. |

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**ANNEXURE-B**

**SITE SPECIFIC DESIGN PARAMETERS**

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

- a) The basic wind speed " $V_b$ " at ten metres above the mean ground level : 39 metres/second
- b) The risk coefficient " $K_r$ " : 1.06
- c) Category of terrain : Category-2

**Note:** Notwithstanding the values of the above mentioned parameters, the design wind pressure so computed at any point shall not be taken less than 1500 N/Sq. metre for all classes of structures, i.e. A, B & C, as defined in IS: 875 (Part-3).

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## ANNEXURE-EQ (GARDARWARA)

### Gadarwara Thermal Power Project

#### **CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT**

All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1):2002 and IS:1893 (Part 4):2005. Pending finalization of Parts 2, 3 and 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for structures other than the buildings and industrial structures including stack-like structures.

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

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

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

#### **Damping in Structures**

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

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

### Method of Analysis

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

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

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

For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value ( $A_h$ ) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using site specific spectral acceleration coefficients with appropriate multiplying factor given in Annexure-I. Further, the spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the building falls to the left of the peak in the spectral acceleration curve.

### Design/Detailing for Ductility for Structures

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

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**ANNEXURE - I**

**SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT**

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

- |  |          |
|--|----------|
| 1) Peak ground horizontal acceleration (MCE)   | : 0.18 g |
| 2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra  |          |
| a) for ordinary moment resisting steel frames designed and detailed as per IS:800  | : 0.0525 |
| b) for braced steel frames designed and detailed as per IS:800   | : 0.039  |
| c) For special moment resisting RC frames designed and detailed as per IS:456 and IS:13920   | : 0.0315 |
| d) for steel chimney   | : 0.079  |
| e) for design of structures not covered under 2 (a) to 2 (d) above and under 3 below   | : 0.0525 |
| 3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted | : 0.105  |

Note: g = Acceleration due to gravity

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

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**ANNEXURE - I**

**HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS  
(In units of 'g')**

| Time Period<br>(Sec) | Damping Factor (as a percentage of critical damping) |       |
|----------------------|--|-------|
|                      | 2%   | 5%    |
| 0                    | 1  | 1     |
| 0.03                 | 1  | 1     |
| 0.04                 | 1.287  | 1.178 |
| 0.05                 | 1.564  | 1.337 |
| 0.06                 | 1.835  | 1.482 |
| 0.07                 | 2.101  | 1.618 |
| 0.08                 | 2.361  | 1.746 |
| 0.09                 | 2.618  | 1.866 |
| 0.1                  | 2.871  | 1.982 |
| 0.105                | 2.996  | 2.037 |
| 0.11                 | 3.121  | 2.092 |
| 0.115                | 3.245  | 2.145 |
| 0.12                 | 3.368  | 2.198 |
| 0.123                | 3.442  | 2.229 |
| 0.127                | 3.500  | 2.270 |
| 0.13                 | 3.500  | 2.300 |
| 0.135                | 3.500  | 2.500 |
| 0.14                 | 3.500  | 2.500 |
| 0.145                | 3.500  | 2.500 |
| 0.15                 | 3.500  | 2.500 |
| 0.2                  | 3.500  | 2.500 |
| 0.25                 | 3.500  | 2.500 |
| 0.3                  | 3.500  | 2.500 |
| 0.35                 | 3.500  | 2.500 |
| 0.4                  | 3.500  | 2.500 |
| 0.43                 | 3.500  | 2.500 |
| 0.45                 | 3.500  | 2.500 |
| 0.48                 | 3.500  | 2.500 |
| 0.49                 | 3.369  | 2.500 |
| 0.5                  | 3.302  | 2.500 |
| 0.52                 | 3.175  | 2.212 |
| 0.555                | 2.975  | 2.072 |
| 0.56                 | 2.948  | 2.054 |
| 0.565                | 2.922  | 2.035 |
| 0.57                 | 2.896  | 2.018 |
| 0.575                | 2.871  | 2.000 |
| 0.58                 | 2.847  | 1.983 |
| 0.585                | 2.822  | 1.966 |

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**ANNEXURE - I**

**HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS  
(In units of 'g')**

| Time Period<br>(Sec) | Damping Factor (as a percentage of critical damping) |       |
|----------------------|--|-------|
|                      | 2%   | 5%    |
| 0.59                 | 2.798  | 1.949 |
| 0.595                | 2.775  | 1.933 |
| 0.6                  | 2.752  | 1.917 |
| 0.65                 | 2.540  | 1.769 |
| 0.7                  | 2.359  | 1.643 |
| 0.75                 | 2.201  | 1.533 |
| 0.8                  | 2.064  | 1.438 |
| 0.85                 | 1.942  | 1.353 |
| 0.9                  | 1.834  | 1.278 |
| 0.95                 | 1.738  | 1.211 |
| 1                    | 1.651  | 1.150 |
| 1.05                 | 1.572  | 1.095 |
| 1.1                  | 1.501  | 1.045 |
| 1.15                 | 1.436  | 1.000 |
| 1.2                  | 1.376  | 0.958 |
| 1.25                 | 1.321  | 0.920 |
| 1.3                  | 1.270  | 0.885 |
| 1.35                 | 1.223  | 0.852 |
| 1.4                  | 1.179  | 0.821 |
| 1.45                 | 1.139  | 0.793 |
| 1.5                  | 1.101  | 0.767 |
| 1.55                 | 1.065  | 0.742 |
| 1.6                  | 1.032  | 0.719 |
| 1.65                 | 1.001  | 0.697 |
| 1.7                  | 0.971  | 0.676 |
| 1.75                 | 0.943  | 0.657 |
| 1.8                  | 0.917  | 0.639 |
| 1.85                 | 0.892  | 0.622 |
| 1.9                  | 0.869  | 0.605 |
| 1.95                 | 0.847  | 0.590 |
| 2                    | 0.826  | 0.575 |
| 2.05                 | 0.805  | 0.561 |
| 2.1                  | 0.786  | 0.548 |
| 2.15                 | 0.768  | 0.535 |
| 2.2                  | 0.750  | 0.523 |
| 2.25                 | 0.734  | 0.511 |
| 2.3                  | 0.718  | 0.500 |
| 2.35                 | 0.703  | 0.489 |
| 2.4                  | 0.688  | 0.479 |

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**ANNEXURE - I**

**HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS  
(In units of 'g')**

| Time Period<br>(Sec) | Damping Factor (as a percentage of critical damping) |       |
|----------------------|--|-------|
|                      | 2%   | 5%    |
| 2.45                 | 0.674  | 0.469 |
| 2.5                  | 0.660  | 0.460 |
| 2.55                 | 0.647  | 0.451 |
| 2.6                  | 0.635  | 0.442 |
| 2.65                 | 0.623  | 0.434 |
| 2.7                  | 0.611  | 0.426 |
| 2.75                 | 0.600  | 0.418 |
| 2.8                  | 0.590  | 0.411 |
| 2.85                 | 0.579  | 0.404 |
| 2.9                  | 0.569  | 0.397 |
| 2.95                 | 0.560  | 0.390 |
| 3                    | 0.550  | 0.383 |
| 3.05                 | 0.541  | 0.377 |
| 3.1                  | 0.533  | 0.371 |
| 3.15                 | 0.524  | 0.365 |
| 3.2                  | 0.516  | 0.359 |
| 3.25                 | 0.508  | 0.354 |
| 3.3                  | 0.500  | 0.348 |
| 3.35                 | 0.493  | 0.343 |
| 3.4                  | 0.486  | 0.338 |
| 3.45                 | 0.479  | 0.333 |
| 3.5                  | 0.472  | 0.329 |
| 3.55                 | 0.465  | 0.324 |
| 3.6                  | 0.459  | 0.319 |
| 3.65                 | 0.452  | 0.315 |
| 3.7                  | 0.446  | 0.311 |
| 3.75                 | 0.446  | 0.307 |
| 3.8                  | 0.435  | 0.303 |
| 3.85                 | 0.423  | 0.299 |
| 3.9                  | 0.413  | 0.295 |
| 3.95                 | 0.402  | 0.291 |
| 4                    | 0.392  | 0.288 |

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**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : II B**

**SECTION : C**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1 of 1**

## **SECTION – C**

### **SPECIFIC REQUIREMENTS**

- SECTION C1 : SELF CLEANING STRAINERS**
- SECTION C2 : ELECTRICAL SYSTEMS**
- SECTION C3 : C&I SYSTEMS**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : IIB**

**SECTION : D**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1 of 1**

**SECTION C1  
SELF CLEANING STRAINERS  
(MECHANICAL DETAILS)**



**TITLE : TECHNICAL SPECIFICATION  
FOR**

**SELF CLEANING STRAINERS (SCS).**

**SPEC. NO: PE-TS-394-165-N002**

**VOLUME : II B**

**SECTION:C1**

**REV. NO. 0**

**DATE : 30.06.14**

**SHEET 1 OF 8**

## 1.0 GENERAL

The Self Cleaning Strainers (SCS) complete with all accessories shall conform to the standard technical specifications (Section-D) and Data Sheet-A enclosed herewith. In addition the requirements of this section C shall also be complied with. However, wherever the details given in Section-D and Data Sheet-A are different, the requirements of Data Sheet-A shall prevail. Similarly in the event of contradictions between Section-C & Section-D/ Data Sheet-A, Section-C shall prevail.

Section C consists of 3 parts viz. Sec. C1, C2 and C3 for Mechanical, Electrical and C&I respectively, the requirements of all 3 sections shall be complied with.

## 2.0 DESCRIPTION OF EQUIPMENTS :

### 2.1 Self Cleaning Strainers (SCS) :

Self Cleaning Strainers per unit where specified shall be installed on the suction side of ACW booster pumps. The water through the self cleaning strainers outlet shall be supplied to the ACW pumps & ACW additional pumps. The clarified water analysis is indicated in project information in section B, annexure-A-III.

## 3.0 SCOPE OF SUPPLY UNDER THE SPECIFICATION IN THE BIDDER'S SCOPE FOR SELF CLEANING STRAINERS.

3.1 The scope of supply for Self Cleaning Strainers covered under this specification is as under.

The size, MOC's and other particulars of the equipments are detailed in Data Sheet A annexed with Section – D of the specification.

| SL.NO. | PROJECT                                 | SELF CLEANING STRAINERS                          |
|--------|---|--|
| 1.     | NTPC 2x800 MW GADARWARA<br>STPP STAGE-1 | 2 SETS PER UNIT<br>VIZ. TOTAL 4 SETS FOR 2 UNITS |



**TITLE : TECHNICAL SPECIFICATION  
FOR**

**SELF CLEANING STRAINERS (SCS).**

**SPEC. NO: PE-TS-394-165-N002**

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### 3.2 SCOPE OF SUPPLY OF SCS INCLUDED IN THE BIDDER'S SCOPE :

The Qty of SCS covered under the specification shall be as per Data Sheet A of respective projects.

Each self cleaning strainer shall be complete with following accessories and auxiliaries.

- a) Flushing pump with drive Motor (as per manufacturer's design) - 1 No.
- b) Supply of complete debris disposal pipe work shall be in scope of Bidder. However bidder is to consider minimum 40 mtr. of debris disposal pipework and 5 numbers bends for each SCS in their scope of supply. In case actual piping comes out to be less than 40 mtrs. and number of bends less than 5 nos. still bidder has to supply 40 mtrs pipework and 5 nos. bends as minimum requirement. Bidder shall finalize the pipework to suit the layout at contract stage in such a way that no site welding is required for his pipework otherwise the same shall be carried out by bidder at site.
- c) Filter body/ housing Vent and Drain connections along with their isolating valves.
- d) SCS shall be supplied along with flanges as well as the Counter flanges, complete with bolts, nuts and gaskets.
- e) Differential pressure measuring system for SCS. DP measuring system shall comprise 1 No. DPT + 1 No. DPS + 1 No. DPG for SCS and shall be with *Remote seal* arrangement. Stubs for DPT, DPS and DPG shall be independent.
- f) Supporting arrangement complete with foundation plates, anchor bolts, nuts, sleeves, inserts, all installation materials, fixing bolts, clamps, saddle supports (if applicable) and other accessories etc for complete equipment supplied under this package.
- g) Set of commissioning spares, on "As required basis".
- h) The Electrical & C&I items/ accessories as specified in succeeding clause / respective sections herein.
- i) Scope of Starter Panel (Switch Gear Panel) shall be as follows:  
  
2 Sets of SCS 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 (1 Working + 1 Standby feeder).



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FOR**

**SELF CLEANING STRAINERS (SCS).**

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Switch Gear Panel shall be located in the vicinity with in around 20 meters of distance from SCS.

- j) Power and Control cables between Starter Panel (Switch Gear Panel) and various drives in bidder's scope of supply.
- k) Control cables between field instruments and junction box / Starter Panel (Switch Gear Panel) .
- l) Set of mandatory spares as indicated in Data Sheet A.
- m) All the field instruments stipulated in this specification shall be in Bidder's scope.
- n) Finish paints for touch up painting of equipment after erection at site, in sealed containers.
- o) Set of special tools and tackles if required for maintenance and erection of the equipment supplied.
- p) 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.
- q) Local Control Panels & Instruments: Scope and Type as specified in C&I section wherever required.

Any item not specified but required to make SCS a complete package shall also be in bidders 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 SCS for respective projects

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

The trial run of equipment shall be generally conducted immediately after commissioning while PG testing shall be conducted at a later date. These activities for different units shall be timed separately.

The no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.



**TITLE : TECHNICAL SPECIFICATION  
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**SELF CLEANING STRAINERS (SCS).**

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In the event of order no. of visits as follows shall be made as a minimum with charges included in the bidder's base price itself.

- **For drawings/documents approval**

In the event of order all drawings / documents in soft as well as hard copy shall be submitted as per NIT.

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

- **Site Visits :**

- i. No. of site visits for combined activities of erection checks and commissioning for SCS as applicable shall be one per unit - for both sets of equipments of one unit. Time duration for erection and commissioning shall be "on as required basis" with equipments run for trial operation thereafter for requisite period to demonstrate satisfactory operation.

However the no. of visits may be suitably assessed by bidders as per their experience with site stay periods on as required basis.

- ii. Bidder shall demonstrate guarantees including pressure drops at site during subsequent visit for SCS of each unit.
- iii. For trouble shooting on "as required 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-D the following shall also be complied under scope of this specification:

- 6.1 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

|   |  |                                     |                        |
|---|--|-------------------------------------|------------------------|
| 16<br> | <b>TITLE : TECHNICAL SPECIFICATION<br/>FOR</b> | <b>SPEC. NO: PE-TS-394-165-N002</b> |                        |
|   |  | <b>VOLUME : II B</b>                |                        |
|   |  | <b>SECTION:C1</b>                   |                        |
|   | <b>SELF CLEANING STRAINERS (SCS).</b>          | <b>REV. NO. 0</b>                   | <b>DATE : 30.06.14</b> |
|   |  | <b>SHEET 5 OF 8</b>                 |                        |

by the bidder for the intended duty which shall be subject to purchaser's approval during detailed engineering in the event of order.

- 6.2 Housing/ body of SCS Filter 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 the thickness as specified in "Pipe size Table" enclosed in Data Sheet-A of SCS.
- 6.3 Adequate provision for future installation of Cathodic Protection for SCS (Sacrificial type shall be in Purchaser Scope) shall be kept by the bidder in the equipment.
- 6.4 Velocity in the pipe work shall be less than 1.5 m/ sec for pump suction and less than 2.2 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 Self Cleaning Strainers :

7.1.1 Performance Guarantee Parameters shall be as under :


- Pressure drop in Self Cleaning Strainers in clean condition viz. after backwashing.

7.1.2 Bidder to note that bids shall be evaluated on account of pressure drop across Self Cleaning Strainers (in clean condition) & liquidated damages on account of not meeting the same shall be in accordance with following :

##### A) Bid Evaluation Criteria and Liquidated Damages:

The bids received shall be evaluated for Pressure drop across Self Cleaning strainers :

- The permissible limit of pressure drop across self cleaning strainers in clean condition shall be 0.6 MWC.
- If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ Rate as mentioned in Data Sheet-A on pro-rata basis per **0.1 MWC** pressure drop (viz. per unit).
- However no advantage shall be given for pressure drops quoted less than above permissible limit.
- The maximum acceptable limit for pressure drop across self cleaning strainer (with technical loadings) shall be 1.0 MWC.  
The bids will be technically rejected for pressure drops quoted higher than above maximum limit.
- The guaranteed pressure drops shall be demonstrated at site by vendors and if found higher shall be subject to LD @ Rate as mentioned in Data

|   |  |                                     |                        |
|---|--|-------------------------------------|------------------------|
| 16<br> | <b>TITLE : TECHNICAL SPECIFICATION<br/>FOR</b> | <b>SPEC. NO: PE-TS-394-165-N002</b> |                        |
|   |  | <b>VOLUME : II B</b>                |                        |
|   |  | <b>SECTION:C1</b>                   |                        |
|   |  | <b>REV. NO. 0</b>                   | <b>DATE : 30.06.14</b> |
|   |  | <b>SHEET 6 OF 8</b>                 |                        |

Sheet-A.

**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 3<sup>rd</sup> party inspection (TUV/ equivalent) for imported components wherever required shall be included by bidder in the base price itself. Witness for all the test identified under agency "C" & "N" in Quality plan shall be by third party.

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 for each project shall be as per NIT.
- b. Drawings submission schedule shall be as per NIT/as advised by Project Group.

**11.0** The makes of various bought out items shall be subjected to purchaser's approval 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 :

- Compliance certificate duly signed and stamped (Enclosed at Schedules).
- Guarantee schedule duly signed and stamped (Enclosed at Schedules).



**TITLE : TECHNICAL SPECIFICATION  
FOR**

**SELF CLEANING STRAINERS (SCS).**

**SPEC. NO: PE-TS-394-165-N002**

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- GA drawings of following with empty/ filled-ups.
  - GA of SCS (As applicable).
  - Debris Flushing pumps (if applicable)
  - Other equipments considered necessary for Layout/ Civil.
- Electrical Load Data (Enclosed at Vol. III of Specification)
- Schedule of Deviation (Enclosed at Schedules).

The bidder to note that load requirement furnished and finalised 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.

16



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS).**

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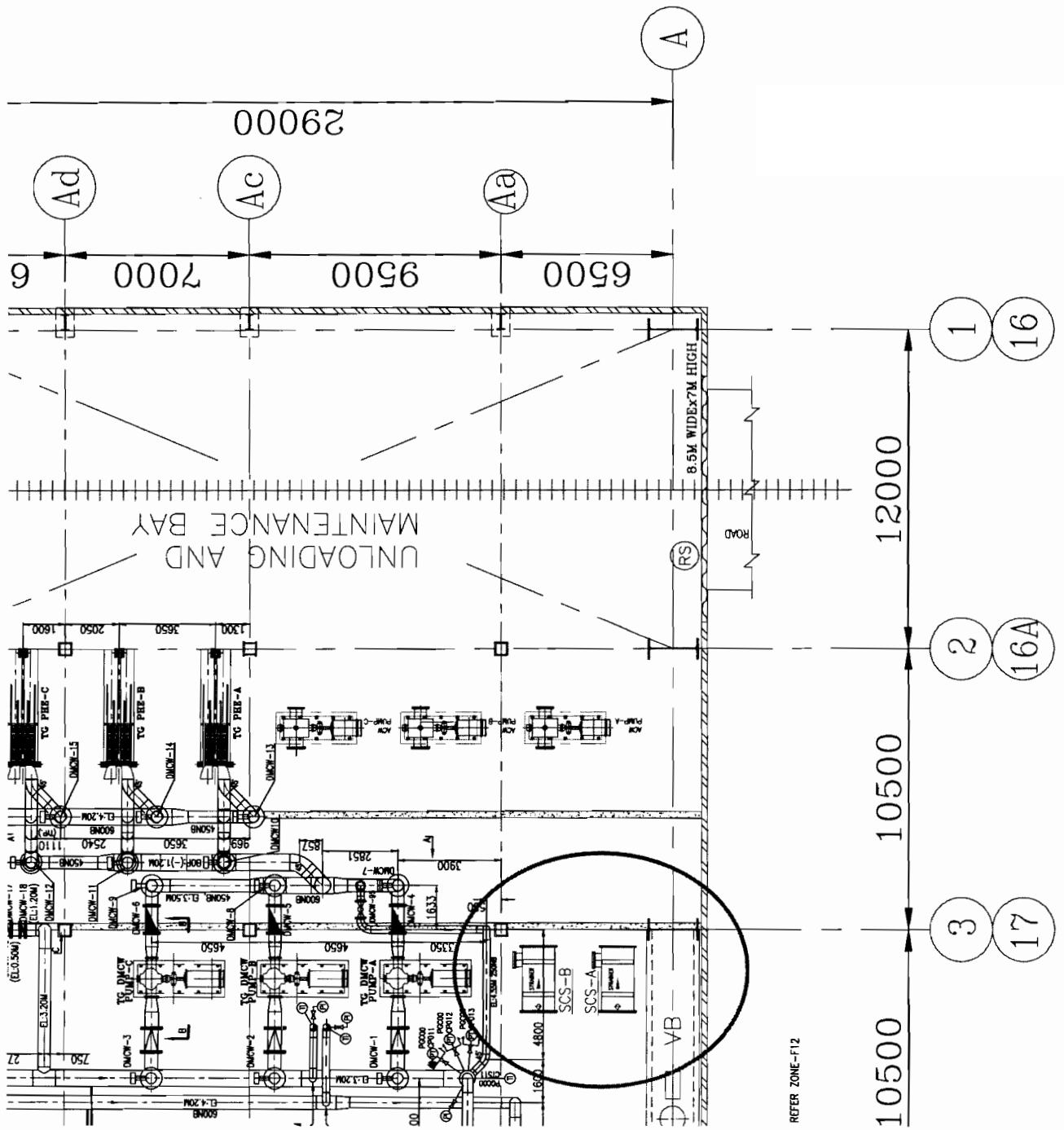
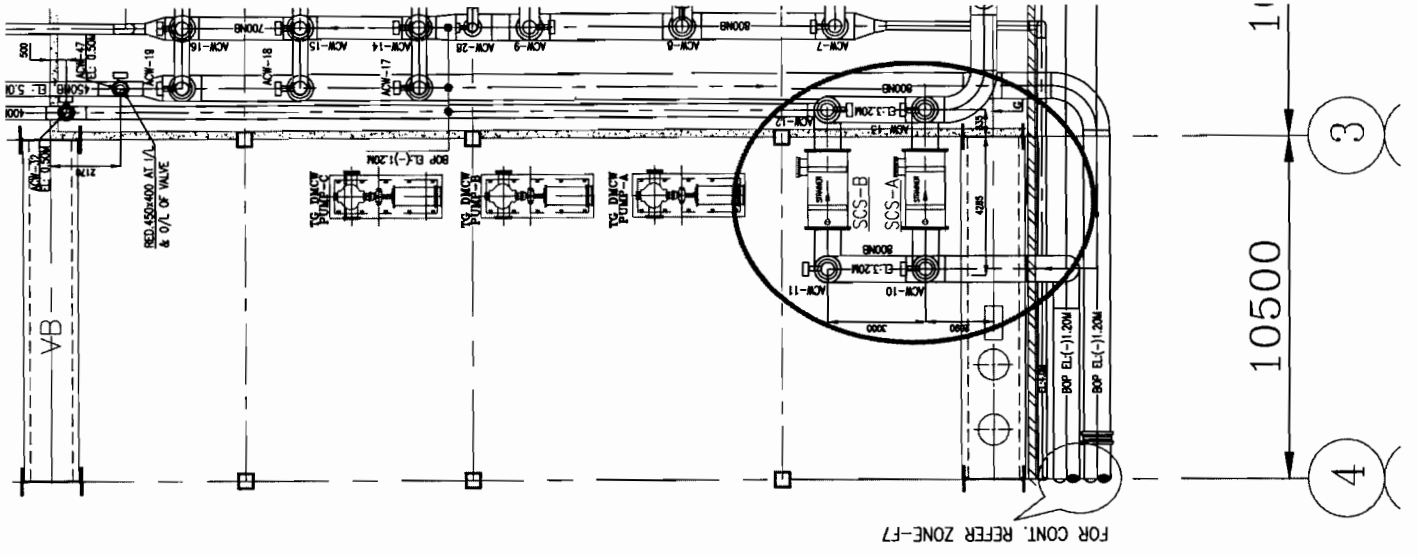
**DATE : 30.06.14**

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**ANNEXURE-I**

**SELF CLEANING STRAINERS**

| <b>SL.NO.</b> | <b>Projects</b>                              | <b>Size (NB)</b> | <b>Length of SCS (Including Counter Flange)</b> | <b>Scope of Counter Flange</b> | <b>Scope of nuts and bolts.</b> |
|---------------|--|------------------|---|--------------------------------|---------------------------------|
| 1.            | NTPC 2 x 800 MW<br>GADARWARA<br>STPP STAGE-1 | 800 NB           | 2500 mm   | In Bidder's<br>Scope           | In Bidder's<br>Scope            |





**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

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**SECTION C2  
SELF CLEANING STRAINERS  
ELECTRICAL DETAILS**

**ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR  
PACKAGE : SELF CLEANING STRAINER**

PROJECT: 2 X 800MW GADARWARA STPP

| <u>S.NO</u> | <u>DETAILS</u>  | <u>SCOPE SUPPLY</u> | <u>SCOPE E&amp;C</u> | <u>REMARKS</u>   |
|-------------|---|---------------------|----------------------|--|
| 1           | 415 V Switchgear  | NTPC                | NTPC/BHEL SITE       | 415 V AC/240 V AC supply shall be provided by NTPC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. DC supply (battery bank, charger etc) and any other supply as required for PLC/control panel (as applicable) shall be provided by vendor.                       |
| 2           | Local Push Button Station ( for motors)   | VENDOR              | NTPC/BHEL SITE       | Located near the motors.   |
| 3           | Power cables, control cables and screened control cables<br>a) both end equipment in vendor's scope<br>b) one end equipment in vendor's scope & one end in NTPC scope.<br>c) one end equipment in Vendor's scope & one end in BHEL scope. | Vendor              | NTPC/BHEL SITE       | Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL/NTPC). Finalisation of cable sizes shall be done by NTPC. Vendor shall provide lugs & glands accordingly.  |
| 4           | Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc  | Vendor              | NTPC/BHEL SITE       |  |
| 5           | Cable trays, accessories & cable trays supporting system<br>a) for cables in main route<br>b) for cables in branch route  | NTPC Vendor         | NTPC/BHEL SITE       |  |
| 6           | Cable glands and lugs for equipments supplied by Vendor   | Vendor              | NTPC/BHEL SITE       | 1. Double compression Ni-Cr plated brass cable glands.<br>2. Solder less crimping type heavy duty tinned copper lugs for power cables<br>3. Solder less crimping type heavy duty copper lugs for control cables.   |
| 7           | Conduit and conduit accessories for cabling between equipments supplied by vendor   | Vendor              | NTPC/BHEL SITE       | Cabling shall be through conduits. However vendor can use the trunk route where available for laying of cables. Conduits shall be supplied by vendor and shall be medium duty, hot dip galvanized cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to NTPC/ BHEL approval at contract stage. |
| 8           | Lighting  | NTPC                | NTPC                 |  |
| 9           | Equipment grounding & lightning protection  | Vendor              | Vendor               |  |
| 10          | Below grade grounding   | NTPC                | NTPC                 |  |
| 11          | Motors with base plate and foundation hardware  | Vendor              | Vendor               | Makes shall be subject to NTPC/ BHEL approval at contract stage.   |

**ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR  
PACKAGE : SELF CLEANING STRAINER**

|    |  |                            |                |   |
|----|--|----------------------------|----------------|---|
| 12 | Mandatory spares   | Vendor                     | -              | Vendor to quote as per specification.   |
| 13 | Recommended O & M spares, E & C spares, erection & maintenance tools & tackle  | Vendor                     | -              |   |
| 14 | Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system). | Vendor                     | NTPC/BHEL SITE |   |
| 15 | a) Input cable schedules (C & I)<br>b) Cable interconnection detail for the above<br>c) Cable block diagram  | Vendor<br>Vendor<br>Vendor | -<br>-<br>-    | Cable listing for control cables for vendor supplied equipment (soft copies in the NTPC cable schedule format) shall be furnished during detail engineering by vendor.  |
| 16 | Equipment layout drawings  | Vendor                     | -              | For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable routing details marked on the drawing as per CUSTOMER interface comments. Electrical equipment layout drawing shall be to NTPC approval. |
| 17 | Electrical equipment GA drawing  | Vendor                     | -              |   |

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/NTPC after award of contract.
2. All QPs shall be subject to approval of BHEL/NTPC after award of contract without any commercial implication.
3. Painting: The painting for electrical equipment shall be epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns. However in case electro static process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be applicable for finish coat. The vendor shall furnish the complete painting details during detailed engineering.



TITLE

**LV MOTORS**  
**DATA SHEET-A**

SPECIFICATION NO.

VOLUME II B

SECTION D

REV NO. DATE

SHEET 1 OF 1

- 1.0 Design ambient temperature : 50 °C
- 2.0 Maximum acceptable kW rating of LV motor : 200 KW
- 3.0 Installation (Indoors/ Outdoors) : As required
- 4.0 Details of supply system
- a) Rated voltage (with variation) : 415V ± 10%, 11/3.3kV ± 6%,
  - b) Rated frequency (with variation) : 50 Hz ± 5%
  - c) Combined voltage & freq. variation : 10% (sum of absolute values)
  - d) System fault level at rated voltage : 40 kA for 1 sec for 11kV & 3.3kV  
45 kA for 1 sec for 415V system
  - e) 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) : 80% of rated voltage
- 7.0 Power cables data : Details attached
- 8.0 Earth Conductor Size & Material : Details attached
- 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 : Details as per spec attached
  - b) Permissible tolerance, if any : ±20%
- 12.0 Energy Efficient Motors : Details as per spec attached
- 13.0 Additional tests : As per QP
- 14.0 Flame-proof motor
- a) Enclosure suitable (As per IS:2148) : As per requirement
  - b) Classification of Hazardous area (As per IS: 5572 part-I) : As per requirement
- 15.0 Makes : ABB/ Bharat Bijlee/ CGL / KEC/ NGEF/Siemens/ALSTOM (SUBJECT TO CUSTOMER APPROVAL DURING DETAILED ENGG)

**Note: Motor name plate rating at 50°C shall have at least 10% margin over input power requirement at rated duty point unless otherwise stated in driven equipment specification**



**ELECTRICAL EQUIPMENT SPECIFICATION  
FOR  
SELF CLEANING STRAINER  
2X800MW GADARWARA TPP**

|                              |
|------------------------------|
| SPECIFICATION NO.            |
| VOLUME NO. : II-B            |
| SECTION : C                  |
| REV NO. : 00 DATE : 30.06.14 |
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**TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINER  
(ELECTRICAL PORTION)**



**ELECTRICAL EQUIPMENT SPECIFICATION  
FOR  
SELF CLEANING STRAINER  
2X800MW GADARWARA TPP**

|                              |
|------------------------------|
| SPECIFICATION NO.            |
| VOLUME NO. : II-B            |
| SECTION : C                  |
| REV NO. : 00 DATE : 30.06.14 |
| SHEET : 2 OF 3               |

**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) Erection and Commissioning spares.
- e) Erection & Maintenance tools & tackles.
- f) Electrical load requirement for mill reject system.
- g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- h) 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
- i) 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.
- j) Motor shall meet minimum requirement of motor specification.
- k) LT power & control cables shall meet minimum requirement of LT power & control cables specification.
- l) Cabling, earthing & lightning protection shall meet minimum requirement of cabling, earthing & lightning protection specification.

**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 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/quality assurance requirements stipulated. In line with this two signed and stamped copies of the following shall be furnished by the bidder as technical offer:

- a) A copy of this sheet "Electrical equipment Specification for Sump Pump" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
- b) List of Erection and Commissioning spares.
- c) List of Erection & Maintenance tools & tackles.
- d) Electrical load requirement

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.



**ELECTRICAL EQUIPMENT SPECIFICATION  
FOR  
SELF CLEANING STRAINER  
2X800MW GADARWARA TPP**

SPECIFICATION NO.

VOLUME NO. : II-B

SECTION : C

REV NO. : 00 DATE : 30.06.14

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4.0 List of enclosures :

- a) Electrical scope between NTPC/BHEL & vendor.
- b) Technical specification, datasheets & quality plans for 415V Electric motors.
- c) Technical Specification, datasheets & quality plans for LT power & control cables.
- d) Technical Specification, datasheets & quality plans for cabling, earthing & lightning protection.
- e) Electrical Load data format.



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

**VOLUME : IIB**

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**SECTION C3  
SELF CLEANING STRAINERS  
C&I DETAILS**

|      |   | 2X800 MW GADARWARA |
|------|---|--------------------|
| 1.00 | SYSTEM  | SCS                |
| 2.00 | COMMON / PER UNIT                             | PER UNIT           |
| 3.00 | CONTROL SYSTEM                                | DCS (TG 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                 |
| 5.10 | PURPOSE OF HARDWIRED INTERFACE WITH DCS       |                    |
| 5.11 | a) COMMAND FROM DCS (Y/N)                     | NA                 |
| 5.12 | b) STATUS FEEDBACK TO DCS (Y/N)               | NA                 |
| 5.13 | c) GROUP FAULT ALARM TO DCS (Y/N)             | NA                 |
| 6.00 | SOFTLINK TO DCS (Y/N)                         | NA                 |
| 6.10 | PURPOSE OF SOFTLINK TO DCS                    |                    |
| 6.11 | a) COMMAND INTERFACE WITH DCS (Y/N)           | NA                 |
| 6.12 | b) STATUS MONITORING IN DCS (Y/N)             | NA                 |
| 7.00 | PROTECTION CLASS FOR PLC / RIO PANEL          | NA                 |

|       |  |        |
|-------|--|--------|
| 8.00  | CONTROL FROM PB'S ON LCP/OWS ON LCP  | NA     |
| 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     |
| 11.10 | COMMUNICATION CABLE SCOPE (BIDDER/ PEW/ EDN/ CUSTOMER)   | NA     |
| 11.20 | REDUNDANT CABLE (Y/N)  | NA     |
| 11.30 | PROTOCOL   | NA     |
| 12.00 | RIO / RPU (Y/N)  | NA     |
| 13.00 | ## NO. OF OWS / LAPTOP   | NA     |
| 13.10 | SIZE OF OWS/ CRT OR LCD  | NA     |
| 14.00 | NO. OF PRINTER   | NA     |
| 14.10 | PRINTER SIZE AND TYPE  | NA     |
| 15.00 | \$\$ POWER SUPPLY AVAILABLE FOR BALL MONITOR (24V DC / 110 V AC UPS / 230 V AC UPS)              | 24V DC |
| 15.10 | && POWER SUPPLY AVAILABLE FOR PLC PANEL (3PHASE, 415 V AC/ 1PHASE, 110 V UPS/ 1PHASE, 230 V UPS) | NA     |
| 15.20 | REDUNDANT FEEDERS (R) / NON-REDUNDANT (NR) FEEDERS FOR POWER SUPPLY                              | NA     |
| 15.30 | UPS BATTERY CONFIGURATION (1X100% / 2X100%)  | NA     |

|       |  |   |
|-------|--|---|
| 15.40 | BATTERY TYPE (LEAD ACID/ Ni-Cd)                      | NA  |
| 15.50 | BATTERY BACK-UP TIME (in minutes)                    | NA  |
| 16.00 | ACTUATOR WITH INTEGRAL STARTER (Y/N)                 | Y   |
| 17.00 | PG/ DPG/ PS/ DPS/ PT/ DPT per Self Cleaning Strainer | DPT = 1 no.<br>DPG = 1 no.<br>DPS = 1 no. |
| 18.00 | REMARKS  |   |
| 19.00 | PROJECT SPECIFIC INFO                                |   |

**19.00 NOTES:**

1. \$\$ THIS IS APPLICABLE FOR DCS CONTROLLED SYSTEMS ONLY.
2. & THIS IS APPLICABLE FOR PLC CONTROLLED SYSTEMS. ALL POWER SUPPLY REQUIREMENTS FOR INDIVIDUAL SUB-SYSTEMS/ COMPONENTS EG. BALL MONITOR, SOL VALVES ETC SHALL BE DERIVED BY THE VENDOR FROM THIS POWER SUPPLY.
3. \*\*\* THE UPS FOR PLC SHALL BE IN BIDDER'S SCOPE. ITS CONFIGURATION SHALL BE 2X100% CHARGERS / INVERTERS.
4. IN CASE OF DCS CONTROLLED SYSTEMS. 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
5. IN CASE OF PLC CONTROLLED SYSTEMS, ALL CABLES & CABLE ENGINEERING SHALL BE IN BIDDER'S SCOPE.
6. ## FOR PLC BASED CONTROL SYSTEM WHERE OWS IS PROVIDED, THE OWS SHALL HAVE PROGRAMMING & CONFIGURATION FACILITY.
7. OWS SHALL BE MOUNTED ON THE FRONT OF LCP.
8. COLOUR OF PLC PANEL SHALL BE AS PER IS-8 SHADE #31 OR EQUIVALENT.
9. INSTRUMENT RACK AND JUNCTION BOXES SHALL BE IN BIDDER'S SCOPE OF SUPPLY. NECESSARY STRUCTURAL STEEL FOR MOUNTING THE INSTRUMENTS(DPG,DPT,DPS), JUNCTION BOX, INSTRUMENT RACK, SWGR PANEL, ETC. SHALL BE IN BIDDER'S SCOPE.
10. BIDDER TO FURNISH ELECTRICAL LOAD DATA DURING DETAILED ENGINEERING.
11. ALARM FACIA SHALL BE UNDER BIDDER'S SCOPE. NO. OF FACIA SHALL BE DECIDED DURING DETAILED ENGINEERING.

**LEGEND:**

- DCS- DISTRIBUTED CONTROL SYSTEM
- PLC- PROGRAMMABLE LOGIC CONTROLLER
- RPU - REMOTE PROCESSING UNIT



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FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

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## **SECTION – D**

### **STANDARD TECHNICAL SPECIFICATION**

**SECTION D1 : SELF CLEANING STRAINERS**

**SECTION D2 : ELECTRICAL SYSTEMS**

**SECTION D3 : C&I SYSTEM**



**TITLE : TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS (SCS)**

**SPEC. NO. PE-TS-394-165-N002**

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**SECTION D1  
STANDARD TECHNICAL SPECIFICATION  
FOR  
SELF CLEANING STRAINERS**

|   |   |  |                          |
|---|---|--|--------------------------|
|   | <b>TITLE :</b>                          | <b>SPEC. NO.</b><br><b>PE-TS- 999-165-N002</b> |                          |
|  | <b>STANDARD TECHNICAL SPECIFICATION</b> | <b>VOLUME : II B</b>                           |                          |
|   | <b>SELF - CLEANING FILTERS</b>          | <b>SECTION : D</b>                             |                          |
|   |   | <b>REV. NO. 0</b>                              | <b>DATE : 02.12.2009</b> |
|   |   | <b>SHEET 1 OF 10</b>                           |                          |

1.00.00 **GENERAL**

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 filter (Backwash Type) complete with all accessories as specified hereinafter.

2.00.00 **CODES AND STANDARDS**

2.01.00 The design, materials manufacture, inspection and testing of the self-cleaning filter 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 **DESIGN AND CONSTRUCTION**

3.01.00 **General Requirements**

3.01.01 Unless otherwise necessary manufacturer's standard and proven models of the self cleaning filter shall be supplied.

3.01.02 The self-cleaning filter 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.

3.01.04 Unless otherwise specified in Data Sheet-A, the inlet and outlets of the filter shall be co-axial without any off set between the centre lines of inlet and outlet pipes.

3.02.00 **Performance Requirements**

The self-cleaning filter with all accessories shall be designed and guaranteed to meet the following requirements :-

3.02.01 The self - cleaning filter 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,

|   |                                  |                                   |
|---|----------------------------------|-----------------------------------|
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wood pieces etc. The performance of the filter shall be continuous with minimum number of flushing / backwashing operations.

3.02.02 The self-cleaning filter shall be designed such that the pressure drop across the filter (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 debris filter 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 debris flushing / backwash unit such that the pressure drop across the filter after flushing / backwashing, shall not be more than the pressure drop under clean conditions.

3.03.00 **Operational Requirement**

The self-cleaning filter 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
- ◆ 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 filter housing/body shall be designed and manufactured as per the applicable codes for pressure vessels. However in no case thickness of housing/ body shall not be less than connecting pipe thickness as specified in Data Sheet-A. It shall house the filter section / screen assembly and shall have flanged inlet, outlet, flushing / debris discharge openings and pressure measuring tappings etc.

3.04.02 In design of filter housing / body due attention shall be given for easy removal and replacement of filter section / screen assembly.


3.04.03 The filter shall be provided with inspection hole with bolted cover.

|   |   |  |                          |
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|  | <b>STANDARD TECHNICAL SPECIFICATION</b> | <b>VOLUME : II B</b>                           |                          |
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- 3.04.04 The filter 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 **Filter Section / Screen assembly.**
- 3.05.01 The filter 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 filter section shall not be more than that specified in Data Sheet-A.
- 3.05.03 The arrangement of the filter section shall be such that there shall be no forced accumulation of debris.
- 3.06.00 **Differential Pressure Measuring System**
- 3.06.01 The self-cleaning filter 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 separate differential pressure transmitter for normal automatic flushing operation and separate DP Switch as a backup in the event of DPT failure, a differential pressure gauge for manual observation with adequate no. of tappings with isolating valves and equalizing valves.
- 3.06.02 The contacts for differential pressure transmitter, differential pressure switch 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 also be equipped with built in flushing arrangement consisting of flushing pump, valves and associated piping, to prevent blockage of the system with any debris. Unless otherwise specified in Section C, water required for flushing the differential pressure measuring system shall be taken from downstream side of the strainer/ screen.
- 3.07.00 **Flushing / Backwash Unit. :**
- 3.07.01 The self-cleaning filter 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.
- 3.07.3 The flushing backwash unit shall be either fixed type with actuator operated

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|   | <p>flushing valves or electric motor driven (through reduction gear) backwash rotor. In case of backwash rotor, it shall be fitted with removable shoes for smooth and close running contact with the filter section/screen and to prevent the unfiltered water from bypassing to waste.</p> <p>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 with necessary pump, valves and piping for water injection supplied by the bidder.</p> <p>3.07.05 View glass to be provided in debris outlet pipe to monitor the flushing of debris.</p> <p>3.08.00 <b><u>Valves</u></b></p> <p>The flushing valves (if any,) the debris discharge/backwash outlet valve, isolation, vent and drain valves shall conform to appropriate codes / standards. The debris discharge/backwash outlet valve shall be larger than the debris discharge/back wash outlet pipe.</p> <p>3.09.00 <b><u>Instrumentation and Control System</u></b></p> <p>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 filter and its associated electrical devices.</p> <p>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.</p> <p>3.09.03 All instrumentation shall be of reputed make and shall meet the requirement of the enclosed specification.</p> <p>3..10.00 <b><u>Other Accessories.</u></b></p> <p>3.10.01 Counter flanges, flat faced slip on type, 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.</p> <p>3.10.02 Self-cleaning filter shall be provided with suitable lifting arrangement for handling during erection and maintenance.</p> <p>3.10.03 Necessary supporting arrangement (wherever applicable) complete with foundation plates, bolts, nuts etc., shall be provided.</p> |  |

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|   | SHEET <b>5</b> OF <b>10</b>             |  |

3.11.00 **Material of Construction**

Material of self-cleaning filter and other accessories shall be corrosion resistant and consistent with the fluid handled. However material specification for various components shall be equal or superior to those specified in Data Sheet-A.

4.00.00 **PAINTING**

4.01.00 The surface preparation of the filter housing / body and other parts shall be done as per the standard mentioned in Data Sheet-A and shall include the following :

- a) Removal of oil, grease, dirt and swarf etc.
- b) Removal of rust and scale etc.
- c) Sand blasting/shot blasting.

4.02.00 All internal surfaces of the filter which are subject to immersion or water spray and which are not made of stainless steel or other corrosion resistant materials after surface preparation, shall be coated with adequate coats (minimum 200 to 250 microns thick) of epoxy paint of approved make and quality over a coat of zinc chromite primer, unless otherwise specified in Data sheet-A.

4.03.00 The external surfaces of the filter and other accessories after surface preparation, shall be coated with adequate coats (minimum 175 to 200 microns thick) of synthetic enamel paint of approved make and quality over two coats of red oxide primer, unless otherwise specified in Data Sheet-A.

5.00.00 **SHOP INSPECTION AND TESTS**


5.01.00 **General :**

5.01.01 Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the self-cleaning filter and other accessories shall conform to the requirements of this specification and of the applicable codes/standards.

5.01.02 All materials used for manufacture/fabrication of the filter 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.

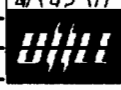
5.01.03 All shop tests shall be conducted in the presence of BHEL's representative and test certificates / reports for the same shall be furnished to BHEL for approval.

5.01.04 Qualification of welding procedures and welders shall be as per ASME B&PV

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|   | <b>TITLE :</b>                          | <b>SPEC. NO.</b><br><b>PE-TS- 999-165-N002</b> |
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|   | <b>SELF - CLEANING FILTERS</b>          | <b>SECTION : D</b>                             |
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|         |  |
|---------|--|
|         | Code, Section-IX / applicable codes.   |
| 5.02.00 | <b><u>Filter Housing / Body</u></b>  |
| 5.02.01 | Chemical analysis, mechanical tests shall be carried out on housing/body material.   |
| 5.02.02 | 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. |
| 5.03.00 | <b><u>Rubber Lining (as applicable)</u></b>  |
|         | Rubber lining shall be subjected to surface crack test, 100% spark and hardness tests and shall be checked for layer thickness, defects etc.   |
| 5.04.00 | <b><u>Filter Section/Screen assembly</u></b>   |
|         | Supporting cage and filter section/screen materials shall be tested for chemical properties. Checks shall be carried out for perforation/mesh size, defects etc.   |
| 5.05.00 | <b><u>Flushing / Backwash Unit</u></b>   |
| 5.05.01 | Material of various components of the flushing/Backwash Unit shall be tested for chemical and mechanical properties.   |
| 5.05.02 | 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.   |
| 5.06.00 | <b><u>Valves</u></b>   |
|         | 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.          |
| 5.07.00 | <b><u>Flanges</u></b>  |
| 5.07.01 | In case of fabricated flanges, all the welds shall be subjected to 100% radiography as per ASME B&PV code, section VIII, Division-1.   |
| 5.07.02 | In case of forged flanges, ultrasonic testing shall be carried out as per ASTM-E 388.  |
| 5.07.03 | If the thickness of the plate used for flanged is 40mm or more the same shall be checked ultrasonically as per ASTM-A 435 to demonstrate the absence of lamination and lack of fusion etc.   |
| 5.07.04 | Chemical and mechanical test certificates shall furnish for flange materials.  |
| 5.07.05 | Flanges shall be checked for edge preparation, fit up and satisfactory working with  |

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|          | <b>TITLE :</b>   | <b>SPEC. NO.</b><br><b>PE-TS- 999-165-N002</b> |                          |
| 01/03/09 | <b>STANDARD TECHNICAL SPECIFICATION</b>  | <b>VOLUME : II B</b>                           |                          |
|          | <b>SELF - CLEANING FILTERS</b>   | <b>SECTION : D</b>                             |                          |
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|          |  | <b>SHEET 7 OF 10</b>                           |                          |
| 5.08.00  | matching parts.<br>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.  |  |                          |
| 5.09.00  | <b><u>Dimensional Checks</u></b><br><br>Dimensional checks of various components of the filter shall be carried out as per the drawings approved by BHEL.  |  |                          |
| 5.10.00  | <b><u>Hydrostatic Test</u></b><br><br>Hydrostatic test shall be conducted on the filter housing/body at a pressure of 2 times the design pressure. The duration of the test shall be minimum 30 minutes.   |  |                          |
| 5.11.00  | <b><u>Leakage Test</u></b><br><br>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.  |  |                          |
| 5.12.00  | <b><u>Functional Tests</u></b><br><br>The self-cleaning filter assembly complete with valves, actuators and other accessories shall be subjected to functional tests and the following shall be checked :-   |  |                          |
| 5.12.01  | Smooth and free operation of all movable parts.  |  |                          |
| 5.12.02  | Interlocks and sequential operation.   |  |                          |
| 5.12.03  | Satisfactory operation of actuator torque switches, limit switches etc.  |  |                          |
| 6.00.00  | <b><u>TESTING AT SITE</u></b><br><br>After completion of installation at site, the self cleaning filter 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. |  |                          |
| 7.00.00  | <b><u>PERFORMANCE GUARANTEE</u></b>  |  |                          |
| 7.00.00  | <b><u>PERFORMANCE GUARANTEE &amp; Bid evaluation criteria</u></b><br><br>The Self cleaning strainer shall be guaranteed to meet the performance requirements specified in Section-D , Data Sheet A and Guarantee schedule and also for trouble free operation after commissioning. Schedule of performance guarantees (enclosed in   |  |                          |

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|---|----------------------------------|-----------------------------------|
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|  | SELF - CLEANING FILTERS          | SECTION : D                       |
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|   |                                  | SHEET 8 OF 10                     |

Volume III) duly filled and signed shall be furnished with the bid.

The Performance guarantees of equipments shall stand valid till the satisfactory completion of performance testing & its acceptance by BHEL/ Customer. If the guarantee period specified in the Commercial Specification is higher, same shall prevail.

- 7.01.00 Performance Guarantee Parameters shall be as under :
- Pressure drop in Self cleaning strainer in clean condition viz. after backwashing.

- 7.02.01 Bidder to note that bids shall be evaluated on account of pressure drop across Self cleaning strainer (in clean condition) & liquidated damages on account of not meeting the same shall be in accordance with following :

**A) Bid Evaluation Criteria and Liquidated Damages:**

The bids received shall be evaluated for Pressure drop across Self cleaning strainer:

- The permissible limit of pressure drop across Self cleaning strainer in clean condition shall be 0.6 MWC.
- If the pressure drops quoted are higher than above limit, the bids shall be technically loaded @ Rate as mentioned in Data Sheet-A for respective projects per 1 MWC pressure drop (viz. per unit).
- However no advantage shall be given for pressure drops quoted less than above permissible limit.
- The maximum acceptable limit for pressure drop across self cleaning strainer ( with technical loadings) shall be 1.0 MWC

The bids will be technically rejected for pressure drops quoted higher than above maximum limit.

- The guaranteed pressure drops shall be demonstrated at site by vendors and if found higher shall be subject to LD @ twice the bid evaluation factor as above.

**8.00.00 QUALITY ASSURANCE & QUALITY PLAN**


- 8.01.00 The self - cleaning filter and other accessories to be supplied shall have assured quality and workmanship.


- 8.02.00 Typical quality plans (Q.P. No. PEM-MSE-SQP-07) 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.


**9.00.00 NAME PLATE AND TAG NUMBERS**


- 9.01.00 The filter shall be provided with a permanently attached brass or stainless steel plate indicating the following details:-

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| 8/15/09  | <b>STANDARD TECHNICAL SPECIFICATION</b> | <b>VOLUME : II B</b>                           |                          |
|   | <b>SELF - CLEANING FILTERS</b>          | <b>SECTION : D</b>                             |                          |
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|  |   | <b>SHEET 9 OF 10</b>                           |                          |
| <p>a) Design flow<br/> b) Design and test pressures<br/> c) Design temperature<br/> d) Filter section/screen mesh size<br/> e) Empty and operating weights<br/> f) Revolving speed of backwash rotor</p> <p>9.02.00 Each valve shall be provided with a name plate indicating the following :-</p> <p>a) Service<br/> b) Design and test pressures<br/> c) Maximum flow and flow direction<br/> d) Size<br/> e) Engineer's Tag Number</p> <p>Tag numbers will be indicated on the drawing submitted for approval during contract stage.</p> <p>9.03.00 Each motor / actuator shall be provided with a name plate indicating the following details :</p> <p>a) Supply conditions.<br/> b) KW Rating<br/> c) Make</p> <p>10.00.00 <b><u>DRAWINGS, DATA &amp; INFORMATION TO BE SUBMITTED WITH THE BID</u></b></p> <p>The bidder shall furnish the following drawings, data and information alongwith the bid without which the offer will be deemed incomplete.</p> <p>10.01.00 Data sheet-B with all particulars / data duly filled in.</p> <p>10.02.00 General arrangement / installation drawings of the self-cleaning filter with all accessories, incorporating the principal dimensions and weights of equipment offered, size and location of various nozzle connections, supporting arrangement (if applicable) and scope of supply etc.</p> <p>10.03.00 Cross-sectional / detailed drawings of filter housing / body, filter section / screen assemblies, flushing / backwashing unit, differential pressure measuring system, actuators, motors, control panel etc., indicating bill of quantities and materials of construction.</p> <p>10.04.00 Flow and control logic diagrams for complete filter during normal and flushing / backwashing operations.</p> <p>10.05.00 Performance evaluation procedure at site.</p> |   |  |                          |

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|   | <b>TITLE :</b>  | <b>SPEC. NO.</b><br><b>PE-TS- 999-165-N002</b> |                          |
|  | <b>STANDARD TECHNICAL SPECIFICATION</b>   | <b>VOLUME : II B</b>                           |                          |
|   | <b>SELF - CLEANING FILTERS</b>  | <b>SECTION : D</b>                             |                          |
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|   |   | <b>SHEET 10 OF 10</b>                          |                          |
| 10.06.00  | Control panel layout and list of instruments provided on control panel.   |  |                          |
| 10.07.00  | List of annunciations, protections and interlocks provided.   |  |                          |
| 10.08.00  | Write-up on operation, control, monitoring, interlocks and protection of filter.  |  |                          |
| 10.09.00  | Manufacturer's descriptive and illustrative literature on the equipments / components being offered.  |  |                          |
| 10.10.00  | A detailed experience list about the successful installations of similar equipment of equal or higher inlet / outlet sizes and flow capacities for similar application. |  |                          |
| 10.11.00  | A comprehensive write-up on the testing facilities, tests to be conducted inspection methods and QA system adopted by the manufacturer.                                 |  |                          |
| 10.12.00  | Quality plan for the self-cleaning filter and for all its accessories.  |  |                          |
| 11.00.00  | <b><u>DRAWINGS, DATA &amp; INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT :</u></b>  |  |                          |
|   | The drawings, data and other documents as required in Data Sheet-C shall be furnished after the award of contract.  |  |                          |

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|---|---|---|--------------------------|
|   | <b>TITLE :</b>  | <b>SPECIFICATION NO. PE-TS-317/328-165-N002</b> |                          |
|  | <b>DATA SHEET - C</b>   | <b>VOLUME : II - B</b>                          |                          |
|   | <b>SELF - CLEANING FILTER</b>   | <b>SECTION : D</b>                              |                          |
|   | <b>( Backwash Type )</b>  | <b>REV. NO. 02</b>                              | <b>DATE : 02.12.2009</b> |
|   |   | <b>SHEET 1 OF 2</b>                             |                          |
| <b>1.00.00</b>  | <b><u>DRAWINGS, DATA AND INFORMATION TO BE SUBMITTED AFTER THE AWARD OF CONTRACT :</u></b>  |   |                          |
|   | After the award of contract, the following drawings, data and information is to be submitted for review / approval of BHEL as per the distribution schedule given in Section -C.  |   |                          |
| <b>1.01.00</b>  | Within 3 (three) weeks of the data of LOI, the following shall be submitted :   |   |                          |
| <b>1.01.01</b>  | Data Sheet -B duly revised conforming to accepted bid.  |   |                          |
| <b>1.01.02</b>  | 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 filter 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 another bolts etc.   |   |                          |
| <b>1.02.00</b>  | <b><u>With in the stipulated time period as per vendor's drawing/document list, the following shall be submitted :</u></b>  |   |                          |
| <b>1.02.01</b>  | 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.    |   |                          |
| <b>10.02.02</b>   | Flow and control logic diagrams for complete filter during normal and flushing operation and system write-up covering all modes of operation.   |   |                          |
| <b>1.02.03</b>  | Final version of performance evaluation procedures at site.   |   |                          |
| <b>1.02.04</b>  | Detailed schedule of valves indicating tag numbers, type, make, size, pressure & temperature ratings, materials etc.  |   |                          |
| <b>1.02.05</b>  | Detailed schedule of power & control cable.   |   |                          |
| <b>1.02.06</b>  | Detailed schedule of piping and fittings indicating sizes, materials, maximum working pressure & temperatures etc.  |   |                          |
| <b>1.02.07</b>  | Control panel layout and list of instruments provided on control panel and internal wiring diagrams.  |   |                          |
| <b>1.02.08</b>  | List of annunciations, protections and interlocks provided.   |   |                          |

|   |                               |   |                          |
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|  | <b>TITLE :</b>                | <b>SPECIFICATION NO. PE-TS-317/326-165-N002</b> |                          |
|   | <b>DATA SHEET - C</b>         | <b>VOLUME : II - B</b>                          |                          |
|   | <b>SELF - CLEANING FILTER</b> | <b>SECTION : D</b>                              |                          |
|   | <b>( Backwash Type )</b>      | <b>REV. NO. 02</b>                              | <b>DATE : 02.12.2009</b> |
|   |                               | <b>SHEET 2 OF 2</b>                             |                          |

- 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.

ANNEXURE TO DATASHEET-A  
PIPE SIZE TABLE

PIPE SIZES

| NB   | O.D.(MM) | MAX. | THK.(MM) |
|------|----------|------|----------|
| 15   | 21.8     |      | 3.2      |
| 25   | 34.2     |      | 4.0      |
| 50   | 60.8     |      | 4.5      |
| 100  | 115.0    |      | 5.4      |
| 150  | 166.5    |      | 5.4      |
| 200  | 219.1    |      | 6.0      |
| 250  | 273.0    |      | 6.0      |
| 300  | 323.9    |      | 6.0      |
| 350  | 355.6    |      | 6.0      |
| 400  | 406.4    |      | 6.0      |
| 450  | 457      |      | 6.0      |
| 500  | 508.0    |      | 6.0      |
| 600  | 610.0    |      | 6.0      |
| 700  | 711.0    |      | 7.0      |
| 800  | 813.0    |      | 8.0      |
| 2500 | 2540     |      | 20       |

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|--|--|--------------------------------------|---|
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| S. No.   | DESCRIPTION  | UNITS                                | 2 X 800 MW NTPC GADARWARA STPP, STAGE-1   |
| 1.0  | GENERAL  |                                      |   |
| 1.1  | Type of Strainers/ Filters   | -                                    | Self Cleaning Strainers   |
| 1.2  | No. of Strainers/ Filters required   | Nos.                                 | Total 4 nos for two units i.e. 2 nos per unit (1working + 1 standby)            |
| 1.3  | Inlet connection   | mm Nb                                | 800   |
| 1.3  | Outlet connection  | mm Nb                                | 800   |
| 1.4  | Filter type/ duty  | -                                    | On line / continuous  |
| 1.5  | Location   | -                                    | ACW Pump common suction Header  |
| 1.6  | Liquid handled   | -                                    | Clarified Water as per analysis attached in annexure-A-III of proj. information |
| 2.0  | DESIGN DATA  |                                      |   |
| 2.1  | Operating pressure   | Bar (g)                              | 1.8 to 2.2  |
| 2.2  | Design pressure  | Kg/cm <sup>2</sup>                   | 7.5   |
| 2.3  | Design temperature   | Deg. C                               | 60  |
| 2.4  | Flow rate through filter<br>a) Normal (cub.m/hr)<br>b) Maximum (cub. m/hr) |                                      | 4000<br>4800  |



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**2 X 800 MW NTPC GADARWARA STPP, STAGE-1**

| S. No. | DESCRIPTION   | UNITS        |   |
|--------|---|--------------|---|
| 2.5    | Design differential pressure for filter section/ screen   | Bar (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 <ul style="list-style-type: none"> <li>• For initiating flushing/ backwashing</li> <li>• For alarm/ annunciation</li> </ul> | mbar<br>mbar | 110<br>160  |
| 2.8    | Filter section/ screen perforation size   | mm           | 2 mm (Max)  |
| 2.9    | Free flow area in the screen basket   | -            | At least 120 % of pipe inlet area   |
| 3.0    | <b>GUARANTEED PERFORMANCE REQUIREMENT</b>   |              |   |
| 3.1    | Pressure drop across the filter (i.e. between inlet and outlet connection) at normal flow   | -            |   |



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2 X 800 MW NTPC GADARWARA STPP, STAGE-1

| S. No. | DESCRIPTION                                  | UNITS      |  |
|--------|--|------------|--|
|        |  |            | Refer Section – C of specification   |
|        | a) Clean condition                           | mbar       |  |
|        | b) Partially (50%) choked condition          | mbar       | Not to exceed 110  |
| 3.2    | Debris discharge flow during flushing period | Cub m/ Hr. | Not to exceed 2.5% of total flow rate  |
| 4.0    | <b>MATERIALS OF CONSTRUCTION</b>             |            |  |
| 4.1    | Filter body/ housing                         | -          | IS:210 Gr. FG 260 or ASTM-A-515 Gr.75/ IS :2062 and internally painted with Epoxy., with housing thickness same as connecting pipe thickness |
| 4.2    | Filter screen/ section                       | -          | SS-316   |
| 4.3    | Shaft  | -          | SS-316   |
| 4.4    | Supporting cage                              | -          | SS-316   |
| 4.5    | Differential measuring system                | -          | SS-316   |
| 4.6    | Flushing/ backwashing unit                   | -          | SS-316   |
| 4.7    | Backwash rotor shoes                         | -          | Neoprene   |

|   |   |  |   |  |
|---|---|--|---|--|
|  | <b>TITLE :</b><br><b>DATA SHEET - A2 FOR SELF CLEANING STRAINERS (SCS)</b>                                    |  | <b>SPECIFICATION NO. PE-TS-394-165-N002</b> |  |
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| S. No.                                  | DESCRIPTION                             | UNITS |                     |
|---|---|-------|---------------------|
| 2 X 800 MW NTPC GADARWARA STPP, STAGE-1 |   |       |                     |
| 4.8                                     | Any other internal hardware /pipes etc. | -     | SS-316 or eq.       |
| 4.9                                     | Flushing Pump                           |       | If required         |
| a)                                      | Casing                                  |       | IS:210 Gr. FG 260   |
| b)                                      | Impeller                                |       | ASTM-A-351 CF8M     |
| c)                                      | Shaft                                   |       | SS316 or equivalent |

|        |                                   |   |   |
|--------|-----------------------------------|---|---|
| 4.10   | Valves                            | - |   |
| 4.10.1 | Check Valves (all sizes)          |   | For size 50 NB and below-Piston type<br>For sizes 65 NB and above-Swing check type or dual plate type |
|        | a) Body & Bonnet                  | - | ASTM A216 Gr. WCB / ASTM A105 / BS 1452 Gr. 14/ IS-210 Gr. FG 260                                     |
|        | c) Disc for Check Valve           | - | ASTM A216 Gr. WCB/ASTM A105 / BS 1452 Gr. 14/ IS-210 Gr. FG 260                                       |
|        | d) Hinge Pin for Check Valve      | - | AISI - 316  |
| 4.10.2 | Globe/ Gate Valves 350 Nb & Below |   |   |
|        | Body & Bonnet                     |   | ASTM A216 Gr. WCB / ASTM A105 / BS 1452 Gr. 14/ IS-210 Gr. FG 260 (2% Ni)                             |
|        | Internals                         |   | SS 316  |



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2 X 800 MW NTPC GADARWARA STPP, STAGE-1

UNITS


DESCRIPTION

S. No.

|        |  |   |  |
|--------|--|---|--|
| 4.10.3 | <ul style="list-style-type: none"> <li>➤ BF Valves (above 350Nb)</li> <li>➤ Body &amp; Disc</li> <li>➤ Shaft</li> <li>➤ Seal</li> <li>➤ Seat ring</li> <li>➤ Bearings</li> <li>➤ Companion Flange</li> </ul> |   | <ul style="list-style-type: none"> <li>2 % Ni Cl as per IS 210, FG 260, epoxy coated</li> <li>SS - 410/ BS 970 431 S 291</li> <li>Nitrile Rubber</li> <li>18-8 SS</li> <li>Self lubricating type</li> <li>Carbon steel as per IS 2062 Gr. B</li> </ul> |
| 4.11   | <p><b>C) Ball valves</b></p> <ul style="list-style-type: none"> <li>i) Body</li> <li>ii) Ball</li> <li>iii) Stem</li> </ul> <p>Piping</p>  | - | <ul style="list-style-type: none"> <li>SA 351 CF8M</li> <li>SA 351 CF8M</li> <li>SS 316</li> <li>By Bidder</li> </ul>  |
| 4.12   | Material   |   | Piping upto including 150 NB : carbon steel ERW, IS:1239 (Heavy grade)<br>Piping above including 200 NB, Rolled & Welded conforming to IS:3589 Required, 600NB   |
| 5.0    | COUNTER FLANGES  |   | In Bidder's Scope  |
| 5.1    | Material   |   |  |
|        | Flanges  |   | IS 2062, Gr. B   |

|   |  |   |  |   |  |
|---|--|---|--|---|--|
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|   |  | 2 X 800 MW NTPC GADARWARA STPP, STAGE-1   |  | Page 6 of 8                                 |  |

|     |                                 |         |   |
|-----|---------------------------------|---------|---|
| 5.2 | Drilling Standard               | -       | BS 4504 or equivalent   |
| 6.0 | Connecting pipe size (OD & Thk) | mm      | 813 X 8   |
| 7.0 | <b>PAINTING</b>                 |         |   |
| 7.1 | External Surface                | -       |   |
|     | a) Surface preparation          | -       | SA 2.5 of Swedish Specification SIS 05.5900.197   |
|     | b) Primer                       |         | Two coat of Epoxy resin based Zinc Phosphate  |
|     | c) Intermediate                 |         | Epoxy based TiO2 pigmented coat   |
|     | d) Final paint                  |         | Synthetic enamel paint to achieve DFT of 175 to 200 microns. Colour code shall be as per IS-9404 (Appendix-A) |
| 7.2 | Internal Surface                |         |   |
|     | e) Surface preparation          | -       | SA 2.5 of Swedish Specification SIS 05.5900.197   |
|     | f) Primer                       |         | Two coat of Epoxy resin based Zinc Phosphate  |
|     | g) Final paint                  |         | Adequate no. of coats of coal tar epoxy paint to achieve total dry film thickness of 200 to 250 microns.      |
| 8.0 | <b>SHOP TEST</b>                |         |   |
| 8.1 | Hydrostatic test                |         |   |
|     | a) Test Pressure                | bar (g) | 1.5 times design pressure   |

|   |                    |  |  |   |  |
|---|--------------------|--|--|---|--|
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| <b>Page 7 of 8</b>  |                    | <b>2 X 800 MW NTPC GADARWARA STPP, STAGE-1</b>                                       |  |   |  |
| <b>S. No.</b>   | <b>DESCRIPTION</b> | <b>UNITS</b>   |  |   |  |

|     |                  |         |                 |
|-----|------------------|---------|-----------------|
|     | b) Test duration | min.    | 30              |
| 8.2 | Leakage test     |         |                 |
|     | a) Test Pressure | bar (g) | Design Pressure |
|     | a) Test duration | min.    | 30              |

# Bidder to note that electrical power supply shall be provided by purchaser based on electrical load list of bidder furnished at tender stage and any changes or additional requirement of electrical load by bidder during contract stage shall be provided by BHEL(purchaser) with cost repercussions to the bidder

|      |  |  |   |
|------|--|--|---|
| 9.0  | Adequate provision for future installation of cathodic protection required |  | YES   |
| 10.0 | Flow straightener for streamlining the ACW flow in SCS                     |  | If required as per bidder's design – the same to be incorporated by bidder in its constructional feature. |
| 11.0 | Performance Guarantee & Bid Evaluation                                     |  |   |
| 11.1 | Performance Parameters to be Guaranteed                                    |  |   |
|      | ❖ Pressure drop SCS  |  | As per Guarantee schedule of bidder   |
| 11.2 | Bid evaluation Criteria & Liquidated damages                               |  | As per clause no. 8.00.00 of section C1   |
| 11.3 | Bid evaluation rate  |  | @ Rs 1.65 Lacs per 0.1 MWC pr. Drop across each SCS   |
| 11.4 | Liquidated damages   |  | @ Rs 2.35 Lacs per 0.1 MWC pr. Drop across each SCS   |



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**2 X 800 MW NTPC GADARWARA STPP, STAGE-1**

| S. No. | DESCRIPTION   | UNITS |                   |
|--------|---|-------|-------------------|
| 12.0   | Whether automatic flushing/back-washing operation effected by the following :<br>i. Differential pressure<br>ii. Adjustable timer<br>iii. Push button |       | YES<br>YES<br>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 Spare to be supplied under this specification   |       | Not Applicable    |

| Manufacturer's Name & Address   |        | STANDARD QUALITY PLAN                                     |                                 | SHEL Doc No.: PE-V4-XXX-165-N08 |  |
|---|--------|---|---------------------------------|---------------------------------|--|
| P.O. No.  |        | Item 1  | Vendor O.P. NO.                 | PROJECT:                        |  |
|   |        | Self Cleaning Strainer                                    | PACKAGE: SELF CLEANING STRAINER | CUSTOMER:                       |  |
|   |        |   | Date: Page 01 of 12             | PURCHASER:                      |  |
|   |        |   |                                 | CONSULTANT:                     |  |
|   | S. No. | DESCRIPTION   |                                 | PAGE NOS.                       |  |
|   | 1      | SELF CLEANING STRAINER                                    |                                 | 2-4                             |  |
|   | 2      | BALL VALVES   |                                 | 5                               |  |
|   | 3      | BUTTERFLY VALVES  |                                 | 8                               |  |
|   | 4      | PRESSURE GAUGE, DP GAUGE, DP SWITCH<br>DP TRANSMITTER     |                                 | 7                               |  |
|   | 5      | GEAR MOTOR, DRIVE & WORM PLANETARY GEAR BOX               |                                 | 8                               |  |
|   | 6      | ACTUATORS   |                                 | 9                               |  |
|   | 7      | STARTER PANEL   |                                 | 10                              |  |
|   | 8      | PASTENERS   |                                 | 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                               |  |
| <p>Note: Items not included in quality plan to be inspected as per Approved datasheet/drawings.</p>   |        |   |                                 |                                 |  |
| <p><b>LEGEND</b></p> <p>* Records identified with "STAR" shall be essentially included by contractor in QA Documentation.</p> <p>** M : Manufacturer/ Sub-contractor</p> <p>C : CONTRACTOR</p> <p>O : OWNER</p> <p>Indicate "P" - Perform, "W" - Witness and "V" - Verification</p> |        | <p>Name &amp; Sign. Of approving authority &amp; Seal</p> |                                 |                                 |  |

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