ODISHA POWER GENERATION CORPORATION LIMITED

2 X 660 MW, SUPER-CRITICAL TPS, UNIT # 3 & 4 AT JHARSUGUDA, ODISHA

TECHNICAL SPECIFICATION
FOR

AUXILIARY STEAM PRESSURE REDUCING AND DESUPERHEATING STATION ALONGWITH ACCESSORIES

SPECIFICATION No: **PE–TS –391-142–N101 (REV 00)**

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA, INDIA

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VOLUME - II B

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1.0 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 tech. Requirements specific to the contract, not covered in Section – D.

Section – D : This section comprises of tech. Specifications of equipments complete with data sheet A,B&C.

Data Sheet – A specifics data and other requirements pertaining to the equipment.

Data sheet – B specifics data to be filled by the bidder (Data Sheet B is contained in Volume – III.

Data Sheet – C indicates data/ documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

CONTENTS

FILLED-UP QUALITY PLAN AS MINIMUM REQUIREMENTS IS INCLUDED FOR CONTROL VALVE & STEAM DESUPERHEATER.

SECTION – A

SCOPE OF ENQUIRY

1.1 This enquiry covers the Design, Manufacture, Assembly, Inspection and Testing at Vendor's and/or his sub-vendors works, painting and delivery to site of Auxiliary Steam Pressure Reducing & Desuperheating Stations, as mentioned in different sections of this specification for OPGCL – 2X660 MW JHARSUGUDA, ODISHA UNIT-3/4.

The tenderer shall also quote separately for the following:-

a) Supervision of erection & commissioning of the equipment, if applicable.
b) Recommended spares for 3 years of post guarantee period operation.

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

1.3 The bidder may quote for his standard, proven design of equipment and shall indicate any deviations from this specification in the enclosed schedule. **In the absence of duly filled deviation schedule, it shall be presumed that the offer confirms exactly to this specification**. The bidder shall also furnish the performance feedback data of the equipment from similar installations. However, the acceptance of the deviations/options is not binding on the Engineer/Owner.

1.4 The bids shall be in English language and MKS Units.

1.5 Filled up quality Plans as minimum technical requirements, are included in this specification in Vol. IIB Sec D. Bidder is required to submit the enclosed Quality Plan, or bring out specific deviations on it, while submitting the bid.

1.6 Similar to Quality Plan, Bidder is required to furnish Field Quality Plan (FQP), if applicable. FQP shall indicate all inspection/test to be carried out at site covering the following:

i). Receipt of material.
ii). Storage or Conservation.
iii). Pre-Erection & Erection
iv). Pre-Commissioning, commissioning & post commissioning.

FQP shall furnish adequate instructions to be followed by erection & commissioning agency at site.

Bidder is requested to refer standard no PE S-100-918 on field quality plan enclosed in Volume III of this specification.

1.7 The omission of specific reference to any co mponent / accessory necessary for the proper performance of the equipm ents shall not re lieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

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

1.9 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / OPGCL.

SECTION – B

PROJECT INFORMATION

CONTENT

VOLUME : IIA

SECTION-III

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed Thermal Power Station comprising of 2 x 660 MW base unit size, Super-Critical Units would be set up by Odisha Power Generation Corporation Limited (OPGCL) in the Jharsuguda district of Odisha, India. OPGCL had already installed two units of 210 MW each adjacent to the proposed units under Phase-I of the project at IB Thermal Power Station and the units have been working for the last fifteen years.

Seller has acquainted himself by visiting to the site, with the conditions prevailing at site. The information given here in under is for general guidance and shall not be contractually binding on the Buyer. All relevant site data /information as may be necessary shall have to be obtained/ collected by the Seller.

2.00.00 APPROACH TO SITE

The project site is located at Banaharpalli in the Jharsuguda district of Odisha on the bank of Hirakud Reservoir and about 20 km south of Belpahar railway station and 40 km south west of Jharsuguda. The main Howrah-Mumbai railway line passes 20 km north of the plant (at Belpahar). NH-200 (Chandikhole to Raipur) and SH-10 (Sambalpur to Sundergarh) pass through Jharsuguda town.

OPGCL has a private railway siding connecting the plant to the Indian Railways network at Lajkura Railway station.

Nearest Airport – Bhubaneswar.

Nearest Seaport – Paradeep/ Haldia.

3.00.00 LAND

The total land proposed to be required (around 40 Ha) taking into account the locations of various facilities and plant auxiliaries for units 3 & 4 under IB Thermal Power Station 2 x 660 MW units 3 & 4 and also future 2 x 660 MW will be as per the Plot Plan enclosed in Volume II-L. Land for the proposed units have already been acquired and Power block area is fairly flat land sloping towards South to South -West with contour variation from RL 204.00 M to RL 199.00 M. The Seller shall accommodate equipment offered under this specification generally within the spaces allocated for such equipment in the Plot Plan. Specific approval from Consultant shall be taken by the Seller prior to any revision or relocation.

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7.00.00 **METEOROLOGICAL DATA**

7.01.00 For the purpose of equipment design, the following Ambient Conditions / Meteorological data of site (Jharsuguda) shall be taken into consideration:-

Site elevation above MSL	:	199.5 M
Highest temp recorded	:	48.0 °C.
Lowest temp recorded	:	4.0 °C.
Monthly max. dry bulb temp	:	38.9 °C/28.0 °C/33.4 °C (Summer/winter/monsoon)

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Monthly min. dry bulb temp	:	25.4 °C/16.7 °C/26.8 °C (Summer/winter/monsoon)
Monthly max. wet bulb temp	:	23.9 °C/17.8 °C/25.5 °C (Summer/winter/monsoon)
Monthly min. wet bulb temp	:	17.6 °C/13.4 °C/25.0 °C (Summer/winter/monsoon)
Maximum Relative Humidity	:	46% / 67% / 87% (Summer/winter/monsoon)
Minimum Relative Humidity	:	21% / 33% / 87% (Summer/winter/monsoon)
Average relative Humidity	:	65%
Average Annual Rainfall	:	1460 mm.
Normal period of rain fall	:	June – September.
Heaviest rainfall in 24 hours	:	257.8 mm
Wind direction	:	South West – North East.
Basic Wind Speed at 10 m Height	:	44 m/sec as per IS:875 Part-3 (1987).
Seismic Zone	:	Zone III as per IS:1893 Part-1 (2002).
		Geographical location : At Latitude 21° 48' North and Longitude 83° 52' East.

SECTION-C

SPECIFIC TECHNICAL REQUIREMENTS

1.0.0 BRIEF SYSTEM DESCRIPTION

1.1.0 Auxiliary steam system is designed to provide steam for the turbine auxiliaries, boiler auxiliaries and fuel oil heating system during start-up, low loads and normal running of unit.

1.2.0 The system comprises of two auxiliary steam pressure reducing and desuperheating stations (PRDS). One "High capacity PRDS" with tapping off steam from main steam line to meet auxiliary steam requirements during unit start-up, low loads & for fuel oil system, and the other "Low Capacity PRDS" with tapping off steam from CRH line to meet auxiliary steam requirements during normal running. Spray water required for desuperheating will be tapped off from CEP discharge.

1.3.0 These two stations will reduce the pressure and temperature of the steam tapped off from CRH line and main steam line to 16 kg/cm2 (abs) & 310^{o}C at the high temperature auxiliary steam header and subsequently to 16 kg/cm2 (abs) & 250^{o}C at the low temperature auxiliary steam header through a suitable desuperheater between the high temperature and low temperature auxiliary steam headers.

2.0.0 EQUIPMENT TO BE PROVIDED BY TENDERER

2.1.0 AUXILIARY STEAM PRDS COMPRISING OF :

2.1.1 Control Valves & Accessories:

2.1.1.1 Combined Type High Capacity Pressure Reducing & Desuperheating Valve (On MS line) (ASV-22) : One No. / Unit (02 nos. for 02 Unit)

2.1.1.2 Low Capacity PRV on CRH Line (ASV-26) : One No. / Unit (02 nos. for 02 Unit)

2.1.1.3 Spray Control Valve for HC-PRDS (CDV-151) : One No. / Unit (02 nos. for 02 Unit)

2.1.1.4 Spray Control Valve for LT-DESH (CDV-157) : One No. / Unit (02 nos. for 02 Unit)

2.1.1.5 Spray Control valve to TGS DESH (CDV-93) : One No. / Unit (02 nos. for 02 Unit)

2.1.1.6 Each control valve shall be supplied with the accessories specified in the relevant data sheets at Section-D.

2.1.2 Desuperheaters :

2.1.2.1 Direct mixing type LT desuperheater (DESH-2) : One No. / Unit (02 nos. for 02 Unit)

2.1.2.2 Direct mixing type TGS desuperheater (DESH-3) : One No. / Unit (02 nos. for 02 Unit)

2.1.2.3 The desuperheater shall be complete with pipe, spray nozzle along with necessary attachment as specified in section-D. **Insertion type desuperheaters are not acceptable.**

SPECIFIC TECHNICAL REQUIREMENTS.

1. In case of any clash between this SPECIFIC TECHNICAL REQUIREMENTS and customer SPECIFIC TECHNICAL REQUIREMENTS, attached further the customer specific technical requirements shall override

2. The Hook-up diagram for Control valve, is attached. the scope demarcation as indicated should be adhered. The connection details at Instrument Air valve shall be furnished to successful bidder after the award of contract.

3. Valve Body Sizes shall be quoted to take care of the specification requirements like parameters, and limitations of Fluid outlet velocities, Noise Level etc. **However Port (Trim) Sizes shall be selected to suit CV requirement for achieving percentage valve lift as per Technical Specification.**

4. Bidder to note that, **wherever downstream side of the valve is subjected to the Vacuum service, bidder to offer double Gland packing, and in that case, flow direction of working fluid shall be to close the valve**. Separate indication for the same has not been made in the data sheets-A.

5. For valves subjected to cavitation service, anti-cavitation trim shall be provided.

6. In case during erection/commissioning of the control valve, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the bidder free of cost

7. Facility to adjust the maximum travel of the stem & starting point of travel shall be incorporated.

8. SS nameplate to control valve shall include Tag no./ KKS no./ Sl. No./ Body material/ size/ Press Rating/ Trim material/ Trim type/ action on air failure/ diaphragm air press at full open and close condition

9. Hand wheel shall have open/ close direction.

10. Limit switch shall be designed for 1,00,000 operations.

11. JB shall be 36 ways as per enclosed hook-up diagram.

12. The material of filter for Air Filter Regulator shall be Sintered bronze.

13. Bidder to indicate pick-up & drop out voltage for all solenoid valves.

14. Protection class for Limit switches, I/P converter and Position transmitter shall be IP-65 only.

15. All JBs and valves shall be with double compression type Ni plated brass cable glands.

16. Solenoid valve class of protection shall be IP-65.

17. All local cabling up to JBs shall be in Conduit (Flexible/Rigid). If JB is not mounted near valve

18 . All regulating type final control elements shall have actuator of pneumatic type.

Control Valve Sizing and Construction

i) The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.

ii) The valve sizing shall be suitable for obtaining rated flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required rated flow. Further, the valve stem travel range from minimum flow condition to rated flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA on control valves. While deciding the size of valves, Seller shall ensure that valves port outlet velocity does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Seller shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which shall be subject to Consultant's approval during detailed engineering stage.

iii) Control valves of steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and downstream piping. Thus for cavitation/flashing service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation shall occur or not for any given application shall be furnished during detailed engineering stage.

v) All control valves shall have minimum leakage rate as per leakage Class-IV. However the leakage class may vary in critical applications subject to approval.

vi) The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.

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Valve Construction

i) All valves shall be of globe body design & straightaway pattern with single or double port unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure drops permit.

ii) Valves with high lift cage guided plugs & quick change trims shall be supplied.

iii) Cast iron valves are not acceptable.

iv) Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Consultant. Bonnet joints of the internal threaded or union type shall not be acceptable.

v) Plug shall be one-piece construction either cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.

vii) Valve characteristic shall match with the process characteristics.

viii) Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.

Valve Materials

The control valve body & trim material shall be as stipulated in Annexure-IV of this section.

However, Seller may offer valves with body and trim materials better than specified materials and in such cases Seller shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-à-vis the specified material for Consultant's consideration and approval.

End Preparation

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Valve body ends shall be either butt welded/socket welded, ~~flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Consultant's approval.~~ The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11 ~~Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of control valve body~~.

Valve Actuators

~~The HP and LP Bypass, turbine inlet control valves shall be with electro-hydraulic actuators and all other~~ control valves shall be furnished with pneumatic actuators. The Seller shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg. C continuously.

Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified.

The travel time of pneumatic actuators shall not exceed 10 seconds.

Control Valve Accessory Devices

All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements. Microprocessor based electronic positioner shall be provided as per the requirements of Annexure V of this section.

7.03.07 All Control valves shall be tested in accordance with the quality assurance programme agreed between the Buyer and Seller which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:

Non destructive test as per ANSI B-16.34

Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.

Valve closure test and seat leakage test in accordance with ANSI- B 16.34 and as per the leakage class.

Functional test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.

CV test: CV test ~~**shall be carried out as**~~ **report not older than 5 (five) years** type test on each size, type and design of the valves as per ISA 75.02 standard and test report shall be furnished for Buyer's acceptance.

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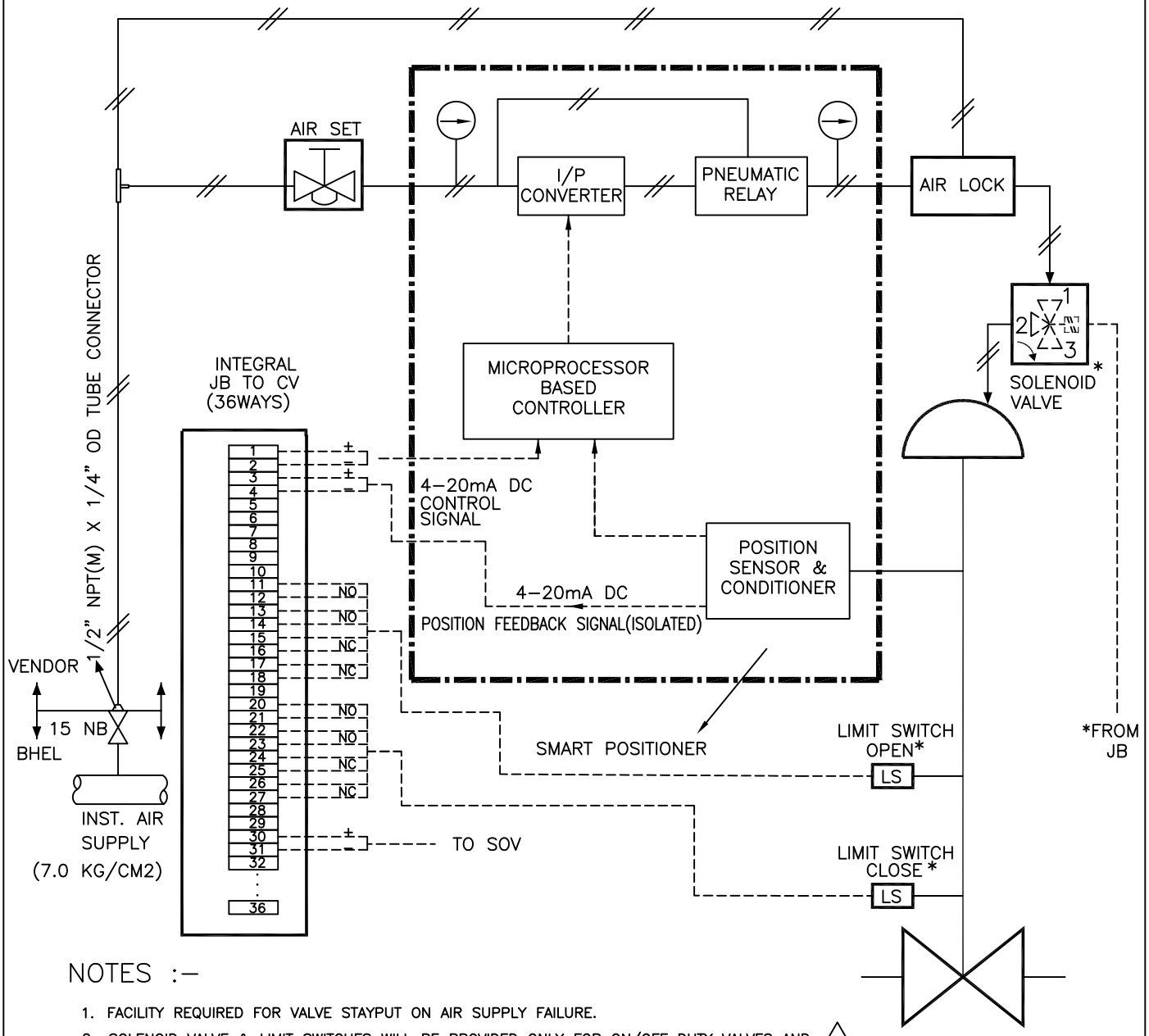
7.05.00

BANAHARPALLI SUPER THERMAL POWER PROJECT - 2 X 660 MW

HOOK–UP DIAGRAM WITH SMART POSITIONER



NOTES :–

1. FACILITY REQUIRED FOR VALVE STAYPUT ON AIR SUPPLY FAILURE.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR ON/OFF DUTY VALVES AND FOR CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND INDICATED IN RESPECTIVE DATA SHEETS.
3. SOLENOID VALVES PORTS CONDITION:
   PORT 1 AND 2 SHALL BE CONNECTED UNDER DE–ENERGISED CONDITION.
   PORT 2 AND 3 SHALL BE CONNECTED UNDER ENERGISED CONDITION.
4. GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 4–20mA (ISOLATED SIGNAL)
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
8. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVES
   THE FOLLOWING ACCESSORIES SHALL NOT BE APPLICABLE:–
   a) SMART POSITIONER b) POSITION TRANSMITTER c) I/P CONVERTER
9. 12 METERS 1/4" PVC COATED COPPER TUBING & 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VLV AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END. ALL THE BRASS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER SHALL BE PROVIDED IF REQUIRED

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* SOLENOID VALVE & LIMIT SWITCH– IF APPLICABLE AS PER DATASHEET

2

4.0.0 SPARES, CONSUMABLE AND SPECIFIED TOOLS & TACKLES (For all Units):

4.1.1 Commissioning Spares & Consumables
The bidder shall supply spares and consumables for all the above valves & desuperheater required during start-up. A list of all spares and consumables to be supplied shall be submitted along with the bid.

4.1.2 Recommended Spares

The bidder shall submit a list of recommended spares for all the above valves and desuperheaters for three years of normal operation. These are to be quoted separately & unit prices to be indicated, to enable placement of a separate order later if required.

4.1.3 Special Tools & Tackles

The bidder shall supply one complete set of special tools & tackles required for the erection, assembly, disassembly & maintenance of the equipment. A list of such tools & tackles to be supplied shall be submitted along with the bid.

4.1.4 Bidder to indicate the service life expectancy period for the spare parts under normal working conditions. The spares shall be treated and packed for long storage under climatic conditions prevailing at site. Small items shall be packed in sealed transparent plastic bags with desiccators' packs as necessary.

5.0.0 SPARES: The following spares are required to be offered.

a) Stat-up & Commissioning spares:

i) Start-up and Commissioning spares are those spares, which may be required during the start-up and commissioning of the Control Valves. All start-up spares, which are supplied under this contract, shall be strictly interchangeable with the parts for which they are intended for replacements. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III

ii) The Start-up and commissioning spares indicated by the bidder shall be a part of the main Control valves supply. However bidder to indicate prices separately. The list of these spares required to be supplied shall be submitted along with the bid.

LIST OF COMMISSIONING SPARES

S.No.	ITEM DESCRIPTION	QUANTITY REQUIRED (per unit)
1	Gaskets	One (1) set with each control valve Tag
2	Gland Packings	One (1) set with each control valve Tag
3	Cu Tubing	25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for each CV

6.0.0 INFORMATION TO BE FURNISHED ALONGWITH THE OFFER BY THE BIDDER.

The bidder shall submit four (04) sets of the following drawings and data along with the bid without which the offer will be deemed incomplete.

6.1.0. Un-priced Bill of Quantities (BOQ) for main package & mandatory Spares.

6.2.0. Calculations for valve sizing, actuator sizing, valve velocities and noise level.

6.3.0. Dimensioned outline drawing giving overall dimensions, material.

6.4.0. **Duly filled BHEL technical data sheets 'B'** for each control valve & desuperheater in the format as enclosed in volume III of this specification.

6.5.0. Hook-up diagram of control valves with actuator & accessories.

6.6.0. Reference list, Catalogue & Technical bulletins for various items being offered.

6.7.0. Any deviations from the specification / data sheet & reasons thereof.

6.8.0. Schedules as in Vol. III.

6.9.0. Quality Plan for the equipment offered in the format enclosed with this specification.

6.10.0. Field quality plan, if applicable

6.11.0. List of commissioning and recommended spares.

6.12.0. List of tools & tackles, if applicable

6.13.0. List of consumables / lubricants, if applicable

7.0.0 DRAWING

For general arrangement and terminal point details refer enclosed drawings nos. PE-DG-391-142-N101 in Volume II B Sec. D.

8.0.0 QUALITY PLAN

The bidder shall furnish quality plan along with the offer and the same shall be finalized before the issue of LOI.

Detailed quality plan shall be submitted by the successful tenderer after the placement of order for each project during contract execution for final approval by BHEL / its customer. BHEL / its customer shall indicate Customer Hold Points (CHP) in the approved quality plan beyond which work shall not proceed without the approval of BHEL / its customer for any particular project during final execution.

The quality plans enclosed in volume-II-B 'D' of the specification are for bidder's guidance only and are not exhaustive. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in BHEL/Customer formats in the event of order based on the guidance given as above for BHEL/Customer's approval.

DATA SHEET- A-1
SIZING DATA FOR AUXILIARY STEAM PRDS

SL. NO	PARAMETERS	**CASE-I**	**CASE-II**	**CASE-V**	**CASE-VI**	**CASE-VII**	**CASE-VIII**	MECH. DESIGN
1.0	**INLET PARAMETERS TO COMBINED PRDS (ASV-22)**							
1.1	PRESSURE (Kg/Cm^2a)	63	109	247	94	108	108	271
1.2	TEMP. (^0C)	375	490	565	385	425	440	573
1.3	FLOW (T/HR)	Bidder to calculate						
2.0	**OUTLET PARAMETERS AT COMBINED PRDS (ASV-22)**							
2.1	PRESSURE (Kg/Cm^2a)	16	16	16	16	16	16	21
2.2	TEMP. (^0C)	310	310	310	310	310	310	360
2.3	FLOW (T/HR)	109.4	69.3	159.7	132.3	137.1	160	-
3.0	**INLET OF SPRAY CONTROL VALVE (CDV-262)**							
3.1	PRESSURE (Kg/Cm^2a)	37	37	34.7	37	37	35.7	46
3.2	TEMP. (^0C)	47	46.6	46.3	47	46.6	46.6	55
3.3	FLOW (T/HR)	Bidder to calculate						

NOTE:

1. Case-1 is the capability check point for PRV ASV-22. Case-V is the capability check point for Spray Water control valves.
2. High capacity steam pressure reducing valve (ASV-22) min. flow at 10% valve lift shall correspond to the passing capability of low capacity steam pressure reducing valve (ASV-26) at 95% valve list (refer datasheet A-2).
3. Outlet pressure of HT-DESH is indicative only. Bidder shall calculate outlet pressure of Combined PRDS considering pressure drop across DESH-2

DATA SHEET- A-2
SIZING DATA FOR AUXILIARY STEAM PRESSURE REDUCING VALVE (PRV) ASV- 26

S.NO	PARAMETERS	**CASE-III**	**CASE-IV (A)**	**CASE-IV (B)**	MECH. DESIGN
1.0	**INLET PARAMETERS OF PRV (ASV-26)**				
1.1	PRESSURE (Kg/Cm^2a)	22.66	22.66	56.13	67.3
1.2	TEMP. (^0C)	343.5	343.5	334.2	360
1.3	FLOW (T/HR)	14.10	11.40	11.70	-
2.0	**OUTLET PARAMETERS OF PRV (ASV-26)**				
2.1	PRESSURE (Kg/Cm^2a)	16	16	16	21
2.2	FLOW (T/HR)	14.10	11.40	11.70	-

NOTE:

1. High capacity steam pressure reducing valve (ASV-22) min. flow at 10% valve lift shall correspond to the passing capability of low capacity steam pressure reducing (ASV-26) valve at 95% valve list (refer datasheet A-1).

2. Outlet pressure of ASV-26 is indicative only. Bidder shall calculate outlet pressure of PRV (ASV-26) considering pressure drop across DESH-2/DESH-3.

3. Valve shall be suitable for passing **30T/Hr** at rated parameters (i.e. Case-IV B above).

DATA SHEET- A-3
SIZING DATA FOR AUXILIARY STEAM PRDS ((DESH-2) & SPRAY CONTROL VALVE (CDV-157)

Sl. No.	PARAMETERS	CASE-I	CASE-II	CASE-III	CASE-IV	CASE-V	CASE-VI	CASE-VII	CASE-VIII	MECH. DESIGN
1.0	**PARAMETERS AT DESUPERHEATER INLET (DESH-2)**									
1.1	PRESSURE (Kg/Cm^2a)	16	16	16	16	16	16	16	16	21
1.2	TEMP. (^0C)	310	310	333	332.3/ 291.6	310	310	310	310	350
1.3	FLOW (T/HR)	Bidder to calculate								
2.0	**PARAMETERS AT DESUPERHEATER OUTLET (DESH-2)**									
2.1	PRESSURE (Kg/Cm^2a)	16	16	16	16	16	16	16	16	21
2.2	TEMP. (^0C)	250	250	250	250	250	250	250	250	280
2.2	FLOW (T/HR)	90.6	53.7	12.2	11.8	134.5	97.7	112.6	165	-
3.0	**INLET OF SPRAY CONTROL VALVE CDV-157**									
3.1	PRESSURE (Kg/Cm^2a)	37	37	35.7	35.7 / 34.7	34.7	37	37	35.7	46
3.2	TEMP. (^0C)	47	39.6	39.6	46.3	45.9	39.6	46.6	46.6	55
3.3	FLOW (T/HR)	Bidder to calculate								

NOTE:

1. Vendor to ensure the D/S pressure of DESH-2 shall be 16 Kg/ Cm^2 (a)

DATA SHEET- A-4
SIZING DATA FOR TGS DESUPERHEATER (DESH-3) & SPRAY CONTROL VALVE (CDV-93)

S.NO	PARAMETERS	Condition-1	Condition-2	Condition-3	Condition-4	MECH. DESIGN
1.0	**PARAMETERS AT TGS DESUPERHEATER INLET (DESH-3)**					
1.1	PRESSURE (Kg/Cm^2a)	16	16	16	16	21
1.2	TEMP. (^0C)	310	310	310	290	350
1.3	FLOW (T/HR)	Bidder to calculate				
2.0	**PARAMETERS AT TGS DESUPERHEATER OUTLET (DESH-3)**					
2.1	PRESSURE (Kg/Cm^2a)	16	16	16	16	21
2.2	TEMP. (^0C)	270	300	270	270	350
2.3	FLOW (T/HR)	2.7	2.7	2.7	2.7	-
	INLET OF SPRAY CONTROL VALVE (CDV-93)					
3.1	PRESSURE (Kg/Cm^2a)	34.7	37	35.7	37	46
3.2	TEMP. (^0C)	46.3	47	46.6	39.6	60
3.3	FLOW (T/HR)	Bidder to calculate				

SECTION – D

EQUIPMENT SPECIFICATIONS

SECTION – D

EQUIPMENT SPECIFICATIONS

FOR

CONTROL VALVE WITH PNEUMATIC ACTUATOR

1.0 SCOPE

This specification covers the Design, Manufacture, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Control valve (with Pneumatic/Electric Actuator) for use in Utility/Captive Power Station/Combined Cycle Station.

2.0 CODES AND STANDARDS

2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards.

2.2 The Design and Materials used for the components shall also comply with the relevant National and International standards.

2.3 As a minimum requirement, the following standards shall be complied with :

Indian Boiler Regulation (IBR)		
Allowable Seat leakage	:	ANSI-B16.104 / FCI-70.2
Pressure & Temperature ratings	:	ANSI-B16.34
Enclosure class	:	IEC-144 / NEMA / IS-13947
Control Valves	:	ISA S-75
Electric Motor operated Actuators	:	IS-9334

3.0 TECHNICAL REQUIREMENTS

The Control valve, Actuator and the accessories shall be suitable for continuous operation under an ambient temperature of 0-55°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB Section-B or Section-C.

3.1 Control Valve

The control valve shall be suitably designed for the operating conditions and system characteristics as specified in the Data Sheet-A.

3.1.1 The control valve shall be of globe body design with single port. The valve trim, shall be suitable for quick removal without any cutting or welding.

3.1.2 The material of body, internals and packing shall be as specified in the data sheets. Alternatives, considered more suitable for service specified may be given as alternative offer, along with adequate justification. However main offer shall totally meet specification requirements. Asbestos shall not be used for the packing or any other component.

3.1.3 The valve bonnet and packing shall be suitable for the service conditions as in Data Sheet-A. Gland sealed type bonnets are not acceptable. Double packing is mandatory for applications involving vacuum service. Bonnets having teflon packing shall have valve stem finished to 2-4 microns. Packing material requiring lubrication will not be acceptable. Justification for proper selection of bonnet & packing shall be furnished in the bid.

3.1.4 The valve end connection as specified in Data Sheet-A shall conform to ANSI B16.25 for Butt Weld connection and ANSI B16.5 for flanged ends. End to end dimension shall be as per ANSI 16.10.

3.1.5 The valve seat leakage shall be as per ANSI B16.104 / FCI-70.2. The leakage class shall be as per Data Sheet-A.

3.1.6 The valve body shall have the direction of flow embossed on all valves.

3.1.7 The sizing shall conform to the requirements of ANSI/ISA(S75- 01), and the valve capacity shall be selected so as to meet the following:

Valve with Linear characteristic.	-	Normal Flow (Design Point)	:	70-75% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
Valve with Equipercentage Characteristic	-	Normal Flow (Design Point)	:	75-85% valve lift.
	-	Max. Flow	:	90% valve lift.
	-	Min. Flow	:	>10% valve lift.
ON/OFF Quick open Characteristic	-	1.1 times the CV calculated on the basis of maximum flow condition.		

3.1.8 Calculation for valve sizing, velocity and noise shall be subject to purchaser's approval during contract stage. However responsibility of proper selection and design for the duties specified lies with the vendor. Any modifications required to be done on the valves or actuators & accessories to achieve satisfactory performance of the control system shall be done without any commercial implication.

3.1.9 Suitable justification and evidence shall be furnished regarding proper selection of the valve.

3.1.10 The valve outlet velocities shall be limited to the following values, unless otherwise specified in the Data sheet-A.

i)	Liquid service	<=	7 Metres/Sec.
ii)	Steam service	<=	1/3 Sonic velocity in the flow medium.

3.1.11 For flashing duty, the trim design shall be such that the vapour bubbles are kept away from valve body.

3.1.12 For cavitation service, the trim design shall be of multistage pressure drop type, so as to avoid cavitation altogether, instead of keeping cavitation away from valve parts.

3.1.13 In case of predicted noise level above 85 dBA, suitable low noise trim or inbuilt diffusers shall be provided to bring down the noise level below 85dBA.

3.1.14 The equivalent weighted sound level measured at 1.5M. above floor level in elevation and one metre horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA (without pipe insulation). The offer shall include noise prediction calculations for each valve.

3.1.15 In case of wrong selection/mal operation of valve and for associated actuator during guarantee period, the vendor shall replace the valve suitably with a modified/new valve of design as approved by purchaser and all the expenses for replacement, rectification/modification including transportation both ways will be at vendor's expenses.

3.2 Pneumatic Actuator

The pneumatic actuators shall be employed for modulating or open/close duty, as specified in Data Sheet-A. The bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drops and shut off pressure.

3.2.1 The pneumatic spring opposed diaphragm actuator for modulating duty shall be capable of positioning the associated valve at desired opening for all the operating conditions specified.

3.2.2 The pneumatic actuator for open/close duty shall be suitable for fast opening/closing of the associated valve.

3.2.3 The actuator design shall allow valve assembly to be mounted at 45° inclination on either side in the vertical plane.

3.2.4 The actuators shall be suitably sized to ensure that the associated valve travel time from full open to full closed position and vice versa is less than 20 seconds under the most stringent service conditions.

3.2.5 The actuator shall be painted with epoxy based paint.

3.3 Accessories for Control valve with Pneumatic Actuator

The bidder shall offer all the accessories as specified in the Data Sheet - A for the Pneumatic Actuators under modulating or OPEN/CLOSE duty. The accessories specified shall be supplied duly mounted on the valve actuator and piped with PVC covered copper tube and flareless brass fittings (Refer typical hook up diagram in sheet 12 of 12).

3.3.1 Handwheel

Handwheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve. The handwheel shall have a circular stainless steel plate with Tag number and service.

3.3.2 Local Position Indicator

Each actuator shall be provided with a mechanical pointer attached to stem, moving over a graduated scale with markings, for OPEN, 25%, 50%, 75%, CLOSE positions.

3.3.3 Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20 mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0-100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have accuracy and enclosure class. Necessary cable glands shall be supplied.

3.3.4 Air Filter Regulator

Instrument quality air at suitable pressure of 5.5 Kg/Cm2(g) to 7 Kg/Cm2(g) shall be supplied to each valve through air filter regulator. The filter regulator shall include an inbuilt blow-down valve, 5 micron size filter. The design pressure for regulator shall be 7 Kg/cm2g. The Air filter regulator shall be selected to meet the requirements of positioner/actuator, E/P convertor and air-lock. The flow capacity of the Air filter regulator shall be variable with a knob. Output gauge shall be provided wherever pneumatic positioner is not specified for the valve.

3.3.5 Air Lock Relay

Air lock relay shall retain the valve position stayput, in case of air supply failure and shall reset automatically on resumption of air supply. Air lock shall have a threaded plug for evacuating diaphragm air if required for local manual operation.

3.3.6 Solenoid Valves

Solenoid valves are meant for interlock & protection purposes overriding the controller signal, and/or to result stayput action on controller signal failure. The Solenoid valve shall be 3-way Universal type and the valve internals shall be of stainless steel. The coil shall have class-H insulation and rated for continuous AC/DC duty as specified in Data sheet-A. The enclosure shall be to IP-55. Cable gland shall be provided for cable entry. The solenoid shall in general conform to IS-8935. The solenoid operation shall be universal type. The solenoid shall be suitable for 24V DC supply, unless specified otherwise in Data Sheet-A.

3.3.7 Limit Switches

Limit switches are required as specified in the data sheet-A. Each limit switch shall have 2NO+2NC contacts with contact rating of 5A at 240V AC/0.2A at 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.

3.3.8 I/P Converter

I/P Converters shall preferably be of force balance type and shall produce pneumatic output signal corresponding to input current signal, also specified in Data Sheet. Convertor electronics shall be protected against reverse connection of signal polarities and a separate external connection shall be provided to facilitate grounding of instrument casing. Cable glands with neoprene gromets suitable for PVC cables shall be provided. I/P convertor shall have span adjustment facility. I/P convertor enclosure shall conform to IP-55 enclosure class.

3.3.9 Positioner

Positioner shall be suitable for accepting controller output signal 0.2-1.0 Kg/cm2, 0.2-0.6 Kg/cm2 or 0.6-1.0 Kg/cm2 as specified and give an output suitable for the actuator. Pneumatic positioner shall have 3 gauges. All gauges shall have metric scales. The positioner input signal range shall be adjustable. Wherever applicable, it shall be possible to bypass the positioner by means of a switch. Linearity and Hysterisis shall be as indicated in Data sheet-A

3.3.10 Electro pneumatic Positioner

In place of separate E/P Converter and pneumatic positioner a combined electro pneumatic positioner can also be supplied. The electro pneumatic positioner shall have 2 gauges.

3.3.11 Junction Box

Wherever specified, an integral junction box with all electrical accessories conduited up to JB shall be supplied. The junction box shall have two (2) cable glands for outgoing cables. Junction box shall have enclosure class of IP-55.

3.4 Guarantee & Performance

3.4.1 The overall performance of the control valve with pneumatic actuator assembly shall be as follows:-

i)	Hysteresis	:	± 1% of span
ii)	Linearity	:	± 2% of span
iii)	Sensitivity	:	± 0.5% of span.
iv)	Repeatability	:	± 1% of span
v)	Accuracy (Overall)	:	± 2% of span

3.4.2 The guarantee for the control valve, pneumatic actuator & accessories shall be for 12 months continuous operation from the date of commissioning, unless specified otherwise in VOL-IIB Section-B or Section-C.

3.5 Electric Actuator

The electric actuator shall be employed for modulating duty.

3.5.1 The actuator assembly shall be complete with drive motors, gears, hand wheel, signaling & switching units, associated control, integral starter, (when specified) and other accessories as required.

3.5.2 The Electric Actuator shall be capable of positioning the associated valve at the desired opening for all the operating conditions.

3.5.3 The motor shall meet the requirements of Current, torque, Axial thrust, Accelerating & stall time as imposed by the driven equipment.

3.5.4 The motor shall be suitable for direct on line starting.

3.5.5 Motors shall be suitable for inching & plugging duty operations.

3.5.6 The motors shall be capable of starting and accelerating to rated speed at 85% of rated voltage.

3.5.7 The motors shall be rated for continuous operations for modulating duty.

3.5.8 The motor shall operate satisfactorily under the following conditions:

i) ±10% supply voltage variation at rated frequency.

ii) -5% to + 3% variation in frequency at rated supply voltage.

iii) Simultaneous variation in voltage and frequency, the sum of absolute percentage not exceeding 10%.

3.5.9 The Actuator shall be suitable for mounting directly on the valve and shall be suitable for mounting in any position. Supports required for inclined mounting shall form part of supply of valve assembly.

3.5.10 The actuator shall be capable of producing the required torque and thrust at the output shaft for satisfactory operation of the associated valve.

3.5.11 Each actuator shall have a hand wheel for emergency operation. The hand wheel shall be designed such that it is declutched automatically when the power supply to the motor is restarted.

3.5.12 The hand wheel shall be so arranged that when looking from hand wheel, the valve is closed by rotating the hand wheel in clockwise direction.

3.5.13 Motor shall be totally enclosed conforming to IP-65 or better as per data sheet. The enclosure shall be suitable to protect the motor from leakage steam, water or oil from valve joints and glands.

3.5.14 Where flameproof enclosures are specified, it shall meet the specification IS-2148.

3.5.15 Insulation shall be at least class-B or better and shall be tropicalised to withstand the atmospheric condition.

3.5.16 The actuator shall be provided with antifriction bearing in grease filled cartridge.

3.5.17 Each actuator shall be provided with a mechanical position indicator to indicate accurately the valve position.

3.5.18 The integral starter, if specified in data sheet-A, shall be provided in weatherproof enclosure with protection class not less than IP-65 or better as per data sheet.

The integral starter shall consist of:

i) Mechanical & Electrically interlocked reversing contractors suitable for class AC4 duty or Thyristor as pet data sheet.

ii) Thermal overload relay.

iii) Step down control transformer with fuses.

iv) Interposing relay.

v) Monitoring relay..

vi) Open, Close & Stop push buttons.

vii) Indicating lamps.

viii) Local-Remote lockable selector switch with spare potential free contacts, wired for remote interface.

ix) A potential free contact shall be provided for remote annunciation of power failure/overload condition. The contact shall be SPDT, rated for at 5A 240V AC or 0.2A at 220V DC.

3.5.19 The actuator shall be suitably time rated for the duty cycle involved with the necessary number of starts per hour, but in no case, less than 1200 starts per hour.

3.5.20 The actuator shall be provided with a suitable control unit for receiving 4-20 mA signal from remote controller.

3.5.21 The servomotor gear should have self locking or suitable brake so as to maintain it's last position as and when the motor power is switched off.

3.5.22 Thermostat/Thermistor as specified in the data sheet shall be provided for sensing the winding temperature and giving trip command. The trip contact shall be change over type. The contact shall be wired up to the actuator terminal box.

3.6 Accessories for Control Valve with Electric Actuator

3.6.1 Torque Switches

i) Each actuator shall be provided with at least one open and one close torque switches each with 2 NO+2 NC contacts. The contacts shall be rated for 5A at 240V AC or 0.2A at 220V DC.

ii) The torque switches shall have a minimum accuracy $\pm$ 3% of set value.

iii) The torque switches shall be provided with calibrated knobs for setting desired torque. Separate knobs shall be provided for close and open torque switches.

iv) The torque switches shall be provided with mechanical latching device to prevent operation when unsealing from the positions. The latching device shall unlatch as soon as the valve leaves the end position. If such provision is not possible, the torque switches shall be bypassed by end position limit switches, which open on valve leaving end position. These limit switches are additional to the number of limit switches specified elsewhere.

v) The torque switches or worm gear shall be self-locking type so that when torque switch operates it remains operated until the actuator is operated in the reverse.

vi) The torque switch enclosure shall conform to IP-55.

3.6.2 Limit Switches

Each limit switch shall have 2NO+2NC contact with contacts rated for 5A 240V AC/0.2A 220V DC unless otherwise specified. The switch enclosure shall conform to IP-55. Each limit switch shall be supplied with cable glands.

3.6.3 Space Heater

A space heater shall be provided in limit switch and starter compartments to prevent condensation. This shall be suitable for the power supply specified in the data sheet. Where integral starters are provided the space heaters shall be wired to control supply within the actuator.

3.6.4 Remote Position Transmitter

The position transmitter shall be supplied as indicated in Data Sheet-A. The electronic position transmitter shall be non-contact type with 4-20mA DC 2-wire output suitable for 12-50V DC supply. The resistance type position transmitter shall have 0- 100 ohm variation for valve position change of 0-100%. The position transmitters of both types shall have ± 1% accuracy. The enclosure shall conform to IP-55. Necessary cable glands shall be supplied.

3.6.5 Wiring

i) The actuator and the accessories will be neatly wired up to the terminal boxes.
ii) The internal wiring shall be minimum of 1 mm^2 stranded PVC insulated copper conductor.
iii) The wiring shall be identified by means of numbered ferrules on both ends of all wires.

3.7 Terminal and Terminal boxes

3.7.1 Motor Terminal Box

i) The terminals, terminal boards, terminal boxes, winding tails and associated equipment shall be suitable for connection to supply system having short circuit capacity specified in data sheet and clearance time determined by the associated fuses.

ii) The terminals shall be stud type insulated from the frame. The insulation shall not be porcelain. The studs shall be of brass or stainless steel or phosphor bronze of adequate size.

iii) The terminal box shall be totally enclosed conforming to degree of protection IP-65.

3.7.2 Actuator Terminal Box

i) All terminals of limit and torque switches, space heater, position transmitters, thermostat/thermister shall be brought to a common terminal box. The enclosure shall be to degree of protection IP-65.

ii) Terminal board with plug in connector shall be provided. Alternatively stud type or insertion type may be considered. Pinch screw type however will not be accepted. All terminals shall be shrouded to prevent accidental contact. Where stud type terminals are offered, it shall be as per clause 3.7.1 (ii).

iii) There shall be at least five terminals spare to terminate spare cores of cable.

3.7.3 Cable Glands

The motor terminal box and actuator terminal box shall be provided with required number of double compression nickel plated brass cable glands to suit cable type and associated size.

3.7.4 Earthing Terminal

Two earthing terminal shall be provided on either side of motor and actuator terminal box.

3.7.5 Painting

The Actuator shall be painted with epoxy-based paint.

4.0 TESTING AND INSPECTION

4.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.

4.2 The bidder shall furnish the Quality Plan in the format enclosed in volume-III. In case the Quality Plan(s) is/are included in volume-IIB, the bidder shall furnish his Quality Plan strictly in line with the same. The Quality Plan shall be discussed and finalised with the technically accepted bidders before opening the price bid. The stages where purchaser would like to be associated for witnessing or verification of tests would be indicated by the purchaser in the Quality Plan before approval.

4.3 The following test shall be conducted as a minimum requirement.

4.3.1 Control Valve

i) Radiographic tests on castings.
ii) Dye penetrant tests on machined surface.
iii) Ultrasonic tests for the forgings & bars of all valves with 60 Kg/cm^2 & higher ratings.
iv) Hydrostatic tests as per ANSI B 16.34 prior to seat leakage tests.
v) Valve closure and seat leakage tests as per ANSI B 16.104 / FCI-70.2.

4.3.2 Pneumatic Actuators

Functional test of actuator and each accessory.

4.3.3 Electric Actuator

i) Routine tests on motors as per IS: 325.
ii) Functional test on actuator and each accessory.
iii) Insulation resistance and high voltage test.
iv) Stall current & Stall torque test.
v) Output shaft speed and torque of actuator and corresponding current tests.

4.3.4 Control valve with Actuator & Accessories fully assembled

i) Functional tests of control valve operation along with actuator & accessories.
ii) Dimension checks.

4.3.5 Type tests or Test Reports

i) Valve lift vs. Flow test (Cv Test)
ii) Degree of protection tests for the enclosures
ii) Temperature rise test (applicable for Electrical Actuator only).
iii) Type test for motor as per IS: 325.

4.4 Inspection will be conducted by BHEL and/or their authorised representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder, for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests covered under 4.3.5 above, "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorised representatives or in independent Test House/Laboratory approved by BHEL.

4.5 The Standard QP is included in this specification to enable bidder to understand the extent of inspection and testing requirements to execute this job. The successful bidder has to follow the agreed QP, taking care of customer requirements mentioned in Sec-C and submit QP for final approval by BHEL / Customer.

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

As part of the main equipment supply, the bidder shall supply all commissioning spares and consumables required during Start-up,

5.2 Mandatory Spares

The bidder shall offer along with main offer, the Mandatory Spares as specified in Volume IIB Section-C of the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

5.3 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation along with unit rate against each item to enable BHEL / BHEL's Customer to place a separate order later, if required.

5.4 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

6.0 DRAWINGS AND DOCUMENTS

6.1 The bidder shall furnish the following documents in required number of copies along with the bid:

6.1.1 Data sheet-B, completely filled-up along with all enclosures.

6.1.2 Wiring diagrams for Electrical Actuators.

6.1.3 Hook up diagrams of Control Valve with Actuator & accessories.

6.1.4 Valve & actuator assembly dimensional drawings with weights.

6.1.5 Quality Plan

6.1.6 All relevant Catalogs with detailed technical information.

6.1.7 Bar-chart to indicate the time schedule for procurement, manufacture, testing and despatch.

6.2 The successful bidder shall furnish the following documents in required number of copies to BHEL during the contract stage:

6.2.1 For approval

i) Dimensional drawings.

ii) Installation drawings with overall dimensions of the completed equipment and clearances for operation and maintenance.

iii) Data sheet-C, completely filled-up along with all the enclosures including the sizing calculations & noise calculations.

iv) Quality Plan.

v) Test Certificates.

6.2.2 Final / As-built Drawings

Final / As-built drawings / CDs in required number of copies shall be submitted.

6.3 Operation & Maintenance Manuals

O&M Manuals in required number of copies shall be submitted. O&M manuals shall also contain storage and commissioning instructions.

7.0 MARKING AND PACKING

7.1 Marking

A stainless steel metal nameplate should be permanently fixed on each equipment giving its tag number and technical specifications.

7.2 Packing

All equipment / materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea water spray (where applicable) as well as rough handling and delays in transit and storage in open.

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8.0 APPLICABLE DATA SHEET FORMS

This document shall be read with one or more of the following data sheet forms :

- Data sheet A&B for Control Valve with Pneumatic Actuator : Data sheet no. PES-145-06-DS1-1
- Data sheet C for Control Valve with Pneumatic Actuator : Data sheet no. PES-145-06-DS2-1
- Data sheet A&B for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS3-1
- Data sheet C for Control Valve with Electric Actuator : Data sheet no. PES-145-06-DS4-1

ANNEXURE-IV

MATERIALS OF CONSTRUCTION FOR CONTROL VALVES

Materials for Control Valves shall be equivalent/superior to the following:

Sl. No.	Service	Body Material	Trim Material
1	Non-corrosive, non-flashing and non-cavitation service below 275 deg. C. like Aux. steam flow to deaerator, condensate flow to deaerator, CRH flow to deaerator etc.	Compatible with piping material	SS-316 with stellite faced guide posts and bushings.
2	Severe flashing/ cavitation services like HP Heaters and LP Heaters, emergency drain, Deaerator overflow drain to hotwell etc.	Alloy steel as per ASTM A 217 Gr. WC9	400 series SS or equivalent to suit the specific requirement
3	Low flashing/ cavitation service like HP Heater/ LP Heater normal drains level control, GSC minimum flow, Gland seal steam pressure control valve etc.	Alloy steel as per ASTM A 217 Gr. WC6	400 series SS or equivalent to suit the specific requirement
4	Condensate service below 300 deg. C. like condensate normal and emergency make-up control, DMCW DP control	SS-316	SS-316

Note : Valve body rating shall meet the process pressure and temperature requirements as per ANSI B16.34.

ODISHA POWER GENERATION CORPORATION LTD. BHUBANESWAR

PS-I, TG.

ANNEXURE-V

DATA SPECIFICATIONS SHEET FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER

Electrical	Input Signal	4-20 mA.
	Power Supply	Loop Powered from the output card of Control System.
	Hart Protocol	Compatibility For Remote Calibration & Diagnostics (Super-Imposed Hart Signal On Input Signal(4-20 mA).
	Valve Position Sensing	Position Sensing (Non Contact-Sensing Type), 4-20 Ma O/P Signal For Control System To Be Provided.
Environment	Operating Temp	(-)30 To 80 Deg. C
	Humidity	0-95 %
	Protection Class	IP-65 Minimum.
Software For Configuration And Diagnostic	Software	Windows Based Software. Configuration Shall Meet the Requirement, Diagnostics, Calibration Testing Of The Actuator.
	Diagnostic/Test Features	Advanced Diagnostic Features Like Features Stroke Counter Or Travel Counter, Leakage In Actuators, On Line Partial Closure Test, Valve Signature Analysis, Step Response Test, Valve Friction /Jamming Detection Etc To Be Provided.
	Factory Valve Signature Tests Reports (Pr Vs Valve Travel And Travel Vs I/P Signal) are to be provided.	
Hardware	PC	For Configuration/Software, Ref PC Specified Under DDCMIS Section.
Tests Certificates		Test certificates as per Manufacture Standard/Relevant Standard are To Be Submitted.
Configuration / Remote Calibration, Auto & Manual Calibration Shall Be Possible.		
Operating	Operating Range	Full Range & Split Range Signal Range.
Modes	Valve Action	Direct & Reverse. Valve Action.
	Flow Characterisation	Possible To Fit Valve Characteristic Curve Linear & Equal Percentage.

Fail Safe/Fail Freeze	Fail Safe/Fail Freeze Feature is to be Provided.	
Pneumatic	Air Capacity	Sufficient To Handle The Valves Selected/Boosters To Be Supplied If Required.
	Air Supply Pressure	To Suit The Air Supply Pressure/ Quality Available.
	Process Connection	1/4 Inch NPT.
Performance	Characteristic Deviation	<=0.5 % Of Span.
	Ambient Temp Effect	<=0.01 %/Deg C Or Better.
EMC & CE Compliance	Required To International Standard Like EN/IEC.	En50081-2& En50082 Or Equivalent.
Accessories	In Built Operator	Display With Push Buttons For Configuration Panel And Display On The Positioner Itself (Password Protected/Hardware Lock).
	Hand Held Hart Calibrator	Universal Hart To Be Calibrator Provided, One Per Unit.
	Press Gauge Block	For Supply & Output Pr., Filter Regulator Other Accessories Shall Be Provided As On Required Basis For Making System Complete.
	Electrical Cable Entry	1/2-Npt, Side Or Bottom Entry To Avoid Water Ingress.
	Valves Mounting Assembly	For Sliding Stem/Rotary/Single Acting/Double Acting On Required Basis.

DATA SHEETS- A&B
FOR CONTROL VALVES

INDEX

Control Valve datasheets for

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPECIFICATION NO.: PE-TS-391-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 05.07.2014 SHEET 3 OF 13

Tag No.: **ASV-22** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL - 2 x 660 MW Suratgarh**	.....
	SERVICE	**COMBINED TYPE MAIN STEAM TO AUX. STEAM PRDS (HC PRDS)**	.....
	LOCATION		.....
	DUTY	[•] INDOOR [] OUTDOOR	.....
	PIPE SIZE (inlet / outlet)	[] ON/OFF [•] MODULATING	.....
	PIPE MATERIAL (inlet / outlet)	**Ø 219.1x 34 | Ø 508 x 9.53** **SA 335 P91 | SA 335 P22**	.....|.....
BODY*	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[] GLOBE [•] ANGLE | [] TOP [•] CAGE | ONE	.....|.....|.....|...
	BODY SIZE: PORT SIZE: DESIGN CV		.....|.....|.....
	END CONNECTION & RATING (ANSI)	[•] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [] A217 WC6 [•] SA182 F91 [] SS	.....
		[] A217 C5 [] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•] GRAFOIL [] DOUBLE [•] SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [•] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....|.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST)	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [•] MAC NO. < 1/3 (STM)	.....|.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	PNEUMATIC PISTON TYPE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR OPEN TO CLOSE AND		.....
	CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPECIFICATION NO.: PE-TS-391-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 05.07.2014 SHEET 4 OF 13

Tag No.: **ASV-22** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-1 for Aux. Steam PRDS (Case-1 is the capability point for control valve ASV-22)							

	VALVE TYPE	[] CAVITATION [] FLASHING [•] HIGH DP
	* MAX SHUT OFF PRESS (KG/CM2(A) **271** * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 271 | **573** * IBR FORM III-C [•] REQUIRED [] NOT REQUIRED	…… ……|…… ……
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. DESIGN C_V SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPECIFICATION NO.: PE-TS-391-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 05.07.2014 SHEET 5 OF 13

Tag No.: **ASV-26** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL - 2 x 660 MW Suratgarh**	.....
	SERVICE	**COLD REHEAT STEAM TO AUXILIARY STEAM PR. REDUCING VALVE (LC PRV)**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 114.3x6.02 | Ø 219.1 x 8.18**	.....|.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	
BODY*	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE |[] TOP [•]CAGE| ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV		.....|.....|.....
	END CONNECTION & RATING (ANSI)	[•] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCC [•] A217 WC9 [] SS [] A217 C5 [] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•] GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [•] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE [] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	SS316 (ST) | SS316 (ST)	.....|.....
	: CAGE | GUIDE BUSH	SS316 (ST) | SS316 (ST)	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [•] MAC NO. < 1/3 (STM)	.....|.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 Dba (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	1.0 | 0.2	.....|.....
	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[•] TO OPEN [] STAYPUT [] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 6 OF 13	

Tag No.: **ASV-26** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-2 for Aux. Steam PRDS Low Capacity Pressure Reducing Valve ASV-26							
	VALVE TYPE						[] CAVITATION [] FLASHING [•] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 74.1 BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 74.1 | **360** * IBR FORM III-C [•] REQUIRED [] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. DESIGN C_V SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 7 OF 13	

Tag No.: **CDV-151** Qty.: **ONE EACH PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL - 2 x 660 MW Suratgarh**	.....
	SERVICE	**SPRAY TO COMBINED PRDS CONTROL VALVE**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 60.3 x5.54 | Ø 60.3 x5.54**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	.....|.....
BODY*	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE |[] TOP [•] CAGE |ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV		.....|.....|.....
	END CONNECTION & RATING (ANSI)	[•] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [•] A217 WC6 [] SS [] A217 C5	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS-316 | SS-316	.....|.....
	: CAGE | GUIDE BUSH	SS-316 | SS-316	.....|.....
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3	.....|.....
	REQUIRED LEAKAGE CLASS	(STM)	.....
		[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	.....|.....
	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 8 OF 13	

Tag No.: **CDV-151** Qty.: **ONE EACH PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-1 for High Capacity PRDS							
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) 46 * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) 46 | **60** * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. DESIGN C_V SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 9 OF 13	

Tag No.: **CDV-157** Qty.: **ONE EACH PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL - 2 x 660 MW Suratgarh**	.....
	SERVICE	**SPRAY TO LT DESH CONTROL VALVE**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 48.3 x5.08 | Ø 48.3 x5.08**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	...|...
BODY*	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE |[] TOP [•] CAGE |ONE	...|...|...|...
	BODY SIZE: PORT SIZE: DESIGN CV		...|...|...
	END CONNECTION & RATING (ANSI)	[] BWE [•] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [•] A217 WC6 [] SS [] A217 C5	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS-316 | SS-316	...|...
	: CAGE | GUIDE BUSH	SS-316 | SS-316	...|...
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3	...|...
	REQUIRED LEAKAGE CLASS	(STM)	.....
		[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	...|...
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	...|...
	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 10 OF 13	

Tag No.: **CDV-157** Qty.: **ONE EACH PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-3 for Low Capacity PRDS							
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2 (A) 46 * BODY DESIGN : PRESS (KG/CM2 (A) | TEMP (DEG C) 46 | **60** * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. DESI GN C_V SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

BHEL	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPECIFICATION NO.: PE-TS-391-142-N101 VOLUME II - B SECTION D REV. NO. 0 DATE : 05.07.2014 SHEET 11 OF 13

Tag No.: **CDV-93** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

	DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL*	PROJECT	**RRVUNL - 2 x 660 MW Suratgarh**	.....
	SERVICE	**SPRAY TO TGS DESUPERHEATER (DESH-3)**	.....
	LOCATION	[•] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [•] MODULATING	.....
	PIPE SIZE (inlet / outlet)	**Ø 33.4 x4.55 | Ø 33.4 x4.55**	.....
	PIPE MATERIAL (inlet / outlet)	**SA 106 Gr. B | SA 106 Gr. B**	...|...
BODY*	MODEL NO.	BIDDER TO SPECIFY	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[•]GLOBE [] ANGLE |[] TOP [•] CAGE |ONE	...|...|...|...
	BODY SIZE: PORT SIZE: DESIGN CV		...|...|...
	END CONNECTION & RATING (ANSI)	[] BWE [•] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [•] A217 WC6 [] SS [] A217 C5	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [•]GRAFOIL []DOUBLE [•]SINGLE	.....
	BONNET TYPE	[] STD [] EXTENDED [] FINNED	.....
	TRIM FORM	[] LINEAR [•] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS-316 | SS-316	...|...
	: CAGE | GUIDE BUSH	SS-316 | SS-316	...|...
	FLOW	[] BELOW SEAT [] ABOVE SEAT	.....
	OUTLET VELOCITY	[•] < 7 M/SEC (WATER) | [] MAC NO < 1/3	...|...
	REQUIRED LEAKAGE CLASS	(STM)	.....
		[] II [] III [] IV [•] V [] VI	.....
	NOISE LEVEL (dBA) (spec. 3.1.14)	LESS THAN 85 dBA (AT ONE METER DESTANCE)	.....
	VACUUM SERVICE	[] YES [•] NO	.....
	ANTI CAVITATION TRIM	[] YES [•] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO SPECIFY	...|...
	CLOSE AT : OPEN AT (KG/CM2g)	0.2 | 1.0	...|...
	*TRAVEL TIME FOR OPEN TO CLOSE AND CLOSE TO OPEN	LESS THAN 10 SECS.	.....
	*VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [•] TO CLOSE	.....
	*VALVE POSN. ON SUPPLY AIR FAILURE	[•] STAYPUT	.....
ACCESSORIES	POSITIONER (SMART)	[•] REQUIRED [] NOT REQUIRED	
	AIR FILTER REGULATOR	[•] REQUIRED [] NOT REQUIRED	
	AIR LOCK RELAY	[•] REQUIRED [] NOT REQUIRED	
	POSITION LIMIT SWITCH	[•] REQUIRED [] NOT REQUIRED	
	POSITION TRANSMITTER	PART OF SMART POSITIONER	
	SOLENOID VALVE	[•] REQUIRED [] NOT REQUIRED	
	E/P CONVERTOR	PART OF SMART POSITIONER	
	JUNCTION BOX	[•] REQUIRED [] NOT REQUIRED	
	HAND WHEEL (SIDE MOUNTED)	[•] REQUIRED	
	LOCAL POSITION INDICATOR	[•] REQUIRED	

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR) For OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha	SPECIFICATION NO.: PE-TS-391-142-N101	
		VOLUME II - B	
		SECTION D	
		REV. NO. 0	DATE : 05.07.2014
		SHEET 12 OF 13	

Tag No.: **CDV-93** Qty.: **ONE PER UNIT** Data Sheet No. PES-145-06-DS1-0

DATA SHEET – A & B

DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR) (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
PERFORMANCE OF VALVE	LINEARITY HYSTERISIS SENSITIVITY ACCURACY (OVERALL)	± 2% ± 1% ± 0.5% ± 2%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	TEMP DEG (C)	CALCU-LATED CV	% VALVE LIFT	VALVE O/L VELOCITY
SERVICE CONDITION*									
		Refer Sizing Data Sheet A-4 for TGS DESUPERHEATER							
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	* MAX SHUT OFF PRESS (KG/CM2(A) **46** * BODY DESIGN : PRESS (KG/CM2(A) | TEMP (DEG C) **46** | 60 * IBR FORM III-C [] REQUIRED [•] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. DESI GN C_V SHALL BE BASED ON SERVICE CONDITIONS INDICATED AS PER SPECIFICATION CLAUSE NUMBER 3.1.7. OF SPECIFICATION NO. : PES – 145 – 06 VOL IIB SECTION D OF TECHNICAL SPECIFICATION

FORM NO. PEM-6666-0

	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.: PE-TS-387-145-I106	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE :07.11.2012
		SHEET	OF

Tag No: Applicable for all tag nos. **Quantity: As required** Data Sheet No. PES-145-06-DS1-0

Applicable for tag nos. wherever statement "REQUIRED" indicated in the individual CV data sheets

DATA SHEET – A & B for ACCESSORIES
DATA SHEET – A FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)

SMART POSITIONER (UNIVERSAL HART PROTOCOL BASED)	MFR. & MODEL NUMBER			Bidder to Specify		
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ■ NO	☐ THREE ■ TWO	■ IP – 65
	INPUT SIGNAL			4- 20 mA DC		
	OUTPUT SIGNAL (Kg / Cm^2) T			O SUIT ACTUATOR		
AIR FILTER REGULATOR TWO (2) Nos./CV <=5MICRON (SINTERED BRONZE)	MFR. & MODEL NUMBER			Bidder to Specify		
	AIR SUPPLY PRESS (MAX.) (Kg / Cm^2 g)			■ 7.0 ☐		
	OUTPUT PRESS (Kg / Cm^2 g)			TO SUIT ACTUATOR		
	OUTPUT GAUGE			■ REQUIRED (2 Inch) ☐ NOT REQUIRED		
AIR LOCK	MFR. & MODEL NUMBER			Bidder to Specify		
	SET PRESS (Kg / Cm^2)					
	SUPPLY PRESS (MAX.) (Kg / Cm^2)			■ 7.0 ☐		
	RESET TYPE			AUTO		
	VENT PLUG			REQUIRED		
LIMIT SWITCH	MFR. & MODEL NUMBER			Bidder to Specify		
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**	**1 NO.**
	CONTACT TYPE			SPDT		
	RATING (AC / DC)			5A 240V AC AND 0.5A 220V DC		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
POSITION TRANSMITTER	MFR. & MODEL NUMBER			Bidder to Specify (Part of SMART Positioner)		
	TYPE			■ Electronic (2-Wire) Contactless ☐ OTHER		
	SUPPLY			■ 24V DC ☐ 220V DC ☐ 110V AC ☐ 240V AC		
	OUTPUT RATING			■ 4-20mA ☐ 0-100 ohms		
	ACCURACY +			_ 2% FS		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
SOLENOID VALVE	MFR. & MODEL NUMBER			ROTEX / ASCO		
	RATING			■ 24V DC ☐ 220V DC ☐ 240V AC ☐		
	OPERATION Q	UANTITY		☐ Stayput ■ Interlock	■ 1 ☐ 2	
	COIL INSULATION CLASS			CLASS - H		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
	BODY & TRIM			SS BAR STOCK & AISI SS-316 respectively		
JUNCTION BOX	NO. OF WAYS			☐ 24-WAYS ☐ AS REQUIRED ■ 36-Ways		
	SIZE AS			REQUIRED		
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
I/P CONVERTER (Part of SMART Positioner)	INPUT SIGNAL	POWER SUPPLY		4-20mA DC	24V DC	
	SPLIT RANGE			☐ YES ☐ NO		
	ENCLOSURE CLASS			☐ NEMA-4 ■ IP-65		
	Accuracy	Repeatability		± 0.5 % FS	± 0.5 % FS	
Cu. Tubing & Fittings / per CV	**This is in addition to cu. Tubing and fittings which are integral part of CV as per ASTM B68 to B75 (USA)**			25 Meters of ¼ " PVC coated anneled Cu. Tubing, with 1 set of Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		

SECTION – D

EQUIPMENT SPECIFICATIONS

FOR

STEAM DESUPERHEATER

1.0.0 GENERAL

This standard specification covers the design, materials, construction features, manufacturing process, assembly, inspection and testing requirements, painting and packing requirements of Steam Desuperheater along with spray nozzle.

2.0.0 CODES AND STANDARDS

2.1.0 The design, manufacture, inspection and testing of the equipment shall comply with the requirements of the latest national and international codes and standards wherever applicable. Wherever the specific code requirements are specified herein,. the same shall be adhered to.

In particular, the equipment shall be designed to comply with latest editions of the following standards

(i) Indian Boiler Regulations (IBR).

(ii) ASME Section - VIII / Div. - 1.

(iii) Material specifications as per ASTM, AISI.

3.0.0 DESIGN AND CONSTRUCTIONAL FEATURES

3.1.0 The desuperheater shall be of direct mixing mechanical spray type. The assembly shall consist of desuperheater pipe with steam inlet and outlet & spray water connection along with spray nozzle. The spray nozzle shall direct the spray in the direction of steam flow for proper mixing and arranged in such position that direct impingement of spray water on desuperheater walls is avoided.

3.2.0 The spray nozzle shall be accurately sized for best results in total range as stipulated in the data sheet.

3.3.0 The desuperheater shall be complete with matching counter flanges including bolts, nuts, gaskets, necessary reducers / expanders to suit purchaser's pipe line and supporting legs / pads & holding down bolts as required.

3.4.0 The material of construction shall be as indicated in Data Sheet – A.

4.0.0 SHOP INSPECTION AND TEST

4.1.0 The bidder shall submit along with the offer the Quality Plans in the enclosed format together with all reference documents/standards etc. as applicable.

4.2.0 Indicative Quality Plans, specifying minimum checks and tests as considered necessary are enclosed along with this specification for compliance. These however are not intended to exhibit the total comprehensive testing programmes, which are the responsibility of the bidder.

4.3.0 Detailed Quality Plans to be submitted by the bidders should also include all the checks/tests carried out by the suppliers as part of their normal practice. The Quality Plans submitted by the bidders shall be subject to approval of BHEL/their Customer who reserves the right to ask for further checks during finalization of Quality Plans. BHEL/their Customer shall indicate customer hold points in the approved Quality Plans beyond which the work shall not proceed without their approval.

4.4.0 The supplier shall furnish their production program along with scheduled dates of testing at least three months in advance to enable BHEL/their customer to plan for witnessing the tests identified as hold points.

4.5.0 Material identification and co-relation with test certificates for all major components shall be essentially required. In absence of these, the material of each component shall be tested as per relevant specification for Chemical Composition and Mechanical properties i.e. Yield Stress, Ultimate Tensile Stress, Impact test, % Elongation, % Reduction in Area, Hardness etc. In addition, to ensure freedom from surface and sub-surface defects, suitable Non Destructive Testing shall also be carried out.

4.6.0 Following tests shall be done at Manufacturers' works during various stages as minimum requirement:

4.6.1 Visual examination of all components.

4.6.2 Check for weld joints for proper fit up, Dye Penetration Test after root run and final welding. 100% Radiographic test as per ASTM E 165 for all butt welds.

4.6.3 Verification of stress relieving chart if post-weld heat treatment is called for.

4.6.4 Check / test for pressure retaining bolts and nuts as per relevant Codes/Standards.

4.6.5 Dimension check for all components including surface finish.

4.6.6 Hydraulic Test to two times the rated design pressure for desuperheater body and other pressure retaining parts.

4.6.7 Check for final completeness, cleaning, surface finish, appearance, identification, surface preparation, painting, marking and packing including spares.

4.6.8 The equipment comes under the purview of IBR (Indian Boiler Regulations). All tests certificates duly signed by Chief Inspector (IBR) / authorized representative shall be furnished in IBR from III-C.

4.6.9 The particulars of proposed shop tests and process of test shall be submitted to BHEL/their Customer along with Quality Plan for approval.

5.0.0 PERFORMANCE REQUIREMENTS

Bidder shall guarantee that equipment offered shall meet the rating and performance requirements as stipulated in this specification. In case it is not as per guarantee furnished by the bidder, the deficiency shall be made good by the bidder by rectification / replacement of defective parts within reasonable time at their own cost inclusive of cost of transportation both ways if required. The Purchaser is entitled to reject the equipment in case of repeated failures to meet the guaranteed performance.

6.0.0 PAINTING

6.1.0 All foundry sand and loose material shall be removed and surface should be made thoroughly clean for further protection as required.

6.2.0 A shop coat of paint, removable after installation at site, shall be applied to all steel surfaces and other exposed surfaces requiring corrosion protection during transit and storage at site.

7.0..0 PRESERVATION, MARKING AND PACKING

7.1.0 A Stainless Steel metal nameplate should be permanently fixed on each equipment giving its Tag. No. and technical specifications i.e. Service, Size, Pressure Rating etc.

7.2.0 All equipments / materials shall be packed suitably and protected from impact, abrasion, corrosion, incidental damage due to vermin, Sun-light, high temperature, rain, moisture, humidity, dust, sea water (where applicable) as well as rough handling during entire period of dispatch, storage and erection including delays in transit and storage in open.

7.3.0 Spares shall be packed separately and marked clearly for identification. These shall be specially packed for long storage without damage.

DESUPERHEATER DATA SHEET A-1

DATA SHEET FOR LOW TEMP. DESUPERHEATER DESH-2

S.NO.	DESCRIPTION	UNITS	DATA FOR HIGH CAP. PRDS DESUPERHEATER
1.0	TAG NO.		DESH-2
2.0	TYPE	VARIABLE ORIFICE / VENTURI TYPE	
3.0	STEAM PARAMETERS	(INLET OF DESUPERHEATER)	
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-3
3.2	PRESSURE	$Kg/cm^2(a)$	BIDDER TO DECIIDE BASED ON SIZING DATA
3.3	TEMPERATURE	^0C	BIDDER TO DECIIDE BASED ON SIZING DATA
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-3
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-3
5.2	PRESSURE	Kg/cm^2 (a)	BIDDER TO DECIIDE BASED ON SIZING DATA
5.3	TEMPERATURE	^0C	REFER SIZING DATA SHEET A-3
6.0	END DETAILS	(STEAM INLET / OUTLET)	
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 457.2 x 9.53
7.0	END DETAILS	(SPRAY WATER INLET)	
7.1	TYPE / MATCHING PIPE		SW/ 48.3 x 5.08
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A216 WCB
8.2	PIPE		SA 106GRB
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316 (Spray Nozzle design pressure shall be equal to Design Spray Water Pressure)
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	$Kg/cm^2(a)$	21
9.2	DESIGN TEMPERATURE	^0C	350

DESUPERHEATER DATA SHEET A-2

DATA SHEET FOR 'TGS DESUPERHEATER' DESH-3

S.NO.	DESCRIPTION	UNITS	DATA FOR HIGH CAP. PRDS DESUPERHEATER
1.0	TAG NO.		DESH-3
2.0	TYPE	VARIABLE ORIFICE / VENTURI TYPE	
3.0	STEAM PARAMETERS	(INLET OF DESUPERHEATER)	
3.1	FLOW	T/HR	REFER SIZING DATA SHEET A-4
3.2	PRESSURE	$Kg/cm^2(a)$	BIDDER TO DECIIDE BASED ON SIZING DATA
3.3	TEMPERATURE	^0C	BIDDER TO DECIIDE BASED ON SIZING DATA
4.0	STEAM PARAMETERS (OUTLET OF DESUPERHEATER)		REFER SIZING DATA SHEET A-4
5.0	SPRAY WATER PARAMETERS		(INLET OF DESUPERHEATER)
5.1	FLOW	T/HR	REFER SIZING DATA SHEET A-4
5.2	PRESSURE	Kg/cm^2 (a)	BIDDER TO DECIIDE BASED ON SIZING DATA
5.3	TEMPERATURE	^0C	REFER SIZING DATA SHEET A-4
6.0	END DETAILS	(STEAM INLET / OUTLET)	
6.1	TYPE / MATCHING PIPE	mm x mm	BW / 88.9 x 5.49
7.0	END DETAILS	(SPRAY WATER INLET)	
7.1	TYPE / MATCHING PIPE		SW/ 33.4 x 4.55
8.0	MATERIALS OF CONSTRUCTION		
8.1	BODY		A216 WCB
8.2	PIPE		SA 106GRB
8.3	SPRAY NOZZLE WITH ASSEMBLY		SS 316 (Spray Nozzle design pressure shall be equal to Design Spray Water Pressure)
9.0	DESIGN PARAMETERS		
9.1	DESIGN PRESSURE	$Kg/cm^2(a)$	21
9.2	DESIGN TEMPERATURE	^0C	350

DATA SHEET-C

LIST OF DOCUMENTS AND DATA TO BE SUBMITTED AFTER AWARD OF CONTRACT

The list of documents and data to be submitted by the successful bidder after the award of the contract are specified in Data Sheet - C.

The supplier shall after award of contract submit FIFTEEN (15) sets of the following documents for purchaser's approval / vetting.

(i) Certified final drawings & data sheets as per cl. 4.0.0 of section-C.

(ii) Quality Plans, Inspection/Test Reports as agreed with the Purchaser.

(iii) Material and Hydraulic Test Certificates along with IBR form III C.

(iv) Performance Test Procedures and Reports.

(v) Field Quality Plan as agreed.

(vi) Storage Instructions.

(vii) List of Commissioning and Recommended Spares.

(viii) List of Tools and Tackles required.

(ix) List of lubricants.

(x) Operation and Maintenance Instruction Manual.

NOTE: Above list is only tentative. Successful bidder shall prepare detailed schedule of Drawings/ Documents, which shall be mutually agreed and included in the contract document/ordering Specification.

FINAL DOCUMENTATION

S.NO.	DESCRIPTION	INITIAL SUBMISSION FOR APPROVAL TO BHEL	COPIES FOR NLC/TCE APPROVAL AFTER BHEL CLEARANCE
1.	Vendor drawing / document for approval Note : ▪ Initial submissions with Rev. No. P0, P1, P2 etc. ▪ After BHEL clearance, submission to OPGC with Rev. No. R0, R1, R2 etc.	05+Soft Copy	3+Soft Copy
~~2.~~	~~Issue of action A/B/C Civil / Erection Drawings / documents for construction at site (for civil packages only)~~	~~8~~	
3.	Release of finally approved drawings / documents (action A/E) i.e. distribution prints	6 + Soft Copy+2 CD's	
4.	O&M Manuals	2+Soft	9+Soft+4 CD's
5.	"As-Built" drawings, certificates, reports etc	9+Soft+4 CD's	

	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION** **OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **II-B** SECTION **D** REV NO. **00** DATE 05.07.2014 SHEET 1 OF 1

QUALITY PLAN

DRAWING NO. PE-QP-391-145-1006

QUALITY PLAN
FOR CONTROL VALVES

REV.	DATE	ALTD	CHD	APPD
03	09.04.14	RM -sd-	SSB -sd-	MAM -sd-
	REVISED INLINE WITH CUST. COMMENTS RCVD VIDE LETTER NO. □PGC/BTG/0193/05-04-2014			
02	27.02.14	RM -sd-	SSB -sd-	MAM -sd-
	REVISED INLINE WITH CUST. COMMENTS RCVD VIDE LETTER NO. □PGC/BTG/0040/28-01-2014			
01	23.12.13	RM -sd-	SSB -sd-	MAM -sd-
	REVISED INLINE WITH CUST. COMMENTS RCVD VIDE LETTER NO. □PGC/BTG/3843/12-12-2013			

JOB NO. 391
STATUS STANDARD
DISTRIBUTION
TO
No. of

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
I	DESN	RM	-sd-	08.11.13
	CHD	SSB	-sd-	08.11.13
	APPD	MAM	-sd-	08.11.13

TITLE
QUALITY PLAN FOR CONTROL VALVES

DEPT.
SIGN
DATE
SCALE

DRAWING NO.
PE-QP-391-145-1006

SHEET 00 OF 06 REV. 03

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-391-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	03 DATE: 09.04.14
SHEET	1 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.0	**MATERIAL**											
1.1	Body & Bonnet casting / forgings, plug, valve stem, seat ring/cage.	1. Physical, Chemical properties	MA	Physical, Chemical tests	One/ Heat(HT Batch)	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3	---	2,1	
		2. Heat Treatment	MA	Review of H.T. Chart	Each H.T.	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Test Certificate	3/2	2	1	IBR Certification (if applicable) to be verified by BHEL
		3. Internal quality of castings	MA	RT for Body & UT for Bonnet(NDT)	100%	ASME B 16.34	ASME B 16.34	Test Report / FILM	3/2	2	1	Only for rating ANSI 900 and above. Applicable for Body and Bonnet only. For Lower rating only if called for in specification.
		4. Surface Quality	MA	1. Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1	
				2. MT/PT	100%	ASME B 16.34	ASME B 16.34	Test Certificate	3	2	1	After Machining on machined surface only

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test
PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test.; W - Agency Witnessing the Test.; V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-391-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	03 DATE: 09.04.14
SHEET	2 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
		5. Pressure test for shell	MA	Hyd. Test	100%	ISA-S-75.19/ ASME B 16.34	ISA-S-75.19/ ASME B 16.34	Test Certificate	2	2	1	For Body & Bonnet after machining
1.2	Diaphragm	1. Surface Quality	MA	Visual	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1	
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2		2,1	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Appd Drg	Record	3	---	2,1	

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1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Rele. Standards	Rele. Standards	Test Certificate	3	---	2,1	In case TC is not available, Actual test shall be conducted
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2,1	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1	
2.0	**IN PROCESS INSPECTION**											
2.1	After machining, i, Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	------	Proper Physical Contact	---	2	---	---	
3.0	**TESTS ON COMPLETED VALVE**											

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STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-391-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	03 DATE: 09.04.14
SHEET	4 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $ P	Agency $ W	Agency $ V	Remarks
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1,4	1	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	No Leakage	Test Certificate	2	1,4	1	Refer Note-4 3
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1,4	1	Refer Note-4
4.0	**OPERATION TEST ON COMPLETED VALVE (Final inspection)**	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		7. Accuracy (Overall) 1	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1	1	Refer Note-4
		8. Control Valve Flow characteristics / CV Test	MA	♦Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet / ISA S75.02 1	As per specs/ Approved drg. / data sheet	Test Certificate	2	1,4 3	1	♦Size = Body & port size Or Body size & CV for non std port. Refer Note 1.

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test
PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.
1 - BHEL 2 - Vendor 3 - Sub-vendor 4 - Customer

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-391-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	03 DATE: 09.04.14
SHEET	5 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Report	2	1	1	On assembled valve Refer Note-4
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Records	2	1	1	Refer Note-4
		11. Pre defined valve position in case of air failure	MA	Visual	100%	As per spec & Appd drg	As per spec & Appd drg	Test Certificate	2	1	1	
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2	1	1	
5.0	**AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)**											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	Overall leakage including tubing
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1	

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.
1 - BHEL 2 - Vendor 3 - Sub-vendor 4 - Customer

PEM :: C&I

STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-391-145-I 006**			
VOLUME	IIB		
SECTION	D		
REV. NO.	03	DATE:	09.04.14
SHEET	6	OF	7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2	1	1	
6.0	**PAINTING**	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	---	Refer Note-2
7.0	**PACKING**	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test; PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

PEM :: C&I	STANDARD QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)	QUALITY PLAN NO.: **PE-QP-391-145-I 006** VOLUME IIB SECTION D REV. NO. 03 DATE: 09.04.14 SHEET 7 OF 7

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	

NOTES:

1. In case valid CV test certificate for a similar control valve(Same type, Same size, Same CV) is not submitted to BHEL by the vendor, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, if applicable.
4. The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. Copies of all TC's(Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests(Leak/Operation) shall be submitted to BHEL for verification and acceptance.

LEGEND:
* CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
RT- Radiographic Test; UT – Ultrasonic Test
PT – Dye penetrant Test; MT- Magnetic Test
$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.
1 - BHEL; 2 - Vendor; 3 - Sub-vendor; 4 - Customer

BHEL	**STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS**	CUSTOMER : OPGCL	PROJECT: 2X660MW IB TPS, JHARSUGUDA,ODISHA	SPECIFICATION NUMBR **PE-TS-391-142-N995**
		BIDDER/ VENDOR : AS PER APPROVED LIST	SPECIFICATION TITLE : **AUXILIARY STEAM P.R.D.S**	
	SHEET 1 of 2	SYSTEM ITEM : **STEAM DESUPERHEATER**	QUALITY PLAN NUMBR	SECTION VOLUME

SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	**Raw Materials**											
1.1	Pipes	Mechanical & Chemical Prop.		Mechanical & Chemical	100%	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Leakproofness		Hydraulic test	100%	-do-	-do-	TC	3/2	-	1	
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
1.2	Forging	Physical & Chemical Prop.		Physical & Chemical Prop.	1/heat	Appd Specn./ Data Sheet/Drg.	Appd Specn./ Data Sheet/Drg.	TC	3/2	-	1	Correlation required
		Dimensions		Measurement	100%	-do-	-do-	IR	3/2	-	1	
		Heat Treatment		Scrutiny	100%	-do-	-do-	HT/SR Chart	3/2	-	1	Correlation required
2.0	**In Process**											
2.1	Forgings	Internal defects		U.T	100%	ASTMA 435	ASTMA 435	IR	3/2	-	1	
2.2	Machining Body Internals	Dimensions		Measurement	100%	Appd.Drg.	Appd.Drg.	IR	3/2	-	1	Correlation required
2.3	Body	Surface Defects		D.P. Check	100%	ASTME165	ASME-B 16.34 ,Appendix-III	TC	3/2	-	1	

PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR	
NAME				
SIGNATURE				
DATE				BIDDER'S/ VENDOR'S COMPANY SEALS

BHEL	**STANDARD QUALITY PLAN FOR AUXILIARY STEAM PRDS**	CUSTOMER : OPGCL	PROJECT: 2X660MW IB TPS, JHARSUGUDA,ODISHA	SPECIFICATION NUMBR **PE-TS-391-142-N995**
		BIDDER/ VENDOR : AS PER APPROVED LIST	SPECIFICATION TITLE : **AUXILIARY STEAM P.R.D.S**	
	SHEET 2 of 2	SYSTEM ITEM : **STEAM DESUPERHEATER**	QUALITY PLAN NUMBR	SECTION VOLUME

SL. NO.	COMPONENT/ OPERATION	CHARACT-ERISTIC CHECK	CAT.	TYPE METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11
2.4	WPS,PQR,WPQ	WPS,PQR,WPQ		Physical	100%	ASME Sec-IX/IBR	ASMESec-IX/IBR	Format	3/2	-	1	Records to be shown
3.0	**Final Inspection**											
3.1	Assembly	Completeness and Marking		Visual	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
		Dimensional		Measurement	100%	Appd Specn./Data Sheet/Drg.	Appd Specn./Data Sheet/Drg.	IR	3/2	1	-	
3.2	Pressure Test	Leak Proofness		Hydraulic Test	100%	-do-	-do-	IR	3/2	1	-	
4.0	**Painting**	Surface Prepn., Uniformity, Shade & Thick.		Visual, Measurement	100%	-do-	-do-	IR	3/2	-	1	
5.0	**Packing**	Soundness of Packing, Marking		Visual	100%	Appd Specn./Mfr. Standard	Appd Specn./Mfr. Standard	IR	3/2	-	1	
	Note:: IBR –Certificate in Form III C shall be submitted.											

LEGEND P – PERFORM W – WITNESS V – VERIFICATION
1 – BHEL, CUSTOMER/CONSULTANT 2 – VENDOR 3 – SUB VENDOR

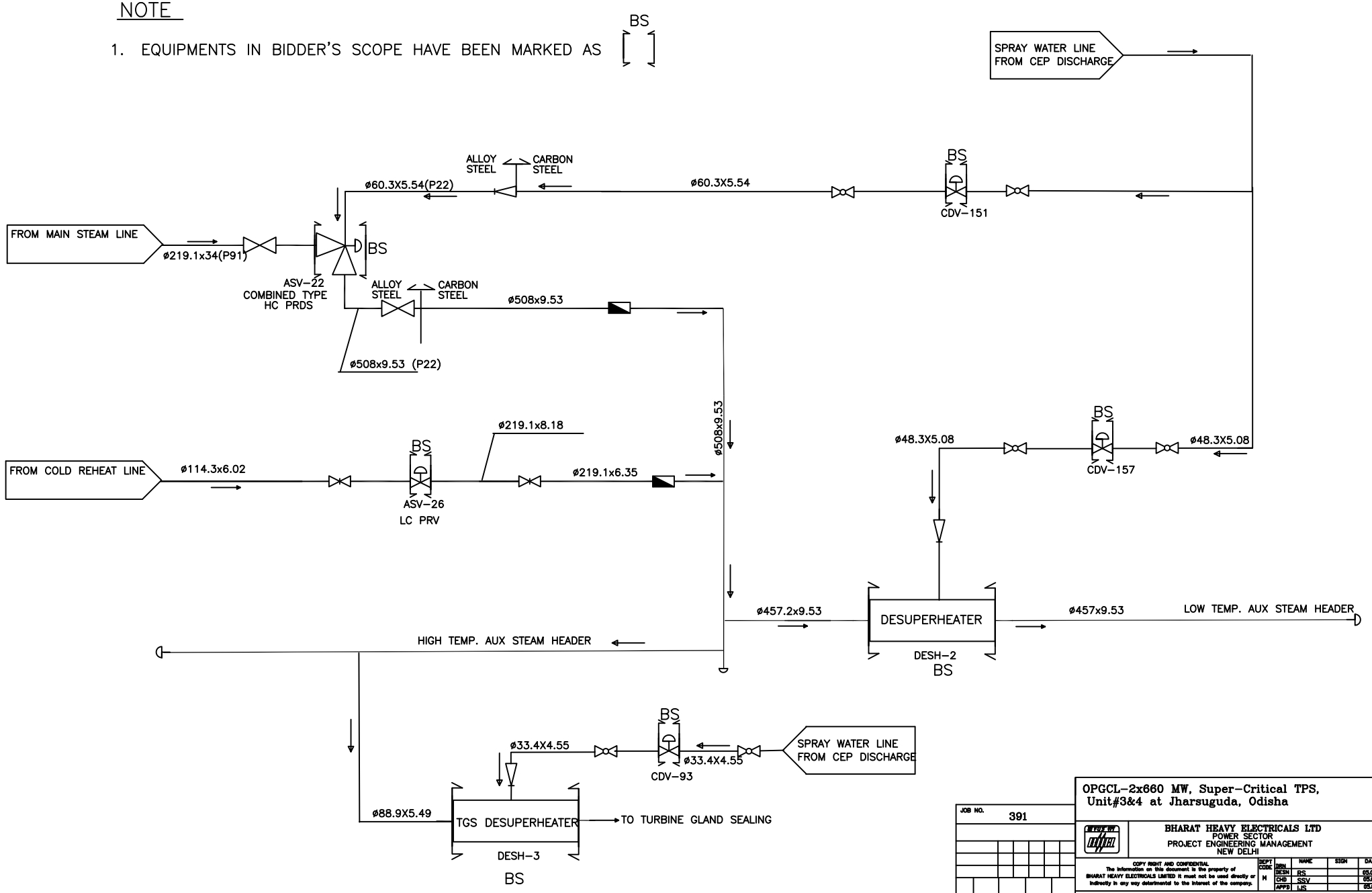
PARTICULARS	CUSTOMER/CONSULTANT	BHEL	BIDDER / VENDOR	
NAME				
SIGNATURE				
DATE				BIDDER'S/ VENDOR'S COMPANY SEALS

	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION** **OPGCL - 2 x 660 MW, IB TPS, Unit # 3 & 4 at Jharsuguda, Odisha**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **II-B** SECTION **D** REV NO. **00** DATE 05.07.2014 SHEET 1 OF 1

TENDER DRAWINGS

NOTE

1. EQUIPMENTS IN BIDDER'S SCOPE HAVE BEEN MARKED AS [BS]



DRAWING NO. PE-TS-391-142-N102

CUSTOMER'S DRAWING NO.

JOB NO. 391

OPGCL-2x660 MW, Super-Critical TPS, Unit#3&4 at Jharsuguda, Odisha

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
H	DRN			
	DESN	RS		05.07.2014
	CHD	SSV		05.07.2014
	APPD	LJS		05.07.2014

TITLE: TECHNICAL SPEC. for AUXILIARY PRDS

C&I | DEPT. | SCALE NTS | DRAWING NO. PE-TS-391-142-N102
SIGN
DATE
SHEET 01 OF 01 | REV. 00

ODISHA POWER GENERATION CORPORATION LIMITED

2 X 660 MW, SUPER-CRITICAL TPS, UNIT # 3 & 4 AT JHARSUGUDA, ODISHA

TECHNICAL SPECIFICATION
FOR

AUXILIARY STEAM PRESSURE REDUCING AND DESUPERHEATING STATION ALONGWITH ACCESSORIES

VOLUME - III

SPECIFICATION No: **PE–TS –391-142–N101 (REV 00)**

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA, INDIA

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.

1.0 Volume III comprises of following: -

1.1 Data Sheet : Data Sheet(s) 'B' Section 'D'.

1.2 Schedules :

PART – A : Technical Schedules

PART – B : Price Schedules

(See clause 2 (b) below for unpriced schedules)

The Schedule and Data Sheets enclosed/indexed shall be completely filled up by the bidder and furnished with the bid duly signed and stamped by the bidder. Purchaser reserves the right to ask the bidder to fill additional schedules, which are not listed in the contents.

2.0 Form No. PEM-6020 is a 'Checklist', which is enclosed to facilitate the bidder to make sure that the necessary data/information is furnished by him in his bid. The remarks column of this schedule shall be filled up by the bidder as per the instructions given below:-

a) The bidder shall write 'Not Applicable' against those schedules / documents which are not listed in the contents.

b) The bidder shall write 'Enclosed' for the listed schedules / documents which are filled and furnished by the bidder with the bid. Otherwise 'Not Enclosed' shall be written.

c) Duly filled Part-A schedules as well as Data Sheet-B shall be furnished with the technical offer while Part-B (Price Schedules) shall be submitted with price offer in separate covers.

d) Wherever unpriced schedules are to be furnished with Part-A schedules in tech. bids. the same is indicated in the filling space of price schedule formats.

e) Other documents / information as required in the checklist shall also be furnished by the bidder.

3.0 The Data Sheet(s)-B shall be filled-up completely and typed written and shall be duly signed with Rev. No. and date. One copy of the same shall be furnished with the bid. The items, which deviate from the specification, shall be marked with an asterisk (*) in the data sheets and details shall also be given in the 'Schedule of deviations' from technical specification (Form No. PEM-6036).

4.0 Bidder shall fill specification No. in all schedules .

5.0 Schedules PEM – 6020 & PEM 6040 duly filled in shall be enclosed by bidder both in Technical and price offers.

CONTENTS

PART-A

* To be filled up by successful bidder after LOI.

CONTENTS

PART-B

* to be filled up by successful bidder after LOI.

	TITLE **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **III** SECTION **PART-A** REV NO. **00** DATE 17.07.2014 SHEET 1 OF 1

VOLUME-III
PART-A

SCHEDULES AND DATA SHEETS

	TITLE **EQUIPMENT SPECIFICATIONS** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **III** SECTION **D** REV NO. **0** DATE 17.07.2014 SHEET 1 OF 1

DATA SHEETS - C
AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION

(TO BE FILLED BY SUCCESSFUL VENDOR AFTER THE AWARD OF CONTRACT)

	Technical specification for **APRDS CONTROL VALVES** (Pneumatically Operated) **OPGCL-2X660MW, Super-Critical TPS, Unit -3 & 4 at Jharsuguda,Odisha**	SPECIFICATION NO. **PE-TS-391-142-N101**
		VOLUME **III**
		SECTION **D**
		REV. NO. 00 | DATE: 17.07.2014
		SHEET 1 of 3

	NAME
	SIGNATURE
	DATE

Tag No…… **Quantity**…… Data Sheet No. PES-145-06-DS2-0

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

GENERAL*	PROJECT	
	SERVICE	
	LOCATION	
	DUTY	
	PIPE SIZE (inlet / outlet)	
	PIPE MATERIAL (inlet / outlet)	
BODY	MODEL NUMBER	
	TYPE OF BODY : GUIDING : NO. OF PORTS	
	BODY SIZE : PORT SIZE : DESIGN DV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE	
	TRIM FORM	
	TRIM MATERIAL : SEAT | PLUG	
	TRIM MATERIAL : CAGE | GUIDE	
	FLOW	
	OUTLET VELOCITY	
	REQUIRED LEAKAGE CLASS	
	NOISE LEVEL (dBA) (Spec. 3.1.14)	
	VACUUM SERVICE	
	ANTI CAVITATION TRIM	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	
	CLOSE AT : OPEN AT (Kg / Cm^2g)	
	*TRAVEL TIME FOR OPEN TO CLOSE, CLOSE TO OPEN	
	*VALVE POSN. ON SIGNAL AIR FAILURE	
	*VALVE POSN. ON SUPPLY AIR FAILURE	
ACCESSORIES	POSITIONER	
	AIR FILTER REGULATOR	
	AIR LOCK RELAY	
	POSITION LIMIT SWITCH	
	POSITION TRANSMITTER	
	SOLENOID VALVE	
	E / P CONVERTER	
	JUNCTION BOX	
	HAND WHEEL (SIDE MOUNTED)	
	LOCAL POSITION INDICATOR	
	ELECTRO PNEUMATIC POSITIONER	

Tag No…… **Quantity**…… Data Sheet No. PES-145-06-DS2-0

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

PERFORMANCE OF VALVE	LINEARITY	
	HYTERSIS	
	SENSITIVITY	
	ACCURACY	

SERVICE CONDITION*	**SL.+ NO.**	**LOAD**	**FLOW (T/HR)**	**INLET PR. (KG/CM^2 (A)**	**OUTLET PR. (KG/CM^2 (A)**	**TEMP DEG. C**	**CALCULATED CV**	**% VALVE LIFT**	**VALVE O/L VELOCITY**

	VALVE TYPE
	* MAX SHUT OFF PRESS ((**KG/CM^{2}g)**
	* BODY DESIGN : PRESS ((**KG/CM^{2}g)** | **TEMP (DEG. C)**
	* IBR FORM III-C

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) KG.

FORM NO. PEM-6666-0

	Technical specification for **Control Valves with Accessories** (Pneumatically Operated)	SPECIFICATION NO.
		VOLUME **III**
		SECTION **D**
		REV. NO. / DATE:
		SHEET / OF

Tag No..... **Quantity**..... Data Sheet No. PES-145-06-DS2-1

DATA SHEET C

DATA SHEET – C FOR CONTROL VALVE (WITH PNEUMATIC ACTUATOR)
(TO BE FILLED BY THE BIDDER AFTER THE AWARD OF CONTRACT)

POSITIONER	MFR. & MODEL NUMBER	
	BYPASS / GAUGES / ENCL. CLASS	
	INPUT SIGNAL (Kg / Cm^2)	
	OUTPUT SIGNAL (Kg / Cm^2)	
AIR FILTER REGULATOR	MFR. & MODEL NUMBER	
	AIR SUPPLY PRESS (Kg / Cm^2 g)	
	OUTPUT PRESS (Kg / Cm^2 g)	
	OUTPUT GAUGE	
	FILTER SIZE	
AIR LOCK	MFR. & MODEL NUMBER	
	SET PRESS (Kg / Cm^2)	
	SUPPLY PRESS (Kg / Cm^2)	
	RESET TYPE	
	VENT PLUG	
LIMIT SWITCH	MFR. & MODEL NUMBER	
	OPEN posn / INT posn / CLOSE posn	
	CONTACT TYPE	
	RATING (AC / DC)	
	ENCLOSURE CLASS	
POSITION TRANSMITTER	MFR. & MODEL NUMBER	PART OF POSITIONER.
	TYPE	
	SUPPLY	
	OUTPUT RATING	
	ACCURACY	
	ENCLOSURE CLASS	
SOLENOID VALVE	MFR. & MODEL NUMBER	
	RATING	
	OPERATION / QUANTITY	
	COIL INSULATION CLASS	
	ENCLOSURE CLASS	
HANDWHEEL	ORIENTATION	
JUNCTION BOX	NO. OF WAYS	
	SIZE	
	CABLE GLANDS (Size / Quantity)	
	ENCLOSURE CLASS	
I/P CONVERTER	INPUT SIGNAL / POWER SUPPLY	PART OF POSITIONER.
	SPLIT RANGE	
	ENCLOSURE CLASS	
	LINEARITY	
	HYSTERISIS	
Cu. Tubing & Fittings / per CV	25 Meters of ¼ " PVC coated Cu. Tubing, with 1 set of Fittings for connection to IA Header on one end and accessories on another end of CV	

COMPANY SEAL
NAME
SIGNATURE
DATE

FORM No. PEM - 6019 A-0

	TITLE	SPEC. NO.: PE-TS-391-142-N101
	DATA SHEET - C **STEAM DESUPERHEATER**	VOLUME III PART -A SHEET 1 OF 2

INSTRUCTIONS TO BIDDER
1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B.
2. Items which deviate from specification shall be marked with an asterisk (*)
3. This data sheet shall be submitted alongwith bid.

SL.NO.	ITEM	UNIT	PARTICULARS
1.0	TYPE OF DESUPERHEATER	-	
2.0	MODEL NO.	-	
3.0	NUMBER OFFERED	NOS.	
4.0	FLOW CAPACITY (OUTLET OF DESUPERHEATER)	T/HR	
5.0	STEAM PARAMETERS AT INLET		
5.1	PRESSURE	KG/CM^2A	
5.2	TEMPERATURE	^0C	
5.3	FLOW	T/HR	
6.0	STEAM PARAMETERS AT OUTLET		
6.1	PRESSURE	KG/CM^2A	
6.2	TEMPERATURE	^0C	
7.0	SPRAY WATER PARAMETERS		
7.1	PRESSURE	KG/CM^2A	
7.2	QUANTITY	T/HR	
8.0	DESIGN PARAMETERS OF DESUPERHEATER BODY		
8.1	PRESSURE	KG/CM^2G	
8.2	TEMPERATURE	^0C	
9.0	DESIGN PRESSURE OF SPRAY NOZZLE	KG/CM^2G	
10.0	TYPE OF SPRAY NOZZLE		
10.1	FIXED / VARIABLE AREA ORIFICE		
10.2	SINGLE HOLE / MULTI HOLE		

INSTRUCTIONS FOR BHEL
1. In the column "SPECIFICATION NO." the specification number for the project shall be entered by DE before issue for an enquiry. The standard specification number shall not be entered.

Name of Bidder / Vendor				Project	
Revision Number	0	1	2	3	
Signature of Bidder / Vendor / Authorised Representative					
Date					BIDDER'S SEAL

FORM No. PEM - 6019 A-0

	TITLE	SPECIFICATION NO. PE-TS-391-142-N101
BHEL	**DATA SHEET - C** **STEAM DESUPERHEATER**	VOLUME III PART -A SHEET 2 OF 2

INSTRUCTIONS TO BIDDER
1. This data sheet shall be read in conjunction with specification No. PES - 148 - 01 Section - D, Volume - II B.
2. Items which deviate from specification shall be marked with an asterisk (*)
3. This data sheet shall be submitted alongwith bid.

SL.NO.	ITEM	UNIT	PARTICULARS
11.0	NUMBER OF SPRAY NOZZLE / TURNDOWN RATIO		
12.0	SPRAY WATER NOZZLE CHARACTERISTICS		
13.0	SIZE OF ORIFICE	MM	
14.0	MIN. VELOCITY ACCEPTABLE IN THE DESUPERHEATER PIPE	M/SEC	
15.0	END CONNECTIONS TYPE & SIZE		
15.1	DESUPERHEATER INLET / OUTLET		
15.2	SPRAY WATER INLET		
16.0	MATERIAL OF CONSTRUCTION		
16.1	BODY		
16.2	SPRAY NOZZLE		
17.0	OVERALL DIMENSIONS	MM	
18.0	WEIGHT OF DESUPERHEATER	KG	
19.0	MOUNTING RECOMMENDATIONS (IF ANY)		
20.0	DESIGN CODE		
21.0	HYDRAULIC TEST PRESSURE	$KG/CM^2 G$	

INSTRUCTIONS FOR BHEL
1. In the column "SPECIFICATION NO." the specification number for the project shall be entered by DE before issue for an enquiry. The standard specification number shall not be entered.

Name of Bidder / Vendor				Project	
Revision Number	0	1	2	3	
Signature of Bidder / Vendor / Authorised Representative					
Date					BIDDER'S SEAL

FORM No. PEM - 6020-2

CHECKLIST — LIST OF SCHEDULES

Sl. No.	Form No.	Description	Tick Applicable Forms
1.	PEM-6024	Schedule of Drawings / Catalogues submitted with Bid	✓
2.	PEM-6025@	Schedule of Occurance of Key Events of Delivery,Erection& Commissioning	
3.	PEM-6026	Schedule of Equipment Manufacture, Despatch and Shipment to Site.	✓
4.	PEM-6027	Schedule of Weights & Dimensions	✓
5.	PEM-6028@	Schedule of Performance Guarantee	
6.	PEM-6030	Inspection Schedule	✓
7.	PEM-6031	Schedule of Cement and Steel and Quarterly Cement Requirement	
8.	PEM-6032	Schedule of Quarterly Requirement of Reinforcing Bars and Structural Steel	
9.	PEM-6033@	Bill of Quantities (Civil Works)	
10.	PEM-6035	Schedule of Bidder's Proposed Construction / Site Fabrication Facilities.	
11.	PEM-6036	Schedule of Deviations	✓
12.	PEM-6040	Schedule of Declaration	✓
13.	PEM-6041	Quality Plan	✓
14.	PEM-6042	Vendor's Drawings / Documents Schedule	✓
15.	PEM-6043@	Schedule of Occurance of Key Events for Civil / Structural Works	
16.	PEM-6046	Inspection Request	✓
17.	PEM-6051	Schedule of Prices	✓
18.	PEM-6052@	Schedule of Unit Prices	✓
19.	PEM-6053	Schedule of Prices for Commissioning & Mandatory Spares	✓
20.	PEM-6054	Schedule of Prices for Recommended Spares	✓
21.	PEM-6055	Schedule Prices for Erection and Maintenance Tools & Tackles	✓
22.	PEM-6056	Schedule of Bidder's Man-power for Supervision of E & C and their Charges.	✓
23.	PEM-6057	Schedule of Daily & Overtime Rates	
24.	PEM-6058	Schedule of Hire-charges for Construction / Site Fabrication Facilities	
For Forms marked with @ certain information to be filled by DEs - before issuing to bidder.			

FORM No. PEM - 6024-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	SCHEDULE OF DRAWINGS / CATALOGUES SUBMITTED WITH BID	VOLUME III PART - A
		SHEET ..... OF .....

Section C/D enclosed with the specification indicate the drawings / catalogues to be furnished with the bid. The bidder in addition to furnishing the same, can also include any other drawings / catalogues which he may desire to submit with the bid. This schedule duly lists out such drawings as enclosed by the bidder with the bid.

DRAWING./ CATALOGUE NUMBER	DESCRIPTION	NUMBER OF SHEETS

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

FORM No. PEM - 6026-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	SCHEDULE OF EQUIPMENT, MANUFACTURE, DESPATCH AND SHIPMENT TO SITE	VOLUME III PART - A
		SHEET ..... OF .....

Equipment / Major Bought-out Items	Time for Manufacture/ Procurement from Date of Issue of Letter of Intent (Weeks)	Time for Test, Dismantling Packing & Ready for Despatch (Weeks)	Time required for Shipment to Site (Weeks)	Total Time from Date of Issue of Letter of Intent to Shipment to Site (Weeks)

We, the undersigned hereby undertake to meet the above time schedule in weeks for manufacture, despatch and shipment of each equipment and procurement of major boughtout items as listed above.

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

FORM No. PEM - 6027-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	SCHEDULE OF WEIGHTS & DIMENSIONS	VOLUME III PART - A
		SHEET ..... OF .....

The bidder shall state below the weights and dimensions of various packages for shipment covering the complete scope.

Description of Package(s)	Dimensions (in meters)	Weight (in tonnes)

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

FORM No. PEM - 6030-0

INSPECTION SCHEDULE

SPECIFICATION NUMBER	PE-TS-391-142-N101
P.O. NUMBER	
VOLUME - III PART-A	SHEET OF

S. No.	ITEM / COMPONENT	PLACE & ADDRESS OF TEST / INSPECTION	Scheduled Date of Inspection	Duration of Test / Inspection (in days)

This schedule shall be in line with specification and quality plan requirements. The information in this form shall be furnished after receipt of LOI / PO.

PARTICULARS OF VENDOR' s / AUTHORISED REPRESENTATIVE			
NAME	SIGNATURE	DATE	**COMPANY SEAL**

FORM No. PEM - 6036-0

	TITLE	SPECIFICATION NUMBER
	*** SCHEDULE OF DEVIATIONS** ( ) From Conditions of Contract (Volume - I) ( ) From General Technical Conditions (Volume - II A) ( ) From Technical Specifications (Volume - II B)	PE-TS-391-142-N101 VOLUME III PART - A SHEET ..... OF .....

* Each type of deviation shall be listed on a seperate sheet. Tick the applicable ☑

We the undersigned hereby certify that the above mentioned are the only deviations.

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

FORM No. PEM - 6040-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
BHEL	* SCHEDULE OF DECLARATION	VOLUME III PART - A
		SHEET ..... OF .....

DECLARATION

I,.....certify tha t all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our formal proposal number Dated..... and there is no deviation to the specification.

I hereby certify that I am duly authorised representative of the Bidder's company whose name appears above my signature.

Biders Company Name .....

Authorised representative's Signature .....

Name .....

Bidder's Intent

The bidder hereby agrees to fully comply with the requirements and intent of this specifications for the price indicated.

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

* Bidder shall include this schedule both in technical and Price offers.

INSTRUCTIONS FOR FILLING QUALITY PLAN

(Form No. PEM-6042-0)

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/ component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

Column 1- Serial Number

Column 2- Component/Operation- The component and/or operation being checked shall be given here.

Column 3- Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc..

Column 4- Category - 'CR' stands for critical characteristic - affecting safety of equipment and personnel

'MA' stands for major Characteristic - affecting safety of equipment and personnel

'MI' stands for minor characteristic - affecting appearance etc.

Column 5- Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc.

Column 6- Extent of check, such as, 100, 10, 1 per heat etc.

Column 7- Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done.

Column 8- Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided.

Column 9- Format of Record - Formats, log shets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here.

Column 10- Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/ operation shall be written in sub-column 'V'

The agencies are codified as 1,2 & 3

'1' stands for (BHEL)

'1' * means the operation shall be cleared by BHEL before the start of the next operation.

'2' Stands for Vendor

'3' stands for sub-Vendor of the Vendor and so on.

Example :

Entry '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC

Entry '2' in column 'W' means test./inspection to be witnessed by Vendor's QC

Entry '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL

Column II- Remarks - Any special remarks shall be given here.

NOTES :

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn bgy BHEL and all tests as per relevent specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be compiled with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the approproate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in septuplicate (7 Copies).

FORM NO PEM 6046-1

INSPECTION REQUEST

(From Vendor to BHEL Inspection Agency)

1 PROJECT TITLE:

2 NAME OF VENDOR:

3 BHEL'S LOI / PO NO: **DATE :**

4 SYSTEM / ITEM DESCRIPTION

5 ITEMS BEING OFFERED FOR INSPECTION WITH SL. NO. AS PER LOI / PO / BILLING SCHEDULE

6 DESCRIPTION AND SL. NO. OF INSPECTION AS PER QUALITY PLAN

7 QUANTITY OFFERED FOR INSPECTION

8 PLACE OF INSPECTION (FULL ADDRESS AND NAME OF SUB-VENDOR, IF ANY)

PLACE …….

ADDRESS ……..

……

……..

9 CONTACT PERSON (FOR SL. NO. 8 ABOVE).

NAME ……. DESIGNATION ……..

TELEPHONE ……. FAX …… TELEGRAM ……..
TELEX ……..

10 THE FOOLOWING DOCUMENTS ARE APPROVED BY BHEL AND AVAILABLE AT PLACT OF INSPECTION

(A) QUALITY PLAN (B) DRAWINGS (C) DATA SHEETS, CHARACTERISTIC CURVES ETC. (D) PLANT STANDARDS

11 REQUIRED DATE OF INSPECTION …… LIKELY DURATION (No of Working days)……..

WEEKLY OFF DAY ……. WORKING HOURS ……..

(At least 15 days prior notice shall be given by the Vendor to Inspection Agency)

We here by certify that the above items are complete in all respects and have been fully inspected/tested by us and are found to be as per te chnical s pecification/approved drawings /data s heets/characteristic curves a nd are a cceptable to our QC departm ent. The detailed inspection and test reports of our QC department are enclosed.

VENDOR'S PARTICULARS					
NAME	DESIGNATION	SIGNATURE	PLACE	DATE	COMPANY SEAL

	TITLE **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 17.07.2014 SHEET 1 OF 1

VOLUME-III
PART-B

PRICE SCHEDULES

BHEL	TITLE **SCHEDULE OF PRICES** **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	SPEC. NO.: PE-TS-391-142-N101 VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 17.07.2014 SHEET 1 OF 1

S.No.	Description of Works or Equipment/System	Price (in Lakhs of Rs.)
1.0	Total price for design, manufacture, assembly, inspection, testing, packing and dispatch to site of auxiliary steam pressure reducing and desuperheating stations complete with desuperheaters, controls valves and all accessories including commissioning spares and special tools & tackles as specified and necessary as per technical specification PE-TS-391-142-N101	
2.0	Recommended spares, item-wise break up with item-wise price to be given as per "Schedule of Recommended Spares" enclosed under Vol. III of technical specification- price not to be included in clause 1.0 above, Bidder to indicate the break up.	
3.0	Optional price of supervision of erection and commissioning of equipments – prices not to be included in clause 1.0 above.	
	Indicate all duties, taxes etc. Stating whether included/excluded in above price.	

-Bidder shall furnish this price schedule in his price offer only.

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PARTICULARS OF VENDOR's/AUTHORISED REPRESENTATIVE

NAME	SIGNATURE	DATE	COMPANY SEAL

TITLE	SPEC. NO.: PE-TS-391-142-N101
SCHEDULE OF UNIT PRICES **AUXILIARY STEAM PRESSURE REDUCING & DESUPERHEATING STATION**	VOLUME **III** SECTION **PART-B** REV NO. **0** DATE 17.07.2014 SHEET OF

S.No.	Item Description	Unit Price (in Lakhs of Rs.)
1.0	Design, manufacture, inspection & testing, packing and delivery for site for following as specified in Technical specification PE-TS-391-142-N101:	
1.1	Unit Price of Control valves (2X660 MW, OPGCL, JHARSUGUDA, ODISHA) a) Combined Type Aux. Steam High Capacity Pr. Reducing Valve (ASV-22) b) Low Capacity Pressure Reducing Valve (from CRH line) (ASV-26) c) HC PRDS Control Spray Valve (CDV-151) d) DESH-2 Control Spray Valve, (CDV-157) e) Low Temperature desuperheater (DESH-2) f) TGS Desuperheater (DESH-3) g) Spray control valve to DESH-3, (CDV-93)	
1.2		
Note a) b)		

FORM No. PEM - 6053-0

	TITLE	SPECIFICATION NUMBER
BHEL	*** SCHEDULE OF PRICES FOR COMMISSIONING ~~AND MANDATORY~~ SPARES**	PE-TS-391-142-N101
		VOLUME III
		SHEET ..... OF .....

The bidder shall incidate here the quantity required for erection / commissioning and mandatory spares for equipment as listed in Section-C / Section - D. If the listed spares are not adequate, then the bidder shall indicate those and additional spares considered necessary by him.

Type	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity Required	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)
Erection and Commissioning									
Mandatory Spares									
Additional Spares Mandatory Erection / Commissioning									

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

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.

FORM No. PEM - 6054-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	*** SCHEDULE OF PRICES FOR RECOMMENDED SPARES**	VOLUME III
		SHEET ..... OF .....

The bidder shall give below a list of spares recommended for three years (or as otherwise specified in section - C) for trouble free performance of the equipment / system offered.

S. No.	Manufacturer's Drawing No. / Part of spare	Description	Material	Quantity per Unit / Equipment	Quantity reco-mmended	If set, Nos. Per set	Delivery period (Weeks)	Unit Price (Rs.)	Total Price (Rs.)

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

* Unpriced schedule shall also be furnished along with Part-A Schedule in Technical Bid.

FORM No. PEM - 6055-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	SCHEDULE OF PRICE FOR ERECTION AND MAINTENANCE TOOLS & TACKLES	VOLUME III
		SHEET ..... OF .....

The bidder shall be give below the list of erection and maintenance tools and tackles as offered by him. This shall also include the customer's list of maintenance tools, if specified in Section - C / Section - D.

S. No.	Description of Tools & Tackles	Quantity offered	Unit Price (Rs.)	Total Price (Rs.)

NOTE : The hire charges for vendor's equipment called for in this schedule shall include the cost of consumables, operation services, depreciation, wear and tear as well as vendor's over head and profit. (These rates will be payable by customer to the vendor, only if the customer's requires the use of this equipment for carrying out his own work out side the scope of this contract.)

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

FORM No. PEM - 6056-0

	TITLE	SPECIFICATION NUMBER PE-TS-391-142-N101
	SCHEDULE OF BIDDER's MAN POWER FOR SUPERVISION OF E & C AND THEIR CHARGES	VOLUME III
		SHEET ..... OF .....

The bidder shal indicate below, designation-wise, the personnel required for superivsion of erection and commissioning and their charges.

SUPERVISION OF ERECTION

S. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

SUPERVISION OF COMMISSIONING

Sl. No.	Designation	Normal rate per day of 8 hours	Overtime rate per hour

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