

	ENQUIRY VALVES	Bharat Heavy Electricals Limited (A Government of India undertaking) HIGH PRESSURE BOILER PLANT PURCHASE DEPARTMENT/VALVES TIRUCHIRAPPALLI-620 014.	Phone: +91 (431) 257 4797 Email: vavinash@bhel.in	
		ENQUIRY NO.	DATE	DUE DATE FOR QUOTATION
		ENSFV00243	10.06.2021	01.07.2021
		Please quote Enquiry No., and due date in correspondences <i>This is only a request for quotation and not an order.</i>		
<u>Date, Time & Venue of tender opening:</u> 01.07.2021 at 14.30 Hrs. at The Tender Opening Cell/Valves Room No. -26, Building -24 Bharat Heavy Electricals Limited Tiruchirappalli - 620014, Tamilnadu, India Email: tender_cell@bhel.in		<u>Scope of supply</u> Supply of Needle Valves as per the purchase specification enclosed. List of Annexures 01. Annexure 1A - PRE QUALIFICATION CRITERIA 02. Annexure 1B – SPEC:CV:008 Rev 00 & VSS 03. Annexure 2A - GENERAL TERMS AND CONDITIONS 04. Annexure 2B - CONFIRMATION TO THE TERMS AND CONDITIONS 05. Annexure 3A - PBG FORMAT 06. Annexure 3B - LIST OF CONSORTIUM BANKS 07. Annexure X- BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS 08. Annexure Z- SAMPLE LOCAL CONTENT CERTIFICATE		
Please, submit your lowest quotation in duplicate subject to our terms and conditions, for the above materials, so as to reach us on or before the due date by 14.00 Hrs. (IST) Quotations will be opened at 14.30 Hrs. (IST) on the due date in the presence of tenderers who may like to be present. Late tenders will not be considered.		Yours faithfully, For Bharat Heavy Electricals Ltd Avinash Vijayagopal Sr. Engineer/Purchase/Valves		

ANNEXURE 1A

PRE-QUALIFICATION

CRITERIA



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE
Trichy - 620 014, India

Ref: ENSFV00243

Product: Needle Valves with OBE requirements for – NPCIL KNPP.

Pre-Qualification Criteria:

Needle Valves with OBE requirements offered by the bidder shall be in successful operation in at least one Nuclear power plant for a period not less than two years.

Bidder should produce documents (like end-user certificates, unpriced POs, proof of dispatch etc.) supporting the above requirement. These documents should be submitted along with the part-1 (techno-commercial) bid. Bidder shall also submit any additional documentation requested by BHEL during the course of the approval process.

End-customer approval is applicable for this project. The submitted documents will be evaluated by the end-customer for approval of the bidder. Part-II (price) bids of the bidders who are NOT approved by the end-customer will NOT be considered. Performa which needs to be filled for obtaining end customer is also attached with this document.

ANNEXURE 1B
VALVE SPECIFICATION



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **1** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Revision Record:

Rev. No	Date	Details of Revision
Click here to enter text.	Click here to enter a date.	Click here to enter text.

Table of Contents

1.0.	SCOPE	2
2.0.	SYSTEM DESCRIPTION	3
3.0.	APPLICABLE STANDARDS	4
4.0.	DESIGN REQUIREMENTS	5
5.0.	TESTS AND INSPECTION	8
6.0.	PERFORMANCE GUARANTEE	9
7.0.	SPARE PARTS AND MAINTENANCE TOOLS.....	10
8.0.	SPECIAL CLEANING, PROTECTION AND PAINTING	10
9.0.	IDENTIFICATION & MARKING	10
10.0.	EXAMINATION OF PRODUCT	10
11.0.	PACKAGING AND SHIPMENT	11
12.0.	DATA / DOCUMENTS TO BE SUBMITTED	11
13.0.	VALVE SPECIFICATION SHEET	12
14.0.	QUALITY ASSURANCE PLAN	13
	ANNEXURE I	19
	ANNEXURE II	26
	ANNEXURE - III	39
	ANNEXURE-IV	42
	ANNEXURE-V	74



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **2** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

1.0. SCOPE

This specification is intended to cover the requirements of design, construction features, manufacture, assembly, inspection, testing, packing, supply, delivery and guarantee of various types of manual valves for sea water systems in accordance with the requirements of this specification, applicable valve specification sheets and in a manner acceptable to the NPCIL.

1.1. Scope of Supply

The scope of supply shall include PUQ and GML system valves as per this specification, datasheets and referred specifications and standards. The scope of supply includes the following valves.

WEDGE TYPE GATE VALVE

Sr. No.	KKS Code	Nominal Bore (mm)	Safety Class	Seismic Category	Building/ Location	Quantity for two units
1	GML21AA001	150	4	II (OBE)	UQA	2
2	GML22AA001	150	4	II (OBE)	UQA	2

FLAP (SWING CHECK) VALVES

Sr. No.	KKS Code	Nominal Bore (mm)	Safety Class	Seismic Category	Building/ Location	Quantity for two units
1.	PUQ10AA603	150	4	II (OBE)	UQZ	2
2.	PUQ20AA603	150	4	II (OBE)	UQZ	2
3.	PUQ30AA603	150	4	II (OBE)	UQZ	2
4.	PUQ40AA603	150	4	II (OBE)	UQZ	2
5.	PUQ10AA604	150	4	II (OBE)	UQZ	2
6.	PUQ20AA604	150	4	II (OBE)	UQZ	2
7.	PUQ30AA604	150	4	II (OBE)	UQZ	2
8.	PUQ40AA604	150	4	II (OBE)	UQZ	2
9.	PUQ10AA601	80	3	I (SSE)	UQZ	2
10.	PUQ20AA601	80	3	I (SSE)	UQZ	2
11.	PUQ30AA601	80	3	I (SSE)	UQZ	2
12.	PUQ40AA601	80	3	I (SSE)	UQZ	2
13.	PUQ10AA602	80	3	I (SSE)	UQZ	2
14.	PUQ20AA602	80	3	I (SSE)	UQZ	2
15.	PUQ30AA602	80	3	I (SSE)	UQZ	2
16.	PUQ40AA602	80	3	I (SSE)	UQZ	2



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **3** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

17.	GML21AA601	150	4	II (OBE)	UQA	2
18.	GML22AA601	150	4	II (OBE)	UQA	2
19.	GML31AA601	80	4	II (OBE)	UQA	2
20.	GML32AA601	80	4	II (OBE)	UQA	2

REGULATING GLOBE (NEEDLE) VALVES

Sr. No.	KKS Code	Nominal Bore (mm)	Safety Class	Seismic Category	Building/ Location	Quantity for two units
1.	GML21AA301	15	4	II (OBE)	UQA	2
2.	GML22AA301	15	4	II (OBE)	UQA	2
3.	GML31AA301	15	4	II (OBE)	UQA	2
4.	GML32AA301	15	4	II (OBE)	UQA	2
5.	GML21AA002	15	4	II (OBE)	UQA	2
6.	GML31AA002	15	4	II (OBE)	UQA	2
7.	PUQ10AA301	10	4	II (OBE)	UQZ	2
8.	PUQ20AA301	10	4	II (OBE)	UQZ	2
9.	PUQ30AA301	10	4	II (OBE)	UQZ	2
10.	PUQ40AA301	10	4	II (OBE)	UQZ	2
11.	PUQ10AA302	10	4	II (OBE)	UQZ	2
12.	PUQ20AA302	10	4	II (OBE)	UQZ	2
13.	PUQ30AA302	10	4	II (OBE)	UQZ	2
14.	PUQ40AA302	10	4	II (OBE)	UQZ	2

2.0. SYSTEM DESCRIPTION

The drain water removal system **PUQ**, is intended for draining of PEB pipelines to the drainage pits in the tunnels in case of maintenance requirement and for water removal from tunnel in case of pipeline break. The system **PUQ** system pipelines (200 NB) for emptying PEB pipeline is a supporting safety system with functions of normal operation system and belongs to safety class 2. It is designated as 2NO.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **4** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

CHEMICAL COMPOSITION OF SEA WATER:

Sr. No.	Element	Value
1	Calcium, mg/l	360-420
2	Magnesium, mg/l	1248-1322
3	Sodium, mg/l	7500-8500
4	Potassium, mg/l	390-415
5	Hydro carbonates, mg/l	73.2-109.8
6	Carbonates, mg/l	67.2-76.8
7	Sulphates, mg/l	2709-2761
8	Chlorides, mg/l	19500
9	General salt content, %	3.6
10	Water hardness, mg/l	6500
11	pH value	8
12	Insoluble matters, mg/l	20
13	Biological assay data, mg/l	70

System GML20, where valves GML21 (22) AA601 and GML21 (22) AA001 are installed, is designed for pumping household, industrial wastes and other contaminated liquids, including with traces of oil products, with the maximal density 1050 kg/m³, having pH value from 4 to 12, with temperature up to 60 °C, with the maximal viscosity not higher than 1·10⁻⁶ m²/s, with the maximal volumetric concentration of abrasive particles 10 % and maximal coarseness up to 5 mm.

3.0. APPLICABLE STANDARDS

All valves to be furnished as outlined in this specification shall conform to the latest edition as on bid due date of all applicable requirements of the following national / international standards as specified in the individual valve specification sheet

- (i) American National Standards Institution (ANSI) standards.
- (ii) American Standards for Mechanical Engineers (ASME)
- (iii) American Petroleum Institute (API) standards.
- (iv) American Society for Testing Materials (ASTM) standards.
- (v) Bureau of Indian Standards.
- (vi) Manufacturer's Standards Specification (MSS)- Standard Practices.
- (vii) ASME B 16.34- Steel Valves flanged and butt welding ends.
- (viii) ASME B 16.5 -Steel Pipe Flanges and Flanged Fittings.
- (ix) ASME B 16.25- Butt Welding Ends.

In the event of any conflict between provision of this specification and the documents listed above, this specification shall govern.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **5** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

4.0. DESIGN REQUIREMENTS

- 4.1 All valves shall conform to the design standard mentioned in valve specification sheets (VSS).
- 4.2 End connections shall be as per the VSS enclosed.
- 4.3 Design pressure, temperature and material of construction of valves shall conform to individual valve specification sheets.
- 4.4 Valves with socket weld ends shall have socket to suit the pipe as specified in piping material specification or VSS. If the valves are specified as flanged ends, the flanges shall have diameter and drilling in accordance with ASME B 16.5 or as specified in VSS. Valves with butt welded ends shall have the ends conforming to ASME B 16.25. The facing shall be specified in valve specification sheet.
- 4.5 Valves shall be closing in clockwise direction wherever applicable.
- 4.6 All valves shall be furnished with vertical stems.
- 4.7 The design of valves shall ensure a streamlined passage and low pressure drop. The seats and discs shall be easily removable and / or shall be suited for easy refacing and grinding.
- 4.8 Valve disc should be of such a design as to keep the seats tight when valve body is subjected to pipeline stresses, temperature changes and pressures.
- 4.9 The thickness of the body for the steel valves shall be as per ASME B 16.34 or specification indicated in VSS for the pressure class specified. The valves shall be suitable for installation with the shaft in any position. The final orientation of the valves will be intimated to the supplier while reviewing the valve drawings.
- 4.10 Packing materials should be suitable for the fluid handled and the valve design should facilitate easy replacement of packing.
- 4.11 Components and spare parts of valves shall be interchangeable among valves of one size, and elsewhere to the maximum practical extent.
- 4.12 The valves shall be capable of safe, proper and continuous operation under the specified conditions.
- 4.13 Bolts, nuts and gaskets shall conform to the material standards specified in the valve specification sheets. For stainless steel valves, the low alloy steel / carbon steel bolts and nuts shall be cadmium plated. Studs and screws for valves shall conform to the applicable Indian Standard except otherwise noted. All nuts and bolts have hexagonal heads, unless otherwise specified.
- 4.14 All external terminal pipe thread connections shall conform to IS: 554 unless otherwise noted on specification sheets.
- 4.15 The valve design shall be such that the back face of the valve seats will not interfere with full tightening of the connection pipe to the valve.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **6** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- 4.16 The valves shall function smoothly without sticking, rubbing, vibrating or scouring in any position of the valve. Valve trim material shall be selected to avoid galling.
- 4.17 The valves shall be constructed essentially as described in the specification.
- However, it is not intended that this specification limits the supplier in providing construction features resulting in more economic and functional valves as long as the features are equal to or better than described herein.
- The mere approval of documents like drawings, data sheets, flow calculations, etc., will not however relieve the bidder from meeting our specification requirements, relevant product and testing standard requirements and generally accepted engineering principles. Ultimately, the system has to perform satisfactorily at the service conditions and at the end user place.
- 4.18 Provision shall be made for lifting heavy components by means of lugs, eye bolts or standard device of the manufacturer(s).
- 4.19 All carbon steel forgings shall be tested by magnetic particle test in accordance with ASTM E-109/138 and basis of acceptance shall be ASTM E-125.
- 4.20 All valves shall have permanent name plates indicating tag number and service for which they will be used and the pressure and temperature ratings.
- 4.21 All valves after assembly shall be operated from fully closed to fully open position several times to ensure that the valve required reasonable effort to operate manually.
- 4.22 Parts subjected to wear, corrosion, or other deterioration, requiring adjustment, inspection or repair shall be accessible and capable of reasonably convenient removal for repair/replacement when required and where applicable wearable parts shall have means of adjustment.
- 4.23 Trim material shall be as specified in the individual valve specification sheets. There shall be hardness difference of minimum 50 BHN between seat and disc/plug when the material of construction of both is same. The hardness of the trim material shall be BHN 250 (Rockwell O25) minimum. Wherever stellited face has been asked for, the hardness shall be BHN 350 (Rockwell C-30) minimum.
- 4.24 Swing check valve shall be spring loaded swing type with hinge stopper and positioner. Lift type check valve shall be preferably of ball type with spring loading. Body seat ring shall be renewable. Difference in hardness of 50 BHN must be maintained between the disc/ball and body seat ring in case of metal seated valve. Material of construction of spring shall be as specified in valve specification sheet.
- 4.25 Needle valves shall be of integral body bonnet straight pattern with V shaped plug/ taper needle integral with stem. Material of construction shall be stainless steel or as specified in VSS.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **7** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- 4.26 Valves shall maintain their operability, strength, leak tightness and fulfil their functions before, during and after Safe shutdown earthquake (SSE) & Design basis earthquake (DBE). The available response spectra from seismic impact of SSE and DBE level for different buildings at the elevation of valves installation are given in Annexure - II and balance response spectra will be provided to bidders at suitable bidding stage.
- 4.27 Material of valve insert/rubber coating shall be resistant against seawater added with sodium hypochlorite with 1 g/m³ concentration in supplied water volume.
- 4.28 The materials of construction as indicated in VSS are the minimum acceptable. The bidder may offer equivalent or better materials, provided such materials are approved by the Purchaser.
- 4.29 The sea water parameters of working medium handled by the valves are follows.
- Seawater nominal temperature 31 Deg. C
 - Seawater minimal temperature 21 Deg. C
 - Possible seawater maximal temperature 60 Deg. C
 - Maximum Particle/ Debris Size, 20 mm
 - Specific electric conductivity 2000 µS/cm
 - Seawater will be added with sodium hypochlorite continuously with concentration of 1.0 g/m³ and periodically with four times a day within 15 min with concentration of 10.0 g/m³.
- 4.30 Design of swing / lift check valves, materials used and manufacture quality shall provide the following reliability parameters.
- | | |
|---|-------|
| -Average lifetime between overhauls, years, not less than | 10 |
| - Operable state restoration time, hours, not more than | 30 |
| - Service lifetime, years | 30 |
| - Mean time to failure, hours, not less than | 10000 |
- 4.31 Design of Check, gate valves, materials used and manufacture quality shall provide the following reliability parameters.
- | | |
|--|-------|
| -Average lifetime between overhauls, years, not less than | 10 |
| - Operable state restoration time, hours, not more than | 30 |
| - Service lifetime, years | 30 |
| -average service lifetime of removable and component parts, years, not less than | 15 |
| - average resource, cycles, not less than | 80000 |



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **8** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

5.0. TESTS AND INSPECTION

- 5.1 The supplier shall be responsible for and shall perform all inspection and tests specified herein to ensure that the material and workmanship conform to his tender and design drawings and to demonstrate that the valves supplied by him will perform as specified herein to the approval of NPCIL. All materials designated in accordance with ASTM standards shall be tested accordingly. Proof in the form of certified test reports or mill certificates that the required tests have been carried out at the source will be acceptable, but if these are not performed then the tests will be carried out by the Supplier.
- 5.2 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his sub-suppliers to ensure the mechanical accuracy of components, compliance with drawings, identity and acceptability of all material parts and equipment.
- 5.3 All components machined or fabricated from plate, sheet or stock, shall meet the material requirements of ASTM or material specification approved by NPCIL.
- 5.4 Non Destructive Examinations (NDE) shall be carried out in accordance with governing valve specification sheet (VSS) or standard.
- 5.5 Supplementary NDE /Tests shall be as per the valve specification sheets.
- 5.6 For check valves in addition to other test specified in VSS, low pressure closure test shall be conducted at a pressure 25% of hydrostatic seat / disc test pressure for minimum duration of 3 minutes. Low pressure closure tests shall be conducted as per the procedures specified in clause 4.4 of API 598. For both low pressure closure test and high pressure closure tests, visual evidence of leakage through the disc, behind the seat rings is not permitted. The allowable rate of leakage of test fluid past the seats shall be as specified in API- 598.
- 5.7 The extent of the hydrostatic test to be performed by the supplier shall include but not be limited to the following :-
- a) All body and bonnet castings shall be hydrostatically tested at the pressures specified in valve design standard or as per individual specification sheet. However, duration for test should not be less than 10 minutes.
 - b) All valve seats shall be tested for tightness in the following manner.

The valves shall be subjected to water pressure of maximum of 3 kg/cm² (g); the pressure shall then be increased to the maximum design pressure of the valve being tested. Then the pressure shall be increased to one and a half times the design pressure. Valves shall then be cracked open at the highest pressure to determine the tightness of the seat ring on the body.
 - c) During the hydrostatic test of the shell, stem packing shall be tested as follows and shall meet the requirements stated herein.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **9** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- (i) The pressure on the valve shall first be raised to the maximum service pressure stated in the valve specification sheet. The packing gland shall be adjusted so that there is no visible leakage past the packing.
- (ii) The pressure on the valve shall then be raised to full hydrostatic test pressure to complete the shell and seat test. The packing gland shall be adjusted only if necessary to meet the following requirements. On valves with actuators, minor leakage is permitted at the packing gland. On valves with conventional hand wheels, no leakage shall be permitted at the packing gland.
- (iii) The packing gland of valves with actuators shall be retested at the maximum service pressure stated on the Valve Specification Sheet. No visible leakage at the packing gland shall be permitted.

5.8 All valves hydrostatically tested shall be completely drained prior to dispatch.

5.9 Five sets of certified physical and chemical analysis certificates of all components and certified hydrostatic test certificates shall be submitted.

5.10 The rubber parts used in the valve shall be visually inspected. Shore hardness test of the rubber parts shall be carried out and certificate of compliance for the rubber components shall be submitted.

5.11 The supplier inspection shall include the control of quality of manufacturing process.

5.12 Valves shall not be shipped until released, after shop examination by NPCIL's inspection or unless the shop examination is waived by NPCIL. (Seller shall notify well in advance of date by which the valves will be ready for final inspection). Shop examination and inspection by NPCIL shall not relieve the supplier of his contractual responsibility to furnish valves in compliance with specification and meeting specified guarantees.

5.13 Inspection or Test Failures

In the event of failure of any part of the equipment to meet any inspection or test requirement specified herein, the Supplier shall notify NPCIL immediately.

The Supplier shall obtain permission from NPCIL before repair or subsequent use of such equipment or part except in the case of repair of a casting. However, the repair technique and all radiographs shall be subject to approval by the NPCIL.

If any repairs or re-designs are likely to affect the results of tests or work previously completed, appropriate re-inspection and retesting shall be conducted.

6.0. PERFORMANCE GUARANTEE

As per GCC (General Conditions of Contract) attached along with the Tender documents.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **10** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

7.0. SPARE PARTS AND MAINTENANCE TOOLS.

It will be the responsibility of the bidder to provide all commissioning spares required for initial operation till satisfactory completion of the trial operation. At least one set of seal kit (packing rings, gaskets & renewable seat rings) to be supplied along with Valves.

Recommended spare parts list for 3 years of operation shall be furnished for each valve and actuator. Detailed list of spare parts with item no. shall be furnished in the O&M manual. Bidder shall indicate price of each spare part separately. BHEL reserves the right to order any or all of the components / items/quantity offered as recommended spares.

Supplier shall also furnish a list of mechanical tools necessary for maintenance. The list shall be complete with quantities and unit prices.

8.0. SPECIAL CLEANING, PROTECTION AND PAINTING

All valves shall be free of mill scale. The inside of all the valves shall be free of sand, dirt and other foreign matter. All openings shall be adequately sealed. Internally threaded pipe connections shall be plugged with a threaded metal plug.

A sack containing silica gel desiccant shall be firmly attached to the inner surface on the cover of one end of each valve.

For the valves having welded ends, the ends should be properly cleaned and treated with a suitable rust preventive other than grease and then securely fitted with plastic or wooden caps.

All steel and cast iron surfaces shall be thoroughly cleaned to remove mill scales, rust etc. by wire brushing or grit blasting as required. All interior and exterior surfaces of valves shall be coated with two coats of Primer 75μ dft. The exterior surfaces shall be further coated with top coat. The painting of external surfaces shall be carried out as per painting requirements specified in valve specification sheet (VSS). The paint applied shall be compatible for the medium handled by the valve and harsh saline environment.

9.0. IDENTIFICATION & MARKING

The valve body and attached plate shall be marked with the information called for in MSS-SP. In addition, the supplier is required to affix a stainless steel metal tag to each valve with corrosion resistant wire. The tag number (KKS Code) shall be as shown in the individual specification sheets and Annexure V.

10.0. EXAMINATION OF PRODUCT

The completed valve shall be examined to determine its conformance with this specification with respect to its material, workmanship, finish, markings and dimensions and to assess its conformance with other requirements stated or reasonably implied and not covered by specific tests.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **11** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

11.0. PACKAGING AND SHIPMENT

11.1 All valves shall be prepared for shipment in accordance with the instructions stated below.

- a) The interior of the valve shall be clean and dry.
- b) The valves shall be so packed and protected as not to suffer corrosion, deterioration or damage of any sort during shipment to end storage at the project. All openings of the valves shall be closed with suitable plastic caps. Flanged openings shall be covered with a 20mm thick plywood blank flange held in place with 4 bolts and sealed with a blank gasket of natural rubber or equivalent.
- c) Packaging shall be prepared for a period in transit exceeding two months.
- d) The construction and lining of the boxes shall provide protection for their contents. The packaging shall also include adequate cushioning, blocking, bracing, skidding, hoisting and the tie-down provisions. The packaging shall be subject to the approval of NPCIL.

11.2 All parts shall be properly packed, boxed, gated or otherwise protected for preventing any possible damage during transportation. Packing Procedures shall be submitted for NPCIL 's approval. All exposed surfaces shall be protected by fitting suitable wooden blank flanges so that they are not damaged during transportation. No shipment shall be done unless shipping release is issued by NPCIL in writing and for shipment.

12.0. DATA / DOCUMENTS TO BE SUBMITTED

12.1 Data I Documents to be submitted along with the bid

- (a) The Supplier shall fill applicable clauses of VSS and submit along with the bid.
- (b) The Supplier shall submit along with the proposal the outline drawings for each type of valve and actuator assembly, indicating various dimensions, part details and material of construction, details of ends, location of support etc. Clearance above or below the centre line of valve bodies to remove inner parts from valve bodies shall also be indicated.
- (c) Typical sectional details for each type of valves, showing internal arrangement and parts list shall be submitted along with the bid.
- (d) Reliability data / parameters for each type of valves.
- (e) Curves showing valve opening flow coefficient (C_v) characteristic / pressure drop curves / K_v values and flow characteristics curves shall also be submitted.

12.2 Inspection History Document / Documents To Be Submitted After Placement of Order / At Final Stage

The supplier shall be required to submit the following documents within one month after dispatch of equipment.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **12** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- a) Bound History dockets five sets each comprising the following documents.
 - (i) P.O. and Sub-Order copies.
 - (ii) Approved as built drawings.
 - (iii) Curves showing valve opening flow coefficient (Cv) characteristic / pressure drop curves / Kv values and flow characteristics curves
 - (iv) Approved QAP
 - (v) Approved Procedures.
 - (vi) Material test certificates.
 - (vii) NDT Reports.
 - (viii) Stress relief Time-Temperature charts
 - (ix) Welding procedures and Welder 's Qualification reports.
 - (x) Hydrostatic Test Certificates.
 - (xi) Performance Test Procedure and Performance Test Reports with curves / other test reports.
 - (xii) Dimensional Reports.
 - (xiii) Radiography films if any.
 - (xiv) Shipping release copies.
 - (xv) All Design Concession reports if any.
 - (xvi) Guarantee and Compliance Certificate.
- (b) Five hard and soft copies / sets of Operation and Maintenance Manuals covering Preventive maintenance requirements and procedures.
- (c) Five no's of Reproducible for each of the drawings; and drawings on magnetic media preferably on CD.
- (d) Five Prints of Final Approved drawings submitted during execution of Contract.
- (e) Five copies of approved Seismic Qualification Reports.

13.0. VALVE SPECIFICATION SHEET

The Valves supplied shall be as per the Valve Specification Sheet attached along with this specification. Typical VSS formats for the following valves are enclosed in **Annexure- I**.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **13** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- (i) Wedge Type Gate Valve
- (ii) Flap (Swing Check) Valves
- (iii) Regulating Globe (Needle) Valves

14.0. QUALITY ASSURANCE PLAN

Sample QAP attached in this document is only indicative. The bidder has to prepare a detailed QAP and submit the same for the approval of the purchaser.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **14** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

SAMPLE QUALITY ASSURANCE PLAN FOR WEDGE TYPE GATE VALVE										PAGE - 1 / 3
REF. PRODUCT: WEDGE TYPE GATE VALVE										
CLIENT/CUSTOMER: Nuclear Power Corporation of India Limited										
CONTRACTOR :										
PROJECT : Kudankulam Nuclear Power Project for unit – 3&4										
SYSTEM :										
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CATEGORY	TYPE / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOC.	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY REMARK P W R CHP	REMARKS
1.0	RAW MATERIAL									
1.1	BODY, BONNET CASTING	Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 2 2.1	Ref. General Note 1 & 3
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	No Defects	Inspection Report	3 - 2.1	-
1.2	WEDGE	Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	No Defects	Inspection Report	3 - 2.1	-
1.3	BODY, BONNET & WEDGE	Surface defects	Major	Visual	100%	MSS - SP - 55	No Defects	Inspection Report	3 - 2.1	-
		Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
1.4	SPINDLE	Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	No Defects	Inspection Report	3 - 2.1	-
		Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
1.5	BODY & WEDGE FACE RINGS	Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	No Defects	Inspection Report	3 - 2.1	-
1.6	FASTNERS	Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3 - 2.1	Ref. General Note 1
		Visual & dimension	Major	Visual &	Random	Approved Drawing	Approved Drawing	Inspection Report	3 - 2.1	-
1.6	GASKET	Material compliance report & visual inspection report	Major	Measurement visual	100%	Approved Drawing	Approved Drawing	Inspection Report	3 - 2.1	-



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **15** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

SAMPLE QUALITY ASSURANCE PLAN FOR WEDGE TYPE GATE VALVE											PAGE - 2 / 3		
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CATEGORY	TYPE / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOC.	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY REMARK				REMARKS
									P	W	R	CHP	
IN PROCESS INSPECTION													
2.0													
2.1	BODY, BONNET, WEDGE & SPINDLE MACHINING	Dimensions	Major	Measurement	100%	Manufacturing Drawing	Manufacturing drawing	Log Book	3	-	2.1	-	-
2.2	SPINDLE	Surface defects	Major	D.P. Test	100%	ASTM - E - 165	No defect	Test Report	3	-	2.1	-	-
2.3	SPINDLE, WEDGE FACE RING & BODY FACE RING	Hardness	Major	Hardness	One test bar / heat	MFG. STD.	MFG. STD.	TC/ Lab Report	3	2	2.1	-	-
FINAL INSPECTION													
3.0													
3.1	VALVE ASSEMBLY	Body hydrostatic test	Major	Integrity	100% by PC & 10% by NPCIL	As per VSS	As per VSS	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Seal Hydrostatic test	Major	Integrity	100% by PC & 10% by NPCIL	As per VSS	As per VSS	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Back seal Hydrostatic test	Major	Integrity	100% by PC & 10% by NPCIL	As per VSS	As per VSS	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Air Leak Test	Major	Integrity	100% by PC & 10% by NPCIL	As per VSS	As per VSS	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Dimensional & Visual Inspection	Major	Overall Dimensions	100% by PC & 10% by NPCIL	Approved Drawing	Approved Drawing	Test Report	3	2	2.1	-	-
		Painting & Corrosion Protection	Major	Visual & paint Thickness	100%	Approved Drawing / Specification	Approved Drawing / Specification	Inspection Report	3	2.1	2.1	-	100% by "2" & 10% by "1"
		Packing (with end Protection)	Major	Visual	100%	MFG. STD.	MFG. STD.	Inspection Report	3	2	2.1	-	-
		Documentation	Major	Review	100%	Approved Drawing / Specification	Approved Drawing / Specification	Inspection Report	3	2	2.1	-	-
LEGENDS / ABBREVIATIONS													
Activity		MFG – Manufacturer											
P – Performed by W – Witness by R – Review by		STI - Scheme of Testing & Inspection											
CHP- Customer Hold Point		Quality Assurance Plan											
Agency		QAP –											
1 – NPCIL QS or its authorized representative (Purchaser)		ASTM - American Society for Testing and Materials MSS –											
2 – Prime Contractor / its authorized inspection agency		Material Standard Specification											
3 -Vendor/Sub Vendor/Manufacturer/External Testing Lab		DRG. – Drawings STD – Standards											
PC – Prime Contractor		TC – Test Certificate											
MTC - Material Test Certificate		SPEC - Specifications											
		VSS - Valve Specification Sheet											
							(PREPARED BY)				(CHECKED & APPROVED BY)		



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **16** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

PAGE - 3 / 3	SAMPLE QUALITY ASSURANCE PLAN FOR WEDGE TYPE GATE VALVE
	General Note : 1) Co - related material test certificate is acceptable. In absence of co-related material test certificate, sample per lot (lot means, all material having same heat mark / material specification requirement constitute the lot) for chemical and physical test shall be drawn and witnessed by Prime Contractor Q.S. Chemical and physical test shall be carried out in NPCIL approved labs only and prime contractor shall submit all material verification reports and test reports to NPCIL Q.S. for checking / verification and clearance. Physical test includes Tension test, Hardness test & Impact test as per Material Standards. 2) Welding Procedure and welder performance qualification shall be as per Scope document of Fire Fighting system Package. 3) First heat/lot of pouring to be witnessed by "2" and mechanical test for all heat to be witnessed by "2". 4) Random check of LPE on final pass of weld joints by NPCIL - QS - This is "witness point". LPE other than welds, NPCIL, QS will witness on 100% basis if no sample size is mentioned in the QAP. This also "witness point". 5) All test reports, test certificates and inspection reports shall be reviewed by Manufacturer before submitting the same for verification by NPCIL. 6) Chemical and mechanical tests on the material shall be performed in laboratories approved by NPCIL. 7) Castings shall be taken from foundries approved by NPCIL. 8) Heat treatment shall be carried out in furnaces approved by NPCIL. 9) Calibrated instruments shall be used during inspection, examination and testing. 10) NPCIL approved chemicals for liquid penetrant examination shall be used. 11) Non-destructive examinations shall be carried out by personnel qualified to Level - II of INST for ASNT. 12) Electrodes / Filler wire shall be of brand approved by NPCIL. Batch testing of electrodes is required, if specified in the applicable specification. 13) On painting, adhesion test also should be indicated. Any deviation to this QAP shall be brought out by vendor in his offer failing which this QAP shall be compiled duly.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **17** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

SAMPLE QUALITY ASSURANCE PLAN FOR NON RETURN VALVES												PAGE -1 / 2	
CLIENT/CUSTOMER: Nuclear Power Corporation of India Limited												REF. PRODUCT: NON RETURN VALVES-150 MB & 80 NB	
CONTRACTOR :												DOC. NO.	
PROJECT : Kudankulam Nuclear Power Project for unit -3&4												REV. NO.	
SYSTEM :												DATE:	
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CATEGORY	TYPE / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOC.	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY REMARK				REMARKS
									P	W	R	CHP	
1.0	RAW MATERIAL												
1.1	BODY, DISK COVER CASTINGS	Physical	Major	Physical test	One test bar / heat lot	Relevant material Specification	Relevant material Specification	MTC	3	2	2,1	1	Ref. General Note 1 & 3
		Chemical	Major	Chemical test	One test bar / heat lot	Relevant material Specification	Relevant material Specification	MTC	3	-	2,1	1	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	MSS - SP - 55	Inspection Report	3	-	2,1	-	-
1.2	HINGE PIN	Physical	Major	Physical test	One test bar / heat lot	Relevant material Specification	Relevant material Specification	MTC	3	-	2,1	-	Ref. General Note 1
		Chemical	Major	Chemical test	One test bar / heat lot	Relevant material Specification	Relevant material Specification	MTC	3	-	2,1	-	Ref. General Note 1
		Visual	Major	Visual	100%	MSS - SP - 55	MSS - SP - 55	Inspection Report	3	-	2,1	-	-
1.3	BODY FACE RINGS & DISC FACE RINGS	Physical	Major	Physical test	One test bar / heat lot	Relevant material Specification	Relevant material specification	MTC	3	2	2,1	-	Ref. General note 1
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material specification	MTC	3	-	2,1	-	Ref. General note 1
		Visual	Major	Visual	100%	MSS - SP - 55	No defects	Inspection Report	3	-	2,1	-	-
1.4	FASTNERS	Physical	Major	Physical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3	2	2,1	-	Ref. General Note 1
		Chemical	Major	Chemical test	One test bar / heat	Relevant material Specification	Relevant material Specification	MTC	3	-	2,1	-	Ref. General Note 1
		Visual & Dimension	Major	Visual & Measurement	Random	As per Drawing	As per Drawing	Inspection Report	3	-	2,1	-	-
1.5	GASKET	Material Compliance Report & Visual Inspection Report	Major	Visual	100%	As per Drawing	As per Drawing MTC	Inspection Report	3	-	2,1	-	-
2.0	IN PROCESS INSPECTION												
2.1	BODY, DOOR & COVER MACHINING	Visual & Dimensions	Major	Measurement	100%	Manufacturing Drawing	Manufacturing Drawing	Log book	3	-	2,1	-	-
2.2	HINGE PIN	Surface Defects	Major	D.P.test	100%	ASTM - E - 165	No defect	Test Report	3	2	2,1	-	-
2.3	BODY FACE RINGS & DISC FACE RINGS	Hardness	Major	Hardness	One test bar / Heat / lot	As per Drawing	As per Drawing	TC/ Lab Report	3	2	2,1	-	-



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **18** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

SAMPLE QUALITY ASSURANCE PLAN FOR NON RETURN VALVES										PAGE -2 / 2			
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CATEGORY	TYPE / METHOD OF CHECK	QUANTUM OF CHECK	REFERENCE DOC.	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY REMARK				REMARKS
									P	W	R	CHP	
3.0	FINAL INSPECTION												
3.1	VALVE ASSEMBLY	Body hydrostatic test	Major	Integrity	100%	Approved drawing	No visually detectable leakage	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Seat hydrostatic test	Major	Integrity	100%	Approved drawing	Approved drawing	Test Report	3	2.1	2.1	1	100% by "2" & 10% by "1"
		Dimensional & visual inspection	Major	Overall dimensions	100%	Approved drawing	Approved drawing	Test Report	3	2	2.1	-	-
		Painting & Corrosion protection	Major	Visual & paint thickness	100%	Approved drg /spec.	Approved drawing / spec	Inspection Report	3	2.1	2.1	-	Min 10% witnessed by "1"
		Packing (with end protection)	Major	Visual	100%	MFG. STD	MFG. STD	Inspection Report	3	2	2.1	-	-
		Documentation	Major	Review	100%	Approved drg /spec.	Approved drawing / spec	Inspection Report	3	2	2.1	-	-
LEGENDS / ABBREVIATIONS													
Activity P – Performed by W – Witness by R – Review by CHP- Customer Hold Point Agency 1 – NPCIL, OS or its authorized representative (Purchaser) 2 – Prime Contractor / its authorized inspection agency 3 – Vendor/Sub Vendor/Manufacturer/External Testing Lab PC – Prime Contractor MTC - Material Test Certificate MFG – Manufacturer STI - Scheme of Testing & Inspection BISIS - Bureau of Indian Standard			QAP – Quality Assurance Plan AWWA – American Water Works Association ANSI – American National Standards Institute ASTM – American Society for Testing and Materials MSS – Material Standard Specification DRG – Drawings STD – Standards TC – Test Certificate SPEC - Specifications			(PREPARED BY)							
										(CHECKED & APPROVED BY)			

General Note :

- Co - related material test certificate is acceptable. In absence of co-related material test certificate, sample per lot (lot means - all material having same heat mark / material specification requirement constitute the lot) for chemical and physical test shall be drawn and witnessed by Prime Contractor Q.S. Chemical and physical test shall be carried out in NPCIL approved labs only and prime contractor shall submit all material verification reports and test reports to NPCIL Q.S. for checking / verification and clearance.
- Welding Procedure and welder performance qualification shall be witnessed by PC Q.S. and report along with test results shall be submitted to NPCIL Q.S. for review. NPCIL Q.S. shall witness welder procedure cum performance qualification on at least one welder of each PC / Sub-vendor Based on each approved welding procedure specification. If the sample of procedure cum performance qualification witness by NPCIL Q.S. fails to meet the requirements specified for procedure and welder qualification, then re-qualification of all welders in the PC / Sub-vendor will be carried out in presence of NPCIL Q.S.
- First heat/cut of pouring to be witnessed by "Z" and mechanical test for all heat to be witnessed by "Z".
- Random check of LPE on final pass of weld joints by NPCIL - OS - This is "witness point". LPE other than welds, NPCIL Q.S. will witness on 100% basis / no sample size is mentioned in the QAP, this also "witness point".
- All test reports, test certificates and inspection reports shall be reviewed by Manufacturer before submitting the same for verification by NPCIL.
- Chemical and mechanical tests on the material shall be performed in laboratories approved by NPCIL.
- Castings shall be taken from bunnies approved by NPCIL.
- Heat treatment shall be carried out in furnaces approved by NPCIL.
- Calibrated instruments shall be used during inspection, examination and testing.
- NPCIL approved chemicals for liquid penetrant examination shall be used.
- Non-destructive examinations shall be carried out by personnel qualified to Level-II of INST for ASNT.
- Electrodes / Filler wire shall be of brand approved by NPCIL. Batch testing of electrodes is required, if specified in the applicable specification.
- On painting, adhesion test also should be indicated.

Any deviation to this QAP shall be brought out by vendor in the offer falling which this QAP shall be compiled duly.

Definitions:

Customer Hold point - Witness is mandatory before proceeding the further activities. This activity shall be kept under hold till inspection clearance or written waiver is obtained from the agency responsible for this stage (NPCIL Q.S. or its authorized representative).

Witness Point - Witness points are critical steps in manufacturing and examination / inspection / testing. Where the supplier is obliged to notify in sufficient advance of the start of the operation / test so that it may be witnessed. The supplier may proceed with the work past a witness point, if the NPCIL-QS or its authorized representative is not available at the appointed time.

Review - Review / Verification of documents carried out by agency for compliance and acceptance.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

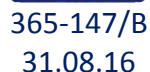
Page: **19** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE I

VALVE SPECIFICATION SHEET FOR GML SYSTEM WEDGE TYPE GATE VALVE OF 150 NB

G E N E R A L	VALVE TYPE	WEDGE TYPE GATE VALVE				VALVE SPEC. SH. NO.:	
	SIZE	150 NB				102.KK34.0.0.TH.TS.PR006	
	APPL. SPECN.	--				KKS CODE: 3,4 GML21/22AA001	
	DESIGN STD.	ASME B16.34				REV.NO.	
						ENV.QUAL.REQUIREMENT	: NA
						SEISMIC REQUIREMENT	: OBE
B O D Y	PRESSURE RATING	: #150					
	END CONNECTION	: RF/125AARH, SERRATED FINISH, FLANGED AS PER ANSI B16.5 150#					
	MATERIAL : BODY	: ASTM A 216 GR.WCB (CAST)				LINING	: N.A
	BOLTS	: ASTM A193 GR B8M				NUTS	: ASTM A194 GR 8M
	BORE TYPE	:					
B O N N E T	TYPE	: BOLTED,					
	MATERIAL	: ASTM A 216 GR.WCB					
	BONNET GASKET	: SP WND SS316-GRAFOIL FILLER/CORRUGATED SS 316					
	HAND WHEEL	: REQUIRED				MATERIAL	: CS
	STEM PACKING	: RENEWABLE WITH VALVE OPEN ON STREAM				MATERIAL	: CORROSION INHIBITED DIE FOR MED FLEXIBLE GRAPHITE WITH BRAIDED ANTI EXTRUSION RINGS
	GLAND TYPE	:				MATERIAL	:
T R I M	STEM (RISING/NON RISING)	: RISING				MATERIAL	: 13% CR.STEEL (NO CASTING)
	WEDGE/DISC	: SOLID/FLEXIBLE				MATERIAL	: 13% CR STEEL FACING/13% CR. STEEL
	BODY SEAT RING	: RENEWABLE/NON RENEWABLE				MATERIAL	: 13% CR STEEL FACING/13% CR. STEEL
	BACK SEAT BUSH	:				MATERIAL	: 13% CR STEEL
	GLAND BUSH	:				MATERIAL	:
S E R V I C E	FLUID	: POTABLE WATER		Max	Min		
	PRESSURE (Kg/cm ² g)	: DESIGN	10	OPERATI-NG	-	-	
	TEMP (°C)	: MAX.	60	MIN	21	NORMAL	31
	FLOW (m ³ /hr)	: MAX.		MIN		NORMAL	-
	DENS.(Kg/m ³)@15°C	: 1000					
	HYDRAULIC FRICTION FACTOR	: NOT MORE THAN 1.0					
	DISC DIFFERENTIAL PRESSURE(kg/cm ² g)	: SAME AS VALVE RATING					
	Cv	: #					
NOTES : 1. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS. 2. MANUFACTURER TO SUBMIT QAP AND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING 3. TESTING AS PER API : 598 4. DIFFERENCE IN HARDNESS OF MIN. 50 BHN SHALL BE MAINTAINED BETWEEN DISC AND SEAT RING. 5. NON DETACHABLE LOCKING ARRANGEMENT SHALL BE PROVIDED FOR THE VALVES WHICH ARE TO BE KEPT IN FULLY OPEN / CLOSED POSITION. 6.POSITION(STATUS) INDICATOR TO BE PROVIDED.							



Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: 20 of 76

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

I N S P T E S T S	DESCRIPTION		PRESSUR (Kg/cm ² g)	DURATION IN (MINUT.) (MIN)	APPLICABLE CLAUSE OF SPECIFICATION	REMARKS
	HYDROSTATIC BODY	TEST	30	10		NPC TO WITNESS
	HYDROSTATIC SEAT / DISC	TEST	22	3		
	AIR LEAK BODY	TEST	-	-		
	AIR LEAK SEAT	TEST	5.5	3		
	BODY HYDRO. WITH BELLOW TEST		NA	NA		
	BACK SEAT LEAK	TEST	22	3		
	VALVE & ACTUATURPERFORMANCE TEST		REQUIRED			
	ACTUATOR TEST		N.A			
	FUNCTIONAL QUALIFICATION TEST		NOT REQUIRED			
	MATERIAL		PHYSICAL & CHEMICAL T.C. FROM MFG.			
	DIMENSIONAL CHECKS		MFG. CERTIFICATES & SAMPLE CHECK BY NPC			
ACCESSORIES			NOT APPLICABLE (NA)		APPLICABLE (✓)	
LIMIT SWITCHES			OPEN	N.A	CLOSE	N.A
TORQUE SWITCH			OPEN	N.A	CLOSE	N.A
CHAIN WHEEL				FLOOR STAND	WITH POSITION INDICATOR	
EXTN. BONNET				SUPPORT LU		
FLANGES	MATING FLANGE AS PER B16.5, SORF, #150			OTHERS	EXTENDED STEM TO SUITE SITE LOCATION.	

- VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#)
- MANUFACTURER TO SUBMIT QAP & OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING.
- TESTING SHALL BE AS PER API 598.
- SHAFT DIAMETER SELECTION, SHAFT TO DISC CONNECTION, PIN SIZING, OPERATOR SIZING SHALL BE IN-LINE WITH AWWA-C 504. CALCULATIONS TO BE SUBMITTED FOR PURCHASERS APPROVAL.
- VENDOR SHOULD FURNISH THE PERFORMANCE CERTIFICATE FOR MINIMUM 2 YEARS OF SATISFACTORY OPERATION FOR SEAL OFFERED.
- OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH COPON HYCOTE 162HB, 1000 MICRONS DFT.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **21** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

SWING CHECK VALVES FOR 150 NB VALVES

GENERAL	VALVE	SWING CHECK VALVE		VALVE SPEC. SH.NO.:		I02.KK34.0.0.TH.TS.PR006		
	SIZE	150 NB		KKS CODE:		3,4 PUQ10/20/30/40 AA603/604 : 3,4 GML21/22 AA601		
	APPL. SPECN.			REV. NO.				
	DESIGN.	ASME B16.34		ENV.QUAL.REQUIREMENT		:	NA	
	LOCATION			SEISMIC REQUIREMENT		:	OBE	
BODY	PRESSURE RATING	:	CLASS 150					
	END CONNECTION	:	FLANGED TO B16.5, RF, SERRATED FINISH, FACE TO FACE DIMENSIONS AS PER B16.10					
	MATERIAL: BODY	:	ASTM A105		LINING	:	EPDM (TOTAL WETTED SURFACE SHALL BE FULLY LINED)	
	BOLTS	:	A 193 Gr B8M		NUTS	:	A 194 Gr 8M	
	CONSTRUCTION FEATURES	:						
BONNET	TYPE	:			MATERIAL	:		
	BONNET GASKET	:			MATERIAL	:		
	HAND WHEEL	:			MATERIAL	:	NA	
	GLAND TYPE	:			MATERIAL	:		
TRIM	STEM (RISING/NON RISING)	:			MATERIAL	:	NA	
	WEDGE/DISC	:			MATERIAL	:	A182 F6b	
	BODY SEAT RING	:			MATERIAL	:	Hard-faced	
	HINGE & BRACKET	:			MATERIAL	:	SS316	
	SPRING	:			MATERIAL	:		
SERVICES	FLUID	:	SEA WATER		Max.	Min.		
	PRESSURE	:	DESIGN	10	OPERATING			
	TEMP (°C)	:	MAX.	60	MIN.	21	NORMAL	31
	FLOW (m³/hr)	:	MAX.		MIN.		NORMAL	
	DENS.(kg/m³) @ 15 °C	:	1000					
	Hydraulic friction factor	:	Not more than 3.0					
	Cv	:	#					
	NOTES :							
1. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS.								
2. MANUFACTURER TO SUBMIT QAPAND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING.								
3. OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH COPON HYCOTE 162HB, 1000 MICRONS DFT.								
INSPECTION	DESCRIPTION	PRESSURE (kg/cm² g)	DURATION IN (min.) (MIN)	APPLICABLE CLAUSE OF SPECIFICATION		REMARKS		
	HYDROSTATIC BODY TEST	30	10			NPC TO WITNESS		
	HYDROSTATIC SEAT / DISC TEST	22	5					
	LOW PRESSURE SEAT LEAK TEST							
	AIR LEAK SEATTEST							
	BODY HYDRO. WITH BELLOW TEST							
	BACK SEAT LEAK TEST							
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED						
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.						
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC						
ACCESSORIES								
LIMIT SWITCH :		OPEN	CLOSE	NOT APPLICABLE		APPLICABLE		
CHAIN WHEEL	NA			FLOOR STAND :				
EXTN. BONNET	NA			SUPPORT LUGS :				
FLANGES	Mating Flanges as per B16.5, SORF, Class 150			OTHERS :				



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **22** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

80 NB SWING CHECK VALVES OF PUQ SYSTEM

GENERAL	VALVE	SWING CHECK VALVE		VALVE SPEC. SH.NO.:		I02.KK34.0.0.TH.TS.PR006		
	SIZE	80 NB		KKS CODE:		3,4 PUQ10/20/30/40 AA601/602		
	APPL. SPECN.			REV. NO.				
	DESIGN.	ASME B16.34 and ASME Section III ND		ENV.QUAL.REQUIREMENT		:	NA	
	LOCATION			SEISMIC REQUIREMENT		:	SSE	
BODY	PRESSURE RATING	:	CLASS 150					
	END CONNECTION	:	FLANGED TO B16.5, RF, SERRATED FINISH, FACE TO FACE DIMENSIONS AS PER B16.10					
	MATERIAL: BODY	:	ASTM A105		LINING	:	EPDM (TOTAL WETTED SURFACE SHALL BE FULLY LINED)	
	BOLTS	:	A 193 Gr B8M		NUTS	:	A 194 Gr 8M	
	CONSTRUCTION FEATURES	:						
BONNET	TYPE	:			MATERIAL	:		
	BONNET GASKET	:			MATERIAL	:		
	HAND WHEEL	:			MATERIAL	:	NA	
	GLAND TYPE	:			MATERIAL	:		
TRIM	STEM (RISING/NON RISING)	:			MATERIAL	:	NA	
	WEDGE/DISC	:			MATERIAL	:	A182 F6b	
	BODY SEAT RING	:			MATERIAL	:	Hard-faced	
	HINGE & BRACKET	:			MATERIAL	:	SS316	
	SPRING	:			MATERIAL	:		
SERVICES	FLUID	:	SEA WATER		Max.	Min.		
	PRESSURE	:	DESIGN	10	OPERATING			
	TEMP (°C)	:	MAX.	60	MIN.	21	NORMAL	31
	FLOW (m³/hr)	:	MAX.		MIN.		NORMAL	
	DENS.(kg/m³) @ 15 °C	:	1000					
	Hydraulic friction factor	:	Not more than 3.0					
	Cv	:	#					
INSPECTION	DESCRIPTION	PRESSURE (kg/cm² g)		DURATION IN (min.) (MIN)		APPLICABLE CLAUSE OF SPECIFICATION		REMARKS
	HYDROSTATIC BODY TEST	30		10				NPC TO WITNESS
	HYDROSTATIC SEAT / DISC TEST	22		5				
	LOW PRESSURE SEAT LEAK TEST							
	AIR LEAK SEAT TEST							
	BODY HYDRO. WITH BELLOW TEST							
	BACK SEAT LEAK TEST							
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED						
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.						
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC						
ACCESSORIES				NOT APPLICABLE		APPLICABLE		
LIMIT SWITCH :	OPEN		CLOSE					
CHAIN WHEEL	NA				FLOOR STAND :			
EXTN. BONNET	NA				SUPPORT LUGS :			
FLANGES	Mating Flanges as per B16.5, SORF, Class 150				OTHERS :			



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **23** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

80 NB SWING CHECK VALVES OF GML SYSTEM

GENERAL	VALVE		SWING CHECK VALVE				VALVE SPEC. SH.NO.: I02.KK34.0.0.TH.TS.PR006				
	SIZE		80 NB				KKS CODE: 3,4 GML31/32 AA601				
	APPL. SPECN.						REV. NO.				
	DESIGN.	ASME B16.34				ENV.QUAL.REQUIREMENT		:	NA		
	LOCATION					SEISMIC REQUIREMENT		:	OBE		
BODY	PRESSURE RATING		:	CLASS 150							
	END CONNECTION		:	FLANGED TO B16.5, RF, SERRATED FINISH, FACE TO FACE DIMENSIONS AS PER B16.10							
	MATERIAL: BODY		:	ASTM A105				LINING	:	EPDM (TOTAL WETTED SURFACE SHALL BE FULLY LINED)	
	BOLTS		:	A 193 Gr B8M				NUTS	:	A 194 Gr 8M	
	CONSTRUCTION FEATURES		:								
BONNET	TYPE		:					MATERIAL	:		
	BONNET GASKET		:					MATERIAL	:		
	HAND WHEEL		:					MATERIAL	:	NA	
	GLAND TYPE		:					MATERIAL	:		
TRIM	STEM (RISING/NON RISING)		:					MATERIAL	:	NA	
	WEDGE/DISC		:					MATERIAL	:	A182 F6b	
	BODY SEAT RING		:					MATERIAL	:	Hard-faced	
	HINGE & BRACKET		:					MATERIAL	:	SS316	
	SPRING		:					MATERIAL	:		
SERVICE CONDITIONS	FLUID		:	SEA WATER				Max.	Min.		
	PRESSURE		:	DESIGN	10	OPERATING			NOTES : 4. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS. 5. MANUFACTURER TO SUBMIT QAPAND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING. 6. OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH COPON HYCOTE 162HB, 1000 MICRONS DFT.		
	TEMP (°C)	:	MAX.	60	MIN.	21	NORMAL	31			
	FLOW (m³/hr)	:	MAX.		MIN.		NORMAL				
	DENS.(kg/m³) @ 15 °C		:	1000							
	Hydraulic friction factor		:	Not more than 3.0							
	Cv		:	#							
INSPECTION	DESCRIPTION		PRESSURE (kg/cm² g)		DURATION IN (min.) (MIN)		APPLICABLE CLAUSE OF SPECIFICATION		REMARKS		
	HYDROSTATIC BODY TEST		30		10				NPC TO WITNESS		
	HYDROSTATIC SEAT / DISC TEST		22		5						
	LOW PRESSURE SEAT LEAK TEST										
	AIR LEAK SEAT TEST										
	BODY HYDRO. WITH BELLOW TEST										
	BACK SEAT LEAK TEST										
	FUNCTIONAL QUALIFICATION TEST		NOT REQUIRED								
	MATERIAL		PHYSICAL & CHEMICAL T.C. FROM MFG.								
	DIMENSIONAL CHECKS		MFG. CERTIFICATES & SAMPLE CHECK BY NPC								
ACCESSORIES					NOT APPLICABLE		APPLICABLE				
LIMIT SWITCH :		OPEN		CLOSE							
CHAIN WHEEL		NA				FLOOR STAND :					
EXTN. BONNET		NA				SUPPORT LUGS :					
FLANGES		Mating Flanges as per B16.5, SORF, Class 150				OTHERS :					



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **24** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

VALVE SPECIFICATION SHEET FOR GML SYSTEM NEEDLE VALVES OF 15 NB

GENERAL	VALVE	NEEDLE VALVE		VALVE SPEC. SH.NO.:			
	SIZE	15 NB		I02.KK34.0.0.TH.TS.PR00X			
	APPL. SPECN.			KKS CODE: 3,4 GML21/22/31/32AA301			
	DESIGN.	ASME B16.34		3,4 GML21/31AA002			
	LOCATION	In Main Pump House (UQA) at elevation. (-)6.725 m		REV. NO. PAGE: 1 OF 1			
BODY	PRESSURE RATING	CLASS 150		ENV.QUAL.REQUIREMENT : NA			
	END CONNECTION	WELDED, AS PER ASME B16.25		SEISMIC REQUIREMENT : OBE			
	MATERIAL: BODY	ASTM A182 F316L		LINING			
	BOLTS	NA		NUTS	NA		
	CONSTRUCTION FEATURES						
BONNET	TYPE	SCREWED		MATERIAL	A 182 F316L		
	BONNET GASKET			MATERIAL			
	HAND WHEEL	REQUIRED		MATERIAL	CS		
	STEM PACKING	GRAPHOIL		MATERIAL			
TRIM	STEM (RISING/NON RISING)			MATERIAL			
	PLUG FORM			MATERIAL			
	BACK SEATING			MATERIAL			
	BORE TYPE			MATERIAL			
SERVICE CONDITIONS	FLUID	SEA WATER		Max.	Min.		
	PRESSURE	DESIGN	10	OPERATING			
	TEMP (°C)	MAX.	60	MIN.	21	NORMAL	31
	FLOW (m³/hr)	MAX.		MIN.		NORMAL	
	DENS.(kg/m³) @ 15 °C	1000					
	Hydraulic friction factor	#					
	Cv	#					
INSTALLATION TESTS	DESCRIPTION	PRESSURE (kg/cm² g)	DURATION IN (min.) (MIN)	APPLICABLE CLAUSE OF SPECIFICATION		REMARKS	
	HYDROSTATIC BODY TEST	AS PER STD.	AS PER STD			NPC TO WITNESS	
	HYDROSTATIC SEAT / DISC TEST						
	LOW PRESSURE SEAT LEAK TEST						
	AIR LEAK SEAT TEST						
	BODY HYDRO. WITH BELLOW TEST						
	BACK SEAT LEAK TEST						
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED					
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.					
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC					
ACCESSORIES							
LIMIT SWITCH :	OPEN		CLOSE	NOT APPLICABLE		APPLICABLE	
CHAIN WHEEL	NA			FLOOR STAND :			
EXTN. BONNET	NA			SUPPORT LUGS :			
FLANGES	NA			OTHERS :			



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **25** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

NEEDLE VALVES OF 10 NB

GENERAL	VALVE	NEEDLE VALVE		VALVE SPEC. SH.NO.:		I02.KK34.0.0.TH.TS.PR00X	
	SIZE	10 NB		KKS CODE:		3,4 PUQ10/20/30/40AA301/302	
	APPL. SPECN.			REV. NO.		PAGE: 1 OF 1	
	DESIGN.	ASME B16.34		ENV.QUAL.REQUIREMENT		: NA	
	LOCATION	In Main Pump House (UQA) at elevation. (-)6.725 m		SEISMIC REQUIREMENT		: OBE	
BODY	PRESSURE RATING	: CLASS 150					
	END CONNECTION	: WELDED, AS PER ASME B16.25					
	MATERIAL: BODY	: ASTM A182 F316L		LINING	:		
	BOLTS	: NA		NUTS	:	NA	
	CONSTRUCTION FEATURES	:					
BONNET	TYPE	: SCREWED		MATERIAL	:	A 182 F316L	
	BONNET GASKET	:		MATERIAL	:		
	HAND WHEEL	: REQUIRED		MATERIAL	:	CS	
	STEM PACKING	: GRAPHOIL		MATERIAL	:		
TRIM	STEM (RISING/NON RISING)	:		MATERIAL	:		
	PLUG FORM	:		MATERIAL	:		
	BACK SEATING	:		MATERIAL	:		
	BORE TYPE	:		MATERIAL	:		
SPECIFICATION	FLUID	: SEA WATER		Max.	Min.		
	PRESSURE	: DESIGN 10		OPERATING			
	TEMP (°C)	:	MAX. 60	MIN. 21	NORMAL	31	
	FLOW (m³/hr)	:	MAX.	MIN.	NORMAL		
	DENS.(kg/m³) @ 15 °C	: 1000					
	Hydraulic friction factor	: #					
	Cv	: #					
	NOTES :						
	1. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS.						
	2. MANUFACTURER TO SUBMIT QAPAND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING.						
3. OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH INTERGRAD 269 PRIMER 50 MICRONS DFT & INTERGRAD 740 TOP COAT 75 MICRONS DFT; TOTAL 125 MICRONS DFT.							
INSTALLATION	DESCRIPTION	PRESSURE (kg/cm² g)	DURATION IN (min.) (MIN)	APPLICABLE CLAUSE OF SPECIFICATION		REMARKS	
	HYDROSTATIC BODY TEST	AS PER STD.	AS PER STD			NPC TO WITNESS	
	HYDROSTATIC SEAT / DISC TEST						
	LOW PRESSURE SEAT LEAK TEST						
	AIR LEAK SEAT TEST						
	BODY HYDRO. WITH BELLOW TEST						
	BACK SEAT LEAK TEST						
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED					
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.					
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC					
ACCESSORIES							
LIMIT SWITCH :	OPEN	CLOSE	NOT APPLICABLE		APPLICABLE		
CHAIN WHEEL	NA		FLOOR STAND :				
EXTN. BONNET	NA		SUPPORT LUGS :				
FLANGES	NA		OTHERS :				



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

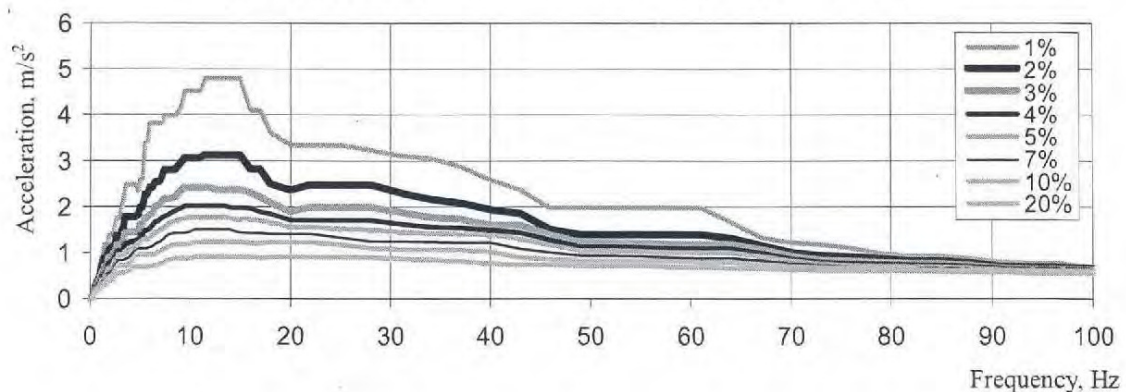
Effective Date: **25/01/2021**

Page: **26** of **76**

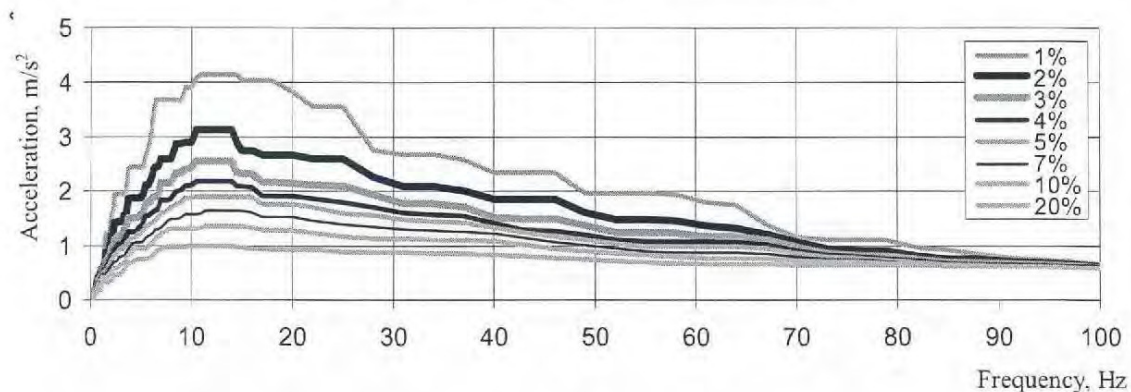
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE II

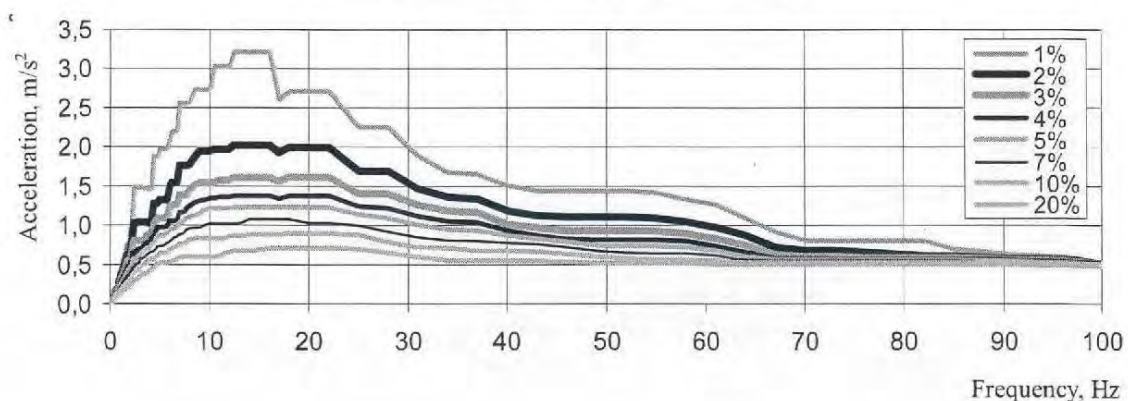
Response spectra from seismic load of the pump station UQA



a) Along the horizontal grid x ($ZPA = 0.54 m/s^2$)



b) Along the horizontal grid y ($ZPA = 0.58 m/s^2$)



c) Along the vertical grid z ($ZPA = 0.47 m/s^2$)

Figure B.1 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevation minus 11,000



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

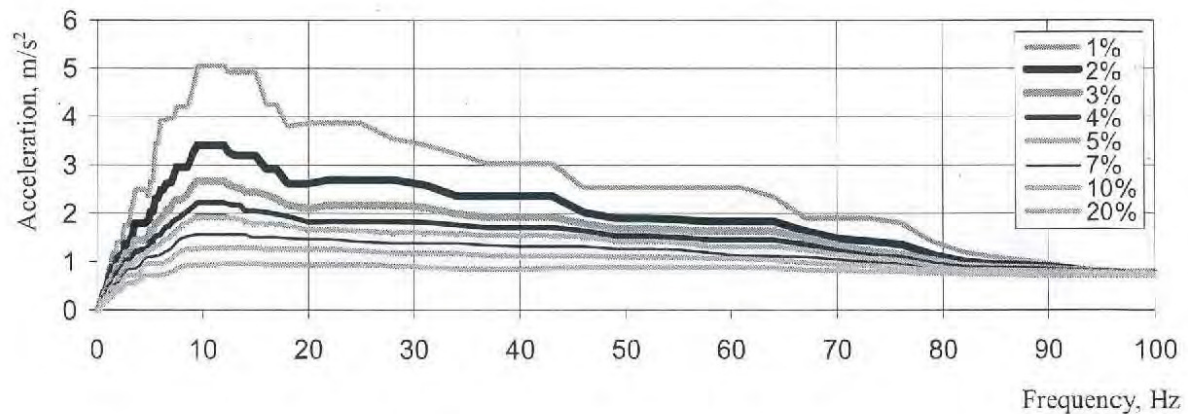
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

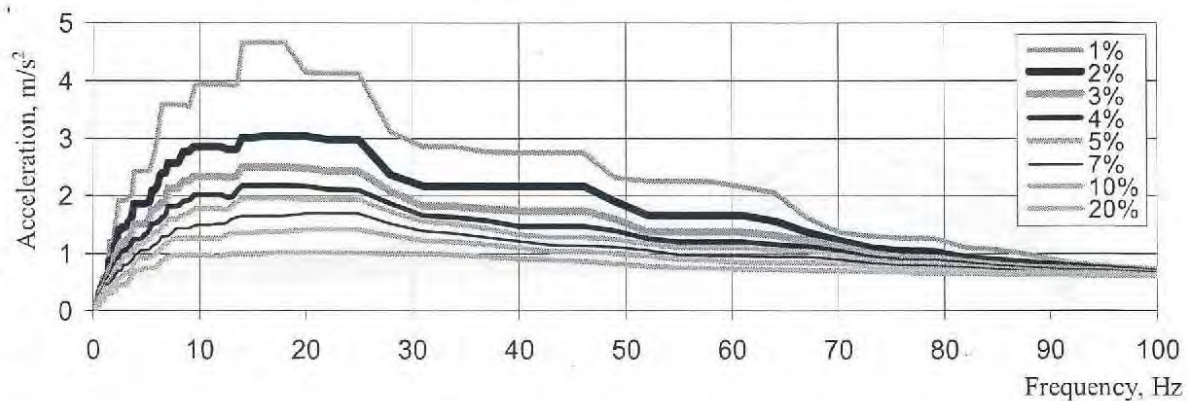
Effective Date: **25/01/2021**

Page: **27** of **76**

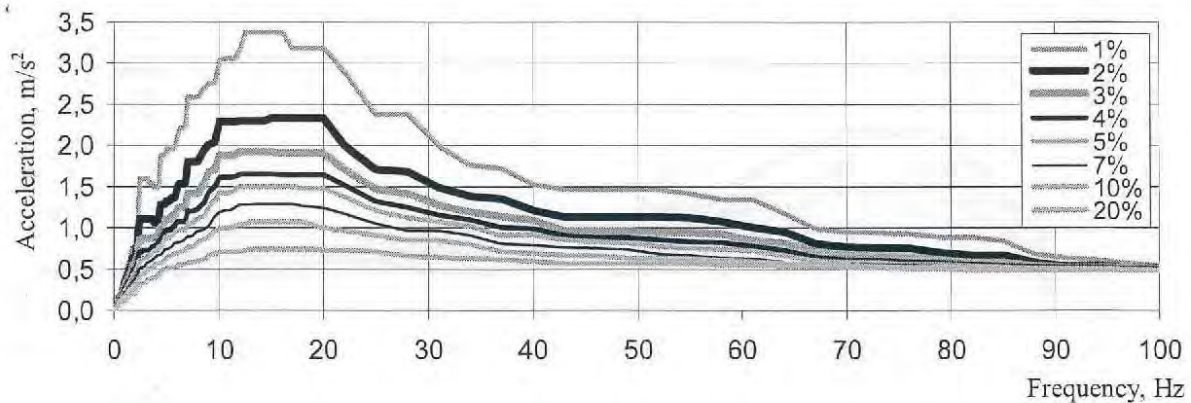
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 0.60 m/s²)



b) Along the horizontal grid y (ZPA = 0.59 m/s²)



c) Along the vertical grid z (ZPA = 0.47 m/s²)

Figure B.2 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevation minus 7.000



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

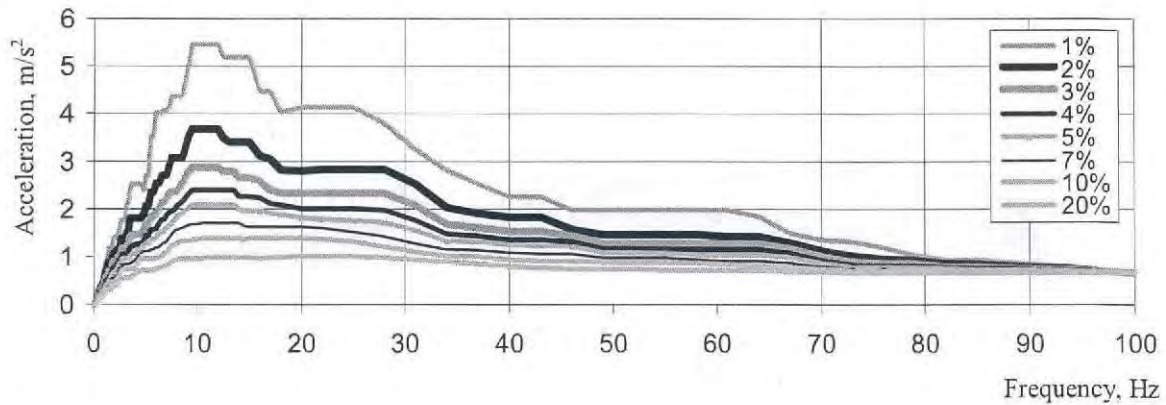
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

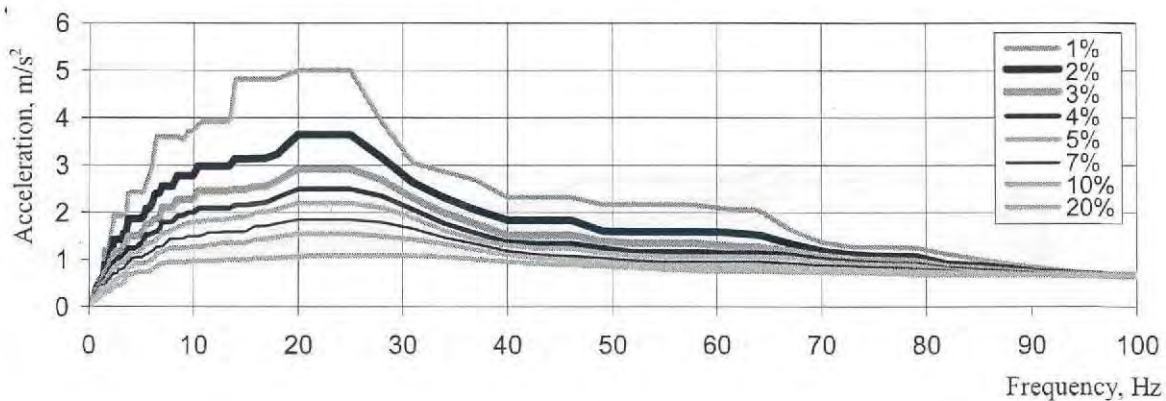
Effective Date: **25/01/2021**

Page: **28** of **76**

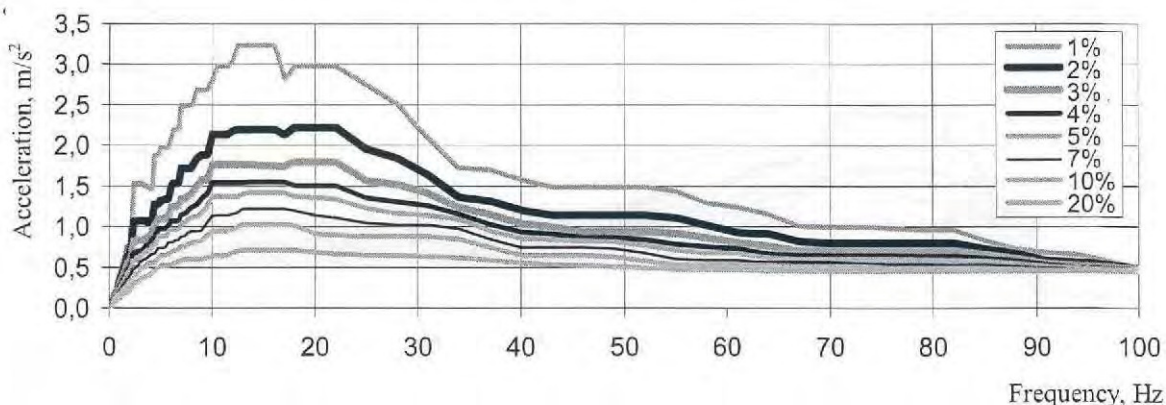
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 0.65 m/s²)



b) Along the horizontal grid y (ZPA = 0.64 m/s²)



c) Along the vertical grid z (ZPA = 0.44 m/s²)

Figure B.3 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevation minus 4.200



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

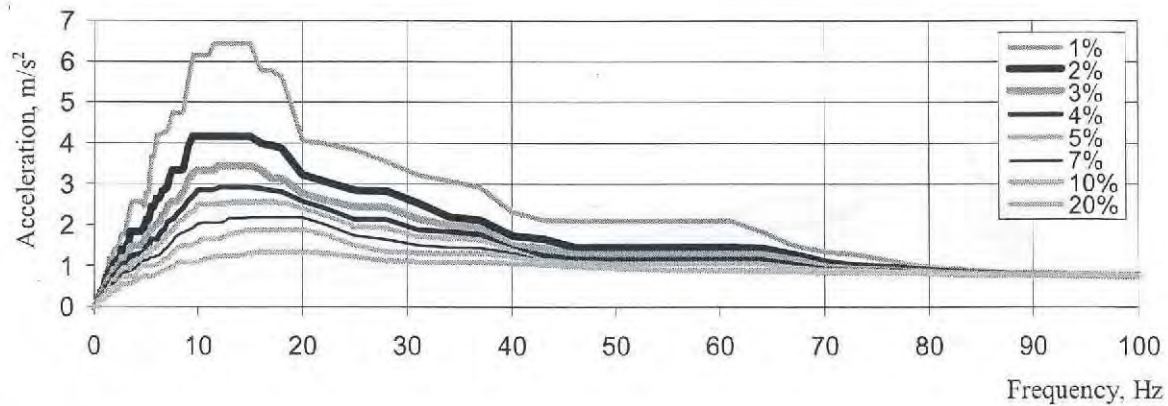
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

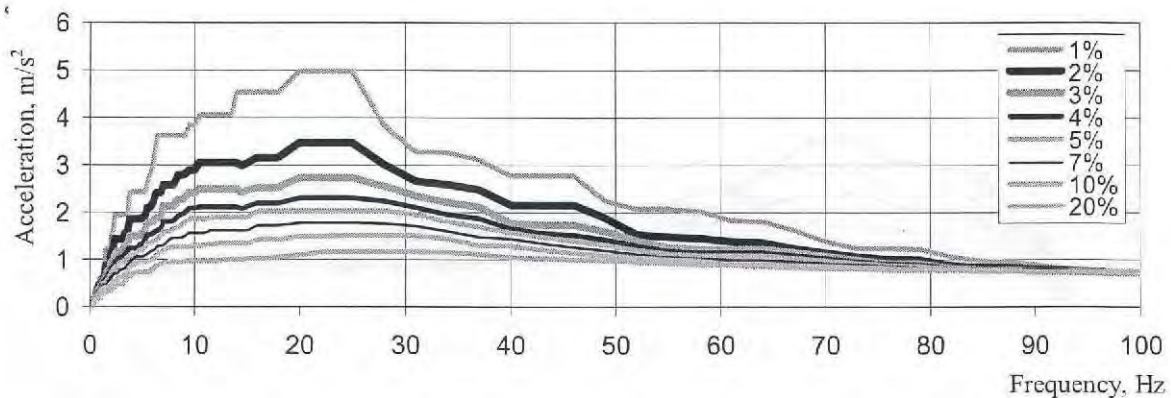
Effective Date: **25/01/2021**

Page: **29** of **76**

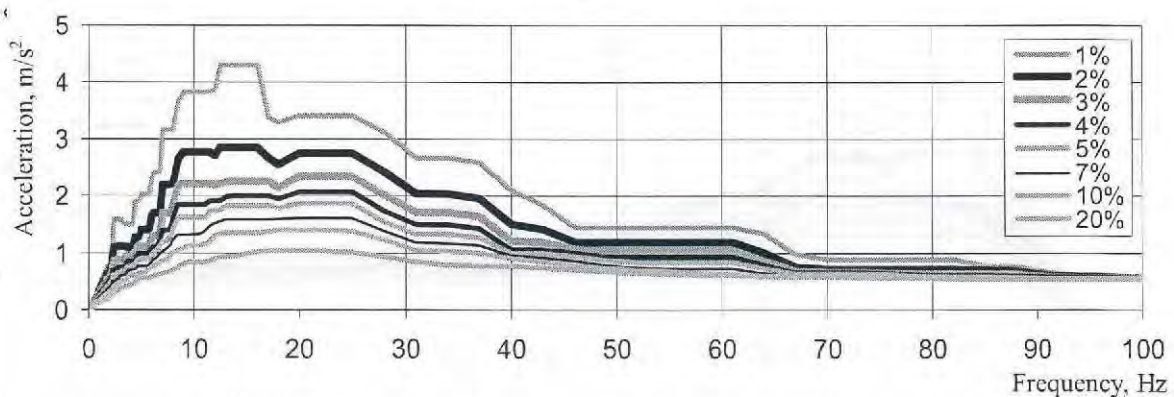
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x ($\text{ZPA} = 0.77 \text{ m/s}^2$)



b) Along the horizontal grid y ($\text{ZPA} = 0.72 \text{ m/s}^2$)



c) Along the vertical grid z ($\text{ZPA} = 0.54 \text{ m/s}^2$)

Figure B.4 – BuildingUQA. Generalized floor response spectra under seismic load of DBE level. Elevation minus 4,000



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

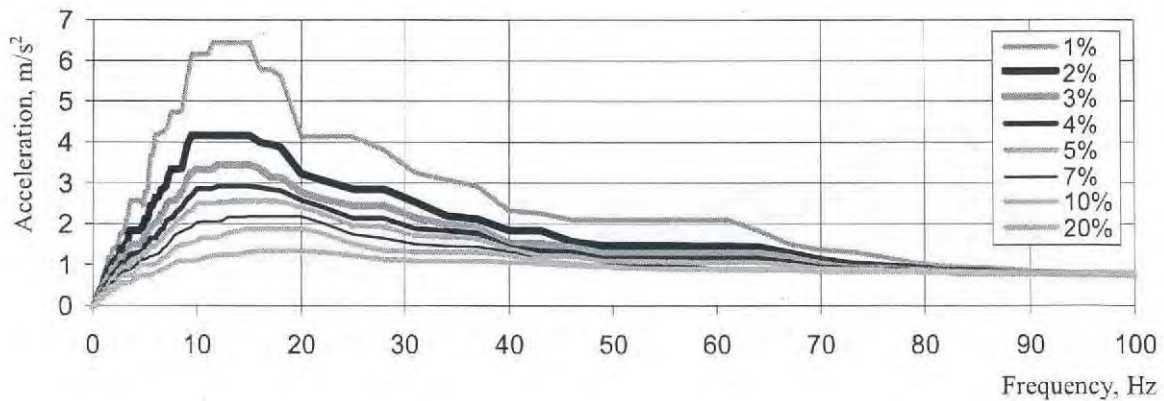
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

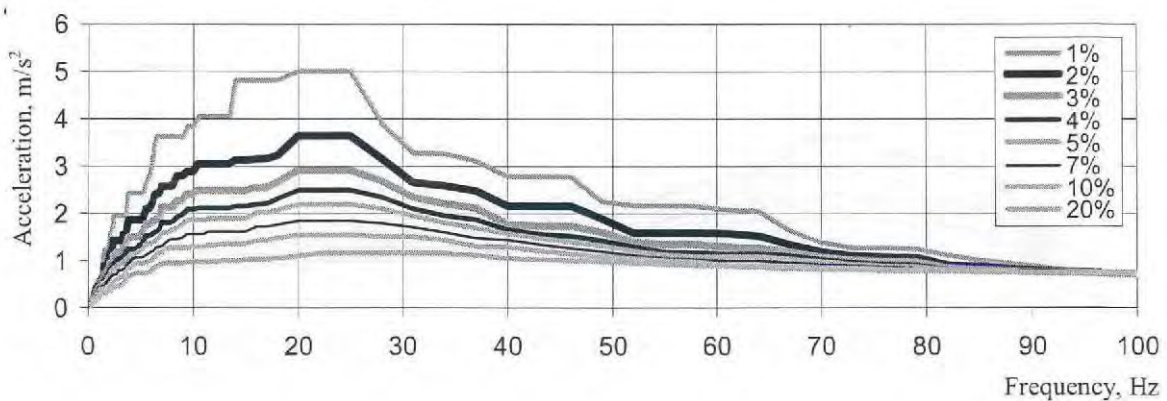
Effective Date: **25/01/2021**

Page: **30** of **76**

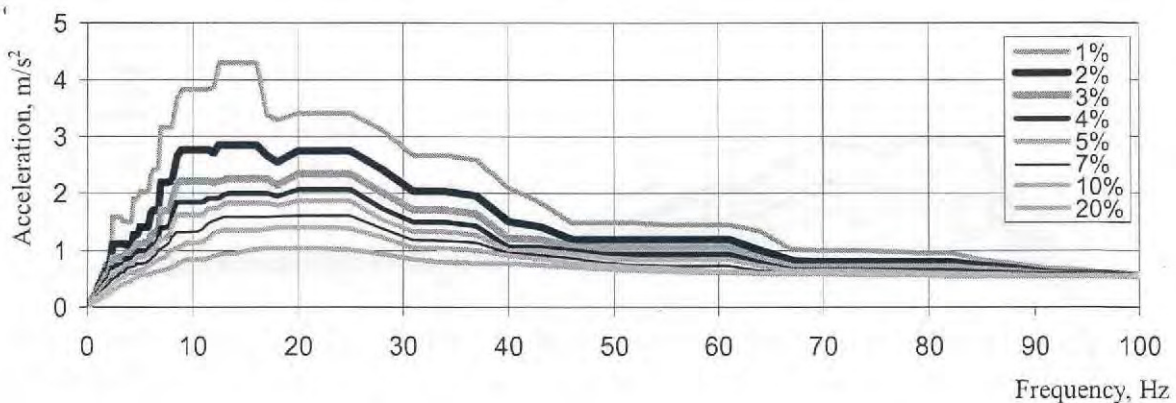
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 0.77 m/s²)



b) Along the horizontal grid y (ZPA = 0.72 m/s²)



c) Along the vertical grid z (ZPA = 0.54 m/s²)

Figure B.5 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevations minus 4.200 and minus 4.000



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

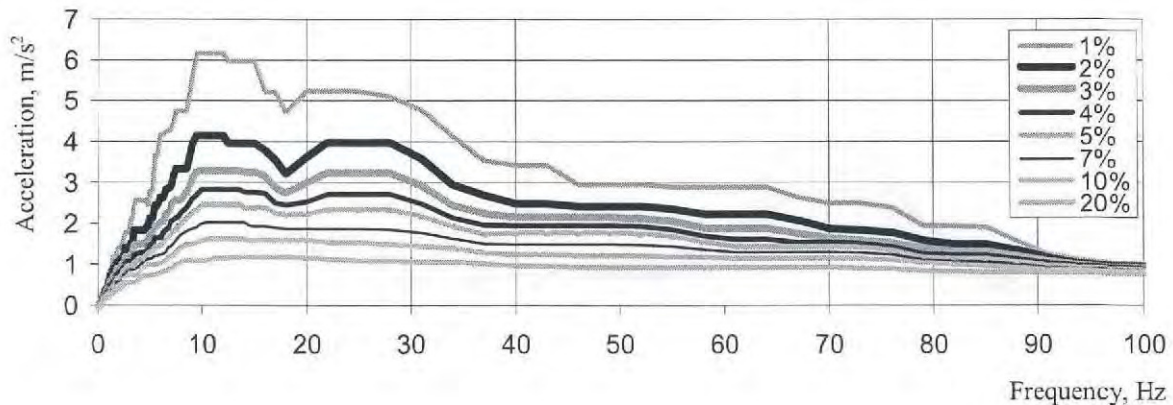
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

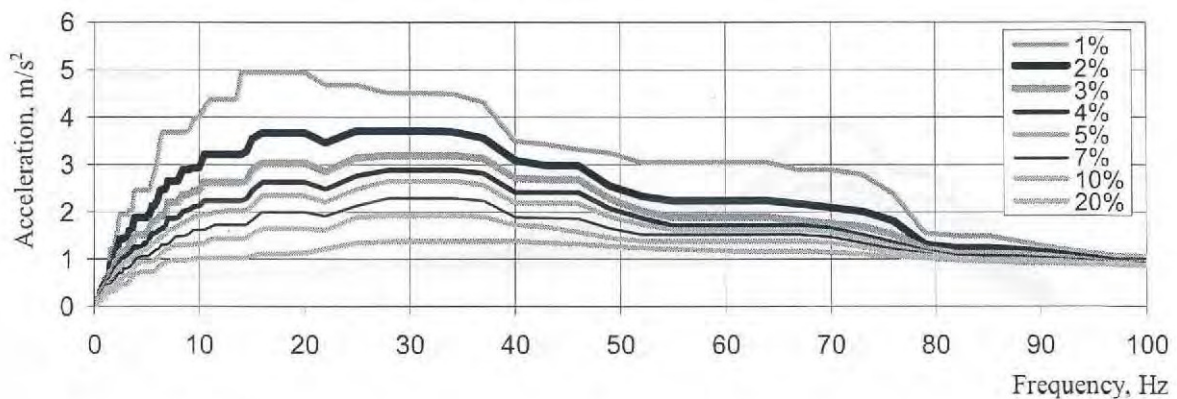
Effective Date: **25/01/2021**

Page: **31** of **76**

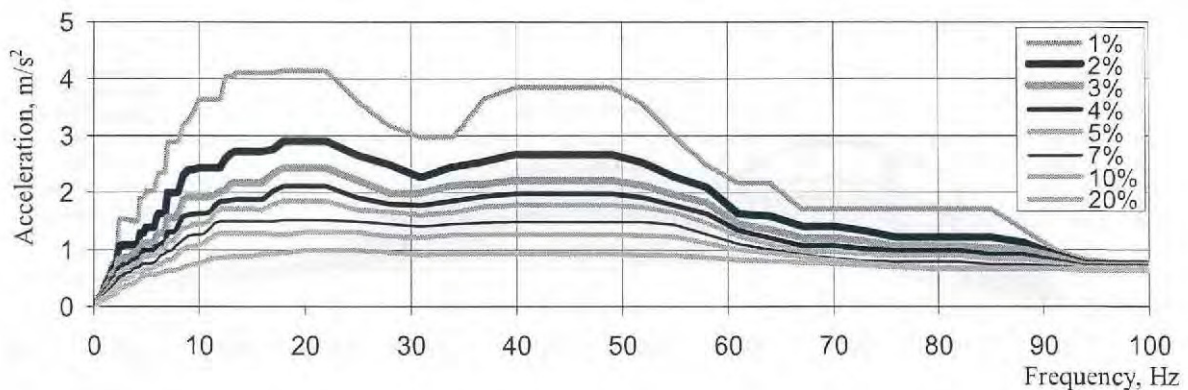
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 0.74 m/s²)



b) Along the horizontal grid y (ZPA = 0.83 m/s²)



c) Along the vertical grid z (ZPA = 0.58 m/s²)

Figure B.6 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevation minus 3.300



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

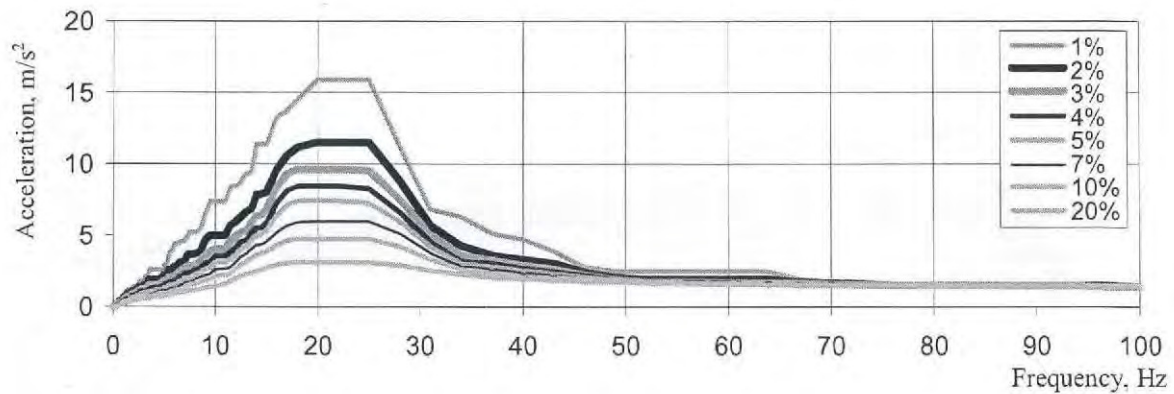
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

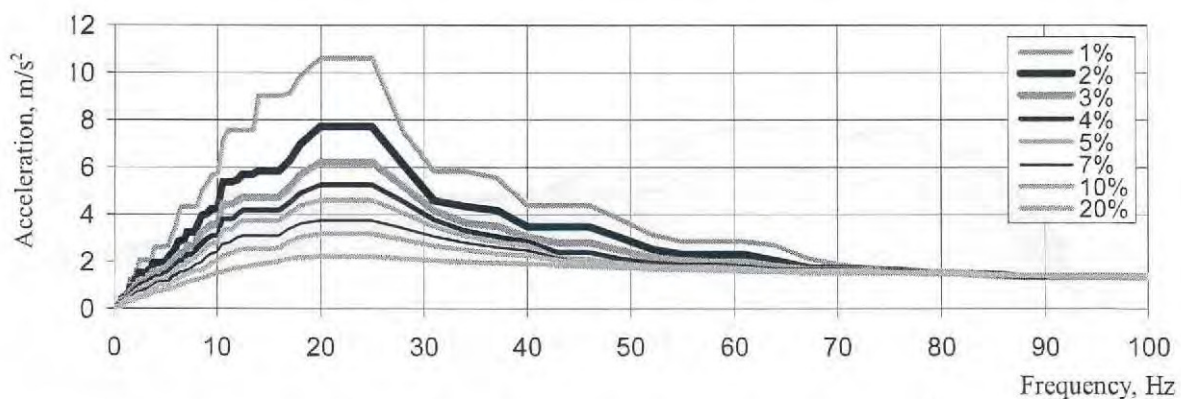
Effective Date: **25/01/2021**

Page: **32** of **76**

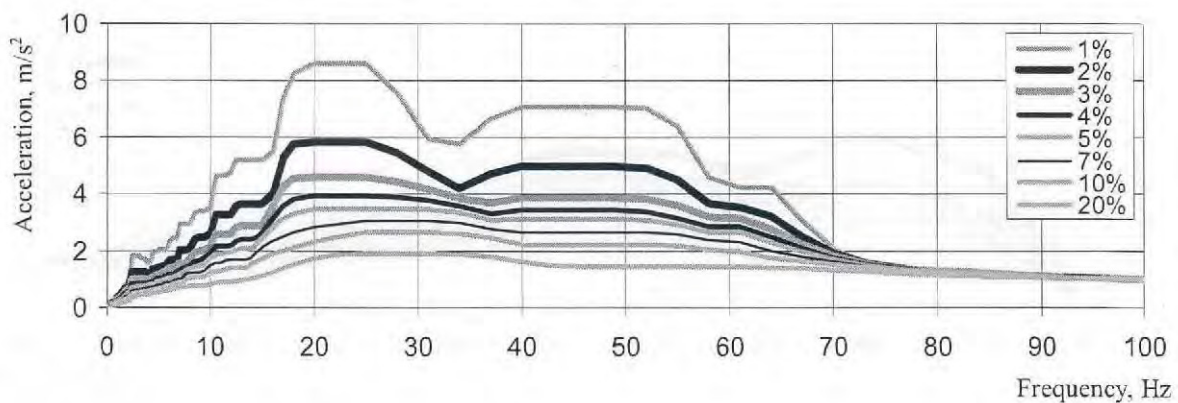
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = $1.42 m/s^2$)



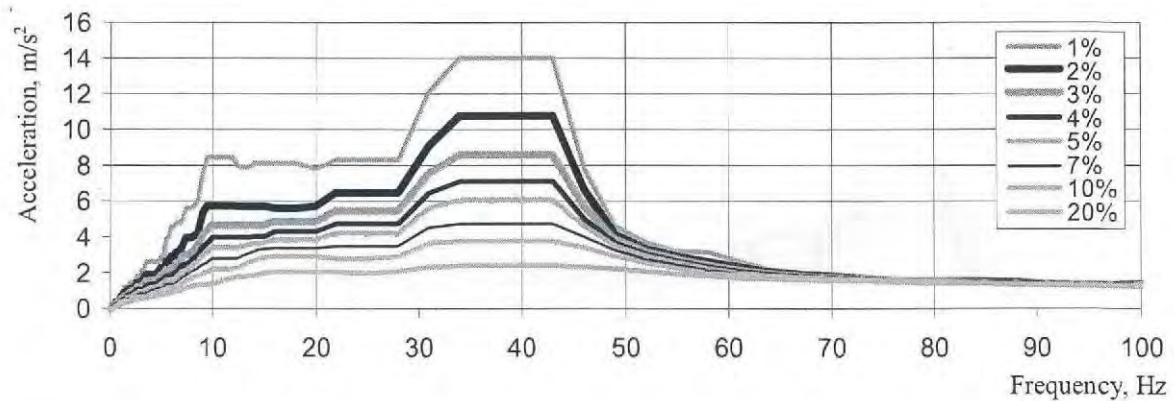
b) Along the horizontal grid y (ZPA = $1.36 m/s^2$)



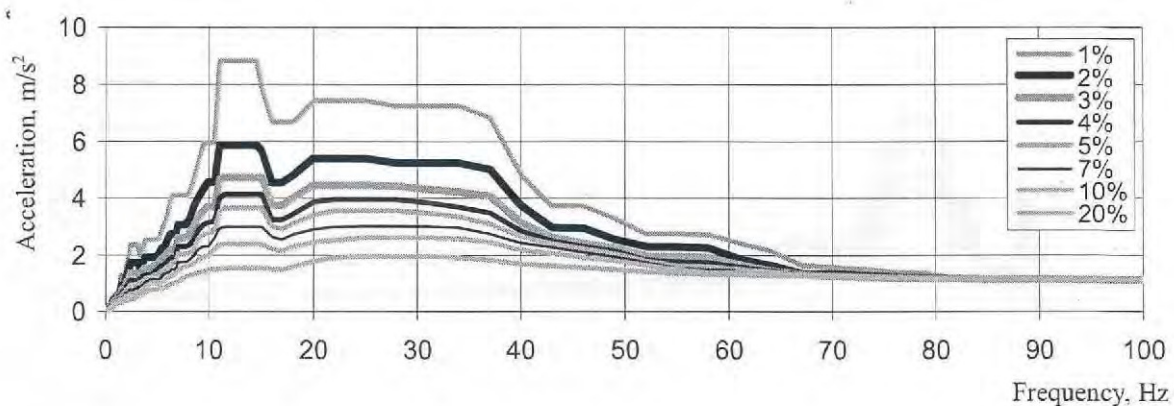
c) Along the vertical grid z (ZPA = $0.95 m/s^2$)

Figure B.7 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Elevation + 2.850

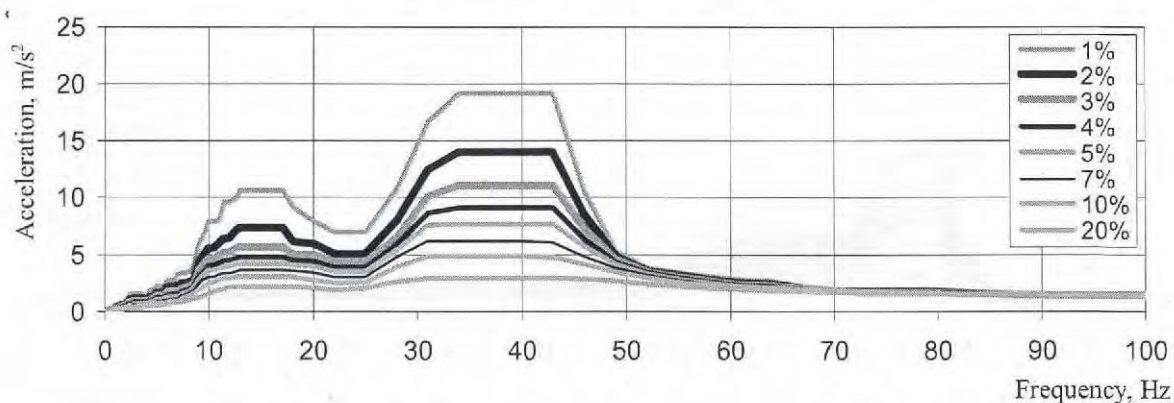
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 1.27 m/s²)



b) Along the horizontal grid y (ZPA = 1.05 m/s²)



c) Along the vertical grid z (ZPA = 1.34 m/s²)

Figure B.8 – BuildingUQA. Generalized floor response spectra under seismic load of DBE level. Elevation + 7.550



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

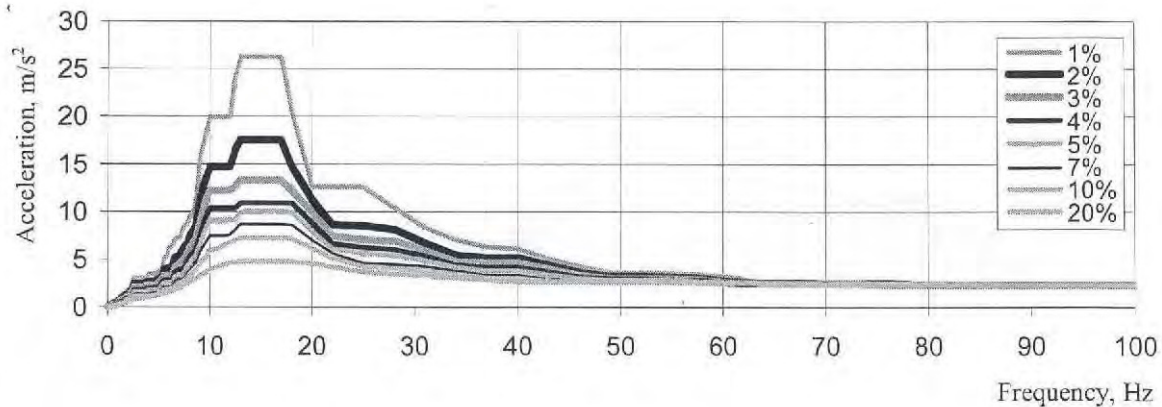
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

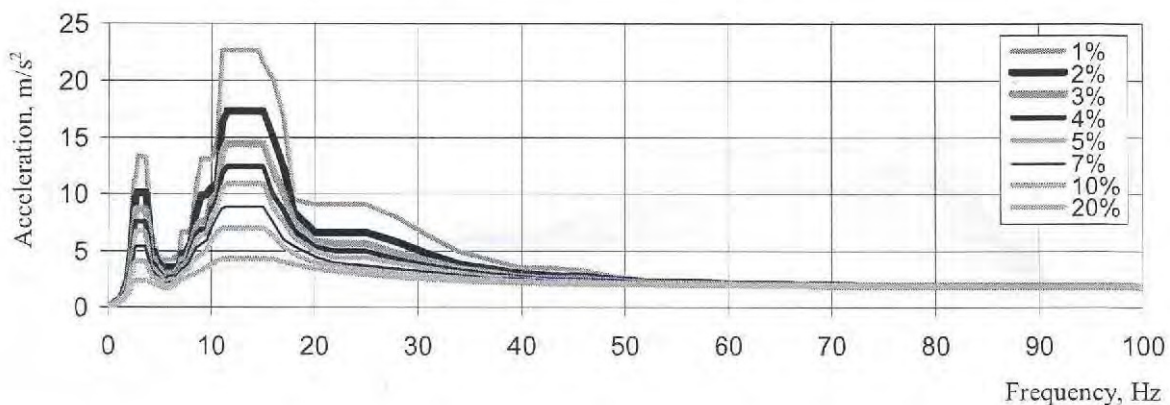
Effective Date: **25/01/2021**

Page: **34** of **76**

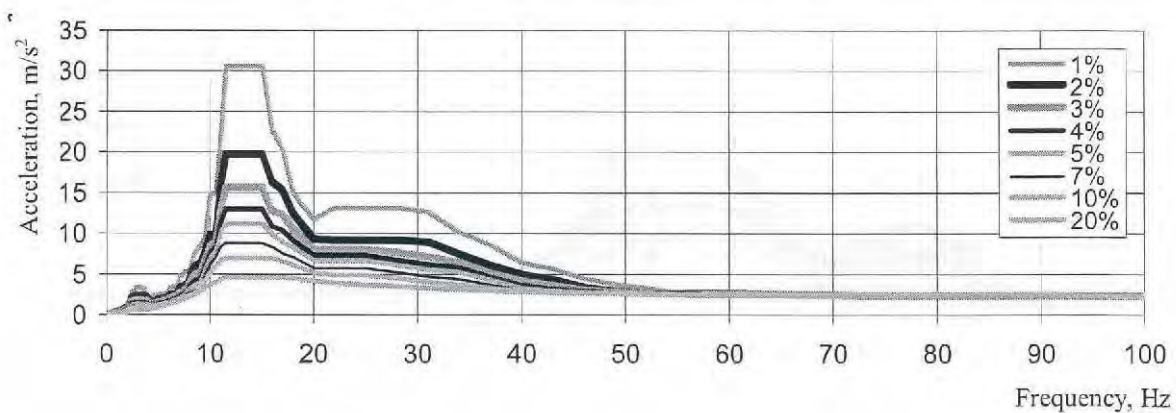
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) Along the horizontal grid x (ZPA = 2.35 m/s^2)



b) Along the horizontal grid y (ZPA = 1.86 m/s^2)



c) Along the vertical grid z (ZPA = 2.34 m/s^2)

Figure B.9 – Building UQA. Generalized floor response spectra under seismic load of DBE level. Roof



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

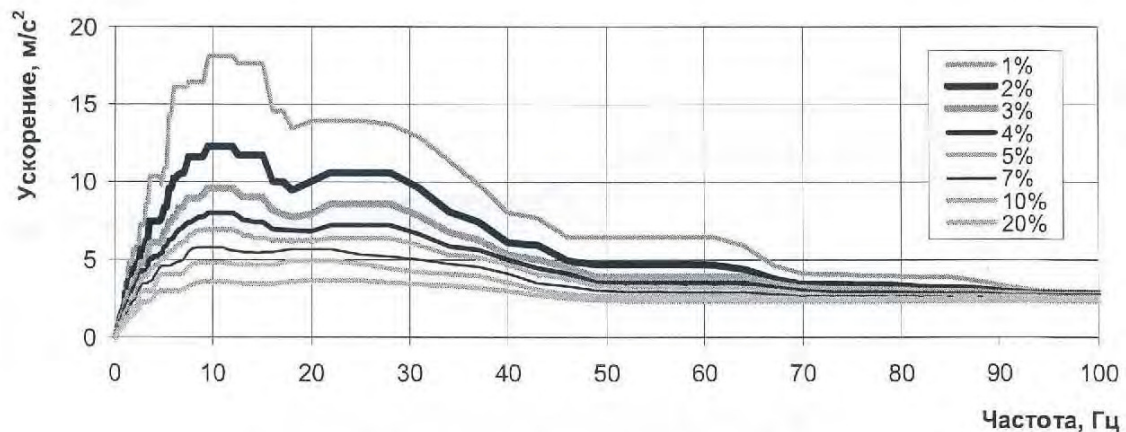
DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

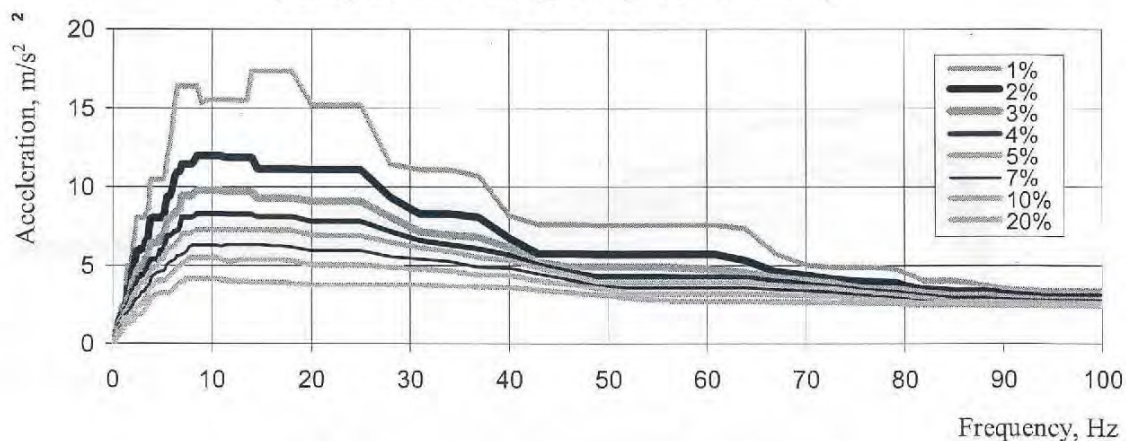
Page: **35** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

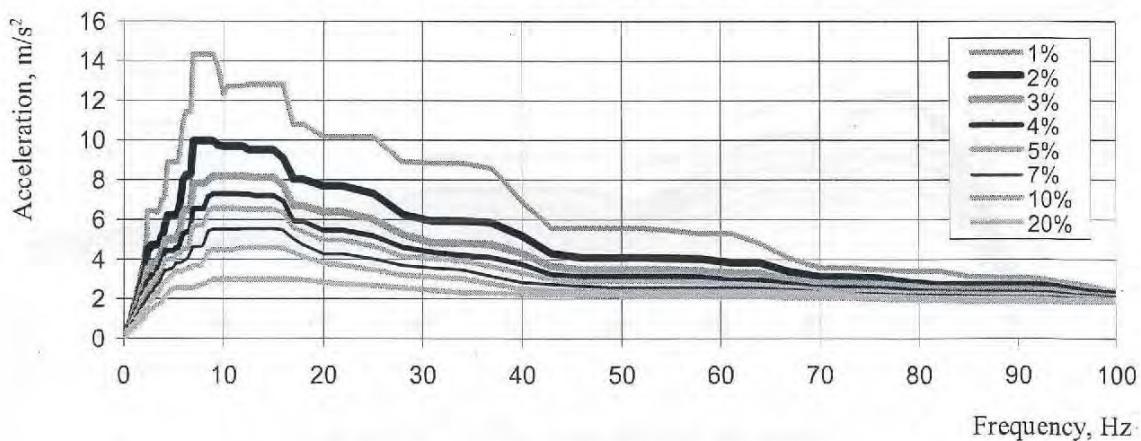
Response spectra from seismic load of the UQZ tunnel.



a) along the horizontal grid x (ZPA = 2,15 m/s²)



b) along the horizontal grid y (ZPA = 2,33 m/s²)



c) along the vertical grid z (ZPA = 1,86 m/s²)

Picture C.1 – Structures 31UQZ (41UQZ). Generalized floor response spectra under seismic load of SSE level. From elevation minus 0,500 to minus 0,700



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

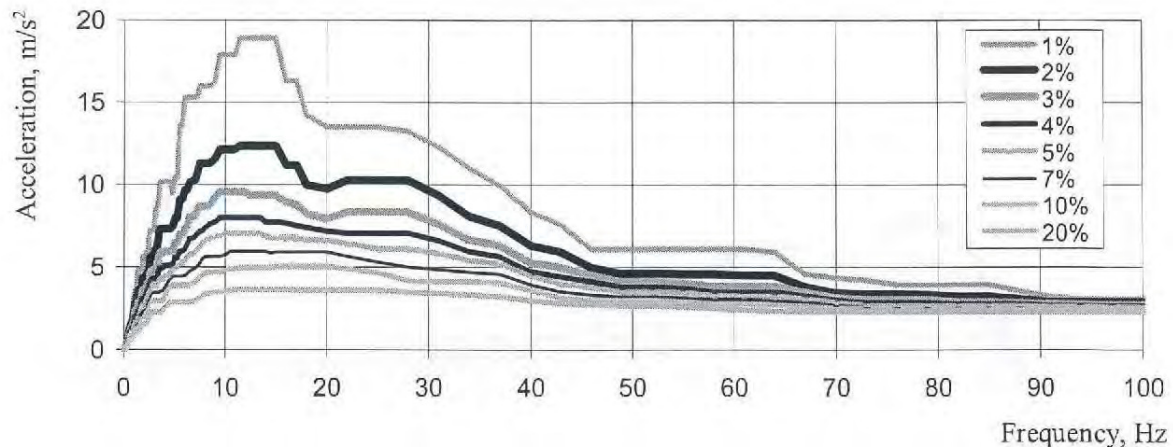
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

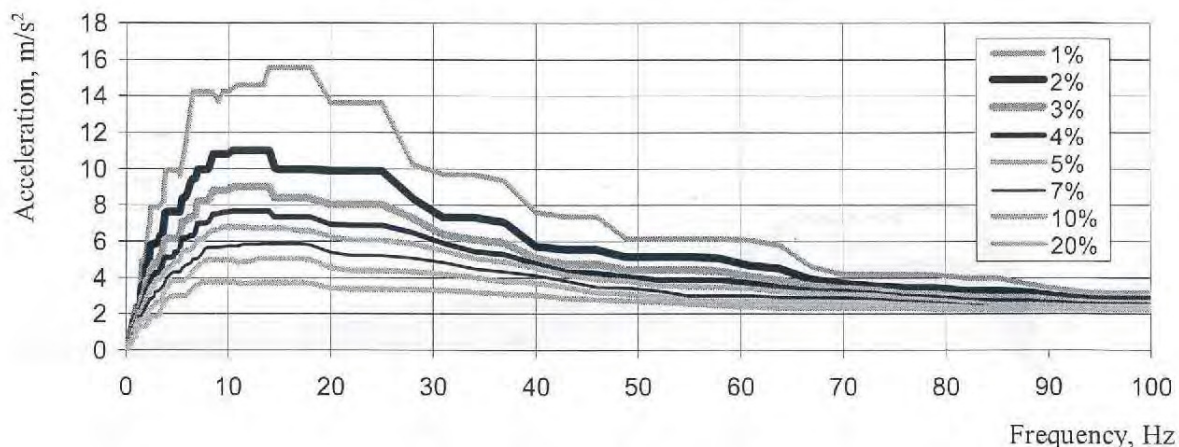
Effective Date: **25/01/2021**

Page: **36** of **76**

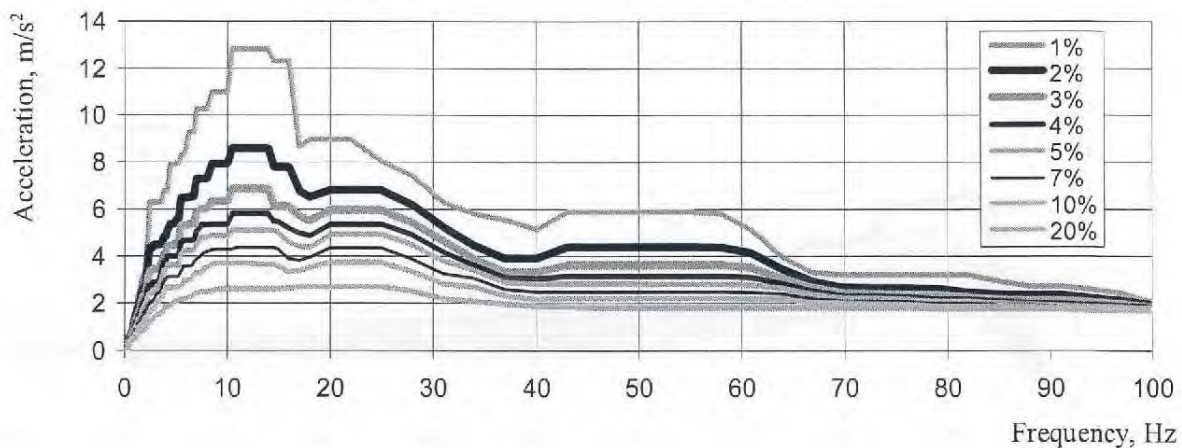
Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.



a) along the horizontal grid x ($ZPA = 2,14 \text{ m/s}^2$)



b) along the horizontal grid y ($ZPA = 2,21 \text{ m/s}^2$)



c) along the vertical grid z ($ZPA = 1,59 \text{ m/s}^2$)

Picture C.2 – Structures 32UQZ (42UQZ). Generalized floor response spectra under seismic load of SSE level. From elevation minus 0,500 to minus 0,600



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **37** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Response spectra of pump house for 1UQZ, 2UQZ tunnels draining and drying system.

Table- Horizontal and vertical response spectra of pump house for Essential load tunnels draining and drying system, calculated for decay 2 % of critical value in case of DBE.

In meters per squared second

Frequency, Hz	At damping 2% from the critical one	
	Horizontal acceleration	Vertical acceleration
0.50	1.50	1.10
1.00	3.00	2.20
1.50	4.50	3.30
2.00	6.00	4.40
2.50	6.13	4.50
3.00	6.26	4.60
3.50	6.40	4.71
4.00	6.53	4.81
4.50	6.66	4.91
5.00	6.79	5.01
5.50	6.92	5.11
6.00	7.05	5.21
6.50	7.19	5.32
7.00	7.32	5.42
7.50	6.91	5.85
8.00	6.86	5.81
8.50	6.80	5.76
9.00	6.75	5.72
9.50	6.69	5.68
10.00	6.64	5.63
10.50	6.58	5.59
11.00	6.53	5.55
11.50	6.47	5.50
12.00	6.42	5.46
12.50	6.37	5.36
13.00	6.32	5.26
13.50	6.28	5.15
14.00	6.23	5.05
14.50	6.18	4.95
15.00	6.13	4.85



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **38** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Frequency, Hz	At damping 2% from the critical one	
	Horizontal acceleration	Vertical acceleration
15.50	6.08	4.75
16.00	6.03	4.65
16.50	5.99	4.54
17.00	5.94	4.44
17.50	5.89	4.34
18.00	5.84	4.24
18.50	5.79	4.14
19.00	5.75	4.03
19.50	5.70	3.93
20.00	5.65	3.83
20.50	5.60	3.73
21.00	5.55	3.63
21.50	5.50	3.53
22.00	5.46	3.42
22.50	5.41	3.32
23.00	5.36	3.22
23.50	5.22	3.14
24.00	5.07	3.05
24.50	4.93	2.97
25.00	4.79	2.90
25.50	4.64	2.80
26.00	4.50	2.72
26.50	4.36	2.63
27.00	4.21	2.55
27.50	4.07	2.47
28.00	3.92	2.38
28.50	3.78	2.30
29.00	3.64	2.22
29.50	3.49	2.13
30.00	3.35	2.05



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **39** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE - III

INDICATIVE FORMAT OF DESIGN CONCESSION REQUEST

APPLICATION FOR DESIGN CONCESSION

Purchase Order No: -----

Date of PO: -----

Sub. Order. No (If applicable):

Date: -----

(For package contract include all relevant order details)

Concession Request No (Proj. /USI No./Sr. No.) _____

Manufacturer/Contractor _____

Component / System / Structure/ Item: _____

Manf. /Contractor's Ref No Spec & Drg. No

Equipment/ Tag No. _____ P.O. Item No. _____

-
- Details of deviations and proposed concessions:
 - Correlation with the relevant drawings I specifications (Attach relevant portions of drawings or sketches and relevant portion of the specification wherever applicable)
 - Reasons for occurrence of Non-conformance and root cause analysis
 - Corrective action of Non-conformance and root cause analysis
 - Cost implication: This request does/does not involve a change in contract price.
 - Cost reduction proposed from the purchaser order value Rs.

Request by:

(Name, Designation, Signature, Date & Seal)



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **40** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

QUALITY SURVEYOR'S COMMENTS

- | | |
|---|----------|
| 1. All relevant inspection reports/test reports attached | Yes / No |
| 2. All the deviations are identified and included | Yes / No |
| 3. Analysis / Technical comments of QS engineer on proposed DCR | |

(Name, Designation, Signature, Date & Seal)

Tick as applicable

- There is no financial implication to NPCIL by acceptance of this deviation
(Refer Para 8.0 of the Procedure).
- Cost implication/reduction as worked out by the manufacturer is justified.

Justification appended.

DCR Forwarded with comments/Technical justifications to Design Group for concurrence.

DCR Checked by

Indenter/Project Engineer/Field Engineer

(Name, Designation Signature & Date)

Designer's concurrence: Acceptance of the DCR will affect / not affect the design intent. Technical justification is appended.

DCR Concurred / Not Concurred

(Name, Designation, Signature & Date)

To

Indenter/Project Engineer/ Field Engineer for further processing



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **41** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

APPROVAL / REJECTION OF DCR:

Tick as applicable:

- Design intent is not affected. Justification for acceptance appended with the DCR. Financial implication as brought out in page 2 of 3 of this format is approved.
- Deviations are accepted after detailed calculations, analysis. Justification for acceptance of the deviation is attached with this DCR. Financial implication as brought out in page 2 of 3 of this format is approved.
- No other System/ Assembly/ component (of other USIs) is affected by this deviation.
- List of system/components/ assemblies (of other USIs) affected by this deviation and the concurrence from the concerned design group is appended.

APPROVED

APPROVED AS NOTED

REJECTED

Notes:

Reviewed by

(Name, Designation, Signature & Date)

Approved by

(Name, Designation, Signature & Date)

Note: All the signatories shall have valid Technical Authorization (refer ED-Proc.-60)

CLOSING OF DCR IN CASE OF "APPROVED AS NOTED (TECHNICAL REASONS) IREJECTED" DCRs:
VERIFICATION BY QUALITY SURVEYOR OF MANUFACTURER I CONTRACTOR I QA NPCIL.

All stipulations in conditional approval met? Yes, I No

If No, defective item rejected If repaired, new DCR No

(Name, Signature & Date)

QA of Manufacturer/contractor

Distribution

(Name, Signature & Date)

QA NPCIL

CONSTRUCTION

1. Indenting Group

2. Design Group

3. Consultant

4. Quality Surveyor

5. Contractor/Manufacturer

6. Hist. Docket

7. Concerned Construction Group CE/ACE.

8. Ex. Director (QA)

9. Ex. Director (Proc.)

10. Head (QA).

11. Head (FE)



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **42** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE-IV

(FOR SEISMIC QUALIFICATION OF VALVES)

1.0 CONTENTS

The specification has been presented under the following Sections and Annexures: Section Title

1. Contents
2. Scope
3. Definitions
4. Introduction
5. Applicable codes and standards
6. Qualification methods and procedures.
7. Specification for qualification of valves.

Annexure-1 Load Combinations for Design Condition and Service Levels for Equipment and Supports

Annexure-2 General design guideline for equipment

Annexure-3 List of shake table test facilities in India

Annexure-4 Static side load test

Annexure-5 Sample Seismic Test Procedure for Valve/Valve actuator.

Annexure-6 Impact Hammer Test for Frequency Determination of Valves.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **43** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

2.0 SCOPE

This specification describes methods and procedures for seismic qualification of Structures, Systems and Components (SSC) of a nuclear power plant. The methods and procedures described in section 6 are applicable to all SSC of a NPP. However, detailed procedures for seismic qualification of valves are described in sections 7,8,9 & 10 of this specification. Qualification of primary civil structures and piping are excluded from the scope of this specification.

3.0 DEFINITIONS

- 3.1 Cut-off Frequency: The frequency in the response spectrum where the Zero Period Acceleration asymptote essentially begins. This is the frequency beyond which the single-degree-of-freedom oscillators exhibit very little or no amplification of motion and indicates the upper limit of the frequency content of the waveform being analysed.
- 3.2 Damping: An energy dissipation mechanism that reduces the amplification and broadens the vibratory response in the region of resonance. Damping is usually expressed in terms of percentage of critical damping. Critical damping is defined as the least amount of viscous damping that causes a SDOF system to return to its original position without oscillation after initial disturbance.
- 3.3 Design Condition: The design conditions include those pressure, temperature, and mechanical loadings selected as the basis for the design of systems, structures or components within a facility.
- 3.4 Design Basis Events: The set of events which serves as part of the basis for the establishment of design requirements for systems, structures and components within a facility. Design basis events (DBEs) include normal operations, operational transients and certain accident conditions under postulated initiating events (PIE) considered in the design of the facility.
- 3.5 Level A Service Limits (Normal Operating Conditions): Level A Service Limits are those sets of limits that must be satisfied for all Level A Service Loadings identified in the Design Specifications to which the component or support may be subjected in the performance of its specified service function.
- Normal Operation of a plant or equipment within specified operational limits and conditions. In case of a nuclear power plant, this includes, start-up, power operation, shutting down, shutdown state, maintenance, testing and refuelling.
- 3.6 Level B Service Limits (Upset Conditions): Level B Service Limits are those sets of limits that must be satisfied for all Level B Service Loadings identified in the Design Specifications for which these Service Limits are designated. The component or support must withstand these loadings without damage requiring repair.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **44** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

All operation processes deviating from normal operation which are expected to occur once or several times during the operating life of plant that and which, in view of appropriate design provisions do not cause any significant damage to items important to safety nor lead to accident conditions.

- 3.7 Level C Service Limits (Emergency Condition): Level C Service Limits are those sets of limits that must be satisfied for all Level C Service Loadings identified in the Design Specifications for which these Service Limits are designated. These sets of limits permit large deformations in areas of structural discontinuity that may necessitate the removal of the component or support from service for inspection or repair of damage to the component or support. Level-C service Loadings has a low probability of occurrence.
- 3.8 Level D Service Limits (Faulted Condition): Level D Service Limits are those sets of limits that must be satisfied for all Level D Service Loadings identified in the Design Specifications for which these Service Limits are designated. These sets of limits permit gross general deformations with some consequent loss of dimensional stability and damage requiring repair, that may require removal of the component or support from service. Level-D service Loadings has extremely low probability of occurrence.
- 3.9 Response spectrum: A plot of the maximum response, as a function of oscillator frequency, of an array of Single Degree Of Freedom (SDOF) damped oscillators subjected to the same base excitation.
- 3.10 Required Response Spectrum (RRS): The response spectrum issued by the user or the user's agent as part of the specifications for qualification or artificially created to cover future applications. The RRS constitutes a requirement to be met for seismic qualification of equipment by shake table testing.
- 3.11 Rigid Equipment: Equipment, structures, and components whose lowest natural frequency is greater than the cut-off frequency on the response spectrum.
- 3.12 Seismic Anchor Movement (SAM): Seismic anchor movement (or 'SAM') is the differential motion between pipe support attachment points (for example, supports attached to an upper floor would sway with the building, with a larger amplitude than supports attached at a lower elevation), or the differential motion between equipment nozzles and pipe supports. Seismic anchor movements are input as displacements (translations and rotations) at the support attachments or at equipment nozzles. The resulting stresses and loads in the piping system are then combined by square root sum of the squares (SRSS) to the stress and loads due to inertia.
- 3.13 S1 Level Earthquake - Operating Basis Earthquake (OBE): An earthquake which, considering the regional and local geology and seismology and specific characteristics of local sub-surface material, could reasonably be expected to affect the plant site during the operating life of plant. The features of nuclear power plant necessary for continued safe operation are designed to remain functional, during and after the vibratory ground motion caused by this earthquake.
- 3.14 S2 Level Earthquake - Safe Shutdown Earthquake (SSE) : The earthquake which is based upon an evaluation of the maximum earthquake potential considering the regional and local geology and



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **45** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

seismology and specific characteristics of local sub-surface material. It is that earthquake which produces the maximum vibratory ground motion for which certain structures, systems and components are designed to remain functional. These structures, systems and components are those which are necessary to assure

- a) The integrity of reactor coolant pressure boundary; or
- b) The capability to shutdown the reactor and maintain it in a safe shutdown condition; or
- c) The capability to prevent the accident or to mitigate the consequences of accidents which could result in potential off-site exposures higher than the limits specified by the Regulatory Body; or
- d) The capacity to remove residual heat.

3.15 Seismic Category-1 : Seismic category-1 shall includes all SSCs

- a) Whose failure could directly or indirectly cause accident conditions, or
- b) Which are required for shutting down the reactor, monitoring critical parameters, maintaining it in a safe shutdown condition and removing decay heat on a long term basis, or
- c) Which are required to prevent radioactive releases or to maintain release below limits established by AERB for accident conditions (e.g. containment system).

All seismic category-1 structures, systems and components should be designed or qualified for both S1 (OBE) and S2 (SSE).

3.16 Seismic category-2 : Seismic category-2 shall includes all SSCs which are required to:

- a) Prevent the escape of radioactivity beyond the limits prescribed for normal operation and not covered in category-1, or
- b) Mitigate those accident conditions which last for such long periods that there is a reasonable likelihood of an earthquake of the defined severity occurring during this period and not covered in category-1.

All seismic category-2 structures, systems and components shall have demonstrated capability to withstand the effects of S1 (OBE).

3.17 Seismic category-3: Seismic category-3 includes SSCs which are not important to safety and those not covered in category 1 or 2.

3.18 Test response spectrum (TRS) : The response spectrum that is developed from the actual time history motion given to the shake table.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **46** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

3.19 Zero Period Acceleration (ZPA): The acceleration level of the high frequency, non amplified portion of the response spectrum. This acceleration corresponds to the maximum peak acceleration of the time history used to derive the response spectrum.

4.0 INTRODUCTION:

A Nuclear Power Plant (NPP) has variety of Structures, Systems and Components (SSC) comprising primary civil structures and secondary structures, systems and components viz., tanks, vessels, heat exchangers, piping, supports; valves; pumps, fans, blowers, motors; compressors, diesel generators, reciprocating pumps; instrumentation and electrical panels, instrumentation and electrical devices, reactor control and shutdown devices, etc. These NPP structures, systems and components are designed and qualified for various service conditions viz. design, normal, upset (pressure, temperature, mechanical, transients), emergency, faulted (pressure, mechanical) and test conditions as applicable, including natural phenomenon like earthquake. The seismic design considers two levels of earthquake i.e. Operating Basis Earthquake OBE (S1) alone or OBE (S1) and Safe Shutdown Earthquake SSE (S2) as specified. Design of structures, systems and components for dead weight, sustained loads, pressure and temperature and mechanical loads is a standard industrial design practice. However, seismic design is a special branch of engineering and has been specifically dealt within this specification. The General guidelines for seismic design are given in Annexure-2. As specified in the NPCIL's equipment specifications, for the qualification of an equipment, following requirements shall be met:

i) Structural integrity and pressure boundary integrity

and

ii) Intended functional operability as applicable.

The seismic qualification of structures, system and components should establish that the structures, systems or components perform their intended safety functions during and after the specified earthquake(s). The examples of safety functions are structural integrity, degree of leak tightness, mechanical or electrical functional operability, preservation of geometrical dimensions or combination of these and any other specified function related to the specific structure, system or component under consideration. The seismic analysis should be based on clear understanding of the functions which should be assured during or after the specified earthquake(s).

Various structures, systems and components are classified into either seismic category 1 or seismic category 2 or seismic category 3. Items in category 1 should be designed for both S1 (OBE) and S2 (SSE) level earthquake ground motions. Items in category 2 should be designed for S1 (OBE) level earthquake ground motions. Seismic category 3 items should be designed for earthquake resistance according to the National practice. Loads during normal operation, anticipated operational occurrences, and loads during accident conditions should be combined with specified seismic loads as applicable. The allowable limits for stresses and



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **47** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

deformations under different load combinations should be used to assess the safety function and design intent as per the applicable code or specification of the structure, system and component.

For passive equipment viz., tanks, vessels, heat exchangers and supports qualification requirement are structural integrity and pressure boundary integrity. However, for active equipment viz., valves; pumps, fans, blowers, motors; compressors, diesel generators; electrical and instrumentation panels and devices involving mechanical motion, the qualification requirements shall also include functional operability.

This specification covers the procedure for qualification of secondary support structures, systems and components except civil structures, piping, to meet the above qualification requirements. For an equipment any specific requirement, other than the general requirement specified in the code shall also be met.

5.0 APPLICABLE CODES AND STANDARDS

Applicable codes and standards for design and qualification of various structures, systems and equipment are given below.

- 5.1. ASME Boiler and Pressure Vessel code, Section-III, Division-1, Subsection NB, Class 1 components, 2012.
- 5.2. ASME Boiler and Pressure Vessel code, Section-III, Division-1, Subsection NC, Class 2 components, 2012.
- 5.3. ASME Boiler and Pressure Vessel code, Section-III, Division-1, Subsection ND, Class 3 components, 2012.
- 5.4. ASME Boiler and Pressure Vessel code, Section-III, Division-1, Subsection NF, Component Supports, 2012.
- 5.5. ASME Boiler and Pressure Vessel code, Section-III, Division-1, Appendices, 2012.
- 5.6. ASME Boiler and Pressure Vessel code, Section-VIII, Pressure Vessels, Division 1, 2012.
- 5.7. ASME Boiler and Pressure Vessel code, Section-VIII Pressure Vessels, Division 2, Alternative Rules 2012.
- 5.8. ASME/ANSI B-31.1, Code for Power Piping, 2010
- 5.9. ASME Boiler and Pressure Vessel code section II, Material Specifications, 2012.
- 5.10. ACI 349-85, Code Requirements for Nuclear Safety Related Concrete Structures and commentary ACI-349 R-85, 1985.
- 5.11. ASCE 4-98, Seismic Analysis of safety related nuclear structures and commentary on standard for seismic analysis of safety related nuclear structures, 1998.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **48** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- 5.12. IS-800, Code of practice for use of structural steel in general building construction, 2007.
- 5.13. IS-456, Code of practice for plain and reinforced concrete, 2000.
- 5.14. Mechanical standard TEMA, class C, 2007.
- 5.15. Welding Research council bulletin WRC 107, Local stresses in spherical and cylindrical shells due to external loading, 2002.
- 5.16. Welding Research Council bulletin WRC 297, Local stresses in cylindrical shells due to external loading on nozzle, 1987.
- 5.17. Combined modal response and spatial components in seismic response analysis USNRC RG 1.92, 2006.
- 5.18. USNRC RG 1.100 revision 3 'Seismic Qualification of Electrical & Active Mechanical equipment and Functional Qualification of Active Mechanical equipment for Nuclear Power Plants', September 2009.
- 5.19. Paper on response combination by R.P.Kennedy, NUREG 1061 Vol. 4, Appendix A of SMA 1211.02.R2.0, March 1984.
- 5.20. NUREG/CR-6241, BNL-NUREG-52422, Technical guidelines for Aseismic design of Nuclear Power Plants, 1994.
- 5.21. IEEE Std-344, IEEE recommended practice for seismic qualification of Class 1E equipment for nuclear power generating stations, 2013.
- 5.22. IEEE Std-382, IEEE standard for qualification of actuators for power operated valve assemblies with safety related function for Nuclear Power Plants, 2006.
- 5.23. IEC-60780, Nuclear Power Plants – Electrical equipment of the safety system qualification, 1998.
- 5.24. IEC-60980, Recommended practice for seismic qualification of electrical equipment of the safety system for nuclear generating stations, 1998.
- 5.25. ASME QME 1-2007 Qualification requirements for active mechanical equipment for nuclear power plants, 2012.
- 5.26. IAEA Safety Guide 50-SG-S2, Seismic analysis and testing of Nuclear Power Plants, 1980.
- 5.27. IEEE C37.98-1987, IEEE standard Seismic Testing of Relays.
- 5.28. IS-1893, Criteria for earthquake resistant design of structures, 2002.
- 5.29. IEEE-693 - IEEE recommended practice for Seismic Design of sub-stations, 2005.
- 5.30. ACI-318/318 R-95: Building Code Requirement for Structural Concrete and Commentary.
- 5.31. IEEE-420 – IEEE Standard for design of class 1E Electrical Boards, Panels, Racks, 2001.



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **49** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- 5.32. AERB Guide No. AERB/NPP-PHWR/SG/D-23 Seismic Qualification of Structures, Systems and Components of Pressurised Heavy Water Reactors, 2009.
- 5.33. AERB SAFETY GUIDE NO. AERB/NPP-PHWR/SG/D-1 Safety Classification and Seismic Categorisation for Structures, Systems and Components of Pressurised Heavy Water Reactors, 2003.
- 5.34. USNRC RG 1.29 Revision 3 'Seismic Design Classification', September 1978.
- 5.35. USNRC RG 1.26 Revision 4 'Quality Group Classifications and Standards for Water, Steam and Radioactive Waste Containing Components of Nuclear Power Plants', March 2007.
- 5.36. IEEE-323 – IEEE Standard for qualifying class 1E Equipments for Nuclear Power Generating Station, 2001.
- 5.37. U.S. Atomic Energy Commission, 'Nuclear Reactors and Earthquakes', TID-7024, Washington, D.C., 1963.
- 5.38. Program on technology innovation, 'The effects of high frequency ground Motion on structures, components, and Equipment in nuclear power plants' EPRI, June 2007.
- 5.39. EPRI Draft White Paper, 'Considerations for NPP Equipment and Structures Subjected to Response Levels Caused by High Frequency Ground Motions', March 2007.
- 5.40. 'Seismic Screening of Components Sensitive to High Frequency Vibratory Motions', EPRI White Paper, June 2007.
- 5.41. 'Seismic Design and Retrofit of Piping Systems', ASCE, July 2002.
- 5.42. 'Seismic Evaluation Procedure for Equipment in US Department of Energy Facilities DOE/EH-0545, March 1997.

The codes and standards referred above or any of their latest revisions can be used in concurrence with NPCIL. The general requirements of other standards and codes or guides applicable for manufacture, design and qualification for specific equipment which are not listed above shall also be met. For example IEEE-387 guide for emergency diesel generator sets, IEEE-628 for cable trays, IS-9000 for environmental qualification of electrical & instrumentation etc.

6.0 SEISMIC QUALIFICATION METHODS AND PROCEDURES

The seismic qualification in terms of structural and pressure boundary integrity and /or functional operability as applicable can be performed by any of the following commonly used methods viz.,

a) Analysis

b) Testing

c) Analysis and Testing



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **50** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

These methods, or other justifiable methods, may be adequate to verify the ability of the SSC to meet the seismic qualification requirements. The choice should be based on the practicality of the method for the type, size, shape, complexity of the SSC configuration, whether safety function can be assessed in terms of structural integrity/pressure boundary integrity alone and/or in terms of functional operability.

6.1 Qualification for Structural and Pressure Boundary Integrity

Qualification of SSCs, whether passive or active, can be performed by analysis to assess their intended function in terms of structural integrity and pressure boundary integrity as per the requirements of governing code.

6.1.1 Qualification by Analysis using Simplified Method

Wherever feasible analytical methods using classical bending and direct stress equations, where free body diagram determine a simple stress distribution that is in equilibrium with applied loads may be used with prior approval from NPCIL. Empirical formulae and equations as given in relevant codes & guides for specified equipment may be used.

6.1.2 Qualification by Analysis using FEM

Qualification of SSCs are required to be performed for various loads viz., design loads, loads during normal and upset conditions (pressure, temperature, mechanical, cycles, transients), including OBE; loads during emergency and faulted conditions (pressure, mechanical) including SSE; test loads; etc. as specified in NPCIL's equipment specification and in the Vendor's General Equipment Specification (VGES).

The general steps involved to meet the qualification requirements are:

- i) Preparation of the finite element model which represents the SSC adequately.
The guidelines on modelling are given in para 6.1.2.1
- ii) Identification of the applicable loads.
- iii) Determination the structural response for these loads in terms of forces, moments, displacements and stresses. The seismic response shall be determined by using response spectrum analysis/time history analysis/ equivalent static analysis method.
- iv) Combination of the seismic responses with other operating stresses and displacements as per the load combinations given in Annexure-1.
- v) Comparison of the combined stresses and displacements with those that ensure compliance with design/ codal requirements. The stresses and displacements shall be less than allowable values.

6.1.2.1 FEM Modeling



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **51** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Seismic analysis of SSCs generally uses Finite Element (FE) methods. Most of the commercially available computer codes have the capability to perform the analysis. The following are some of the acceptable methods of modeling the SSC.

i. Finite Element Model using Beam or One-Dimensional Element

This modelling is typically applied to beams, columns, frames, ducts, cable trays, conduits, cabinets, storage racks, which are expressed as a continuous or one dimensional finite element in a two or three- dimensional space. Masses are represented by lumped parameters, which develop a diagonalised elemental mass matrix. Tanks, pressure vessels and heat exchangers can also be modelled this way, especially when using the equivalent static method.

ii. Finite Element Model using Plate & Shell Element

This type of modeling is adopted for items whose primary mode of failure is by biaxial bending stress, plane stress or plane strain. Typically included in this category are : cabinets, tanks, pressure vessels and heat exchangers whose shells support significant eccentric loads which would tend to excite shell or local modes of vibration.

iii. Finite Element Model using Solid Element

In this, the SSC is modeled by using solid elements. This type of modeling is expensive and is preferable for local analysis to obtain correct stress picture at openings, shell-nozzle junctions etc.

While modelling the equipment apart from beam & shell/plate elements, solid elements and other type of elements or combination thereof may be used. The mathematical model should not be oversimplified nor over-discretised. If FEM is to be used, the model should adequately represent the dynamic and static characteristic of the equipment as realistically as practicable. The model should be able to predict functional performance as well as structural adequacy.

6.2 Qualification for Functional Operability

Qualification of SSCs can be demonstrated by analysis and/or testing for assessing their intended functional operability.

6.2.1 Functional Operability by Analysis

The qualification of rotating equipment viz., pumps, fans, blowers, motors etc. and reciprocating equipment viz., compressors, diesel generators, reciprocating pumps etc. may be performed by analysis to assess their functional operability. The general steps involved in qualification of these equipment to meet the qualification requirements of functional operability are the same as in para 6.1.1. In addition, the displacements of the moving components shall be demonstrated to be less than the clearances/gaps between the moving and stationary components/parts viz., impeller-casing, stator-rotor etc. The alignment of equipment shaft & motor shaft shall also be demonstrated to be



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **52** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

within the specified value. The reactions at the bearing location shall be shown to be less than the specified bearing capacity.

6.2.2 Functional Operability by Test

Qualification of various types of active equipment, valves, electrical and instrumentation items (panels, instruments and devices including reactor control and shutdown devices, batteries, transformer, switchgear, MCC etc.) can be performed by test to demonstrate their functional operability. In general, the seismic test shall be conducted by mounting the equipment/ component on a shake table. While a seismic motion is given to the shake table corresponding to the location of equipment/component, the equipment/ component shall be checked for its intended functional operability. During the test, the operating loads/conditions of the equipment/ component shall also be simulated adequately. The test should conservatively simulate the seismic motion at the equipment/ component mounting location. The multidirectional nature of earthquake should be simulated. The list of the test facilities available in the country is given in Annexure-3.

6.2.3 Functional Operability by a Combination of Analysis and Test

Electrical & instrumentation panels, devices and other active equipment/ component can be qualified by a combination of analysis and test. The panel as a structure supporting the various active devices mounted at different locations in the panel can be analysed to calculate the seismic motion at the base of the active devices. The active devices then can be qualified on a shake table for the seismic motion determined at the base of these devices.

Moreover, it is not always practical to qualify all the equipment by testing. This may be because of the size of the equipment, its complexity, nature of equipment, etc. Large equipment, such as multibay equipment racks and consoles/panels etc., may be impractical to test at full scale due to limitations of the shake table. These type of equipment can be qualified by using combination of analysis and testing.

6.3 Qualification by Previous Seismic Analysis & Test Reports

If two or more equipment of same type, make, size, model and design are used in same or different nuclear power plant or different application and if any one of them is seismically qualified for one application requirement then other equipment can be accepted for different application provided following requirements are met:

1. It should be established that equipment design is similar to the reference equipment already qualified.
2. Equipment are mounted/ anchored with similar bolting/welding/EP/support arrangement.
3. Required response spectra of new application is same or lower than the previous application, when compared for same values of damping and OBE & SSE levels of earthquake as applicable.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **53** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

4. If equipment is qualified by testing then Test Response spectra is enveloping the new RRS of the equipment to be qualified, for same values of damping in the frequency range of interest.
5. Adequate and sufficient documentation in terms of qualification report and justification as above are available to verify the qualification requirement.

6.4 Vendor's General Equipment Specifications (VGES)

For demonstrating structural integrity and pressure boundary integrity by analysis, the various loadings on the equipment as specified in the NPCIL's equipment specification shall also be specified in Vendor's General Equipment Specification (VGES). These loadings shall include design loads, loads during normal and upset conditions (pressure, temperature, mechanical), number of cycles of transients experienced by the equipment, including OBE; loads during emergency and faulted conditions (pressure, mechanical), including SSE; test loads, etc., as specified in NPCIL's equipment specification. Above list is not complete, and as such, any additional loading coming on equipment due to specific design features shall also be specified in the VGES. The equipment is also required to be qualified for its intended functional operability for the earthquake loading in combination with other operating loads as specified in NPCIL's technical specification and should form part of the VGES.

In order to meet the functional operability requirement of the equipment as brought out in this technical specification, various functions to be performed and functional parameters to be measured by the various devices and sub-devices in the equipment and which are to be monitored during the shake table test shall be brought out in the VGES. These include opening and closing time of valves, change in status of electrical contacts and relays; electrical contact and relay chattering; pressure, temperature, resistance, voltage, current settings etc as applicable.

7.0 SPECIFICATION FOR QUALIFICATION OF VALVES

This section covers the procedure for qualification of a general valve assembly including actuator, in terms of structural integrity, pressure boundary integrity and functional operability as brought out in NPCIL's equipment specification and in the VGES. The procedure shall be applicable to various power operated valves such as gate valve, globe valve, ball valve, butterfly valve, diaphragm valve, solenoid valve etc and relief valves. Manually operated valves and check valves are not required to be seismically qualified either by analysis or seismic test. However general requirements of design given in ASME Section-III, Division-1, Subsection-NB, NC and ND whichever is applicable shall be met for manually operated valves and check valves. For a specific valve, due to its specific design features if any additional technical requirements are to be met, same shall also be included in the VGES and shall also become part of the below mentioned qualification procedure.

In case of valves, general requirements of design are given in ASME Section-III, Division-1, Subsection-NB, NC and ND whichever is applicable. If any supports are used in the valve to support the valve



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **54** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

component or the valve actuator from the valve body, those should be designed as per the general requirements given in ASME Section III, Division-1, Subsection NF. The material used for the valve assembly shall be as given in NPCIL's specification or as given in VGES. Structural integrity and pressure boundary integrity of the valve assembly shall be demonstrated by carrying out analysis, as applicable. For active valve assemblies, such as active power operated valve assemblies, and pressure relief valve assemblies, the functional operability of valve assembly shall be demonstrated by a test as applicable. The test covered in the specification pertain only to a seismic test. The list of shake table test facilities presently available in the country is given in Annexure-3.

The detailed procedure for qualification of a typical power operated valve assembly is given below:

7.1 Qualification for Structural Integrity and Pressure Boundary Integrity

7.1.1 Qualification by Analysis

Structural integrity and pressure boundary integrity of the valve assembly shall be assessed by performing an analysis. Simplified analysis may be performed based on static forces resulting from equivalent earthquake accelerations acting at the centres of gravity of the extended masses. Classical bending and direct stress equations, where free body diagrams determine a simple stress distribution that is in equilibrium with the applied loads, can be used (Ref-ASME Sec III NB-3524 & NB 3592.3 Earthquake) or FEM method as described below can be used.

7.1.1.1 Finite Element Modeling

Valve body, stem, bonnet, yoke, brackets for actuators, gear boxes and any other component may be modelled with appropriate material properties and section properties as calculated from the component detailed drawing using beam elements, shell elements, 3D brick element or combination thereof with justification of assumptions.

Connection between valve body-stem, valve body-yoke, valve yoke-stem, gearbox housing-stem, actuator shaft-gear, bearings, and any other connection specific to the valve may be appropriately modelled.

Concentrated masses of actuators, gearboxes, handwheel, disc of butterfly valve, limit switches or any other devices of the valve may be modelled as lumped mass at the C.G. location. The eccentricity of mass in the finite element model shall be taken into account. The bearings if any shall be modeled by suitable spring elements. The spring constants for bearings shall be used from authenticated document and shall be referred/attached with the report.

Valve ends should be modeled appropriately using boundary elements, spring element or fixed boundary condition. Any other peculiar construction details of valve assembly may also be modelled appropriately using spring or mass or spring-mass system.

Finite element model of the valve assembly using above considerations shall adequately represent the realistic static/dynamic characteristics of the valve assembly. While modeling the



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **55** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

valve assembly apart from beam elements, shell, plate, 3D brick element or combination thereof may also be used with justification. The Finite Element Model shall be forwarded to NPCIL both in soft and hard copies for review and approval before proceeding for further analysis. The assumptions made in the finite element idealization with justifications shall be brought out in the report and all the inputs used in the data preparation shall be from authenticated documents and shall be referred/attached with the report.

7.1.1.2 Finite Element Analysis

Using validated software, the valve assembly as modelled above shall be analysed to extract the natural frequencies of the valve. Two different sets of seismic qualification procedures exist depending upon whether the first natural frequency of the valve assembly is less than or greater than rigid/cutoff frequency as determined from the applicable spectra. When the first natural frequency is less than rigid/ cutoff frequency, the valve assembly is called as flexible assembly, whereas when the first natural frequency is greater than or equal to rigid/cutoff frequency it is called as rigid assembly. All the valve assemblies shall be qualified for OBE alone or for OBE and SSE as applicable as given in NPCIL specification. Worst combinations of unsigned earthquake stresses with signed stresses to non seismic loads, shall be considered for qualification.

In case of rigid valve, the valve model shall be further analysed to evaluate seismic forces/stresses/displacements using equivalent static analysis method. In case of flexible valve assembly, either equivalent static analysis or response spectrum analysis may be performed.

In the equivalent static analysis method for rigid valves, force equivalent of 1.5 times the floor spectral peak acceleration shall be applied in 3 orthogonal directions at all mass points and the static analysis be carried out. In the equivalent static analysis method for flexible valves, force equivalent of 2.25 times (i.e. 1.5 x 1.5) the floor spectral peak acceleration shall be applied in 3 orthogonal directions at all mass points and the static analysis be carried out. The floor response spectra for OBE (2% damping) and SSE (3% damping) corresponding to the valve location, will be given by NPCIL as applicable.

For the response spectrum analysis to be performed on the flexible valve assembly, the applicable response spectra are the spectra at the valve mounting location on the piping system or equipment. These response spectra for OBE and SSE for 2% & 3% damping respectively will be derived by NPCIL & given by NPCIL corresponding to the valve location.

The response spectrum analysis shall include the addition of modal responses in each direction after accounting for closely spaced modes as per USNRC RG 1.92 and missing mass response as per NUREG 1061 vol. 4 (missing mass is the mass of the equipment which has not participated upto rigid/cutoff frequency) and three orthogonal directional responses combination by SRSS method.

If response spectra at the valve mounting locations are not available then floor response spectra accelerations scaled up by a factor of 1.5 shall be used (Ref-ASME QME 1-2012).



365-147/B
31.08.16

**BHEL – Tiruchirappalli – 620014,
India**

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **56** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

The valve assembly shall be analysed for various loads viz., design loads, loads during normal and upset conditions (pressure, temperature, mechanical, cycles, transients), including OBE; loads during emergency and faulted conditions (pressure, mechanical), including SSE; test loads; hydrodynamic, electromagnetic loads or any valve specific load, etc. as specified in the NPCIL's equipment specification and in the VGES.

If the valve actuator assembly is supported at multiple locations & subjected to different seismic motion, then the assembly shall be analysed for seismic anchor movement (SAM). The SAM values at the support locations for OBE & SSE will be given by NPCIL as applicable.

The seismic displacements as obtained by seismic analysis shall be combined with displacements/deflections due to other loads and shall be checked for operational/allowable clearances specified at various component sub-assemblies viz. piston-cylinder of pneumatic actuator, stem-bush or steam-gland at the bush and gland location of the yoke, valve disk to valve seat deflections etc.

For fatigue analysis if applicable, fifty stress cycles corresponding to five numbers of OBEs (ten stress cycles per OBE) and ten stress cycles corresponding to one SSE event shall be accounted in addition to the stress cycles due to other loads as specified in the NPCIL's equipment specification and in the VGES.

7.1.2 ASME Codal Qualification

Load combinations to be adopted for ASME Class-1, 2 & 3 valves for design condition and various service levels are given in Annexure –1.

The combined stresses calculated in the valve assembly shall meet the relevant codal requirements viz. ASME Section-III, Division-1, Subsection-NB-3000, NC-3000, ND-3000 whichever is applicable.

The combined stresses in the bracket, supporting structure of actuator etc shall meet the requirements of ASME-III, Division-1, Subsection-NF-3000.

If there are any bearings, the load at the bearing location shall be less than the bearing load capacity.

The stresses in the weld connections if any shall be checked. The stresses may be checked as per NUREG CR-6241, IS 800, IS 456 or any other applicable code.

The seismic displacements as obtained by seismic analysis shall be combined with displacements/deflections due to other loads and shall be checked for operational/allowable clearances specified at critical locations of valve actuator assembly, if applicable.

7.2 Qualification for Functional Operability

7.2.1 Qualification by Analysis



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **57** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

The functional qualification of certain valves can be demonstrated by Analysis with prior approval of NPCIL. The seismic response as obtained by seismic analysis shall be combined with responses due to other loads and shall be checked for operational/allowable values specified at various component sub-assemblies. For example, the functional operability of relief valves can be demonstrated by analysis, showing that valve disc does not lift up by seismic inertial force.

The functional qualification of large size valves viz. Main Steam Isolation Valve (MSIV) etc. is not possible to demonstrate by shake table test. In such cases for such large size valves, the functional operability can be checked by performing analysis by showing that the deflections and so the resultant clearance being less than allowable clearances i.e. between piston-cylinder of pneumatic actuator, stem-bush or steam-gland at the bush and gland location of the yoke, valve disk to valve seat deflections.

7.2.2 Qualification by Test

7.2.2.1 Determination of Natural Frequency

The first natural frequency or all modes below the cutoff frequency or rigid frequency of valve assembly may be determined by exploratory vibration test. Exploratory vibration test on a valve assembly may be conducted on a shake table, using resonance search test as per IEEE 344, with the modification that the vibration test shall be over a frequency range of 1 to 100 Hz or cutoff frequency as applicable. Natural frequency determination can also be done by Impact Hammer test, or any other justifiable method. The procedure for the Impact hammer test is given in Annexure-6.

The procedure covering the details of test method; mounting arrangements; test setup; test sequence; test equipment, instruments; measuring parameters; etc. shall be prepared as per the clauses given in this specification and shall be submitted to NPCIL for prior approval.

Exploratory vibration test Impact Hammer test shall then be conducted meeting the requirements of approved procedure.

7.2.2.2 Environmental Aging Test

Any environmental (temperature, pressure, humidity, plant operating vibration, irradiation) aging effects on the valve assembly, if specified in NPCIL's valve specification, shall be performed before conducting the equivalent static loading test or shake table test. The guidelines for these tests viz., normal thermal aging test, normal pressurization cycle test, normal radiation test, vibration aging test, Design Basis Event (DBE) environment test are given in Part-III of IEEE 382 (2006). If the valve is determined not to have significant aging mechanisms by virtue of periodic inservice surveillance, maintenance etc., then periodic surveillance, maintenance interval becomes qualified life, if applicable as per NPCIL specification or VGES. In view of the above, omission or partial fulfillment of the environmental aging tests with justification shall be forwarded to NPCIL for approval.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **58** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

7.2.2.3 Qualification of Actuator

Since valves are mostly rigid and are tested by equivalent static load test, whereas actuators see the earthquake motion at the valve top which is amplified by piping and support. Hence the valve actuators shall be separately qualified seismically as per the requirements of IEEE 382. However, the test frequency range should be from 1-100Hz in case of hard rock sites. In case, the actuator has already been seismically qualified by the actuator supplier, qualification report shall be submitted to NPCIL for approval.

7.2.2.4 Qualification of Valve by Testing

The valve assembly is required to be tested for demonstrating the functional operability by any one of the following methods:

1. Single frequency input on uniaxial shake table,
2. Multi frequency input on tri-axial shake table,
3. Static side load test.

For quick acting solenoid valves e.g. solenoid valves in SSS (Secondary Shutdown System) / SDS#2 (Shut Down System # 2) or Pilot Operated Valves in Shutdown system of BWRs, and critical valves that are required to perform during OBE and/or after SSE event or the valves important to reactor safety, housing flexible components in it e.g. springs etc they shall be shake table tested.

For other power actuated valves, static side load test may be conducted as per ASME QME 1-2012.

If the valve is required to be functional during OBE and SSE, only one test corresponding to SSE level loading need to be performed.

7.2.2.4.1 Qualification using Single Frequency Inputs on Uniaxial Shake Table

The tests on valve actuator assembly can be conducted on uniaxial shake table capable of giving horizontal and vertical motion, one at a time. The valve actuator assembly shall be mounted on the shake table. While a seismic motion is given to the table the valve assembly should be checked for its intended functional operability. As specified in the approved procedure, during the test, the operating loads on the valve assembly should also be simulated adequately. Single (Discrete) frequency tests using sinusoidal waveforms shall be used for frequencies from 1 Hz to 100 Hz or cutoff frequency as applicable. The test frequencies may be spaced at 1/3 octave interval upto 50 Hz and at 1/6 octave interval beyond 50Hz, if required. The acceleration values shall be taken as 1.5 times of spectral peak acceleration of envelope of the floor response spectra of the floors on which valve mounted pipelines are supported. The floor response spectra of all three directions with 2 % damping for OBE and 3% damping for SSE shall be used. The acceleration value of OBE and SSE whichever is maximum shall be used as input motion. The test duration at each frequency shall be 30 second or more to verify the opening and closing of the valve assembly or for intended functional operability. The acceleration at



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **59** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

low frequencies i.e below 4Hz shall be given upto the capability of the shake table. The test shall be conducted in two horizontal directions and one vertical direction.

If accelerations values are not available, then tests at 3.5g acceleration level as input can be permitted (Ref. Fig.1 of IEEE-382, 2006) with proper justification.

Typical procedure for uniaxial shake table test is given in Annexure-5.

The procedure for seismic qualification test of valve on uniaxial shake table covering the details of mounting arrangements, loadings, shake table description, test sequence etc. shall be prepared as per clauses given above/Annexure and as per IEEE 344 and shall be submitted to NPCIL for prior approval.

The seismic qualification test on shake table, for valve assembly shall then be performed at a test facility and shall meet the requirements of IEEE 344/IEC 60980 and/or approved procedure.

7.2.2.4.2 Qualification using Multi Frequency Input on tri-axial Shake Table

The valve actuator assembly shall be mounted on the shake table. While a seismic motion is given to the table the valve assembly should be checked for its intended functional operability. As specified in the approved procedure, during the test, the operating loads on the valve assembly should also be simulated adequately. The test should conservatively simulate the seismic event at the valve mounting location. The SSE and OBE required response spectra (RRS) at valve mounting location will be given by NPCIL. If response spectra at the valve mounting locations are not available, then floor response spectra accelerations scaled up by a factor of 1.5 times may be used (Ref-ASME QME 1-2012). The multidirectional nature of earthquake shall be accounted. In general, the shake table motion shall be such that it

- i) produces a Test Response Spectra (TRS) that envelopes the Required Response Spectra (RRS).
- ii) has a peak acceleration equal to or greater than RRS Zero Period Acceleration (ZPA).
- iii) does not include frequency content above the RRS ZPA asymptote.
- iv) has sufficient duration commensurate with strong motion part and fatigue inducing potential of the time history.

The procedure for seismic qualification test of valve on triaxial shake table covering the details of mounting arrangements, loadings, shake table description, test sequence etc. shall be prepared as per clauses given above/Annexure and as per IEEE 344 and shall be submitted to NPCIL for prior approval.

The seismic qualification test on shake table, for valve assembly shall then be performed at a test facility and shall meet the requirements of IEEE 344/IEC 60980 and/or approved procedure.

7.2.2.4.3 Qualification using Static Side Load Test

ASME QME 1-2012 permits the use of static side load test for power actuated valves.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **60** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Static side load testing is a seismic test intended to demonstrate the functional capability of the valve actuator assembly when subjected to loading that is representative of a specified seismic load qualification level.

The static side load test method for Power actuated valves are given in Annexure-4.

For static side load test, accelerations corresponding to 1.5 times the spectral peak acceleration of the floor response spectra corresponding to valve location in three orthogonal directions at 2 % damping for OBE and 3% damping for SSE shall be considered. Accelerations in three orthogonal directions shall be combined by SRSS method. Acceleration value thus obtained shall be further multiplied by following factors (Ref-ASME QME 1-2012).

1.1 (test margin) if the valve assembly is determined to be rigid, or

1.65 (amplification coefficient of 1.5 plus test margin) if the valve assembly is determined to be flexible, by carrying out analysis as per 7.1 or natural frequency determination test.

Typical procedure for Static side load test is given in Annexure-4.

The procedure for seismic qualification test of valve by Static side load test covering the details of mounting arrangements, loadings, test sequence etc. shall be prepared as per clauses given above/Annexure and as per IEEE 344 and shall be submitted to NPCIL for prior approval.

The seismic qualification by static side load test, for valve assembly shall then be performed at a shake table test facility and shall meet the requirements of IEEE 344/IEC 60980 and/or approved procedure.

7.3 Documentation

The valve assembly finite element model and the data giving details viz., nodal coordinates, element type used, element node relationship, material and section properties, lumped masses, rigid elements, and end release codes, details as to whether consistent mass matrix or lumped mass matrix, loads applied, boundary conditions etc. shall be submitted for prior approval of NPCIL in both soft and hard copies prior to taking up the analysis. The validation report of the software, describing the benchmark problem used to establish the dynamic analysis capabilities of the package along with the benchmarking report shall also be submitted to NPCIL.

The qualification report shall be prepared covering the description of the finite element model, assumptions made in the modeling and their justification, input data with supporting reference documents, name and version of the software used for analysis and its validation, natural frequencies calculated, modal mass participation factors, missing mass correction calculations, equivalent static / response spectrum analysis results viz., stresses and displacements; combination of stresses for different service levels, compliance of stresses with nodal requirements and displacements to be within the design clearances, results, conclusions stating the fulfillment of qualification requirements, etc. shall be submitted to NPCIL for approval.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **61** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

The finite element model along with analysis input data files and results in hard and soft copies shall be submitted to NPCIL for records.

For the valve assembly qualified by testing (including impact hammer test), the test reports covering the approved test procedure, mounting methods, shake table details, test setup, test sequence, input motion and details of compliance with IEEE 344 and IEC 60980 etc. shall be prepared & submitted to NPCIL for approval & records.

The analysis/test reports shall be documented in the form such that the reports shall be self-explanatory and independently reviewable. Guidelines given in Clause-11 of IEEE 344 or Appendix-C of ASME section III, including the NPCIL VGES procedure are to be followed for the same.

ANNEXURE - 1

Load Combinations for Design Condition and Service Levels for Equipment & Supports

Plant Classification	Load	Design/Service level	Load combination
Design		Design condition	Pressure, dead weight, sustained loads, temperature(1)
Normal		Service level A	Normal operating loads and transients (pressure, temperature, mechanical)
Upset		Service level B	Pressure, dead weight, sustained loads, upset condition transients (pressure, temperature(2), mechanical), including OBE(3)
Emergency		Service level C	Pressure, dead weight, sustained loads, temperature(1), emergency condition transients (pressure, mechanical), SSE (3),(4)
Faulted		Service level D	Pressure, dead weight, sustained loads, temperature(1), faulted condition transients (pressure, mechanical), pipe rupture loads, SSE (3)



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **62** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Note:

- 1) Temperature is used to determine allowable stress only
- 2) Thermal transients under Level C shall also be considered in Level B
- 3) OBE and SSE include both inertial and Seismic Anchor Movement (SAM)
- 4) SSE inertial & SAM can be considered in level-C service limits if specified, otherwise SSE inertial and SSE SAM are to be considered in level D only.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **63** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE-2

1.0 General Design Guidelines for Equipment

Following points should be taken into account to improve the resistance of equipment to an earthquake-induced vibration:

- a) For the portions of the equipment with a certain degree of freedom in design, the position of the center of gravity should be made as low as possible, and the mounting should be as stable as possible.
- b) In case when equipment with a lower safety class is closely located to equipment with a higher safety class, it is necessary to check the configuration plan to make sure that the damage to the equipment with a lower safety class due to earthquake does not affect the equipment with a higher safety class.
- c) In addition, the seismic supports should be such that they do not cause difficulties in the maintenance and servicing of the machines/ equipment.
- d) It is important to avoid, as far as practicable, resonance of equipment, piping, instrumentation and core internals at the frequency of the dominant modes of supporting structures. In most cases, stiffness can be increased to avoid resonance. In some cases, when systems are made stiffer, the effect of thermal stresses, other dynamic loads and differential motions of supporting points may become significant.
- e) For S2 Level earthquake ground motion, equipment may enter the range of nonlinear/elasto-plastic behaviour. In this case, it is necessary to make sure that the required ductility is present in the system, particularly in the Embedded Parts (EPs). The design of the embedded part (EP) of the support should be such that the failure in concrete is avoided. Therefore, the strength of the load path through concrete should be much more than the strength of the anchorage rod of the EP.
- f) Particular attention should be paid to the possibility of collision between adjacent components, or between components and adjacent parts of a building, as a consequence of their dynamic displacement. It is also important to allow for flexibility of connections between such components, between components and building penetrations and underground connections to buildings, as well as between buildings.

2.0 General Design Guidelines for Valves

- a) Valves with heavy operators should not be mounted on small lines (< 1" dia) or, valve, operator and the line should be well supported and anchored to the same support structure to avoid overstressing of adjacent piping.
- b) Valve operator cantilever length (distance between center-line of pipe to the top of the operator) should not be too large.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **64** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- c) The valve actuator and the yoke should not be independently braced to the structure unless the pipe is also braced to the same structure immediately adjacent to the valve. If the operator is independently supported from the valve and attached piping, it may act as a pipe support and attract considerable load through yoke and possibly fail or bind the shaft. If both the operator and the valve/pipe are restrained, and if they are both not tied to the same support structure, then differential motion may lead to high seismic loads.

ANNEXURE-3

List of Shake Table Test facilities in India

S.No.	Shake Table Test facility	Size	Capacity	Frequency range (Hz)	Acceleration (g)
1.	ERDA, Vadodara	0.6m x 0.6m	150 Kg Uniaxial shaketable	1-50	3.5
2.	ECIL, Hyderabad	1m x 1m, 35 cm stroke length	100 Kg Uniaxial shaketable	1-50	3.5
3.	SERC, Chennai	4m x 4m, 4 vertical & 4 hori. Actuators	30 T Triaxial shaketable	0.1-50	1.0
		2m x 2m	5 T Uniaxial shaketable	5-50	3.0
		3m x 3m	10 T Triaxial shaketable	0.1-50	1.0
4.	CPRI, Bangalore	3m x 3m, 4 ver & 4 hor actuators	10 T Triaxial table	0.1-50	1.0
5.	IGCAR, Kalpakkam	3m x 3m, 4 ver & 4 hor actuators	10 T Triaxial table	0.1-50	1.0
6.	IIT Roorkee	3.5m x 3.5m, 2 ver & 1 hor actuator	20 T Biaxial shaketable	0.1-50	1.0
7.	IIT Kanpur	1.2m x 1.8m	4 T, Uniaxial shaketable	NA	NA
8.	IIT Guwahati	2.5m x 2.5m, stroke length=500mm, max horizontal acceleration = 2g	5 T, Uniaxial shaketable	NA	NA
9.	IIT Mumbai	1.2m x 1.2m	1 T, Uniaxial shaketable	NA	NA

Note:

1. Above details are for information and guidance only.
2. Other electrodynamic/hydraulic shake tables at test facilities like ERTL Labs, CWPRS Pune, ARAI Pune, FCRI Pallakkad Kerala and any other test facilities which can meet the test specification may be explored and shaketable specification may be forwarded to NPCIL for approval prior to actual seismic test on equipment.
3. NA: not available



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **65** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE-4

Static side load test

1. Purpose

Static side load testing is a seismic test intended to demonstrate the functional capability of the combination of a QME-1 qualified valve and a QME-1 qualified actuator when subjected to loading that is representative of a specified seismic load qualification level.

2. Definition

Rigid Equipment: Equipment, structures, and components whose lowest natural frequency is greater than the frequency value at the start of the zero period acceleration (ZPA) or the cut-off frequency of the applicable response spectrum.

Essential-to-function parts/components: those parts or components of the assembly that are essential to cause, permit, or enable the assembly to perform the specified accident-condition function or whose failure could prevent the performance of this function.

3. GENERAL REQUIREMENTS

- a). Static side load testing shall be performed on the QME-1 qualified valve assembly under the seismic load to which the valve assembly is to be qualified. The adequacy of qualification testing performed under this Code Case shall be evaluated where differential pressure cannot be maintained sufficiently to simulate the full range of design-basis conditions for which the valve/actuator assembly is being qualified.
 - b). The magnitude of the seismic loading is determined to simulate the effect of the specified tri-axial acceleration g-levels for which the valve assembly is to be qualified. A single axial force concentrated at the center of gravity of the valve extended structure, and applied along the least rigid axis (unless a more critical axis can be determined) may simulate specific seismic g-loads. If desired, increased seismic g-levels may be used to extend the seismic qualification to similar constructions.
1. The first step in calculating the seismic test load force, F_t , is to convert the tri-axial acceleration g-level components, acting on the valve assembly, into a single resultant axial acceleration g-level by using the square-root-sum-of-squares (SRSS) method. If acceleration at the valve location is not available, then 1.5 times the floor peak acceleration (corresponding to 2% for OBE and 3% for SSE) shall be used as the g-values. This single axial g-level is then multiplied by the weight of the valve assembly extended structure to obtain a qualification load force F_q . This qualification load force may need to be further adjusted to compensate for the effects of gravity on the test valve assembly, depending upon the orientation of the valve assembly



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **66** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

during the test and minor adjustment of the location of the test load force to assure contact with a structural member. Regardless of the location, the load must still create an equivalent moment in the most highly stressed location of the extended structure.

2. The test load force, F_t , is determined to ensure adequate margin to account for any dimensional or material tolerance differences between the test valve assembly and any production valve assemblies. Unless a different factor is justified to account for material and dimensional tolerances, the following relationship should be used to determine the test load force:

$$F_t \geq (A)(F_q)$$

where:

F_t = test load force, lbf (N)

F_q = required qualification load force, lbf (N)

A = multiplication factor, dimensionless = 1.10 (test margin) if the valve assembly is determined to be rigid, or = 1.65 (amplification coefficient of 1.5 plus test margin) if the test valve assembly is determined to be flexible.

- c). Test Pressure, psig (kPag).

For Power Actuated Valve Assemblies as per QME-1, QV-7450, the test operating pressure shall be the design pressure rating, but no greater than the 100°F (38°C) cold-working pressure rating for the valve assembly being qualified. The test operating pressure shall be greater than that for which the test valve assembly is to be qualified by a factor equal to the ratio of the actual test bar yield strength of the tested body material divided by the specified minimum yield strength of the body material, but no greater than 1.5 times the 100°F (38°C) cold-working pressure rating.

- d). Test Differential Pressure, psig (kPag). The test differential pressure shall be the pressure differential maintained across the valve disc during the opening stroke. The value of the differential test pressure shall be determined by valve/actuator margin analysis calculations. The test differential pressure is not considered a rating value for the actuator or valve, but creates a repeatable test condition for diagnostic data comparison.

- e). All essential-to-function accessories shall be attached to the valve assembly to satisfy the rigidity requirements of QME-1, QV-7450(b). The essential-to-function accessories that have not been previously qualified in accordance with IEEE-344 as part of the actuator assembly shall be seismically qualified by test in accordance with the test section of IEEE-344 per QME-1, QV-7450(b).

- f). Testing will be performed at normal room temperature, not to exceed 100°F (38°C).



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **67** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

4.0 TEST METHOD

4.1 Power Operated Valve Assemblies

- a). The valve assembly shall be installed in a test fixture with suitable provision for imposing the static test load, and such that the valve assembly is mounted by its normal mounting points (usually the valve body ends). The valve mounting shall be sufficiently rigid to resist the applied seismic load and ensure that the load force remains essentially perpendicular to the centerline of the valve extended structure. The test load force, Ft, shall be applied as described in 4(b)(1) above.
- b). The seismic functionality test shall be made starting with one full operating cycle utilizing normal motive power. With the valve fully open, the valve body is maintained at the designated test pressure (as defined in 4(c) above), and valve closure is initiated. Following valve closure, establish the test differential pressure (as defined in 4(d) above) in the specified flow direction (or in the most adverse direction for bidirectional valves). Valve opening is then initiated. Differential pressure need not be maintained after the test valve assembly is unseated. Thrust (and/or torque), diagnostic data and stroke time measurements in both directions are to be recorded to establish baseline measurements. For guidance, see QME-1, Section QV-G, "Guide to Section QV: Determination of Valve Assembly Performance Characteristics."
- c). With the valve in the open position, test operating pressure (as defined in 4(c) above) shall be established in the valve, and (while pressure is maintained) the test load force, Ft, shall be applied as specified in 4(b)(2) above. Deflection measurements of the extended structure are to be recorded.
- d). While maintaining the test load force, Ft, a seismic functionality test shall then be performed in accordance with 5.1(e), and 5.1(f) below.
- e). Three full operating cycles shall be performed with the test valve depressurized and utilizing the maximum motive power for actuation. Data, similar to 5.1(b) above, shall be taken for comparison to the baseline measurements.
- f). Three full operating cycles shall be performed utilizing minimum motive power. With the valve fully open, the valve is pressurized at the designated test pressure and valve closure shall be initiated and timed. Following valve closure, establish the test differential pressure in the specified flow direction (or in the most adverse direction for bidirectional valves). Valve opening is then initiated. Differential pressure need not be maintained after the test valve assembly is unseated. Data, similar to 5(b) above, shall be taken for comparison to the baseline measurements.
- g). With the valve in the open position, remove the test load force, Ft, and record deflection measurements of the extended structure.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **68** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- h). Repeating test 5.1(b) above, finish testing with one full operating cycle utilizing normal motive power. With the valve fully open, the valve body is maintained at the designated test pressure (as defined in 4(c) above) and valve closure is initiated. Following valve closure, establish the test differential pressure (as defined in 4(d) above) in the specified flow direction (or in the most adverse direction for bidirectional valves). Valve opening is then initiated. Differential pressure need not be maintained after the test valve assembly is unseated. Data, similar to 5.1(b) above, shall be taken for comparison to the baseline measurements.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **69** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE-5

Sample Seismic Test Procedure for Valve/Valve actuator/ Instrument/Device

a) Mounting arrangement :

Mount the Valve/Valve actuator/ Instrument/Device (here in after called as test sample) on the shake table with a suitable fixture, simulating the actual mounting condition in the plant, meeting the requirements specified in section 8.1.1 of IEEE-344. The mounting arrangement shall be proposed by the supplier for approval of NPCIL.

b) Monitoring Requirements During Testing :

Necessary arrangements shall be made to assess the functional operability of test sample as required, meeting the requirements specified in section 8.1.2 of IEEE-344 and NPCIL equipment technical specification. The detail scheme for the monitoring function shall be proposed by the supplier, subject to approval of NPCIL.

c) Aging Requirements :

Prior to the seismic test, the test sample shall be subjected to applicable environmental aging mechanisms, such as thermal aging, radiation aging etc., as mentioned in 8.2.1.1 of this specification and as detailed in the respective NPCIL equipment specifications according to the qualified life of test sample. However, vibrational aging and OBE seismic testing are not required to be done on the test sample as the SSE test accelerations are enveloping OBE accelerations as well as vibrational aging due to number of sinusoidal tests in all three directions separately each for 30 seconds during SSE test as mentioned below.

d) Resonance Search Test:

Sine sweep test (Resonant frequency search test) shall be conducted on the equipment, varying the frequency at the rate of 1 octave/minute from 1 Hz to 100 Hz or cutoff frequency as applicable (up sweep) and 100 Hz or cutoff frequency as applicable to 1 Hz (down sweep) maintaining acceleration at constant magnitude of 0.2g to determine the resonant frequencies of the equipment. Structural response in terms of acceleration and strains shall be monitored by mounting the accelerometers and strain gauges at the pre-identified locations on the equipment being tested. Sine sweep test can be conducted in both vertical and horizontal axes. Resonance frequencies in all the three axes shall be identified in the frequency range of 1.0 Hz to 100 Hz or cutoff frequency as applicable. The Resonant frequency search test parameters are shown in Table below:



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **70** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

1	Type of Motion	Sinusoidal sweep
2	Axis of Motion	X,Y & Z
3	Frequency range	1.0 to 100 Hz or cutoff frequency as applicable
4	Acceleration	0.2g
5	Sweep rate	1.0 Octave/minute

Based on the results of resonant search test, if no malfunction or no natural frequency is observed below 10 Hz then acceleration levels for single axis test can be lowered in low frequency range with prior approval from NPCIL. However, it should be ensured during resonant search test that devices are in energized condition and proper functional and response monitoring is ensured by suitable monitoring measures.

e) Seismic Test Procedure (SSE Test)

- i) **Motion** : Sinusoidal
- ii) **Frequently Range** : 1 Hz to 100 Hz or cutoff frequency
as applicable
- iii) **Test Frequencies** : 1.0 Hz, 1.26 Hz, 1.59 Hz, 2.0 Hz, 2.52 Hz,
3.17 Hz, 4.0 Hz, 5.04 Hz, 6.35 Hz, 8.0 Hz,
10.08 Hz, 12.67 Hz, 16.0 Hz, 20.16 Hz, 25.0
Hz, 32.0 Hz, 40.31, 50.8 Hz, 57.02 Hz, 64 Hz,
71.84 Hz, 80.63 Hz, 90.51 Hz, 100 Hz.]
- iv) **Peak acceleration** : The peak acceleration at frequencies 1.0 Hz,
1.26 Hz, 1.59 Hz, 2.0 Hz, 2.52 Hz, 3.17 Hz
shall be preferably between 1.0g and 3.5g or
to the capability of shake table. However at
these frequencies, excitation must be
continued to be maintained to the capability of
shake table. For and beyond 4 Hz the peak
acceleration shall be 3.5 g as a minimum or to
the capability of shake table. Beyond 50.0 Hz,
the acceleration shall be maintained about
1.0g or to the capability of shake table.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **71** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

- v) Test duration : 30 Sec. at each test frequency
- vi) Test axes : Test shall be carried out in 2 orthogonal horizontal axes and vertical axis (one axis at a time).
- vii) The procedure for seismic qualification test of valve/valve actuator/instrument/device on shake table covering details of mounting arrangement, monitoring arrangement, shake table description, test sequence etc., shall be prepared as per the clauses given in applicable NPCIL equipment technical specification and/or IEEE-344 and shall be submitted to NPCIL for prior approval.
- viii) The accelerations calculated at location of mounting of devices in stands, racks, cabinets, panels or line mounted devices, should be shown to be less than test accelerations by carrying out analysis of stands/racks/panels/cabinets/piping either by vendor or NPCIL as per applicable scope in tender specification.
- ix) The seismic qualification test on shake table shall then be performed at the test facility and shall meet the requirements of IEEE-344 and/or NPCIL approved test procedure for seismic qualification of respective valve/valve actuator /instrument/device.

f) Test Acceptance Criteria:

The test sample shall meet the performance requirements during and after completion of the tests as specified in applicable NPCIL equipment technical specification/NPCIL approved test procedures.

g) Test Report:

The external laboratory conducting this test shall issue an approved test report consisting mainly of the following:

- i) Copy of approved seismic qualification test procedure.
- ii) Description of test sample along with its mounting and monitoring procedure
- iii) Specification of test facility
- iv) Mounting arrangement with photograph
- v) Video recording in the form of DVD/pen drive of the complete shake table testing.
- vi) Performance results of the test sample.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **72** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

ANNEXURE-6

Impact Hammer Test for Frequency Determination of Valves

Impact hammer test shall be used for estimation of modal frequencies of the valves. The test will require impact hammers instrumented with a force transducer to measure the impact force, response measuring transducers (accelerometers) to measure the response caused by the known impact force, signal conditioners to condition the signal for the required frequency band and amplification, two channel signal analyser for signal analysis; and for computing frequency response function and coherence function. The modal frequencies shall be estimated by appropriate analytical curve fitting method.

The particular characteristics of each element of the test are described below:

1. **Impact Hammer:** The impact hammer shall have a built in force transducer. Two important characteristics of impact hammer are its weight and tip hardness. Appropriate range hammer with selectable tip (soft, medium and hard) shall be used. The force transducer shall be integrally fixed on the hammer for impact force measurement.
2. **Response Transducer (accelerometers):** Transducer shall be used for measurement of response at atleast two locations on the valve body. Sensor sensitivity shall be high enough to get repeatable signal above background noise.
3. **Signal Conditioning Units:** The units shall be suitable for low signal-to-noise ratio (40dB) and must be able to detect over load in the response signal.
4. **Analysis System:** Two-channel dynamic signal analyser shall be used. The analyser shall have zoom transform capability, appropriate window functions for impulse input signal and decaying response signals, and analytical curve fitting capability to extract modal properties.

Measurement Procedure

1. The valve assembly should be mounted in the rigid flange fixture. This fixture should be anchored to the anchor bolts embedded in rigid heavy mass concrete platform. The machinery noise in the shop should be minimal.
2. **Frequency Response Measurement (FRF)** shall be made at many locations on the valve body to identify major resonances. Use impact hammer of appropriate weight and tip hardness. Determine two best locations along each axis for mounting response accelerometer either by a strong magnet or by adhesive.



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

PURCHASE SPECIFICATION

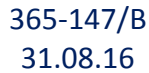
DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **73** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

3. Check the repeatability of FRF Test. Preload the valve body (if required) to minimize non-linearities caused by gaps and clearances. Confirm low non-linearity effect on the response signal by coherence measurement.
4. Ensure that input signal is not zero in the frequency band of interest.
5. Monitor input force signal and apply appropriate window function. Reject poor measurement. Ensure input auto spectrum.
6. Monitor response signals and apply exponential decay window. Reject poor measurement and overload.
7. Determine FRF from the ratio of Cross Spectrum to Power Spectrum of input signal. Average (at least 24) and process the signal to minimize bias error in the estimation of the Cross-Spectrum. Estimate the coherence function to monitor the quality of FRF measurement.
8. Display FRF as magnitude versus frequency in logarithmic scale. Display phase versus frequency in linear scale.
9. Estimate modal parameter (if specified) by fitting an analytical curve on the FRF function. Ensure reasonable fit for good estimation of modal properties.
10. Perform zoom analysis around closely spaced modal frequency (Resolution 10:1).
11. Determine the phase between two measurement locations (along the axis) at the identified natural frequencies.
12. Include one set of prints of input auto spectrum, FRF and coherence function, phase angle etc. for each direction of test in the report.



Valves Engineering and R&D

DOC No: **SPEC:CV:008** Rev: 00

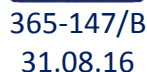
Effective Date: **25/01/2021**

Page: **74** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

(LIST OF VALVES)

S.No.	Valve Type	Material code	Material description	Qty (Nos.)	Siesmic Category	Safety Class	KKS Code					
1	WEDGE GATE VALVES	969991883100	6-C150-GV-FL-HO-WCB(OBE)	4	2 (OBE)	4	3GML21AA001					
2							4GML21AA001					
3							3GML22AA001					
4							4GML22AA001					
5	FLAP VALVE	969991883000	6-C150-FV-FL-A105(OBE)	16			3PUQ10AA603					
6							4PUQ10AA603					
7							3PUQ20AA603					
8							4PUQ20AA603					
9							3PUQ30AA603					
10							4PUQ30AA603					
11							3PUQ40AA603					
12							4PUQ40AA603					
13							3PUQ10AA604					
14							4PUQ10AA604					
15							3PUQ20AA604					
16							4PUQ20AA604					
17							3PUQ30AA604					
18							4PUQ30AA604					
19							3PUQ40AA604					
20							4PUQ40AA604					
21							969991882800	3-C150-FV-FL-A105(SSE)	16	1 (SSE)	3	3PUQ10AA601
22												4PUQ10AA601
23												3PUQ20AA601
24												4PUQ20AA601
25	3PUQ30AA601											
26	4PUQ30AA601											
27	3PUQ40AA601											
28	4PUQ40AA601											
29	3PUQ10AA602											
30	4PUQ10AA602											
31	3PUQ20AA602											
32	4PUQ20AA602											
33	3PUQ30AA602											
34	4PUQ30AA602											
35	3PUQ40AA602											
36	4PUQ40AA602											



Valves Engineering and R&D

PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: 75 of 76

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

S.No.	Valve Type	Material code	Material description	Qty (Nos.)	Siesmic Category	Safety Class	KKS Code
37	FLAP VALVE	969991883000	6-C150-FV-FL-A105(OBE)	4	2 (OBE)	4	3GML21AA601
38							4GML21AA601
39							3GML22AA601
40							4GML22AA601
41		969991882900	3-C150-FV-FL-A105(OBE)	4			3GML31AA601
42							4GML31AA601
43							3GML32AA601
44							4GML32AA601
45	REGULATING GLOBE VALVE	969991882700	1/2-C150-RV-BW-HO-F316L(OBE)	12			3GML21AA301
46							4GML21AA301
47							3GML22AA301
48							4GML22AA301
49							3GML31AA301
50							4GML31AA301
51							3GML32AA301
52							4GML32AA301
53							3GML21AA002
54							4GML21AA002
55							3GML31AA002
56							4GML31AA002
57		969991882600	3/8-C150-RV-BW-HO-F316L(OBE)	16			3PUQ10AA301
58							4PUQ10AA301
59							3PUQ20AA301
60							4PUQ20AA301
61					3PUQ30AA301		
62					4PUQ30AA301		
63					3PUQ40AA301		
64					4PUQ40AA301		
65					3PUQ10AA302		
66					4PUQ10AA302		
67					3PUQ20AA302		
68					4PUQ20AA302		
69					3PUQ30AA302		
70					4PUQ30AA302		
71					3PUQ40AA302		
72					4PUQ40AA302		



365-147/B
31.08.16

BHEL – Tiruchirappalli – 620014,
India

Valves Engineering and R&D

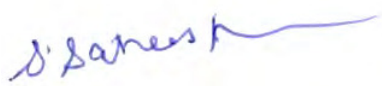
PURCHASE SPECIFICATION

DOC No: **SPEC:CV:008** Rev: **00**

Effective Date: **25/01/2021**

Page: **76** of **76**

Product: TECHNICAL SPECIFICATION FOR GATE, GLOBE, REGULATING AND CHECK VALVES FOR GML AND PUQ SYSTEMS IN NUCLEAR POWER PLANT.

Signature			
Name	Sameer Ahmad Bhat	Jalaludeen. K	S. Sathees Kumar
Designation	Senior Engineer	Deputy Manager	Manager
Date	25 January 2021	25 January 2021	25 January 2021
Action	Prepared By	Checked & Reviewed By	Approved By

VALVE SPECIFICATION SHEET FOR GML SYSTEM **NEEDLE VALVES OF 15 NB**

GENERAL	VALVE	NEEDLE VALVE		VALVE SPEC. SH.NO.:			
	SIZE	15 NB		I02.KK34.0.0.TH.TS.PR00X			
	APPL. SPECN.			KKS CODE: 3,4 GML21/22/31/32AA301 3,4 GML21/31AA002			
	DESIGN.	ASME B16.34		REV. NO. PAGE: 1 OF 1			
	LOCATION	In Main Pump House (UQA) at elevation. (-)6.725 m		ENV.QUAL.REQUIREMENT : NA			
				SEISMIC REQUIREMENT : OBE			
BODY	PRESSURE RATING	: CLASS 150					
	END CONNECTION	: WELDED, AS PER ASME B16.25					
	MATERIAL: BODY	: ASTM A182 F316L				LINING	:
	BOLTS	: NA				NUTS	:
	CONSTRUCTION FEATURES		:				
BONNET	TYPE	: SCREWED				MATERIAL	:
	BONNET GASKET	:				MATERIAL	:
	HAND WHEEL	: REQUIRED				MATERIAL	:
	STEM PACKING	: GRAPHOIL				MATERIAL	:
TRIM	STEM (RISING/NON RISING)	:				MATERIAL	:
	PLUG FORM	:				MATERIAL	:
	BACK SEATING	:				MATERIAL	:
	BORE TYPE	:				MATERIAL	:
SERVICES	FLUID	: SEA WATER				Max.	Min.
	PRESSURE	: DESIGN		10	OPERATING		
	TEMP (°C)	:	MAX.	60	MIN.	21	NORMAL
	FLOW (m³/hr)	:	MAX.		MIN.		NORMAL
	DENS.(kg/m³) @ 15 °C	:	1000				
	Hydraulic friction factor	:	#				
	Cv	:	#				
	NOTES :						
	1. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS.						
	2. MANUFACTURER TO SUBMIT QAPAND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING.						
3. OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH INTERGRAD 269 PRIMER 50 MICRONS DFT & INTERGRAD 740 TOP COAT 75 MICRONS DFT; TOTAL 125 MICRONS DFT.							
INSTALLATION	DESCRIPTION	PRESSURE (kg/cm² g)	DURATION IN (min.) (MIN)	APPLICABLE CLAUSE OF SPECIFICATION		REMARKS	
	HYDROSTATIC BODY TEST	AS PER STD.	AS PER STD			NPC TO WITNESS	
	HYDROSTATIC SEAT / DISC TEST						
	LOW PRESSURE SEAT LEAK TEST						
	AIR LEAK SEAT TEST						
	BODY HYDRO. WITH BELLOW TEST						
	BACK SEAT LEAK TEST						
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED					
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.					
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC					
ACCESSORIES							
LIMIT SWITCH :		OPEN	CLOSE	NOT APPLICABLE		APPLICABLE	
CHAIN WHEEL	NA			FLOOR STAND :			
EXTN. BONNET	NA			SUPPORT LUGS :			
FLANGES	NA			OTHERS :			

NEEDLE VALVES OF 10 NB

GENERAL	VALVE	NEEDLE VALVE				VALVE SPEC. SH.NO.:																																																					
	SIZE	10 NB				I02.KK34.0.0.TH.TS.PROOX																																																					
	APPL. SPECN.					KKS CODE: 3,4 PUQ10/20/30/40AA301/302																																																					
	DESIGN.	ASME B16.34				REV. NO.																																																					
	LOCATION	In Main Pump House (UQA) at elevation. I-16.725 m				PAGE: 1 OF 1																																																					
BODY	PRESSURE RATING	CLASS 150																																																									
	END CONNECTION	WELDED, AS PER ASME B16.25																																																									
	MATERIAL: BODY	ASTM A182 F316L				LINING																																																					
	BOLTS	NA				NUTS	NA																																																				
	CONSTRUCTION FEATURES																																																										
BONNET	TYPE	SCREWED				MATERIAL	A 182 F316L																																																				
	BONNET GASKET					MATERIAL																																																					
	HAND WHEEL	REQUIRED				MATERIAL	CS																																																				
	STEM PACKING	GRAPHOIL				MATERIAL																																																					
TRIM	STEM (RISING/NON RISING)					MATERIAL																																																					
	PLUG FORM					MATERIAL																																																					
	BACK SEATING					MATERIAL																																																					
	BORE TYPE					MATERIAL																																																					
SERVICE CONDITIONS	FLUID	SEA WATER				Max.	Min.																																																				
	PRESSURE	DESIGN		10	OPERATING																																																						
	TEMP (°C)	MAX.	60	MIN.	21	NORMAL	31																																																				
	FLOW (m³/hr)	MAX.			MIN.			NORMAL																																																			
	DENS. (kg/m³) @ 15 °C	1000																																																									
	Hydraulic friction factor	#																																																									
	Cv	#																																																									
	NOTES : 1. VENDOR TO INDICATE VALUES FOR ITEMS MARKED (#) THUS. 2. MANUFACTURER TO SUBMIT QAP AND OBTAIN NPC'S APPROVAL BEFORE MANUFACTURING. 3. OUTSIDE SURFACE OF THE VALVE SHALL BE COATED WITH INTERGRAD 269 PRIMER 50 MICRONS DFT & INTERGRAD 740 TOP COAT 75 MICRONS DFT; TOTAL 125 MICRONS DFT.																																																										
INSPECTION TESTS	DESCRIPTION	PRESSURE (kg/cm² g)	DURATION IN (min.) (MIN)		APPLICABLE CLAUSE OF SPECIFICATION		REMARKS																																																				
	HYDROSTATIC BODY TEST	AS PER STD.	AS PER STD.				NPC TO WITNESS																																																				
	HYDROSTATIC SEAT / DISC TEST																																																										
	LOW PRESSURE SEAT LEAK TEST																																																										
	AIR LEAK SEAT TEST																																																										
	BODY HYDRO. WITH BELLOWS TEST																																																										
	BACK SEAT LEAK TEST																																																										
	FUNCTIONAL QUALIFICATION TEST	NOT REQUIRED																																																									
	MATERIAL	PHYSICAL & CHEMICAL T.C. FROM MFG.																																																									
	DIMENSIONAL CHECKS	MFG. CERTIFICATES & SAMPLE CHECK BY NPC.																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="5">ACCESSORIES</td> <td colspan="2">NOT APPLICABLE</td> <td colspan="3">APPLICABLE</td> </tr> <tr> <td>LIMIT SWITCH :</td> <td>OPEN</td> <td></td> <td>CLOSE</td> <td></td> <td colspan="2"></td> <td colspan="3"></td> </tr> <tr> <td>CHAIN WHEEL</td> <td colspan="4">NA</td> <td colspan="2">FLOOR STAND :</td> <td colspan="3"></td> </tr> <tr> <td>EXTN. BONNET</td> <td colspan="4">NA</td> <td colspan="2">SUPPORT LUGS :</td> <td colspan="3"></td> </tr> <tr> <td>FLANGES</td> <td colspan="4">NA</td> <td colspan="2">OTHERS :</td> <td colspan="3"></td> </tr> </table>										ACCESSORIES					NOT APPLICABLE		APPLICABLE			LIMIT SWITCH :	OPEN		CLOSE							CHAIN WHEEL	NA				FLOOR STAND :					EXTN. BONNET	NA				SUPPORT LUGS :					FLANGES	NA				OTHERS :				
ACCESSORIES					NOT APPLICABLE		APPLICABLE																																																				
LIMIT SWITCH :	OPEN		CLOSE																																																								
CHAIN WHEEL	NA				FLOOR STAND :																																																						
EXTN. BONNET	NA				SUPPORT LUGS :																																																						
FLANGES	NA				OTHERS :																																																						

ANNEXURE 2A
GENERAL TERMS &
CONDITIONS



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE
Trichy - 620 014, India
GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

1. QUOTATIONS:

a. BID system

The offers are invited in Two part bid system (Part I will be Techno-commercial bid and part II will be Price Bid). Techno-commercially suitable vendors alone will be intimated for price bid opening.

b. Submission of offer:

Each part of offer should be sent in a double cover separately and the same should be sealed and super scribed with details such as enquiry reference, name of the vendor, item of supply and due date of opening. Two or more quotations should not be sent in one cover. Price Bid should contain only "Price per unit" for each type. Offer should be sent to the below mentioned address:

The Tender Opening Cell / Valves
Room No. -26, Building -24
Bharat Heavy Electricals Limited
Tiruchirappalli - 620014, Tamil Nadu, India
Or
Email ID: tender_cell@bhel.in

- c. Late offers:** Offer received after 2.00 pm on due date will be considered as Late offers. Late offers will not be considered under any circumstance.
- d. Regulations:** Offers should be free from correction and erasures. Corrections if any must be attested. All amounts shall be indicated both in words as well as figures. In case of a difference between the amount quoted in words and figures, the amount quoted in words shall prevail.
- e. PVC:** Price Variation clause not acceptable. Prices should be firm.
- f. Catalogue:** Manufacturer's name, Trade Mark or Patent No. if any should be specified. Illustrative leaflets giving technical particulars are required along with quotation.
- g. Samples:** Samples should be submitted separately, if specially requested in tender, before the due date of the enquiry. They should be clearly marked with the enquiry reference and date on the enclosing cover to facilitate identification.
- h. GST Number:** GST registration number, HSN number (Item wise) with applicable taxes should be mentioned in the offer. If the vendor is not GST registered the offer is liable for rejection.
- i. Deviation.** Any deviations from the specification are to be furnished separately as "Schedule of Deviation". If there is no deviation, vendor should indicate "No Deviation" in the offer.
- j. Confirmation:** Confirmation for compliance is to be given in the offer for all the techno commercial conditions specified in the tender.

2. COMMERCIAL TERMS & CONDITIONS:

a. Terms of Payment:

For Indigenous Suppliers: (Non-MSE)

Payment term is 100% direct payment after 60 days from the date of receipt and acceptance of materials and against 10% PBG valid for the warranty period.

Any deviation in the above payment terms, any other conditions in payment terms or any other payment terms will not be accepted and offers will not be considered.

For Foreign Suppliers:

Payment term is 100% payment on CAD basis after 60 days from the date of receipt of documents specified in PO along with PBG at BHEL bank. Respective bank charges to respective account.



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

If supplier insists for LC, only Usance LC with 60 days' credit will be opened, one month prior to material readiness, Further loading will be considered @ 1.5% on the offered value. Hence, supplier shall intimate the material readiness accordingly for opening LC. LC validity period will be 90 days and for any extension, applicable charges will be to suppliers account.

Any deviation in the above payment terms, any other conditions in payment terms or any other payment terms will not be accepted and offers will not be considered.

- b. Liquidated Damage:** Liquidated damages shall be 0.5% of the total order value per week of the delay or part thereof, subject to a maximum of 10% of the total order value. Any deviation from the above LD clause, loading will be applied to the extent to which it is not agreed by the bidder (at offered value)

Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers. Hence applicable GST shall also be recoverable from suppliers on LD amount. Debit note will be issued by BHEL for this amount, indicating the respective supply invoice number.

c. Delivery Terms:

For Indigenous Suppliers: FOR BHEL Trichy Stores. The quoted Rate shall be inclusive of Packing, Forwarding and Freight. (Ex-Works, Freight to pay basis is not acceptable to BHEL.) Insurance will be on BHEL scope.

For Foreign Suppliers: CFR Chennai seaport as per Incoterms 2010.

- d. Validity of Offer:** Prices should be fixed and should be valid for period as mentioned in the "Confirmation to the Terms and Conditions" attached.
- e. Delivery period:** Delivery schedule will be as mentioned in the "Confirmation to the Terms and Conditions" attached.
- f. Guarantee period:** The vendor shall give a guarantee for the performance of his supplies for a period of **eighteen months** from the date of dispatch or **twelve months** from the date of commissioning whichever is earlier.
- g. Miscellaneous:** Any conditions which might have been quoted by the seller and are in contravention to the terms of PO and which have not been specifically accepted by Purchaser will not be applicable to the contract/PO.
- h. Performance Bank Guarantee:** If tender calls for Performance Bank Guarantee, vendor should provide a performance bank guarantee (PBG) in BHEL format for 10% of the total Purchase order value valid for warranty/guarantee period with an additional claim period of 3 months. PBG should be issued from list of consortium banks.

3. COMPLIANCE / ACCEPTANCE REQUIRED FOR FOLLOWING POINTS TO ENSURE INPUT TAX CREDIT

- a.** Response to Tenders for Indigenous supplier/Vendor will be entertained only if the vendor has a valid GST registration No (GSTIN) which should be clearly mentioned in the offer. If the Vendor is exempted from GST registration, a declaration with due supporting documents need to be furnished for considering the offer. Vendor under composition scheme should declare that he is a composition Vendor supported by the screen shot taken from GST portal. The dealer has to submit necessary documents if there is any change in status under GST.
- b.** Supplier shall mention their GSTIN in all their invoices (incl. credit Notes, Debit Notes) and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No. which is linked/uploaded in GSTN network shall be clearly indicated), Billed to party (with GSTIN) & Shipped to party details, item description as per PO, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, Place of Supply etc.
- c.** Invoices will be processed only upon completion of statutory requirement and further subject to following:
- Vendor declaring such invoice in Form GST ANX-1
 - Receipt of Goods or Services and Tax invoice by BHEL
- d.** All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
- e.** As the continuous uploading of tax invoices in GSTN portal (in GST ANX-1) is available for all (i.e. both Small & Large) tax payers under proposed new GST Return System, all invoice raised on BHEL may be uploaded immediately in GST portal on despatch of material /rendering of services. The supplier shall ensure availability of Invoice in GST portal before submission of invoice to BHEL. Invoices will be admitted by BHEL only if the invoices are available in GSTN portal (in BHEL's GST ANX-2).



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

- f. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
- g. All documents like Test Certificate, LR copy, any other document mentioned in PO, shall be sent along with the vehicle/consignment. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
- h. In case of discrepancy in the data uploaded by the supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note or debit note (details also to be uploaded in GSTN portal) for the shortages or rejections in the supplies or additional claims, within the calendar month informed by BHEL.
- i. In cases where invoice details have been uploaded by the vendor but failed to remit the GST amount to GST Department (Form PMT-08 or Form GST RET-01 to be submitted) within stipulated time, then GST paid on the invoices pertaining to the month for which GST return not filed by the vendor will be recovered from the vendor along with the applicable interest (currently 24% p.a) and all subsequent bills of the vendor will not be processed till filing of the GST return by the vendor.
- j. Under GST regime, BHEL has to discharge GST liability on LD recovered from suppliers/contractors. Hence applicable GST shall also be recoverable from suppliers/contractors on LD amount. For this, debit note will be issued by BHEL indicating the respective supply invoice number.
- k. In case any changes in taxes and duties as per Gov. Notification (including GST), the same shall be applicable from time to time.
- l. Duplicate copy of the Invoice meant for the transporter should accompany the material as stipulated under CE Rules 52A and 172C OR 57CE.
- m. TDS on GST shall be applicable as per the GST Act.
- n. In case GST credit is denied to BHEL due to non-receipt or delayed receipt of goods and/ or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount claimed in the invoice shall be disallowed to the vendor.
- o. Where any GST liability arising on BHEL under Reverse Charge (RCM), the vendor has to submit the invoices to BHEL well within the timeline prescribed in GST Law, to enable BHEL to discharge the GST liability. If there is a delay in submission of invoice by the vendor resulting in delayed payment of GST by BHEL along with Interest, then such Interest payable or paid shall be recovered from the vendor.
- p. GST TDS will be deducted as per Section 51 of CGST Act 2017 and in line with Notification 50/2018 – Central Tax dated 13.09.2018. GST TDS certificate which will be generated in GST portal subsequent to vendor accepting the TDS deduction in the GST portal, will be issued to the vendor.

4. SPECIAL PROVISIONS FOR MICRO AND SMALL ENTERPRISES (MSE):

- a. In case both MSE and Non-MSE Vendors have participated and non-MSE Vendor has become the lowest bidder and the quantum envisaged in the tender cannot be split, then the MSE vendor will be given preference for ordering the available quantum provided the MSE vendor quoted price is within L1 + 15%, and if the MSE vendor accepts the L1 rate.
- b. MSE suppliers can avail the intended benefits only if,
The vendor submits along with offer, Udyam registration certificate for the financial year of the date of part-1 bid opening,
(or)
The vendor has already submitted the above documents for the financial year of the date of part-1 bid opening and the MSE status has been updated in BHEL Trichy's records.
Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.
- c. Payment for MSE vendors will be as per MSMED Act, 2006.



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

5. RISK PURCHASE PENALTIES

- a) In the event of any successful Tenderer's failure to fulfil any of the tender / Contract obligations including supply of whole or any part of the ordered items as per Contract / Agreement, BHEL has the right to terminate the contract and purchase from elsewhere, at the risk and cost of the defaulted supplier, either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated in the contract or if the same were not available, the best and nearest available substitute thereof. The supplier shall be liable for the additional expenditure/difference in Cost, if any, including consequential losses which BHEL may sustain by reason of risk purchase in addition to the applicable LD as per the Purchase order/contract. b) The decision of BHEL with regard to the additional expenditure / difference in cost and consequential losses incurred by BHEL shall be final and binding on the supplier.
- b) The amount recoverable under risk purchase shall be recovered from the defaulted supplier in all or any of the following manners:
- from dues available in the form of Bills payable to defaulted supplier, SD, BGs against the same contract.
 - from the dues payable to defaulted supplier against other contracts in the same Region/Unit /any other region/unit
 - c) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against defaulted supplier.
 - d) Withdrawal of offer after price bid opening or varying the same in any manner within the validity period, but before the placement of order will be liable for suitable action for suspension of further business with the vendor as per BHEL corporate procedures.
 - e) Abridged version of extant 'Guidelines for suspension of business dealings with suppliers/ contractors' has now been uploaded on www.bhel.com on "supplier registration page" at the following link:
http://www.bhel.com/vender_registration/vender.php (Guidelines for suspension of business dealings with suppliers/ contractors).

6. GENERAL CONDITIONS

- a. The manner of finalization will be as mentioned in the "Confirmation to the Terms and Conditions" attached. Separate orders will be released for each project and documents should be supplied for each order separately.
- b. BHEL reserves the right to reduce the tender quantity and to NOT to order for some or all material based on the changes in project.
- c. BHEL shall have the right to visit vendor works during the execution of contract along with end customer for verifying status, inspection and testing of the material.
- d. BHEL reserves the right to negotiate or re-float the tender in case the quoted prices are not acceptable.
- e. Supplier shall arrange packing to avoid loss or damages during Road Transport, Site handling & Storage.
- f. BHEL reserves the right to reject the offer of a particular bidder due to unsatisfactory past performance in the execution of a contract at any of BHEL projects / units.
- g. The Drawings and Technical documents given in this enquiry are the sole property of BHEL. This should not be misused in any form.
- h. Purchase Order, PO Item serial number, Material code, Quantity should be clearly marked on the packing
- i. Confirmation for compliance is to be given in the offer for all the conditions specified above and to the respective Purchase Specification.
- j. The bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL fraud prevention policy (refer www.bhel.com) and shall immediately bring to the notice of the BHEL management about any fraud or suspected fraud as soon as it comes to their notice.
- k. For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017, 28.05.2018, 29.05.2019 and 04.06.2020, issued by DPIIT, Ministry of Commerce and Industry. Subsequent Orders issued by the respective Nodal Ministry, if any, shall be applicable even if issued after issue of this NIT but before finalization of



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE
Trichy - 620 014, India
GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

contract / PO / WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase and / or local content in respect of this procurement, same shall be applicable.

I. Force Majeure clause

a. Notwithstanding the provisions contained in other clauses, the supplier shall not be liable for imposition of any such sanction so long the delay and/or failure of the supplier in fulfilling its obligations under the contract is the result of an event of Force Majeure. For purposes of this clause, Force Majeure means an event beyond the control of the supplier and not involving the supplier's fault or negligence and which is not foreseeable and not brought about at the instance of the party claiming to be affected by such event and which has caused the non – performance or delay in performance. Such events may include, but are not restricted to, wars or revolutions, hostility, acts of public enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes excluding by its employees, lockouts excluding by its management, freight embargoes and Acts of GOD.

b. If a Force Majeure situation arises, the supplier shall promptly notify the Purchaser/Consignee in writing of such conditions and the cause thereof within twenty-one days of occurrence of such event. Unless otherwise directed by the Purchaser/Consignee in writing, the supplier shall continue to perform its obligations under the contract as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

c. If the performance in whole or in part or any obligation under this contract is prevented or delayed by any reason of Force Majeure for a period exceeding sixty days, either party may at its option terminate the contract without any financial repercussion on either side.

d. In case due to a Force Majeure event the Purchaser/Consignee is unable to fulfil its contractual commitment and responsibility, the Purchaser/Consignee will notify the supplier accordingly and subsequent actions taken on similar lines described in above sub-paragraphs.

m. Resolution of Disputes

The Parties agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the contract/tender which the Parties are unable to settle mutually), arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.

2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Annexure X to this Terms and conditions.

The Annexure X together with its appendices will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this terms and conditions.



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to other Party refer such dispute or difference to sole arbitration of an arbitrator appointed as per the Arbitration and Conciliation Act, 1996 (India) or statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force.

The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the parties. Subject as aforesaid, the provision of Arbitration & Conciliation Act 1996 (India) or statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause.

The seat of arbitration shall be Trichy, Tamil Nadu, India

The cost of arbitration shall be borne as per the award of the Arbitrator.

Subject to arbitration in terms of clause above, the Courts at Trichy, Tamil Nadu, India shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.

Notwithstanding the existence or any dispute or difference and/or reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of its obligation under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

In Case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/Port Trusts inter se and also between CPSEs and Government Departments/Organizations (Excluding disputes concerning Railways, Income Tax, Customs & Excise Departments, such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE OM No. 4(1)/2013 –DPE (GM)/FTS-1835 dated 22-05-2018.

7. DOCUMENTATION:

- a. **With Consignment:** Duplicate for transporter copy, Original Invoice, Packing List, Delivery Challan, O&M manual (if applicable) Material Test Certificate, Test Certificates, Compliance Certificate, Guarantee/Warranty Certificate and other documents mentioned in PO/TDC/Drawing.
- b. **To Purchase:**
 - i. FOR BHEL TRICHY case- Original Invoice, Duplicate for transporter copy, Packing list, LWB and Delivery challan, GST declaration as mentioned in point 3c.
 - ii. FOR Site case- Original Invoice, Original LWB, Original Packing List, Original IBR documents, Original despatch clearance Certificate and Inspection report, Test certificates as per PO, Original Site Acknowledgment etc.
- c. **Identification:** Material code, Purchase Order, PO item serial number, Unique serial number if any should be provided in all despatch documents, materials and packing clearly.

8. TENDER EVALUATION:

- a. **Techno-commercial Bid.**
 - i. All vendors should submit General arrangement drawing, datasheet and C&I diagram (if any) of the offered product
 - ii. Point by point technical confirmation of all pages of our technical specifications and commercial conditions are required with your sign and seal along with techno commercial offer.
 - iii. Offers from supplier not having technical capability or not agreed for commercial terms, will be rejected.
- b. **Price Bid.**
 - i. Bidders qualified for part I will be intimated for participating in priced bid opening.



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

- ii. L1 bidder will be decided based on landed cost for the equipment to BHEL.

Indigenous Vendors

Total Landed cost/rate for each item = FOR Rate in INR (A) + Applicable Taxes (B) + Loading non-acceptance of commercial terms (C) – Applicable input tax credit (D)

A - Indigenous vendors submit offers on Free on Road (FOR), Stores, HPBP BHEL Trichy in INR for Spares and Free on Road (FOR), Panki Site for Main Supply items.

B - Applicable GST and any other charges quoted by indigenous vendors will be added to the base price.

C - Loading for non-acceptance of payment terms & liquidated damages (LD) will be added to the F.O.R. value for arriving the landed rate.

D - However, input tax credit shall be availed for GST, hence the same is excluded for arriving at the landed cost.

Foreign Vendors

Total Landed cost = CFR Rate in INR (A) + Applicable Duties (B) + Incidental Charges (C) + Loading for Container Shipment (D) + Loading for non-acceptance of commercial terms (E)

A - Foreign vendors to submit offers on CFR (Cost & Freight), Chennai port (LILO – Liner In; Liner Out) basis per item wise in foreign currency, which will be converted to INR by multiplying with the Exchange rate (SBI TT Selling rate) as on the technical bid opening date. If the date of opening happens to be a bank holiday, then the forex rate as on previous bank (SBI) working day shall be taken.

B - Customs duty, Safe guard duty (as per the notification No 02/2014-Customs (SG) dated 13th August 2014) and antidumping duty (as per the notification No 18/2016-Customs (ADD) dated 17.05.2016) as if applicable will be added to the INR price.

C - Incidental charges will be added to the CFR Value. The incidental charge is inclusive of port handling charges, & freight charges for movement from Chennai port to BHEL, Trichy for spares and Chennai port to Panki Site for Main supply items.

D - In case of shipment through containers, if 14 free days for Container detention is not provided in the offer, a loading of 22% on the freight rate per MT shall be considered by BHEL for arriving at the Total Landed Cost.

E - Loading for non-acceptance of payment terms, delivery schedule & Liquidated Damages (LD) will be added to the CFR value for arriving at the landed cost.

- iii. In case of tie for the L1 positions,

- In the course of evaluation, if more than one bidder happens to occupy L1 status, effective L1 will be decided by soliciting discounts from respective L1 bidders.
- In case more than one bidder happens to occupy the L1 status even after soliciting discounts, the L1 bidder shall be decided by a toss/draw of lots, in the presence of the respective L1 bidders(s) or their representative(s).
- Ranking will be done accordingly, BHEL's decision in such situation shall be final and binding.

9. IMPORTANT INFORMATION FOR FOREIGN SUPPLIERS:

- Port of loading should be indicated in the offer without fail.
- Port of discharge should be Chennai Sea/Air Port, India.
- The preferred shipment mode "Containerized Cargo or Break Bulk" shall be specified clearly in the offer.

d. In case of CFR INCO TERMS - CONTAINERIZED CARGO

- In case of CFR terms, moved through CONTAINERS (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted is on LILO (LINER IN LINER OUT) basis including extra charges, if any, like Container Imbalance Charges, Trade Imbalance charges or any other charges payable to the Liner. No other charges other than the quoted Freight rate will be paid by BHEL excepting applicable Terminal Handling Charges, Container cleaning Charges, DO charges to Shipping Liner at Discharge Port. 14 FREE DAYS for Container detention shall be provided. If any deviation is taken by Tenderer, a loading of 22% on the freight rate per MT shall be considered by BHEL for arriving at the Total Landed Cost.
- In case of shipment through Containers on CFR basis, the BL should bear the endorsement that "14 free days for Container Detention is applicable".



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014, India

GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

- e. In case of CFR INCO TERMS - BREAKBULK CARGO:** In case of CFR terms, moved through BREAK BULK BASIS (Suppliers should clearly specify this in their offer) it would be presumed by BHEL that the freight charges quoted is on LILO (LINER IN LINER OUT) basis. The materials will be Custom cleared from Port itself.
- i.** The Indian Customs imposed, a penalty on late filing of Bill of Entries (Air/Sea Shipments) by the importer. The maximum free time allowed is 24 hrs from the time of arrival of cargo at final port of discharge. Rs.5000/- per day (for Initial 03 days) & Rs.10000/- per day (thereafter)
- ii.** The vendor should furnish the Non-Negotiable Documents (Air Way Bill/Bill of Lading, Commercial Invoice, Packing List, and Certificate of Origin) either by email or post/courier to BHEL well before the landing of cargo at final port of discharge.
- iii.** Vendor will be held responsible for the penalty arises against the late filing of Bill of entry due to:
- Non availability of Non-Negotiable Documents (NNDs) before the cargo arrival
 - Discrepancy in documents
 - Short landing of Consignments (For shipments on CFR/CPT/CIF/CIP – Chennai Port)
- iv.** All the shipments for the contracts (POs) finalized on CFR -Chennai Port basis
- Delivery Orders involving multiple agencies like liners/freight forwarders are not allowed. There must be a single agency office at the final discharge Port (Chennai) for issuing the Delivery Order to BHEL.
 - The detention/demurrage charges arise due to the delay in collection of Delivery Orders from multiple agencies of liner/freight forwarder also whose offices are not at available Chennai, the same amount will be deducted from Vendor's bills only.
 - Apart from the normal charges like Terminal Handling Charges, Container cleaning Charges, Delivery Order Charges at final port of discharge no other charges will be borne by BHEL.
 - The liner/freight forwarders should be properly communicated by the Vendor for not to claim such charges for issuing Delivery Order. If the liner/freight forwarder claims such charges in their invoices, the same amount will be deducted from the Vendor bills without any prior intimation in order to avoid the delay in Customs clearance.
- The likely additional/hidden costs or charges are:
- CIC - Container Imbalance Charges/Surcharges
 - EIC - Equipment Imbalance Charge/Surcharges
 - CAF - Container/Currency Adjustment Factor
 - BAF - Bunker adjustment Factor
 - RDS - Rupee Depreciation Surcharge
 - CDS - Currency Depreciation Surcharge

f. Transport Conditions for Import:

The Original Documents (Bill of Lading, Invoice, Packing List, Certificate of Origin & Test Certificate) shall reach BHEL well in advance before the vessel arrival. The soft copies of the above shall be forwarded to BHEL immediately after shipment.

- In the event of delayed submission of documents by the supplier, an amount up to 5% of the invoice value will be retained towards demurrage & other charges and the difference if any between actual charges and recovery will be settled separately through supplementary invoice.
- In such cases, the Supplier shall authorize the Steamer / Shipping agent / transporter to freely release the consignment to BHEL by providing a "Surrender Bill of Lading".
- Otherwise, No-objection Certificate shall be issued to the Liner, authorizing BHEL to get the Delivery Order without producing the Original Bill of Lading.
- This is required to ensure avoidance of demurrage at Chennai Sea-port that may arise in case of delayed presentation of documents by the Seller.

Following details to be endorsed in OBL

- Import & Export Code (IEC) of importer: 0588138690
- GST Identification No (GSTIN) of importer: 33AAACB4146P2ZL
- Official email id of importer: sivabala@bhel.in ; sivama@bhel.in

d. Indian Agent & Agency commission:



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE
Trichy - 620 014, India
GENERAL TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

- i. An Indian Agent can represent / submit offer of only one original equipment manufacturer (OEM) against a particular Tender. If any Indian Agent represents two or more than one OEM against the same tender, then the Offer will be rejected.
- ii. The CFR - Cost and Freight Chennai Sea Port, price quoted by the Foreign Bidder shall also include the Agency commission. The bidder shall furnish authenticated copy of the Agency Agreement detailing the precise relationship between them and their mutual interest in the business so as to consider the offer of the Indian Agent for the indigenous portion of the supply. For the main equipment, the offer should be from the Principal / OEM. The bidders have to furnish the original Authorization Letter for the Indian Agent along with the Techno-Commercial Offer.

Note:

No routine correspondence shall be addressed to the IEM (phone/post/email) regarding the clarifications, time extensions or any other administrative queries etc. on the tender issued. All such clarifications / issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below

(1)
Avinash V
Sr. Engineer
Valves Purchase
24 Building, 3rd Floor,
BHEL, Trichy-620014
+91 431 2574797
vavinash@bhel.in

(2)
A Wilfred Joseph
AGM
Valves Purchase
24 Building, 3rd Floor,
BHEL, Trichy-620014
+91 431 2578146
wiljoe@bhel.in

ANNEXURE 2B
CONFIRMATION TO TERMS
& CONDITIONS



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014. India

CONFIRMATION TO TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

<u>TERMS & CONDITION</u>	<u>VENDOR CONFIRMATION</u>
a. Quotation No and date	
b. Vendor should give confirmation to BHEL's Technical Specification. Any deviations from the specification are to be furnished separately as "Schedule of Deviation". If there is no deviation vendor should indicate "No Deviation".	
c. The offer has to be submitted as a Two-part bid i.e. 1. Techno-commercial 2. Price bid	
d. Terms of Payment: <u>Indigenous Supplier (Non-MSE):</u> Payment term is 100% direct payment after 60 days from the date of receipt and acceptance of materials and against 10% PBG valid for the warranty period. <u>Indigenous Supplier (MSE):</u> Payment will be as per MSMED Act, 2006 Suppliers quoting for MSE payment must produce CA certificate (original), based on audited reports of FY 2019-2020, in the enclosed template in terms and conditions (signed and sealed in CA's letter pad) and copy of UAM. If submitted earlier, same shall be informed. OR Suppliers quoting for MSE payment must produce Udyam registration certificate in part 1 bid documents. <u>Import Supplier:</u> 100% payment on CAD basis after 60 days from the date of receipt of documents specified in PO along with PBG at BHEL bank. Respective bank charges to respective account.	
e. Liquidated Damage: Liquidated damages shall be 0.5% of the total order value per week of the delay or part thereof, subject to a maximum of 10% of the total order value.	
f. Delivery Terms: Prices shall be quoted on " FIRM PRICE " basis only. <u>For Indigenous Supplies:</u> FOR/ BHEL Trichy Stores. The quoted Rate shall be inclusive of Packing, Forwarding and Freight. (Ex-Works, Freight to pay basis is not acceptable to BHEL.) <u>For Import Supplier:</u> CFR/Chennai Seaport. The quoted Rate shall be inclusive of Packing, Forwarding and Freight. (Ex-Works, Freight to pay basis is not acceptable to BHEL.)	
g. Validity of Offer: Prices should be valid for 120 days from the date of part-1 bid opening of this tender. The delay in responding to BHEL technical clarification beyond four days will be subsequently added to the validity period, Revised Price Bids will not be encouraged	
h. Delivery period: Delivery period should be 12 weeks from the date of document approval. for Vendor quoted delivery period shall include all the activities i.e. manufacturing / production, Inspection, Packing, Forwarding and dispatch.	
i. Risk Purchase: Risk purchase penalties as per clause 5 of general terms and conditions is applicable for this enquiry. Non acceptance to risk purchase clause the offer is liable for rejection.	
j. Guarantee Clause: The vendor shall give a guarantee for the performance of his supplies for a period of eighteen months from the date of dispatch or twelve months from the date of commissioning whichever is earlier.	



BHARAT HEAVY ELECTRICALS LTD

VALVES PURCHASE

Trichy - 620 014. India

CONFIRMATION TO TERMS AND CONDITIONS

Enquiry Reference: ENSFV00243

<u>TERMS & CONDITION</u>	<u>VENDOR CONFIRMATION</u>
k. Performance Bank Guarantee: Vendor should provide a performance bank guarantee (PBG) in BHEL format for 10% of the total Purchase order value valid for warranty/guarantee period with an additional claim period of 3 months. PBG should be issued from list of consortium banks	
l. Local content certificate: Supplier shall submit the local content certificate with self-declaration in part 1 bid documents.(Refer sample for local content certificate in attachment)	
m. Inspection: Inspection shall be done by BHEL/TPIA and NPCIL/TPIA at vendor works as per VQP approved by NPCIL. Clause wise Indexing, based on Quality Plan, shall be part of Test reports and Test certificates submitted	
n. Document submission: In case of PO, documents (drawings, data sheets and quality plan) shall be submitted within 14 days from the date of receipt of PO and the revised documents shall be submitted within 1 week from the date of receipt of engineering / quality comments. Any delay beyond the above specified period will be considered during LD calculation.	

Supplier Seal and Sign

ANNEXURE 3A
PRICE BANK GUARANTEE
FORMAT

BANK GUARANTEE FOR PERFORMANCE SECURITY

(Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s))

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

IFSC AND MICR CODE

Dear Sirs,

1. In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____¹ through its Unit at.....(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) (VENDOR CODE) with its registered office at _____² hereinafter referred to as the ' Vendor / Contractor / Supplier ', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated³ valued at Rs.....⁴ (Rupees -----)/FC.....(in words.....) for⁵ (hereinafter called the 'Contract') and the Vendor / Contractor / Supplier having agreed to provide a Contract Performance Bank Guarantee, equivalent to% (... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

2. we,, (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer any sum or sums upto a maximum amount of Rs -----⁶ (Rupees -----) without any demur, immediately on first demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand.

3. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

4. We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor / Contractor / Supplier in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

5. The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the Vendor / Contractor / Supplier shall have no claim against us for making such payment.

6. We thebank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract/satisfactory completion of the performance guarantee period as per the terms of the Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

7. We.....BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Vendor / Contractor / Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Vendor / Contractor / Supplier and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Vendor / Contractor / Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Vendor / Contractor / Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

8. The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Vendor / Contractor / Supplier and notwithstanding any security or other guarantee that the Employer may have in relation to the Vendor / Contractor / Supplier's liabilities.

9. This Guarantee shall remain in force upto and including.....⁷ and shall be extended from time to time for such period as may be desired by Employer.

10. This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Vendor / Contractor / Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

11. Unless a demand or claim under this guarantee is made on us in writing on or before the⁸we shall be discharged from all liabilities under this guarantee thereafter.

12. Any claim or dispute arising under the terms of this document shall only be enforced or settled in the Courts at Tiruchirappalli.

13. We..... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed.....⁶

- b) This Guarantee shall be valid up to⁷
- c) Unless the Bank is served a written claim or demand on or before (minimum 3 to 6 months from the expiry date)⁸ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

14. We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

BANK EMAIL ID:

BANK PHONE NO:

AUTHORISED SIGNATORIES CELL PHONE NO:

BANK FAX NO:

¹ NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

² NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

⁴ CONTRACT VALUE

⁵ PROJECT/SUPPLY DETAILS

⁶ BG AMOUNT IN FIGURES AND WORDS

⁷ VALIDITY DATE

⁸ DATE OF EXPIRY OF CLAIM PERIOD

ANNEXURE 3B
LIST OF CONSORTIUM
BANKS

List of BHEL's Consortium Bankers

1. State Bank of India
2. Canara Bank
3. Punjab National Bank
4. Bank of Baroda
5. Corporation Bank
6. Syndicate Bank
7. Oriental Bank of Commerce
8. Indian Bank
9. State Bank of Travancore
10. State Bank of Hyderabad
11. IDBI Limited
12. ICICI Bank Limited
13. HDFC Bank Ltd.
14. Kotak Mahindra Bank
15. The Hongkong and Shanghai Banking Corporation Ltd.
16. Standard Chartered Bank
17. Citi Bank N.A.
18. Deutsche Bank AG
19. Allahabad Bank
20. Andhra Bank
21. Central bank
22. Indian Overseas Bank
23. Punjab & Sindh bank
24. UCO Bank
25. Union Bank of India
26. United Bank of India
27. Vijaya bank
28. J P Morgan
29. Axis bank
30. The Federal Bank Limited
31. Indusind Bank
32. Yes Bank

ANNEXURE X

**PROCEDURE FOR CONDUCT OF
CONCILIATION PROCEEDINGS**

**ANNEXURE TO MODEL CONCILIATION CLAUSE FOR CONDUCT OF
CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018**

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:
2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings.
3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL.
5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.
7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within

15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.

8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.
9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.
12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.

14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.
15. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
16. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
17. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
18. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
19. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.
20. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall

however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.

21. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.
22. The proceedings of Conciliation under this Scheme may be terminated as follows:
- On the date of signing of the Settlement agreement by the Parties; or,
 - By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,
 - By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
 - By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration.
 - On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.
23. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	Particulars	Amount
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator)

Sl No	Particulars	Amount
		In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator) In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation and stay at outstation i) Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)	As per entitlement of the equivalent officer (pay scale wise) in BHEL.
	Others	As per the extant entitlement of whole time Functional Directors in BHEL.

Sl No	Particulars	Amount
		Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class.
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region / Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

24. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.
25. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.
26. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.
27. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.

28. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 3 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.
29. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/regulatory body, as the case may be.
30. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
- a. Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
 - b. admissions made by the other party in the course of the Conciliator proceedings;
 - c. proposals made by the Conciliator;
 - d. The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.
31. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
32. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
33. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue

notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.

34. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

ANNEXURE Z
SAMPLE LOCAL CONTENT
CERTIFICATE

(Vendor's Letter Head)

DECLARATION

In line with the Government Public Procurement, Order No. P-45021/2/2017-PP (BE-II) dated 28.05.2018, we hereby certify that we,

Supplier Name:,

with Vendor Code, are local supplier meeting requirement of minimum local content (.....%) defined in as above orders for the following items in Enquiry Serial Nos of BHEL Enquiry No:

- Mention quoted items Enquiry Serial Nos -

Details of location at which local value addition will be made is as follows:

.....
.....

By issuing this declaration, we understand and are in acceptance to the following-

- False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.
- In case of debarment by any procuring entity for violation of the provisions of the Public Procurement (Preference to Make in India), Order 2017 we shall not be eligible for preference for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities, the debarment takes effect prospectively from the date of uploading on the website(s) of The Department of Expenditure, GOI in such a manner that ongoing procurements are not disrupted.
- We undertake the onus of responsibility of submission of appropriately certified documents. We understand that BHEL is not at liability to verify the contents and will not be responsible for the declaration made by us. However, in case BHEL has any reason to doubt the authenticity of the local content, BHEL reserves the right to obtain the complete back up calculations before award of contract and we are liable to submit the same if requested by BHEL. We also understand that our bid is liable for rejection in case we fail to submit the details as requested by BHEL.

Date:

Seal and Signature of authorized signatory