


Form No:	 PE&SD	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	PEMC-06697
		TECHNICAL DELIVERY CONDITION	Rev. No. 01
		FOR VALVES FOR RSPL-3X16.65 MW STG	Page 1 of 9

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TECHNICAL DELIVERY CONDITION FOR VALVES FOR RSPL-3X16.65 MW STG

1.0 GENERAL

- 1.1 Scope:
- 1.2 This Standard stipulates the Technical Delivery Conditions for Industrial Valves to DIN/ANSI/IS/BS Standards, covering the requirements of constructional features, Accessories, Inspection, Tests, Test Certificates, Documentation, and Preservation, Packing and Marking.
- 1.3 This Standard supplements the individual BHEL Valve Standards and forms a part of the Purchasing Conditions.
- 1.4 In addition to the general requirements stipulated in this Standard, any special requirements specified on the Enquiry /Purchase Order/Quality plan shall also be complied with.
- 1.5 The suppliers shall strictly comply with this standard in all respects. No deviations shall be allowed, unless written permission of BHEL is obtained before finalization of the Order.

2.0 CONSTRUCTIONAL FEATURES

Provision of the constructional features given in Table-1 shall be ensured for different types of Valves.

3.0 ACCESSORIES

The accessories mentioned in Table - 2 shall be provided for different types of Valves.

4.0 INSPECTION

4.1 INSPECTION AGENCY

Inspection agency for different categories of valves shall be as follows:

4.1.1 ATTESTED VALVES

For carbon and alloy steel attested valves coming under the purview of IBR (Indian Boiler Regulations), the inspection agency shall be as follows

a) Indigenous Valves: Authorized Inspector of CIB (Chief Inspector of Boilers).




In addition, BHEL representative shall witness the Inspection/Testing at supplier's works (other than BHEL, Tiruchy) for the following categories of valves,


- i) All Valves of Class 600 and above
- ii) All Valves of size 350 NB and above of all pressure ratings.
- iii) All Motor / Gear operated valves,
- iv) All valves with BW end.
- v) All valves with any special features like sealed gland, regulating disc etc.

b) Imported Valves: M/s Lloyds/TUV or any other inspection agency approved by IBR.

4.1.2 NON-ATTESTED (CERTIFIED) VALVES

- a) For Cast Iron, Gun Metal and other general purpose Valves (other than Stainless Steel Valves), not coming under the preview of IBR, the supplier's Inspection. Department shall undertake testing/inspection in presence of BHEL representative. However, witnessing of testing/inspection by BHEL representative may be waived off for Cast Iron and gun metal Valves on case to case basis.
- b) In case of all Stainless Steel Valves, the inspection agency shall be M/s Lloyds/BHEL Inspectors, unless otherwise specified in the Enquiry / Purchase Order.

Refer Doc	LAYOUTS& PIPING ENGINEERING	PREPARED	CHECKED	APPROVED	DATE
	PROJECT ENGINEERING & SYSTEMS DIVISION	 IMRAN AHMAD	 DS BARAIK	 SRIKANTH G	09.06.16

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4.2 SCOPE OF INSPECTION

The scope of inspection shall be as follows:

- (a) All tests listed in Cl.5
- (b) Any other tests specified in the Enquiry / Purchase Order / Quality Plan
- (c) Stamping of all accepted Valves and issue of Inspection reports and certificates.

5.0 TEST & TEST CERTIFICATES

The tests specified in Table-3 shall be conducted and 5 copies of the relevant test certificates shall be furnished to BHEL along with each consignment. The following abbreviations are used in the table. AI - Authorized Inspector; CS - Carbon Steel; AS - Alloy Steel; SS - Stainless Steel.

6.0 GUARANTEE CERTIFICATE

2 copies of the guarantee certificate shall be submitted before dispatch of valves. All the valves shall be guaranteed for trouble free operation for a period of 12 months from the date of commissioning or 24 months from the date of dispatch. The valves found defective due to design deficiency, manufacturing defects etc., during the guarantee period shall be replaced by the supplier at no extra charge to BHEL.

7.0 DOCUMENTS

7.1 ALONG WITH THE OFFER

4 copies each of the following documents shall be submitted along with the quotation.


- i) Drawing/leaflet/catalogue for the offered item indicating complete cross sectional arrangement, standards governing the valves and valve rating, indicating direction of flow by an arrow marked on the body, binding dimensions, bill of materials with material specification details, hydraulic/air test pressure for body/seat/ back seat, overall height, dismantling clearances, weight and special features, if any, as specified in the main specification of the valves.
- ii) One copy of the valve specification signed as "Accepted" with all deviations marked.
- iii) Any deviations to this standard / individual specification proposed by the supplier.
- iv) Quality plan adopted by the supplier during manufacture and inspection / testing of valves.
- v) List of recommended spares for 3 years trouble free operation of valves.
- vi) List of recommended spares for 3 years trouble free operation of valves.
- v) Any deviations to this standard / individual specification proposed by the supplier.
- vi) Actuator technical data sheet, wiring diagram, limit Switch development diagram.
- vii) Regulation characteristics for Regulating globe valve.

The offer submitted without the above mentioned documents shall be considered as incomplete and therefore and the offer shall be ignored for the purpose of technical /commercial evaluation.

7.2 AFTER PLACEMENT OF ORDER

7.2.1 Immediately after placement of order as per purchase order the following documents shall be furnished,

- i) Certified contract drawings for approval. After approval of the same RTF shall be furnished
- ii) Standard Quality plan duly countersigned by the supplier.
- iii) Operation and maintenance instructions.
- iv) Lubricant recommendation covering the following details:
 - a) Item to be lubricated.
 - b) Method of lubrication.
 - c) Type of lubricant and source of supply
 - d) Frequency of lubrication.
- v) Storage instructions.

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8.0 CLEANING

Particular care shall be taken to ensure that all foundry sand and loose material is properly removed by fettling/shot blasting.

9.0 PAINTING

Valves shall be painted externally after the hydraulic testing has been carried out. Just before the painting, valve bodies and other items shall be thoroughly cleaned. The valves shall be first painted with red oxide primer followed by 2 coats of spray painting with enamel paint. The colour of the paint shall be Blue for Carbon Steel Valves and Aluminum heat resisting for alloy steel valves. In case of forged steel valves up to 2" phosphating may be done instead of painting. For alloy steel forged valves a yellow band may be painted on the body after phosphating.

10.0 MARKING ON VALVES

10.1 BODY

The body of the valve shall have the following markings:

- Nominal size.
- Pressure rating.
- Material grade of body.
- Supplier's Trade Mark.
- Arrow showing direction of flow (for globe and check valves).

10.2 NAME PLATE

10.2.1 The nameplate shall be fitted below the hand wheel nut for globe/gate valve and on the body/cover for Non-return valves covering the following details.

- Manufacturer's name.
- Nominal size,
- Pressure rating.
- Material grades of body, bonnet and trim
- Manufacturer's identification/serial No.
- Year of manufacture.
- BHEL material code number/Tag No. From Purchase Order

10.2.2 ACTUATOR

A name plate covering the following details shall be fitted to the actuator.


- Make.
- Model No.
- Output shaft r.p.m.
- K.W. rating

10.3 HAND WHEEL

Hand wheel shall have the working "open" and "shut" - duly cast along with the arrow to show direction of closing the valve.

11.0 PRESERVATION

Suitable temporary rust preventive with minimum life of one year shall be applied inside the valve body in order to prevent corrosion.

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12.0 END PROTECTION

12.1 FLANGED VALVES

A circular blanking plate made of thin steel sheet or plastic with diameter 6mm less than the bolt holes inner PCD, shall be firmly fixed to the flange faces by the application of adhesive, after ensuring that the flange faces have been thoroughly degreased. A thin coat of adhesive shall be applied to the flange face and the blanking plate and then allowed to dry for 15 to 20 minutes. The coated face of the blanking plate should then be joined to the face of the flange taking care that the plate is concentric with the flange. Firm pressure shall be applied to ensure intimate contact between the plate and flange.

A wooden blank should then be bolted to the flange using a minimum of four bolts.

12.2 SCREWED, SOCKET & BUTT WELDED VALVES

Valve ends shall be protected from external damage and sealed against the ingress of dirt by means of plastic/ Steel shall be press fit type.

12.3 Any improved method of end protection can however be considered and the suppliers shall furnish complete details at offer stage.

13.0 PACKING

13.1 All the valves shall be packed suitably in closed wooden cases in order to avoid damage during transit and storage at BHEL. Suitable supports shall be provided inside the cases in order to avoid internal movement. In case of imported consignments the packing shall be seaworthy.

13.2 Each valve after end protection should be wrapped in polythene sheet before packing in the cases.

13.3 Valves of sizes up to NB 50mm (2") could be packed in one packing case taking care that they do not strike with each other. Enough packing material shall be kept inside the case to avoid damage.

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13.5 Each packing case must contain 2 copies of the shipping list giving details of all the contents of the case

14.0 MARKING

The following marking shall be done on each packing case minimum on two sides and also at the top.

- Complete address of the consignee and destination as per BHEL Purchase Order.
- BHEL Purchase Order Number.
- BHEL Valve Standard Number(s).
- Number of pieces in each packing case.
- Net weight.
- Gross weight.
- Packing case numbers and total number of packings.
- Arrow indicating top of the packing case.



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TABLE I – CONSTRUCTIONAL FEATURES

CL No.	FEATURE	VALVE TYPE	PRESSURE CLASS ANSI/DIN RATING																	
			CL 150	CL 300	CL 600	CL 900	CL 1500	CL 2500												
			NP 10&16	NP25&40	NP64&100	NP160	NP250	NP320 & 400												
2.1	SPINDLE	GLOBE GATE	Outside screw & Yoke type with rising Spindle.																	
2.2	BONNET/ COVER	GLOBE GATE CHECK	Bolted to the body for all sizes.		Pressure-seal bonnets or cover shall be used. Welded bonnets are acceptable for lower than NB 50 for classes #900 and above.															
			Valve body/bonnet shall be forged /cast specified. Forgings are acceptable in casting but not vice-versa.																	
2.3	BORE	GLOBE GATE CHECK	Full bore ANSI rating. For DIN rating		Shall not be less than the 80% of the full venture bore area.															
2.4	DISC	GLOBE	Radii used/ Spherical Seating Disc. For NB65 and above, the Disc shall be free to revolve on the spindle for valves up to CL 900.																	
		REG GLOBE	Taper Plug type Disc/Parabolic type Disc. For NB65 and above the disc shall be free to revolve on the spindle.																	
		SWING CHECK N.R.V	The Body Seat shall be inclined at such an angle from the vertical, to facilitate positive closing and to prevent valve chatter. The friction between Hinge pin and bush shall be as minimum as possible so as to ensure that the check valve closes when the re of flow is even at a pressure of 1 ata. Hinge pin shall be fully enclosed by the valve body. The hinge pin shall be secured by the cover flange against loosening.																	
		PISTON LIFT N.R.V	Shall be provided with guided Disc, which enables the back pressure to be utilized fully for positive disc closing. The fluid collected in the space between disc, body and Cover should act as a damper.																	
2.5	WEDGE	GATE	Plain Solid wedge for up to NB 40, Flexible Wedge for NB 50 & above.																	
2.6	TRIM	GLOBE GATE N.R.V	Minimum Hardness Values for various trim materials shall be as follows and the seating surface of stainless steel shall have a minimum differential Hardness of 50 BHN.																	
			<table><thead><tr><th>Part</th><th>Hardness BHN</th></tr></thead><tbody><tr><td>Steam /Hennepin</td><td>200-220</td></tr><tr><td>Body seat</td><td>250-270</td></tr><tr><td>Wedge /Disc seating</td><td>300-320</td></tr><tr><td>Back seat bush</td><td>250-270</td></tr><tr><td>Thrust plate(gate valve)</td><td>350-370</td></tr></tbody></table> <p>Wherever the term “satellite” is mentioned it means of facing of seat and disc or wedge by cobalt –chromium- tungsten alloy, Stelliting should be able to maintain hardness of 375 BHN at high temperature. Wherever the term ‘HARD’ is mentioned with reference to seat and or disc of valve, it should be 350-500 BHN minimum.</p>						Part	Hardness BHN	Steam /Hennepin	200-220	Body seat	250-270	Wedge /Disc seating	300-320	Back seat bush	250-270	Thrust plate(gate valve)	350-370
Part	Hardness BHN																			
Steam /Hennepin	200-220																			
Body seat	250-270																			
Wedge /Disc seating	300-320																			
Back seat bush	250-270																			
Thrust plate(gate valve)	350-370																			
2.7	BACK SEAT	GATE GLOBE	Shall be provided for all sizes and all valve shall have back seat on the bonnet. For NB 65 and above back seat Bush will be Provided																	

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2.8	DIRECTION OF FLOW	GLOBE	The direction of flow shall be preferably from bottom to top and the arrow showing the direction shall be cast on the body.
2.9	OPENING/CLOSING	GLOBE GATE	The valves shall close by rotating the Hand Wheel in clockwise. Arrow showing the direction shall be cast on the body.
3.0	STEM		Stem shall be forged or machined from forged/rolled bar. No casting is permitted. However integral stem of cast stainless steel ball valve is acceptable. For gate valve The stem to disc connection shall be with T-slot within the disc.

TABLE -2 ACCESSORIES

CL. NO	FEATURE	VALVE TYPE	PRESSURE CLASS ANSI/DIN					
			CL150	CL300	CL600	CL900	CL1500	CL2500
			NP10&16	NP25&40	NP64 &100	NP160	NP 250	NP320&400
3.1	Position Indicator	GLOBE GATE REG GLOBE	Shall be provided for all regulating globe valve and other valves of Non-rising spindle type.					
3.2	Impact hand Wheel	GLOBE	Shall be provided wherever necessary.					
3.3	Ball bearing	GLOBE GATE	Shall be provided wherever necessary for smooth operation.					
3.4	Gear Operation	GATE	Shall be provided with open/close position indicator for the following sizes for different pressure class.					
			CL 150	CL 300	CL 600	CL 900	CL 1500	CL2500
			NB 300 & above	NB 300 & above	NB200 & above	NB150 & above	NB80 & above	NB80 & above
		GLOBE	Shall be provided with open/close position indicator for the following sizes for different pressure class.					
			NB 200 & above	NB 200 & above	NB 150 & above	NB 150 & above	NB80 & above	NB80 & above
			For Gate and Globe valve Gear Shall be totally enclosed helical worm or combination of helical worm and spur gear in grease case with grease nipples/plugs.					
		BUTTERFLY	Shall be provided for the following sizes for different pressure class.					
			NB 250 & above	NB 150 & above				
			For Butterfly valve Gear Shall be totally enclosed bevel gear in grease case with grease nipple /plugs.					
			Gear Drives shall be enclosed in weatherproof gear operators and shall be designed for maximum differential pressure across the closed valve equal to the cold non shock pressure rating. Hand wheel orientation of the gear operated valves shall be specified in outline drawing.					
3.5	Hand wheel		Hand wheel diameter shall not exceed 750 mm and lever length shall not exceed					

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	/lever		500 mm on each side. Effort to operate shall not exceed 35 kgf at hand wheel periphery.					
3.6	Integral Bypass	GATE	NB650& above	NB400& above	NB200 & above	NB 150 & above	NB100 &	NB100 & above
		GLOBE	NB600& above	NB 350& above	NB150 & above	NB 100 & above	NB 80 & above	NB80 & above

*NOTE: Integral Bypass hall be provided as per MSS: SP-45. If the main valve is motor operated the integral bypass valve also be of motor operated. The Bypass pipe shall be seamless, schedule 80 minimum and of the same material as of the valve body. Size of the bypass globe valve shall be of NB25.

3.7	Eye bolts	All Valves	Suitable eyebolts shall be provided for heavy valves.					
3.8	Flange	All valves	All Flanged valve shall have flanges integral with the valve body. However forge valve can have weld on flanges. Weld-on flanges shall be made by full penetratio and joints and 100% radiographic.					
3.9	Yoke		Yoke material shall be equal to body material.					
4.0	Drain	Check valve	Unless otherwise specified all check valve 3" and above (except 900# and 1500 rating) shall have a drain boss at location "G" (Refer Fig No. of ASME B16.34). tapped drain hole with plug shall be provided as per ASME B 16.34. Threads Shall be as per ASME B1.20.1 (taper) NPT.					

TABLE – 3 TESTS

CL CL NO	TEST	APPLICABLE STANDARDS	APPLICABLE COMPONENTS	EXTENT OF TESTING	CERTIFICATE REQUIRED
5.1	Visual inspection	MSS-SP 55 IS:210 IS: 318	Steel casting CI Casting Gunmetal casting	100%	Inspection by 'AI' and then attestation of Manufacturer's certificate by 'AI'
		Manufacturer's standard	Forging and other components	100%	Verification of Manufacturer's certificate by 'AI'
5.2	Dimensional Check	Relevant BHEL standard	Overall dimensions and end connection	100%	IBR, Form III C inspection report by 'AI'
5.3	Material Tests:				
5.3.1	Chemical analysis	Relevant Material standard	Body, bonnet, Yoke	Each heat melt	Body test certificate attested by 'AI', Body bonnet & yoke shall have identification.
5.3.2	Mechanical analysis	-do-	-do-	-do-	-do-
5.3.3	Heat Treatment	-do-	-do-	100%	Inspection Report test Certificate

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5.3.4	Hardness test	-do-	-Trim-	100%	Inspection Report test Certificate
CL.No.	TEST	APPLICABEL STANDARD	APPLICABLE COMPONENTS	EXTENT OF TESTING	CERTIFIED REQUIRED
5.4	Non- destructive test :				
5.4.1	Radiography	ASTM:E94 &E412	Body & Bonnet casting	Refer- Table 3A	Inspection report test certificate
5.4.2	Ultrasonic test	ASTM:388	Body /Cover forging	100%	Inspection report test certificate
5.4.3	Magnetic particle Inspection	ASTM: E138/E709	Trim	100%	-do-
5.4.4	Liquid Penetrate inspection/ Dye penetration Inspection	ASTM:E165	Seating surfaces, Spindle, Butt Welding ends of valves	100%	-do-
# 5.5	Hydraulic Test	API: 598	a)Body & seat b) Back seat	100% 100%	IBR-forth III C. AI Authorized inspector's certificate.
# 5.6	Air Leak test	API: 598	Seat	100%	-do-
5.7	Functional test on Assembled valves with actuators/gears (with hand wheel on actuator and with electrical actuator.		Motor/ Gear Operated valves	100%	AI Authorized inspector's certificate

#Note: Test pressure shall be as given in individual BHEL standards and no leakage shall be allowed during hydraulic/air test. The test duration shall be as follows:

TEST DURATION	Nominal Size 'mm'	Minimum test duration		
		Body	Seat	Back seat
	Up to and including 50	15	15	15
	65 up to and including 150	60	60	15
	200 up to and including 300	120	120	15
	350 and above	300	120	15


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Table-3A Radiography Test

All casting shall be of radiographic quality. This requirement to be ensured by sample radiography before proceeding with the actual productions.

Material	Class	Size	Extent of testing
Carbons steel material (except Cat D & Fire water service for which it is NIL)	150	Up to NB 600	5%
Alloy steel & Stainless steel	150	Up to NB 600	10%
All materials (Nil for Cat 'D' & Fire water service.)	150	NB 650 & above	100%
All materials	300	NB 400	10%
All materials	300	NB 450 & above	100%
All materials	600 & above	All Size	100%

Any But welded joints shall be radiographed 100%.

Note- No Radiography is required for casting for 'Demineralized water service (Cat D).

TABLE – 4 Duration of Required Test Pressure

Valve size NPS	Minimum Test duration (seconds)*				
	SHELL		Back seat	Closure	
	Check Valves (API STD 594)	Other Valves	All Valves with Back seat feature	Check Valves (API STD 594)	Other Valves
2 & below	60	15	15	60	15
2 ½ -6	60	60	60	60	60
8-12	60	120	60	60	120
14 & above	120	300	60	120	120

Note: * The test duration is the period of inspection after the valves is fully prepared and is under full pressure.