GUJARAT STATE ELECTRICITY CORPORATION LIMITED

1 X 800 MW WANAKBORI TPS EXTN UNIT-8

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

VOLUME II-B & III

SPECIFICATION No: PE-TS-408-145-I104

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

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

1.1 **Volume-I (CONDITIONS OF CONTRACT)**

This consists of four parts as below :-

Volume-IA	:	This part contains instructions to bidders for making bids to BHEL.
Volume-IB	:	This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
Volume-IC	:	This part contains special conditions of contract.
Volume-ID	:	This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 **Volume-II TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume-II which comprises of :-

Volume-IIA	:	General Technical Conditions
Volume-IIB	:	Technical Specification including Drawings, if any.

1.2.1 **Volume-IIB**

This volume is sub-divided into following sections :-

Section-A	:	This section outlines the scope of enquiry.
Section-B	:	This section provides "Project Information".
Section-C	:	This section indicates technical requirements specific to the contract, not covered in Section-D.
Section-D	:	This section comprises of technical specifications of equipments complete with data sheet A, B and C.

Data Sheet - A specifies data and other requirements pertaining to the Equipment.

Data Sheet - B Specifies data to be filled by the bidder (Data Sheet-B is contained in Volume-III).

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

1.2.2 **Volume-III TECHNICAL SCHEDULES**

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. PE-SS-999-100-Q-002 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.

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CONTENTS

VOL-II B

SECTION – A

SCOPE OF ENQUIRY

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1. SCOPE

1.1 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the **Control Valves with Pneumatic Actuator along with Accessories, Start-up/Commissioning and Mandatory Spares** as mentioned in different sections of this specification for **1X800 MW WANAKBORI TPS EXTN UNIT-8.**

1.2 The quality plan enclosed forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.

1.3 Bidder to note that Cv test is required to be conducted on one type per size, Cv value. Bidder to group such valves and indicate the same along with the price bid. Unpriced portion to be submitted to engineering.

1.4 Following signed & stamped documents with company seal to be submitted by bidder.

a) Complete offer including calculation sheets, catalogues etc.
b) Quality Plan
c) Datasheet A & B, duly filled
d) Schedule of prices & unit prices, inspection schedule
e) Schedule of submission of drawings/documents, equipment manufacture, inspection & dispatch.

2 GENERAL TECHNICAL INSTRUCTIONS

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

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipment shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

2.3 BHEL' s / Customer' s representatives shall be given access to the shop in which the equipment are being manufactured or tested and all test records shall be made available to them.

2.4 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 / Customer.

SECTION – B

PROJECT INFORMATION

VOLUME : IIA

SECTION-II

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 1x800 MW Supercritical Thermal Power Project would be set up by Gujarat State Electricity Corporation Limited (GSECL) at Kheda district of Gujarat.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

2.00.00 APPROACH TO SITE

The proposed site is located in Kheda district about 13 kilometers from the nearest commercial town of Balasinor & 10 kilometers from Sevalia town. The National Highway, NH-08, connecting Dakor – Godhra is about 10 kilometers from the site. The State Highway SH – 59 connecting Balasinor – Sevalia is about 2 Kilometers from the site. Nearest railway station to the existing site is Sevalia, located about 8 kilometers from the site on Anand – Godhara main broad gauge line of Western Railway.

Nearby Air Ports are Ahmedabad at a distance of about 110 kilometers from the site and Vadodara at a distance of about 85 kilometers from the site.

3.00.00 LAND

The proposed extension unit will be developed in the existing Wanakbori Thermal Power Station and will be located north east side of the existing plot in the Kheda District of Gujarat. The land of the proposed plant will be filled in upto a desired level. Existing Ash Pond/ Dyke area will be utilized for the extension unit.

4.00.00 SOURCE OF COAL

Indian coal would be sourced from captive mines Machha Kata in Talcher, State – Orissa which are situated about 1800 Kms from the project site. GSECL will arrange for transportation of the coal required for the extension unit from these captive mines by the existing railway facilities for delivery of coal supply to the Wanakbori power station.

SECTION-C

SPECIFIC TECHNICAL REQUIREMENT

SPECIFIC TECHNICAL REQUIREMENTS

The requirements in this section are specific for this project and shall over-ride the specification under Section-D in case of any contradiction. However In case of any contradiction between this SPECIFIC TECHNICAL REQUIREMENTS and customer SPECIFICATION attached further, the customer SPECIFICATION shall prevail and BHEL's decision shall be final.

1) Bidder to note that data sheet-B, Format "Schedule of submission of Drawings/ Documents, Equipment Manufacture, Inspection and Despatch" enclosed in Section-D, to be signed and stamped and submitted with the bid. Quality Plan enclosed in Volume-IIB should be furnished duly signed and stamped. NO DEVIATION IS ACCEPTABLE.

2) All the formats in Volume-III should be filled-up and furnished with the bid, complete in all respect. Catalogue, Leaflets related with the models of Control Valves as well as each Accessory must be furnished with the offer. In the absence of those, the bid would be considered incomplete and shall be liable for rejection. Catalogue, Leaflets related with the models of Control Valves as well as each accessary must be furnished with the offer.

3) The Hook-up diagram for Control valve is attached in Section-C. The Bidder's scope starts from isolation valve at Inst. Air Supply header. The suitable connector required for connection of pneumatic tubing to isolation valve at Instrument Air Header is also in bidder's scope.

4) 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.**

5) Type of bonnet shall be according to the service condition. Extension bonnets shall be provided when the maximum temperature of the flowing fluid is greater than 280 Deg C.

6) Valve and actuator shall be designed for full differential pressure (Max. shut-off pressure).

7) Tolerances on end to end, center to center, center to face shall be in accordance with ASME B16.10.

8) Anti-cavitation trims shall be provided for valves with cavitation services and hardened trims for flashing services.

9) Multistage and Multipath Control Valve to be provided for Low Load Feed Control Valve.

10) Valve type like cavitation/flashing/ high DP has been indicated in the data sheet. Bidder to offer the valve accordingly. However if process is cavitating, although not indicated in the valve type, bidder to offer Anti-cavitation trim.

11) Valve Body and trim design shall achieve Noise abatement. However if the required noise level is not achievable due to design constraint, external Low Noise Pack (Cartridge/Silencer) may be used in the downstream side of the valve. Low Noise pack and the expander/reducer between the valve outlet and the low noise pack shall be in Bidder's scope.

12) Control valve accessories shall be fitted on the valve body. Integral pneumatic tubing shall be ¼ "OD SS, and fittings shall be of SS. Applicable accessories shall be terminated at the junction box (mounted on the body).

13) Type of flow action ("under the seat" or "over the seat") will be selected by the bidder. However in cases where downstream side is subjected to vacuum, flow action shall be "flow to close" (over the seat). Specific mention for the same has not been made in the datasheets.

14) Trim material and body material has been specified in the Datasheets-A. Bidder to offer body material & trim material combinations equivalent or better than the material specified in Datasheets-A. Wherever there is deviation from the datasheets, bidder to furnish the documentary proof for confirming superior trim material/ body material selection along with their offer. BHEL/Customer reserves the right to accept/reject any variation to the specification.

15) Trim supplied shall be suitable for quick changing and trim exit velocity shall be limited to avoid cavitation.

16) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.

17) The End Connections Shall Be Socket Welded for Sizes up to 50 NB and Butt Welded For sizes above 50 NB.

18) Stem material for all Control Valves shall be SS 316 STELLITED.

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

20) Bidder to furnish the list of all control valves for which Cv test is to be carried. Cv test shall be carried out for each type of control valve (of same size, Cv, trim characteristics). Cv test reports shall be verified by BHEL/Customer. Type test certificate shall also be acceptable.

Bidder to note that only those type test reports for same type of control valves shall be offered for verification which are not older than 3 years from the date of Part 1 opening (receipt of technical unpriced offer).
In case, Cv type test reports found not acceptable, Bidder to conduct Cv test for the same without any commercial implication.

21) Calculation of Cv, noise level, valve outlet velocity, trim exit velocity, actuator sizing, Data sheet-C in line with Datasheet-A of specification, dimensional drawings / edge preparation details, etc. shall be submitted for BHEL/Customer review and approval, to reach BHEL within 15 days after receipt of PO/LOI.

22) 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 over the seat (as to close the valve)**. Separate indication for the same has not been made in the data sheets-A.

23) Selection of valves and actuators are bidder's responsibility. Any change in selection of type of valve / sizing / percentage opening, calculations, QP, etc., if desired by BHEL / customer during approval of the documents after award of contract, without major changes in process parameters as per tender specification, shall be carried out by bidder without any commercial implication and time delay.

24) Limit switch, position feedback shall be terminated up to JB by 0.5 mm2/PVC/Cu/1.1 KV/FRLS shielded control cables. Solenoid valve shall be terminated by 2.5 mm2 size cable.

25) SS nameplate for 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 pressure at full open and close condition.

26) Open to close and close to open time of pneumatic actuator (modulating type) shall be less than 10 sec. Bidder to include volume booster if required to achieve response time less than 10 sec. For ON/OFF type control valve also, the actuator shall have a response time less than 10 sec.

27) Hand wheel shall have open/close direction.

28) Air filter regulator shall be designed for an inlet pressure of 5-8 kg/cm2.

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

30) Expander/reducer b/w the main pipe and the valve inlet and outlet shall be in BHEL's scope of supply. However, any expander/reducer coming b/w the valve and low noise pack (as applicable) shall be in bidder's scope of supply.

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

32) Inspection shall be carried out in line with approved drawing/data sheet/QP & specific technical requirements.

33) Third party inspection: Customer shall witness the inspection for control valves at the manufacturer's works/ FCRI, PALAKKAD as per the enclosed QAP. Bidder to inform 15 days before the date of inspection.

34) 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.

35) The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 85% of total stem travel & minimum flow condition not less than 10% of total stem travel. All the valves shall be capable of handling at least 120% of required maximum flow. The stem travel range from minimum flow condition to maximum flow shall not be less than 50% of the total stem travel

36) **SPARES:** The following spares are required to be offered

(A) Mandatory Spares:

The items listed in list of mandatory spares attached at section-D, of this specification, are the essential spares required to be offered by the bidder, and the price (Lump sum as well as individual) for each item to be quoted separately under the separate heading. The format for price schedule to be filled-up by the bidder is enclosed in Volume-III. The prices for Mandatory spares indicated by the bidder shall be used for bid evaluation purpose.

Each case/container containing Mandatory spares shall be clearly marked or labelled on the outside with the description of the spares contained in it. When more than one item of spare parts is(are) packed in a single case/carton, a general description of the contents shall be shown outside such case/container, and detailed list enclosed. All Cases, Containers and Packages must be suitably marked and numbered for the purpose of identification.

(B) Recommended Spares:

In addition to the Mandatory spares mentioned, the bidder shall also furnish a List of Recommended spares for 3 years of normal operation of Control valves / Accessories. BHEL/Customer reserves the right to buy any or all of the recommended spares.

(C) Start-up & Commissioning Spares:

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

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 is enclosed in section-D of this specification.

37) 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.

38) Specification of Electrical Actuator given in section-D shall not be considered.

39) In case of multistage valves, pressure drop across each stage shall ensure that the valve does not cavitate in any of the stages.

40) Bidder to use epoxy based corrosion resistant paints for painting the valves. Paint of all accessories must comply with this requirement. Bidder to follow the painting procedure as per the specification of painting attached.

41) Bidder to furnish a certificate certifying that design of control valve body, bonnet, fittings shall be as per ASTM Standards & tests on Control Valve body shall be as per ANSI B 16.34.

42) **Bidder to provide diagnostic software (for all tags) to be installed on HMS PC for communicating with the smart positioner and accessing the diagnostic features of the smart positioner. Bidder to offer latest version of calibration and diagnostic software which should be compatible** with latest operating system at the time of commissioning of valve/positioner without any additional cost to BHEL.

43) **SMART POSITIONER**

i) The smart positioner shall accept 4-20 mA signal from the control system as input and provide a compatible signal for driving the pneumatic actuator.

ii) In addition to the electrical-to-pneumatic signal conversion and positioning functions, it shall also perform detailed diagnostics &

make available the actuator/control valve faults via hart interface. The hart signal for the detailed faults shall be superimposed on the 4-20 mA control signal itself. The faults to be covered shall include valve jamming, air supply failure, leakage etc.

iii) It shall have facility of characterisation of the valve (i.e. equal percentage, quick opening, linear, etc.) in the positioners itself.

iv) The positioner shall have the facility of detection of control signal failure and making the valve either stayput/open/close as per process requirement upon this condition.

v) The smart positioner shall have the fail-freeze feature.

44) **Documentation:**

(A) Along with the bids: following documents for respective projects separately

a) **Signed and stamped compliance certificates in attached format (VOL.-III).**

b) **Schedule of prices in attached format (VOL.-III).**

c) **Schedule of submission of Drg./Doc, Equip. Manufacture, Inspection and Dispatch.**

d) **Inspection schedule**

e) **Quality Plan duly signed & stamped.**

(B) After the award of contract:

The documentation as listed below for the project

9 sets of the following documents + 5 sets of CDs to be enclosed with the bids for Approval:

a. Assembly (dimensional) drawings.

b. Valve Edge preparation details.

c. Data sheet-C completely filled-up..

d. Hook-up diagram of Control Valve with Actuator & Accessories.

e. Valve & Actuator assembly dimensional drawings with weights.

f. Quality Plan duly signed and stamped.

g. All calculations like CV, Noise Level, Valve Outlet Velocity, Actuator sizing etc.

h. All relevant catalogues for the models of the valves as well as accessories finalized.

i. Bar chart to indicate the time schedule for procurement, manufacture, testing and dispatch.

(C) Final documentation:

Copies of documents / drawings to be furnished by the successful bidder shall be as follows:

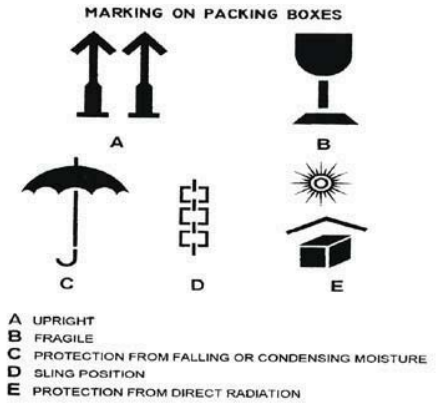
a. Category I & IV approved final drawings/datasheets–16 sets with 6 CD–ROMS.
b. Valve sizing calculations, noise level calculations and outlet velocity calculations – 16 sets with 6 CD – ROMS
c. Test certificates – 10 sets with 4 CD-ROMS
d. "As built" drawings – 10 sets with 4 CD-ROMS
e. Operation & maintenance manuals for Control Valve, Actuator and all accessories - 18 sets with 4 CD-ROMS

Note: Packing instructions:-

1) After inspection of control valves assembly. Smart Positioner along with Pressure Gauge shall be disassembled & packed separately.
2) Packing of the control valves and Smart Positioner along with Pressure Gauge shall be done in separate wooden boxes/cases in order to avoid damage during transit and also during storage at site in tropical climatic conditions for a period of 18-24 months.
3) Packing boxes shall have clear marking "to be stored indoor, away from water & dust".

Guidelines for Packing

- ✓ After inspection of control valves assembly. Smart Positioner along with Pressure Gauge shall be disassembled & packed separately.
- ✓ Threaded connection of Smart Positioner & Pressure Gauge shall be shipped with the end caps fitted to avoid any damage.
- ✓ Instructions with sketch for mounting the Smart Positioner & Pressure Gauge shall be sent along with the aforesaid accessories.
- ✓ Packing of the control valves and Smart Positioner along with Pressure Gauge shall be done in separate wooden boxes/cases in order to avoid damage during transit and also during storage at site in tropical climatic conditions for a period of 18-24 months.
- ✓ All valves & smart positioner along with pressure gauges shall be packed properly with quality wooden planks with proper wooden frame support. Moreover the valves are internally covered with polythene sheets to protect from the water and moisture entry.
- ✓ Stronger shock absorbing cover material like expanded Polyurethane which can take any direct impact on it shall be used for packing
- ✓ Proper reaper support to be provided in the packing and Valve assembly to be aligned properly to avoid the damage of accessories during transit due to vibration effect.
- ✓ Marking for Fragile & Condensing environment shall be done on the packing box.



The Following Details are to be marked on the Packing Cases

- ✓ Address of consignee
- ✓ Purchase order no.
- ✓ Description of items or title of packing list
- ✓ Weight
- ✓ Dimension of the Box
- ✓ Marking showing upright position
- ✓ Marking showing sling position
- ✓ Marking showing umbrella (i.e. for machines/components to be stored under covered storage)

Synchroscope shall be designed to provide an illuminate and indication of phase and frequency difference between bus voltage and Generator voltage. It shall denote the actual frequency difference corresponding to the inverse of time taken for one rotation of the illuminated vector spot. The instrument shall be designed for industrial applications, which require precise, reliable and robust instruments for the display range and indication. Synchroscope shall be designed as per the DIN / IEC / BS standards.

4.00.00 **CONTROL VALVES, ACTUATORS & ACCESSORIES**

General Technical Guidelines for the Control Valves shall be as follows :

a) Bidder shall exercise caution in selecting severe service control valves like BFP recirculation valves, HP & LP bypass valves, superheater & reheater attemperator valves, PRDS valves for Boiler & Turbine, Soot blower steam pressure control valve, control valves whose down stream are connected to vacuum such as HP/LP heater emergency level control, condenser make up water control valve, separator level control and CEP minimum flow control valve. For such critical applications, Bidder shall offer valves which are proven for similar application. Above valves shall have leakage class equal or better than class-V with metal-to-metal seating.

b) Wherever, steam conditioning calls for Pressure reducing & desuperheating, combined PRDS type valves shall be offered.

c) Bidder shall provide redundant control valves for Main condensate flow control, Superheat attemperation control and Reheat attemperation control as a minimum for high availability. For other application, if the availability criteria for the plant cannot be met even with the best established product, redundant control valves shall be provided.

d) Control valves shall be located near floor or platform for ease of access and with adequate clearances for maintenance and lay-down and shall be placed as station with upstream motorized isolating valve, down-stream isolating valve, inching duty motorized bypass valve and manual drain valves. Each redundant control valve shall have its upstream motorized and down-stream manual isolating valves. Where quick shut off requirement is foreseen such as in case of SH & RH attemperation valves, upstream isolation valve shall be pneumatic type.

4.01.00 General

4.01.01 Control valves for regulating service shall normally be globe body, preferably cage guided, metal-to-metal seated, pneumatically operated and shall be provided with characterized plugs having ANSI leakage class-IV except for the control valves indicated above.

4.01.02 Where the operating time is critical for the operation of the plant, as in case of HP or LP bypass valves, hydraulic actuators with electro-hydraulic interface shall be offered.

4.01.03 Bonnet joints for all control valves shall be of flanged and bolted type.

4.01.04 Flanged valve shall be rated at no less than class 300 lbs.

4.01.05 Valve Body / End Connections

4.01.06 Valve end to end dimension and connection shall be according to ANSI standard, straight through pattern. However, Bidder may offer angle body valve for high pressure drop applications. For high pressure drop applications, construction of the valve shall be such that the gland is not exposed to inlet pressure.

4.01.07 Control valves of 40 mm. size and above with line pressure up to 50 Kg / Sq. cm may have flanged or welded end connections.

4.01.08 Control valves, used in high pressure services shall have butt welded end connections for size 65mm and above and socket weld end connection for size 50 mm or below.

4.01.09 Control valve body shall be selected as per the ISA guideline. Generally control valve body shall be cast and machined for pressure rating up to 1500 lbs. Above 1500 lbs, valve body shall be of forged steel. For Demineralized Water application, valve body shall be Stainless Steel.

4.01.10 The direction of flow shall be clearly engraved on the body .

4.02.00 Valve Body Material (material shall match the process condition for super critical boiler)

SR. NO.	SERVICE		MATERIAL
1.	Non corrosive, non-flashing and non cavitating service for fluid temperature up to 275ºC	:	Cast carbon steel ASTM A216 Gr. WCB
2.	Non corrosive, non-flashing and non cavitating service for fluid temperature above 275ºC	:	Cast alloy steel ASTM A217 Gr. WC9
3.	Severe flashing / cavitating services	:	Cast alloy steel ASTM A217 Gr. WC9
4.	Low flashing / cavitating services	:	Cast alloy steel ASTM A217 Gr. WC6
5.	DM water application (condenser hotwell normal, emergency make up etc.)	:	Cast type 316 stainless steel ASTM A351 Gr. CF8M

4.03.00 Valve Size

The control valve sizing (Cv / Kv) shall be based on following guidelines :

a) The valves shall pass normal flow (MCR condition) with 60 to 70 percent opening for linear characterised valves and between 70 to 80 percent opening for equal percentage characterised valves.

b) The valves shall have adequate rangeability to pass the minimum and maximum flows at 10% and 85% of the valve opening respectively. Valve stem travel range from minimum to maximum flow condition shall not be less than 50% of the total valve stem travel.

c) Valve Cv shall be selected in such a way that the valve shall be capable of handling at least 120% of required maximum flow.

d) The valve selection shall be based on the highest size dictated by the above considerations unless noise, flashing or other factors dictate the final selection.

e) Trim outlet velocity for the control valves shall be no more than 7 m/sec for water service and Mach number less than 1/3 for steam and air service application.

f) The sizing procedure followed shall be as per latest edition of ANSI/ISA or equivalent standard.

4.04.00 Valve Top work

4.04.01 Top work shall be sized so that the valve shall operate properly when upstream pressure is 10 percent above maximum inlet pressure and downstream pressure is atmospheric.

4.04.02 Extended bonnet/Finned bonnet and high temperature packing shall be used for high temperature application.

4.04.03 The gland material shall be chosen to suit the operating temperature. PTFE may be chosen for lower temperature application (232ºC maximum) and for high temperature application graphited asbestos glands are to be provided. For vacuum services, the glands shall be of dry seal type.

4.05.00 Valve Trim

4.05.01 Valve trim for applications up to leakage class-V shall be stainless steel 316 SS for pressure drop up to 7 Kg/ Sq. cm. For pressure drops above 7 Kg/Sq. cm hard trim (stelliting or equivalent) shall be used. Other alloys or treatment such as nitride shall be used if severe erosion is expected.

4.05.02 Balanced trim valves shall be offered for high shut-off pressure or high pressure drop condition to reduce the size of the actuators.

4.05.03 For flashing services and two stage mixtures, the trim material shall be 17-4 PH SS or equivalent.

4.05.04 If cavitating condition is foreseen, Bidder shall offer multistage or labyrinth trims valves. Trim of severe service valves shall be of multistage and multipath design with number of discrete pressure drop stages to eliminate the chances of erosion, cavitation, noise and vibration throughout the control range of the valve.

4.05.05 Quick replacement type trim shall be considered for easy maintenance.

4.05.06 Trim Material

SR. NO.	SERVICE		MATERIAL
1.	Non corrosive, non-flashing and non cavitating service for fluid temperature up to 275ºC.	:	SS 316 stellited
2.	Non corrosive, non-flashing and non cavitating service for fluid temperature above 275ºC.	:	SS 316 stellited

SR. NO.	SERVICE		MATERIAL
3.	Severe flashing /cavitating services	:	440 C
4.	Low flashing /cavitating services	:	17-4 PH SS
5.	DM water application (condenser hotwell normal, emergency make up etc.)	:	17-4 PH SS

4.06.00 Noise Level

The equivalent sound level measured at 1.5M above nearest floor level in elevation and 1 M horizontally from the control valve expressed in decibels to a reference of 0.0002 microbar shall not exceed 85 dBA. If the calculated noise is more than the above limit, even with low noise trim design, diffusers shall be included. Diffusers shall be made of stainless steel and shall be integrally connected to the control valve with spool piece. The spool piece shall be in conformity with the main line piping specification.

4.07.00 Valve Actuators

Spring-diaphragm type actuators shall generally be used. Piston type actuators shall be offered in case of high shut-off pressure & quick response requirement.

4.07.01 The actuator shall be designed for 150% thrust required for the valve (at shut-off pressure) at an air line supply pressure of 5.5 Kg/Sq. cm.

4.07.02 Diaphragms shall be designed for 200% maximum operating pressure.

4.07.03 Nylon reinforced neoprene is preferred as diaphragm material.

4.07.04 Valve actuators shall be capable of operating at 80O C ambient, continuously.

4.07.05 Entire actuator assembly shall be painted with corrosion inhibiting paint.

4.07.06 Air connection size shall be 1/4" NPT (F) unless otherwise dictated by process response time. Integral tubing shall be stainless steel.

4.07.07 Bidder shall indicate the stroking time of the valve assemblies with positioner and ensure that the stroke time shall meet the process and equipment dynamics and shall be better than 20 seconds.

4.07.08 All actuators shall be of fail safe design signifying that the spring direction will tend to move the valve (open or close) in a direction safe for the process. “Failure to Open” or “Failure to Close” shall be marked on the actuator.

4.08.00 Valve Positioners

4.08.01 Regulating duty valves shall be offered with Electro Pneumatic Positioners to ensure accuracy and repeatability of response.

4.08.02 Positioners shall have integral non contact (LVDT) type position transmitter, input and output gauges, local keypad & display.

4.08.03 Positioners shall be capable of functioning under hot, humid and vibrating conditions.

4.08.04 Positioner casings shall be dust tight, corrosion resistant and weatherproof.

4.08.05 In general, positioner shall operate at signal range 4 - 20 mA DC for the full travel of the valve.

4.09.00 Valve Accessories

Accessories shall include side mounted hand wheels, limit switches, junction boxes, airlock relays etc.. Solenoid valve wherever required shall be furnished.

5.00.00 **CONTROL DESK / PANEL / RACK**

5.01.00 Convenient and logical approach to operational interfaces and aesthetics in the overall view of the panel /desk shall be considered.

5.02.00 For items susceptible to vibration, suitable anti-vibration padding shall be provided to prevent damage or malfunction.

5.03.00 All items inside the panels/cabinets shall be neatly arranged with easy access/ maintenance approach.

5.04.00 Incoming power supply feeders shall be duplicated. Alarm shall be provided for failure of a power supply feed.

5.05.00 Desk / panel shall be provided with interior illumination, utility receptacles with plug and cooling fan.

5.06.00 Panel / Desk shall have gland plate at cable entry to panel. Thickness of gland plate shall not be less than 3 mm.

5.07.00 Wire shall be routed / laid through covered trough.

5.08.00 Crating of the panels and desks shall be suitable for protection against shock, vibration, inappropriate handling and inclement weather conditions during transportation and warehousing. Mounted equipment shall have adequate protection against damage during handling, transit and storage. Suitable desiccant shall be used inside the packing case.

5.09.00 Nameplate

a) Nameplate shall be provided for instrument or device mounted on the panel.

b) Nameplates for panels shall be provided both in front and rear.

5.10.00 Control Desks

5.10.01 Devices mounted on the desks shall be flush type. Devices shall be so mounted that their removal and replacement can be accomplished without interruption of services to others.

5.10.02 Desk shall be ergonomically designed to suit working on a 24 X 7 basis. Aesthetics, ergonomics and illumination shall be considered while positioning of the desk, large video screen and panels in control room.

5.10.03 Control desk shall be free standing floor mounting type of table-top design with compartments for locating the hardware. Desk shall be constructed from aluminum extrusion with high pressure laminate MDF board for work surface of approved colour. Aluminium structure shall be anodized or powder coated paint finish.

5.10.04 Monitors with retractable keyboard, emergency push buttons shall be provided on the desk. Desk shall be arranged in arc-like shape without any sharp edges. Edges shall be extruded PVC or rounded post-formed laminate..

5.10.05 Desks shall be of modular, scalable and industrially ruggedized design and shall have Telephones and Intercom connections.

5.10.06 Desks shall have concealed cable trays for wire dressing.

18.	Nameplate	:	Tag number, service engraved in stainless steel tag plate
19.	Accessories	:	Mounting accessories, 3/4"ETcable gland.

1.25.00 Rotameter

01.	Type	:	On-line up to 2". By-pass above 2"
02.	Metering tube	:	Borosilicate glass
03.	Float	:	AISI 316-SS unless the process fluid demands some other material.
04.	Body MOC	:	AISI 316-SS
05.	Scale	:	Graduated- Engraved black on white background.
06.	Process connection	:	Flanged
07.	Accuracy	:	± 2% of full scale detection or better for on-line type and ±4% of full-scale detection or better for by-pass type.
08.	Nameplate	:	Tag number, service engraved in stainless steel tag plate
09.	Accessories	:	Slip-on orifice plate of 316-SS and taps of Stainless Steel as per application requirements. Applicable SS Isolation valves and SS Range Orifice - for bypass type rotameters.

1.26.00 I/P Converter

01.	Type	:	Electro-pneumatic (Outdoor Type)
02.	Input level	:	4-20 mA DC
03.	Output range	:	0.2 to 1.0 Kg/Sq. cm With 'Fail Freeze' feature. (i.e in case of wire snapping the last good value of pneumatic signal out put will hold for at least six hours)
04.	Split range	:	For typical application wherever required.
05.	Control Action	:	Selectable air to close, air to open and fail freeze application
06.	Supply pressure	:	1.2 to 1.6 Kg/cm^2 (1.4 typical)
07.	Max. supply pressure	:	7 Kg/ sq.cm.
08	Response Time	:	5 Seconds for 0 to 90% output pressure
09.	Housing	:	IP 55
10.	Repeatability	:	±0.1% of span
11.	Accuracy	:	± 0.25% of span
12.	Supply pressure effect	:	Less than 1%
13.	Span and Zero adjustments	:	Screw
14.	Pneumatic connection	:	¼" NPT

15.	Stability	:	Less than 0.25% of Span / Zero for six months.
16.	Cable connection	:	¾" ET
17.	Mounting	:	Field (pipe/wall mounting)
18.	Accessories	:	Air filter regulator, mounting accessories, cable gland etc.

1.27.00 Air Filter Regulator

01.	Filter Element	:	Sintered Bronze
02.	Filter Size	:	5 microns
03.	Input Air	:	10.0 Kg/Sq. cm (maximum)
04.	Output	:	Adjustable from 0-2.0 Kg / Sq. cm or 0-7.0 Kg / Sq. cm (continuous) as applicable for I/P converter, control drives and control valve
05.	Effect of Supply	:	Maximum 0.02 Kg/Sq. cm for a change pressure variation in supply pressure of 4 Kg/Sq. cm
06.	Bowl Material	:	Metallic cover around high temperature area / clear transparent polycarbonate with metallic cover for ordinary applications.
07.	Accessories	:	2" dial size output pressure gauge
08.	Desirable Feature	:	No perceptible drop of pressure on opening the drain port.

1.28.00 Solenoid Valve

01.	Operating Principle	:	Electromagnetic (noiseless)
02.	Coil voltage rating	:	240 V AC / 220 V DC/24 V DC/110 V (as required)
03.	Ways	:	Generally 3-ways other depending on requirement
04.	Port size	:	1/4" NPT all ports
05.	Body	:	SS bar stock
06.	Trim	:	SS-316
07.	Duty	:	Suitable for continuous energization
08.	Sealing	:	Airtight and leak proof
09.	Ambient Temperature	:	0 - 50 ^{O} C
10.	Fluid Temperature	:	0-150 ^{O} C (approx.)
11.	Coil Enclosure	:	Stainless Steel
12.	Insulation	:	Class-H
13.	Coil Casing	:	IP-65 (Explosion proof for NEC Class-1, Division-1 area)
14.	Mounting	:	On pipe or on panel
15.	Cable Connection	:	3/4" ET
16.	Accessories	:	Mounting brackets, nuts and bolts

	17.	Preferred feature	:	a) Solenoid valve directly integral to actuator body shall have NAMOOR interface for uniformity b) Local indication for power
1.29.00		Sight Glass		
	01.	Type	:	Flap-type
	02.	End connection	:	Screwed / Flanged
	03.	Material:		
		a) Body	:	CS/SS as per process medium
		b) Indicator	:	Stainless steel
	04.	Sight Glass	:	Toughened Borosilicate
	05.	Gasket	:	Neoprene
	06.	Bolts & Nuts	:	High tensile steel
	07.	Hydraulic Test Pressure	:	1.5 times maximum working pressure
	08.	Accessories	:	As required
1.30.00		Flow Indicating Switch		
	01.	Type	:	On line metal tube Rotameter
	02.	End connection	:	Flanged
	03.	Material:		
		a) Body	:	CS/SS as per process medium
		b) Float	:	Stainless steel
		c) End fittings/flange	:	Stainless steel
		d) Other wetted part	:	Stainless steel
		b) Casing	:	Di cast Alluminium
	04.	Accuracy	:	+/- 2.0% of FSR
	05.	Rangeability	:	10:1
	06.	Electrical connection	:	¾" ET
	07.	Switch type	:	Snap acting hermitically sealed 2 nos. SPDT
	08.	Contact rating	:	5A, 240V AC
	09.	Protection class	:	IP-65
	10.	Accessories	:	As required

2.00.00 **CLOSED CIRCUIT TELEVISION SYSTEM**

2.01.00 Closed Circuit Television System

2.01.01 Closed Circuit Television System (CCTV) with all equipment and accessories shall be installed for the purpose of surveillance of major plant areas. Also, cameras shall be installed at the Main plant (TG Hall, Boiler ESP) and other common auxiliary plants.

2.01.02 The CCTV system shall meet the specific functional & design requirements towards collecting live video information from the various areas of the plant and displaying that information at monitors.

a) Rack shall be free standing type constructed from 6 mm thick steel channel frame provided with a canopy to protect the instrument from dripping water or falling objects and shall be epoxy painted. Rack Major load-bearing posts shall be suitably supported by gusset plates or moment members. Suitable protective grill shall be welded to the end-posts of the rack to outline a boundary beyond which no mounted equipment shall project. Canopy shall be of CRCA steel sheet of at least 3 mm thickness. Center posts or any member, which would reduce access, shall be avoided.

b) 2" NB galvanized pipes laid horizontally and supported at two end channels shall be employed at working accessible height for mounting of instruments.

c) All internal wirings between the instruments and junction box shall run through flexible conduits. No exposed wirings are admissible.

d) All racks shall have a common blowdown drain header, which will connect individual instrument blowdown line after suitable pressure breaking through regulating globe type blowdown valves. Header shall be of 2" NB ASTM A 106, Sch-80 Gr. C installed at a slope of 1:25 and extended beyond the rack for connection to plant drain header.

5.13.04 Junction Box

Junction boxes of FRP construction with protection class conforming to IP 55.

a) Junction box shall be provided at a dry compartment at one side of the enclosure / rack with front opening type door. Earth stud shall be furnished at rack for safety grounding.

b) Terminals shall be screwless cage clamp type of reputed make and 20% spare terminals shall be furnished in the junction box.

6.00.00 DISTRIBUTED CONTROL SYSTEM (DCS)

6.01.00 System Functional Description

6.01.01 Integrated functionally distributed and hierarchically structured real time control (both binary and modulating), Data acquisition, Man machine interface, Historization units and Management Information System (MIS) system synthesized from one general family of identical interchangeable multifunction hardware has been envisaged.

6.01.02 System shall be highly reliable with the availability of not less than 99.7% with adequate redundancy and fault tolerant configuration.

6.01.03 The system shall be unitized and connectivity with other plant control system.

6.01.04 Remote input output stations as a data concentrator for acquisition and monitoring of Boiler metal temperature are foreseen. RIO shall be industrially ruggedized and shall be provided with integral air conditioner considering the harsh environment.

6.01.05 For Power supply to system refer Volume IIE Section I.

6.01.06 Controls of some plant auxiliaries for CW & ACW Pumps and Fuel oil heating & pressurizing system controls shall be realized in DCS through Remote I/O (RIO) cabinets.

6.01.07 Off-site & BOP plants such as Coal Handling Plant, Ash Handling Plant, Raw water & Pretreatment plant, Compressed Air System, Mill Reject System and Demineralized water plant etc. having microprocessor based or PLC based

1.0 GENERAL PAINTING REQUIREMENTS

1.1 Painting of equipment shall be carried out as per the specifications indicated below and attached annexures and shall conform to the relevant IS specification/ international standards for the material and workmanship.

1.2 The following latest Indian Standards may be referred to for carrying out the painting job:

IS:5	:	Colours for ready mixed paints and enamels
IS:1303	:	Glossary of terms relating to paints
IS:2379	:	Colour code for identification of pipelines
IS:1477	:	Code of practice for painting of ferrous metals in Buildings (Parts I & II)
IS:2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS:158	:	Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting
IS:2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS:104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel, synthetic, exterior (a) undercoating (b) Finishing
IS :2933	:	Specification for enamel synthetic exterior type II
IS:2339	:	Specification for Aluminium paints for general purpose

1.3 **Preparation of Surfaces**

All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out sand scrapping may be permitted with steel wire brushes and /or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER/OWNER RESPRESENTATIVE.

The sheet steel of electrical and instrumentation panels shall be pre-treated through chemical cleaning (7 tank) process of rinsing, degreasing, rinsing, derusting, rinsing, phosphate and rinsing. However, in case mechanical cleaning is also required the Contractor shall carry out the same to get a smooth finish.

1.4 **Primer Paint**

After the surface is prepared one coat of Zinc Phosphate primer conforming to IS 2074 shall be applied.

1.5 Tie Paint

After the coat is dried up completely, second coat of Zinc Phosphate primer conforming to IS 2074 shall be applied by brushing, spray, roller as per manufacture recommendation to ensure a continuous film. The dry film thickness of each coat shall be as indicated in Ann-I & II enclosed. Insulated surfaces will have only primer coating and no finish painting.

1.6 **Finish Paint**

Synthetic enamel paint conforming to IS 2932 shall be used for finish coats. The colour /shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

1 Note For structural painting, customer's specification V II/G2/8 Cl 3.03.11 shall be followed however DFT and coating system shall be followed in line with paint manufacturer's recommendation.

1.7 **Painting and Corrosion Protection for Pipes & Fittings**

1.7.1 All uninsulated piping systems, hangers and supports shall have two coats of Zinc Phosphate Primer (conforming to IS 2074) (One primer coat and one tie coat) and finish paint using synthetic enamel paint to give a finish coat. Shades shall be as per IS 5 or as indicated by PURCHASER/OWNER. Service of the pipeline designations shall be painted on all pipes at visible locations.

1.7.2 Before application of paint, Contractor shall clean the pipes of all mill scale, dirt dust, soot grease, rust etc.

1.7.3 All pipe lines, piping components shall be adequately protected against corrosion during manufacture, fabrication, shipment and storage by appropriate protective paint.

1.7.4 Shop fabricated equipment/items shall be dispatched with final paint. Necessary touch up shall be done at site. Site fabricated equipment/items shall be dispatched with primer painting only and final painting shall be applied at site.

1.8 **Painting and Corrosion Protection for Valves & Specialties**

1

Primer of thickness as indicated in Ann-II shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion before dispatch. The use of grease or oil, other than light grade mineral oil, for corrosion protection is prohibited. Bores of all vales shall be covered immediately after testing, draining and drying with suitable plastic end covers to avoid ingress of foreign materials.

1.9 **Suggested Colour Codes for Painting**

Suggested colour codes shall be furnished by the successful bidder after award of contract. Colour codes for piping shall be as per IS 2379 with necessary modifications. Where band colour is specified for piping, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.

2.0 **Approved Paint Makes**

i) Asian Paints (I) Ltd.
ii) Berger Paints India Ltd
iii) Goodlass Nerolac
iv) Jenson & Nicholson (I) Ltd
v) CDC carboline (I) Ltd.
vi) Shalimar Paints Ltd.
vii) Addison Paints Ltd
viii) Grand Polycoat
ix) Bombay Paints
x) Hemple Paints (Singapore)
xi) Jotun Paints
xii) Akzonobel coatings

2.1 **PAINTING SCHEDULES**

2.1 Painting schedules for various systems/ items are furnished as per enclosed Annexures-I and II. Vendors of different packages/ items will furnish detailed painting schedule for customer approval during detail engineering as per this guide specification.

PAINTING SCHEDULE

1x800 MW WANAKBORI TPS

Annexure-I

Paint Reference Scheme	Surface Preparation Grade / Surface Profile	Primer Coat			Intermediate Coat			Finish Coat			Total DFT in microns
		Premier Paint	No. of Coats	DFT in Microns	Intermediate Paint	No. of Coats	DFT in Microns	Finish Paint (See Note)	No. of Coats	DFT in Microns	
Various type of equipment/valve, etc. (Temp. upto 90°C)	Degreasing and Mech. Cleaning with wire brushing/hand tool (Sa1/St2/St3 as applicable)	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140
Structural 	- do -	Epoxy resin based HB Zinc phosphate (alkyd medium)	1	50 – 75 per coat	Epoxy based HB MIO pigmented polyamide cured paint	1	110-125 per coat	Polyamide cured epoxy finish coating + Polyurethane coat	1+1	50 – 60 per coat + 25 – 35 per coat	235 - 295
LP Piping/ Vessels, etc. (Temp. upto 90°)	- do -	HB Zinc Phosphate as per IS:2074 (alkyd medium)	1	35 – 45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110-140
Equipment with (Temp. upto 250°)	- do -	Heat resistant Al – paint	2	20 per coat	- NA	-	-	NA	Insulated	NA	40
Equipment in corrosive areas like CPU (regeneration) Dosing skid, etc.	Blast clean to Sa $2^1/2$	HB Epoxy resin based zinc phosphate primer	1	50 per coat	Epoxy based MIO pigmented paint	1	50 per coat	Polyamide cured Epoxy finish coat	2	25 – 35 per coat	150 - 170
Elect. / Control Panels, etc.	Seven tank process	HB Zinc phosphate (alkyd Medium) as per IS:2074	2	35 – 45 per coat	HB Zinc Phosphate (alkyd Medium) as per IS:2074	1	35-45 per coat	Synthetic enamel (alkyd med.) as per IS:2932 	2	20 – 25 per coat	110 – 140
Large dia pipes	As per customer specification for Large diameter piping CI. No. 9.00.00 of VII-I/S-5										

Notes:

1. Surface preparation shown above is as per Swedish Standards SIS 05-5900. Degreasing will be as per Standard SSPC-SP1.

2. In case of insulated surfaces, only primer coats shall be applied.

3. GM/SS items with piping and G.I. pipes will not be painted. Further SS/GI piping shall be given necessary colour banding for identification as per colour scheme.

4. All instruments shall be painted as per manufacturer standard practice.

5. All structural steel items shall be painted at site. Piping shall go with primer coating & finish Paint shall be applied at site. Equipment shall be finish painted at shop.

6. Method of painting application shall be as per paint manufacturer's recommendation.

1

7. Based on above painting schedule, detailed painting schedule will be prepared by respective Package supplier and approved painting schedule shall be submitted to GSECL/DCPL under information category.

8. This painting schedule is applicable for bought out equipment/packages of PEM. Painting specification for various piping/ equipment in scope of various other BHEL units like Power cycle piping, CW piping, LP piping, R.E. joints, Butterfly valves, Power cycle valve etc., shall be furnished by unit separately.

ANNEXURE –II

LDO/HFO Storage Tank			
	Internal	**External**	**Underneath**
Surface preparation	Wire bushing	ST2 (Wire Brushing/ Hand tool cleaning)	Blast clean to SA 2.5
Primer	NA	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish	2 coats of double boiled linseed oil	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns (DFT) each	N.A
Total DFT		100 – 120 microns	80 – 100 microns

ANNEXURE-III

SUGGESTED COLOUR CODES FOR PAINTING

SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admirality Grey	632	-	-
2.0	Fans, pumps, motors, compressors, Blowers	Light Grey	631	-	-
3.0	Tanks (without insulation and cladding)				
3.1	Outdoor, Stand pipes, vent pipes	Aluminum	-	-	-
3.2	Indoor	Aluminum	-	-	-
4.0	Vessels & all other proprietary equip-ment (without insulation & cladding)	Light grey	631	-	-
5.0	Switchgear	Light grey	631	-	-
6.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
7.0	Transformers	Dark Admiralty Grey	632	-	-
8.0	Machinery guards	Signal red	537	-	-
9.0	Piping (without insulation and cladding)				
9.1	Water System				
a)	Boiler feed	Sea green	217	-	-
b)	Condensate	Sea green	217	Light brown	410
c)	D M Water	Sea Green	217	Light orange	557
d)	Soft water	Sea green	217	French blue	166
e)	Bearing cooling water	Sea green	217	French blue	166
f)	Potable & filtered water	Sea green	217	French blue	166
g)	Service & clarified water	Sea green	217	French blue	166
h)	Raw water	Sea green	217	White	-
i)	Cooling water	Sea green	217	French blue	166
9.2	Compressed Air System				
a)	Service air	Sky Blue	101	-	-
b)	Instrument air	blue	101	White	-
9.3	Oil system				
a)	Fuel oil	Light brown	410	French Blue	166
b)	Light oil	Dark Brown	412	Brilliant green	221
c)	Lubricating oil	Light brown	410	Light grey	631

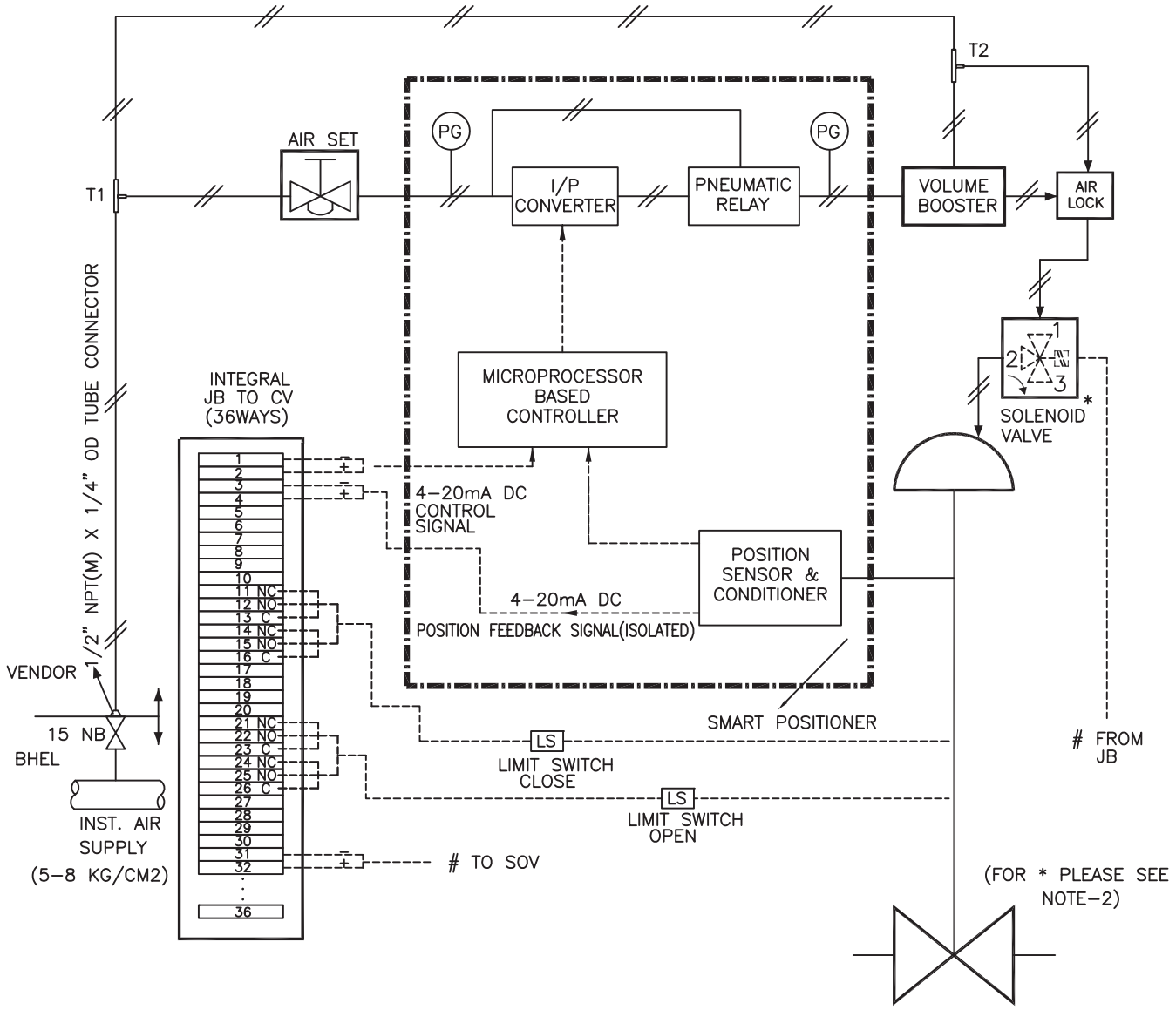
SL. NO.	ITEM/SERVICE	COLOUR	IS-5	COLOUR (BAND)	IS-5
d)	Control oil	Light brown	410	Light orange	557
e)	Transformer oil	Light brown	410	Light orange	557
9.4	Gas system				
a)	Carbon dioxide	Canary yellow	309	Light grey	631
9.5	Fire services	Fire red	536	-	-
9.6	Drainage	Black	-	-	-
9.7	Stand pipes and all Vent pipes	Aluminum	-	-	-

Notes:

1. This color code basically refers to IS:2379 for piping with necessary modifications.

2. Where band color is specified, same shall be provided at 10 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

CONTROL VALVE HOOK-UP DIAGRAM
(WITH SMART POSITIONER)

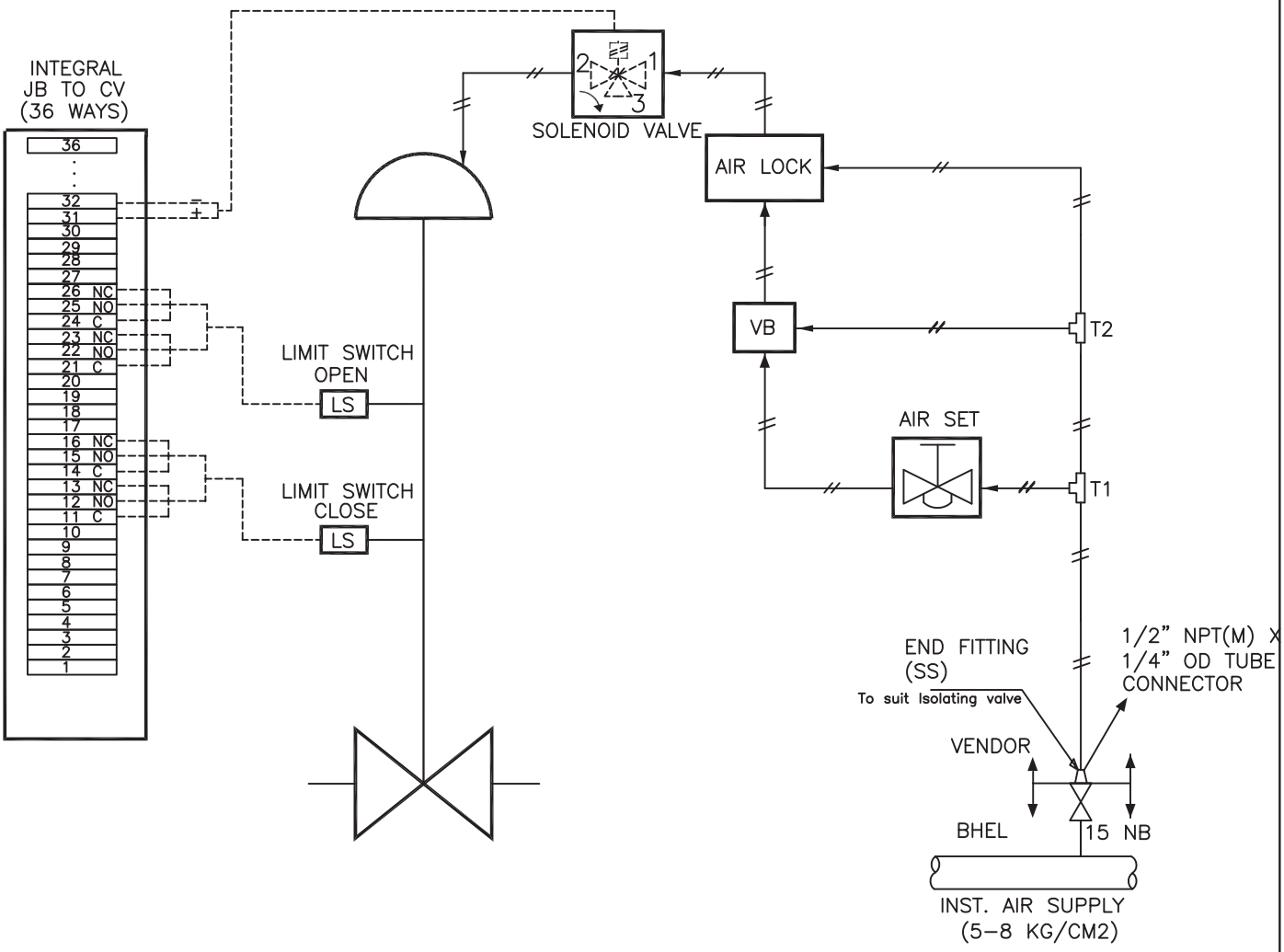


NOTES :-

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. SOLENOID VALVE WILL BE PROVIDED ONLY FOR CONTROL VALVES IF 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. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4-20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF SS 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 SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE-T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE-T2 SHALL BE PROVIDED.

BHEL	1 X 800 MW WANAKBORI STPP	DRG. No.	PE-TS-408-145-I104		
	TITLE:- CONTROL VALVE HOOK-UP DIAGRAM	REV. No.	00	DATE	31.07.15
		SHEET	34	OF	129

CONTROL VALVE HOOK-UP DIAGRAM
(FOR ON / OFF TYPE)

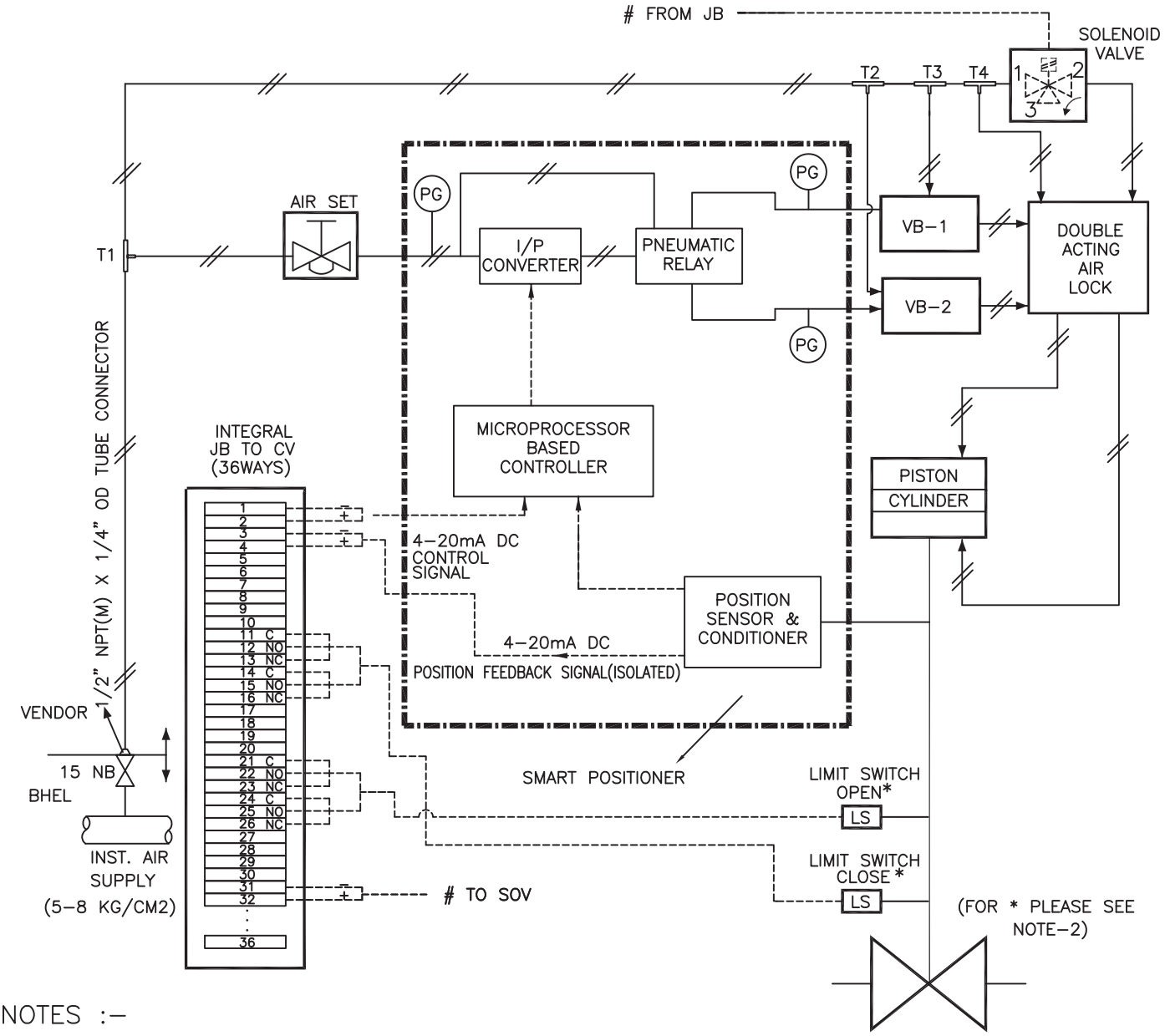


NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRIC SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET.
2. 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.
3. MOUNTING ACCESSORIES AS REQUIRED.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION,THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET.
5. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
6. 12 METERS I/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF SS 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 SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.

BHEL	1 X 800 MW WANAKBORI STPP	DRG. No.	PE–TS–408–145–I104		
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. No.	00	DATE	31.07.15
		SHEET	35	OF	129

STANDARD CONTROL VALVE HOOK-UP DIAGRAM
(DOUBLE ACTING PISTON ACTUATOR WITH SMART POSITIONER)



NOTES :–

1. POSITION OF EACH VALVE ON SUPPLY AIR FAILURE / ELECTRICAL SIGNAL FAILURE SHALL BE AS PER SPECIFICATION / DATA SHEET. AIR LOCK SHALL BE PROVIDED ACCORDINGLY.
2. SOLENOID VALVE & LIMIT SWITCHES WILL BE PROVIDED ONLY FOR CONTROL VALVES IF 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. PRESSURE GAUGES REQUIRED FOR AIR SUPPLY & OUTPUT(S).
5. MOUNTING ACCESSORIES AS REQUIRED.
6. POSITION FEEDBACK SIGNAL SHALL BE 2 WIRE 4–20mA ISOLATED SIGNAL.
7. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE. EXTERNAL CONNECTION, OF PLUG IN TYPE OR THROUGH CABLE GLAND, SHALL BE AS PER DATA SHEET
8. ALL APPLICABLE ACCESSORIES SHALL BE PROVIDED AS INDICATED IN THE INDIVIDUAL CONTROL VALVE DATA SHEET / ACCESSORIES DATA SHEET.
9. 12 METERS I/4" SS TUBING (AS PER ACCESSORIES DATA SHEET) & 1 SET OF SS 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 SS FITTINGS SHALL BE DOUBLE COMPRESSION TYPE.
10. VOLUME BOOSTER (ALONG WITH TEE–T2 AND RELATED TUBING & CONNECTORS) SHALL BE PROVIDED IF REQUIRED. AIR CONNECTION TO VOLUME BOOSTER FROM TEE–T2 & TEE–T3 SHALL BE PROVIDED.

BHEL	1 X 800 MW WANAKBORI STPP	DRG. No.	PE–TS–408–145–I104		
	TITLE:– CONTROL VALVE HOOK–UP DIAGRAM	REV. No.	00	DATE	31.07.15
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BHEL	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **1 X 800 MW WANAKBORI TPS** **EXTN UNIT-8**	SPECIFICATION NO. **PE-TS-408-145-I104** VOLUME **II-B** SECTION **D** REV. NO. 00 | DATE: 31.07.15 SHEET 37 OF 129

SECTION – D

- **EQUIPMENT SPECIFICATION**
- **DATA SHEETS – A & B**
- **DATA SHEETS FOR ACCESSORIES**
- **DATA SHEETS – C**
- **QUALITY PLAN**
- **BILL OF QUANTITY**
- **SPARES**
- **SUB-VENDORS LIST**
- **SCHEDULE OF SUBMISSION OF DRAWINGS / DOCUMENTS, EQUIPMENT MANUFACTURE INSPECTION AND DESPATCH**

SECTION-D

EQUIPMENT SPECIFICATION

BHEL	**SPECIFICATION FOR CONTROL VALVE (WITH PNEUMATIC / ACTUATOR)**	SPECIFICATION NO.: PES – 145 – 06
		VOLUME II B
		SECTION D
		REV. NO. 05 DATE : 15/05/2007
		SHEET 1 OF 11

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 flare less brass fittings (Refer typical hook up diagram in sheet 12 of 12).

3.3.1 Hand wheel

Hand wheel shall have OPEN & CLOSE direction marking and clockwise rotation as viewed from front shall close the valve. The hand wheel 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 $\pm$ 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

BHEL	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **1 X 800 MW WANAKBORI TPS** **EXTN UNIT-8**	SPECIFICATION NO. **PE-TS-408-145-I104** VOLUME **II-B** SECTION **D** REV. NO. 00 DATE: 31.07.15 SHEET 50 OF 129

SECTION – D

SPECIFICATION FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER (SMART)

(PES – 145 – 06A)

1.0 Electrical

Input Signal	4-20mA
Power Supply	Loop Powered from the output card of Control System (12-30 V DC)
Hart Protocol	Compatibility For Remote Calibration & Diagnostic (Super-Imposed HART Signal On Input Signal (4-20mA)
Valve Position Feedback (4-20mA)	Position Sensing 4-20mA O/P Signal For Control System To Be Provided. If non contact type of Position feedback signal is required, Position transmitter to be separately provided.

2.0 Environment

Operating Temperature	(-) 30 To 80 Deg.C
Humidity	0-95%
Protection Class	IP-65 (Minimum)

3.0 Software For Configuration & Diagnostic

Software	Windows Based Software, Software Shall Meet The Requirement For Configuration, Diagnostics, Calibration And Testing Of the Actuator. Valve positioning timing, actuator leakage, and Valve Wear & tear, fault alarm to be offered as a minimum. Easily up gradable with same hardware and compatible with any HART management systems /AMS.
Diagnostic/Test Features (Optional)	Advanced Diagnostic Features Like Stroke On Line Partial Closure Test, Valve Signature Analysis (Online graphical representation), 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 (OPTIONAL)
Test Certificates		Test Certificates As Per Manufacture Standard/Relevant Standard Are To Be Submitted.

Configuration / Remote Calibration, Auto & Manual Calibration Shall Be Possible.

4.0 Modes

Valve Action	Direct & Reverse, Valve Action. (Same positioner for Single Acting or Double Acting And no separate relays required for changing from Single acting to double).
Flow Characterization	Possible to fit valve characteristic curve linear & Equal percentage
Fail Safe/Fail Freeze (Optional)	Fail Safe/Fail Freeze feature is to be provided.

5.0 Performance

Characteristic Deviation	<=0.75% of span
Ambient temp effect	<=0.01%/Deg C or better.
Dead Band	Adjustable 0.1 to 10%.
Scan Time	10ms
Resolution	<=0.05%
Sensitivity/Linearity	0.3-0.4% of FS
Repeatability	0.32% of FS
Auto-Tune	Yes

Leak Test	Yes

7.0 EMC & CE compliance

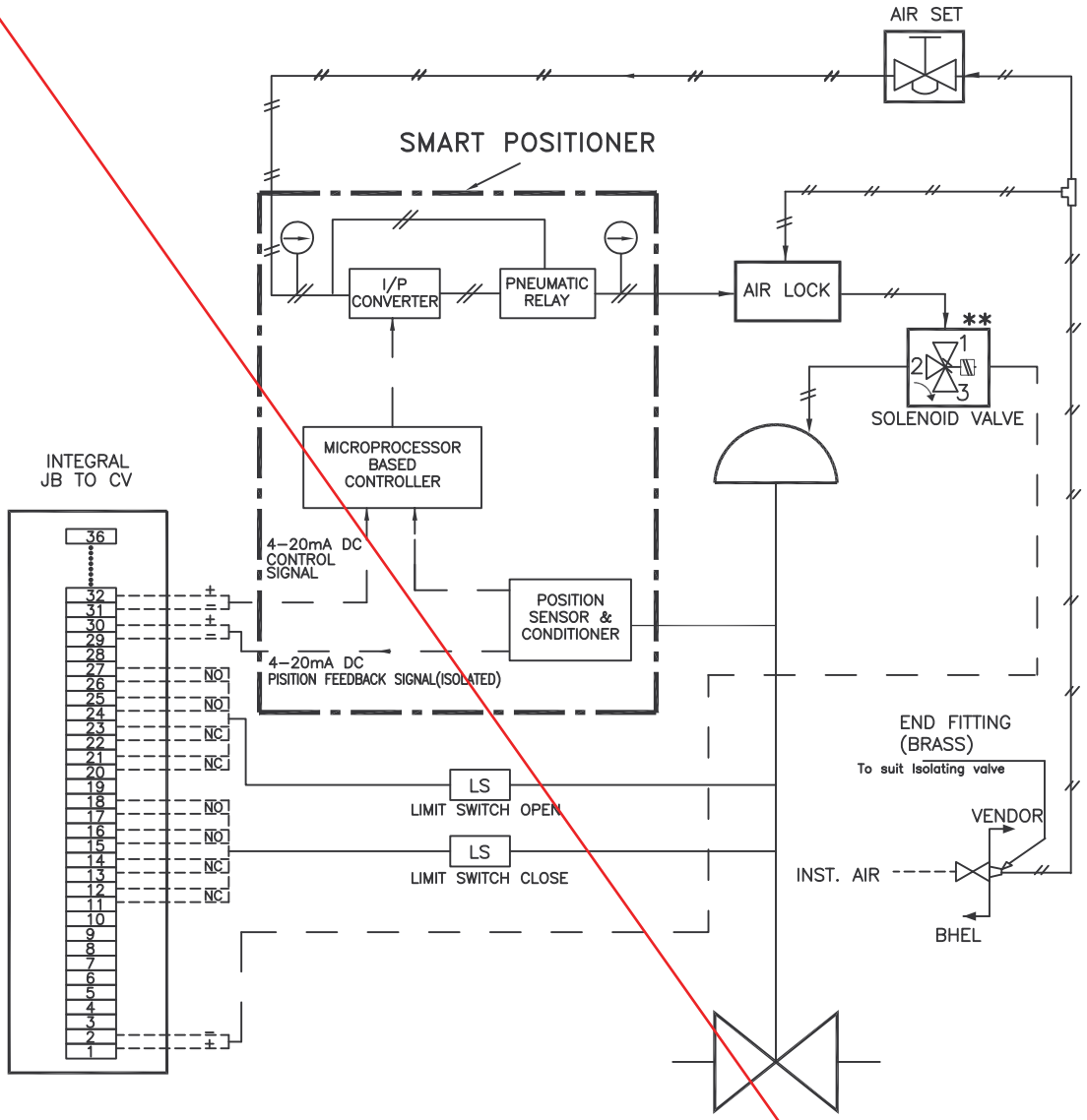
Required International Standard Like EN/IEC.	To En50081-2&En50082 or equivalent

8.0 Accessories

In Built Operator Panel	Display With Push Buttons For Configuration And Display On The Positioner Itself
Hand Held Hart Calibrator (Optional)	Universal Hart Calibrator To Be 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	½-Npt, side or bottom entry to avoid water Ingress.

TITLE

STANDARD TYPICAL CONTROL VALVE HOOK-UP DIAGRAM WITH SMART POSITIONER



NOTE:-

1. SOLENOID VALVE WILL BE PROVIDED ONLY FOR ON/OFF DUTY VAVLVES & FOR CONTROL VALVES WHERE OPEN/CLOSE INTERLOCK IS REQUIRED AND INDICATED IN RESPECTIVE DATA SHEETS.
2. SOLENOID VALVES PORT CONDITION:
   PORT 1 & 2 SHAL BE CONNECTED UNDER DE-ENERGISED CONDITION.
   PORT 2 & 3 SHAL BE CONNECTED UNDER ENERGISED CONDITION.
3. FOR ON/OFF DUTY PNEUMATIC CONTROL VALVE,SMART POSITIONER SHALL NOT BE APPLICABLE.
4. JB TERMINALS SHALL BE CAGE CLAMP TYPE SUITABLE FOR 2.5 SQ. MM COPPER WIRE.
5. 10 METERS 1/4 " PVC COATED COPPER TUBING AND 1 SET OF FITTINGS TO BE SUPPLIED FOR EACH CONTROL VALVE FOR CONNECTION TO ISO VALVE AT INST AIR HEADER ON ONE END AND TO AIR LOCK RELAY/AIR FILTER REGULATOR ON THE OTHER END.
6. VOLUME BOOSTER IF REQUIRED SHALL BE PROVIDED.

** APPLICABLE TO VALVES WHERE OPEN/CLOSE ACTION REQUIRED ON INTERLOCK CONDITION

SECTION-D

DATA SHEETS - A&B

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 56	OF 129

Tag No. :… ASV-8… Qty.: …1
KKS No: LBG51AA101 Ref. Drg. No:-PE-DG-408-100-N103

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	D/A PEGGING FROM AUX. STEAM HEADER	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 508 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY:GUIDING:NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE /	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....
	DOUBLE	BIDDER TO INDICATE	.....|.....
	BONNET TYPE	[■] LINEAR [] EQ. PERCENTAGE	.....
	TRIM FORM	[] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....|.....
			.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[] < 7 M/SEC (WATER) | [■] MAC NO. < 1/3 (STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	< 10 SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN		.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 57	OF 129

Tag No. :…ASV-8… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	7.5% BMCR (COLD)	19	16	1.7	290			
	2.	15% BMCR (COLD)	38	16	1.7	290			
	3.	15% BMCR (HOT)	54	16	3.7	290			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 20 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 20 | 320 IBR FORM III-C [■] REQUIRED [] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 58	OF 129

Tag No. :…CRHV-6… Qty.: …1
KKS No: LBQ10AA101 Ref. Drg. No:-PE-DG-408-100-N103

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	D/A PEGGING FROM CRH LINE	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	406.4 x 16 | 965 x 34	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING: NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■]A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	.....|.....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	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	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	< 10 SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN		.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 59	OF 129

Tag No. :…CRHV-6… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	15% BMCR	52	15	3.7	341			
	2.	30% BMCR	104	20	3.7	347			
	3.	60% BYPASS	212	37	5	360			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 73.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.5 | 360 IBR FORM III-C [■] REQUIRED [] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. : CDV-22 & CDV-25 Qty.: 2 (One against each Tag No.)
KKS No: LCA50AA101/LCA51AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	MAIN CONDENSATE CONTROL	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	457 x 12.7 | 457 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	..... | .....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	..... | ..... | ..... | .....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	..... | ..... | .....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	..... | .....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	..... | .....
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	..... | .....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	..... | .....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	..... | .....
	TRAVEL TIME FOR	<10SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN		.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 61	OF 129

Tag No. : CDV-22 & CDV-25 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No.	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% LOAD	646	35	18	39.5			
	2.	60% LOAD	938	32	21	40.5			
	3.	100% MCR	1527	33	25	43			
	4.	VWO	1648	32	26	43.5			
	5.	MIN. (10% LOAD)	150	38	8	40			
	6.	HP-LP Bypass	1507	33	16	52.5			
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45 | 60 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							……		

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 62	OF 129

Tag No. :…CDV-40… Qty.: …1
KKS No: LCA31AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	GSC MIN. FLOW RECIRCULATION	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3X7.11 | 168.3 x 7.11	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	< 10 SEC	.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…CDV-40… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

SERVICE CONDITION

SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCIT Y
1.	MIN.	32	38	0.3	43			
2.	MAX	324	36	0.5	50			

VALVE TYPE	] CAVITATION [] FLASHING] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45/ VACUUM | 60 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…CDV-46… Qty.: …1
KKS No: LCA41AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	EXCESS RETURN TO CST	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	219.1 x 8.18 | 219.1 x 6.35	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[] GLOBE [■] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS [] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE [] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	<10 SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN	| |	.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 65	OF 129

Tag No. :…CDV-46… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	MIN.	40	35	2	50			
	2.	MAX	400	32	4	43			
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45 | 60 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

Tag No. :…CDV-67… Qty.: …1
KKS No: LCA34AA201 Ref. Drg. No:-PE-DG-408-100-N111

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	CONDENSATE SPRAY TO FLASH TANK-B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[■] ON/OFF [] MODULATING	.....
	PIPE SIZE (inlet / outlet)	33.4 x 4.55 | 33.4 x 4.55	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[] BWE [■] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[] LINEAR [] EQ. PERCENTAGE	.....
		[■] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[■] YES [] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	<10SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN	| |	.....
	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	[] REQUIRED [■] NOT REQUIRED	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	[] REQUIRED [■] NOT REQUIRED	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…CDV-67… Qty.: …1

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)	± 5% # ± 5% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	MAX.	10	35.0	0.3	50			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45/VACUUM | 60 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

NOTES:

1. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.

Tag No. :…CDV-72… Qty.: …1
KKS No: LCA33AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	CONDENSATE FOR VALVE GLAND SEALING	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	60.3 x 5.54 | 60.3 x 5.54	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[■] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] A351 CF8M	.....
	BONNET TYPE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	TRIM FORM	BIDDER TO INDICATE	.....
	TRIM MATERIAL: SEAT | PLUG	[] LINEAR [■] EQ. PERCENTAGE	.....
	: CAGE | GUIDE BUSH	[] QUICK OPEN (ON/OFF)	
		17-4 PH SS | 17-4 PH SS	.....|.....
		17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 69	OF 129

Tag No. :…CDV-72… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	MAX.	4	31	3.0	50			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45 | 60 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. : DRV-14 & DRV-20 Qty.: 2 (One against each Tag No.)
KKS No: LCH30AA101/ LCH40AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 12.7 | 273 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	.....
			.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO CLOSE	
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-14 & DRV-20 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	51	23.6	9.7	178			
	2.	60% MCR	90	35.4	14.3	196			
	3.	100% MCR	195	58.7	23.4	222			
	4.	VWO	216	62.9	25	225.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 73.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.5 | 230 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. : DRV-17& DRV-23 Qty.: 2 (One against each Tag No.)
KKS No: LCH35AA101/LCH45AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-7A/7B ALT. DRAIN TO F/T-A	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 12.7 | 323.9 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	.....|.....
	: CAGE | GUIDE BUSH	440C | 440C	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES **[■] NO**	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-17 & DRV-23 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	51	24	0.3	220.5			
	2.	60% MCR	90	36	0.3	243			
	3.	100% MCR	195	59	0.3	273			
	4.	VWO	216	63.5	0.3	277.5			

VALVE TYPE	[] CAVITATION [■] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 73.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 73.5/ VACUUM | 280 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. : DRV-27& DRV-34 Qty.: 2 (One against each Tag No.)
KKS No: LCH10AA101/LCH20AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 273 x 6.35	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO CLOSE	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-27& DRV-34 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	65	7	5.6	159.5			
	2.	60% MCR	115	11	7.7	174			
	3.	100% MCR	244	20	11.7	196.5			
	4.	VWO	269	22	12.4	199.5			

VALVE TYPE	[] CAVITATION [■] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 30 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 30 | 200 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 76	OF 129

Tag No. : DRV-30 & DRV-37 Qty.: 2 (One against each Tag No.)
KKS No: LCH15AA101/LCH25AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-6A/6B ALT. DRAIN TO F/T-A	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	.....|.....
	: CAGE | GUIDE BUSH	440C | 440C	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-30& DRV-37 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	....

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	65	10	0.3	179			
	2.	60% MCR	115	15	0.3	197			
	3.	100% MCR	244	24	0.3	220.5			
	4.	VWO	269	25.5	0.3	223.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 30 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 30/ VACUUM | 230 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						.....		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						.....		

Tag No. :…DRV-58… Qty.: …1
KKS No: LCJ31AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	LPH-3 ALT. DRAIN TO F/T-B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	273 x 6.35 | 323.9 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	.....|.....
	: CAGE | GUIDE BUSH	440C | 440C	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	|	.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC |	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER(PART OF POSITIONER)	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…DRV-58… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	68	1.3	0.3	106.5			
	2.	60% MCR	108	1.8	0.3	116			
	3.	100% MCR	200	2.7	0.3	129			
	4.	VWO	218	2.9	0.3	131.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 3.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 3.5/ VACUUM | 140 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…DRV-73… Qty.: …1
KKS No: LAA01AA201 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	DEAERATOR OVERFLOW TO F/T-B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[■] ON/OFF [] MODULATING	.....
	PIPE SIZE (inlet / outlet)	219.1 x 6.35 | 323.9 x 9.53	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[] LINEAR [] EQ. PERCENTAGE	.....
		[■] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	.....|.....
	: CAGE | GUIDE BUSH	440C | 440C	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	<10 SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN		.....
	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	[] REQUIRED [■] NOT REQUIRED	.....
	SOLENOID VALVE	[■] REQUIRED [] NOT REQUIRED	.....
	E/P CONVERTER	[] REQUIRED [■] NOT REQUIRED	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…DRV-73… Qty.: …1

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)	± 5% # ± 5% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	MAX 10% VWO	250	15.5	0.3	198.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 14 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 14/ VACUUM | 200 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… ……|…… ……		
	TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg						……		

NOTES:

1. # WITHOUT POSITIONER, LINEARITY SHALL BE ± 5% ONLY.

Tag No. : DRV-2 & DRV-8 Qty.: 2 (One against each Tag No.)
KKS No: LCH50AA101/LCH60AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 10.97 | 168.3 x 10.97	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	.....|.....
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO CLOSE	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-2 & DRV-8 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	13	32.5	23.7	225.5			
	2.	60% MCR	24	48.5	35.5	247.5			
	3.	100% MCR	57	79.5	58.8	278.5			
	4.	VWO	64	85	63	283.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 95 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 95 | 290 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… …… ……		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							……		

Tag No. : DRV-5 & DRV-11 Qty.: 2 (One against each Tag No.)
KKS No: LCH55AA101/LCH65AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	HPH-8A/8B ALT. DRAIN TO F/T-A	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 10.97 | 219.1 x 12.7	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR C	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	.....
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....|.....
	BONNET TYPE	BIDDER TO INDICATE	.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	.....|.....
	: CAGE | GUIDE BUSH	440C | 440C	.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	.....
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. : DRV-5 & DRV-11 Qty.: 2 (One against each Tag No.)

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	13	32.5	0.3	237			
	2.	60% MCR	24	48.5	0.3	260.5			
	3.	100% MCR	57	79.5	0.3	293			
	4.	VWO	64	85	0.3	297.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 95 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 95/ VACUUM | 300 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…DRV-40… Qty.: …1
KKS No: LCJ40AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	LPH-4 NORMAL DRAIN TO LPH-3	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 219.1 x 6.35	.....
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	...
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	.....
		[] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....
	BONNET TYPE	BIDDER TO INDICATE	.....|.....
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	.....|.....
			.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[] YES [■] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
			.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR	<10SEC	.....
	OPEN TO CLOSE, CLOSE TO OPEN		.....
	VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	.....
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO CLOSE	.....
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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…DRV-40… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	23	2.3	1.3	106.5			
	2.	60% MCR	36	3.3	1.8	117			
	3.	100% MCR	69	5.1	2.7	131.5			
	4.	VWO	75	5.4	2.9	133.5			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 7 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7 | 140 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… …… ……		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							……		

Tag No. :…DRV-43… Qty.: …1
KKS No: LCJ41AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	……
	SERVICE	LPH-4 ALT. DRAIN TO F/T-B	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	168.3 x 7.11 | 219.1 x 6.35	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY	MODEL NO.	BIDDER TO INDICATE	……
	TYPE OF BODY:GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……
	BONNET TYPE	BIDDER TO INDICATE	……|……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	……
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	
	: CAGE | GUIDE BUSH	440C | 440C	……|……
			……|……
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
			……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	……|……
	TRAVEL TIME FOR		……
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	……
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	……
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 POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	……

Tag No. :…DRV-43… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	23	2.3	1.3	124			
	2.	60% MCR	36	3.3	1.8	136			
	3.	100% MCR	69	5.1	2.7	151.5			
	4.	VWO	75	5.4	2.9	154			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 7 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 7/ VACUUM | 160 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						…… …… ……		
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg							……		

Tag No. :…DMV-2… Qty.: …1
KKS No: LCR81AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	DM NORMAL MU TO HOTWELL	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	114.3 x 3.05 | 114.3x 3.05	.....
	PIPE MATERIAL (inlet / outlet)	SA 312 TP 304 (ERW) | SA 312 TP 304 (ERW)	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…
	BODY MATERIAL	[] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[■] A351 CF8M	.....
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	.....
	BONNET TYPE	BIDDER TO INDICATE	.....|.....
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	.....
		[] QUICK OPEN (ON/OFF)	.....
	TRIM MATERIAL: SEAT | PLUG	SS 316 STELLITED | SS 316 STELLITED	
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....|.....
			.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
			.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

BHEL PEM	**DATA SHEET FOR CONTROL VALVES (WITH PNEUMATIC ACTUATOR)**	SPECIFICATION NO.: PE-TS-408-145-I104	
		VOLUME IIB	
		SECTION D	
		REV. NO. 00	DATE : 31.07.2015
		SHEET 91	OF 129

Tag No. :…DMV-2… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	MIN.	13	3.5	0.2	33			
	2.	NORMAL	25	3	0.3	33			
	3.	MAXIMUM	50	2.5	0.4	33			
	VALVE TYPE						[] CAVITATION [] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 10 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/ VACUUM | 50 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…DMV-5… Qty.: …1
KKS No: LCR83AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	.....
	SERVICE	DM EMERGENCY MU TO HOTWELL	.....
	LOCATION	[■] INDOOR [] OUTDOOR	.....
	DUTY	[] ON/OFF [■] MODULATING	.....
	PIPE SIZE (inlet / outlet)	168.3 x 3.4 | 168.3 x 3.4	.....
	PIPE MATERIAL (inlet / outlet)	SA 312 TP 304 (ERW) | SA 312 TP 304 (ERW)	.....|.....
BODY	MODEL NO.	BIDDER TO INDICATE	.....
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	.....|.....|.....|.....
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	.....|.....|.....
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…
	BODY MATERIAL	[] A216 WCB [] A217 WC6 [] SS [] A217 CS	.....
		[■] 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 STELLITED | SS 316 STELLITED	
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	.....|.....
			.....|.....
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	.....
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	.....
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	.....
	VACUUM SERVICE	[■] YES [] NO	.....
	ANTI CAVITATION TRIM	[] YES [■] NO	.....
			.....
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	.....|.....
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	.....|.....
	TRAVEL TIME FOR		.....
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	.....
	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 POSITIONER	.....
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	.....
	E/P CONVERTER	PART OF POSITIONER	.....
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	.....
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	.....
	LOCAL POSITION INDICATOR	[■] REQUIRED	.....
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	.....

Tag No. :…DMV-5… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

SERVICE CONDITION	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
	1.	MIN.	25	3.5	0.2	33			
	2.	NORMAL	75	3	0.3	33			
	3.	MAXIMUM	150	2.5	0.4	33			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 10 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 10/ VACUUM | 50 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…FDV-8… Qty.: …1
KKS No: LAB50AA101 Ref. Drg. No:-PE-DG-408-100-N105

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	GSECL- 1X800 MW WANAKBORI TPS	……
	SERVICE	LOW LOAD FEED CONTROL	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	355.6 x 64 | 355.6 x 64	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR C | SA 106 GR C	……|……
BODY	MODEL NO.	BIDDER TO INDICATE	……
	TYPE OF BODY:GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…
	BODY MATERIAL	[] A216 WCB [■] A217 WC9 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [] DOUBLE [■] SINGLE	……
	BONNET TYPE	BIDDER TO INDICATE	……|……
	TRIM FORM	[] LINEAR [■] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	……
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	……|……
			……|……
	FLOW DIRECTION	BIDDER TO INDICATE	
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
			……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	……|……
	TRAVEL TIME FOR		……
	OPEN TO CLOSE, CLOSE TO OPEN	<10 SEC	……
	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 POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	……

Tag No. :…FDV-8… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	5% MCR (MIN.SPEED)	130	165	12	111			
	2.	15% MCR	390	160	32	138			
	3.	30% MCR	780	155	115	138			

VALVE TYPE	[] CAVITATION [] FLASHING [■] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 450 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 450 | 200 IBR FORM III-C [■] REQUIRED [] NOT REQUIRED	…… …… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…DRV-52… Qty.: …1
KKS No: LCA83AA101 Ref. Drg. No:-PE-DG-408-100-N106

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	GSECL- 1X800 MW WANAKBORI TPS	……
	SERVICE	DRIP PUMP DISCHARGE CONTROL	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	219x 8.18 | 219x 8.18	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY	MODEL NO.	BIDDER TO INDICATE	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|…… …….|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	…
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[■] A216 WCB [] A217 WC9 [] SS [] A217 CS	……
		[] 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 STELLITED | SS 316 STELLITED	……|……
	: CAGE | GUIDE BUSH	SS 316 STELLITED | SS 316 STELLITED	……|……
	FLOW DIRECTION	BIDDER TO INDICATE	……
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	……
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[] YES [■] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	……|……
	TRAVEL TIME FOR	<10SEC	……
	OPEN TO CLOSE, CLOSE TO OPEN		……
	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 POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	……

Tag No. :…DRV-52… Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	68	27	12	105			
	2.	60% MCR	108	26	15	115			
	3.	100% MCR	200	25	20.5	129.5			
	4.	VWO	218	24.5	21.5	131.5			
	5.	LPH-1&2, DC-1&2 BYPASS	286.5	24	20	125.5			

VALVE TYPE	[] CAVITATION [] FLASHING [] HIGH DP
MAX SHUT OFF PRESS (KG/CM2g) 45 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 45 | 140 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED	…… ……|…… ……
TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :….DRV-78 …. … Qty.: …1
KKS No: LCJ23AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	…….
	SERVICE	LPH-2A&2B NORMAL DRAIN TO DC-1	…….
	LOCATION	[■] INDOOR [] OUTDOOR	…….
	DUTY	[] ON/OFF [■] MODULATING	…….
	PIPE SIZE (inlet / outlet)	219.1 x 6.35 | 219.1 x 6.35	…….
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY	MODEL NO.	BIDDER TO INDICATE	…….
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	……|……|……
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	…….
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	…….
		[] A351 CF8M	……|……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	…….
	BONNET TYPE	BIDDER TO INDICATE	…….
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	
		[] QUICK OPEN (ON/OFF)	……|……
	TRIM MATERIAL: SEAT | PLUG	17-4 PH SS | 17-4 PH SS	……|……
	: CAGE | GUIDE BUSH	17-4 PH SS | 17-4 PH SS	…….
			…….
	FLOW DIRECTION	BIDDER TO INDICATE	…….
	OUTLET VELOCITY	[■] < 7M/SEC (WATER) |[] MAC NO. < 1/3(STM)	…….
	REQUIRED LEAKAGE CLASS	[] II [] III [■] IV [] V [] VI	…….
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	…….
	VACUUM SERVICE	[■] YES [] NO	
	ANTI CAVITATION TRIM	[] YES [■] NO	
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	……|……
	TRAVEL TIME FOR		…….
	OPEN TO CLOSE, CLOSE TO OPEN	<10SEC	…….
	VALVE POSN. ON SIGNAL AIR FAILURE	[] TO OPEN [] STAYPUT [■] TO CLOSE	…….
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO CLOSE	…….
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 POSITIONER	…….
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	…….
	E/P CONVERTER	PART OF POSITIONER	…….
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	…….
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	…….
	LOCAL POSITION INDICATOR	[■] REQUIRED	…….
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	…….

Tag No. :… DRV-78 ……. Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	17	0.3	0.12	64			
	2.	60% MCR	28	0.4	0.16	72			
	3.	100% MCR	54	0.55	0.25	82.5			
	4.	VWO	59	0.6	0.25	84			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 3.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 3.5/VACUUM | 90 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

Tag No. :…DRV-81 …. … Qty.: …1
KKS No: LCJ24AA101 Ref. Drg. No:-PE-DG-408-100-N104

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	GSECL- 1X800 MW WANAKBORI TPS	……
	SERVICE	LPH-2A&2B ALT. DRAIN TO F/T-B	……
	LOCATION	[■] INDOOR [] OUTDOOR	……
	DUTY	[] ON/OFF [■] MODULATING	……
	PIPE SIZE (inlet / outlet)	219.1 x 6.35 | 219.1 x 6.35	……
	PIPE MATERIAL (inlet / outlet)	SA 106 GR B | SA 106 GR B	……|……
BODY	MODEL NO.	BIDDER TO INDICATE	……
	TYPE OF BODY: GUIDING : NO. OF PORTS	[■] GLOBE [] ANGLE | [] TOP [■] CAGE | ONE	……|……|……|…… ……|……|……
	BODY SIZE: PORT SIZE: DESIGN CV	BIDDER TO INDICATE	…
	END CONNECTION & RATING (ANSI)	[■] BWE [] SWE [] FLANGED	……
	BODY MATERIAL	[] A216 WCB [■] A217 WC6 [] SS [] A217 CS	……
		[] A351 CF8M	……
	PACKING: MATERIAL SINGLE / DOUBLE	[] PTFE [■] GRAFOIL [■] DOUBLE [] SINGLE	……|……
	BONNET TYPE	BIDDER TO INDICATE	……
	TRIM FORM	[■] LINEAR [] EQ. PERCENTAGE	……
		[] QUICK OPEN (ON/OFF)	
	TRIM MATERIAL: SEAT | PLUG	440C | 440C	……|……
	: CAGE | GUIDE BUSH	440C | 440C	……|……
	FLOW DIRECTION	BIDDER TO INDICATE	……
	OUTLET VELOCITY	[■] < 7 M/SEC (WATER) | [] MAC NO. < 1/3(STM)	……
	REQUIRED LEAKAGE CLASS	[] II [] III [] IV [■] V [] VI	……
	NOISE LEVEL (dBA)	LESS THAN 85 dBA	……
	VACUUM SERVICE	[■] YES [] NO	……
	ANTI CAVITATION TRIM	[] YES [■] NO	……
PNEUMATIC ACTUATOR	MODEL NO. & SIZE	BIDDER TO INDICATE	……|……
	CLOSE AT : OPEN AT (KG/CM2g)	TO SUIT ACTUATOR'S DESIGN	……|……
	TRAVEL TIME FOR	<10 SEC	……
	OPEN TO CLOSE, CLOSE TO OPEN		……
	VALVE POSN. ON SIGNAL AIR FAILURE	[■] TO OPEN [] STAYPUT [] TO CLOSE	……
	VALVE POSN. ON SUPPLY AIR FAILURE	[■]TO OPEN	……
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 POSITIONER	……
	SOLENOID VALVE	[] REQUIRED [■] NOT REQUIRED	……
	E/P CONVERTER	PART OF POSITIONER	……
	JUNCTION BOX	[■] REQUIRED [] NOT REQUIRED	……
	HAND WHEEL (SIDE MOUNTED)	[■] REQUIRED	……
	LOCAL POSITION INDICATOR	[■] REQUIRED	……
	ELECTRO PNEUMATIC POSITIONER	[] REQUIRED [■] NOT REQUIRED	……

Tag No. :… DRV-81 ….. … Qty.: …1

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)	± 1% ± 1% ± 0.5% ± 1%	…… …… …… ……

	SL. No. +	LOAD	FLOW (T/HR)	INLET PR. KG/CM2(A)	OUTLET PR. KG/CM2(A)	INLET TEMP DEG (C)	CALC ULATED CV	% VLV LIFT	VLV O/L VELOCITY
SERVICE CONDITION	1.	40% MCR	17	0.3	0.2	64			
	2.	60% MCR	28	0.4	0.2	72			
	3.	100% MCR	54	0.55	0.2	82.5			
	4.	VWO	59	0.6	0.2	84			
	VALVE TYPE						[] CAVITATION [■] FLASHING [] HIGH DP		
	MAX SHUT OFF PRESS (KG/CM2g) 3.5 BODY DESIGN : PRESS (KG/CM2g) | TEMP (DEG C) 3.5/ VACUUM | 90 IBR FORM III-C [] REQUIRED [■] NOT REQUIRED						……		

TOTAL WEIGHT (VALVE + ACTUATOR + ACCESSORIES) Kg	……

SECTION – D

DATA SHEETS – ACCESSORIES FOR CONTROL VALVES

BHEL	Technical specification for **Control Valves with Accessories** (Pneumatically Operated) **1 X 800 MW WANAKBORI TPS** **EXTN UNIT-8**	SPECIFICATION NO. PE-TS-408-145-I104 VOLUME IIB SECTION D REV. NO. 00 DATE: 31.07.15 SHEET 103 OF 129

Tag No…… **Quantity**……. Data Sheet No. PES-145-06-DS1-0

ITEMS SHALL BE 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) (TO BE FILLED BY PURCHASER)						DATA SHEET – B (TO BE FILLED-UP BY BIDDER)
POSITIONER (SMART)	MFR. & MODEL NUMBER			TO BE INDICATED IN VENDOR'S DOCUMENT		
	BYPASS	GAUGES	ENCL. CLASS	☐ YES ■ NO	☐ THREE ■ TWO ■ IP-55	
	INPUT SIGNAL (ELECTRICAL)			4-20 mA DC		
	OUTPUT SIGNAL (PNEUMATIC)(Kg / Cm^2)			TO SUIT ACTUATOR		
AIR FILTER REGULATOR	MFR. & MODEL NUMBER			TO BE INDICATED IN VENDOR'S DOCUMENT		
	AIR SUPPLY PRESS (Kg / Cm^2 g)			■ 5.0 - 8.0		
	FILTER SIZE			5 MICRONS		
	OUTPUT PRESS (Kg / Cm2 g)			TO SUIT SMART POSITIONER		
	OUTPUT GAUGE			■ REQUIRED ☐ NOT REQUIRED		
AIR LOCK	MFR. & MODEL NUMBER			TO BE INDICATED IN VENDOR'S DOCUMENT		
	SET PRESS (Kg / Cm^2)			TO BE INDICATED IN VENDOR'S DOCUMENT		
	SUPPLY PRESS (Kg / Cm^2)			■ 5.0 - 8.0		
	RESET TYPE			AUTO		
	VENT PLUG			REQUIRED		
LIMIT SWITCH	MFR. & MODEL NUMBER			TO BE INDICATED IN VENDOR'S DOCUMENT		
	OPEN posn	INT posn	CLOSE posn	**1 NO.**	**---**	**1 NO.**
	CONTACT TYPE			SPDT 2 NO + 2 NC		
	RATING (AC / DC)			5A 240V AC AND 0.2A 220V DC		
	ENCLOSURE CLASS			■ IP 55		
POSITION TRANSMITTER (IN BUILT IN SMART POSITIONER)	MFR. & MODEL NUMBER			NOT APPLICABLE		
	TYPE			■ Electronic (2-Wire Type),Non-Contact Type ☐ OTHER		
	SUPPLY			■ 24V DC ☐ 220V DC ☐ 110V AC ☐ 240V AC		
	OUTPUT RATING			■ 4-20mA ☐ 0-100 ohms		
	ACCURACY			± 1% FS		
	ENCLOSURE CLASS			■ IP 65		
SOLENOID VALVE	MFR. & MODEL NUMBER			TO BE INDICATED IN VENDOR'S DOCUMENT		
	RATING			■ 24V DC ☐ 220V DC ☐ 240V AC ☐		
	OPERATION	QUANTITY		☐ Stayput ■ Interlock	AS PER DATASHEET & HOOK UP	
	COIL INSULATION CLASS			CLASS - H		
	ENCLOSURE CLASS			■ IP 65		
HANDWHEEL	ORIENTATION			☐ TOP MOUNTED ■ SIDE MOUNTED		
JUNCTION BOX	NO. OF WAYS			☐ 24-WAYS ■ 36-Ways ☐ AS REQUIRED		
	SIZE			AS REQUIRED		
	CABLE GLANDS (Size / Quantity)			AS REQUIRED (Double Compression Type).		
	ENCLOSURE CLASS			■ IP 55		
I/P CONVERTER	MFR. & MODEL NUMBER			IN BUILT IN SMART POSITIONER		
	INPUT SIGNAL	POWER SUPPLY				
	SPLIT RANGE					
	ENCLOSURE CLASS					
SS Tubing & Fittings / per CV	**This is in addition to SS Tubing and fittings which are integral part of CV**			12 Meters of ¼ " SS Tubing, with 1 set of SS Fittings for each CV for connection to IA Header on one end and accessories on another end of CV.		

COMPANY SEAL
NAME
SIGNATURE
DATE

SECTION-D

DATA SHEETS -C

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 CV	
	END CONNECTION & RATING (ANSI)	
	BODY MATERIAL	
	PACKING MATERIAL SINGLE / DOUBLE	
	BONNET TYPE / MATERIAL	
	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	
	VLV POSN. ON SIGNAL ELEC 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	
	PRESSURE GAUGES	

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.									

SECTION-D

QUALITY PLAN

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-408-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	00 DATE: 31.07.15
SHEET	108 OF 129

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	1,4	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/ Consultant

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-408-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	00 DATE: 31.07.15
SHEET	109 OF 129

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	

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/ Consultant

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	Refer Note-7
		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**											

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/ Consultant

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.:	**PE-QP-408-145-I 006**
VOLUME	IIB
SECTION	D
REV. NO.	00 DATE: 31.07.15
SHEET	111 OF 129

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	
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1,4	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	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	1,4	1,4	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		3. Linearity/cam characteristic	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		4. Repeatability	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2	1,4	1,4	Refer Note-4
		8. Control Valve 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	As per specs/ Approved drg. / data sheet	Test Certificate	2	1,4	1,4	♦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/ Consultant

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
		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	1,4	1,4	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	1,4	1,4	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	1,4	1,4	
		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	1,4	1,4	
		13. Manual Opening & Closing (Hand wheel Operation)	MI	Visual	One per type	------	-------	Test Certificate	2	1,4	1,4	
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	---	1,4	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	---	1,4	
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1,4	

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/ Consultant

PEM :: C&I

QUALITY PLAN
FOR
CONTROL VALVE (PNEUMATIC)

QUALITY PLAN NO.: **PE-QP-408-145-I 006**
VOLUME IIB
SECTION D
REV. NO. 00 DATE: 31.07.15
SHEET 113 OF 129

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	
5.4	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	1,4	
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, 4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1, 4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
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, 4	
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1, 4	
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1,4	
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Approved data sheet / Mfr. Standard	Approved data sheet / Mfr. Standard	Test Certificate	2	1	1,4	

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/ Consultant

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	
6.0	**PAINTING**	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1,4	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

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. Validity of the Cv test certificate shall not be more than 3 years.
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 and Customer.
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.
7. Calibrator used for calibration shall be approved by government agency & its calibration certificate shall be submitted.

SECTION-D

BILL OF QUANTITY

BILL OF QUANTITY

[A] CONTROL VALVES COMPLETE WITH SMART POSITIONER AND ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB

Sl. No.	TAG NO.	SERVICE/ ITEM DESCRIPTION	TOTAL QTY
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	1
2	CRHV-6	D/A PEGGING FROM AUX. CRH LINE	1
3	CDV-22/25	MAIN CONDENSATE CONTROL	2
4	CDV-40	GSC MIN. FLOW RECIRCULATION	1
5	CDV-46	EXCESS RETURN TO CST	1
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK- B	1
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	1
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	2
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	2
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	2
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	2
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	1
13	DRV-78	LPH-2A & 2B NORMAL DRAIN TO DC-1	1
14	DRV-81	LPH-2A & 2B ALT. DRAIN TO F/T-B	1
15	DRV-73	DEAERATOR OVERFLOW TO F/T	1
16	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	2
17	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	2
18	DRV-40	LPH-4 NORMAL DRAIN TO LPH-3	1
19	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	1
20	DMV-2	DM NORMAL MAKE UP TO HOTWELL	1
21	DMV-5	DM EMERGENCY MAKE UP TO HOTWELL	1
22	DRV-52	DRIP PUMP DISCHARGE CONTROL	1
23	FDV-8	LOW LOAD FEED CONTROL	1
[B]	**¼" SS TUBING (To be supplied Loose)**		360 Meters
[C]	**FITTINGS: (To be supplied Loose)**	**(i)** SS FITTING for Connection to Air Filter Regulator	1 Lot
		(ii) SS FITTING for Connection to Air Lock Relay	1 Lot
		(iii) SS FITTING for Connection to IA Header isolation valve	1 Lot
		(iv) SS EQUAL TEE	1 Lot
		(v) ½" NPT (M) X I/4" OD TUBE CONNECTOR	1 Lot

SECTION-D

SPARES

LIST OF COMMISSIONING SPARES

Sl. No.	ITEM DESCRIPTION	QUANTITY
1.	Gaskets	One (1) set with each control valve Tag
2.	Gland Packings	One (1) set with each control valve Tag

LIST OF MANDATORY SPARES FOR ALL CONTROL VALVES EXCEPT FEED CONTROL VALVE

Sl. No.	ITEM DESCRIPTION	QUANTITY FOR 1 UNIT
1.	Stem Packing	2 sets for each control valve
2.	Trim (including cage,plug,stem,seat rings,guide bushings etc.)	1 set for each control valve
3.	Actuators	1 Set of each type and rating
4.	SMART positioner	10% of each type
5.	Limit Switch	10% of each type

LIST OF MANDATORY SPARES FOR LOW LOAD FEED CONTROL VALVE

Sl. No.	ITEM DESCRIPTION	QUANTITY FOR 1 UNIT
1.	Bonnet	50% of total quantity used
2.	Stem Packing	2 sets for each control valve
3.	Trim (including cage,plug,stem,seat rings,guide bushings etc.)	1 set for each control valve
4.	Actuators	1 Set of each type and rating
5.	SMART positioner	10% of each type
6.	Limit Switch	10% of each type

SECTION – D

SUB VENDORS LIST

SUB VENDOR LIST

1.	Air Filter regulator	Placka/ Shavo Norgan/ ABB/Bells Control/Schrader/Veljan
2.	Solenoid	ASCO/Avcon/ Rotex/ Schrader/ Herion Norgren/ Schovill Duncan Ltd.
3.	Smart Positioner	Metso/ Emerson/ Seimens/ ABB/ Flow Serve/ Foxboro/ Yamatake

BLANK

GUJARAT STATE ELECTRICITY CORPORATION LIMITED

1 X 800 MW WANAKBORI TPS EXTN UNIT-8

TECHNICAL SPECIFICATION
FOR
CONTROL VALVES WITH ACCESSORIES
(Pneumatically Operated)

VOLUME III

SPECIFICATION No: PE-TS-408-145-I104

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

CONTENTS

VOL-III

SCHEDULE OF DRAWINGS, DATASHEETS, DOCUMENTS, CATALOGUES SUBMITTED WITH THE BID

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

SCHEDULE OF PRICES

[A] CONTROL VALVES COMPLETE WITH SMART POSITIONER AND ALL ACCESSORIES MOUNTED, TUBED AND TERMINATED ON JB

Sl. No.	TAG NO.	SERVICE/ ITEM DESCRIPTION	UNIT PRICE (Ex- Works)	TOTAL PRICE FOR 1 UNIT (Ex- Works)
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER		
2	CRHV-6	D/A PEGGING FROM AUX. CRH LINE		
3	CDV-22/25	MAIN CONDENSATE CONTROL		
4	CDV-40	GSC MIN. FLOW RECIRCULATION		
5	CDV-46	EXCESS RETURN TO CST		
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK- B		
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING		
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B		
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A		
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR		
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A		
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B		
13	DRV-78	LPH-2A & 2B NORMAL DRAIN TO DC-1		
14	DRV-81	LPH-2A & 2B ALT. DRAIN TO F/T-B		
15	DRV-73	DEAERATOR OVERFLOW TO F/T		
16	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B		
17	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A		
18	DRV-40	LPH-4 NORMAL DRAIN TO LPH-3		
19	DRV-43	LPH-4 ALT. DRAIN TO F/T-B		
20	DMV-2	DM NORMAL MAKE UP TO HOTWELL		
21	DMV-5	DM EMERGENCY MAKE UP TO HOTWELL		
22	DRV-52	DRIP PUMP DISCHARGE CONTROL		
23	FDV-8	LOW LOAD FEED CONTROL		
[B]	**360 meters OF SS TUBING (Per Unit) FOR CONNECTION BETWEEN IA HEADER ON ONE END AND ACCESSORIES ON THE OTHER END OF CV**			
[C]	**(i) 1 LOT OF SS FITTINGS FOR CONNECTION TO AIR FILTER REGULATOR (AS PER HOOK-UP DIAGRAM)**			
	(ii) **1 LOT OF SS FITTINGS FOR CONNECTION TO AIR LOCK RELAY (AS PER HOOK-UP DIAGRAM)**			
	(iii) 1 LOT OF SS FITTINGS FOR CONNECTION TO IA HEADER ISOLATION VALVE (AS PER HOOK-UP DIAGRAM)			
	(iv) 1 LOT OF SS EQUAL TEE (AS PER HOOK-UP DIAGRAM)			
	(v) 1 LOT OF ½" NPT (M) X I/4" OD TUBE CONNECTOR			
[D]	**START-UP/COMMISSIONING SPARES(SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)**			
	(i) 1 SET OF BODY AND BONNET GASKETS FOR EACH CV			
	(ii) 1 SET OF GLAND PACKINGS FOR EACH CV			
[E]	**MANDATORY SPARES AS PER LIST ENCLOSED IN SECTION D (SEPARATE SHEET WITH BREAK UP TO BE ATTACHED)**			
[F]	**Cv TEST CHARGES FOR EACH TYPE OF CONTROL VALVE**			

SCHEDULE OF UNIT PRICES

CONTROL VALVE ACCESSORIES

S. No.	ITEMS	UNIT PRICE
1. $	SMART POSITIONER EACH MODEL AND TYPE	
2.	AIR FILTER REGULATOR	
3.	AIR LOCK RELAY	
4. $	POSITION LIMIT SWITCH OF EACH MODEL AND TYPE	
5.	ELECTRONIC POSITION TRANSMITTER OF EACH MODEL AND TYPE	
6.	SOLENOID VALVE	
7.	VOLUME BOOSTER (PNEUMATIC RELAY)	
8. $	PRESSURE GAUGES OF EACH TYPE	
9.	JUNCTION BOX (36 WAYS)	
10.	HANDWHEEL	
11. $	ACTUATOR OF EACH TYPE	
12.	SS FITTING FOR CONNECTION TO AIR FILTER REGULATOR	
13.	SS FITTING FOR CONNECTION TO AIR LOCK RELAY	
14.	SS FITTINGS FOR CONNECTING TO AIR HEADER	
15.	SS EQUAL TEE	
16.	SS TUBING PER METRE	
17. $	VALVE STEM WITH PLUG & SEAT RING EACH SIZE & TYPE	
18. $	GASKET OF EACH SIZE AND TYPE	
19. $	BODY SEAL GASKETS OF EACH SIZE AND TYPE	
20. $	CAGE OF EACH SIZE AND TYPE	
21. $	GLAND PACKING EACH SIZE AND TYPE	
22. $	VALVE TRIM OF EACH SIZE AND TYPE	
23. $	DIAPHRAM OF EACH SIZE AND TYPE	
24. $	SEAL BOX “O” RING OF EACH TYPE AND SIZE	
25. $	COLOR “O” RING OF EACH TYPE AND SIZE	
26.	POSITION TRANSMITTER	

NOTE

$: Separate list to be attached for each size and type of these control valve accessories.

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

CV TEST CHARGES

S.NO.	ITEM DESCRIPTION		CV TEST CHARGES (Ex- works)
S. No.	**TAG NO.**	**SERVICE**	
1	ASV-8	D/A PEGGING FROM AUX. STEAM HEADER	
2	CRHV-6	D/A PEGGING FROM AUX. CRH LINE	
3	CDV-22/25	MAIN CONDENSATE CONTROL	
4	CDV-40	GSC MIN. FLOW RECIRCULATION	
5	CDV-46	EXCESS RETURN TO CST	
6	CDV-67	CONDENSATE SPRAY TO FLASH TANK- B	
7	CDV-72	CONDENSATE FOR VALVE GLAND SEALING	
8	DRV-14/20	HPH-7A/7B NORMAL DRAIN TO HPH-6A/6B	
9	DRV-17/23	HPH-7A/7B ALT. DRAIN TO F/T-A	
10	DRV-27/34	HPH-6A/6B NORMAL DRAIN TO DEAERATOR	
11	DRV-30/37	HPH-6A/6B ALT. DRAIN TO F/T-A	
12	DRV-58	LPH-3 ALT. DRAIN TO F/T-B	
13	DRV-78	LPH-2A & 2B NORMAL DRAIN TO DC-1	
14	DRV-81	LPH-2A & 2B ALT. DRAIN TO F/T-B	
15	DRV-73	DEAERATOR OVERFLOW TO F/T	
16	DRV-2/8	HPH-8A/8B NORMAL DRAIN TO HPH-7A/7B	
17	DRV-5/11	HPH-8A/8B ALT. DRAIN TO F/T-A	
18	DRV-40	LPH-4 NORMAL DRAIN TO LPH-3	
19	DRV-43	LPH-4 ALT. DRAIN TO F/T-B	
20	DMV-2	DM NORMAL MAKE UP TO HOTWELL	
21	DMV-5	DM EMERGENCY MAKE UP TO HOTWELL	
22	DRV-52	DRIP PUMP DISCHARGE CONTROL	
23	FDV-8	LOW LOAD FEED CONTROL	

NOTE: a) CHARGES TO BE INDICATED AGAINST EACH TAG NO.

b) CV TEST TO BE CONDUCTED FOR ONE PER TYPE PER SIZE , CV VALUE , TAG NOS. TO BE GROUPED ACCORDINGLY AND INDICATED

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

INSPECTION SCHEDULE

(PLACE & ADDRESS OF TESTING/ INSPECTION AND ITS SCHEDULE DATE & DURATION IN NUMBER OF DAYS ITEM/COMPONENTWISE TO BE LISTED)

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

DEVIATION SCHEDULE

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