TECHNICAL REQUIREMENTS

ALL THE REQUIREMENTS UNLESS OTHERWISE SPECIFIED IN THIS DRAWING SHALL BE AS PER ST47050 . ALL THE TECHNICAL DATA REQUIRED AS PER ST47050 FOR THE OFFERED SYSTEM SHALL BE FURNISHED BY THE SUPPLIER AT THE TIME OF SUBMISSION OF THE OFFER. LP BY PASS VALVES ALONG WITH THEIR ACTUATORS AND HYDRAULIC SUPPLY UNIT INCLUDING THE WATER INJECTION VALVES, FLOW NOZZLE etc. AS PER THE SCOPE OF SUPPLY MENTIONED IN ANNEXURE-1 SHALL BE OFFERED TO SUIT THE OPERATING PARAMETERS AS GIVEN IN THE CORRESPONDING DRAWINGS/SPECIFICATIONS AND SHALL ALSO MEET THE DESIGN, MANUFACTURING AND SUPPLY REQUIREMENTS AS SPECIFIED BELOW :-

1. DESIGN, MANUFACTURING AND TESTING REQUIREMENTS:-

1.1 LP BYPASS VALVE ALONGWITH DESUPERHEATER AND ELECTRO-HYDRAULIC ACTUATOR:

1.1.1 LP BYPASS VALVES, DESUPERHEATER AND ACTUATORS SHALL BE DESIGNED & MANUFACTURED TO SUIT THE INPUT PARAMETERS SPECIFIED IN THE DRAWING NO.3-12300-07801. SELECTED CV OF LP BYPASS VALVE SHALL HAVE SUFFICIENT MARGIN (AT LEAST 8%) OVER THE MAXIMUM CV VALUE CALCULATED AS PER OPERATING CONDITIONS MENTIONED IN DRAWING NO.3-12300-07801.

1.1.2 SUPPLIER TO FURNISH THE **SIZING CALCULATIONS FOR LP BYPASS VALVE, DESUPERHEATER & ACTUATORS** FOR BHEL REVIEW.

1.1.3 (A) VALVE BODY ALONG WITH DE-SUPERHEATER BODY SHALL BE OF MATERIAL GRADE ASTM A182Gr.F91.

1.1.3 (B) MATERIAL FOR MAJOR VALVE COMPONENTS VIZ. VALVE STEM, VALVE PLUG, VALVE SEAT, INLET CAGE/STRAINER SHALL BE ASTM A182Gr.F91/ INCONEL 718 OR HIGHER GRADE MATERIAL.

1.1.4 VALVE BODY SHALL HAVE **THE TYPE OF CONSTRUCTION** AS SHOWN IN THE ARRANGEMENT DRAWING NO. 3-12300-07802. OVERALL DIMENSIONS OF THE VALVE ALONGWITH ASSOCIATED EQUIPMENT SHALL BE IN ACCORDANCE WITH THE ARRANGEMENT DRAWING. VALVE SEAT OF LP BYPASS VALVE SHALL BE DIRECTLY MOUNTED ON THE VALVE BODY.

1.1.5 WELD END DETAIL AT THE INLET & OUTLET OF LPBP VALVE SHALL BE AS PER ASME B16.25, FORM/ FIGURE-6B.

1.1.6 LP BYPASS VALVE WITH DESUPERHEATER WILL BE WELDED BETWEEN THE INLET & OUTLET PIPES AND SUSPENDED THROUGH VALVE SUSPENSION (IN BHEL SCOPE OF SUPPLY). THE VENDOR SHOULD ENSURE PROVISION OF **SUSPENSION BRACKETS ON THE VALVE BODY** IN LINE WITH BHEL DRG.NO. 3-12300-07802.

1.1.7 (a) SIZING AND DESIGN OF THE ACTUATOR SHALL BE DONE TO SUIT THE OPERATING CONDITION WITH **LINEAR VALVE CHARACTERISTICS** & SHALL BE SUITABLE FOR OPERATION WITH **NORMAL WORKING PRESSURE OF 160 BAR AND MIN WORKING PRESSURE OF 115 BAR** CONTROL FLUID FRF (FIRE RESISTANT FLUID) AS MEDIUM. THE DESIGN OF SERVO VALVE GIVEN IN THE SPECIFICATION ST47050 IS TYPICAL. THE CONTROL BLOCK OF EACH ACTUATOR SHALL BE MOUNTED ON ACTUATOR .THE PROVEN SERVO VALVE IS TO BE OFFERED FOR CONTROL VALVE ACTUATORS.

1.1.7 (b) THE VENDOR TO SUBMIT THE DETAILED SIZING CALCULATION OF THE ACTUATOR IN ALL APPLICABLE OPERATING CONDITIONS MAINLY INCLUDING THE FOLLOWING.

(i) OPENING OF VALVE AT 0% STROKE CONDITION.

(ii) OPENING OF VALVE AT ABOUT 100% STROKE CONDITION.

(iii) CLOSING **OF VALVE AT ABOUT 100% STROKE CONDITION.**

(iv) CLOSING OF VALVE AT ABOUT TO CLOSE CONDITION.

FURTHER VENDOR TO NOTE THAT CALCULATION FOR OPENING CASE SHOULD BE DONE AT MIN WORKING PRESSURE OF 115 BAR AND THERE SHOULD BE SUFFICIENT MARGIN OF AT LEAST 15% FOR THESE CASES (CASE i & ii).

1.1.8 FRF SHALL BE USED FOR ACTUATION OF ACTUATORS. (ALSO REFER CLAUSE 6.4 OF ST47050). THE FRF SHALL BE 100% TRIXYLENYL PHOPHATE (TXP) AND AS PER ANY OF THE FOLLOWING BRANDS:

A) RELOUBE TURBOFLUID 46XC OR B) FYRQUEL EHC-N. VENDOR SHALL ENSURE COMPATIBILITY OF ITS ACTUATORS WITH THESE BRANDS OF FRF.

1.1.9 FUNCTIONAL TESTING OF COMPLETE LPBP SYSTEM INCLUDING WATER INJECTION VALVE (WITH HYDRAULIC ACTUATOR) SHALL BE CARRIED OUT USING **ANY BRAND OF FRF SPECIFIED AT** CL.1.1.8 ABOVE. **IN CASE ANY OTHER BRAND OF FRF IS USED FOR TESTING,** THEN IT SHALL BE DRAINED COMPLETELY AND ALL THE EQUIPMENTS SHALL BE FLUSHED WITH **ANY BRAND OF FRF SPECIFIED AT** CL.1.1.8.

1.1.10 VENDOR TO FURNISH **WARMUP PROCEDURE** ALONG WITH **RECOMMENDED STEAM QUANTITY** AND STEAM PARAMETERS. WARM UP & DRAIN CONNECTION SHALL BE OF SIZE 60.3X6.35mm, MATERIAL P91 OR EQUIVALENT.

1.1.11 THE VENDOR TO FURNISH **CASING DRG. OF LPBP VALVE** WITH COMPLETE DIMENSIONS OF ALL CONTOURS REQUIRED FOR PROCUREMENT OF THERMAL INSULATION BY BHEL ALONG WITH SURFACE AREA.

1.1.12 THE VENDOR SHALL FURNISH STEAM BLOWING DEVICE (SBD) DRAWING & ITS PART LIST FOR LPBP VALVE. THE DESIGN PRESSURE AND TEMPERATURE FOR SBD SHALL BE 60 BAR & 400°C RESPECTIVELY. FUTHER THE VENDOR TO SUBMIT SIZING CALCULATIONS OF SBD INDICATING DISTURBANCE FACTOR CONSIDERED IN THE DESIGN.

1.1.13 THE VENDOR SHALL FURNISH CROSS-SECTIONAL DRG. & BOM OF LPBP VALVE , ACTUATOR & DESUPERHEATER INDICATING DIMENSIONS, WEIGHT & C.G. ALONG WITH THE OFFER.

1.1.14 IN FAILURE MODE, LPBP VALVE SHALL BE IN CLOSED CONDITION.

1.1.15 ALL COMPONENTS OF ACTUATORS (i.e. POS.TRANSMITTERS, LIMIT SWITCHES, SERVO VALVES, POPPET VALVES, CARTRIDGE VALVES, INSTRUMENTS ETC.) SHALL BE PROVEN ONE & PERMANENTLY IDENTIFIED WITH FRF-RESISTANT NAME/RATING PLATES & INSCRIPTION PLATES/TAG NOS. ACCORDING TO THE SYSTEM P&I DIGARAM TO BE FINALIZED AFTER THE PLACEMENT OF ORDER. THE VENDOR SHALL FURNISH, THE DRG & PART LIST OF HYDRAULIC TEST DEVICE.

1.1.16 FOR SINGLE STEM LPBP VALVE STRAINER IS TO BE PROVIDED MANDATORILY BY THE VENDOR, REST REQUIREMENT SHALL BE AS PER CL. 4.5 OF ST47050. MAX. HOLE SIZE (DIA) IN THE STRAINER TO BE $\leq$ 3 mm.

1.1.17 OPERATING PHILOSOPHY OF LP BYPASS ACTUATOR SHALL BE:

FRF PRESSURE TO OPEN AND SPRING FORCE TO CLOSE.

1.2 HYDRAULIC SUPPLY UNIT (HPSU) :

1.2.1 DESIGN & SIZING OF HYDRAULIC SUPPLY UNIT (HPSU) FOR SUPPLY OF OPERATING FLUID FRF (FIRE RESISTANT FLUID) TO VARIOUS ACTUATORS AT NOMINAL PRESSURE OF 160 BAR SHALL BE CARRIED OUT BASED ON THE SELECTED DESIGN OF ACTUATORS FOR LPBP VALVES, WATER INJECTION VALVES & THEIR NOS. SPECIFIED FOR THE LPBP SYSTEM. SUPPLIER SHALL FURNISH THE SIZING CALCULATION OF HPSU FOR BHEL REVIEW AT THE TIME OF SUBMISSION OF OFFER.

1.2.2 HPSU SHALL BE PROVIDED WITH PRESSURE RELIEF VALVES WITH SUITABLE PRESSURE SWITCHES AND GAUGES & TRANSMITER AS PER SUPPLIER'S PRACTICE. SETTING PRESSURE OF RELIEF VALVES SHALL BE INDICATED BY THE SUPPLIER IN THEIR OFFER FOR BHEL REVIEW.

1.2.3 ALL COMPONENTS OF HPSU (I.E. COOLERS, ACCUMULATORS, FILTERS, HEATERS, PUMPS, MOTORS, VALVES, INSTRUMENTS ETC) SHALL BE PROVEN ONE & PERMANENTLY IDENTIFIED WITH FRF-RESISTANT NAME/RATING PLATES & INSCRIPTION PLATES/TAG NO.S ACCORDING TO THE SYSTEM P&I DIAGRAM TO BE FINALISED AFTER THE PLACEMENT OF ORDER.

1.2.4 THE HPSU SHALL BE DESIGNED WITH A SUITABLE PROTECTIVE ENCLOSURE. TECHNICAL DETAILS OF THE SAME SHALL BE FURNISHED IN THE OFFER. DESIGN OF PROTECTIVE CABINET SHALL BE SUITABLE FOR MAX. SOUND PRESSURE LEVEL OF 85dBA AT FULL OUTPUT OF MOTOR/PUMP UNIT AND AUXILIARY CYCLE GIVEN IN THE OFFER.

1.2.5 THE HPSU SHOULD ALSO BE PROVIDED WITH:

A. 100% REDUNDANT CF PUMPS (AXIAL PISTON PUMP) & MOTORS.

B. 100% REDUNDANT PUMP FOR COOLING CUM FILTRATION & REGENERATION CIRCUIT, MOTORS, WATER COOLERS,TEMPERATURE CONTROL VALVES ETC.

C. AIR BREATHER ARRANGEMENT, FILTERS, BALL VALVES, CHECK VALVES, ACCUMULATORS, TANK HEATER, LEVEL INDICATOR, REGENERATION UNIT, LEAK FLUID COLLECTING PAN ETC.

1.2.6 CONTROL FLUID REGENERATION UNIT SHALL BE A WELL PROVEN SYSTEM. VENDOR TO PROVIDE COMPLETE DETAILS IN THE OFFER FOR BHEL REVIEW.

1.2.7 THE PRELIMINARY DATA FOR DESIGN/SIZING OF WATER COOLERS FOR HPSU SHALL BE AS FOLLOWS:

A. DESIGN PRESSURE OF COOLER (MECHANICAL)-25 KG/CM2,

B. DESIGN TEMPERATURE OF COOLER (MECHANICAL)-100°C,

C. COOLING WATER INLET TEMPERATURE - 40°C,

D. MAXIMUM COOLING WATER FLOW RATE-3 CU.M/HR PER COOLER (TOTAL MAX. FLOW RATE-2X3 CU.M/HR=6 CU.M/HR),

E. COOLING WATER SHALL BE PASSIVATED DEMINERALISED WATER (Ph=9.5),

F. INLET TEMPERATURE OF FRF -60°C, G. INLET PRESSURE 0F FRF $\geq$ 12 BAR,

H. INLET WATER PRESSURE -10 BAR(MAX),

THE FINAL DATA FOR DESIGN/SIZING OF WATER COOLERS FOR HPSU SHALL BE CONFIRMED BY BHEL AFTER PLACEMENT OF ORDER.

1.2.8 VENDOR TO PROVIDE PRESSURE RELIEF VALVE, VENT LINES, DRAIN LINES , ISOLATING VALVES & THERMOSTATIC FLOW CONTROL VALVES IN COOLING WATER CIRCUIT OF HPSU (AS PER COOLING WATER SCHEME GIVEN IN SHEET NO. 2).

1.3 WATER INJECTION CONTOL VALVE (WIV):

1.3.1 DESIGN, MANUFACTURING AND SUPPLY OF THE WATER INJECTION CONTROL VALVE AND ITS HYDRAULIC ACTUATOR SHALL BE AS PER THE REQUIREMENTS SPECIFIED IN THE DRAWING NO. 2-12300-07803.

1.3.2 VENDOR SHALL PROVIDE COMPLETE DETAILS OF CONTROL PHILOSOPHY FOR ENTHALPY BASED CONTROL FOR SPRAY WATER VALVE. CONTROL ALGORITHM CONTAINING DETAILS OF GENERATION OF ENTHALPY SET POINT AND CALCULATION OF ACTUAL ENTHALPY SHALL BE FURNISHED. A SCHEME (P & ID) INDICATING THE INSTRUMENTS REQUIRED TO IMPLEMENT THE SYSTEM SHALL ALSO BE FURNISHED.

1.4 FLOW NOZZLES FOR WATER INJECTION VALVE:

1.4.1 DESIGN, MANUFACTURING AND SUPPLY OF FLOW NOZZLE SHALL BE AS PER DRG.NO.3-13360-83501.

1.5 DUMP TUBE :

1.5.1 DUMP TUBE SHALL BE DESIGNED FOR THE FOLLOWING CONDITIONS:

A) ENTHALPY OF EXHAUST STEAM SHALL BE 2650 KJ/KG

B) MECHANICAL DESIGN PRESSURE/TEMPERATUE- 15 BAR/ 500 DEG C

C) 5% MARGIN IN FLOW AREA AGAINST VWO TRIP CASE i.e. 319.95 KG/SEC TO BE CONSIDERED FOR SIZING OF DUMP TUBE.

D) CONDENSER PARAMETERS DURING LPBP OPERATION:- PRESSURE 0.1 BAR & STEAM TEMPERATURE 80.3 DEG. C.

1.5.2 THE ARRANGEMENT OF DUMP TUBE SHALL BE AS PER DRG.NO.3-12300-07802. VENDOR TO SUBMIT **MATERIAL GRADE/DETAILS, SIZING CALCULATIONS & DRAWING OF DUMP TUBE** FOR BHEL REVIEW. **THE DETAILS OF LIFTING/HANDLING, MOUNTING & SUPPORTING OF DUMP TUBE** SHALL BE MUTUALLY AGREED BETWEEN BHEL & VENDOR. VENDOR TO INCLUDE THESE DETAILS IN THE DRAWING OF DUMP TUBE. ANY OTHER INFORMATION/DETAIL REQUIRED FROM ERECTION/COMMISSIONING POINT OF VIEW SHALL ALSO BE INCLUDED IN THE DRAWING.

1.5.3 WELD END DETAIL AT THE INLET OF DUMP TUBE SHALL BE AS PER ASME B16.25, FORM/ FIGURE-6B.

1.5.4 THE MATERIAL OF DUMP TUBE SHALL BE P22 OR EQUIVALENT FORGING GRADE.

1.5.5 THE VENDOR TO PROVIDE PROVISION OF DRAIN STUB AT THE LOWEST POINT IN DUMP TUBE.

1.5.6 WEIGHT OF DUMP TUBE SHALL NOT EXCEED 2000 KG.

1.6 PIPING BETWEEN DESUPERHEATER AND DUMP TUBE (BHEL SCOPE) :

1.6.1 ARRANGEMENT OF THE PIPING SHALL BE AS PER DRG.NO.3-12300-07802. MATERIAL GRADE OF PIPE SHALL BE P22 OR EQUIVALENT.

2. CIE REQUIREMENTS:-

2.1 ALL INDOOR ELECTRICAL/ELECTRONIC EQUIPMENT SHALL BE DESIGNED TO OPERATE WITHOUT AIR CONDITIONING AT AN INDOOR AMBIENT DESIGN TEMPERATURE RANGE BETWEEN 0°C TO 50° C.

2.2 WELL PROVEN SERVO-VALVES SHALL BE SUPPLIED FOR CONTROL OF THE BYPASS VALVE AND WATER INJECTION VALVE ACTUATORS.

MATERIAL CODE : W903123010 73

2-12300-07700 Ref.Drawing No>

Sign & Date

Inventory No

REV	DATE	ALTERED / CHECKED

GRADE OF UNTOL.DIM

~~M/CC. C/M/F AA0230208~~

~~WELDING A/B/C/D AA0621104~~

~~GAS CUTTING 'T3' AA0621101~~

~~GMS No./GR. SP. NO.~~ STATUS OF DRG U

AGREED DEPT	NAME	SIGN	DATE
CIE	GURPREET	-SD-	09.04.19

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	LOKESH	-SD-	09.04.19
CHD	VIKAS/D.K	-SD-	09.04.19
APPD	R.RAWAT	-SD-	15.04.19

NO. OF VAR —

DEPT STE

CODE 4011

SCALE N.T.S.

WEIGHT (KG) --

REF. TO ASSY. DRG. -----

ITEM No. --

NO. OF ITEMS --

TITLE : LP BYPASS SYSTEM

CARD CODE

DRAWING NO. 2-12300-07800 —

SHEET No. 01 No. OF SHEETS 02

SIZE A2

3. GENERAL REQUIREMENTS:-

3.1 ALL THE FLANGED END CONNECTIONS ON HPSU, ALL ACTUATORS & EQUIPMENTS OF LPBP SYSTEM SHALL BE SUPPLIED WITH MATCHING COUNTER FLANGES, SEALS AND FASTENERS FOR PIPING CONNECTION BY BHEL.

3.2 SUPPLIER SHALL ENSURE THE END CONNECTIONS OF SUPPLY & RETURN PIPELINES OF LPBP SYSTEM EQUIPMENTS AS PER SIZES GIVEN BELOW:-

A SUPPLY PIPE LINE: Ø48.3X5.08, MATERIAL AS PER ASTM A312, GRADE TP321

B RETURN PIPELINE: Ø48.3X3.68, MATERIAL AS PER ASTM A312, GRADETP321

3.3 THE APPLICABLE TIGHTENING TORQUE FOR TIGHTENING ALL THE BOLTS/NUTS SHOULD BE PROVIDED IN THE DRAWINGS OF ALL EQUIPMENTS, AS APPLICABLE.

3.4 ALLOWABLE FORCES (INCLUDING AXIAL & RADIAL FORCES) & MOMENTS (INCLUDING BENDING AND TORSION MOMENTS) AT ALL CONNECTIONS/TERMINAL POINTS OF THE LPBP VALVE (WITH DESUPERHEATER) , HPSU, WATER INJECTION VALVE AND DUMP TUBE SHALL BE PROVIDED BY VENDOR IN THEIR OFFER.

3.5 THE THERMAL EXPANSION VALUES AT ALL CONNECTIONS/TERMINAL POINTS (WITH REFERENCE TO CENTRELINE OF LPBP VALVE OR CENTRELINE OF CONDENSER, AS APPLICABLE) OF THE LPBP VALVE (WITH DESUPERHEATER) AND DUMP TUBE ARE TO BE PROVIDED BY VENDOR IN THEIR OFFER.

3.6 PROVENNESS DETAILS OF THE OFFERED LP BYPASS SYSTEM (i.e. LP BYPASS STOP & CONTROL VALVE ALONG WITH DESUPERHEATER,ACTUATOR,HPSU, WATER INJECTION VALVE WITH ACTUATOR & DUMP TUBE) ARE TO BE SUBMITTED BY THE VENDOR ALONGWITH THE OFFER FOR OUR REFERENCE & CUSTOMER APPROVAL (IF REQUIRED).

3.7 VENDORS MUST ENSURE THAT SIZING CALCULATIONS & SELECTION OF ALL EQUIPMENTS OF LP BY PASS SYSTEM ARE ADEQUATE W.R.T. THE SPECIFICATION REQUIREMENTS OF THE LPBP SYSTEM FOR THE PROJECT. ANY MODIFICATIONS, IF REQUIRED AT A LATER STAGE WILL HAVE TO BE DONE WITHOUT ANY PRICE IMPLICATIONS.

3.8 ALL THE EQUIPMENTS SHALL BE MANUFACTURED WITHIN ±3mm TOLERANCES.

3.9 CHECK-LIST FOR PREPAREDNESS OF SITE BEFORE COMMESSIONING OF LPBP SYSTEM SHALL BE MADE PART OF O&M MANUAL.

4. QUALITY REQUIREMENTS:-

4.1 QUALITY REQTS. SHALL GENERALLY BE IN ACCORDANCE WITH INTERNATIONAL PRACTICES FOR SIMILAR EQUIPMENTS EXCEPT OTHERWISE SPECIFIED IN THE SPECIFICATIONS AND MUTUALLY AGREED QUALITY PLAN ON BHEL FORMAT.

5. TECHNICAL DELIVERY CONDITIONS :-

5.1 SUPPLIER TO FURNISH THE PAINTING DETAIL & GRADE OR ANY OTHER ANTI-CORROSSIVE TREATMENT TO BE DONE ON VARIOUS EQUIPMENTS ALONG WITH THE OFFER FOR REVIEW & APPROVAL BY BHEL.

A. ALL UN-INSULATED EQUIPMENT SHALL BE PAINTED WITH EPOXY RASIN BASED PAINTS WITH MIN. DFT 150 MICRONS. THE PAINT SHALL BE APPLIED IN THREE STAGES i.e. PRIMER, INTERMEDIATE & FINISH COATS IN FOLLOWING MANNER. PRIMER - EPOXY BASED ZINC PHOSPHATE, INTERMEDIATE - EPOXY BASED TiO2 PIGMENTED COAT, FINISH COAT- EPOXY BASED FINISH COAT.

B. EQUIPMENTS WITH HIGH TEMP. SERVICES SHALL BE PAINTED WITH HEAT RESISTANT ALUMINUM PAINT(AS PER IS- 13183) TWO COATS OF PAINT SHALL BE APPLIED WITH TOTAL DFT OF 40 MICRON .

6. DOCUMENTS / INFORMATION REQUIRED ALONG WITH OFFER & AFTER ORDERING (REFER ATTACHED ANNEXURE-II & III):-

6.1 THE VENDOR TO FURNISH THE FILLED UP C**HECK LIST AS PER ANNEXURE - II TO ENSURE COMPLETENESS OF THE OFFER.**

6.2 IN CASE OF ORDER THE VENDOR TO SUBMIT ALL THE DOCUMENTS AS PER MASTER LIST OF DOCUMENTS (ANNEXURE-III) WITHIN 4 WEEKS FROM THE DATE OF PLACEMENT OF P.O. FOR BHEL REVIEW & APPROVAL.

7. SCOPE OF SUPPLY :

COMPLETE SCOPE OF SUPPLY FOR THE SYSTEM AND EQUIPMENTS SHALL BE AS PER ANNEXURE I.

8. PACKING INSTRUCTIONS:

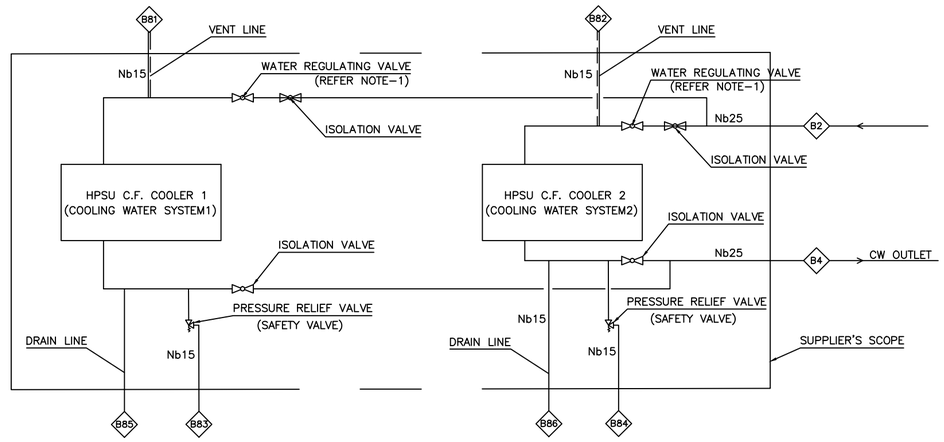
8.1 ALL THE EQUIPMENT/ITEMS SHALL BE SUPPLIED IN CLOSED STEEL BOXES/CLOSED WOODEN BOXES WITH STEEL COVER SHEET.PACKING BOXES SHOULD BE RAIN PROOF.

8.2 PACKING OF ITEM SHOULD BE DONE IN SUCH A WAY THAT IT SHOULD NOT REQUIRE ANY INTERNAL PACKAGE INSPECTION FOR AT LEAST ONE YEAR.

8.3 PACKING BOX OF MANDATORY SPARES SHALL BE PAINTED WITH GREEN COLOUR FOR EASY IDENTIFICATION AT PROJECT SITES.

9. NOTE:-

9.1. DEVIATIONS, IF ANY , FROM THE REQUIREMENTS SPECIFIED IN BHEL DRGS / SPECIFICATIONS SHOULD BE CLEARLY IDENTIFIED IN THE OFFER & SHOULD BE SUBMITTED FOR BHEL REVIEW & APPROVAL.



NOTE-1 : THE REFERRED VALVE SHALL BE SELF ACTUATING TYPE THERMOSTATIC CONTROL VALVE (TYPE-AVTA-25, CODE-003N4150, MAKE-DANFOSS OR EQUIVALENT) TO CONTROL THE WATER SUPPLY ACCORDING TO THE TEMP. OF FRF.

POS.	DESCRIPTION	DIMENSION ACC. TO ASME B36.10M		DIMENSION ACC. TO DIM EN 10220		DIMENSION NOT IN ACC. WITH ASME/DIN EN			CONNECTION				MATERIAL	REMARKS
		Nominal Pipe Size	Schedule	Nominal Size	Wall Thickness	Outer Diameter A* [mm]	Inner Diameter Nominal B* [mm]	Inner Diameter Machined C* [mm]	Type	From/ Figure	Standard**	Nominal Pressure		
B2	COOLING WATER INLET AT HYDRAULIC SUPPLY UNIT	1"	STD	–	–	33.4	–	26.64	butt weld	4	ASME 16.25	–	ASTM-A105	–
B4	COOLING WATER OUTLET AT HYDRAULIC SUPPLY UNIT	1"	STD	–	–	33.4	–	26.64	butt weld	4	ASME 16.25	–	ASTM-A105	–
B81	COOLING WATER SYSTEM 1 TO AIR VENT VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–
B83	COOLING WATER SYSTEM 1 TO SAFETY VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–
B85	COOLING WATER SYSTEM 1 TO DRAIN VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–
B82	COOLING WATER SYSTEM 2 TO AIR VENT VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–
B84	COOLING WATER SYSTEM 2 TO SAFETY VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–
B86	COOLING WATER SYSTEM 2 TO DRAIN VALVE	½"	STD	–	–	21.3	–	15.76	butt weld	4	ASME 16.25	–	ASTM-A105	–

COOLING WATER SCHEME FOR HPSU WATER COOLERS

MATERIAL CODE : W90312301073

* THE DIMENSION A,B&C REFER ONLY TO ASME 16.25

** WELDING BEVEL ∝ =60° FOR ISO 9692-1-FIG. 1.3 AND 2.3

GRADE OF UNTOL.DIM

~~M/CC.-C/M/F AA0230208~~

~~WELDING-A/B/C/D AA0621104~~

~~GAS CUTTING-'T3'AA0621101~~

~~CMS No./CR. SP. NO.~~

	AGREED DEPT	NAME	SIGN	DATE
STATUS OF DRG U	CIE	GURPREET	-SD-	09.04.19

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	LOKESH	-SD-	09.04.19
CHD	VIKAS/D.K	-SD-	09.04.19
APPD	R.RAWAT	-SD-	15.04.19

NO. OF VAR —

DEPT STE

CODE 4011

SCALE N.T.S.

WEIGHT (KG) –

REF. TO ASSY. DRG. -----

ITEM No. --

NO. OF ITEMS --

TITLE : LP BYPASS SYSTEM

CARD CODE

DRAWING NO. 2-12300-07800 —

SHEET No. 02 | No. OF SHEETS 02

SIZE A2

REV	DATE	ALTERED / CHECKED

2-12300-07700 Ref.Drawing No>

Sign & Date

Inventory No

Based on own experience

Purchase Specification

For

Combined LP Bypass Stop & Control Valves With Electro-hydraulic Actuators (EHA)

&

Hydraulic Power Supply Unit (HPSU)

For

Steam Turbine

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
C.I.E	S.K.DAS				
MEMBER-PSC	V.K. CHAUHAN		अनुवादक TRANSLATED BY	-	-
QAX	N.K.MANWANI		निर्माणकर्ता WORKED BY	S.MITTAL	16/04/11
TSX	B.CHOUDHARY	28/04/11	जांचकर्ता CHECKED BY	R.C.AGARWAL	16/4/11
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	R.C.AGARWAL	16/4/11

स्वीकृति APPROVED : (G.C.MISRA) – AGM (STE&GTE) 25.4.11

PR.GP. 3.40

REV.NO. 02 (Supercedes)

Dt. 16.04.11

निर्माण PREPARED : STE

जारी ISSUED : STE –TG

दिनांक DATE : 16.4.11

हस्ताक्षर एवं दिनांक SIGN & DATE 28/4/11

सामग्री सूची संख्या INVENTORY NO. P-6301

I TABLE OF CONTENTS

II LIST OF APPENDICES TO THIS SPECIFICATION

1.0 INTENT OF SPECIFICATION

1.1 Scope of Contract

The Scope of the contract for the system shall be on the basis of the single point responsibility completely covering the following activities and services in respect of all the equipment covered under the specification.

i. Detailed functional design, calculation, analysis & engineering of all equipment, systems, all type of spares, special tools for assembly & disassembly of various equipments & steam blowing devices.
ii. Material Procurement.
iii. Complete manufacturing including functional testing.
iv. Providing engineering data, drawings for purchaser/owner's approval.
v. Providing instruction manuals, as-built drawings, O & M manuals, safety instructions, waste disposal instructions of hydraulic medium etc.
vi. Generation of quality/inspection reports indicating therein the complete test details and their acceptance norms i.e. test certificates indicating therein the chemical, physical & mechanical properties. These test certificates are to be provided as per mutually agreed Quality Plan.
vii. Furnishing list of commissioning & recommended spares.
viii. Seaworthy packing, preservation and transportation from the manufacturer's works to the nearest port for foreign supply; packing and supply ex-works basis for indigenous supply.
ix. Supplier is to make provision that the equipments shall be capable for working continuously at an ambient temperature specified in the input data sheet.

Notes: i. No civil work relating to ground level is in bidder's scope. However, the foundation detail and necessary instructions, if any, in respect to locating of the centralized hydraulic supply unit from foundation point of view, has to be furnished by the bidder well in advance. This detail is required for finalization of the interface engineering activities.
ii. Foundation bolts and fasteners for equipment fastening shall be in the bidder's scope.
iii. Counter flanges along with fasteners & seals suiting to the end connections of actuators & HPSU shall be in bidder's scope.
iv. In this bid specification, the company submitting the inquiry, namely '**BHARAT HEAVY ELECTRICALS LIMITED, HARDWAR, INDIA'** is herein after referred to as "Purchaser" or "BHEL", the manufacturer tendering the bid is referred to as "Bidder", the bidder to whom contract is awarded to as "Supplier".

1.2 Responsibility of bidder:

1.2.1 The bidder shall be responsible for providing all material, equipment and services, specified or otherwise which are required to complete the system and fulfill the intent of ensuring the successful operation, maintainability and the reliability of the complete work covered under this specification. It is not the intent to specify completely here in, all aspects of design and construction of equipment. Nevertheless, the equipment shall conform in all respects to high standards of engineering, design & workmanship & shall be capable of performing in continuous commercial operation, in a manner acceptable to Purchaser/owner.

1.2.2 The bidder is requested to carefully examine and understand the specification prior to submitting the technical offer. Any deviation with respect to BHEL specifications shall be clearly identified in the offer & shall be submitted for BHEL review and approval. No deviation will be allowed after placement of order.

1.2.3 The bidder shall furnish the filled up checklist of documents to ensure completeness of their offer.

1.3 Reliability & Provenness:

All equipments, components & accessories furnished against this specification shall be from the latest proven product range of the bidder. The satisfactory operation & high reliability of these equipments, components & accessories should have been fully established by a considerable record of successful operation. Purchased items shall be procured only from the proven suppliers & the list of all such items shall be furnished for BHEL review/ approval. The Major casting/ forging shall be procured from experienced vendors only. The vendor to submit list of vendors of major casting/ forgings incorporating their experience in last 5 years for the casting/ forgings of applicable material & weight (equal or higher) for BHEL review/approval.

2.0 FUNCTION:

During startup, shutdown due to load shedding or turbine trip out, and also at operations below minimum boiler load, the LP turbine cannot accommodate the entire volume of steam. The LP Bypass control system enables to establish an alternative path for dumping the excess steam into the condenser after de-superheating.

3.0 SCOPE OF SUPPLY:

3.1 The requirement is for LP Bypass Valves comprising of **combined Stop & Control valves mounted in a single valve body with respective Electro-hydraulic Actuators and a centralized Hydraulic Power Supply Unit (HPSU)**. Water injection valve(s) with actuator(s), flow nozzle(s) for measuring water injection quantity are also envisaged in the supplier's scope. The specifications for water injection valve(s) and flow nozzle(s) are separately envisaged.
Accessories for valves e.g. hydraulic test device, steam blowing devices, accessories for hydraulic system e.g. flushing device, filling & gauging device for hydraulic accumulator and manually operated control fluid pump for filling of fluid in control fluid tank of HPSU shall also be in the supplier's scope.
Desuperheating of downstream steam and Fire Resistant Fluid (FRF) may be or may not be in supplier's scope. Such requirements are clarified in input data sheet enclosed with the specification.
Scope of supply with regard to other requirements e.g. special tools & tackles, commissioning spares, mandatory spares, supervision during erection and commissioning, connecting pipe, dump tube etc. shall be as per the input data sheet.

3.2 LP bypass valve with only one stem (single stem valve) is foreseen in some projects as per owner's requirements. In such cases, the valve is actuated for stop as well as control functions by its hydraulic actuator. This requirement is defined in the enclosed input data sheet.

4.0 COMBINED LP BYPASS STOP & CONTROL VALVE:

Valves are to be designed to meet the requirements as stipulated in the input data sheet. The supplier shall ensure that LP bypass valve design shall be capable to withstand thermal shocks occurring during operations.

4.1 Valve Sizing:

Valve supplier will do the valve sizing calculation for **critical flow** based on steam parameters as indicated in the input data sheets and furnish the same for BHEL review and acceptance. The valve supplier shall also furnish the valve data sheets duly indicating therein the valve casing and valve stem material, steam forces, Cv value, valve stroke, opening and closing times etc. Valve manufacturer shall also furnish the Valve characteristics (Flow vs. lift).

4.2 Valve Connections (For Piping) :

Valve manufacturer shall also indicate the steam inlet & outlet connection sizes, material & the type of weld edge preparation inline with input data sheet for BHEL review and approval.

4.3 Valve Seat Tightness :

Seat tightness of LP bypass stop and control valves shall be equivalent to block valve tightness confirming to MSS-SP-61.

4.4 Drain & Warm-up Connections:

Location for warm-up Connection : To be provided at the lowest position of Stop Valve
Location for Drain Connection : To be provided at the lowest position of Control Valve

Drain connection size : Ø60.3X3.91
Warm-up connection size : Ø60.3X3.91

The supplier shall furnish drain & warm-up connection Size, Material and Weld edge detail for BHEL review and approval.

4.5 Steam Strainer:

Steam strainer is to be provided on Stop valve side and it is not mandatory for Control Valve side. It should be installed inside the valve casing in such a way that it renders trouble free, reliable and safe service and is also easy to carryout maintenance. Valve manufacturer is to furnish the detailed sectional view drawing indicating therein the strainer material, fitting details and also specify the pressure drop across the strainer.

4.6 Noise Level:

Maximum Noise Level: 85dB (A) at a distance of 1 meter from the body.

4.7 General Valve Mounting Arrangement:

Type of valve arrangement shall be in accordance with the input data sheet. The valve may be suspended type or pipe mounted as specified in the input data sheet. A typical arrangement of

vertically suspended valve is shown in the **Appendix-1.**

Valve manufacturer shall provide the valve support paws/brackets, which may be welded or integrally cast or fastened to the valve body. Details of the valve support paws/bracket shall be furnished at the time of offer. ***In case of suspended type valve, frame for valve suspension and valve suspension arrangement shall be in BHEL scope.*** Valve manufacturer shall furnish the General Arrangement drawing duly indicating therein the overall assembly dimensions, actuators dismantling space, total weight & must show the location of actuator oil connection and C.G (Center of Gravity) of the complete assembly.

4.8 Steam Blowing blanking arrangement:

Steam blowing of steam inlet pipes is done before putting the valves in actual operation. Valve supplier shall also supply one no. Steam blowing blanking arrangement per LP Bypass valves per Steam Turbine unit along with the main equipment and furnish the blanking arrangement drawing for review.

4.9 Other Requirements:

The supplier to furnish leakage flow quantity through glands of stop & control valve for which pressure of 0.5 bar may be considered at the downstream. Size & material of the weld end for leakage flow connections shall be furnished. In case no leakage from valve glands for stop and control valve are foreseen in the design, specific confirmation for this shall be given in the offer.

5.0 INDIAN BOILER REGULATION:

LP Bypass valves covered under this specification fall under the purview of Indian Boiler Regulation (IBR) and hence must satisfy all the conditions of IBR and the test certificate in IBR form III-C counter signed by an independent inspecting agency/authority approved by Indian Boiler Board shall be required. Assembly drawings of LP bypass valve shall be duly approved/countersigned by the IBR approved inspecting agency/authority.

6.0 LP BYPASS STOP & CONTROL VALVE ACTUATORS:

6.1 LP Bypass Stop & Control Valve Actuators Schemes (Proposed):

a) Sizing of actuators and all other elements such as Filters, Cartridge valves, check valves and throttle orifices etc. mounted on the control manifold of the respective actuators is in the supplier's scope.
Servo-valves for control valve actuators shall act as an interface between the actuators and BHEL's control system, which shall position the control valves as per system requirement. The vendor may offer Servo-valve/ proportional valve as per their standard practice.
The design of the Control Valve Actuator shall be such that in case of interruption of CF supply or the electrical signal, the LP bypass control valve shall remain "IN PLACE" during failure mode.
For quick closing of stop valves, 2 nos. solenoid operated Poppet valves (TSV's) shall be supplied. Solenoid shall be with single / double coils as per supplier's standard practice and operation of coil(s) (simultaneous operation on both coils in case of double coils) of any one

TSV should affect trip. The Trip Solenoid valves shall be connected to protection system supplied by BHEL. All Solenoid Valves (Pilot Valves and TSVs) shall be rated for 25V±5V.
All the valve actuators shall be capable of operating at 60°C control fluid temperature continuously.

Refer proposed actuator schemes as per enclosed Appendix-3 & 4. However, Supplier will prepare their own schemes and submit the same for BHEL review and approval.

b) In case of LP bypass valve with one actuator (Single stem valve), the applicable scheme as per Supplier's standard practice shall be submitted for BHEL review & approval. However a typical scheme is attached as per Appendix-5.

c) All filters of actuators shall be equipped with differential pressure switches for alarm along with local indication for clogging.

6.1.1 Position Measurement of Valves:

Each Stop Valve Actuator should be equipped with **4 Limit Switches** (i.e. 2 for Open & 2 for Close position). Limit Switches shall be of mechanical type. Each Control Valve actuator should be equipped with **non-contact type position transmitter** for measuring the position of the Control valve. Details of the same shall be furnished along with the offer. The output of the Position Transmitter shall be 4 mA (valve fully closed) to 20mA (valve fully opened).

6.2 Operating Time:

(a) For LP bypass stop & control valve (Double stem):

(i) LP Bypass Stop Valve Actuator:

Opening time	: < 2 Seconds for full stroke (Against spring force)
Closing time	: = 1±10% Seconds for full stroke (With spring force)

(ii) LP Bypass Control Valve Actuator:

Opening time	: < 2 Seconds for full stroke
Closing time	: < 2 Seconds for full stroke

(b) For LP bypass valve (Single stem):

In case of single stem valve actuator, the operating time shall be as follows:

Opening time	: < 2 Seconds for full stroke (Against spring force)
Closing time	: = 1±10% Seconds for full stroke (For emergency closure)
Closing time	: < 2 Seconds for full stroke (For modulating control)

To adjust the opening and closing time of actuators, throttle orifices shall be provided wherever necessary.

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6.3 Mounting Arrangement of Actuators:

Type of arrangement required is specifically mentioned in the input data sheet.

A typical arrangement of LP Bypass valve is shown in **Appendix-1 for straight type of valves** for which orientation of actuators shall be as follows:

- Stop Valve Actuator : Vertical (Standing)
- Control Valve Actuator : Vertical (Hanging)

Incase of **Angle type of valve arrangement**, the Stop valve and Control Valve actuators shall be perpendicular to each other respectively. Supplier is to ensure & make provision for proper venting in the actuators for such angle type of valve arrangement.

6.3.1 Mounting Arrangement of Control Block for Actuators:

The Control Block for each actuator shall be mounted on the Power Cylinder. EHA supplier shall ensure that supply and return line connections shall preferably be on the same side of the actuators as shown in the enclosed sketch (Appendix-1).

6.3.2 Actuator Control Fluid Connections:

Supplier will ensure the flange end connections of supply & return pipelines as per sizes given below:

- Supply Pipeline : Ø26.7X3.91, Material as per ASTM A312, GradeTP321
- Return Pipeline : Ø33.4X2.6, Material as per ASTM A312, GradeTP321

If the actuating medium used is **MINERAL OIL** of viscosity class as per ISOVG100 according to DIN51519 then supplier shall also make a provision for **guarded pipeline** connection as per size given below:

- Guarded Pipeline : Ø88.9X5.49, Material Carbon Steel

6.4 Control Fluid (CF) Specification:

(a) The Electro-hydraulic actuation (EHA) system shall be designed suiting to the control fluid medium as specified in the input data sheet. Total control fluid quantity comprising of quantities required for **regular bypass system operation + flushing of the complete EHA system + sufficient quantity for one year make-up** shall be worked out by the EHA supplier and informed to BHEL at the time of offer.

(b) If specified in the input data sheet control fluid of required quantity shall be supplied by the supplier. The supplier shall furnish the specification and source of procurement for BHEL review and approval.

6.5 CF Pressure & Temperature:

- Normal operating pressure - 160 bar
- Minimum operating pressure - 115 bar
- Normal Control Fluid temperature - 50+5°C
- Maximum Control Fluid temperature - 75°C

6.6 Control Fluid Tray for LP Bypass Valve Actuator (Vertically mounted):

CF tray shall be provided to prevent CF falling on valve body in case of leakage & CF sensor shall also be provided in the CF tray to detect leakage for indication in control room.

7.0 HYDRAULIC POWER SUPPLY UNIT (HPSU): (Refer Appendix-2, Proposed)

The Hydraulic Power Supply Unit (HPSU) is required for actuation of LP Bypass Stop & Control Valve Actuators and water injection valve actuator(s) (if hydraulically actuated water injection valve(s) are envisaged in applicable specification). The EHA supplier, suiting to the control medium as specified in the input data sheet, shall do the design & sizing of HPSU. HPSU will consist of all necessary components like CF pumps, filters, hydraulic accumulators, check valves, pressure & temperature measuring instruments, Level measuring instruments, filtration-cum-cooling unit and regeneration unit for Control Fluid (CF) purification.

Supplier to ensure that all the surfaces coming in contact with control fluid including control fluid tank shall be made of stainless steel.

The Control fluid (CF) tank shall be adequately sized to accommodate total system quantity of fluid including fluid contained in pressure lines, return lines, actuators & hydraulic accumulators etc. Suitable provision for vapor extraction shall be provided by the supplier in the CF tank.

Two nos. CF Pumps shall be provided in the CF tank with their pressure and flow control valves and shall be immersed into the CF medium in the CF tank. The electric motors of CF pumps and the pressure control valves for system pressure adjustment shall be mounted on the CF tank cover. Two CF pumps are required in the HPSU, one of that can be pre-selected for operation, whereas the other shall act as standby, operation of which shall be automatically switched over in case of any fault. Changeover of pumps shall take place depending on the CF pressure as well as outage of the working pump motor. Control of Pumps & cooling circuit will be realized in BHEL's control system. Pumps are to be designed by the HPSU supplier as pressure-controlled pumps, which shall maintain the constant pressure to a constant preset value i.e. 160bar and shall regulate the CF quantity according to the demand. Pressure surges/pulsations are required to be dampened by bladder type hydraulic accumulators, which will also ensure that the system pressure does not collapse. Accumulators shall ensure positive supply of oil to hydraulic actuators even when hydraulic oil pumps are not available. Accumulators shall be adequately sized to ensure supply for at least two complete stroking operations of all connected actuators. Sizing of the accumulators shall be done by the HPSU supplier and supplier shall decide the quantity & capacity of accumulators for reliable operation of the actuators.

Two nos. separate cooling-cum-filtration circuits (filtration rate of return line filters is 3μ absolute) shall be provided in order to maintain the cleanliness of the system and to ensure proper cooling. Separate AC driven circulation pumps with 2X100% capacity shall be provided to pump CF into these circuits. 2X100% coolers shall be provided for cooling of CF. The fans of the coolers shall cut in and out depending upon the CF temperature. The circulation pumps shall also pump CF into the regeneration circuit, which shall be equipped with filter (12μ) for continuous filtration of the CF. (Applicable if CF is used). **Cooling by air shall be foreseen if the ambient temperature is up to 49ºC. For ambient temperature more than 49ºC, cooling with water shall be foreseen.** Water quantity & quality requirements shall be furnished by the supplier along with the offer for arranging the same by the purchaser. Provision of heater for heating the control fluid shall be kept for projects where ambient temperature goes up to 5ºC and below.

The HPSU supplier shall mount a console containing local pressure gauges, pressure switches & nipples for commissioning measurements on the CF tank. Moreover, coarse filters with contamination indicator & pressure relief valves for pump protection are to be provided by the supplier. The complete HPSU shall be housed inside the cabinet and for emergency manual tripping, a switch shall be provided on the terminal box. HPSU Circuit diagrams drawn on either metallic or plastic sheet in color should be riveted inside the door panel. Supplier is to make an arrangement for mounting electric lamps inside the housing.

The HPSU supplier shall provide 03 no. pressure line and 03 no. return line connections in HPSU as per the following details:

a) 01 no. each of pressure and return line connections for LPBP stop & control valve no.-1.
b) 01 no. each of pressure and return line connections for LPBP stop & control valve no.-2.
c) 01 no. each of pressure and return line connections for water injection valve(s).
   In case the water injection valve(s) are with pneumatic actuators only 2 no. of pressure and 2 no. of return line connections shall be applicable as mentioned at sl. no. a) & b) above.

7.1 Electric Wiring:

Electrical wiring of all the hydraulic assemblies is part of the supplier's scope of supply. It includes measuring & signal devices. All electric components must be wired up to junction box (JB) of the unit. The JB will have IP55 degree of protection. A separate JB meant for pump motors connection shall also be provided. No internal wiring shall be done by BHEL inside the HPSU housing cabinet. JB wiring diagram along with data of all the electrical equipment as mounted on HPSU & as well as on control block of Actuators, Position measuring instruments and cable termination details must be supplied along with the main equipment. Internal wiring to JB must be housed in protective channels of galvanized sheet metal with removable covers. Steel-clad hose/conduit must protect the connecting cable to individual components. The length of free cables (i.e. at plugs or connections) should not be longer than 500mm.

Protective devices for wiring should also be supplied for equipment, which is not wired (i.e. motors, solenoid valves), ending at the appropriate location of the base frame.

7.1.1 Instruments in HPSU:

(a) Pressure transmitter is to be provided at the discharge of each CF pump and also in the CF header. All pressure transmitter to be 'SMART' type with HART protocol.
(b) All filters to be equipped with differential pressure switches for alarm along with local indication for clogging.
(c) Suitable pressure switches and gauges to be provided in HPSU.
(d) Two (2) nos. Resistance temperature detectors along with temperature transmitters to be provided for measuring the temperature in the tank.
(e) Suitable level gauges & three (3) no. level transmitters to be provided on the CF tank for level measuring.
(f) Contact rating of all the switches to be furnished.
(g) Number & type of instruments shall be subject to BHEL approval. Complete instrument list showing range, model no. and set point of various instruments shall be furnished for BHEL approval.

7.1.2 Interface with BHEL's System:

Signals from the instruments shall be processed in BHEL's system & commands from BHEL's control system shall go for controlling the motors, fans etc in the HPSU and also the Pilot valves, Servo-valves/proportional valve and TSVs in the valve actuators. Supplier is to furnish the recommended operation logics for the entire system enabling BHEL to develop suitable control schemes.

(a) For operation of Control Valves, BHEL shall supply ± 7.5 mA / ± 30 mA signal to servo-valves/ proportional valves from its DCS.

(b) In case vendor system is not able to accept this signal, 4-20 mA demand signal can be furnished by BHEL. In such a case suitable positioner shall be supplied by the vendor for interfacing with servo-valve / proportional valve. In this case, final operation of all the components of actuators (stop valves, control valves and water injection valves), i.e. TSVs, Pilot valves and interlocking valves shall also be from vendor's system. Suitable signals shall be provided from BHEL's DCS for control of these elements. Necessary software for calibration / parameterization of the positioner shall also be supplied.

7.1.3 Power Supply:

Power supply requirements for all 3 phase motors shall be 415V±10% AC. In case of different requirement the same shall be specified in the input data sheet.

7.2 Coating, Cleaning and Preservation:

Supplier shall furnish the colour scheme for BHEL review and acceptance. Before preservation, the interior surface of the HPSU must be cleaned thoroughly.

Before delivery of HPSU, the unit should be coated inside with hydraulic fluid containing a suitable inhibitor. Additives used must not degrade the quality of hydraulic medium. All external connections must be sealed with metal plugs. All items as listed in the supplier's part list have TAG nos. & must have nameplates, which shall be attached in such a way so that they can be seen & read easily. Nameplates must be designed 10X50 mm with 7-mm inscription height & mounted by notch spikes.

8.0 TOOLS & TACKLES:

The bidder shall submit with the equipment one complete set of all special tools & tackles & other instrument required for site erection & commissioning, assembly, disassembly & proper maintenance of the LP Bypass system. The bidder along with the offer shall submit a list of such tools and tackles. In case, new requirement of any special tool arises during installation of LP bypass system equipments the same shall be supplied by the supplier free of cost.

9.0 MATERIAL & SURFACE PROTECTION:

9.1 Material Selection

The materials for all components must be for maximum corrosion resistance under the prevailing ambient conditions. The material utilized for manufacture of various components shall be those, which are already established for use in such applications. Material of all the major items of LP Bypass valves, actuators & HPSU shall be informed during offer stage for purchaser's acceptance. However, during detailed engineering stage if it is established that the materials as informed by the bidder is inferior to present practices, the supplier without any commercial implications shall change it.

9.2 Material Testing:

Product forms for load-bearing parts shall be supplied with **Inspection Certificate 3.1 B as per EN10204**. The product forms for other parts shall be specified in the parts list including bill of material, indicating therein the material number and the standard, including trade names if necessary.

9.3 Welding Materials & Consumables:

The properties of welding materials and consumables to be employed (mechanical, chemical, thermal, long term performance etc.) shall be matched to the base metal. The supplier shall ensure that the welding materials and consumables have National/International approval for the intended application. For site erection purpose, the supplier shall submit to the purchaser the Field Welding Schedule (FWS) for field welding activities. The FWS shall be submitted to the Purchaser/Owner along with all supporting procedures, like welding procedures, heat treatment procedures, NDT procedures etc., at least 30 days before schedule start of erection work at site.

9.4 Welder Qualifications:

For the work to be performed only those welders shall be used who are qualified as per DIN EN287-1 or per any comparable Indian/International standard for metals to be welded and the welding procedure to be employed.

10.0 FUNCTIONAL & TESTING REQUIREMENTS: (Refer Format-1, APPENDIX-6)

Supplier shall furnish & specify the various functional & test requirements of LP Bypass valves, Actuators & HPSU in the prescribed format as enclosed and submit the same for BHEL approval.

The supplier shall also furnish copies of the reference documents/their standards/acceptance norms/tests & inspection procedure etc. as specified in the format-1. Without approval of functional & testing requirements, the supplier will not start manufacturing. This document shall form a part of the contract.

BHEL/Owner shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the BHEL/Owner's Engineer or his authorized representative and beyond which the work will not proceed without consent of Purchaser/Owner/Authorized representative in writing.

Following functional tests are to be carried out at supplier works:

1. HPSU testing as per suppliers approved test procedure
2. LP Stop & Control Valve Actuators testing without bypass valve as per supplier's approved procedure
3. Cv test (type test) of LP Bypass Valve without actuators:
   (i) Cv test will be carried out for LP Bypass valve as per ISA 75.02 and test report shall be submitted for BHEL approval. The Cv test can be carried out physically on the valve or through computer simulation.
   (ii) The Cv test shall be carried out in presence of the BHEL representative, for which minimum 30 days notice shall be given by the supplier. The supplier shall obtain the BHEL approval for the Cv test procedure before conducting the Cv test. The Cv test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the Cv test to be carried out.
   (iii) In case test report is already available on the same model/type/size/rating of the valve as proposed to be supplied under this contract and the Cv test have been either conducted at any independent laboratory or have been witnessed by a client, the same can be considered if Cv test have been carried out not more than 5 years from the date of bid opening.
   (iv) In case the offered valve is already in successful operation using the same valve body, seat and trim combination as of the offered valve, the vendor may furnish the name of project, data sheet, cross sectional drawing of that valve for review in lieu of the Cv test report.
4. NDT of castings/forgings:
   (a) The ultrasonic test shall be carried out as follows:
      I. Forgings conforming to quality level-4 as per EN 10228-3.
      II. Castings conforming to the following requirements as per EN 12680-2:
         (i) All the weld seams, high stress areas and sealing surfaces shall conform to quality level-I.
         (ii) Rest of the casting shall conform to quality level-II.

(b) WPS & PQR shall be got approved by BHEL, before start of welding on weld seams.
(c) Stress relieving shall be performed after welding. The vendor shall report the hardness survey of the heat affected zone (HAZ), weld and parent materials.
(d) All the weld seams shall be radiographically tested conforming to quality level-I as per ASTM E446.

5. Hydrostatic body test of LP bypass valve in accordance with ANSI B-16.34 prior to seat leakage test.
6. Valve closure test and seat leakage test in accordance with ANSI B-16.34 and as per the leakage class MSS SP61.
7. LP Bypass valves testing along with actuators in assembled condition.
8. Functional test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.

Any additional requirement, if any, shall be separately specified in the purchase order.

In general, highest quality of workmanship shall be ensured while manufacturing and assembly of LP Bypass valves, their actuators and HPSU.

10.1 TEST CERTIFICATES:

Supplier has to furnish the Test Certificates, Material Certificates; certificates for weld examination, leakage test, hot tensile tests etc before delivery.

11.0 SPARES:

11.1 Commissioning & Startup Spares:

Spare & wear parts are included in the scope of supply up to completion of trial operation.
The supplier shall prepare lists of all probable spares and wear parts, which indicate the recommended quantities and clear parts identification. The parts shall be manufactured in accordance with the requirements of this specification.

(1) It will be the responsibility of the supplier to provide all commissioning and startup spares required for initial operation till the satisfactory completion of the Trial Operation. The supplier to ensure that no hold ups shall occur at site during erection & commissioning due to non-availability of commissioning spares. The supplier shall furnish a list of all such spares within 60 days from the date of Letter of award & such list shall be reviewed by the purchaser/Owner & mutually agreed to. List of commissioning spares shall include 1 set each of all those items which may get damage during transportation/storage such as receptical connectors & other items e.g. gaskets, packing rings, filters etc.

(2) These spares will be received & stored by the purchaser at least 3 months prior to the date of commencement of trial operation & utilized as and when required.

11.2 Mandatory Spares:

The bidder shall submit their commercial offer separately for the mandatory spares as per the list furnished by the Purchaser/Owner. List of mandatory spares furnished by the bidder shall be duly correlated with their bill of material.

11.3 Recommended Spares:

In addition to the mandatory spares, the bidder is required to submit as part of the contract, a complete list of recommended spare parts, for the equipment supplied based on his experience, which are essential for a plant operation of ten (10) years. In the offer, the bidder is required to furnish item wise price and total lump sum price. The purchaser is free to order these recommended spare parts at any time.

The bidder shall also indicate the service expectancy period for the spare parts under normal operating condition before the replacement is necessary. All categories of spares to be supplied under this contract shall be strictly interchangeable with the parts for which they are intended for replacement. The spares shall be treated and packed for long storage under the climate conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic bags with desiccators packs as necessary.

Each spare shall be clearly marked or labeled on the outside of the packing with its description and assembly parts number.

11.4 General Technical requirements for Spares:

(i) All the mandatory spares covered under the contract shall be manufactured along with the main equipment as a continuous operation and the delivery of the spares will be affected along with the main equipment. In case of recommended spares the above will be applicable provided the order for the recommended spares have been placed with the supplier prior to commencement of manufacture of the main equipment.

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

(iii) The bidder will submit along with the offer the manufacturing drawings, catalogues, assembly drawings and any other document to identify the recommended spares.

(iv) The supplier will provide the purchaser with all the addresses and particulars of his sub-vendors while placing the order on them for items/components/equipment covered under the contract. He will further ensure that the purchaser/Owner if so desires will have the right to place order for spares directly on his sub-suppliers on mutually agreed terms based on their offers.

12.0 PROCESSING & DOCUMENTATION:

It is the duty of the system supplier to clarify interfaces and good cooperation with their sub-suppliers of products that interface with his scope of supply, both in the planning phase as well as on site. The supplier will be notified in writing in the event of any changes (additions or deletions) in the scope of supply and services, with written confirmation to follow on the part of the purchaser. The written confirmation does not constitute acceptance of the indicated additional or reduced costs.

All major functional and mechanical design decisions shall be made together with the purchaser as per mutually agreed meeting schedules.

12.1 Processing Documents:

All verification analysis, which demonstrates compliance with design warranted & specified data and which include information on interface to adjacent systems shall subsequently be designated processing, documents and shall be submitted to the purchaser for review.

Verification analysis required by legislative bodies, regulatory authorities or similar entities of this nature should also be treated as processing documents. The documents to be reviewed by the purchaser or his authorized representative are listed in Section 14.2 & 14.3 below. The purchaser or designated authorized inspectors can also demand to see the documents or verification analysis to be submitted for preliminary review. All documents shall be reviewed by the supplier before being submitted unsolicited to the purchaser /authorized representative.
Fabrication/Manufacturing may begin only after the submission of approved documents by the purchaser.

The supplier shall check the drawings provided for parts from outside vendors for any interface with his own parts at his own end. The supplier shall also finalize all type of interface activities with their own sub-vendors. The supplier shall be held responsible for any mistake done during detailed engineering or manufacturing by their sub-vendor. The extra cost incurred due to this interface shall be borne by the supplier.

The lists and schematic diagrams for instrumentation and open- and closed loop controls if prepared by the supplier shall be thoroughly checked by the supplier for completeness and correctness. All necessary drawings, detailed drawings and spare parts drawings shall be prepared using computer- based drawing programs. These must be deposited finally to the purchaser on disk and must be "AutoCAD" compatible. The required scope of documentation is established in the scope of supply. All documents shall be prepared in the project-specific language stipulated.

In all instances, project-specific requirements must be duly noted and complied with when preparing & identifying the documents.

The purchaser shall be made aware of all changes in the supplier's drawings by pointing out the revision remarks and indices on them is not sufficient. Physical parameters and drawing dimensions shall be given in metric units in accordance with Indian Standards.

12.2 Review Documents:

Following drawings and data are to be furnished along with the technical offers in **triplicate.**

12.2.1 Documents related to HPSU:

1. Schematic circuit diagram showing connection of HPSU with respective bypass actuators & Sizing calculation of HPSU & its main components.
2. General arrangement drawing of HPSU indicating therein the total assembly weight, overall major layout dimensions, foundation detail, space requirement for maintenance, Flanges end connection detail and their material.
3. Schematic diagram duly indicated with all item nos., Tag Nos. and legends. In this diagram, tank capacity, pump capacity of each CF Pumps, Circulation Pumps, rated power consumption of each pump motor, filtration rating of each filter and capacity of each Hydraulic Accumulators has to be specified.
4. Part list duly indicated with item no/Position No., quantity, catalogued / Drg. reference no. & source of procurement etc. BHEL will indicate their TAG nos. against each item for identification purpose and submit the same to the supplier for necessary updation.

5.* HPSU Test procedure duly indicating therein the test detail & their acceptance norms.

6. Data sheets & *functional description of all individual items. Electrical wiring diagram.

7.* Operation, Maintenance & Erection manual.

8.* Field Weld Schedule and erection instruction for site engineers.

9.* List of Bought out items, the source of procurement has to be specified for each item.

10. List of recommended and commissioning spares.

11. Detailed 'Quality Plan' for HPSU. **(See Clause no. 10.0)**

12.2.2 Documents related to LP Bypass Valves & Actuators:

1. Overall General arrangement cross-sectional assembly drawing with all major dimensions required from layout point of view. Steam Inlet & Outlet weld edge sizes, bracket for Valve suspension arrangement, and location of center of gravity and also total assembly weight has to be specified in the drawings. Bill of material (BOM) of the valve with actuator assembly has to be tabulated. Assembly & disassembly maintenance space dimensions should be indicated in the drawings.
2. Separate Stop & Control Valve actuator drawings indicating therein the flange end connection detail, total actuator weight, overall dimension & dismantling space requirement. All items should be marked and listed in the BOM on the drawing itself. On the actuator drawings, schemes for Stop & Control valve actuator should also to be shown schematically.

3.* Catalogs and technical literature of Solenoid valves, Servo-valves, proportional valves, Position transducer, Positioners, Limit Switches, Relief Valves etc.

4. Sizing Calculation for Bypass valves & actuators.
5. Valve Data Sheets for LP Bypass Valve
6. List of special tools (if any)

7. Valve characteristics
   - Lift vs Area ; Lift vs Flow
   - Pressure vs flow (upstream side/ down stream side)

8.* Part list of Valves, Actuators. BHEL will indicate their Tag nos. against each item and the same shall be submitted to the supplier for necessary updation. This is required for identification purpose.

9. List of Recommended & Commissioning spares. The supplier along with the main equipment shall supply commissioning spares for Valves, Actuators & HPSU.

10.* Valve & actuator test procedure. Test log sheets for valves and actuators.

11. Detailed QP for combined LP Bypass Stop & Control valves and their actuators.

12.* List of Instruments duly indicated with BHEL Tag Nos., service, set points, range & make etc. to be furnished.

12.2.3 Documents related to Water Injection Valves & Actuators:

1. Data sheets of valve & actuator indicating therein all parameters & material details.
2. General arrangement drawing of valve with actuator indicating therein major dimensions, dismantling dimensions & assembly weight. Bill of material must be tabulated on the assembly drawing.
3. Pneumatic/ Hydraulic actuator scheme (as applicable) indicating therein part numbers.
4. Part List of valve actuator.
5. Drawing for valve & actuator coupling arrangement.
6. Sizing calculation for valve & actuator.
7. Curve for water mass flow vs. % lift (indicating % lift at max. design water mass flow & min. controlled water mass flow).
8. Data sheets for all the items mounted on the control manifold.
9. Wiring diagram for electrical items.

12.2.4 Other Documents related to C & I:

1. Flow Nozzle data sheet as per ISO 5167.
2. Flow Nozzle drawing.
3. Flow Nozzle characteristic curve between differential pressure and flow (indicating calculation formula also).
4. List of Instruments (HPSU and Actuators) duly indicated with KKS Tag Nos., type, service, set points, range & make etc.

5.* Consumer list, Drive list, Signal I/O List.

6.* Recommended system logics/write-up.

7.* Electrical Terminal Wiring Details (HPSU Junction Boxes/Positioners and other components)

8.* Cabling Layout Diagram.

9.* Electro-pneumatic positioner catalogue (If applicable).

10.* Instruments Catalogues and data sheets of all electrical components.

11.* Separate feeder load list to be furnished, giving details of Power Supply, KW rating, Current drawn etc. for various motors, fans and other electrical drives.

Note: '*'- These documents are required separately after placement of order.

Documents as sent along with the technical offer shall be scrutinized and finalized at BHEL end and the same shall be sent to the supplier for furnishing the final copy in triplicate after incorporating all comments, if any, in their drawings/documents for final approval. One copy of the final document shall be sent to the suppliers for their own record and reference. Order shall be placed on the supplier only after freezing all the technical points mutually.

25 hard copies & 3 soft copies on CD of the O&M manual and all other relevant documents shall be furnished by the vendor in the event of ordering. Out of 25 hard copies of O&M manual, 3 copies shall be kept with the equipments for ready reference & use at site and remaining 22 copies along with 3 soft copies on CD shall be sent to BHEL, Hardwar 10 weeks in advance prior to dispatch of equipment.

13.0 MARKING:

- All items shall be attached / fixed with a metal identification plate indicating thereon the tag number as per schemes, equipment title & main parameters of the equipment.
- All the final documents shall bear the following identification markings:
  - Component manufacturer's name
  - Name of Power Plant
  - Item Description
  - Purchaser Name
  - BHEL P.O. No.
  - Revision index for documents

14.0 PACKING & TRANSPORTATION:

(a) All the equipment shall be suitably protected, coated or boxed (sea worthy packing) and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The bidder shall provide the site storage instruction applicable for the equipment after it arrives at the site. Lifting points & lugs shall be clearly identified.

(b) Painting scheme along with relevant technical details for all the offered equipments shall be furnished by the supplier with the offer for review and approval by BHEL.

(c) Supplier shall intimate shipping/dispatch plan of the offered equipment including details of each boxes & sub boxes to the purchaser at least 2 months prior to dispatch. One complete set of packing list duly indicating therein the detail of all items, should be placed inside the packing box for material verification at site and three copies of the same should be forwarded to the purchaser for their advance information & record. In case, there is any change in the shipping plan the same shall be informed to the purchaser well in advance.

15.0 SUPERVISION DURING ERECTION-COMMISSIONING & TRAINING AT SITE:

The supplier shall depute their representative at project site for erection & commissioning supervision. The lump sum charges for site supervision shall be included in the main offer for which the supplier has to provide the justification in the offer.

The supplier shall conduct minimum 2 days training program at site regarding design/construction features, operation & maintenance of the supplied equipments (including C&I) for customer engineers and BHEL engineers during erection and commissioning. Schedule of the program shall be mutually agreed between supplier and customer/ BHEL engineers.

The vendor to clearly indicate the extent of association of their service engineer during erection and commissioning of the supplied equipments at site in their offer. Further special instructions which are required to be followed at site during erection and commissioning shall be furnished by the vendor as per the schedule mentioned in the enclosed MDL.

16.0 GUARANTEE:

The complete unit shall be guaranteed for 24 months of trouble free performance from the date of shipment or 18 months from commissioning date whichever is earlier. Incase of any failure or trouble reported from site, the supplier would depute their representative immediately to attend the problem and replace the defective component/parts if required.

17.0 PRICE:

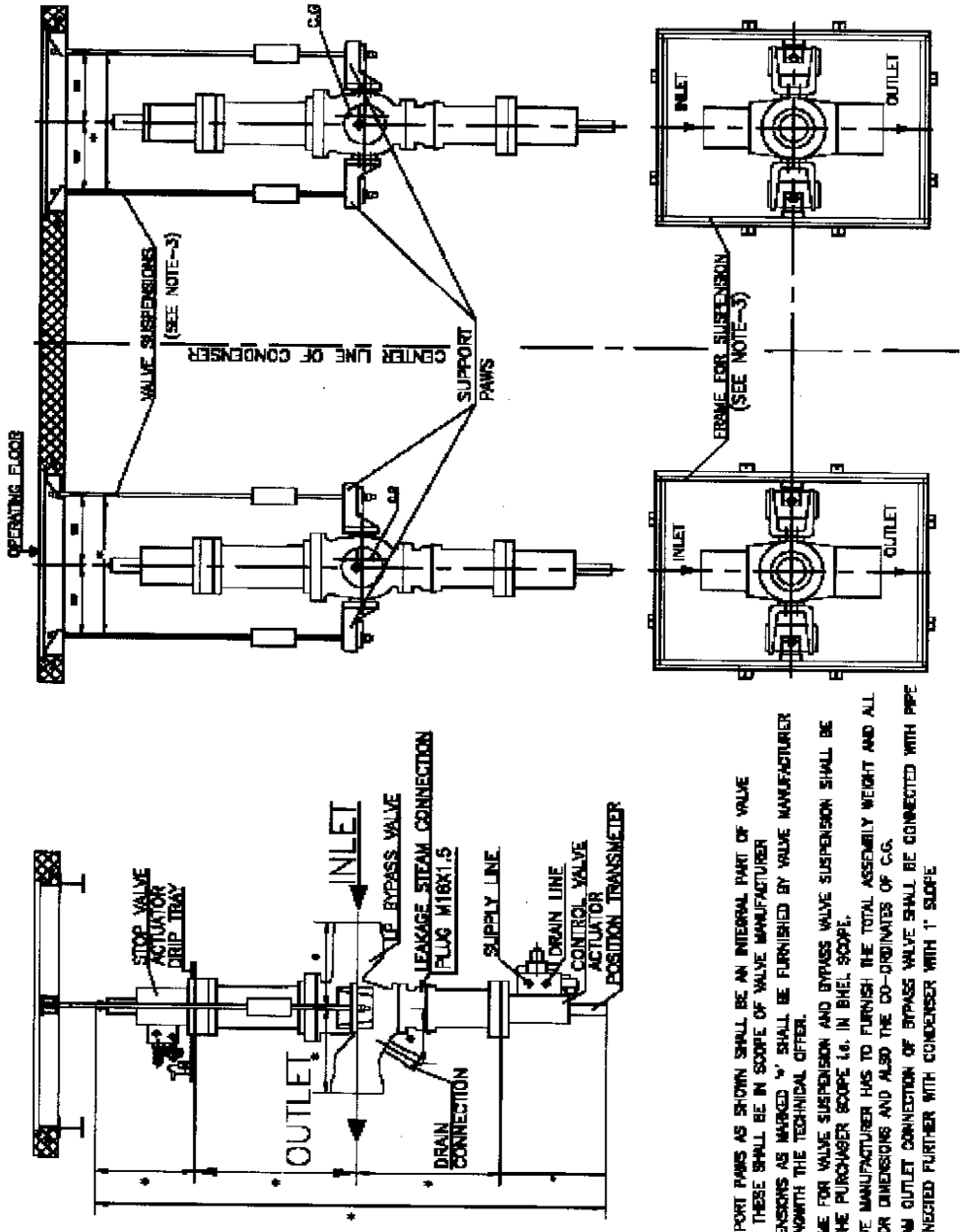
The supplier is to furnish the price against each assembly separately for the scope of supply as indicated in the input data sheet.

18.0 LIST OF CROSS REFERRED DOCUMENTS:

- ASTM A312; DIN51519; EN10204; DIN EN287-1, EN 10228-3, EN 12680-2, ASTM E446.

APPENDIX-1

GENERAL ARRANGEMENT OF LP BYPASS VALVES (TYPICAL)



NOTE :

1. SUPPORT PAWS AS SHOWN SHALL BE AN INTEGRAL PART OF VALVE AND THESE SHALL BE IN SCOPE OF VALVE MANUFACTURER
2. DIMENSIONS AS MARKED '*' SHALL BE FURNISHED BY VALVE MANUFACTURER ALONGWITH THE TECHNICAL OFFER.
3. FRAME FOR VALVE SUSPENSION AND BYPASS VALVE SUSPENSION SHALL BE IN THE PURCHASER SCOPE i.e. IN BHEL SCOPE.
4. VALVE MANUFACTURER HAS TO FURNISH THE TOTAL ASSEMBLY WEIGHT AND ALL MAJOR DIMENSIONS AND ALSO THE CO-ORDINATES OF C.G.
5. STEAM OUTLET CONNECTION OF BYPASS VALVE SHALL BE CONNECTED WITH PIPE CONNECTED FURTHER WITH CONDENSER WITH 1° SLOPE.

सामग्री सूची संख्या INVENTORY NO. P-63011	REV. NO. 02		निर्माणकर्ता WORKED BY	SHUBHAM MITTAL	16.4.11
			जांचकर्ता CHECKED BY	R.C. AGARWAL	16.4.11

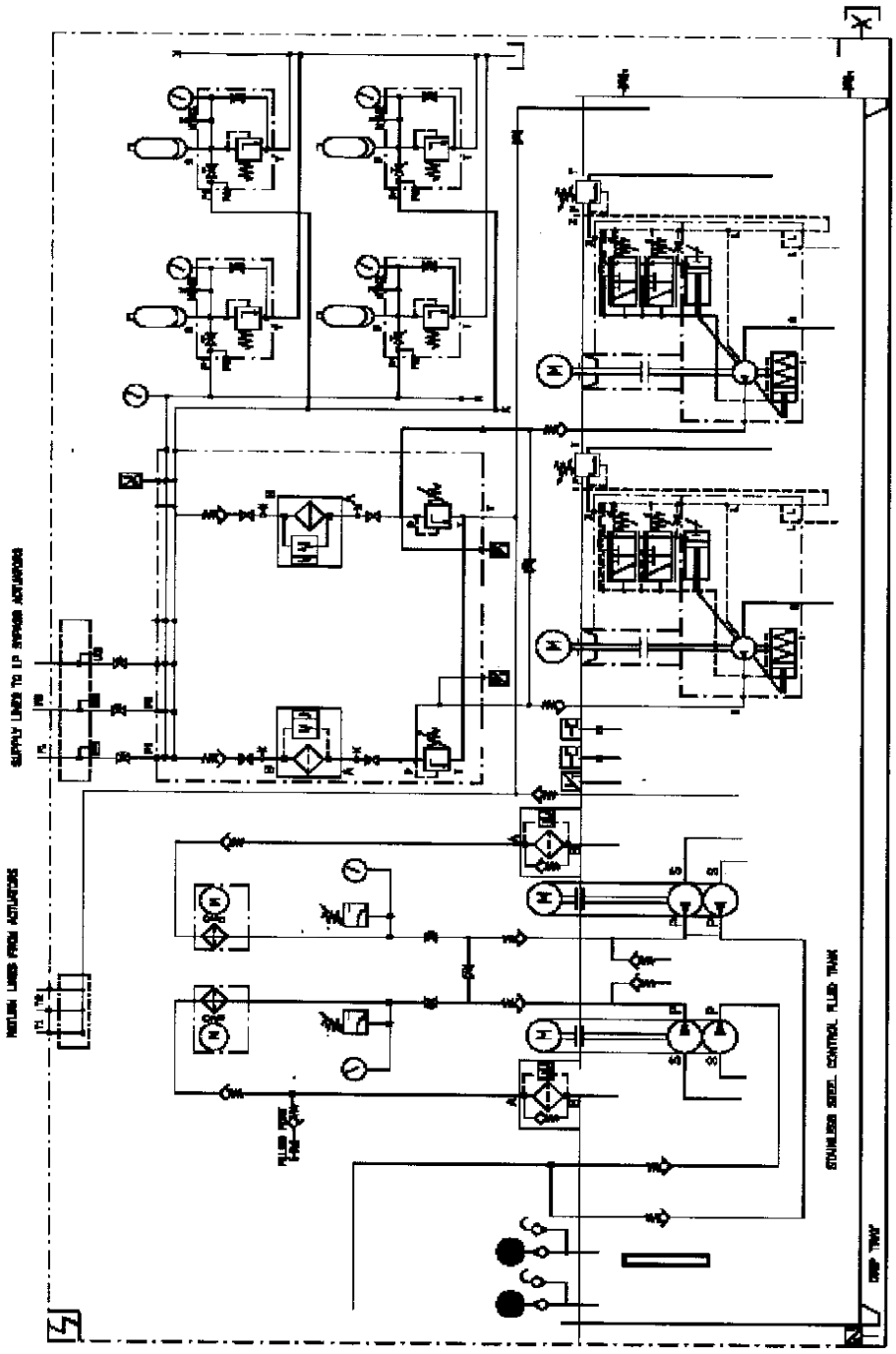
हस्ताक्षर एवं दिनांक SIGN & DATE 28/4/11

सामग्री सूची संख्या को अधिक्रमित करता SUPERSEDES INVENTORY NO

दिनांक एवं हस्ताक्षर SIGN & DATE

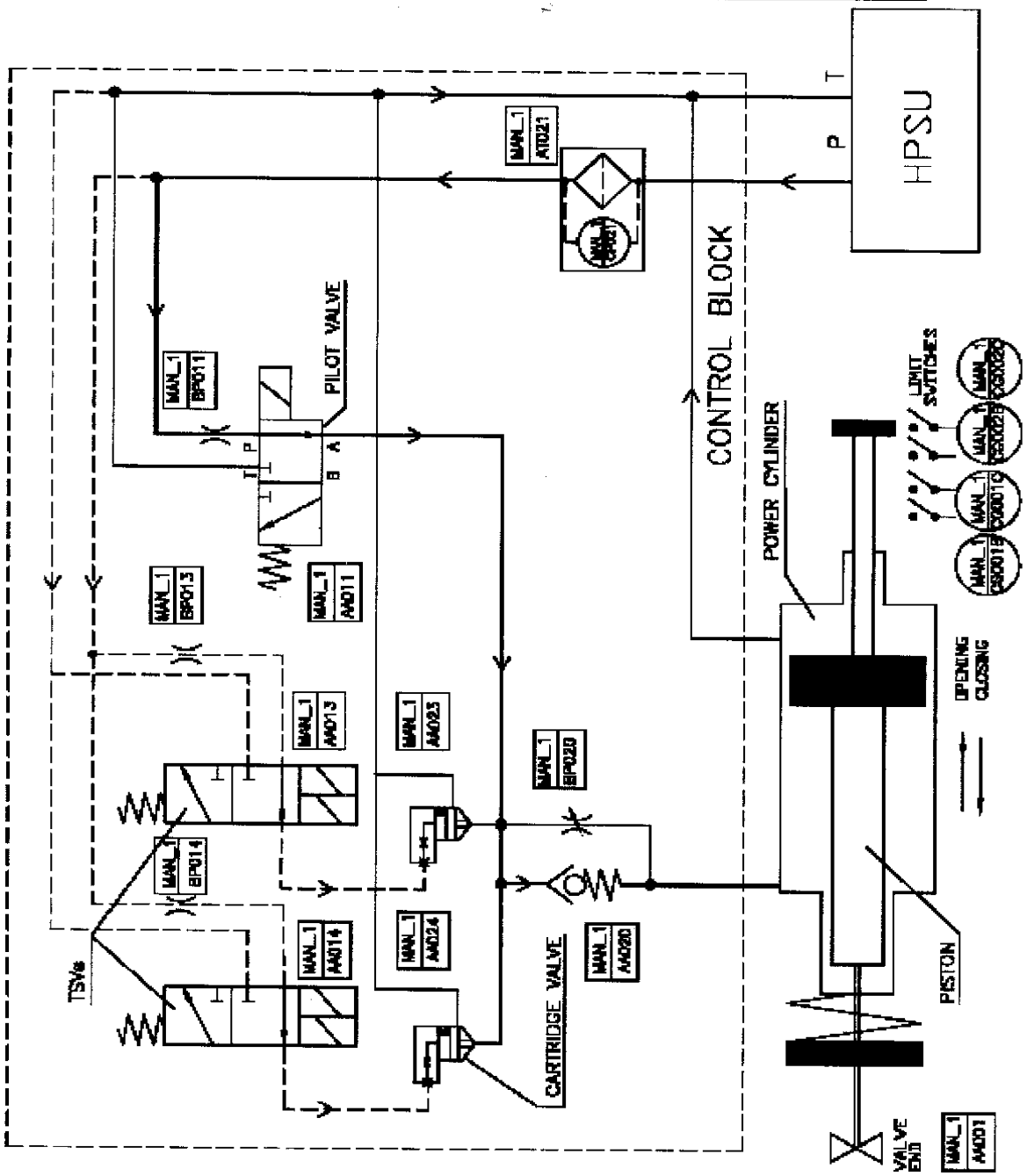
APPENDIX-2

HYDRAULIC POWER SUPPLY UNIT FOR LP BYPASS SYSTEM (TYPICAL)



APPENDIX-3

SCHEME FOR LP BYPASS STOP VALVE ACTUATOR (TYPICAL)

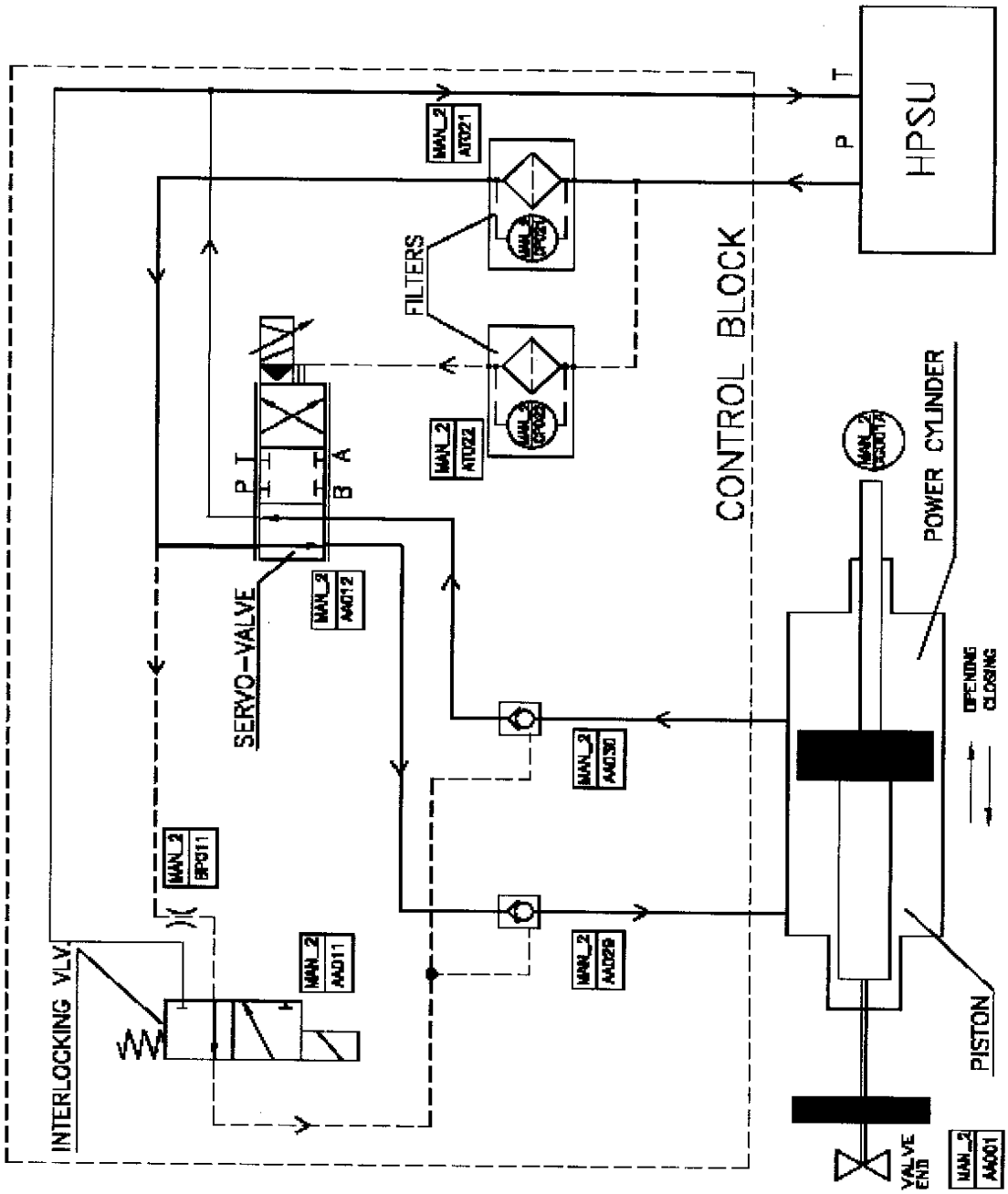


REV. NO. 02

निर्माणकर्ता WORKED BY	SHUBHAM MITTAL		16.4.11
जांचकर्ता CHECKED BY	R.C. AGARWAL		16.4.11

APPENDIX-4

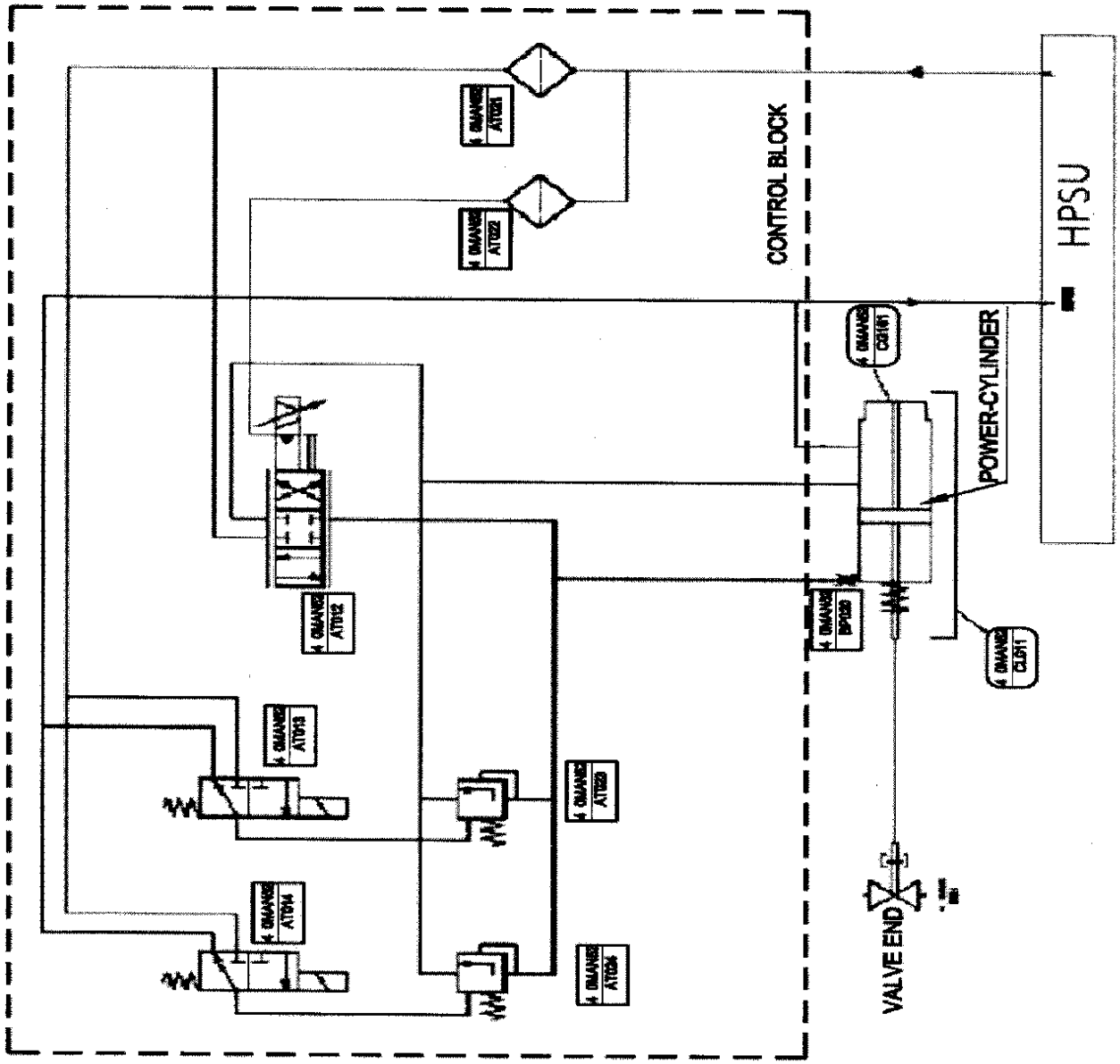
SCHEME FOR LP BYPASS CONTROL VALVE ACTUATOR (TYPICAL)



	REV. NO. 02	निर्माणकर्ता WORKED BY	SHUBHAM MITTAL	16.4.11
P-6301		जांचकर्ता CHECKED BY	R.C. AGARWAL	16.4.11

APPENDIX-5

SCHEME FOR LP BYPASS VALVE (SINGLE STEM) ACTUATOR (TYPICAL)



REV. NO. 02	निर्माणकर्ता WORKED BY	SHUBHAM MITTAL		16.4.11
	जांचकर्ता CHECKED BY	R.C. AGARWAL		16.4.11

सामग्री सूची संख्या INVENTORY NO P-6301

हस्ताक्षर एवं दिनांक SIGN & DATE 28/4/11

ग्रा सूची संख्या INVENTORY	हस्ताक्षर एवं दिनांक SIGN & DATE	सामग्री सूची संख्या को अधिक्रमित करता SUPERSEDES INVENTORY NO.	दिनांक एवं हस्ताक्षर SIGN & DATE
P-6301	28/4/11		

APPENDIX-6, FORMAT-1

FORMAT-1

MANUFACTURER'S NAME & ADDRESS

MANUFACTURING QUALITY PLAN

ITEM

SUB-SYSTEM

QP NO.

REV.

DATE

PAGE OF

PROJECT :

PACKAGE :

CONTRACT NO. :

CONTRACTOR :

SL. NO.	COMPONENT OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFER. DOC.	ACCEPTANCE OF NORMS	FORMAT OF RECORDS	D	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6	7	8	9		10			11

MANUFACTURER/ SUB-CONTRACTOR	CONTRACTOR
SIGNATURE	

LEGEND:
RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION
* M : MANUFACTURER/SUBCONTRACTOR
C: CONTRACTOR/NOMINATED INSPECTION AGENCY
INDICATE
'P'-PERFORM, 'W'-WITNESS & 'V'-VERIFICATION AS APPROPRIATE, 'CHP' –SHALL BE IDENTIFIED IN COLUMN-11

FOR BHEL USE	DOC NO.	
REVIEWED BY		NAME & SIGN OF APPRV.AUTHORITY & SEAL

REV. NO. 02

निर्माणकर्ता WORKED BY	SHUBHAM MITTAL	[signature]	16.4.11
जाँचकर्ता CHECKED BY	R.C. AGARWAL	[signature]	16.4.11

दिनांक एवं हस्ताक्षर SIGN & DATE

सामग्री सूची संख्या को अधिक्रमित करता है SUPERSEDES INVENTORY NO

TLV 9012202

TECHNICAL PURCHASE SPECIFICATION FOR FIRE RESISTANT FLUID

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
ISE & CPL	P.D.RAHUL	03.04.16	अनुवादक TRANSLATED BY		
TSX	A.KUMAR	6/4/16	निर्माणकर्ता WORKED BY	UMESH VERMA	30.3.16
QAX	S.K.CHAUHAN	03.04.16	जांचकर्ता CHECKED BY	VIKAS MALHOTRA	30.03.16
महकमा विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	P.K.BANSAL	2/4/16

स्वीकृति
APPROVED : RAJEEV GULATI (AGM (STE & QTE)) 5/4/16

Gr. NO. 8.20

REV.NO.	05		निर्माण PREPARED : STE	ज़ारी ISSUED : TSX	दिनांक DATE :20.06.2001
Dt.	18.04.17				
CHANGE ADVICE NO.	STE-17-02	21.03.17			

दिनांक एवं हस्ताक्षर SIGN & DATE 6/4/16

सामग्री सूची संख्या INVENTORY NO. P-55573

1.0 SCOPE:

This specification is applicable for fire resistant fluids, hereafter referred to as FRF, Used as a pressure transmitting medium in the turbine control and governing system, electro-hydraulic actuators (compact drives and electro-hydraulic drives) with integrated hydraulic supply (operating pressure upto 160 bar). The specification is based on Siemens TLV 9012 02.

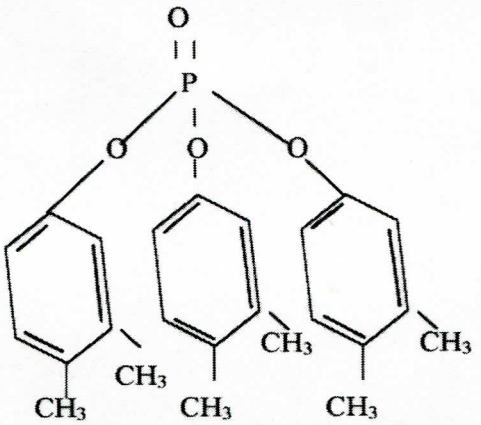
2.0 GENERAL REQUIREMENTS:

2.1 TYPE OF FIRE RESISTANT FLUID:

The FRF shall be Triarylphosphate esters type free from water content. The FRF is designated as ISO-L-HFDR according to ISO 6743/4.

2.2 CHEMICAL COMPOSITION:

The FRF shall be 100% natural Trixylenyl phosphate (TXP), a reaction product of Phosphorus oxychioride and xylol. This product has the following chemical formula.



CAS NUMBER 25155-23-1

Further, Triarylphosphate ester having CAS NO: 68937-40-6 is also acceptable.
The final product must be free of neurotoxic quantities of ortho-cresol-compounds. In order to improve certain properties e.g. corrosion protection, oxidation stability additives may be included provided they have no negative effect on the materials of the FRF-system or its operation.

2.3 CORROSION PROTECTION:

(a) The FRF shall not cause corrosion to the following materials:
Steel, Copper, Copper Alloys, Zinc, Tin, and Aluminum.
(b) The FRF must be capable of providing sufficient corrosion protection to the materials Used in the FRF-system.
(c) The FRF will be continuously regenerated with a regeneration agent.
(d) The FRF must not cause any erosion or corrosion on the edges of the control elements.

2.4 VISCOSITY GROUP:

The FRF shall be of viscosity group ISO VG46.

2.5 LIFE TIME:

Under the mentioned conditions and with regular regeneration, the FRF must provide a minimum life time of 25000 operating hours without any significant change in its properties. The maximum permissible limit of alteration in parameters during its working life are indicated under clause 2.13.

2.6 SHEAR STABILITY:

The FRF must be shear-stable. It should not contain viscosity index (VI) improver.

2.7 FIRE RESISTANCE:

The FRF leaking from the system must not ignite or burn in contact with hot surface (up to 550°C).

2.8 THERMAL STABILITY:

The FRF must be capable for withstanding a continuous temperatures of 75°C without Physical or chemical degradation.

2.9 COMPATIBILITY WITH ANOTHER BRAND OF FRF:

The FRF must be miscible with trace (Max. 3% by volume) of TXP of another brand. There should be no deterioration of the FRF in the presence of such trace quantities.

2.10 COMPATIBILITY WITH PACKING MATERIAL:

The FRF must be compatible with the following packing materials used in the system:
Fluorocarbon rubber (FKM), Butyl rubber (IIR), Polytetrafluoroethylene (PTFE), Polyethylene (PE), Polyamide (PA), Di-isocyanate adhesive, Polyurethane/polyester.
The FRF should not have a negative influence on its air-separation capability in the presence of above packing materials.

2.11 PHYSIOLOGICAL CONSIDERATIONS:

The FRF must not cause a safety or health hazard to the persons working with it provided that normal good industrial hygiene practices are followed.

REV. NO. 05		निर्माणकर्ता WORKED BY	VIKAS MALHOTRA	[signature]	30.03.16
		जांचकर्ता CHECKED BY	P.K.BANSAL	[signature]	2/4/16

2.12 PHYSICAL AND CHEMICAL PROPERTIES:

PROPERTY	NUMERICAL VALUE	UNIT	TEST METHOD	
			DIN/ISO	ASTM
Kinematic viscosity at 40°C (ISO VG 46)	41.4 – 50.6	mm^2/s	DIN 51 562-1	D445
Air release at 50°C	≤ 6	minutes	DIN ISO 9120	D3427
Neutralisation number	≤ 0.1	mg KOH/g	DIN 51 558-1	D 974
Water content	≤ 1000	mg/kg	DIN EN ISO 12937	D1744
Foaming at 25°C Tendency Stability	 ≤ 100 ≤ 450	 ml sec	ISO 6247 (Seq.- 1)	D 892 (Seq.- 1)
Water Separability	≤ 300	sec	DIN 51 589-1	
Demulsification	≤ 20	minutes	DIN ISO 6614	D 1401
Density at 15°C	≤ 1250	Kg/m^3	DIN 51 757	D 1298
Flash point (Cleveland open cup)	> 235	°C	ISO 2592	D 92
Ignition temperature	>550	°C	DIN 51 794	
Wick flame persistence time	≤ 10	sec	ISO 14935	
Pour point	≤ -18	°C	ISO 3016	D 97
Particle distribution*	≤18/15/12	Code	ISO 4406	
Chlorine content	≤ 50	mg/kg	ISO 15597	
Oxidation stability	≤ 2.0	mg KOH/g	DIN EN 14832	
Hydrolytic stability Change of neutralization number	≤ 2.0	mg KOH/g	DIN EN 14833	
Electrical resistivity	> 50	MΩm	IEC 247	

*The cleanliness level refers to the oil condition on delivery. The required system cleanliness is dependent upon the system design. Suitable measures (e.g. filtration, separation) have to be taken to achieve this cleanliness level.

NOTE: THE INFRARED (IR) SPECTRA OF FRF SHALL MATCH WITH THE IR SPECTRA GIVEN AT PAGE-7.

2.13 LIMIT VALUES:

The following limit values should not be exceeded during the required life time:

a) Kinematic viscosity: Maximum alteration ±5% referring to the condition on delivery

b) Neutralisation number: Maximum increase 0.20 mg KOH/g referring to the condition on delivery

c) Air release: Max. 12 minutes

d) Foaming at 25 degrees centigrade:

Tendency: max. 200 ml

Stability: max. 450 s

3.0 INFORMATION TO BE FURNISHED ALONG WITH THE OFFER:

3.1 The bidder shall furnish the complete technical information of the offered product which may also include a) product description, b) chemical name and structure, c) infrared spectra of the fluid, d) properties, e) disposal procedure, f) minimum working life, g) storage, handling and safety instructions, h) shipping method to be adopted at the time of delivery.

3.2 The bidder shall furnish confirmation regarding compliance of all the requirements as specified in this purchase specification along with the offer. In case of any deviation, the same shall be clearly informed by the bidder at the time of offer.

3.3 The bidder shall submit list of their customers utilising the fluid for application defined as per clause 1.0.

3.4 The offered grade of FRF should be of approved grade by M/S Siemens, Germany.

3.5 The approval of FRF does not make the supplier free from their responsibility for the quality of their product. The purchaser must be informed without fail in case of any alteration in their product or manufacturing process. In such cases a new approval by BHEL will become necessary.

4.0 DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF ORDER:

4.1 The supplier shall inform about the test results from internationally accredited lab giving the batch no., parameter, actual value obtained, test method of the batches proposed to be delivered and take approval from the purchaser before its dispatch as a minimum the following parameters have to be checked as per clause 2.12. Viscosity; air release; neutralization number; water content; foaming tendency, water separability or demulsification.

4.2 Certificate of compliance to the specification and also certificate of compliance to the properties as per clause 2.12 as well as chemical structure formula as per clause 2.2 shall be furnished.

4.3 The supplier shall furnish a copy of infrared spectra of the batches proposed to be delivered.

5.0 TEST CERTIFICATES/DOCUMENTS TO BE SUBMITTED WITH SUPPLIES:

10 nos. of hard copies and 3 nos. of soft copies of the following documents shall be furnished by the supplier along with each supply. The customer's and project's name shall be indicated on each document as prescribed by the purchaser.

a) The test certificates as per clause 4.1 and the compliance certificate to the effect that the product supplied is natural trixylenyl phosphate ester fluid and properties as per clause 2.12.

b) The supplier shall furnish material safety data sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during its transportation, storage, handling and disposal.

c) Marking of containers: The FRF must be delivered in cleaned containers. The following information are to be clearly indicated on each container:
   (i) Product name, manufacturer/ supplier, filling date, batch number, Net weight, Gross weight, Expiry date.
   (ii) Corresponding symbol and minimum worded cautionary notice for flammable/corrosive/toxic/harmful/ irritant and oxidising etc. as applicable.

6.0 SPECIAL AGREEMENTS:

Special agreements concerning variations from the requirements of this specification need authorisation by the purchaser. These must be settled through letter.

7.0 FILLING OF THE SYSTEM BY THE SUPPLIER:

7.1 Before filling the system a 02 liter sample shall be taken and sent to the laboratory for analysis. In the case of more than one batch, the supplier will blend a 02 liter sample from those batches. The proportions of the blend should reflect the final mixture that will result from filling the various batches into the hydraulic control system. Permission for filling will be given by the owner/purchaser after review of test results of the sample.

7.2 Filling of the system shall be made by the supplier at his own risk and expense.

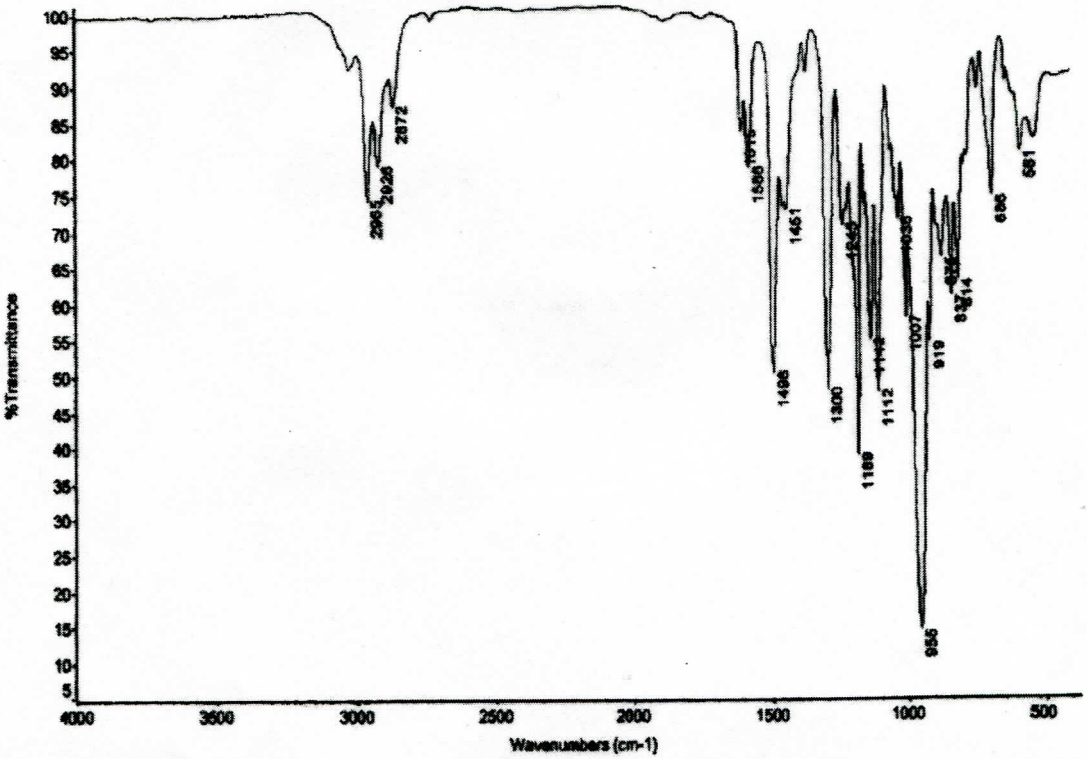
7.3 The filling is to be made through a filter unit having a mesh of 5 micron. The tools Used for filling the system must not affect the quality of FRF.

8.0 SAFETY MEASURES:

The safety precautions which are to be observed by the personnel dealing with FRF, shall be clearly demonstrated/informed to the purchaser by the FRF supplier in the form of specific safety instructions.

9.0 CROSS REFERRED STANDARDS:

DIN 51502; DIN 51562-1; DIN 51381; DIN 51558-1; DIN 51777-3; DIN 51589-1 51599; DIN 51757; DIN ISO 2592; DIN 51794; DIN ISO 14935; DIN ISO 3016; ISO 4406; DIN 51577-3; DIN 51373; DIN 51348; IEC 247; ASTM D 445; ASTM D 3427; ASTM D 974; ASTM D 1744; ASTM D 892 (Seq.1); ASTM D 1401; ASTM D 1298; ASTM D 92; ASTM D 97.



Infrared spectra of FRF (Trixylenyl phosphate)

Rev-00
06/12/2018

C&I ADDENDUM TO ST47050
PANKI(1x660MW)

1. Under Clause no. 6.1.1, Position transmitter of Balluf or equivalent make (standard off the shelf available in the market) is acceptable.
2. Under Clause no. 7.1.1, Pressure switches are to be provided for changeover of Circulation Pump Units. Flow switches shall not be accepted.
3. Clause no. 7.1.1 (a) should be read as 'Three (3) no. Pressure Transmitters are to be provided in HPSU Header.
4. Under Clause no. 7.1.1 (g), complete instrument list shall contain the range, model no. ordering code, set point, make and process connection for all the instruments.
5. Under Clause no. 7.1.2 and 12.2.2, for Interfacing with DCS only Servo valve should be considered. Wherever in the BHEL specification Proportional valve is mentioned, it should be read as Servo valve.
6. Under Clause no. 7.1.2, +/-7.5 mA signal should not be considered as it corresponds to Proportional valve. Only +/-30mA or +/-50mA shall be applicable for Servo Valve. This should be mentioned at the time of offer.
7. Under Clause no. 7.1.2, following additional points to be noted and considered:
   a. 20% spare Terminals in the JB are to be provided
   b. Cable Gland to be provided in JB for DCS end also.
8. Under Clause no. 7.1.3, following additional points should be considered:
   a. All Motors shall be of Premium efficiency class IE3, conforming to IS 12615, or IEC:60034-30.
   b. Complete Load list including power, voltage supply, rated current, starting current and RPM values is to be furnished within 4 weeks from the date of placement of P.O.
   c. Motor shall be painted with corrosion proof paints as per IS-5.
   d. Paint shade shall be light grey finish no. 631 for indoor and outdoor equipment.
9. Under Clause no. 6.1
   a. All the instruments, equipment's and their KKS tags should be as per the schemes only.
   b. Filter and its Differential pressure switch should be provided in each oil supply line for each servo valve.
10. a. Type Test report (As per BS-6647/IEC60770) of all Electronic Transmitters is required for Customer Approval.
    b. Type test report of main CFP motors is to be submitted.
11. Under Clause no. 7.0, Appendix 2 should be read in conjunction with Annexure 2. All the instruments, equipment's and their KKS tags should be as per this scheme (Annexure 2) only.
    Following points should be specially noted:
    a. Two separate motors for regeneration and cooling unit should be provided.
    b. Only one heater (If applicable) of suitable rating should be provided.
12. Under Clause no. 7.0, for Water Cooler (if applicable), mechanical thermostatic valves should be provided for control of oil flowing through the Water cooling circuit thus altogether maintaining the uniform oil temperature in the tank. This Thermostatic valve shall operate independently and no signal exchange from BHEL DCS shall take place.
13. Under Clause no. 11.2, List of Mandatory spares furnished by supplier shall duly mention all the KKS tags for which the corresponding item is applicable.

14. Junction Boxes for the Instruments shall be of Pyrotech, Rittal or equivalent (standard off the shelf available in the market) Make.
15. Process connection for the different type of instruments shall be as follows:
    a. Level Transmitter MAX05CL001/2/3: G ¾ Threaded
    b. Temperature Transmitter MAX05 CT001/2: G ½
    c. Level Gauge MAX05 CL501: M10
    d. All Pressure Gauges : G ½
    e. Leakage sensor MAN51/52/53/54/55/56CL011: M30
    f. All Pressure Switches: G ½
    g. All Differential Pressure Switches: G ½
    h. All Pressure Transmitters: ½ " NPT

06/12/18

06/12/18

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) | FORM DG 38(B)

DRAWING No. 3-12300-07801

DESCRIPTION	INPUT / PROCESS DATA	
Design Pressure (bar abs.)	INLET	OUTLET
	75	15
Design Temp. (°C)	601	601
Valve Diameter – DN	** – Supplier to specify	
Pressure Rating – PN	** – Supplier to specify	
Type of Valve Connections –	Butt welded	
Valve Characteristics– Linear /Quadratic /Equal %	Linear	
Valve Type – Straight / Angle	As per DRG. 3-12300-07802	
Hydraulic Medium – Mineral Oil / FRF for Actuation	Fire Resistant Fluid (FRF)	
Ambient condition	0°C to 50°C	
Material for Valve Casing including Desuperheater	ASTM A182 Gr:F91	

OPERATING REGIMES	CASE:1	CASE:2	CASE:3	CASE:4
Steam flow at inlet of each LP Bypass valve (Kg/Sec.)	184.3	224	226	306.40
Operating pressure at valve inlet P1 (bar abs.)	33.4	55.7	55.30	75
Operating temp. at valve inlet T1 (°C)	593	593	593	601
Spray water flow (kg/sec.)	78.00	93.09	93.95	–
Flow (steam & water) at outlet of each LPBP valve (Kg/Sec.)	262.3	317.09	319.95	–
Operating pressure at valve outlet P2 (bar abs.)	-Supplier to specify (4 bar min.)			–
Enthalpy of steam at valve outlet (KJ/Kg)	2650			–
Condenser pressure (bar abs.)	0.1			–

CASE-1: 65% BMCR flow
CASE-2: HP Heater out of service
CASE-3: VWO Trip condition
CASE-4: Max. operating case (Not to be considered for sizing of Water Injection Valve & Dump Tube)

NOTE:-

1. ALL COMPONENTS OF LPBP VALVE ALONG WITH ACTUATOR SHALL BE DESIGNED FOR OPERATION AT DESIGN PRESSURE 75 bar (a), TEMPERATURE 601°C & CORRESPONDING STEAM FLOW 306.40 KG/Sec.
2. THE LPBP VALVE ALONG WITH ACTUATOR SHALL ALSO BE SUITABLE FOR OPERATION AT MAX. SHORT TERM PRESSURE 78 bar(a) & MAX. SHORT TERM TEMPERATURE 617°C. MAX. SHORT TERM PRESSURE & TEMPERATURE ARE ONLY ALLOWED FOR BRIEF SWINGS OF 15 MINUTES OR LESS, PROVIDED THAT THE TOTAL OPERATING TIME DOES NOT EXCEED 80 HOURS DURING ANY 12 MONTHS OPERATING PERIOD.
3. THE SELECTED CV OF LP BYPASS VALVE SHALL HAVE SUFFICIENT MARGIN (AT LEAST 8%) OVER THE MAXIMUM CV VALUE CALCULATED AS PER THE OPERATING CONDITIONS MENTIONED IN THE DRAWING.

312300077O1 Ref.Drawing No.

Sign & Date

Inventory No.

REV	DATE	ALTERED / CHECKED

REV	DATE	ALTERED / CHECKED

REV	DATE	ALTERED / CHECKED

~~GMS No.~~ C B O M

AGREED DEPT	NAME	SIGN	STATUS OF DRG / DATE

GRADE OF UNTOL. DIM
M/CG.- ~~AA0230208 m~~
WELDING-~~CLASS 'B' OF AA0621104~~
GAS CUTTING-~~TABLE 3 OF AA0621101~~

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD.
RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	LOKESH	SD/-	09.04.19
CHD	D.K/V.M.	SD/-	09.04.19
APPD	R.RAWAT	SD/-	15.04.19

NO. OF VAR: -

DEPT STE
CODE 4011

SCALE NTS

WEIGHT (KG) -----

REF. TO ASSY. DRG. —

ITEM No. —

NO. OF ITEMS —

TITLE : INPUT/PROCESS DATA FOR LPBP VALVE AND ACTUATORS

CARD CODE

DRAWING NO. 3-12300-07801 —

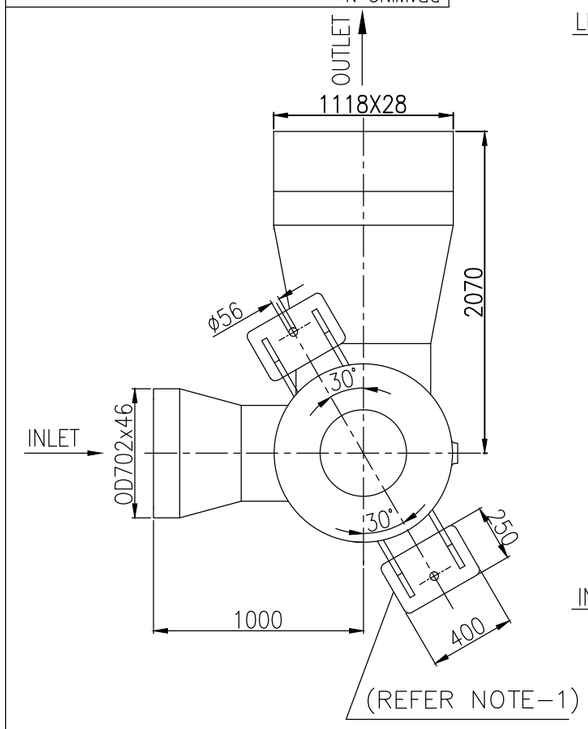
SHEET No. 1 | No. OF SHEETS 1

SIZE A3

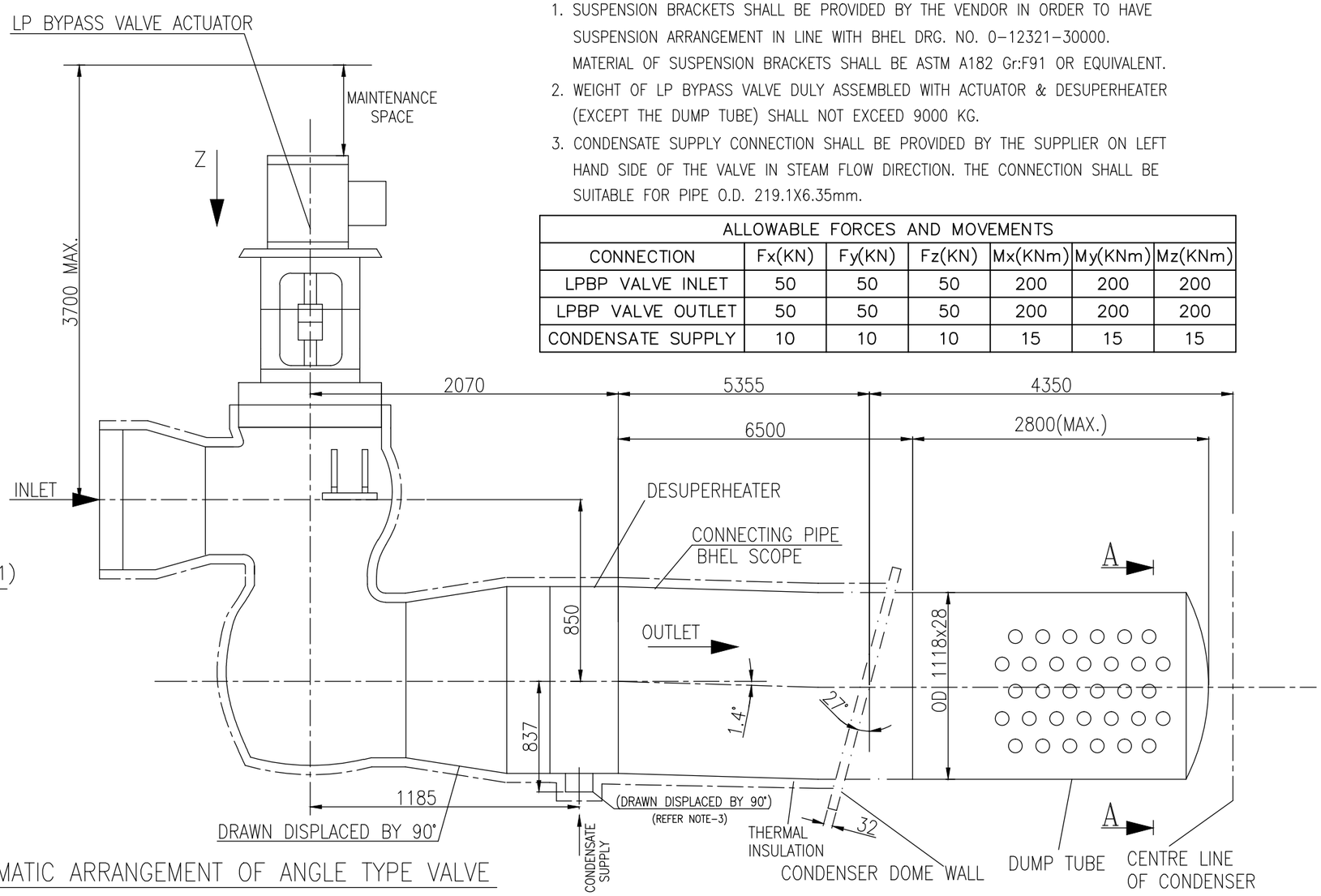
FIRST ANGLE PROJECTION

FORM DG 38(B)

DRAWING NO. 3-12300-07802



VIEW–Z
(WITHOUT ACTUATOR)

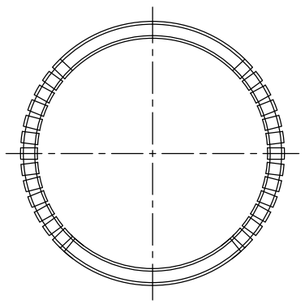


SCHEMATIC ARRANGEMENT OF ANGLE TYPE VALVE

NOTE:–

1. SUSPENSION BRACKETS SHALL BE PROVIDED BY THE VENDOR IN ORDER TO HAVE SUSPENSION ARRANGEMENT IN LINE WITH BHEL DRG. NO. 0–12321–30000. MATERIAL OF SUSPENSION BRACKETS SHALL BE ASTM A182 Gr:F91 OR EQUIVALENT.
2. WEIGHT OF LP BYPASS VALVE DULY ASSEMBLED WITH ACTUATOR & DESUPERHEATER (EXCEPT THE DUMP TUBE) SHALL NOT EXCEED 9000 KG.
3. CONDENSATE SUPPLY CONNECTION SHALL BE PROVIDED BY THE SUPPLIER ON LEFT HAND SIDE OF THE VALVE IN STEAM FLOW DIRECTION. THE CONNECTION SHALL BE SUITABLE FOR PIPE O.D. 219.1X6.35mm.

ALLOWABLE FORCES AND MOVEMENTS						
CONNECTION	Fx(KN)	Fy(KN)	Fz(KN)	Mx(KNm)	My(KNm)	Mz(KNm)
LPBP VALVE INLET	50	50	50	200	200	200
LPBP VALVE OUTLET	50	50	50	200	200	200
CONDENSATE SUPPLY	10	10	10	15	15	15



SECTION–AA

3-12300-07702 Ref.Drawing No>

Sign & Date

Inventory No.

REV	DATE	ALTERED / CHECKED

REV	DATE	ALTERED / CHECKED

REV	DATE	ALTERED / CHECKED

GRADE OF UNTOL. DIM

M/CG.– ~~AA0230208 m~~

WELDING–~~CLASS 'B' OF AA0621104~~

GAS CUTTING–~~TABLE 3 OF AA0621101~~

~~GMS No./~~ C B O M			STATUS OF U DRG
AGREED DEPT	NAME	SIGN	DATE
PED	ANIL	–SD–	09.04.19
HXE	LOKESH	–SD–	09.04.19

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD.
RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	LOKESH	–SD–	09.04.19
CHD	VIKAS/DK	–SD–	09.04.19
APPD	R.RAWAT	–SD–	15.04.19

NO. OF VAR –

DEPT STE

CODE 4011

SCALE NTS

WEIGHT (KG) –––––

REF. TO ASSY. DRG. —

ITEM No. —

NO. OF ITEMS —

TITLE : ARRANGEMENT OF LPBP VALVE ALONG WITH ASSOCIATED EQUIPMENT

CARD CODE

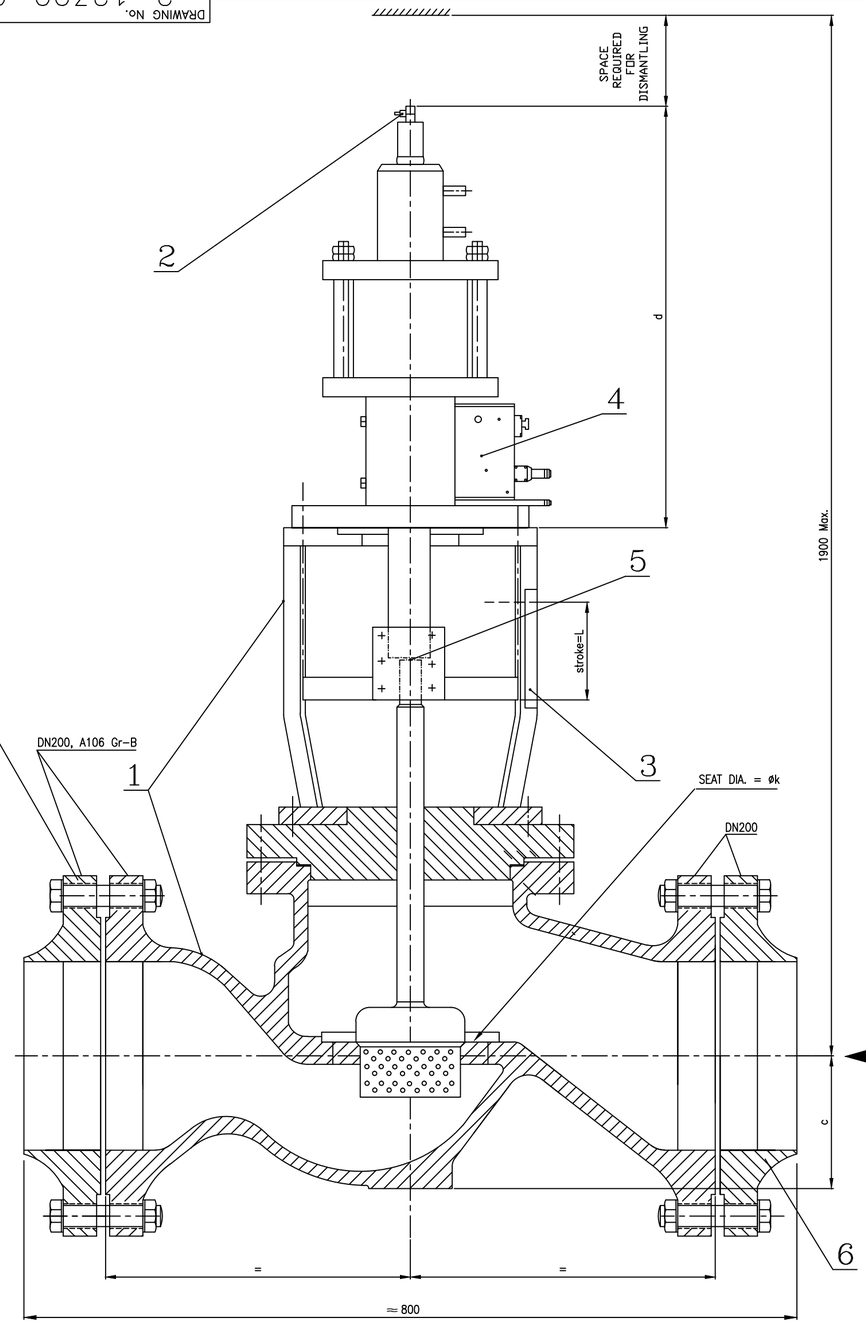
DRAWING NO. 3–12300–07802 —

SHEET No. 01 | No. OF SHEETS 01

SIZE A3

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm) FORM DG 44(B)

DRAWING No. 2-12300-07803



NOTE : – ALL DIMENSIONS AS MARKED (øK, L, c, d) SHALL BE FURNISHED BY THE SUPPLIER

INPUT DATA FOR VALVE & ACTUATOR:

MAX. CALCULATED WATER MASS FLOW	: 93.95 KG/SEC
MIN. CONTROLLED WATER MASS FLOW	: 9.39 KG/SEC
WIV DESIGN PRESSURE/TEMPERATURE	: 50.00 BAR (a) / 100°C
MAX. WATER PRESSURE ACROSS THE VALVE	: 47.00 BAR
WATER PRESSURE AT VALVE INLET	: 29 BAR
WATER INLET TEMPERATURE	: 30 TO 60°C
NOISE REQUIREMENTS	: < 85 dB(A)
INLET & OUTLET CONNECTIONS	: SHALL BE FLANGED END (AS SHOWN)
VALVE SIZE	: DN 200

ACTUATOR TYPE: : ELECTRO-HYDRAULIC

OPERATING MEDIUM	: FIRE RESISTANT FLUID (FRF)
CONTROL FLUID NORMAL OPERATING PRESSURE	: 160 BAR (*)
CONTROL FLUID MINIMUM OPERATING PRESSURE	: 115 BAR (*)
NORMAL CONTROL FLUID TEMPERATURE	: 50+5°C
MAXIMUM CONTROL FLUID TEMPERATURE	: 75°C
CONTROL SIGNAL	: ±30ma
OPENING TIME	: <=3 SEC. (MAX.)
ACTUATOR SPINDLE MOUNTING	: VERTICAL
VALVE CHARACTERISTICS	: EQUAL PERCENTAGE
FAILURE MODE	: STAY PUT
SUPPLY LINE	: 48.3X5.08
RETURN LINE	: 48.3X3.68

(*) – HYDRAULIC OPERATING PRESSURE SHALL BE MADE AVAILABLE FROM THE CENTRALISED HYDRAULIC POWER SUPPLY UNIT (HPSU). MEANT FOR TURBINE BYPASS SYSTEM.

NOTES:–

1. VALVE INLET & OUTLET COUNTER FLANGE END CONNECTIONS:
   ø219.1X6.35, MATERIAL AS PER ASTM A105.
2. PRESSURE DROP IN PIPE LINE FROM OUTLET OF WIV TO INLET OF DESUPERHEATER SHALL BE 0.5 BAR.

TECHNICAL REQUIREMENTS:–

1. VALVE TO BE SUPPLIED ALONG WITH INLET / OUTLET COUNTER FLANGES (WELD NECK, RAISED TYPE), ASSOCIATED FASTENERS AND SEALINGS.
2. SCOPE OF SUPPLY SHALL BE AS PER TABLE-1.
3. BODY MATERIAL : CAST STEEL GS-C25 (1.0619)/ A216 WCB.
4. VALVE SUPPLIER MUST SHOW THE WATER FLOW DIRECTION WITH AN ARROW EMBOSSED OVER THE VALVE BODY.
5. THE ACTUATOR SHALL BE CAPABLE OF MANUAL OPERATION & FURNISH RELEVENT TECHNICAL DETAILS ALONGWITH OFFER.
6. CONTROL BLOCK/MANIFOLD SHOULD BE MOUNTED ON THE POWER CYLINDER AND IT SHOULD CONSIST OF SERVO-VALVE, FILTER, SOLENOID VALVES, CARTRIDGES/CHECK VALVES ETC.
7. ELECTRONIC POSITION FEEDBACK TRANSMITTER SHALL BE NON-CONTACT TYPE REQUIRED FOR MEASURING THE POSITION OF THE CONTROL VALVE. OUTPUT OF THE POSITION TRANSMITTER SHALL BE 4mA (VALVE FULLY CLOSED) TO 20mA (VALVE FULLY OPENED).
8. STRENGTH & LEAK TIGHTNESS TEST : AS PER CLASS V ANSI B 16.104
9. VALVE BODY SHALL BE HYDRAULICALLY TESTED AT MIN. 1.5 TIMES DESIGN PRESSURE AS PER DIN 3230 PT III BA/BQ/ANSI B16.34.
10. WATER INJECTION VALVE (W.I.V.) IS TO BE DESIGNED FOR OPERATION WITH HYDRAULIC ACTUATOR. IN FAILURE MODE THE VALVE SHALL BE IN STAYPUT CONDITION.
11. VALVE CONFIGURATION SHALL BE "FLOW TO CLOSE".
12. SELECTED CV OF WATER INJECTION VALVE SHALL HAVE 15% MARGIN OVER THE MAXIMUM CV VALUE CALCULATED BASED ON MAXIMUM CALCULATED WATER MASS FLOW AS SPECIFIED IN THE DRAWING.
13. THE VALVE SIZING SHALL BE SUITABLE FOR OBTAINING SPRAY WATER FLOW AS 78.00 KG/SEC WITHIN 80% OF TOTAL VALVE TRAVEL.

DOCUMENTS REQUIRED ALONG WITH THE OFFER ARE:–

1. DOCUMENTS REQUIRED ALONG WITH THE OFFER SHALL BE AS PER CL. 12.2.3 OF ST47050.

Table-1

IT.NOS.	ITEM DESCRIPTION
1.	CONTROL VALVE WITH HYDRAULIC ACTUATOR
2.	POSITION TRANSMITTER
3.	SCALE FOR LOCALISED DISPLAY
4.	CONTROL MANIFOLD
5.	COUPLING
6.	COUNTER FLANGES WITH FASTENERS
7.	COMMISSIONING SPARES

21230007703 Ref.Drawing No>
Sign & Date
Inventory No

REV	DATE	ALTERED / CHECKED

GRADE OF UNTOL.DIM
~~M/CG.-C/M/F AA0230208~~
~~WELDING-A/B/C/D AA0621104~~
~~GAS CUTTING-'T3'AA0621101~~

~~CMS No./~~ CBOM No.	AGREED DEPT	NAME	SIGN	STATUS OF DRG U	DATE
	--	---	---	---	---

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	LOKESH	SD/-	09.04.19
CHD	DK/VM	SD/-	09.04.19
APPD	R.RAWAT	SD/-	15.04.19

NO. OF VAR: - (73 74)

DEPT STE
CODE 4011
SCALE NTS
WEIGHT (KG) -
REF. TO ASSY. DRG. -
ITEM No. -
NO. OF ITEMS - (75 77)

TITLE : WATER INJECTION CONTROL VALVE

CARD CODE

DRAWING NO. 2-12300-07803 - (7 22 23 24)

SHEET No. 01 | No. OF SHEETS 01

SIZE A2

LIST OF MANDATORY SPARES AS PER CLAUSE NO.11.2 OF ST47050:-

A. TABLE-1:- MECHANICAL ITEMS

SL. NO.	CUSTOMER CLAUSE	ITEM DESCRIPTION	QTY.	UNIT.
1	I.2.00.26.1	LP BYPASS CONTROL VALVE (SET OF INTERNALS REQUIRED TO FORM ONE VALVE ASSEMBLY EXCEPT VALVE BODY & BONNET)	1	SET
2	I.2.00.27.3	LP BYPASS CONTROL VALVE ACTUATOR WITH CONTROL BLOCK (COMPLETE ASSEMBLY)	1	NO.
3	I.2.00.28.3, I.2.00.29.1 & III.1.00.16.D.3.1	SERVO VALVE FOR LP BYPASS CONTROL VALVE (COMPLETE ASSEMBLY)	3	NO.
4	I.2.00.33.1	WATER INJECTION VALVE FOR LP BYPASS SYSTEM (COMPLETE SET OF INTERNALS REQUIRED TO FORM ONE WATER INJECTION VALVE ASSEMBLY EXCEPT FOR OUTER CASING)	1	SET
5	I.2.00.34.1& III.1.00.16.D.3.2	SERVO VALVE FOR SPRAY WATER INJECTION VALVE FOR LP BYPASS SYSTEM (COMPLETE ASSEMBLY)	2	NO.
6	I.2.00.71.2	BLADDERS FOR ACCUMULATORS OF HPSU OF LP BYPASS SYSTEM (SET COMPRISING OF COMPLETE REPLACEMENT IN ONE TG UNIT)	2	SET
7	III.1.00.16.A.A.3	STEM PACKING FOR LP BYPASS CONTROL VALVE	1	SET
8	III.1.00.16.A.A.4	STEM PACKING FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	SET
9	III.1.00.16.A.C.3	O-RINGS AND RUBBER GASKETS, SEALS FOR LP BYPASS CONTROL VALVE	1	SET
10	III.1.00.16.A.C.4	O-RINGS AND RUBBER GASKETS, SEALS FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	SET
11	III.1.00.16.A.G.4	VALVE TRIMS (SUCH AS PLUG, STEM, SEAT RING/CAGE, GUIDE BUSHING, STEM LOCK PIN, PACKING RETAINING RING, ETC) FOR LP BYPASS CONTROL VALVE	1	SET
12	III.1.00.16.A.G.4	VALVE TRIMS (SUCH AS PLUG, STEM, SEAT RING/CAGE, GUIDE BUSHING, STEM LOCK PIN, PACKING RETAINING RING, ETC) FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	SET
13	III.1.00.16.A.H.1	ELECTRO HYDRAULIC ACTUATOR FOR WATER INJECTION VALVE OF LPBP SYSTEM (WITH CONTROL BLOCK)	1	NO.
14	III.1.00.16.A.I.2	SOLENOID VALVE FOR EHA OF LP BYPASS CONTROL VALVE	2	NO.
15	III.1.00.16.A.I.3	SOLENOID VALVE FOR EHA OF WATER INJECTION VALVE OF LPBP SYSTEM	2	NO.
16	III.1.00.16.C.A.1	STEM FOR LP BYPASS CONTROL VALVE	1	NO.
17	III.1.00.16.C.A.2	STEM FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	NO.
18	III.1.00.16.C.B.1	INLET CAGE FOR LP BYPASS CONTROL VALVE	1	NO.
19	III.1.00.16.C.B.2	INLET CAGE FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	NO.
20	III.1.00.16.C.C.1	NOZZLE BODY FOR LP BYPASS CONTROL VALVE DESUPERHEATER	1	NO.
21	III.1.00.16.C.D.1	VALVE SEAT FOR LP BYPASS CONTROL VALVE	1	NO.
22	III.1.00.16.C.D.2	VALVE SEAT FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	NO.
23	III.1.00.16.C.E.1	GUIDE BUSHING FOR LP BYPASS CONTROL VALVE	1	NO.
24	III.1.00.16.C.E.2	GUIDE BUSHING FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	NO.
25	III.1.00.16.C.F.1	VALVE PACKING FOR LP BYPASS CONTROL VALVE	1	SET
26	III.1.00.16.C.F.2	VALVE PACKING FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	SET
27	III.1.00.16.C.G.1	VALVE GASKETS FOR LP BYPASS CONTROL VALVE	1	SET
28	III.1.00.16.C.G.2	VALVE GASKETS FOR WATER INJECTION VALVE OF LP BYPASS SYSTEM	1	SET
29	III.1.00.16.C.H.1	SEAL SET FOR LPBP CONTROL VALVE ACTUATOR	1	SET
30	III.1.00.16.C.H.2	SEAL SET FOR ACTUATOR OF WATER INJECTION VALVE OF LPBP SYSTEM	1	SET
31	III.1.00.16.D.5.1	SEAL SETS FOR LPBP CONTROL VALVE	4	SET
32	III.1.00.16.D.5.2	SEAL SETS FOR WATER INJECTION VALVE OF LPBP SYSTEM	4	SET
33	III.1.00.16.D.6.1	FILTER ELEMENTS FOR HPSU OF LPBP SYSTEM	1	SET
34	III.1.00.16.D.7.1	SUPPLY MANIFOLD FOR HPSU OF LPBP SYSTEM	1	NO.
35	III.1.00.16.D.8.1	HOSES FOR LPBP SYSTEM (FOR EACH SERVICE)	1	NO. EACH TYPE
36	III.1.00.16.D.9.1	SEAL SET FOR HPSU OF LPBP SYSTEM	1	SET

B. TABLE-2:- C&I ITEMS

SL. NO.	CUSTOMER CLAUSE	ITEM DESCRIPTION (C & I ITEMS)	QTY.	UNIT.	REMARKS
1	1.00.01.01/II/15	PRESSURE TRANSMITTER-LPBP	1	NO.	
2	1.00.01.01/II/16	LEVEL TRANSMITTER-LPBP	1	NO.	
3	1.00.01.01/II/17	TEMPERATURE TRANSMITTER-LPBP	1	NO.	
4	1.00.01.01/II/18 & 1.00.01.04/08	PRESSURE SWITCH (TYPE-1)-LPBP	2	NO.	
5	1.00.01.01/II/19 & 1.00.01.04/09	PRESSURE SWITCH (TYPE-2)-LPBP	2	NO.	
6	1.00.01.01/II/20 & 1.00.01.04/10	DPS (TYPE-1)-LPBP	2	NO.	
7	1.00.01.01/II/21 & 1.00.01.04/11	DPS (TYPE-2)-LPBP	2	NO.	
8	1.00.01.01/II/22	PRESSURE GAUGE (TYPE-1)-LPBP	1	NO.	
9	1.00.01.01/II/23	PRESSURE GAUGE (TYPE-2)-LPBP	1	NO.	
10	1.00.01.01/II/24	PRESSURE GAUGE (TYPE-3)-LPBP	1	NO.	PRESSURE GAUGE (TYPE-2) TO BE OFFERED
11	1.00.01.01/II/25 & 1.00.01.14/02	LEVEL GAUGE-LPBP	3	NO.	
12	1.00.16/D/I/01	POSITION TRANSMITTER (TYPE-1)- SUPER-CRITICAL SETS -LPBP	2	NO.	
13	1.00.16/D/I/02	POSITION TRANSMITTER (TYPE-2)- SUPER-CRITICAL SETS -LPBP	2	NO.	
14	14.02.05/10	LPBP MAIN CFP MOTOR	1	NO.	
15	14.02.05/11	LPBP RECIRCULATION MOTOR	1	NO.	
16	14.02.05/12	LPBP REGENERATION MOTOR	1	NO.	
17	14.02.05	BEARING OF MAIN CFP MOTOR FOR LPBP	4	SETS	

TECHNICAL REQUIREMENTS :-

1 ALL THE SPARES MENTIONED ABOVE ARE FOR REPLACEMENT WITH THEIR PARTS IN THE MAIN EQUIPMENTS. INTERCHANGEABILITY OF THESE SPARES WITH THE ORIGINAL SUPPLY HAS TO BE ENSURED BY THE SUPPLIER.

2. ALL THE SPARES MUST BE PACKED IN SEALED TRANSPARENT PLASTIC BAGS AND CLEARLY MARKED OR LABELED ON THE OUTSIDE OF THE PACKING WITH ITS DESCRIPTION & ASSEMBLY PART NUMBERS.

3. QUALITY CHECKS & TESTING NORMS/REQUIREMENTS FOR SPARES SHALL BE AS PER APPROVED QUALITY PLAN (QP) APPLICABLE FOR THE MAIN EQUIPMENT.

4. ALL THE RELEVENT ASSEMBLY DRGS. SHALL BE FURNISHED BY THE VENDOR MARKING ALL THE OFFERED ITEMS.

5. OFFERED ITEMS SHALL BE CORRELATED WITH THE ITEMS MENTIONED IN THIS DRAWING & WITH RESPECTIVE BOM OF MAIN EQUIPMENT DRAWING.

6. ITEM WISE / UNIT WISE PRICE OF ALL MANDATORY SPARES ARE TO BE INCLUDED IN OFFER.

MATERIAL CODE : W99312301780

REV	DATE	ALTERED / CHECKED
REV	DATE	ALTERED / CHECKED
REV	DATE	ALTERED / CHECKED
REV	DATE	ALTERED / CHECKED
REV	DATE	ALTERED / CHECKED
REV	DATE	ALTERED / CHECKED

GRADE OF UNTOL.DIM
~~M/CC.-C/M/F AA0230208~~
~~WELDING-A/B/C/D AA0621104~~
~~GAS CUTTING -'T3'AA0621101~~

~~GMS No./GR. SP. NO.~~ -- --			STATUS OF DRG U
AGREED DEPT	NAME	SIGN	DATE
CIE	GURPREET	-SD-	09.04.19
--	--	--	--
--	--	--	--

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	UVERMA	-SD-	09.04.19
CHD	DK/VM	-SD-	09.04.19
APPD	R.RAWAT	-SD-	15.04.19

NO. OF VAR —

DEPT STE | CODE 4011 | SCALE N.T.S | WEIGHT (KG) -- | REF. TO ASSY. DRG. -- | ITEM No. -- | NO. OF ITEMS --

TITLE : MANDATORY SPARES-LP BYPASS SYSTEM

CARD CODE

DRAWING NO. 2-12300-07811 —

SHEET No. 01 | No. OF SHEETS 02

SIZE A2

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

FORM DG 38(B)

DRAWING No. 3-12300-56005

SL.NO.	QUANTITY	DESCRIPTION
A-HYDRAULIC POWER SUPPLY UNIT:		
1	2 NO. (EACH TYPE)	FILTER INSERT FOR EACH TYPE OF FILTER IN HPSU.
2	1 SET (EACH TYPE)	O-RINGS, GASKETS, SEALING & PACKING (EACH TYPE) IN HPSU.
3 (03)	1 NO.	BLADDER FOR ACCUMULATOR IN HPSU
B-ELECTRO HYDRAULIC ACTUATORS:		
1	2 NO. (EACH TYPE)	FILTER INSERT FOR EACH TYPE OF FILTER IN ELECTRO-HYDRAULIC ACTUATORS.
2	1 SET (EACH TYPE)	O-RINGS, GASKETS, SEALING & PACKING (EACH TYPE) IN ELECTRO-HYDRAULIC ACTUATORS.
3	1 SET (EACH TYPE)	RECEPTACLE CONNECTORS
(02) C-LP BYPASS STOP VALVE & LP BYPASS CONTROL VALVE:		
1	2 SET (EACH TYPE)	O-RINGS, GASKETS, SEALING & PACKING (EACH TYPE) IN VALVES.
D-WATER INJECTION CONTROL VALVE:		
1	1 SET (EACH TYPE)	O-RINGS, GASKETS, SEALING & PACKING (EACH TYPE) IN VALVES.
E-C&I ITEMS.		
1	1 NO. (EACH TYPE)	POSITION TRANSMITTERS
F-OTHER ITEMS OFFERED BY THE VENDOR AS PER THEIR STANDARD PRACTICE.		

NOTES:

1. SUPPLIER TO FURNISH THE RELEVENT BILL OF MATERIAL & EQUIPMENTS DRAWING ALONG WITH THE OFFER CORRELATING EACH OF ABOVE REFERRED ITEMS.
2. THE VENDOR TO OFFER THE COMMISSIONING SPARES TAKING CARE OF UNINTERRUPTED OPERATION OF LP BYPASS SYSTEM FOR ONE YEAR.

GRADE OF UNTOL. DIM
M/CG.- AA0230208 m
WELDING-CLASS 'B' OF AA0621104
GAS CUTTING-TABLE 3 OF AA0621101

~~GMS No./~~ C B O M — STATUS OF DRG U

AGREED DEPT	NAME	SIGN	DATE
CIE	S.SINGH	-sd-	17.06.13

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. RANIPUR, HARDWAR

	NAME	SIGN	DATE
DRN	SS/DK	-sd-	01.06.13
CHD	LS/RR	-sd-	01.06.13
APPD	R.C.A	-sd-	10.06.13

NO. OF VAR: -

REV	DATE	ALTERED / CHECKED	DESCRIPTION
03	26.03.19	ALTERED LOKESH / CHECKED DINESH	CHANGED AS PER C/A. NO. STE-19-F099.
02	03.06.15	ALTERED UVERMA sd/- / CHECKED ADARSH sd/-	CHANGED AS PER C/A. NO. STE-15-F0198.
01	13.12.14	ALTERED KJSS / CHECKED VIKAS	THIS DRG. SUPERSEDES THE OLD DRG. UNDER THE SAME NO. WITH CHANGES AS PER CHANGE ADVICE NO. STE-14-F0384.

Sign & Date | Ref.Drawing No> | Inventory No.

DEPT	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM No.	NO. OF ITEMS
STE	N.T.S	-	-		-

CODE 4011

TITLE : COMMISSIONING SPARE PARTS FOR LP BYPASS SYSTEM

CARD CODE

DRAWING NO. 3-12300-56005 | -

SHEET No. 1 | No. OF SHEETS 1

SIZE A3

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN mm)

FORM: DG 45(B)

DRAWING NO. 1-12300-56008

TABLE-1 (SPARES OF LP BYPASS STOP VALVE):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 SET	SET OF ALL INTERNALS REQUIRED FOR ONE COMPLETE VALVE EXCEPT VALVE BODY & BONNET
2.	1 SET	STRAINER
3.	1 SET	VALVE PLUG & STEM ASSEMBLY
4.	1 NO.	VALVE SEAT
5.	1 SET	PACKING SET
6.	1 SET	GASKET SET
7.	1 SET	PISTON RING
8.	1 SET	GLAND BUSH
9.	1 SET	HARDWARE ITEMS (ALL STUDS, BOLTS, NUTS & WASHERS)

TABLE-3 (SPARES OF LP BYPASS CONTROL VALVE):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 SET	SET OF ALL INTERNALS REQUIRED FOR ONE COMPLETE VALVE EXCEPT VALVE BODY & BONNET
2.	1 SET	STRAINER
3.	1 SET	VALVE PLUG & STEM ASSEMBLY
4.	1 NO.	VALVE SEAT
5.	1 SET	PACKING SET
6.	1 SET	GASKET SET
7.	1 SET	PISTON RING
8.	1 SET	GLAND BUSH
9.	1 SET	HARDWARE ITEMS (ALL STUDS, BOLTS, NUTS & WASHERS)
10.	1 NO.	SPRAY NOZZLE

TABLE-5 (SPARES OF WATER INJECTION VALVE):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 SET	SET OF ALL INTERNALS REQUIRED FOR ONE COMPLETE VALVE EXCEPT VALVE BODY & BONNET
2.	1 SET	STRAINER
3.	1 SET	VALVE PLUG & STEM ASSEMBLY
4.	1 NO.	VALVE SEAT
5.	1 SET	PACKING SET
6.	1 SET	GASKET SET
7.	1 SET	GLAND BUSH
8.	1 SET	HARDWARE ITEMS (ALL STUDS, BOLTS, NUTS & WASHERS)

TABLE-2 (SPARES OF LP BYPASS STOP VALVE ACTUATOR):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 NO.	COMPLETE ACTUATOR
2.	1 SET	CONTROL UNIT
3.	1 SET	SEAL SET OF ACTUATOR
4.	1 NO.	PILOT VALVE
5.	1 NO.	CARTIRAGE VALVE
6.	1 NO.	TRIP SOLENOID VALVE
7.	1 NO.	FILTER FOR PRESSURE LINE
8.	1 SET	OIL HOSES FOR PRESSURE & RETURN LINES
9.	1 NO.	PISTON OF ACTUATOR
10.	1 NO.	PISTON ROD OF ACTUATOR

TABLE-4 (SPARES OF LP BYPASS CONTROL VALVE ACTUATOR):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 NO.	COMPLETE ACTUATOR
2.	1 SET	CONTROL UNIT
3.	1 SET	SEAL SET OF ACTUATOR
4.	1 NO.	SERVO VALVE
5.	1 NO.	SEAL SET OF SERVO VALVE
6.	1 NO.	FILTER FOR SERVO VALVE
7.	1 NO.	INTERLOCKING VALVE
8.	1 SET	OIL HOSES FOR PRESSURE & RETURN LINES
9.	1 NO.	CARTIRAGE VALVE
10.	1 NO.	TRIP SOLENOID VALVE
11.	1 NO.	FILTER FOR PRESSURE LINE
12.	1 NO.	PISTON OF ACTUATOR
13.	1 NO.	PISTON ROD OF ACTUATOR

TABLE-6 (SPARES OF WATER INJECTION VALVE ACTUATOR):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 NO.	COMPLETE ACTUATOR
2.	1 SET	CONTROL UNIT
3.	1 SET	SEAL SET OF ACTUATOR
4.	1 NO.	SERVO VALVE
5.	1 NO.	SEAL SET OF SERVO VALVE
6.	1 NO.	FILTER FOR SERVO VALVE
7.	1 NO.	INTERLOCKING VALVE
8.	1 SET	OIL HOSES FOR PRESSURE & RETURN LINES
9.	1 NO.	FILTER FOR PRESSURE LINE
10.	1 NO.	PISTON OF ACTUATOR
11.	1 NO.	PISTON ROD OF ACTUATOR

TABLE-7 (SPARES OF HPSU):

SL.NO.	QUANTITY	DESCRIPTION
1.	1 SET	MAIN PUMP WITH DRIVE MOTOR
2.	1 SET	FILTER PUMP WITH DRIVE MOTOR
3.	1 NO.	FILTER FOR MAIN CIRCUIT
4.	1 NO.	FILTER FOR COOLING CIRCUIT
5.	1 NO.	FILTER FOR REGENERATION CIRCUIT
6.	1 NO.	AIR FILTER
7.	1 NO.	PRESSURE RELIEF VALVE
8.	1 NO.	BLADDER FOR HYDRAULIC ACCUMULATOR
9.	1 NO.	CONNECTION BLOCK FOR HYDRAULIC ACCUMULATOR
10.	1 NO.	NITROGEN GAS FILLING DEVICE FOR HYDRAULIC ACCUMULATOR
11.	1 NO.	SUPPLY MANIFOLD
12.	1 SET	O-RINGS, GASKETS, SEALING & PACKING (EACH TYPE) IN HPSU.
13.	1 NO.	COOLING WATER REGULATING VALVE
14.	1 NO.	OIL COOLER (COMPLETE ASSEMBLY)
15.	1 SET	HIGH PRESSURE HOSES
16.	1 SET	MAIN PUMP WITHOUT MOTOR
17.	1 SET	FILTER PUMP WITHOUT MOTOR
18.	1 SET	COUPLING FOR MAIN PUMP
19.	1 SET	COUPLING FOR FILTER PUMP

NOTES:

1. SUPPLIER TO FURNISH PRICE AGAINST EACH OF THE OFFERED ITEM FOR REFERENCE & FUTURE ORDERING.
2. SUPPLIER TO FURNISH THE RELEVANT BILL OF MATERIAL & DRAWING OF MAIN EQUIPMENT ALONG WITH THE OFFER.
3. SUPPLIER TO FURNISH CO-ORELATION WITH MAIN EQUIPMENT (i.e. ITEM NO. & ASSEMBLY DRAWING NO.) FOR EACH OF THE OFFERED ITEMS.

INVENTORY NO. | SIGN & DATE | REF. DRG. NO. -

GRADE OF UNTOL. DIM.:-
~~M/CG- V/C/M/F AA 0230208~~
~~WELDING-A/B/C/D-AA621104~~
~~GAS CUTTING-'T3'AA0621101~~

REV.	DATE	ALTERED / CHECKED

CBOM NO. | STATUS OF DRG. U

AGREED DEPT.	NAME	SIGN	DATE

REV.	DATE	ALTERED / CHECKED

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT: STEAM TURBINE

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN	DATE	NO.OF VAR.
DRN	U VERMA	-SD-	11.12.15	
CHD	VIKAS	-SD-	11.12.15	-
APD	P.BANSAL	-SD-	11.12.15	

DEPT. STE | CODE 4011 | SCALE N.T.S | WEIGHT(Kg.) - | REF. TO ASSY. DRG. -- | ITEM NO. - | NO.OF ITEMS -

TITLE: RECOMMENDED SPARES FOR LPBP SYSTEM (MECHANICAL)

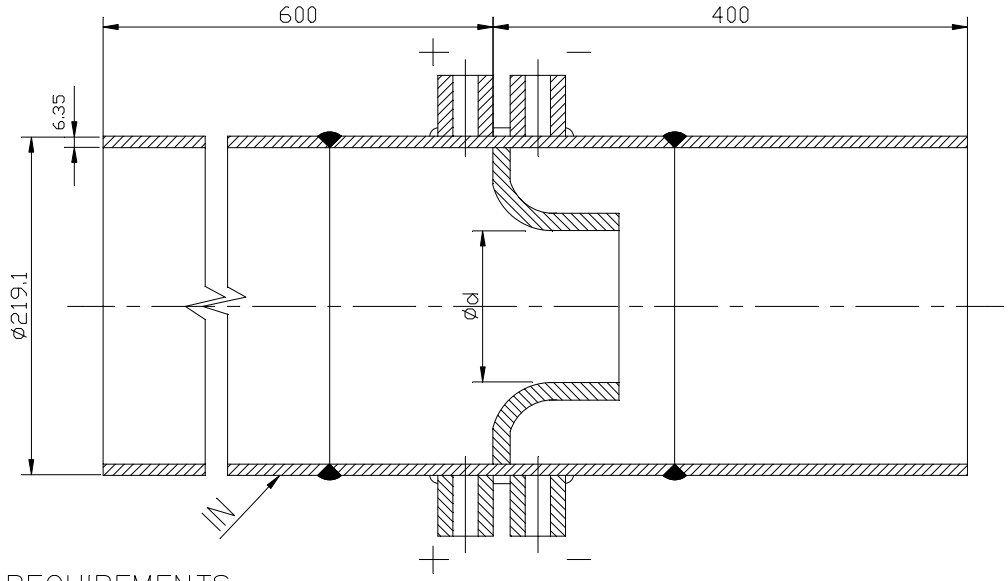
DRAWING NO. 1-12300-56008 —

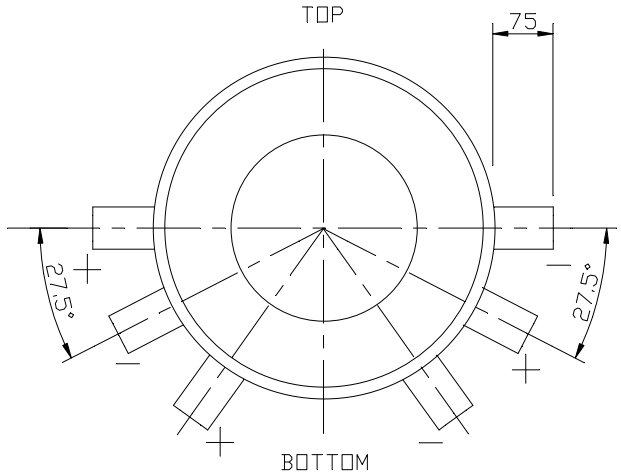
SHEET NO. 01 | NO.OF SHEETS 01

SIZE A1

FIRST ANGLE PROJECTION | (ALL DIMENSIONS ARE IN mm) | FORM: DG-38(B)

DRAWING NO. 31336083501





TECH.REQUIREMENTS: –

TYPE	WELD IN TYPE WITH CORNER TAP AS PER ISA 1932.
MATERIAL OF NOZZLE	15 MO 3
PIPE MATERIAL	ASTM A106 Gr.B
PIPE SIZE.....	ø219.1X6.35
MEDIUM.....	CONDENSATE
MAXIMUM FLOW	110 Kg/Sec
OPERATING/DESIGN PRESS.	30/50 BAR
OPERATING/DESIGN TEMP.	30–60°/100°C
DIFFERENTIAL PRESSURE (AT MAX. FLOW)	Approx. 1500m BAR
TAPS	3+3 CORNER TAPS SUTABLE FOR PIPE SIZE 13.5x2.6
TAP LENGTH	75 MM

(REV. 01)

DOCUMENTS WITH THE OFFER

1. DESIGN CALCULATIONS.
2. DRG. OF THE FLOW NOZZLE.
3. FLOW VERSUS DIFFERENTIAL OF PRESSURE CURVE.

MATERIAL CODE NO. W90313360553

CBOM NO. 21336083500	AGREED DEPT.	NAME	SIGN	DATE
GRADE OF UNTOL. DIM.: –	----	----	----	----
M/CG– V/C/M/F AA 0230208				
WELDING–A/B/C/D–AA621104				
GAS CUTTING–'T3'AA0621101				

STATUS OF DRG.

REV.	DATE	ALTERED / CHECKED
01	01.05.19	ALTERED B.LAL / CHECKED A.SRIVASTAVA

TECH. REQUIREMENTS UPDATED AS PER CHANGE NO. STE-19-F0139.

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT: STEAM TURBINE 10856A11501

BHARAT HEAVY ELECTRICALS LTD. HARDWAR

	NAME	SIGN	DATE
DRN	SSTEBLR1	SSTEBLR1	23/04/2019
CHD	SSTEAS2	SSTEAS2	23/04/2019
APD	ASTEVK	ASTEVK	23/04/2019

NO.OF VAR. 73 | 74

DEPT.	SCALE	WEIGHT(Kg.)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
STE	N.T.S.	25	21336083500	--	--
CODE 4011					75	77

TITLE: FLOW NOZZLE FOR WIV

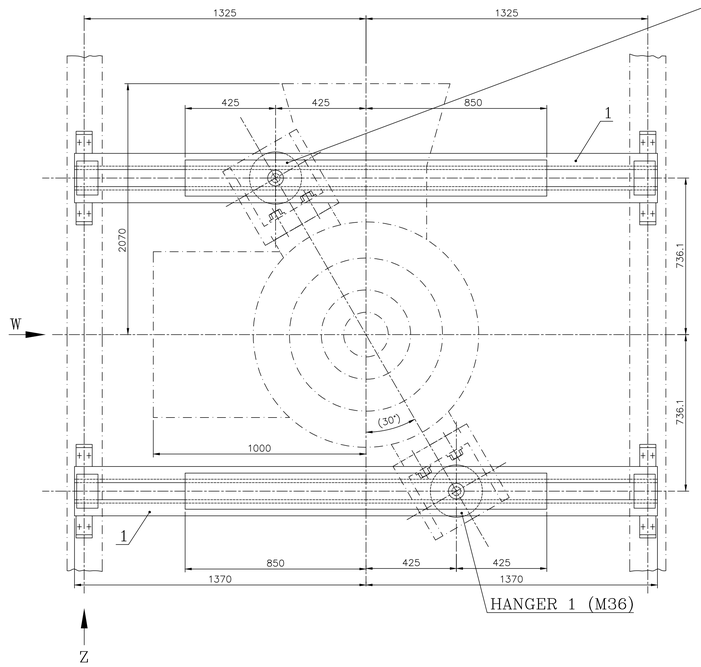
1 3

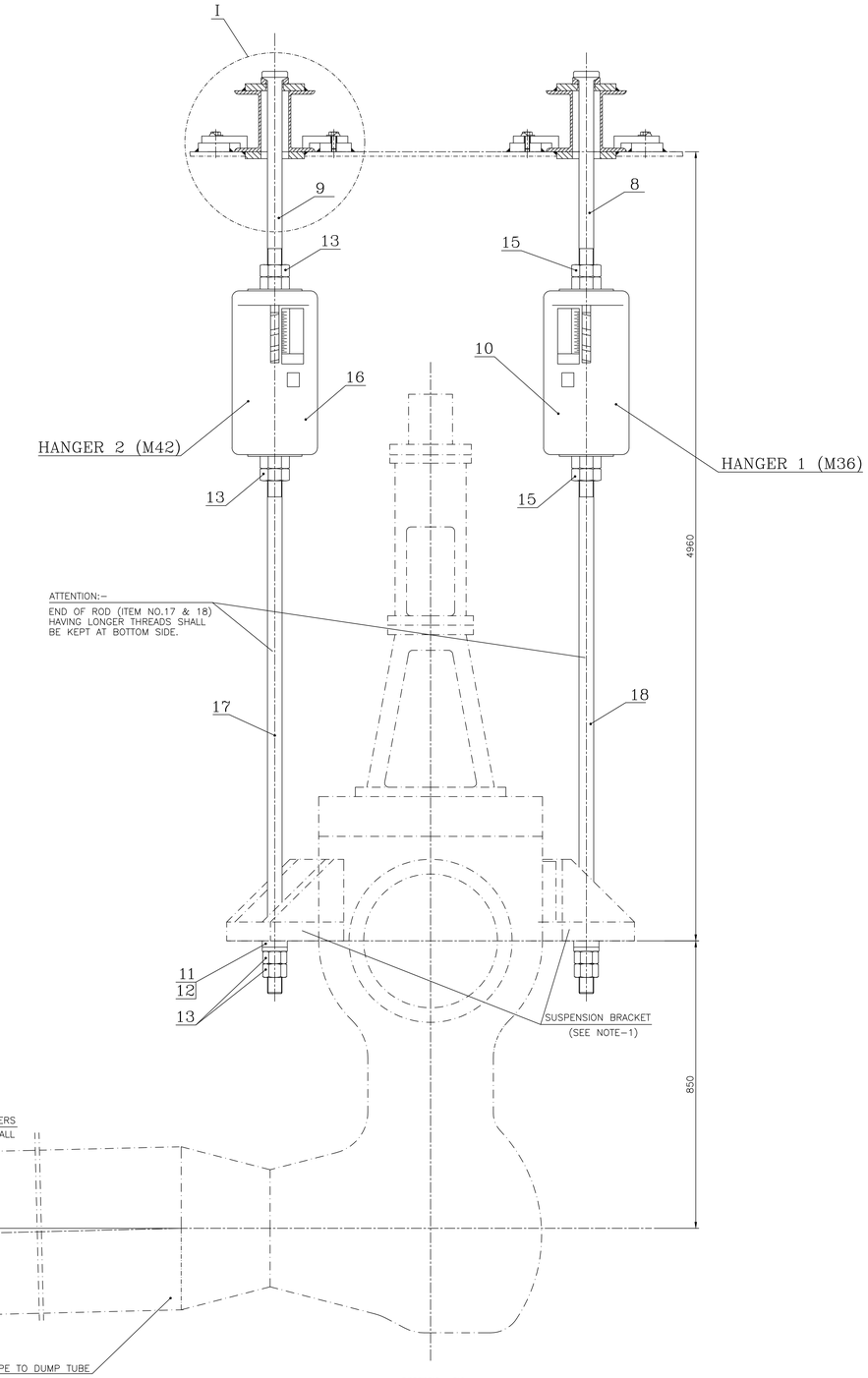
DRAWING NO. 31336083501 (7 | 22 | 23 | 24)

SHEET NO.1 | NO.OF SHEETS 1

SIZE A3

INVENTORY NO.	SIGN & DATE	REF. DRG NO.
		31336082501





VIEW-W

VIEW-Z

DETAIL-I

INSTRUCTION FOR ASSEMBLY AT SITE

1. LP BYPASS VALVE SHALL BE WELDED WITH CONNECTING PIPES.
2. LP BYPASS VALVE SHALL BE SUSPENDED IN HAHGERS AND ALIGENED WITH SUPPORT AND SECURED AGAINST HORIZONTAL MOVEMENT.
3. ADJUST RODS (ITEM NO.17 & 18) SO THAT BYPASS VALVE IS IN THE SPECIFIED POSITION.
4. CLASSIFICATION OF WELD GROUP CK SHALL BE AS PER HW0620099.
5. WELD TEST SCOPE SHALL CONFIRM TO HW0850199 WITH CATEGORY OF SERVICE REQUIREMENT AS 4.
6. ALL WASHERS (ITEM NO.7) ARE BENT ON TWO SIDES OF HEXAGON.

TECHNICAL REQUIREMENTS

1. SPRAY MOLYKOTE ON THREADED PARTS AND SLIDING SURFACES OF ITEM NO.11 & 12.

NOTE:-

1. SUSPENSION BRACKETS SHALL BE SUPPLIED ALONG WITH LP BYPASS VALVE BY THE VALVE SUPPLIER.
2. INITIAL COMPRESSION OF SPRING HANGER-1(ITEM NO.10)=20000N, SPRING HANGER-2(ITEM NO.16)=26660N.
3. MAXIMUM COMPRESSION OF SPRING HANGER-1=60000N, SPRING HANGER-2=80000N.
4. SPRING RATE OF SPRING HANGER-1=400N/mm, SPRING HANGER-2=533.3N/mm.

INVENTORY NO	SIGN & DATE	REF. DRG NO.
		0123215600

GRADE OF UNTOLD DIM:-
MCG.-~~27M/P~~ AA 023020B
WELDING-~~M/B/CAB~~ AA0621104
GAS CUTTING-~~'T3'~~AA0621101

REV	DATE	ALTERED / CHECKED

DMS/GR. SP. NO. CBOM 01232130000 — STATUS OF DRG. —

ADDED REV	NAME	SIGN.	DATE
--	--	--	--

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT: STEAM TURBINE

BHARAT HEAVY ELETRICALS LTD.
RANIPUR - HARDWAR

	NAME	SIGN	DATE	NO. OF VAR.
DRN	UVERMA	SD/-	01.09.18	
CHD	VIKAS	SD/-	03.09.18	-
APD	R.RAWAT	SD/-	05.09.18	-

DEPT.	SCALE	WEIGHT(KG)	REF.TO ASSY DRG.	ITEM NO.	NO. OF ITEMS
STE	N.T.S	675.00	--	--	--

CODE 4011

TITLE: SUSPENSION OF LPBP VALVE

CARD CODE -

DRAWING NO. 0-12321-30000 -

SHEET NO. 01 NO.OF SHEETS 01

ANNEXURE-II A

LP Bypass System - List for Documents to be submitted by the vendor along with Check list (Annexure-II B) during offer stage

Sl.No.	Document details	Enclosed (Yes/No)
1	GA drawing and Datasheet of LP bypass valve	
2	Cross-sectional drawing along with BOM of LP bypass valve	
3	GA drawing and Datasheet of water injection valve	
4	Cross-sectional drawing along with BOM of Water injection valve	
5	GA drawing and Datasheet of Dump Tube (having information regarding total flow area, hole dia & Total No. of holes)	
6	GA drawing & Datasheet of HPSU	
7	Schematic diagram of HPSU and corresponsing Bill of material	
8	Schematic diagrams of actuators and corresponsing Bill of materials	
9	Flow Nozzle data sheet & drawing	
10	List of Mandatory spares duly correlated with the corresponding part no. of vendor's Bill of material of main equipment	
11	List of Commissioning spares duly correlated with the corresponding part no. of vendor's Bill of material of main equipment	
12	Priced list of recommended spares for future ordering.	

Sign & Date:
Name:
Designation:

ANNEXURE-II (B)

Check list for Technical Evaluation of vendor offers for LPBP system.

Project:660MW Panki **BHEL Enquiry No.……..**

SL. No.	BHEL REQUIREMENT	VENDOR'S CONFIRMATION/ RESPONSE
A)	**FOR LP BYPASS VALVES ALONG WITH ACTUATOR AND DESUPERHEATER**	
1	All components of LPBP valve alogwith actuator shall be designed for operation at design pressure 75 bar (a), temperature 601˚C & corresponding steam flow 306.40 Kg/Sec as mentioned in BHEL drg. no. 3-12300-07801.	
2	LP bypass valve alogwith actuator shall be suitable for operating conditions as mentioned in BHEL drg. no. 3-12300-07801.	
3	LP bypass valve alogwith actuator shall also be suitable for operation at short term operating conditions (pressure & temperature) as per note 2 of BHEL drg. no. 3-12300-07801.	
4	Material for LP bypass valve body and internals shall be as per clause no. 1.1.3 (A) & (B) of BHEL drg. no. 2-12300-07800.	
5	Material of Suspension bracket of LP bypass valve shall be as per note 1 of BHEL drg. no. 3-12300-07802.	
6	The selected Cv of LP bypass valve shall have sufficient margin (atleast 8%) over the maximum Cv value calculated as per operating conditons mentioned in BHEL drawing no. 3-12300-07801.	
7	The weld end details of LP bypass valve shall be as per BHEL drg. no. 3-12300-07802 and clause 1.1.5 of BHEL drg. nos. 2-12300-07800.	
8	Arrangement and all the dimensions of LP bypass valve shall be strictly as per BHEL drg. no. 3-12300 07802.	
9	Suspension arrangement of LP bypass valve shall be as per BHEL drg. no. 3-12300-07802 and 0-12321-30000.	
10	The valve characteristics of LP bypass valve should be linear as per BHEL drg. no. 3-12300-07801.	
11	Sizing of LP bypass valve actuator shall be done for normal working pressure of control fluid as 160 bar & min. working pressure of 115 bar.	
12	Actuator sizing calculation shall be submitted by the vendor in the event of ordering as per clause 1.1.7 (b) of BHEL drg. no. 2-12300-07800 and there shall be sufficient margin (atleast 15 %) in the actuator as mentioned in BHEL drg. no. 2-12300-07800.	
13	The control block of actuator should be mounted on actuator itself.	
14	The size & material of warm up & drain connection of LP bypass valve shall be as per clause 1.1.10 of BHEL drg. no. 2-12300-07800.	
15	The Steam blowing device shall be designed for design parameters mentioned as per clause 1.1.12 of BHEL drg. no. 2-12300-07800.	
16	In failure mode, LP bypass valve shall be in closed condition as per clause 1.1.14 of BHEL drg. no. 2-12300-07800.	
17	All the components selected for actuator viz. Servo valve, Solenoid valve, position transmitter etc. shall be proven as per clause 1.1.15 of BHEL drg. no. 2-12300-07800.	
18	Steam strainer to be provided with the specified hole size as per clause 1.1.16 of BHEL drg. no. 2-12300-07800.	
19	The operating time (opening, closing & trip) of LP bypass valve shall be as per **clause 6.2 of BHEL specification ST47050.**	
20	The valve seat leakage class shall confirming to MSS SP61 as per **clause 4.3 of BHEL specification ST47050.**	
21	Weight of LP bypass valve duly assembled with actuator & desuperheater shall be as per note 2 of BHEL drg. no. 3-12300-07802.	
22	Size & orientation of Condensate supply connection at LP bypass valve outlet shall be as per BHEL drg. no. 3-12300-07802.	
23	The LP bypass valve shall be IBR certified as per **clause 5 of BHEL specification ST47050.**	

Signature of Vendor's Authorized executive

SL. No.	BHEL REQUIREMENT	VENDOR'S CONFIRMATION/ RESPONSE
24	The allowable forces & moments at LPBP Valve Inlet, LPBP Valve Outlet & Condensate supply connection shall be as mentioned in BHEL drg. no. 3-12300-07802.	
25	The operating philosophy of LP bypass actuator shall be "FRF PRESSURE TO OPEN AND SPRING FORCE TO CLOSE" as per clause 1.1.17 of BHEL drg. no. 2-12300-07800.	
B)	**FOR WATER INJECTION VALVE**	
1	Water injection valve shall be designed as per design parameters mentioned in BHEL drg no. 2-12300-07803.	
2	The overall dimensions of Water injection valve shall be as per BHEL drg no. 2-12300-07803.	
3	The size & material of weld ends of Water injection valve (inlet & outlet) shall be as per BHEL drg no. 2-12300-07803.	
4	Valve to be supplied along with Inlet/Outlet counter flanges (Weld neck, Raised type), associated fasteners and sealing as per T.R. 1 of BHEL drg no. 2-12300-07803.	
5	The body material of Water injection valve shall be cast steel (ASTM A216 WCB) as per BHEL drg no. 2-12300-07803.	
6	The selected Cv of Water injection valve shall have 15% margin over the maximum Cv value calculated based on maximum calculated water mass flow i.e. 93.95 Kg/sec as per T.R. 12 of BHEL drg no. 2-12300-07803.	
7	The valve sizing shall be suitable for obtaining spray water flow as 78.00 Kg/Sec within 80% of total valve travel as per T.R. 13 of BHEL drg no. 2-12300-07803.	
8	The valve characteristics of Water injection valve should be equal % as per BHEL drg no. 2-12300-07803.	
9	Sizing of Water injection valve actuator shall be done for normal working pressure of control fluid as 160 bar & min. working pressure of 115 bar as per BHEL drg no. 2-12300-07803.	
10	The water injection valve shall be capable of manual operation as per T.R. 5 of BHEL drg no. 2-12300-07803.	
11	The control block of actuator shall be mounted on actuator itself as per T.R. 6 of BHEL drg no. 2-12300-07803.	
12	Actuator sizing calculation shall be submitted by the vendor as per BHEL specification requirements and there shall be sufficient margin (atleast 15 %) in the actuator as mentioned in BHEL purchase specification.	
13	All components selected for actuator viz. Servo valve, Solenoid valve, position transmitter etc. shall be proven.	
14	The opening time of Water injection valve shall be 3 sec. (max.) as per BHEL drg no. 2-12300-07803.	
15	The strength & Leak tightness test shall be as per T.R. 8 of BHEL drg no. 2-12300-07803.	
16	Hydraulic testing of valve body shall be carried out as per T.R. 9 of BHEL drg no. 2-12300-07803.	
17	In failure mode, water injection valve shall be in stay-put condition as per T.R. 10 of BHEL drg no. 2-12300-07803.	
18	Valve configuration shall be “Flow to close” as per T.R. 11 of BHEL drg no. 2-12300-07803.	
C)	**FOR HYDRAULIC POWER SUPPPLY UNIT**	
1	The hydraulic power supply unit shall be suitable for operation of all actuators of LP bypass valve & water injection valve.	
2	The hydraulic power supply unit shall be supplied with all the required items & instruments as per BHEL purchase specifications requirements.	

Signature of Vendor's Authorized executive

SL. No.	BHEL REQUIREMENT	VENDOR'S CONFIRMATION/ RESPONSE
3	All the components of hydraulic power supply unit viz. pumps, motors, coolers, accumulators, filters, instruments etc. shall be proven as per Cl. 1.2.3 of BHEL drg. no. 2-12300-07800. Further, sizing calculation of major components of HPSU such as Tank, Pumps, Coolers, Accumulators shall be provided for BHEL review after placement of order.	
4	The hydraulic power supply unit shall be supplied with protective cabinet as per Cl. 1.2.4 of BHEL drg. no. 2-12300-07800.	
5	The hydraulic power supply unit shall be supplied with proven Regeneration unit as per Cl. 1.2.6 of BHEL drg. no. 2-12300-07800.	
6	The sizing of HPSU cooler shall be done as per parameters given in Cl. 1.2.7 of BHEL drg. no. 2-12300-07800.	
7	The sizing of accumulators of HPSU shall be done as per **Cl. 7.0 of BHEL specification ST47050.**	
8	All the surface of cooler coming in contact of FRF shall be made from stainless steel.	
9	The cooler should be having sufficient margin in the provided surface area (atleast 15 %) viz-a-viz the calculated surface area.	
10	Water Regulating Valve applicable for cooling circuit arrangement of Cooler in HPSU shall be as per note-1 mentioned in Sheet-2 of BHEL drawing no. 2-12300-07800.	
11	The cooling circuit arrangement & connections of Cooler in HPSU shall be as per Sheet-2 of BHEL drawing no. 2-12300-07800.	
12	The vendor to provide 3 no. pressure & 3 no. return line connections in HPSU as per **cl. 7.0 of BHEL specification ST47050.**	
13	Fasteners and foundations Bolts for fastening of HPSU shall be in vendor's scope as per **Cl. 1.1 Note-ii of BHEL specification ST47050.**	
D)	**FOR DUMP TUBE**	
1	The vendor to confirm to supply Dump tube meeting all the requirements of Cl. 1.5 of BHEL drawing no. 2-12300-07800.	
2	The vendor to confirm that 5% margin in flow area against VWO Trip Case i.e. 319.95 Kg/Sec shall be considered for sizing of Dump Tube.	
E)	**C&I REQUIREMENTS**	
1	Vendor to confirm that all the points mentioned in C&I addendum to ST47050 are acceptable. **Note: - Any deviation shall be separately specified.**	
2	Vendor to confirm Flow nozzle and its documents shall be in line with flow nozzle **drawing no. 3-13360-83501.**	
3	Vendor to confirm that all C&I interfaces with DCS shall be in line with previous supplied LPBP system (if any) to BHEL of similar rating except for project specific changes. Note:- Kindly mention project name (if applicable).	
4	Vendor to confirm that the signals from Junction box shall directly go into BHEL DCS. There shall be no controlling element (control box or so) in vendor scope. All the equipments shall be directly controlled from BHEL DCS.	
5	Vendor to indicate corresponding KKS tags/part no. of main supply in mandatory spare list.	
6	Vendor to confirm that in main supply BOM, if more type of instruments are found w.r.t mandatory spares offered by vendor, then supply of spares (i.e. PG, DPS, PS etc.) shall be as per BHEL specification.	
7	Vendor to confirm that C&I spares packing list shall be separate from the main supply and the same shall be approved by BHEL.	

Signature of Vendor's Authorized executive

SL. No.	BHEL REQUIREMENT	VENDOR'S CONFIRMATION/ RESPONSE
F)	**GENERAL REQUIREMENTS**	
1	The vendor to confirm that the vendor's offer is inline with BHEL specification requirements. Any deviation is to be separately specified by the vendor.	
2	The working fluid and functional/testing requirements of complete LP bypass system shall be as per clause 1.1.8, 1.1.9 of BHEL drawing no. 2-12300-07800 and clause 10 of BHEL specification ST47050.	
3	The size & material of terminal connections in actuators & HPSU shall be as per Cl. 3.2 of BHEL drawing no. 2-12300-07800.	
4	All the flanged end connection of HPSU, Actuators & equipments of LP bypass system shall be supplied with matching counter flanges, seal & fasteners by vendor for piping connection by BHEL.	
5	Applicable tightening torques for all the Bolts/Nuts shall be provided by the vendor in drawing of all the equipment as per Cl. 3.3 of BHEL drawing no. 2-12300-07800.	
7	Thermal expansion values at all terminal connections shall be provided by the vendor as per Cl. 3.5 of BHEL drawing no. 2-12300-07800.	
8	The equipment tolerances shall be as per Cl. 3.8 of BHEL drawing no. 2-12300-07800.	
9	Painting of equipment shall be as per Cl. 5.1 of BHEL drawing no. 2-12300-07800.	
10	Maximum noise level of LP bypass system shall be as per **Cl. 4.6 of BHEL specification ST47050.**	
11	The sizing calculation & selection of equipment of LPBP system shall be adequate w.r.t. BHEL specification requirements & any modification if required, at a later stage during detailed engineering, will be done by vendor without any price implication to BHEL.	
12	The vendor to confirm that quantity of FRF i.e. 800 liters is sufficient for Flushing, First fill & Top up for one year of operation as per **Cl. No.-6.4(a) of ST47050.** However, supply of FRF is in BHEL scope.	
13	The vendor to confirm that mandatory spares shall be supplied as per **BHEL drawing no. 2-12300-07811 with proper correlation with corresonding part no. of vendor's BOM/Drawing of main equipment .**	
14	The vendor to confirm that Commissioning spares shall be supplied as per **BHEL drawing no. 3-12300-56005 with proper correlation with corresonding part no. of vendor's BOM/Drawing of main equipment .**	
15	In the event of ordering, if it is found that any mandatory/commissioning spares as per BHEL specification has not been included in vendor's list, then the same shall be supplied by the vendor without any price implication. The vendor to confirm.	
16	In case of order, the vendor to supply 22 no. Hard copies & 4 no. CDs of O&M manuals at BHEL Hardwar as per MDL (Annexure-iii). 3 no. Hard copies & 1 no. CD of O&M manual shall be supplied along with equipments at site.	
17	Storage & handling instructions of the equipments shall be furnished by the vendor separately and 2 copies of the same shall be supplied to site along With main equipment.	
18	Instructions for packing: A) All the equipment/items shall be supplied in closed steel boxes/closed wooden boxes with steel cover sheet. Packing boxes should be rain proof. B) Packaging of item should be done in such a way that it should not require any internal package inspection for at least one year. C) Packing box of mandatory spares shall be painted with green colour for easy identification at project sites.	

Signature of Vendor's Authorized executive

Annexure-III

MASTER LIST OF DOCUMENTS (MDL) OF LP BYPASS SYSTEM (STE-TG)

Rev.04 Dt.01.05.12

Sl. No.	Document	Remarks
A. Documents to be submitted for BHEL reference prior to manufacturing:		
1.	LP bypass valve sizing calculations	STE-TG
2.	Water injection valve sizing calculations	STE-TG
3.	LP bypass valve actuator selection sheet/sizing calculations	STE-TG
4.	Water injection valve actuator selection sheet/sizing calculations	STE-TG
5.	HPSU & its major component sizing calculations	STE-TG
6.	Desuperheater sizing calculation	STE-TG
7.	Dump tube sizing calculation	STE-TG
8.	HPSU water cooler diagram/ detailed technical catalogues including type/size/material of end connections for water inlet/outlet.	STE-TG
9.	Feed forward philosophy (Enthalpy based control) for spray water	STE-TG/CIE
10.	Complete system write up for LPBP system	STE-TG
11.	CV test report	STE-TG
B. Documents to be submitted for BHEL approval prior to manufacturing:		
1.	LPBP valve cross sectional drawing, datasheet & bill of material	STE-TG
2.	GA drg. Of LPBP valve with Desuperheater & dump tube indicating overall & dismantelling dimension and weight	STE-TG
3.	WIV drawing, datasheet & bill of material	STE-TG
4.	HPSU GA drawing data sheet & bill of material	STE-TG
5.	HPSU schematics	STE-TG/CIE
6.	I & R Diagram system	STE-TG/CIE
7.	Steam blowing device & bill of material	STE-TG
8.	Details of Oil/FRF flushing device	STE-TG
9.	Flow nozzle datasheet as per ISO 5167	CIE
10.	Flow nozzle drawing	CIE
11.	Flow nozzle charateristic curve between differential pressure and flow (indicating calculation formula also)	CIE
C. Other documents to be submitted for BHEL approval :-		
1.	LPBP valve actuator drawing & bill of material	STE-TG
2.	WIV actuator drawing & bill of material	STE-TG
3.	O & M manual	STE-TG
4.	Shipping/dispatch plan of the offered equipments including details of each boxes & sub boxes	STE-TG
5.	WPS field piping for the system and recommendations	STE-TG/HXE
6.	Instructions for sequence of erection & commissioning along with supporting drawings/sketches	STE-TG
7.	List of special materials tools, equipments, facilities required for erection and commissioning.	STE-TG

Notes:

1. The vendor to submit the documents within 4 weeks from the data of placement of purchase order.
2. While submitting the documents the vendor to clearly mention the exceptions w.r.t. the documents already approved earlier by BHEL against similar projects.

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN		TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
BHEL	VENDOR'S NAME	ITEM	LP BYPASS SYSTEM	QP NO.	QA/BI/QP/114	
				DATED	10/09/2014	
		DRG. NO.	AS PER PO			
		SPEC.	AS PER PO			
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	D	AGENCY M	AGENCY B	AGENCY N	REMARKS
1	2	3	4	5	6	7	8	9		10			11
LPBYPASS STOP& CONTROL VALVE													
1.0	RAWMATERIAL												
1.1	VALVE BODY	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		C.NDT	MAJOR	UT RT MPI	100%(EXCEPT WELD ENDS) ON WELD ENDS 100%	AS PERAPPROVED DATASHEET/ DRAWING		TC	√	P	V		
1.2	BONNET	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		C.NDT	MAJOR	UT MPI	100% 100%	AS PERAPPROVED DATASHEET		TC	√	P	V		
1.3	NOZZLES	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		C.NDT	MAJOR	UT/MPI	100%	AS PERAPPROVED DATASHEET		TC	√	P	V		
1.4	TRANSITION PIECES	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		C.NDT	MAJOR	UT/MPI	100%	AS PERAPPROVED DATASHEET		TC	√	P	V		
1.5	SUSPENSION	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		

		LEGEND:	FOR CUSTOMER USE	
MANUFACTURER/SUB CONTRACTOR		! RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		APPROVED BY Sanjeev 27/01/2015 संजीव कुमार भारद्वाज Sanjeev Kumar Bhardwaj अभियन्ता/Engineer गुणता आश्वासन/Quality Assurance बी. एच. ई. एल., हरिद्वार/BHEL Haridwar

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MANUFACTURER'S NAME AND ADDRESS		STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET	TC	√		P	V		
		C.NDT	MAJOR	UT/MPI	100%	AS PERAPPROVED DATASHEET	TC	√		P	V		
1.6	BOLTS /NUTS	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET	TC	√		P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET	TC	√		P	V		
1.7	ACTUATOR	CHECKS ON ACTUATOR	MAJOR	TCREVIEW	PERPIECE	AS PERAPPROVED DATASHEET	COC	√		P	V		
2.0	MANUFACTURIN G												
2.1	MACHINING PARTS	VISUAL& DIMENSIONAL INSPECTION	MAJOR	VISUAL/ MEASUREMENT	PERPIECE	SHOP TRAVELER	-	√		P			
2.2	WELDING & HEAT TREATMENT	WPS	MAJOR	VISUAL TIME/TEMPERATUR E	PERPIECE	EN287 /ASMEIX		√		P			
2.3	ASSEMBLY	ASSY.DRWG.	MAJOR	VISUAL	PERPIECE	AS PERAPPROVEDASSY.DRAWING		√		P			
3.0	TESTING & INSPECTION												
3.1	NDEWELDING	RT/UT	MAJOR	RT/UT	PERPIECE	ASMESEC.V/VIII/ HW0980830	TC	√		P	W	-	IN CASE OF RT VERIFICATION OF X-RAY FILM
3.2	NDEWELDING	MT/ PT	MAJOR	MT/PT	PERPIECE	ASME SEC. V/VIII/HW0980829	TC	√		P	W	-	IN CASE OF RT VERIFICATION OF X-RAY FILM
3.3	HYDROSTATIC PRESSURETEST	ASSY.DRWG.	MAJOR	HYDRAULICTEST	ALLVALVES	AS PERAPPROVED DATASHEET/ DRAWING	TC	√		P	W	-	IBRFORM
3.4	SEATLEAKAGE	ASSY.DRWG.	MAJOR	LEAKAGETEST	ALLVALVES	AS PERAPPROVED DATASHEET/ DRAWING	TC	√		P	W	-	

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
3.5	DIMENSION& WALL-THICKNESS CHECK	WELDING+ MAIN DIMENSION	MAJOR	MEASUREMENT	ALLVALVES	AS PERDRAWING		TC	√	P	V		
3.6	NDE MACHINED	PT	MAJOR	PT	ALLVALVES	ASMESEC.V/VIII/HW0980829		TC	√	P	V		
3.7	FUNCTION / PERFORMANCE TEST	FUNCTIONALTEST AS PERAPPROVED TEST PROCEDURE	MAJOR	PERFORMANCE	ALLVALVES	AS PERAPPROVED DATASHEET/ DRAWING		TC	√	P	W		ACTUATOR +VALVE
	NOISELEVEL	CONFIRMATION FOR MEETING NOISE LEVEL	MAJOR	NOISETEST						P	V		
3.8	CV TEST		MAJOR	CV TEST	PERDESIGN	AS PERAPPROVED DATASHEET/ DRAWING		TC	√	P	V		
3.9	PAINTING,PACKING AND PRESERVATION		MAJOR	VISUAL	ALLVALVES	VENDOR'S STANDARD		-	√	P			

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										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
HPSU													
1	INCOMING MATERIAL CONTROL												
1.1	OILTANK	DAMAGE	MAJOR	VISUAL	100%	MANUFACTURERDRAWING		COC	√	P	V		
		DIMENSIONS	MINOR	MEASURMENT	100%	MANUFACTURERDRAWING		COC	√	P	V		
		VERIFICATION OF SUPPLIER CERTIFICATE, IDENTIFICATION& CORELATION TOTCs FORRAWMATERIAL PLATES	MAJOR	CERTIFICATE REVIEW	100%	MANUFACTURERDRAWING		COC	√	P	V		
1.2	BOUGHT OUT ITEMS												
	LEVEL TRANSMITTER	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		CALIBRATION	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	PRESSURE TRANSMITTER	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		CALIBRATION	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	TEMPERATURE TRANSMITTER	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		CALIBRATION	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
	THREEPHASE MOTORS	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		VERFICATION OF SUPPLIER CERTIFICATE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	ACCUMUFATORS	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		PRESSURETEST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	PRESSURE RELIEFVALVES	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		ADJUSTMENT	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	PRESSURE GUAGES	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		MODELCODE	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
		CALIBRATION	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	THERMOMETER	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	CFAIRCOOLER	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		
	COOLINGCUM FILTERATION	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET		COC	√	P	V		

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
	CFPUMPS	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET	COC	√		P			
	GEARPUMPS	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET	COC	√		P			
	COUPLING	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET	COC	√		P			
	FILTERS	DAMAGE, RUST	MAJOR	VISUAL	100%	DRG./DATASHEET	COC	√		P			
2	FUNCTION TEST /FINAL INSPECTION						COC	√		P			
2.1	HPSU	DIMENSIONS	MAJOR	MEASUREMENT	100%	AS PERDRAWING	TC	√		P	W		
2.2	HPSU	CORRECT FITMENT	MAJOR	VISUAL	100%	AS PERDRAWING/CIRCUIT DIAGRAM	TC	√		P	W		
2.3	HPSU	FUNCTION TEST	MAJOR	MEASUREMENT	100%	FP_0019	TC	√		P	W		
2.4	HPSU	PAINTING	MAJOR	VISUAL	100%	DRG./VENDORPROCEDURE	-	√		P			

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MANUFACTURER'S NAME AND ADDRESS		STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
BHEL	VENDOR'S NAME	ITEM	LP BYPASS SYSTEM	QP NO.	QA/BI/QP/114	
				DATED	10/09/2014	
		DRG. NO.	AS PER PO			
		SPEC.	AS PER PO			
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
WATER INJECTION VALVES													
1.0	RAWMATERIAL												
1.1	BODY &BONNET	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET	TC	√		P	V		
		B.MECHANICAL PROPERTIES	-	MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET	TC	√		P	V		
		C.APPEARANCE	-	VISUALINSPECTION	PERLOT	MSS SP-55	TC	√		P	V		
1.2	STUDS&NUTS	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	EN 10204TYPE3.1 ASTMA193 B7 ASTMA194 2H	TC	√		P	V		
		MECHANICAL PROPERTIES	-	MECH.TEST	PERHEAT	EN 10204TYPE3.1 ASTMA193 B7 ASTMA194 2H	TC	√		P	V		
2.0	ASSEMBLY												
2.1	STEM	DIMENSION /VISUAL	MAJOR	VISUAL &DIMENSIONAL INSPECTION	PERLOT	DRAWING	COC	√		P			
2.2	PLUG	DIMENSION /VISUAL	MAJOR	VISUAL& DIMENSIONAL INSEPCTION	PERLOT	DRAWING	COC	√		P			
2.3	SEATRING	DIMENSION /VISUAL	MAJOR	VISUAL& DIMENSIONAL INSEPCTION	PERLOT	DRAWING	COC	√		P			
2.4	BODY ASSLY	A.HYDRO	MAJOR	HYDRO	ALLVALVES	AS PERAPPROVED DATASHEET/ DRG.	TEST REPORT	√		P	W		
		B.SEATLEAKAGE	MAJOR	LEAKAGE	ALLVALVES	AS PERAPPROVED DATASHEET/ DRG.	TEST REPORT	√		P	W		
		C.FUNCTION	MAJOR	•FUNCTION •DIMENSION •PAINT	ALLVALVES	AS PERAPPROVED DATASHEET/ DRG.	TEST REPORT	√		P	W		ASSEMBLED WITH ACTUATOR

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MANUFACTURER'S NAME AND ADDRESS		STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
2.5	TOPASSLY	A.DEMENSION / VISUAL	MAJOR	DEMENSIONAL/ VISUAL	ALLVALVES	TOPASSLY DRWG.	-	√		P			ASSEMBLED WITH ACTUATOR
		B.PAINT	-	VISUAL	ALLVALVES	VENDOR'S STANDARD	-	√		P			
		C.PACKING	-	VISUAL	ALLVALVES	BHELP.O. VENDOR'S STANDARD	-	√		P			

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MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
FLOW NOZZLE FOR WIV													
1.0	RAWMATERIAL												
	BRANCH PIPE	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERLOT	AS PERAPPROVED DATASHEET/ DRG.	TC	√		P	V		
		B.MECHANICAL PROPERTIES		-MECH.TEST		AS PERAPPROVED DATASHEET/ DRG.	TC	√		P	V		
		C.NDT		UT		AS PERAPPROVED DATASHEET/ DRG.	TC	√		P	V		
	FLOWNOZZLE	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	-DO-	AS PERAPPROVED DATASHEET/ DRG.	TC	√		P	V		
		B.MECHANICAL PROPERTIES		-MECH.TEST		AS PERAPPROVED DATASHEET/ DRG.	TC	√		P	V		
2.0	MANUFACTURING												
2.1	MACHINING PARTS	VISUAL& DIMENSIONAL INSPECTION	MAJOR	VISUAL/ DIMENSIONAL	PERPIECE	SHOP TRAVELER		√		P			
2.2	WELDING &HEAT TREATMENT	SEEDRAWING	MAJOR		PERPIECE	EN288 /ASMEIX		√		P			
2.3	ASSEMBLY	SEEDRAWING	MAJOR	VISUAL	PERDESIGN	AS PERAPPROVED DATASHEET/ DRG.		√		P			
3.0	TESTING &INSPECTION							√		P			
3.1	NDEWELDING	RT ORUT	MAJOR	RT/UT	PERPIECE	ASMESECV/VIII/HW0980830	TC	√		P	V		
	NDE MACHINED WELD END	PT	MAJOR	PT	PERPIECE	ASMESECV/VIII/HW0980830	TC	√		P	V		
3.2	HYDROSTATIC PRESSURETEST	PRESSURETEST	MAJOR	HYDRO	PERPIECE	AS PERAPPROVED DATASHEET/ DRG./FollowHW0980829	TC	√		P	W		

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SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
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1	2	3	4	5	6	7	8	9	D	10			11
3.3	DIMENSION CHECK	WELDEND + MAIN DIMENSION	MAJOR	DIMENSIONAL	PERPIECE	DRAWING	TC	√	P	W		
3.4	CALIBRATION REPORT		MAJOR	VISUAL	PERPIECE		COC	√	P	V		
4	FINAL INSPECTION PACK -&SHIPPING	VERIFICATION OF COMPLETION STAMPING PACKING	MAJOR	VISUAL	100%	AS PERAPPROVED DRAWING/ DATASHEET	COC	√	P	V		

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										M	B	N	
1	2	3	4	5	6	7	8	9	D	10			11
DUMP TUBE													
1.0	RAWMATERIAL												
1.1	DUMP TUBE	A. CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		B.MECHANICAL PROPERTIES	MAJOR	-MECH.TEST	PERHEAT	AS PERAPPROVED DATASHEET		TC	√	P	V		
		C.NDT	MAJOR	UT	100	AS PERAPPROVED DATASHEET		TC	√	P	V		
2.0	IN PROCESS												
2.1	WELDING & HEAT TREATMENT	WPS	MAJOR	VISUAL TIME/TEMPERATUR E	PERPIECE	ASMEIX / EN288			√	P	-		
2.2	NDEWELDING	RT MPI/DPT	MAJOR	RT MPI/DPT	PERPIECE	ASMESEC.V/VIII/ HW0980830		TC	√	P	W		

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