बी एच ई एल BHEL	**BHARAT HEAVY ELECTRICALS LIMITED** (A Government of India Undertaking) Ramachandrapuram, Hyderabad, 502032, A.P. India Phone 040-23184526, 23182322 FAX:040-23021910, 1954	**भारत हेवी इलेक्ट्रिकल्स लिमिटेड** (भारत सरकार का उपक्रम) रामचन्द्रपुरम, हैदराबाद, 502032 आंध्र प्रदेश, भारत	RFQ NO :	**PURCHASE DEPARTMENT** **ENQUIRY** क्रय विभाग जांच (ई मेल : tenderbox@bhelhyd.co.in)	SHEET:1 OF :1

HY17001 C REV.NO.0	Phone 091-40-23184526 091-40-23182322	FAX : 091-40-23021910 091-40-23021954	**PURCHASE DEPARTMENT**

GSTIN:	Enq/Collective No :B7H1V01031	Enq.Dt. : 16.08.2022	No.Of Items :4	DUE Dt. OF QUOTN. : 30.08.2022

Office Copy

Please submit your lowest quotation in sealed cover superscribed with Enquiry No./Collective No.(RFQ No .....) and due date subject to our terms and conditions attached ,for the materials mentioned below.Your offer has to reach us onor before due date by 11.00 Hours (IST) and will be opened at 14.00 Hours.(IST).If our Enquiry No./Collective No.(RFQ No .....) and tender due date are not super scribed on the tender cover , your offer shall be summarily rejected. Incomplete offers and late offers will not be considered.

SL NO	Purchase Req.no	item no	Material Code, HSN No.	Drg no - Ver , Rev & Spec - Ver , Rev,Spec-Var	Description	Unit	Qty	Delivery Date	Schedule Qty
1	7000101032	10	TC9756636017 84818030	NA-,,TC56636,00,01	MOV GATE VALVE CS 8" #300RF NACE+H2	EA	1.000	03.12.2022	1.000
2	7000101033	10	TC9756636025 84818030	NA-,,TC56636,00,02	MOV GATE VALVE CS 12" #300RF NACE+H2	EA	1.000	03.12.2022	1.000
3	7000101034	10	TC9756636033 84818030	NA-,,TC56636,00,03	MOV GATE VALVE CS 18" #300RF NACE+H2	EA	1.000	03.12.2022	1.000
4	7000101031	10	TC9756638010 84818030	NA-,,TC56638,00,01	MOV GATE VALVE CS 18" #300RF NACE+H2	EA	2.000	09.12.2022	2.000

Special Remarks

CheckList of Quality Interventions:

BHEL reserves the right to enforce any or all of the following checks during execution of the order.
There is no additional cost to the vendor on account of these checks.

	TEST CERTIFICATE REQD: GUARANTEE REQ : SAMPLE REQD : BID TYPE : TWO PART	For and on-behalf of Bharat Heavy Electricals Limited. SUMIT DAS SARKAR DEPUTY MANAGER/TC_PURCHASE

Bill of Materials: STRAINER - for Numaligarh Refinery Ltd. CCR-RGC Project
Numaligarh Refinery Ltd. RPTU-SGC Project

ITEM Sl. NO	PR	MATERIAL CODE	DESCRIPTION	QTY/EA	SPECIFCATION	IBR REQUIREMENT	REMARKS
1	7000101032	TC9756636017	MOV GATE VALVE CS 8" #300RF NACE+H2	1.000	TC56636	No	
2	7000101033	TC9756636025	MOV GATE VALVE CS 12" #300RF NACE+H2	1.000	TC56636	No	
3	7000101034	TC9756636033	MOV GATE VALVE CS 18" #300RF NACE+H2	1.000	TC56636	No	
4	7000101031	TC9756638010	MOV GATE VALVE CS 18" #300RF NACE+H2	2.000	TC56638	No	

Notes:

1 Delivery Required in **12 Weeks.** Supplier to quote the best possible delivery.

2 Supplier shall submit offer for Destination. P&F,Freight and insurance in supplier scope.

3 Third party Inspection (TPI) is in BHEL scope (Charges to BHEL account). However, supplier shall coordinate with BHEL-TPI agency for inspection.

4 Suppliers shall submit complete compliance to BHEL specifications in their technical bid. Technical acceptance of the offers/ Bids is subject to end customer approval only.

5 Evaluation is on Itemwise basis.

6 Integrity Pact (IP) is mandatory.

7 Item shall be delivered to below address.

For Item Sl. No. 1,2,3,4

TC STORES
BHEL /HPEP-HYDERABAD
RC Puram
TELENGANA
PIN-502032

Clause on IP in the tender

Integrity Pact (IP)

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Email
1.	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2.	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

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 clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

(1) Name: SUMIT DAS SARKAR Deptt: Dy Manager/Purchase-T&C Address: BHEL/HPEP-Hyderabad Phone: (Landline/ Mobile) 04023182155 Email: sdsarkar@bhel.in Fax: ---	(2) Name: B NARASIMHA RAO Deptt: Sr.Manager/Purchase-T&C Address: BHEL/HPEP-Hyderabad Phone: (Landline/ Mobile) 04023182374 Email: bnarasimha@bhel.in Fax: ---

Annexure G

Special Conditions of Contract (SCC) for GEM

Sl. No	Buyer ATC Clause No.	Clause	Available Options	BHEL requirements	Bidder response
1		Bank Guarantee against milestone payment	(If envisaged to be detailed with %)	Not applicable	
2	Others	Contract execution Bank Guarantee	__% of PO Value to be submitted after receipt of PO / Not Applic	Not Applicable	
3	17	Performance Bank Guarantee		Not applicable	
4		Guarantee / Warranty Period	a. Guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier. b. In case erection & commissioning is involved, Guarantee period shall be 12 months from the date of commissioning. c. In case of equipment bought as a package which are intended to be incorporated in installations or systems, the guarantee period shall be 12 months from the date of commissioning of such equipment.	a. Guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier.	
5	48	Detailed Billing Breakup (BBU)	Applicable / Not applicable	Not applicable	
6			(If applicable , Bidder shall provide detailed billing break-up in respect of the major items/components (stipulated in the tender) as part of offer .)		
7	Others	Customer approval of vendor	Applicable / Not applicable	Applicable	
8		Drawing approval	Applicable / Not applicable	Required after placement of PO	
9		QAP approval	Applicable / Not applicable	Required after placement of PO	
10	36	Inspection by	BHEL / BHEL TPI / Vendor TPI / Customer	BHEL TPI	

Annexure-I

Major Activity timelines shall be considered for indigenous purchases

S No	Activity	Agency	Timeline
1	PO acknowledgement	Vendor	03 days from the date of receipt of PO
2	First submission of Drawings, Data sheets and QP Rev-00	Vendor	15 days from receipt of PO
3	commented / approved drawings / data sheets and QP to vendor	BHEL/Customer	07 days from the receipt of Rev-00 submission.
4	Subsequent submission of revised drawings / data sheets and QP	Vendor	07 days from the receipt of commented drawings / data sheets and QP
5	Subsequent Approved /commented Drawings and QP to vendor	BHEL/Customer	07 days from the date of receipt of revised drawings / data sheets and QAP.
6	Raising of Inspection Call	Vendor	07 days before the proposing inspection date. (BHEL will provide approved QP before raising inspection call)
7	Inspection completion	BHEL Third party inspection agency / Customer	07 days from inspection call date.
8	Despatch Instructions	BHEL	07 days from the date of receipt of final approved inspection report to BHEL.
9	Receipt of Material at BHEL stores/ site	Vendor	15 days from Despatch instructions .

Absence of this annexure in NIT will entail non processing of delivery extension cases in case of delay in supplies of goods owing to reason attributable to BHEL.

Vendor Signature

Financial Criteria for Pre-qualification

The minimum average annual financial turnover of the supplier during the last 3 financial should not be less than Rs.74 Lakhs and positive net worth as per latest balance sheet.

Vendors shall enclose the last three financial years balance sheets and Profit & loss statements duly audited and certified by Charted Accountant.

In case of final audited balance sheet / Profit & Loss statement for the last year is not available, provisional statement for the same duly certified by Charted Accountant must be submitted.

In case audited financial statements have not been submitted for any of three years as indicated above, then the applicable audited statements submitted by bidders against the requisite three years will be averaged for three years i.e total divided by three.

Other incomes shall not be considered for arriving at annual financial turnover / sales. For evaluation purpose, only revenue from operations shall be considered.

Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad 502032, India

Ref # TCEL/PQC/VALVES/01 Dt: 11/02/2021

Pre- Qualifying criteria for the vendors participating in "Open Tender for enquiry no _____ – Reg.

Considering BHEL customers' requirement, offers from Chinese manufacturers / Chinese manufactured items are not allowed.

Clause wise response of vendor is necessarily to be submitted for technical evaluation of technical bid

Sl. No.	Description	Vendor's Response	Details of Documents enclosed, if any
1.1. General Requirements			
1.1.1	The manufacturers or their authorized principals (authority letter to be submitted) who are submitting the offer shall have in-house manufacturing facilities, heat treatment and testing facilities suitable for the manufacturing & testing of all valves as per this enquiry. However, the shot blasting & primer coating activity can be outsourced. Note: i) Offers from traders (for the purpose of this tender, any agency who is keeping /buying/supplying martials from different manufacturers under the same company's name, will be treated as trader) will not be considered.		
1.1.2	The offer shall be accompanied with relevant list of the in-house manufacturing and testing facilities & their capacities / ranges etc. Company catalogue or website address which included these details may be provided as an alternative.		
1.1.3	Vendors to confirm that they will meet all the requirements of BHEL specification provided with the enquiry. In case of any dispute/contradictions with the requirement of Pre-qualification criteria (this document) with the specification, the requirements of Pre-qualification criteria will be applicable.		
1.1.4	The vendor must have experience of manufacturing and supplying valves of the corresponding standards and grades as mentioned in the enquiry. Test Certificates shall be submitted as evidence of experience.		

	At least two copies (one for minimum size and class/rating and other for maximum size and class/rating) manufacturer test certificates (TC in IBR form for CS/AS items) for the same or similar grade supplied by them to other customers shall be submitted along with the offer. a) The date of the issue of "Test certificate" shall not be older than 3 years from the NIT date. b) The mill test certificate shall include the results / reports for all the tests like Chemical, Mechanical and NDT etc., as required by BHEL Specification applicable to the present enquiry. c) The test certificates submitted as an evidence of the past experience of the manufacturer must include test requirements as stipulated in BHEL specification.		
1.1.5	Evaluation of Experience Evidence: The experience will be evaluated against the test certificate provided by the vendor with respect to BHEL technical requirement of the specification.		
1.1.6	Prior to dispatch of the material, Test Certificates (English language only) shall be send to BHEL for review and dispatch clearance by BHEL. The photographs of the material with the traceability/ marking and condition of the material before dispatch may be provided for dispatch clearance.		
1.1.7	As per "Ministry of Steel Order (latest as applicable)," if any of the enquiry items fall under "List of Steel Products under Mandatory Bureau of Indian Standards Certification," BIS certificate is to be provided mandatorily. The BIS certificate submitted by the vendor shall be valid till the delivery of material. In case the BIS certificate is expiring before the material delivery date, Vendor shall confirm the renewal of the certificate in advance so that the timely supply of the material to BHEL is ensured.		

Vendor's Name & Address:	**VENDOR MANUFACTURING QUALITY PLAN**		QP. No.:	
	Customer : BHEL, HYDERABAD -32 Project : Product :	BHEL P. O .No.: P.O.Date : BHEL Spec : Rev :	Rev.:	Date :
			Page 1 of 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**												
2.0	**INPROCESS INSPECTION**												
3.0	**FINAL INSPECTION & TESTING**												
4.0	**SURFACE PREPARATION & PAINTING**												
5.0	**PRESERVATION & PACKING**												

Notes:

1. Drawing / Data Sheet / Specification shall prevail over Quality Plan in case of any contradiction.
2. Latest revision of Drawing / Specification shall be applicable.
3. All Manufacturing equipment, inspection equipment, heat treatment furnace / equipment shall be calibrated with applicable validity on the date of manufacture / inspection.

VENDOR TO NOTE (DO NOT SHOW THIS IN QP) THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: **P** : PERFORM, **W** : WITNESS, **V** : VERIFICATION. INDICATE 1 : BHEL / BHEL NOMINATED INSPECTION AGENCY , 2 : VENDOR , 3 : SUB-VENDOR , 4 : BHEL'S CUSTOMER / CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P W & V. * FOR ITEMS MARKED ✓ (TICK) UNDER COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	REVIEWED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP		CUSTOMER'S SIGNATURE & STAMP

Vendor's Name & Address:	**VENDOR MANUFACTURING QUALITY PLAN**		QP. No.:	
	Customer : BHEL, HYDERABAD -32 Project : Product :	BHEL P. O .No.: P.O.Date : BHEL Spec : Rev :	Rev.:	Date :
			Page 1 of 1	

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS

Annexure – I

Notes:

1. PRE-DESPATCH INSPECTION PHOTOGRAPHS OF THE EQUIPMENT/ITEM SHALL BE INCLUDED IN QUALITY DOCUMENTATION.
2. LATEST VERSION OF STANDARDS/DRAWINGS /TOLERANCES ETC TO BE MENTIONED IN QUALITY PLAN/DRAWING. THIS QP SHOULD BE READ ALONG WITH BHEL SPEC, BHEL DRAWINGS / APPROVED DRAWINGS, DATA SHEET, BOM AND PO.
3. DRAWING / DATA SHEET/ SPECIFICATION SHALL PREVAIL OVER QUALITY PLAN IN CASE OF ANY CONTRADICTION.
4. BHEL RESERVES THE RIGHT FOR CONDUCTING REPEAT TEST, IF REQUIRED.
5. BHEL APPROVED INSPECTION ENGINEERS TO BE DEPLOYED FOR INSPECTION.
6. ONLY LEVEL II & ABOVE QUALIFIED PERSON IN RESPECTIVE NDE TO VERIFY OR WITNESS THE NDT TEST REPORT/RESULTS.
7. INSPECTION TO BE OFFERED ONLY AFTER ENSURING THAT ALL DOCUMENTS (QUALITY PLAN, DRAWINGS, DATA SHEET, PURCHASE SPECIFICATIONS, ETC) ARE AVAILABLE AS PER PURCHASE ORDER.
8. VENDOR TO OFFER ORIGINAL TEST CERTIFICATES ISSUED BY THIRD PARTY LABORATORIES OR SUPPLIERS.
9. VENDOR TO ENSURE WITH TPIA THAT A NOTE 'COMPARED WITH ORIGINAL TEST CERTIFICATE. REVIEWED, VERIFIED AND FOUND IN ORDER' SHALL CONTAIN WITH EVERY INSPECTION REPORT.
10. ONLY VALID AND CALIBRATED MEASURING INSTRUMENTS AND EQUIPMENT SHALL BE USED – TPIA TO VERIFY.
11. VENDOR TO ENSURE WITH TPIA THAT MATERIAL TEST CERTIFICTAE & TRACEABILITY RECORDS ARE AVAILABLE FOR USE OF CORRECT MATERIAL.
12. QUALIFICATION OF EQUIPMENT, PROCESS & PERSONNEL FOR SPECIAL PROCESSES LIKE WELDING, BRAZING, PAINTING & METAL COATING ETC. (AS APPLICABLE AS PER PO) SHALL BE ENSURED.
13. VENDOR TO ENSURE THAT ALL CERTIFICATES ARE ENDORSED BY TPIA WITH COMMENTS (WITNESSED OR VERIFIED) AS PER QUALITY PLAN.
14. VENDOR SHALL OFFER LOG SHEETS CONTAINING ACTUAL MEASURED VALUES INSTEAD OF SAYING OK/NOT OK TO TPIA.
15. VENDOR SHALL SUBMIT COMPLETE INSPECTION AND TEST DOCUMENTATION WHICHEVER IS IDENTIFIED WITH (v) UNDER COLUMN 'D' OF APPROVED QULAITY PLAN SHALL BE ENCLOSED WITH THE INSPECTION REPORT.
16. VENDOR SHALL SUBMIT ORIGINAL COPIES OF ALL INSPECTION AND TEST DOCUMENTS AUTHENTICATED BY TPIA.

LEGEND: **P** : PERFORM, **W** : WITNESS, **V** : VERIFICATION. INDICATE 1 : BHEL / BHEL NOMINATED INSPECTION AGENCY , 2 : VENDOR , 3 : SUB-VENDOR , 4 : BHEL'S CUSTOMER / CONSULTANT AS APPROPRIATE AGAINST EACH COMPONENT / CHARACTERISTICS UNDER THE COLUMNS P W & V. * FOR ITEMS MARKED ✓ (TICK) UNDER COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	REVIEWED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP		CUSTOMER'S SIGNATURE & STAMP

Guidelines to vendors for preparation of Quality Plan

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.
2. Each page of QAP shall contain the following information.

    a) Vendor's name & address.
    b) Customer : BHEL, Hyderabad.
    c) Project : as indicated in P.O.
    d) BHEL Product Standard Number/revision number as indicated in P.O.
    e) BHEL Purchase Order Number & Date. LOI Ref. No. is not acceptable.
    f) Product : as per P.O. description.
    g) QAP Number (shall be unique & shall not repeat) / Revision number / date.
    h) Page number and number of pages
    i) Vendor signature & stamp

3. QAP shall contain four parts / stages as follows.
    a) Raw materials and bought out items.
    b) In-process Control / Inspection.
    c) Final assembly, Inspection & Testing.
    d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).
5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc), Hydrostatic test, calibration check etc.)
6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.
7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)
8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)
9. Under 'Reference document' and 'Acceptance norms', appropriate National / International standards, BHEL standards, approved drg references etc should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practise etc". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept.
10. Under 'Format of record', indicate appropriately supplier's Test certificate, calibration certificate, lab report, inspection report etc.
11. Please refer 'Agency' in QAP format.
    "Under P: Perform, W: Witness, V: Verify
    Indicate against each characteristic 1: (BHEL / BHEL Nominated inspection agency), OR 2: (Vendor / Sub-Vendor)
    Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code 1
12. Under 'D' please put (✓Tick) against each characteristic where vendor proposes to submit test certificate / report etc OR as required as per BHEL Spec.
13. Vendor's signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only in line and relevant to the Specification & Approved Drgs.

15. The following operations / characteristics / check points may be included (**As Appropriate)**

    a) Visual check
    b) Dimensional check
    c) Mechanical and Chemical properties.
    d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc as the case may be.)
    e) Painting check for shade, finish, Dry Film Thickness (DFT), Adhesion / peel-off test etc.
    f) Check for correctness for all components mounted as per General arrangement Drg, Bill Of Materials (BOM), etc for range, rating, make, colour, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.
    g) Verification of test certificate for protection class for the enclosures.
    h) Mechanical functioning of switches.
    i) Continuity of earthing and provision of earth points.
    j) Colour coding of wiring, size, tightness & dressing of wiring.
    k) Review of test certificates of assembled items, raw materials, internal test reports etc.
    l) Witness of functional checks, which may include mechanical run & electrical run, H.V. test, IR measurement, Electrical and Mechanical tests etc.
    m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
    n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc)
    o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests.
    p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Preece Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)
    q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
    r) Packing and Preservation.

Annexure 5 - Inspection And Test Plan For Flanges

1.0 SCOPE

This Inspection and Test Plan covers the minimum testing requirements of flanges

The supplier has to develop their own QCP and the same shall be submitted to MPMC/OWNER for approval.

2.0 REFERENCE DOCUMENTS

PO/PR & Standards referred there in / Job specification / Approved documents

3.0 INSPECTION AND TEST REQUIREMENTS

Sl. No.	STAGE	CHARACTERISTICS	QUANTUM OF CHECK	RECORD	SCOPE OF INSPECTION			
					SUPPLIER	TPIA / EPC	MPMC	OWNER
1.0	**Procedure**							
1.1	Supplier Quality Control plan	Documented Procedures	100%	Procedure Documents	P	RD	RD	
1.2	Heat Treatment, NDT and other Procedures	Documented Procedures	100%	Procedure Documents	P	RD		
2.0	**Material Inspection**							
2.1	Raw Material Inspection	Chemical, & Mechanical Properties	100%	Test Certificates	P	R		
3.0	**In Process Inspection**							
3.2	Heat Treatment	Stress Relieving, Normalizing, Tempering, Solution Annealing, Stabilization Heat treatment etc as applicable	100%	HT Chart	P	R		
3.3	Identification of test Samples	Product Chemical, Tensile, Hardness, Impact, IGC and other test as applicable	100%	Test Reports	P	W		
3.4	Corrosion & Metallurgical testing	Intergranular corrosion	Lot as per specification	Test Report	P	R		
3.5	Product Analysis (As applicable)	Chemical composition	PR / Purchase Specfication	Test Reports	P	RW		
3.6	Destructive Testing	Mechanical, Impact, IGC and Other test as applicable	100%	Test Report	P	R		
3.7	NDT As applicable	Surface & Internal Imperfections	PR / Purchase Specfication	NDT Reports	P	RW		
3.8	Machining and Drilling	Visual & Dimensional check	Lot as per specification	Inspection report	P	R		
3.8	Galvanizing (If Applicable)	Integrity Of Galvanished Coating	100%	Inspection Report	P	W		
4.0	**Final Inspection**							
4.1	Final Inspection	1.Visual 2. Dimesnions 3. Hardness 4. Marking etc	100%	Inspection Report	P	W (Note-4)		
4.3	PMI Check(If applicable)	Chemical check	As Applicable	Inspection Report	P	W		
4.4	Final Stamping	Stamping of Accepted Items	100%	Inspection Report	P	W		
5.0	**Painting**							
5.1	Rust Preventive Coating & color Coding	Visual & Color Coding as applicable	100%	Inspection Report	P	RW		
6.0	**Final Documentation**							
6.1	IRN	Issuance of Inspection Release Note after the final inspection	100%	Inspection & Test Reports as per QCP	P	H	I	
6.2	MDRB	Compilation of test reports/test records as per Project Procedure, IBR Form IIIC(If applicable)	100%	Supplier's Test Records / Inspection Witness Record.	-	H	I	

- Supplier to submit internal test reports before offering items for inspection to EPC.

Legend: H-Hold (Do not proceed without approval), P-Perform, RW-Random Witness (As specified or 10% (min.1 no.of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

NOTES (As applicable)

1. For Non NACE & Non Hydrogen service Carbon Steel Flanges, Spectacle Blinds & Drip rings upto 24" - 300 ANSI Class will be accepted on review of Supplier Test Certificates. Supplier Test Certificates to be reviewed by TPIA.
2. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable (unless otherwise agreed upon).
3. Acceptance Norms for all the activities shall be as per PO/PR/STANDARDS referred there in Job specification / Approved Documents.
4. 100% Visual & 10% dimensional checks of each size, pressure rating and type of component at vendors' works by Third Party Inspection Agency (TPIA).
5. TPIA involvement is mandatory

BUYER SPECIFIC - ADDITIONAL TERMS & CONDITIONS (ATC)		
NOTE: Bidder to confirm in affirmative by typing "YES" or "Applicable Data" in the response column.		
Sl. No.	**DETAILED TERMS & CONDITIONS**	**BIDDER RESPONSE**
1	**GENERAL INSTRUCTIONS:**	
A	The quotation should be neatly typed and free from over writing/ erasures. Any correction or addition must be authenticated. The offer including annexures and brochures should be submitted in English. All Pages of Techno Commercial Bids (Main Pages), ATC should be signed and Stamped. Prices shall be quoted both in figures and words. In case of any discrepancy in value, the prices quoted in words shall be considered for evaluation and establishing L1 Status.	
B	Bidders to please note that the Terms & conditions contained in this document and ATC are to be read fully before submission of quotations.	
C	Bidders are advised to comply with ATC, should there be any deviations (where deviations are permitted), it shall be entered in the deviation column. BHEL reserves the right to reject such offers.	
2	**Documentation for Payment**	
A	**Indigenous Purchase**	
	Following documents shall be submitted immediately on dispatch of material to BHEL HPEP Site a. Original Tax Invoice b. Packing List - clearly showing number of packages, gross weight and net weight. c. Test/Warranty/Guarantee certificates, O&M Manual (If specified in ANNEXURE) d. Insurance intimation/declaration certificate e. Pre-dispatch Inspection report /Third Party Inspection Certificates. f. Consignee copy of LR signed & stamped by Customer/Site representative for DD Items g. e-waybill.	
3	**Payment Terms: Following shall be the terms of Payment.**	
	Indigenous: a. Micro & Small Enterprises (MSEs) - 100% Direct EFT payment within 45 days b. Medium Enterprises - 100% Direct EFT payment within 60 days c. Non MSME Bidders - 100% direct EFT Payment within 90 Days Note A. Above due date is reckoned from the date of Receipt of material or 15 days from the date of submission of complete set of documents as per PO whichever is later. Payment will be made on acceptance of Material. B. MSEs (covered under MSME Act) need to register and renew periodically and update the same with BHEL C. The taxes that are reimbursed are limited to applicable taxes as on the Purchase Order delivery date or the amount actually paid whichever is less. D. Adherence to the above time schedule of payment is contingent upon Bidder complying with GST provisions and availment of Input Tax Credit by BHEL before the date of payment. E. In case of packaged items, 10% of supply value will be retained till completion of total supplies.	
4	**Excess materials** supplied beyond tolerance limit as specified in PO will not be paid and bidder may raise credit note for the excess/unaccepted material as per GST law.	
5	**Rejected materials**, if any, shall be collected by the bidder within 90 days of such communication to the bidder. Beyond this period the bidder forfeits their right to the materials.	
6	**PERFORMANCE BANK GUARANTEE (PBG) (Applicable in case mentioned in Annexure G)** In case enquiry specifically spells out PBG requirement, PBG is to be submitted by Bidder in requisite format as per Annexure VII. Further detailing on PBG as specified in Annexure G. The PBG shall be for the performance of the goods and shall remain binding not withstanding such variations, alterations or extensions of item as may be made, give, conceded or agreed to between the Bidder and BHEL under these Terms and conditions or otherwise.	
7	Procurement directly from the manufacturers/ suppliers shall be preferred. However, no agent shall be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from both from the manufacturer/ supplier and the agent, bid received from the agent shall be ignored.	
8	**RIGHT OF REJECTION /NON- PLACEMENT OF PO:** BHEL reserves the right to accept or reject any or all bid/s in full or part without assigning any reason whatsoever.	

9	**INTEGRITY PACT** Bidders shall have to enter into Integrity Pact with BHEL as per Annexure VI - for Tender value of rupees two crores and above and shall be signed by the authorized signatory along with the offer, failing which Bidder's offer will be rejected.
	BHEL HPEP is registered with RXIL (TReDS) platform. MSME bidders are requested to get registered with RXIL (TReDS) platform to avail the facility as per the GOI guidelines.
10	Inspection Measuring and Test Equipment (IMTE) used by the Bidder/ Contractor or sub-contractor shall be calibrated, maintained and controlled. Calibration shall be valid and IMTE maintained in sound condition during usage.
11	ISO-9001, ISO14001 and OHSAS 18001 shall be complied
12	**Risk Purchase clause:** In case bidder fails/delays to supply whole or part of the ordered items or supplies defective items or fails to fulfil any other terms and conditions given in Purchase Order/Contract, BHEL has the right to terminate the order/contract or withdraw balance scope of work/supply and make the purchase of such material / services from elsewhere at the risk and cost of the defaulted bidder. The bidder is 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 order/contract. Non-performance of contract attracts penal provisions in line with BHEL guidelines for Suspension of Business Dealings (SBD).
13	Any other terms and conditions of the bidder attached / referred against the tender enquiry will not be considered.
14	All drawings, patterns and tools supplied by BHEL or made at BHEL's expense are BHEL's property. These cannot be used or referred to any other party and must be used only in the execution of BHEL's orders.
15	Any amount payable by the bidder under any of the conditions of this contract shall be liable to be adjusted against any amount payable to the bidder under any other work / contract awarded by BHEL HPEP or any other BHEL Units. This is without prejudice to any other action as may be deemed fit by BHEL.
16	The bids of the bidders who are on the banned list and also the bids of the bidders, who engage the services of the banned firms, will be rejected. The list of firms banned by BHEL is available on BHEL web site: www.bhel.com
17	**Execution**
	The whole contract is to be executed in the most workman like manner, substantial and approved as per the contracted terms.
18	**Progress Report**
	The bidder shall render such report as to the progress of work and in such form as may be called for by the Buyer from time to time. The submission and acceptance of such reports shall not prejudice the rights of the buyer in any manner. Bidder shall communicate to BHEL immediately, the change of address, ownership, contact person(s), the mobile numbers and e-mail of the dealing person concerned. Milestones shall be periodically updated by bidder through PRADAN Portal **(https://web.bhelhyd.co.in/mm/).** Non updation will adversely affect service rating of bidder performance.
19	**Non-disclosure Obligations**
	Drawings, technical documents or other technical information received by one party shall not without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the submitting party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are confidential and binding only to the extent that they are by reference expressly included in the contract. The bidder shall, as per agreed date/s but not later than the date of delivery, provide free of charge any information and/or drawings which are necessary to permit the Buyer to erect, commission, operate and maintain the product. Such information and drawings shall be supplied as specified in technical specification. All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the contract shall continue to be the property of the submitting party. The bidder shall provide Buyer with all information pertaining to the delivery in so far as it could be of importance to Buyer. The bidder shall not reveal confidential information to its own employees not involved with the tender/contract and its execution and delivery or to third parties, unless Buyer has agreed to this in writing beforehand. The bidder shall not be entitled to use the Buyer's name in advertisements and other commercial publications including website without prior written permission from Buyer. In the event of violation of the confidentiality as agreed, BHEL will take legal action as deemed fit. Non-disclosure agreement to be entered as per **Annexure- II** wherever applicable.
20	**Inspection and Testing**
A	The goods and stores shall be manufactured by approved quality system and each part/component may be inspected and tested by the Buyer prior to shipment and shall comply with relevant requirements. Buyer has the right to inspect at any stage during manufacture/ delivery.

B	Buyer or his authorized representative shall be entitled at all reasonable times during execution to inspect, examine and test at the bidder's premises the material and workmanship of all stores to be supplied under the contract, and if the part of the stores are being manufactured at other premises, the bidder shall obtain for buyer or his authorized representative permission to inspect, examine and test as if the said stores are being manufactured at the bidder's premises. Such inspection, examination and testing, if made shall not release the bidder from any obligation under the contract. For indigenous bidders all costs related to first inspection request shall be borne by the buyer and the cost of subsequent inspections due to non-readiness of material/rework/ rejections shall be borne by the bidder. In case of imports all inspection charges including third party inspections if any shall be borne by the bidder. The cost of inspection staff/third party specified by the Buyer shall be borne by bidder unless otherwise specifically agreed. If the contract provides for tests on the premises of the bidder or any of his sub-contractor/s, bidder shall be responsible to provide such assistance, labor, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by the bidder unless otherwise specifically agreed in the contract. The Bidder shall give the authorized representative of the buyer reasonable notice in writing of the date on and the place at which any stores will be ready for inspection/ testing as provided in the Contract. Annexure – I, may strictly be complied with for the time lines. Any delay in submission of the documents by the bidder will not alter the delivery date.
21	**Quality and Condition of the Deliverables**
	The bidder shall be responsible for compliance with applicable technical, safety, quality, environmental requirements and other regulations in relation to products, packaging and raw and ancillary materials.
22	**Packaging and Dispatch**
	The bidder shall package the deliverables safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by sea/air/rail/road to its destination suitably protected against loss, damage, corrosion in transit and the effect or tropical salt laden atmosphere. The packages shall be provided with fixtures/hooks and sling marks as may be required for easy and safe handling by mechanical means. Special packaging conditions/ environmental conditions as defined in the NIT shall be fully complied. Each package must be marked with consignee name, address, P.O. number, Package Number, gross weight & net weight, dimensions (Lx B x H) and bidder's name. The packing shall allow for easy removal and checking of goods on receipt and comply with carrier's conditions of packing or established trade practices. Packing list for goods inside each package with P.O. item No. & quantity must also be fixed securely outside the box to indicate the contents. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols/instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
23	**Rejected/Short shipments/ warranty/guarantee replacements**
	In case of any short shipment during initial supply which is subsequently dispatched by the bidder or any guarantee / warranty replacements shall be dispatched on "DDP-Delivered duty paid BHEL stores" basis for imported items and "FOR-BHEL Stores/designated destination" basis for indigenous items.
24	**Non-waiver of Defaults**
	If any individual provision of the contract is invalid, the other provisions shall not be affected.
25	**Settlement of Disputes**
	Except as otherwise specifically provided in the contract, all disputes concerning questions of the facts arising under the contract, shall be decided by the Buyer, subject to written appeal by the bidder to the buyer, whose decision shall be final. Any disputes of differences shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration The bidder shall continue to perform the contract, pending settlement of disputes(s).
26	**Conciliation clause**
	CONCILIATION CLAUSE FOR CONDUCTING CONCILIATION PROCEEDINGS UNDER THE BHEL CONCILIATION SCHEME, 2018: 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 agreement, contract or the Memorandum of Understanding, penalty deduction, time extension), 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 and as provided in Procedure in http://www.bhel.com/index.php/story_details?story=2454 . The Procedure together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this ATC.
27	**ARBITRATION (WITH SOLE ARBITRATOR)**
	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, penalty deduction, validity or execution of the Contract; time extension, 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 the other Party refer such dispute or difference to the sole arbitration . Sole arbitrator to be appointed by Head of the Unit - BHEL , HPEP .
	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 provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Sangareddy / Hyderabad, Telangana. The language of arbitration shall be English and the documents shall be submitted in English.
	The cost of arbitration shall initially be borne equally by the Parties subject to the final apportionment of the cost of the arbitration in the award of the Arbitrator.
	Subject to the arbitration in terms of clause 27, the courts at Sangareddy, Telangana State shall have exclusive jurisdiction over any matter arising out of or in connection with this contract. Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations 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.

	ARBITRATION FOR CONTRACT WITH PUBLIC SECTOR ENTERPRISE (PSE) OR A GOVERNMENT DEPARTMENT
	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 0M No 4(1)/2013-DPE(GM/FTS 1835 dated 22-05-2018
28	**Applicable Laws and jurisdiction of Courts**
	This agreement shall be construed and interpreted in accordance with the laws of India and shall have exclusive jurisdiction of Sangareddy/Hyderabad courts, Telangana, India.
29	**BHEL-Fraud prevention policy shall be adhered to.**
	The Bidder along with its associate/ Collaborators/ Sub-contractors/ sub-bidders/ consultants/ service providers shall strictly adhere to BHEL Fraud Prevention policy displayed on BHEL Website http://www.bhel.com and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice. List of nodal officers is hosted on BHEL Hyderabad website https://hpep.bhel.com/.
30	**Suspected Cartel Formation**
	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case , the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies / guidelines .

Note: Purchase officer has to fill Annexure-I while sending enquiry

(To be executed on Non- Judicial Stamp Paper for an appropriate value.
To be stamped as an agreement)

(For Suppliers on Unit's / Division's PMD)

ANNEXURE-II

Framework Confidentiality Agreement Cum Undertaking

This Agreement made on this the _____ day of (month) _____ 20 ___ ("Effective Date") by and between M/s. BHARAT HEAVY ELECTRICALS LIMITED, having registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India), acting through its _____ Unit (hereinafter may be referred to as "BHEL" or "the company").

And

M/s. _____ (address) _____ represented by authorized representative Sri _____ (herein after referred to as the "Supplier").

The supplier and the company may, unless the context otherwise requires, hereinafter be collectively referred to as "Parties" or singly as the "Party".

RECITALS

Whereas, BHEL is engaged in the design, engineering, manufacturing, construction, testing, commissioning and servicing of a wide range of products, systems and services for the core sectors of the economy, viz. Power, Transmission, Industry, Transportation, Renewable energy, Oil & Gas and Defence and providing associated services to varied customers in relation to which BHEL / its affiliates own valuable information of a secret and confidential nature.
Whereas the Company may, in connection with contract(s) (as defined hereunder) placed or to be placed upon the supplier, or otherwise, from time to time, make available, Technical Information as is defined hereunder.

And Whereas BHEL is willing to provide such Technical Information to the Supplier from time to time and the Supplier understands and acknowledges that such Technical Information is valuable for the Company and as such is willing to protect confidentiality of such information, subject to the terms and conditions set out hereunder.

Now therefore, in view of the foregoing premises and in consideration of the mutual covenants and agreements hereinafter set forth, the parties agree as under:

1. Definitions:

Unless the context so requires, in this Agreement, the following terms will bear the meaning ascribed to the said term in this clause.

A. **"Contract"** means the contract entered into with a supplier and includes a Purchase Order, or a Work Order for procurement of any goods or for provision of any services.
B. **"Effective Date"** means the date of this Agreement as mentioned in the preamble of this Agreement.
C. **"Supplier"** includes a Contractor or a Vendor of the Company whether for supplying of goods or for providing any services under a Contract or both.
D. **"Technical Information"** includes Drawings, and / or Product Standards and / or Specifications and / or Corporate / Plant Specifications and / or Technological Process Sheets and / or Technical Data Sheets and / or Jigs & Fixtures and / or Pattern & Dies and / or Special Gauges and / or Tools etc. Belonging to or wherein the Company has acquired from a third party a right of user and includes any improvement thereto from time to time whether carried out by the Company or by the Suppliers.
E. **"Intended Purpose"** means the purpose for which the Technical Information is provided to the supplier under or in connection with a contract.
F. **"Improvement"** includes any modification made to, or adaptation of, the Technical Information which enhances or is calculated to enhance the performance (Whether in terms of effectiveness or in terms of efficiency or both) of the product and / or the service to be provided by the Supplier under a Contract.

2. This Agreement shall come into force / deemed to have come into force, as the case may be, on the Effective Date; or, on the first date when the Technical Information or any part thereof is provided by BHEL to the supplier; whichever is earlier.

3. **Agreement deemed to be incorporated in each contract:** Unless and to the extent otherwise stipulated in the Contract, the conditions of this Agreement are deemed to be incorporated in all Contracts which may be entered into between the Company and the Supplier. Further, unless otherwise stipulated, the obligations under this Agreement are and will be independent of the obligations under the Contracts and such obligations of the Supplier hereunder will remain of full effect and validity notwithstanding that the period of validity of the Contract has expired by efflux of time stipulated therein; or, the contract has been discharged by performance or breach; or, the termination of the Contracts for any reason whatsoever.

4. Ownership:

4.1 The Company may, from time to time, make available to the Supplier, Technical Information on a non-exclusive basis by way of loan.

4.2 The Supplier acknowledges and agrees that all Technical Information and copies thereof that are or may be provided by the Company to the Supplier, are and shall remain the property of

BHEL or that of the concerned entity from whom BHEL has obtained the Technical Information and such Technical Information are and shall constitute trade secrets of the BHEL. Nothing in this Agreement or in any disclosures made hereunder by or on behalf of the Company shall be construed as granting upon the Supplier any patent, copyright or design or any other intellectual property rights of whatsoever description that subsists or may hereinafter exist in the Technical Information. Furthermore, nothing in this Agreement or in any disclosures made hereunder by or on behalf of the Company shall be construed as granting upon the supplier any license or right of use of such patent, copyright or design or any other intellectual property rights of whatsoever description which may now or hereafter exist in the Technical Information except for use of the Technical Information strictly in accordance with this Agreement and the contract and / or as directed in writing by the Company, solely for the Intended Purpose under the Contract.

4.3 Neither party is obligated by or under this Agreement to purchase from or provide to the other party any service or product and that any such purchase / sale of any product and / or service by one party to the other party will be governed by the Contract if any, that may be entered into by and between the Company and the Supplier.

4.4 The Supplier is / has been made well aware and acknowledges that the Technical Information being / which may be shared with it by the Company has been either generated by the Company by incurring huge investment and cost or obtained from foreign collaborators under Technical Collaboration Agreement (TCA) with stringent confidentiality conditions.

4.5 The supplier agrees and undertakes to adhere to confidentiality requirements as applicable to BHEL under a TCA and also ensure that the confidentiality requirements are adhered to by all its concerned employees or sub-contractors /suppliers (where permitted to be engaged by BHEL). Any damages, losses, expenses of any description whatsoever, arising out of or in connection with a breach of the confidentiality requirements under a TCA owing to any act or omission on the part of the supplier or its employees or sub-contractors / suppliers that is claimed by a foreign collaborator from the Company shall be wholly borne by the Supplier and it shall keep BHEL fully indemnified in this behalf. The demand by the Company shall be conclusive upon the Supplier who shall thereupon forthwith pay to the Company without demur, dispute or delay the amount as demanded without demanding any further proof thereof.

4.6 The Supplier agrees and undertakes that unless so decided and advised by the Company in writing all rights / title to any Improvement to the Technical Information shall vest in the Company. The Supplier undertakes and agrees to inform forthwith to the Company of any such Improvement made to the Technical Information and transfer all drawings / documents or other materials connected with such Improvement to the Company and also agrees to fully cooperate with the Company for protecting the Company’s interests in such Improvements

in the Technical Information including but not limited to obtaining necessary protection for the intellectual property rights in such improvement, if so desired by the Company. If a question arises whether a modification amounts to improvement to the Technical Information, the same shall be decided by the Company and such decision shall be final and binding upon the supplier.

5. Use and Non – Disclosure:

5.1 Unless otherwise stipulated by the Company, all Technical Information made available to the supplier, by the Company shall be treated as Confidential irrespective of whether the same is marked or otherwise denoted to be Confidential or not.

5.2 The Supplier undertakes and agrees that the Technical Information in its possession shall be held in strict confidence and will be used strictly in accordance with this Agreement and solely for the Intended Purpose under the Contract. Use of the Technical Information for any other purpose other than Intended Purpose is prohibited.

5.3 In particular, the Supplier shall not use Technical Information or any Improvement in its possession for the manufacture or procurement of the product(s) or components or parts thereof or use the Technical Information or any portion thereof or any modification or adaptation thereof in any form to provide any product and / or service to any third party, without the prior written consent of the Company.

5.4 The Supplier shall not disclose any of such Technical Information to any third party without the prior written consent of the Company. The Supplier agrees that without prior written consent of the Company, the supplier shall not disclose to a third party about the existence of this Agreement, or of the fact that it is / was in possession of or has experience in the use of any Technical Information nor shall the Supplier share in any manner whatsoever, with a third party, the name or details of any Contract(s) awarded by the Company to it or performed by the Supplier or the scope of work thereof or share any document or correspondence by and between the Company and the supplier in or in connection with this Agreement or such Contract(s). Notwithstanding what is stated elsewhere, the overall responsibility of any breach of the confidentiality provisions under this Agreement shall rest with the Supplier.

5.5 This Supplier undertakes and agrees not to make copies or extracts of and not to disclose to other any or all of the Technical Information in its possession, except as follows:

(a) The Supplier may disclose the Technical Information to such of its officers and employees strictly to the extent as is necessary for such officer or employee for the Intended Purpose, provided that the Confidential Information (or copies thereof) disclosed shall be marked

clearly as the confidential and proprietary information of Company and that such officers and employees shall similarly be bound by undertakings of confidence, restricted use and non-disclosure in respect of the Technical Information. The Supplier shall be responsible for any breach of such confidentiality provisions by such officers and employees.

(b) With the prior written consent of Company, the supplier may disclose for the Intended Purpose such Technical Information as is provided for in such consent to such of its professional advisers: consultants, insurers and subcontractors who shall be similarly bound by undertakings of confidence, restricted use and non-disclosure in respect of such Technical Information.

(c) The Supplier shall not be prevented to make any disclosure required by (i) order of a court of competent jurisdiction or (ii) any competent regulatory authority or agency where such disclosure is required by law, provided that where the supplier intends to make such disclosure, it shall first consult Company and take all reasonable steps requested by it to minimize the extent of the Technical Information disclosed and to make such disclosure in confidence and also shall cooperate with the Company in seeking any protective order or any other remedy from proper authority in this matter.

6. <u>Exceptions:</u>

The Obligations of the Supplier pursuant to the provisions of this agreement shall not apply to any Confidential Information that:

a) was / is known to, or in the possession of the Supplier prior to disclosure thereof by the Company;
b) is or becomes publicly known, otherwise than as a result of a breach of this agreement by the Supplier.
c) is developed independently of the Disclosing party by the Supplier in circumstances that do not amount to a breach of the provisions of this Agreement or the Contract;
d) is received from a third party in circumstances that do not result in a breach of the provisions of this Agreement.

7. The Obligation of maintaining confidentiality of the Technical Information on each occasion, shall subsist for the entire duration during which the Technical Information / equipment is in possession of the Supplier and shall thereafter subsist for a further period of _____ years from the date when the complete Technical Information has been returned in portions on different dates, the period of ____ years will be reckoned from the date when the last portion of the Technical Information has been returned. Notwithstanding the expiry of the confidentiality obligation, the obligation of the Supplier under clause 5.4 shall continue to subsist for a further period of _____ years.

8. <u>Warranties & Undertakings</u>:

a) The Supplier undertakes to ensure the due observance of the undertakings of confidence, restricted use and non-disclosure by its persons to whom it discloses or releases copies or extracts of the Technical Information.

b) The Supplier shall keep the Technical Information or improvement made therein properly segregated and not mix up the same with any other material / documents belongings to him / it or to any other third party.

c) The Supplier further undertakes that he / it shall not hypothecate or give on lease or otherwise alienate or do away with any of the Technical Information and / or equipment of the Company, made available to him / it, and undertakes that he / it shall hold the same as a trustee, in capacity of custodian thereof and use / utilise the same solely for the purpose of executing the contract awarded by the Company.

d) The Supplier further undertakes that he / it shall return all the equipment and / or Technical Information as far as practicable in the same condition in which the same was made available to him / it by the Company together with any Improvement thereon and the documents connected with such Improvement, to the Company forthwith upon completion of the scope of work or contract for which such Technical Information was provided by the Company to it or as directed by the Company together with a confirmation by way of an affidavit or in such manner as directed by the Company that it has not retained any equipment and / or Technical Information / improvement thereof. In case any such equipment and / or Technical Information or thereof shall remain in his possession or is not capable of being returned, the retention and use of such Technical Information or improvement thereto shall continue to be governed by this Agreement.

e) The Supplier undertakes to indemnify the Company for all the direct, indirect and / or consequential losses, damages, expenses whatsoever including any consequential loss of business, profits suffered by the Company owing to breach by the Supplier of its obligations under this Agreement and / or the confidentiality requirements, if any, contained in the Contract and that the Supplier hereby agrees that the decision of the Company in all such or any such matter/s shall be final and binding on the Supplier. On mere written demand of the Company, the Supplier shall forthwith and without demur or delay pay to the Company any such sum as determined by the Company as the amount of loss or damage or expense which has been suffered by the Company. The Supplier agrees that the Company shall be entitled to withhold and appropriate any amount payable to the Supplier under any Contract then existing between the Company and the Supplier, in case the Supplier fails to make payment, in terms of the written demand, within 7 days thereof. Without prejudice to the forgoing actions, in respect to any breach of this Agreement, the Company shall be entitled to take

any other action against the Supplier as per applicable laws, the Contract, Company's applicable policies, guidelines rules, procedures, etc.

9. Without prejudice to any other mode of recovery as may be available to the Company for recovery of the amount determined as due as per Clause 9 (f) hereinabove, the Company shall have a right to withhold, recovery and appropriate the amount due towards such losses, damages, expenses, from any amount due to the Supplier in respect of any other Contract (s) placed on him / it by any department / office / unit/ division of the said Company.

10. <u>Arbitration & Conciliation:</u>

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, penalty deduction, validity or execution of the Contract; time extension, 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 the other Party refer such dispute or difference to the sole arbitration . Sole arbitrator to be appointed by Head of the Unit - BHEL, HPEP.

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 provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause.

The seat of arbitration shall be Sangareddy / Hyderabad, Telangana. The language of arbitration shall be English and the documents shall be submitted in English.

The cost of arbitration shall initially be borne equally by the Parties subject to the final apportionment of the cost of the arbitration in the award of the Arbitrator.

Subject to the arbitration in terms of clause 46 of ITB (clause 27 of ATC GeM), the courts at Sangareddy, Telangana State shall have exclusive jurisdiction over any matter arising out of or in connection with this contract.

Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations 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.

ARBITRATION FOR CONTRACT WITH PUBLIC SECTOR ENTERPRISE (PSE) OR A GOVERNMENT DEPARTMENT

ln 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 0M No 4(1)/2013-DPE(GM/FTS 1835 dated 22-05-2018

CONCILIATION CLAUSE FOR CONDUCTING CONCILIATION PROCEEDINGS UNDER THE BHEL CONCILIATION SCHEME, 2018: 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 agreement, contract or the Memorandum of Understanding, penalty deduction, time extension), 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 and as provided in Procedure in http://www.bhel.com/index.php/story_details?story=2454 . The Procedure together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this ITB

11. Governing Law & Jurisdiction:

This agreement shall be construed and interpreted in accordance with the laws of India and shall have exclusive jurisdiction of Sangareddy/Hyderabad courts, Telangana, India.

SIGNATURE

WITNESSES

1

Name:

Address:

2

Name:

Address:

Annexure - III

Proforma for self-certification by Supplier for minimum local content on their letter head for tender value less than Rs 10 Crore

"We _____ (Name of Manufacturer) undertake that we meet the mandatory minimum Local Content (LC) requirement i.e. _____ (to be filled as notified in the policy) for claiming Purchase Preference linked with Local Contents under the Govt. policy against tender no. _____."

Auditor's certification with respect to minimum local content on the letter head of Statutory Auditor for tender value above Rs.10 crore

"We _____ the statutory auditor of M/s _____ (name of the bidder) hereby certify that M/s_____ (name of manufacturer) meet the mandatory Local Content requirements of the Goods and/or Services i.e. _____ (to be filled as notified in the policy) quoted vide offer No._____ dated _____ against BHEL's tender No._____ by M/s _____ (Name ofthe bidder)."

Annexure - IV

Proforma for self-certification by Supplier for Compliance to Clause No 20 (B)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and I certify that M/s…. (Name of firm) is **not from such a country/is from such a country (**delete whichever is NOT applicable**)** and has been duly registered with the Competent authority (delete if NOT applicable) . I hereby certify M/s ….. fulfills all requirements in this regard and is eligible to be considered . (where applicable , valid registration by the competent authority shall be attached)

Sd/-
Authorised Signatory with Stamp

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____

_____. The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 – Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved

in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant IPC/ PC Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors". framed by the Principal.

Section 4 – Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 – Equal treatment of all Bidders/ Contractors/ Sub-contractors

6.1 The Bidder(s)/ Contractor(s) undertake(s) to obtain from all subcontractors a commitment consistent with this Integrity Pact and report Compliance to the Principal. This commitment shall be taken only from those sub-contractors whose contract value is more than 20 % of Bidder's/ Contractor's contract value with the Principal. The Bidder(s)/ Contractor(s) shall continue to remain responsible for any default by his Sub-contractor(s).

6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

6.3 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 –Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

8.7 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the

Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.9 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.10 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins and shall be binding on and from the submission of bid(s) by bidder(s). It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

9.2 If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified as above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 – Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders/ contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

For & On behalf of the Bidder/ Contractor

(Office Seal)

Place----------

Date----------

Witness: _____

(Name & Address) _____

_____

Witness: _____

(Name & Address)_____

_____

Annexure VII

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited [1] (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 _____ through its Unit at……..(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at_____[2] hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……[3] valued at Rs……[4] (Rupees ----------)/FC……(in words……..) for ……[5] (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to ……% (…. Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

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 a maximum amount Rs ---------- (Rupees ----------) without any demur, immediately on a demand from the Employer, .

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. _____ _____.

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

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

We the ……bank 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 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.

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 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 Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said 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.

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 Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including…….. [6] and shall be extended from time to time for such period as may be desired by Employer.
This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the 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.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……[7]we shall be discharged from all liabilities under this guarantee thereafter.

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…… [8]
b) This Guarantee shall be valid up to ……[9]

c) Unless the Bank is served a written claim or demand on or before _____[10] 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.

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…….

[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] PROJECT/SUPPLY DETAILS

[5] BG AMOUNT IN FIGURES AND WORDS

[6] VALIDITY DATE

[7] DATE OF EXPIRY OF CLAIM PERIOD

[8] BG AMOUNT IN FIGURES AND WORDS.

[9] VALIDITY DATE

[10] DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. **Units are advised that expiry of claim period may be kept 2/3 months after validity date.**

2. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

1. SCOPE:

1.1 This standard specifies the requirement of MOTOR OPERATED GATE VALVES flanged, carbon steel body material, with special requirement of NACE+ Hydrogen service+ PWHT

1.2 **APPLICATION:** These valves are used for compressor suction and discharge line

2. DESIGNATION:

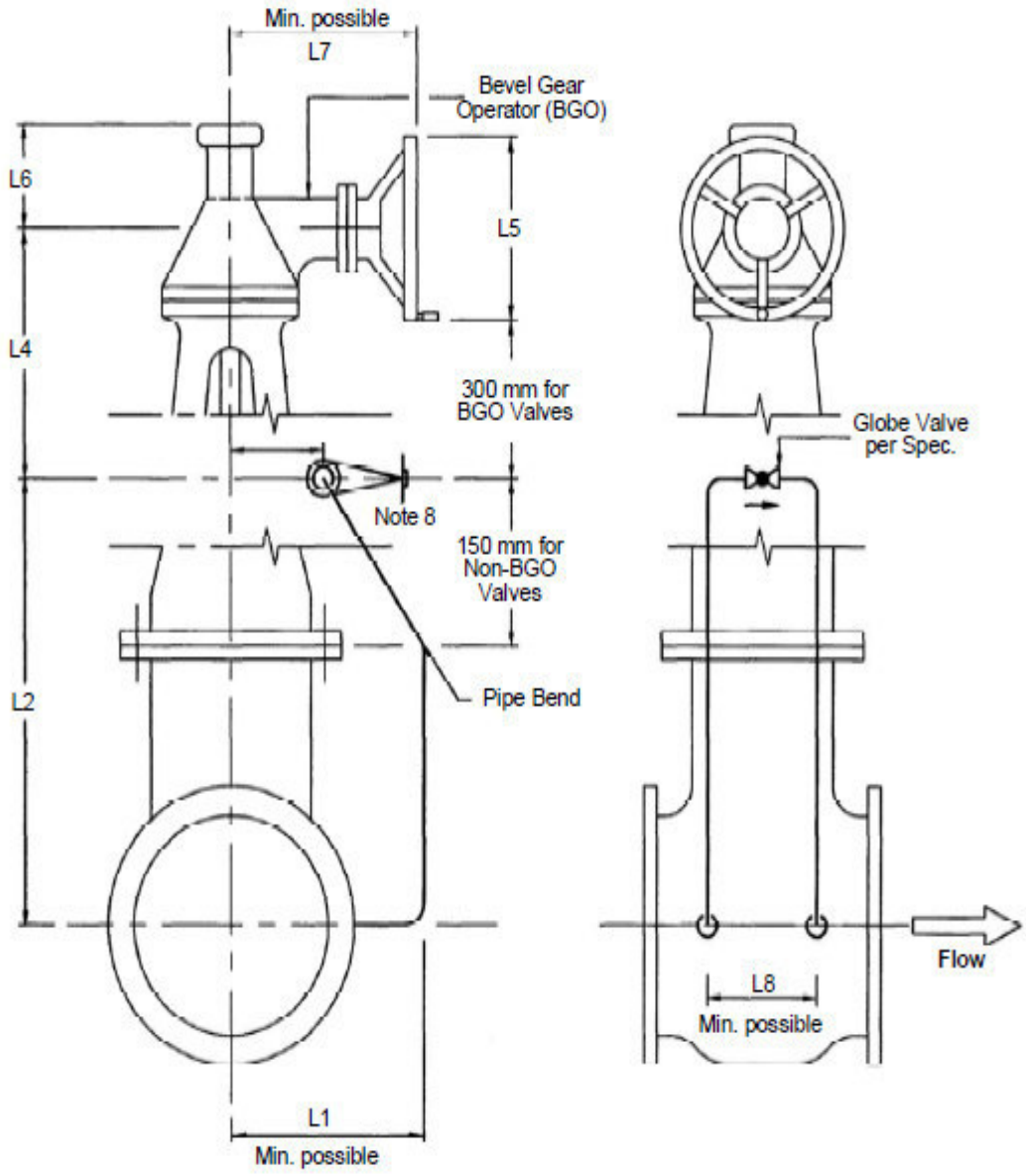
The Ball Valve shall be designated on the material indents as follows:
EX: MO GATE VALVE CS 18" #300RF NACE +H2

3. GENERAL REQUIREMENTS OF GATE VALVES:

3.1 In order to facilitate opening large gate valves subject to high differential pressures, equalizing bypass valves are sometimes installed on the valve bodies. The need for this feature should be considered per table below:

Sr.No.	Valve Rating	Main Valve Size
1	# 150	DN 650 (NPS 26") & Above
2	# 300	DN 400 (NPS 16") & Above
3	# 600	DN 150 (NPS 6") & Above
4	# 900	DN 100 (NPS 4") & Above
5	# 1500	DN 100 (NPS 4") & Above
6	# 2500	DN 80 (NPS 3") & Above

a. By-pass valve shall be a globe valve. The sizes shall be as under:
b. On main valve DN 100 (NPS 4"): DN 15 (NPS 1/2")
c. On main valve DN 150 to 200 (NPS 6" to 8"): DN 20 (NPS 3/4")
d. On main valve DN 250 (NPS 10") & above: DN 25 (NPS 1")
e. By-pass piping shall be of same metallurgy as the main valve. In case details of by-pass arrangement for any Valve tag number is missing, the vendor shall bring it to notice of BHEL and provide by-pass as per specified details.
f. Vendor shall supply the by-pass valve duly tested and fitted to the main valve. Valves with by-pass shall have the direction of flow marked on the main valve. By-pass attachment to the main valve body shall not be screwed. All fillet welds for by-pass installation shall be 100% examined by DP/MP test and Butt-weld joints shall be 100% examined by radiography.
g. Typical Bypass arrangement is shown below:



NOTES:

1. The orientation & location of hand wheel of bevel gear operator & the bypass arrangement shall be strictly as per this sketch.
2. The bypass connection ends shall be socket welded up to 600# and butt welded for 900# and above rating.
3. The bypass arrangement shall be properly clamped to & supported by the body of the main valve.
4. Basic design of bypass shall be to MSS-SP-45.
5. Material of bypass pipe & 90° elbows shall be same or equivalent to the body material of main valve.
6. This sketch is applicable for both BGO & NON-BGO valves.
7. Vendor shall furnish dimensions L1 to L8.
8. Stem shall not be horizontal in the case of Cryogenic Valves.

3.2 Valve stem packing (where applicable) shall consist of flexible graphite complete with corrosion inhibitor (middle rings: die formed; top and bottom rings: braided). Stem Packing shall be Renewable with Valve Open on Stream.

3.3 Spiral wound body/bonnet gaskets shall be fully confined or shall have inner/outer guide rings.

3.4 Requirements pertaining to valve testing:
a. Hydrostatic test fluid shall have a chlorine content of less than 200 ppm for carbon steel valves and less than 50 ppm for stainless steel valves.
b. Valves with gear operators shall be seat tested after the assembly of the operating mechanism.

3.5 All grease / sealant / flushing injection fittings shall be SS 316 minimum except where the service does not allow use of SS 316, in which case UNS N06625 shall be used.

3.6 All valves shall have locking facility to allow locking in the open or closed position.

3.7 The minimum thickness requirements shall be as per B16.34 + the corrosion allowance indicated in the PMS for the respective piping class, but in no case less than the thicknesses indicated in the respective governing standard. In the event the valves have tapped holes on the pressure envelope the minimum thickness requirement shall be applicable from the bottom of the tapped hole to the inside wall of the valve pressure envelope. In the event vendor offers thickness that are lesser than the above then the bidder shall demonstrate through FEM calculations that the corrosion allowance is preserved.

3.8 Gate and globe valves shall be OS & Y (Outside Screw & Yoke) type.

3.9 Bonnet gaskets for gate and globe valves:
a) ASME Class 150 valves: flexible graphite reinforced with a corrugated metal insert (plain flat metal gaskets are not acceptable).
b) ASME Class 300 and higher valves: SS spiral wound gasket with graphite filler for valves with raised face body to bonnet joint or soft iron ring (per ASME B16.20) for valves with ring type body to bonnet joint.

3.10 Seat rings for valves less than or equal to DN40 shall be pressed and or rolled into the body. Screwed in seat rings are acceptable only when they are properly secured against loosening.

3.11 When specified in the purchase order, gate valves shall be provided with equalising globe valve bypass. To permit field retrofit of bypasses, valves as specified in the Clause A.3.4.1 shall have auxiliary connections per ASME B16.34, Clause 6.3.6 in the valve bodies (c/w bull-plug of the same material as the valve body)
Auxiliary connections shall meet the requirements of ASME B16.34 and MSS SP-45 and shall be located at positions A and B of Figure 1 of ASME B16.34.

3.12 Valves shall be provided with back seating facility. Valves shall be provided with stem back seating facility. All body & backseat sealing surfaces on steel and high nickel alloy valves shall be hard faced. The minimum thickness of any hard facing shall be 1.5mm and all hard-facing deposition procedures, together with relevant heat treatments, shall be subject to BHEL approval.

3.13 Flanged valves should be provided with renewable seats.

4. TECHNICAL REQUIREMENTS:

TABLE - I

CL	REQUIREMENTS	COMPLIANCE
4.1	Pressure Temperature ratings	ASME B16.34
4.2	Materials	As specified in Table - II
4.3	Construction	API 600
4.4	End Connections	Flanged
4.4.1	Flanged	ASME B16.5
4.5	Face to Face and End to End dimensions	ASME B16.10
4.6	Schedule	As per PR
4.7	Hydraulic test pressure	1.5 times of maximum working pressure corresponding to valve class
4.7.1	Body	As per pressure class
4.7.2	Seat	As per pressure class
4.7.3	Low Pressure Test	As per relevant standard
4.7.4	Additional requirement	H2 service as per Annexure-1 and NACE MR0103
4.8	Pressure Drop across the Valve	Vendor to specify
4.9	Fugitive Emission	As per ISO 15858 Part-1: Tightness class C
4.10	Mode of Operation	Motor Operated
4.11	Special requirements	PWHT+SOUR Service. Valve shall be fire safe with fire proof actuator. Power and control cables shall be fire proofed
4.12	Fire test	API 607

TABLE - II

DESCRIPTION	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A216 GR. WCB
BONNET	BOLTED	ASTM A216 GR. WCB
API TRIM #		Trim No. 12
Wedge	FLEXIBLE	As per Trim #12
Yoke	SEPARATE	As per Trim #12
Stud Bolts & Nuts		A193: Gr.B7 & A194: Gr.2H
Bonnet Gasket		SPW AISI 316L/Graphite
Body Seat Ring	Renewable	As per Trim #12
Packing		Graphited with Corrosion Inhibitor & Inconel Wire Reinforcement
Hand wheel	Non-rising	
STEM	OS &Y	As per Trim #12

NOTES:

1. 100% valve castings shall undergo radiographic examination.
2. Testing shall be as per API 598. Valve testing as per BS EN-12266-1 and BS 6755 (Part-1) is also acceptable.
3. Supplier shall strictly comply with this standard in all respects. No deviation shall be allowed unless written permission of BHEL is obtained before finalization of the order
4. IGC test shall be done for all SS parts.
5. Solenoid valve and other tube fittings shall be as per customer approved vendor list.

Customer Approved Vendor list for Actuator

	5.163 ACTUATORS – MOV		
1		AUMA INDIA PVT LTD	INDIA
2		EMERSON PROCESS MANAGEMENT INDIA PVT LTD	INDIA
3		FLOWSERVE	INDIA
4		LIMITORQUE INDIA LTD	INDIA
5		MARSH AUTOMATION PVT LTD	INDIA
6		ROTORK CONTROLS INDIA LTD	INDIA

5.0 Actuator Design Basis

5.1 Each MOV actuator shall include the motor, actuator unit, gears, position indicators, limit switches, hand wheel, electrical starter and controls, terminal box etc. as a self-contained unit.

5.2 The actuator shall be sized to provide adequate torque and/or thrust to ensure the complete intended travel of the valve under the worst operating and electrical power supply conditions.

5.3 The enclosure of complete MOV actuator including motor, integral starter, control transformer unit and all control devices shall be Ex d certified and shall have minimum IP-67 degree of protection which shall include the 'O' ring for complete environmental protection.

5.4 When specified, Smart MOV and Field Control Unit to be supplied.

5.5 Actuators shall be capable of applying a torque / force of at least 1.5 times maximum requirement advised by the manufacturer at all points of the open / close cycle. Valve actuators shall be mounted on the valves by the manufacturer at the factory unless otherwise advised.

5.6 All Actuated On/Off Valves

5.6.1 Stem and stem to obturator connection shall be designed for the maximum torque during valve operation by the higher of:

- Spring load
- Specified maximum air supply pressure

5.6.2 The safety factor against specified minimum yield strength of any part of the stem and stem to ball connection shall be minimum 1.2.

5.6.3 The value for maximum required torque to open/close valve shall be based on original documentation from the valve manufacturer.

5.6.4 All On/Off valve actuator shall be designed, manufactured and tested in the actuator manufacturer's shop as per API 6DX. After the actuators are tested and witnessed by Valve manufacturer and by the EPC contractor's inspector the actuator shall be mounted to the respective valves at the valve assembly shop and the valve seat test shall be carried out (all seat tests) using the job actuator.

5.6.5 The actuator drawing shall provide the dimension of the actuator (maximum in all directions) and all connection dimension, mounting dimension, mounting kits dimension and material of construction of all items with corresponding ASTM specification and UNS number or IS standard or full ISO standard. All pressure bearing parts shall be supplied with IS/ISO 10474-3.1B (3.1) certificate or EN 10204-3.1 certificate.

5.6.6 The following information shall be submitted by the Valve/actuator manufacturer (for On/Off Valves) as a minimum

a. Maximum design temperature
b. Minimum design temperature
c. Design pressure to be used for the design of the pressure-containing parts
d. Maximum rated pressure
e. Torque-stroke profile of scotch-yoke gearbox
f. Valve torque and/or thrust data
g. Other specific torque or thrust data
h. Input thrust and/or torque for linear valves
i. Recommended means of limiting supply pressure

5.7 **Master Control Unit**

5.7.1 Central control unit shall be microprocessor-based unit complete with a dedicated keyboard and a display unit. It shall be possible to operate the actuators and configure the network devices from the keyboard/display unit. Protection shall be provided in the central control unit for selecting configuration mode.

5.7.2 Central control unit shall be with dual redundant configuration in such a way that failure of one unit shall automatically transfer the control to the redundant unit. The switch over time shall be of the order of 100 msec. The output shall hold to the last state during switch over.

5.7.3 The system software shall include all software necessary for operation, displays and configuration of the complete system, along with software for communication with DCS/ Host computer. Software shall also be provided for the detailed diagnostics within the system including in the master control unit and in the network. The system shall also be capable to display all diagnostic alarms including those for field control units, network and of central control

unit. Diagnostics shall also identify and display the exact location of network fault.

5.7.4 The system shall operate satisfactorily at 415 V ± 10% 50 Hz ± 3% power supply, unless specified otherwise elsewhere in the document.

5.7.5 The system configuration shall be stored in the retentive memory. Communication with Distributed Control System /HOST computer.

5.7.6 The master control unit (Slave) shall provide RS 485 port with MODBUS protocol for transferring data to DCS / host computer (Master). Redundant ports shall be provided for this connectivity.

5.7.7 It shall be possible to transfer data to and from the DCS to master control unit through this connectivity.

5.7.8 It shall be possible to include or delete any of the MOV from the system from Master Control Station.

5.8 **Motor**

5.8.1 The Motor shall be 3-phase squirrel cage induction type unless otherwise specified. It shall have totally enclosed non-ventilated and surface cooled construction.

5.8.2 The motor shall be designed for valve actuator service with high starting torque and shall be suitable for direct on line starting. It shall be rated for S2- 15-minute duty and shall conform to IS 325 or equivalent international standards.

5.8.3 The actuator assembly shall be provided with thermostat(s) embedded in it to achieve protection of motor against over-temperature.

5.8.4 The motor shall be suitable for starting under required torque with 75% of rated voltage at motor terminals

5.8.5 The motor shall have class 'F' insulation with temperature rise limited to class 'B' limits. Motor winding shall be treated to resist corrosive agents and moisture.

5.8.6 Motor fault may hold the valve in last position (Stay put).

5.8.7 System shall be solidity earthed.

5.8.8 Motor rotor shall preferably be of die-cast aluminum and, if brazed, shall be free from phosphorous.

5.8.9 Motor installed in actuator shall be rated for minimum of 60 starts/stop per hour. This is minimum requirement of actuator envisaged for On-OFF duty only.

5.8.10 In case of intrusive type actuator, anti-condensation heater shall be provided irrespective of IP-66/68 enclosure. However, in case of non-intrusive type actuator, space heater is not required.

5.9 Integral Starter and Control Transformer

5.9.1 The reversing starter, control transformer and local controls shall be integral with the valve actuator, unless specified otherwise. Solid state control of valve actuator and electrically isolated interface for remote control requirement shall be provided, wherever these features exist in manufacturer's design.

5.9.2 The integral starter shall be supplied with the following devices:

a. Electrically and mechanically interlocked reversing contactors for opening and closing operations
b. Control transformer with necessary tapping and protected with suitable easily replaceable fuses.
c. Terminal block for external cable connection fully prewired for internal devices of valve actuator.
d. MOV actuators operating with AC power supply shall be provided with Instantaneous Phase reversal protection.

5.10 **Integral Push Button, Selector switches, Indications and Control devices**

5.10.1 The following local control device shall be provided integral with the MOV actuator:
a. Push buttons for 'Opening/Closing/Stop' or alternatively 'Open/Close' selector switch
b. 'Local/Off/Remote' selector switch, pad-lockable in each position
c. Local continuous position indication from 'Valve fully open' to Valve fully closed' position, which may be of analogue or digital type using mechanical indication/Indicating lamps/LEDs.

5.11 **Torque and Travel Limit Switches**

Torque limit switches shall be provided to protect the motor from over-loading by cutting-off the power supply to motor during opening and closing operations. The limit switches shall be preset, However, it shall be possible to set the value of maximum torque during closing from 50% to 100% of rated torque of actuators. Travel limit switch shall be provided to cut-off the power supply to the motor at the end of preset limit of valve travel. The switches shall be provided with requisite number of potential-free contacts for valve actuator operation and for indication on remote panels. Instead of mechanical torque limit switches, magnetic pulse counter/encoders to measure and control the stroke of actuator may be provided, wherever this feature exists in manufacturer's design.

5.12 **Control Facilities**

The internal controls and monitoring circuits shall be incorporated within the integral starter along with transformer and control unit of valve actuator.
Remote control facility shall be provided as a standard feature. The remote control circuits shall be powered from internally derived control supply voltage. Common status contact indicating the availability of the MOV actuator for remote control shall be provided by monitoring the following:
a. Loss of one or more phases of power supply
b. Loss of control circuit supply
c. Selector switch in local mode
d. Local stop push button set to 'Off'
e. Motor thermostat tripped
f. Any other local fault/abnormal condition.

Where applicable, one number hand-held infrared/blue tooth remote programming device required for site commissioning and reconfiguring (without the need of removal of the MOV cover) shall be supplied for each group of 10 valve actuators (subject to

minimum one infrared/Bluetooth remote setting device, even if number of valve actuators are less than ten)

5.13 **Interface with Owner's DCS/Remote Pushbutton Station**

5.13.1 As a minimum as specified in project requirements, PID and licensor document, Potential free contact for the following shall be provided in actuator assembly for hardwire interface with Owner's DCS and/or Remote Push button station.

a. Run indication
b. Trip indication -
c. Open status - 2 Nos.
d. Close status - 2 Nos.
e. Ready to start indication
f. Torque high indication
g. Thermostat status
h. Open command
i. Close command
j. Local/Remote

5.13.2 MOVs should be operated with 4 hand switches each. One open/stop/close switch at the valve, one at the Local Compressor panel, one close switch 30 meters (100 feet) away from the Compressor for stopping flow to the compressor in case of compressor fire, and One close switch in the control room.

5.14 **Hand Operation**

A hand wheel with hand/auto lockable lever shall be provided for emergency operation of the MOV. the energization of the motor shall automatically re-engage power operation.

5.15 **Remote Position Indicator**

A 4-20 mA remote position transmitter shall be provided in the valve actuator and a continuous position indicator for mounting in remote panel shall be supplied as a loose item, the remote position indicator shall continuously indicate the position of travel of the valve.

5.16 **Wiring and Terminals**

All devices provided in the actuator shall be wired up to the terminal block. The contacts for remote operation and indication shall also be wired up to the terminal block. Minimum 10% spare terminals shall be provided for future interlocks. internal wiring for power and control circuits shall be appropriately sized for MOV actuator rating. Each wire shall be identified at both ends using PVC ferrules. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal so that the actuator electrical components are protected from the ingress of moisture and foreign materials when the terminal cover is removed during installation and maintenance.

The actuator shall be provided with minimum five adequately sized cable entries viz., one for power cable and two for control cables. Suitable double compression cable glands shall be provided with each actuator for all cable entries and sealing plugs for all control cable entries. The cable glands and plugs shall be made of SS 316. Plastic plugs shall not be acceptable.

5.17 **Partial Stroke Testing**

Where ever PST is specified, proprietary partial valve stroke testing mechanisms shall be provided. This mechanism shall include the use of an intelligent valve positioner and shall enable the valve to be stroked partially (adjustable set point) without upsetting normal process operation.

Partial stroke testing shall be from the DCS and shall also be capable of transmitting full valve diagnostics and predictive maintenance data to the Asset Management System. All necessary licenses on software shall be supplied by vendor. Partial stroke test shall be complete with all hardware and software which shall Include but not limited to valve positioner and logic solver etc.,

5.18 **Noise**

Vendor shall examine each valve for noise generation possibilities. Noise generated by valve during operation shall be limited to OSHA specified levels i.e. the maximum allowable noise shall be less than 85 dBA, as measured at a distance of one meter from the valve.

6.0 SPECIAL INSTRUCTIONS

Selection of the correct model numbers for the valve, actuator, solenoid valves shall be entirely the responsibility of the vendor, if any discrepancies are found between model numbers and specifications of offered devices at any stage after placement of LOI/order, same shall be rectified by vendor without any price and time implications.

Unused electrical cable entries shall be plugged with recessed head screw in full compliance with the applicable explosion proof classification and ingress protection level of the respective component.

6.1 Valve NDE & NDT Requirements

All valves shall be subject to NDE/NDT in accordance with ASME B16.34. Piping specification shall be followed for NDE requirement like Radiography (RT), Ultrasonic Testing/magnetic Particle Testing (MT), Dye Penetration Test etc.

6.2 PMI Requirements:

PMI shall be performed for alloy metal valves as per approved Positive Material Identification Procedure.

6.3 Sour and HIC service / NACE Requirements

In case of Sour and HIC service, the valve materials must meet the specific requirements hardness, radiography and other testing requirements, as per NACE MR-0103 latest edition.

6.4 Hydrogen Service Requirement

For valve used in Hydrogen Service, the valve must be certified for the use in Hydrogen service, specifically Hydrogen diffusion problems. Reference list, along-with performance feedback shall be furnished.

For hydrogen service the valve shall meet all the material and testing requirements such as Helium leak test etc. The leakage class for valve shall be in accordance with ISO 15848-1. Stem and body leakage should be as per table 1 and table 2 respectively of ISO 15848-1 with test fluid of min. 97% pure Helium.

6.5 Bolting and Gasket

Bolting and Gaskets shall conform to the following Specifications:

6.5.1 All bolts shall conform to ASME/ANSI B18.21, Nuts to be ASME/ANSI B18.22.

6.5.2 Stud bolts shall be threaded full length with two heavy hex nuts. Length tolerance shall be in accordance with the requirement of table F2 of Annexure F of ASME B16.5.

6.5.3 Threads shall be to coarse Thread series, ANSI B1.1 having class 2A tolerance for Bolts and Studs and class 2B for nuts.

6.5.4 The gasket used shall be of spiral wound type only with suitable filler material and conform to ANSI/ ASME B 16.20. Compressed asbestos fiber (CAF) gaskets shall not be used.

7.0 NAME PLATE

Each valve shall have a stainless-steel nameplate attached firmly to it at a visible place, furnishing the following information:

a. Tag number.
b. Body and port sizes in inches.
c. Max Valve body pressure rating
d. Max shut off pressure
e. Action on air failure.
f. Spring range.
g. Air supply pressure.
h. Electrical supply voltage, phase, frequency (for MOV)
i. Motor Type and rating (for MOV)
j. Manufacturer's name.
k. Manufacturers serial no. and model no. for Valve body, Actuator.
l. Hazardous area classification and IP protection class
m. Certifications (ATEX/BASEEFA/CMRI/ERTL/etc., CCOE/PESO, TUV/FMEDA etc.)

8.0 INSPECTION AND TERSTING

8.1 **INSPECTION AGENCY -** The inspection agency shall be authorized inspector of BHEL and Lloyds /TUV or any other inspection agency approved by BHEL.

8.2 Testing and inspection for all items shall be carried out as per approved factory testing procedures.

8.3 Unless otherwise specified, BHEL reserves the right to test and inspect all the items at the vendor's works, in line with inspection test plan for valves.

8.4 Vendor shall submit following test certificates and test reports:

8.4.1 Material test certificate as per clause 3.1 of EN 10204 for each valve body, bonnet castings/ forgings and as per clause 9.4 for trim.

8.4.2 Certificate of radiography/X-ray for valve castings. 100% radiography shall be carried out for the following valve castings as a minimum:

a. As per piping material specification.
b. Body rating ANSI 600 pounds and above.

c. Radiography procedure for casting shall be as per ANSI B16.34 and acceptance shall be as per ANSI B16.34 Annexure-B.
d. Radiography procedure for welded parts shall be as per Piping Material Specifications /ASTM – ASME 31.3

8.4.3 Post-weld heat treatment shall be provided for welds, as per piping material specification.

8.4.4 Dimensional, hydrostatic test reports for all valve bodies and functional test reports for all valves as per clause given below of this specification.

8.4.5 Type test certificate for fire safety for fire safe valves and its actuator and controls.

8.4.6 Certificate from statutory body for intrinsic safety/explosion proof for limit switches, solenoid valves etc. and type test certificate for weatherproof for these items.

8.4.7 Following type test certificates of offered model of actuator (MOV) shall be submitted for review and approval

a. Life test.
b. Test on motor terminal box.
c. Damp heat recycling test.

8.5 Hydrostatic Test

Each valve body shall be subjected to hydrostatic test pressure equal to 1.5 times the maximum working pressure at ambient temperature in accordance with ANSI B16.34. All valve bodies covered under IBR, shall be tested as per IBR regulations. There shall not be any visible leakage during this test.

8.6 Functional Tests

Following tests shall be done as minimum as part of functionality check for MOVs.

8.6.1 Seat Leakage Test

All valve shall be seat leak tested against standard ANSI/ FCI 70.2 / ISO 5208

8.6.2 Tubing Leak Check

Pneumatic tubes shall be bubble tested for leaks.

8.6.3 Stroke test

Pneumatic actuated valves shall be stroke tested (full open to full close and vice versa) with minimum instrument air supply pressure and maximum DP across the valve. Open and close timing shall be recorded in test report.

8.6.4 MOV Actuator

a. Functional and calibration test for torque and limit switches
b. Response time test
c. Variation of supply voltage
d. Variation of frequency
e. Test on output shaft at 100% torque
f. Tests for motor (As per relevant IS/IEC)

8.7 **Witness Inspection**

Pre-dispatch inspection for all valves shall be performed and following tests/checks shall be carried out as a minimum.

8.7.1 Physical dimensional verification and workmanship.

8.7.2 Hydrostatic test of this specification on representative samples.

8.7.3 Functional tests of this specification on representative samples.

8.7.4 Pneumatic test on actuator on representative samples.

8.7.5 Review of all certificates and test reports of this specification.

In the event when no witness inspection is carried out by BHEL/TPIA, the tests shall anyway be completed by vendor and documents for the same shall be submitted to BHEL/TPIA for scrutiny.

8.8 Certification requirement for valve components:

8.8.1 For all material, all sizes and all rating in H2, Lethal, Toxic Service IS/ISO 10474 3.2, EN 10204 3.2 certificate by BHEL Authorized inspector, appointed by valve vendor.

8.8.2 For CS (other than IBR) up to and including 600 Rating in non-sour service irrespective of size: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.3 CS in Sour Service up to and including size 1.5" irrespective of rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.4 CS in wet H2S service irrespective of the rating, for sizes 2" and above IS/ISO 10474 3.2, EN10204 3.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.5 For LAS (other than IBR) irrespective of size and rating IS/ISO 10474 3.2, EN 10204 3.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.6 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M up to and including 1.5" irrespective of size and rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204- 3.1 certification.

8.8.7 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M up to and including 6" in nonlethal and non-toxic service and non-sour service and non-IBR service up to and including 300 rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.8 For all sizes and rating SS 321, CF8C, CF10C, SS 347H, SS347 IS/ISO 10474 3.2, EN 102043.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.9 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M >= 8" in non-lethal and non-toxic service and non-sour service and non-IBR service up to and including 300 rating and all sizes of 600 rating and above irrespective of service: IS/ISO 10474 3.1, EN 10204-3.1 certification

9.0 SPARES

9.1 Two years Operation spares and commissioning spares shall be supplied by the vendor for all valves and its accessories, which shall include plug, seat ring, gasket set, packing set, diaphragm/ O-ring set etc. as a minimum.

9.2 Any special tools needed for maintenance work shall be supplied. Vendor must certify in their offer in case no special tools are necessary for the offered control valves and their accessories

10.0 SHIPPING

10.1 It is the responsibility of the vendor to ensure that the valve is adequately protected and packed to meet the shipping and delivery requirements. The valve may be stored outdoor for long period before installation. Packing shall be suitable for outdoor storage in the area with heavy rains and high ambient temperature.

10.2 Machined surface which may be exposed to the atmosphere in the transit and subsequent storage shall be properly protected with an easily removable rust preventing coating of the proper consistency applied by the manufacturer, but not until inspection.

10.3 The valve and its accessories shall be supplied pre-assembled and pre-tubed.

10.4 All threaded and flanged openings shall be suitably protected to prevent entry of foreign material. Temporary plugs used should be readily distinguishable from permanent metal plugs.

10.5 Valves with external lubricators shall be lubricated prior to shipment.

11.0 DOCUMENTATION

11.1 Following are the drawings and documents required to be submitted for the Valve, as a minimum:

- 11.1.1 Specification sheet for each valve and its accessories.
- 11.1.2 General Arrangement drawing for each valve providing the complete dimension of valve assembled with actuator and other accessories, weight of the valve assembly
- 11.1.3 Dimensions of clearance space required for maintenance work
- 11.1.4 Lifting Instruction for the valves.
- 11.1.5 Wiring diagram for the accessories like solenoid valve, limit switches including terminal numbers and cable type.
- 11.1.6 Wiring diagram for MOV actuator terminal compartment showing power supply, control signals and other contacts including spares with terminal numbers and cable type.
- 11.1.7 Copy of type test certificates including SIL certificate.
- 11.1.8 Copy of the test certificates for all tests.
- 11.1.9 Installation procedure.
- 11.1.10 Calibration and maintenance procedure including replacement of its parts/internals wherever it is applicable.

11.2 All the documents shall be A4 or A3 size only; all the document prints larger than A4 shall be folded to A4 size with identification data visible at the bottom right.

12.0 GUARANTEE/WARRANTY:

A guarantee certificate for trouble free service for a period of 12 months from the date of commissioning or 24 months from the date of dispatch shall be submitted.

VARIANT TABLE

Var. No	Description
01	Motor Operated Gate valve 8"#300RF NACE +H2
02	Motor Operated Gate valve 12"#300RF NACE +H2
03	Motor Operated Gate valve 18"#300RF NACE +H2
04	

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised	Checked	Approved
00	12.07.2022	First Issue	BKK	CHANDU	CLT

ANNEXURE-1

1. PURPOSE AND SCOPE

1.1 This specification covers additional requirements relating to components intended for operation in Hydrogen service.

1.2 Applicability : This specification applies to all components for which Hydrogen Service requirement is indicated on the component technical data sheets.

2. REQUIREMENTS FOR PIPES, FITTINGS & FLANGES :

2.1 **GENERAL** (applicable to all pipes, fittings, flanges & special parts)

2.1.1 Material identification stamps (cold stamping) including punch marks and large hardness impressions are not permitted on hydrogen contacted surfaces.

2.1.2 Cold stamping on the outside surface shall be performed before heat treatment. Depth and sharpness of indentation shall be compatible with wall thickness of the component. These requirements do not apply to the stamping of flanges on their circumference.

2.1.3 Stamping of fittings after heat treatment is not permitted.

2.1.4 For steels which need to be preheated for welding, the preheat temperatures shall be maintained in all cases such as temporary welding, auxiliary welds and thermal cutting. Preheating shall penetrate the entire cross-sectional area of the material and shall extend over a width of 300 mm on both sides of the weld. Thermocouples shall be attached to the item being heat treated and the temperature shall be recorded for confirmation of the heat treatment.

2.1.5 Evidence shall be furnished for the base metal, heat affected zone and weld metal that hardness limitations have been satisfied. For this purpose, measurements shall be taken on the procedure qualification specimens and on the item concerned. Hardness values shall be checked at least at three locations in a direction perpendicular to the weld.

2.1.6 Serrations on the flange face shall be concentric for hydrogen service. Spiral serration is not acceptable.

2.2 APPLICABLE TO CARBON STEEL (CS) PIPES, FITTINGS, FLANGES & SPECIAL PARTS:

2.2.1 All pipes, forgings and fittings having wall thickness 9.53 mm and thicker shall be normalized. Cold drawn pipes & fittings shall be normalized after the final cold draw pass for all thickness. The normalizing shall be a separate heating operation and not a part of the hot forming operation. In addition, fittings made from forgings shall have carbon – 0.35 % Max. and Silicon – 0.35 % Max.

2.2.2 Carbon equivalent shall not exceed the following value:

$$Ceq = \%C + \frac{\%Mn}{6} + \frac{\%(Cr + Mo + V)}{5} + \frac{\%(Ni + Cu)}{15} \leq 0.42$$

Under no condition Ni content shall be in excess of 1%.

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2.2.3 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIV.-I,UW-51 & ASME SECTION-V. Radiography shall be done before PWHT and 100% UT shall be done after PWHT.

2.2.4 The hardness of any pressure containing component, weld & heat affected zone (after heat treatment) shall be limited to 200 BHN max.

2.3 APPLICABLE TO ALLOY STEEL (Cr-Mo) PIPES, FITTINGS, FLANGES & SPECIAL PARTS :

2.3.1 All pipes, flanges and fittings shall be normalized and tempered. The normalizing and tempering heat treatment shall be a separate heating operation and not a part of hot forming operation.

2.3.2 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIV.-I, UW-51 & ASME SECTION V. 100% radiography & UT shall be performed after PWHT.

2.3.3 The hardness of any pressure containing component, weld & heat affected zone (after PWHT) shall be limited to 225 BHN max.

2.3.4 The alloy content of welds shall be verified by chemical analysis. Tests shall be conducted when changes in weld wire and/or weld flux are made, or when a new set of electrode is used.

2.3.5 Maximum room temperature tensile strength of all pressure containing components and welds shall not exceed 100,000 PSI.

2.3.6 Under no condition Ni content shall be in excess of 1%.

2.4 APPLICABLE TO STAINLESS STEEL PIPES, FITTINGS, FLANGES & SPECIAL PARTS :

2.4.1 All pipes, flanges & fittings shall be solution annealed after welding and pickled.

2.4.2 All stabilized grades of stainless steel (SS321, SS321H, SS347, SS347H) shall be given a stabilizing heat treatment in addition to solution heat treatment at 900 ±10 Deg.C for 4 hours. For "H" grades C content shall be 0.04% minimum. 01

2.4.3 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIVISION I, UW-51 and ASME SECTION V.

2.4.4 For all austenitic stainless steels, weld deposits shall be checked for ferrite content. A ferrite number (FN) of not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment and high temperature service. FN shall be determined by use of a ferrite scope. Ferrite scope measurements must be made prior to post weld heat treatment to be meaningful.

2.4.5 The maximum hardness of any pressure containing component, weld & HAZ shall be 200 BHN.

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3 REQUIREMENTS FOR VALVES:

3.1 GENERAL (applicable to all valves)

3.1.1 Each valve body, bonnet & cover casting shall be subjected to examination by radiography in accordance with ASME SECTION VIII,DIVISION I, APPENDIX 7.

3.1.2 Valves shall be labelled "SUITABLE FOR HYDROGEN SERVICE"

3.1.3 Helium Leakage Test :

Body/bonnet/cover joints & stuffing box of all valves and special parts (both forged and cast) shall have low emission. One valve per metallurgy, per rating and per size shall be helium leak tested as per ASME SECTION V, SUBSECTION A, ARTICLE 10, APPENDIX IV. (Detector Probe Technique) at a minimum of 25% allowable cold (rated) working pressure. Selection of valve for test shall be random. Test duration shall be as follows.

TEST DURATION IN MINUTES				
Nominal Size (mm)	**PRESSURE CLASS**			
	Upto 300	**600**	**800, 900**	**1500**
Upto 2"	3	6	9	12
3" to 6"	6	9	12	15
8" to 16"	9	9	12	15
18" to 24"	9	12	15	18

Leakage rate shall be less than 0.0001 ml/sec of helium.

3.1.4 The design & geometry of valve internals shall remove crevices & stagnant areas.

3.1.5 Valves shall be internally cleaned & free from moisture and grease.

3.2 APPLICABLE TO CARBON STEEL & ALLOY STEEL VALVES :

3.2.1 Carbon steel castings / forgings shall be normalized & alloy steel castings / forgings shall be normalized and tempered.

3.2.2 Critical body, bonnet, cover casting sections, typically defined by ASME B16.34, shall be radiographed and shall meet ASTM E446 (up to 2" thick) Category A, B & CA-Level 2, Category CB, CC & CD-level 3, Category D, E & F level 0. For wall thickness 2" to 4.5" comparable plates of ASTM E186 shall be used. ASTM E94 shall be used for recommended practice & controlling quality of radiography as guide. The entire surface of the castings shall be dye penetrant inspected.

3.2.3 Bend tests and magnetic particle inspection of the entire surface of body and bonnet castings shall be carried out in accordance with ASTM A217 supplementary requirements S3 & S4. Evaluation of magnetic particle inspection shall be in accordance with MSS SP-53 except that no linear discontinuities shall be allowed.

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3.2.4 The brinell hardness of heat treated casting shall not exceed 200 BHN for carbon steel and 225 BHN for alloy steel.

3.2.5 The tensile stress for A.S. shall be less than 100,000 PSI for alloy steel.

3.2.6 Repair of defective casting shall be outlined in writing to the purchaser before repair starts. Repair method to be approved prior to welding.

Castings shall be preheated to a minimum of 400F prior to welding and all Chromium-molybdenum alloys shall be postweld heat treated after welding is complete. Stress relieving is essential for welds.

Dye penetrant test of welds shall be in accordance with ASTM B165 procedure B-2. Interpretation as per appendix-8 of ASME – VIII Div.1.

Repair welds shall be 100% radiographed and evaluated in accordance with paragraph 344.5 of ASME B31.3 with a minimum casting quality factor of 0.95. Dye penetration test shall be as per ASTM E165 procedure B-2, interpretation as per Appendix -8 of ASME-VIII Div.1.

3.3 APPLICABLE TO STAINLESS STEEL VALVES:

3.3.1 Casting shall be in the solution heat treated and pickled condition. All castings and test bars shall be heat treated together.

3.3.2 Critical body and bonnet casting sections, typically defined by ASME B16.34, shall be radiographed and shall meet ASTM E446 (up to 2" thick) Category A, B & CA-Level 2, Category CB, CC & CD-level 3, Category D, E & F level 0. For wall thickness 2" to 4.5" comparable plates of ASTM E186 shall be used. ASTM E94 shall be used for recommended practice & controlling quality of radiography as guide. The entire surface of the castings shall be dye penetrant inspected after pickling.

Repair welds shall be 100% radiographed and evaluated in accordance with paragraph 344.5 of ASME B31.3 with a minimum casting quality factor of 0.95. Dye penetration test shall be as per ASTM E165 procedure B-2, interpretation as per Appendix -8 of ASME-VIII Div.1.

4 IMPACT TESTING:

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4.1 For all carbon steel and alloy steel pipes, flanges and fittings with thickness over 19 mm, Charpy V-notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div.-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and in accordance with ASTM A370. Impact energies at 0 Deg. C shall average greater than 27J (20ft-lb) per set of 3 specimens with a minimum of 19J (15 ft-lb)

If welding is used in manufacturing, impact test of heat affected zone (HAZ) and weld metal shall also be carried out.

Charpy V notch impact testing is to be done for all CS & AS valves material (average 20 ft-lb for set of 3 [minimum value 15 ft-lb] at 30 F).

1. SCOPE:

1.1 This standard specifies the requirement of MOTOR OPERATED GATE VALVES flanged, carbon steel body material, with special requirement of NACE+ Hydrogen service+ PWHT

1.2 **APPLICATION:** These valves are used for compressor suction and discharge line

2. DESIGNATION:

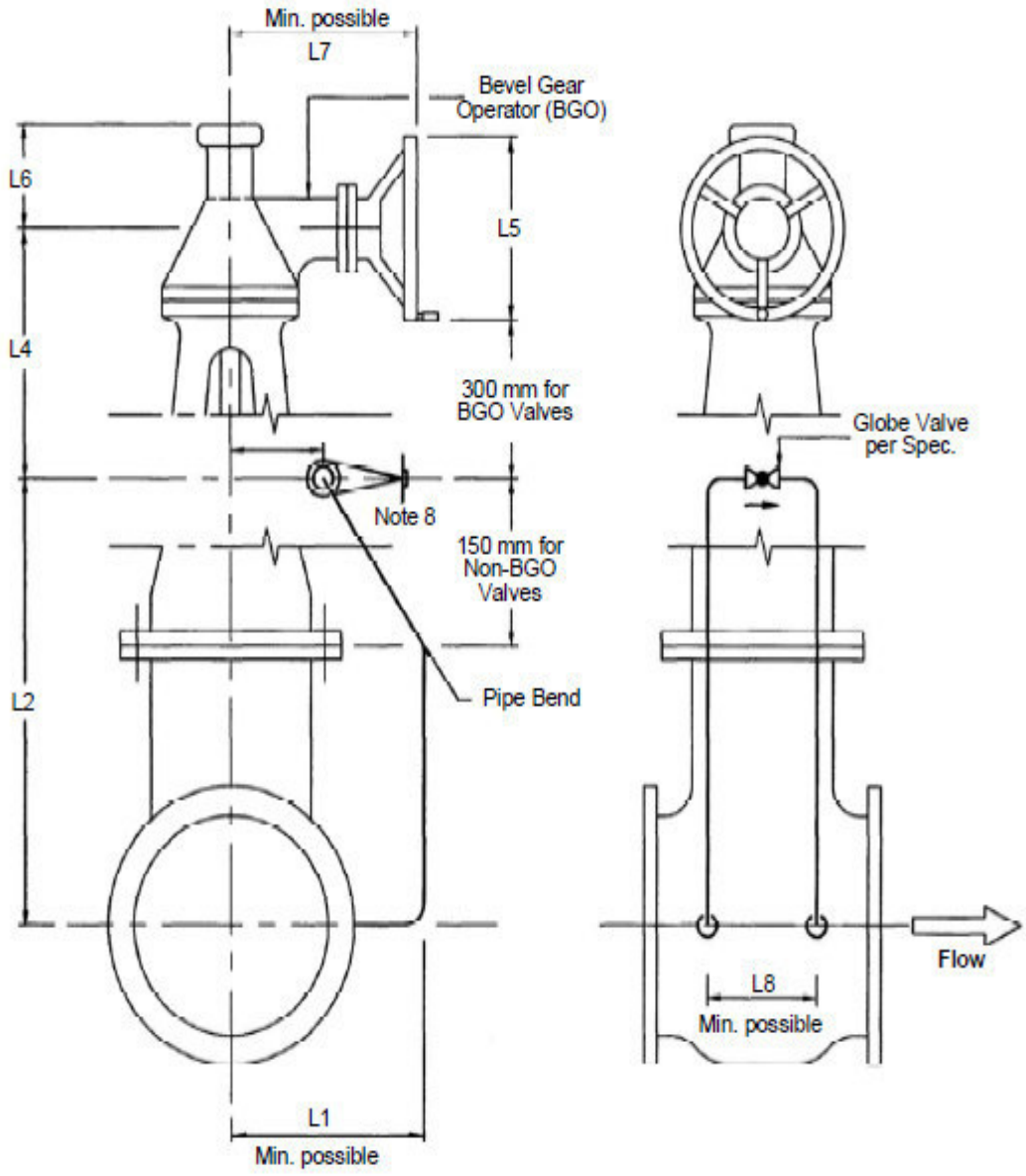
The Ball Valve shall be designated on the material indents as follows:
EX: MO GATE VALVE CS 18" #300RF NACE +H2

3. GENERAL REQUIREMENTS OF GATE VALVES:

3.1 In order to facilitate opening large gate valves subject to high differential pressures, equalizing bypass valves are sometimes installed on the valve bodies. The need for this feature should be considered per table below:

Sr.No.	Valve Rating	Main Valve Size
1	# 150	DN 650 (NPS 26") & Above
2	# 300	DN 400 (NPS 16") & Above
3	# 600	DN 150 (NPS 6") & Above
4	# 900	DN 100 (NPS 4") & Above
5	# 1500	DN 100 (NPS 4") & Above
6	# 2500	DN 80 (NPS 3") & Above

a. By-pass valve shall be a globe valve. The sizes shall be as under:
b. On main valve DN 100 (NPS 4"): DN 15 (NPS 1/2")
c. On main valve DN 150 to 200 (NPS 6" to 8"): DN 20 (NPS 3/4")
d. On main valve DN 250 (NPS 10") & above: DN 25 (NPS 1")
e. By-pass piping shall be of same metallurgy as the main valve. In case details of by-pass arrangement for any Valve tag number is missing, the vendor shall bring it to notice of BHEL and provide by-pass as per specified details.
f. Vendor shall supply the by-pass valve duly tested and fitted to the main valve. Valves with by-pass shall have the direction of flow marked on the main valve. By-pass attachment to the main valve body shall not be screwed. All fillet welds for by-pass installation shall be 100% examined by DP/MP test and Butt-weld joints shall be 100% examined by radiography.
g. Typical Bypass arrangement is shown below:



NOTES:

1. The orientation & location of hand wheel of bevel gear operator & the bypass arrangement shall be strictly as per this sketch.
2. The bypass connection ends shall be socket welded up to 600# and butt welded for 900# and above rating.
3. The bypass arrangement shall be properly clamped to & supported by the body of the main valve.
4. Basic design of bypass shall be to MSS-SP-45.
5. Material of bypass pipe & 90° elbows shall be same or equivalent to the body material of main valve.
6. This sketch is applicable for both BGO & NON-BGO valves.
7. Vendor shall furnish dimensions L1 to L8.
8. Stem shall not be horizontal in the case of Cryogenic Valves.

3.2 Valve stem packing (where applicable) shall consist of flexible graphite complete with corrosion inhibitor (middle rings: die formed; top and bottom rings: braided). Stem Packing shall be Renewable with Valve Open on Stream.

3.3 Spiral wound body/bonnet gaskets shall be fully confined or shall have inner/outer guide rings.

3.4 Requirements pertaining to valve testing:
a. Hydrostatic test fluid shall have a chlorine content of less than 200 ppm for carbon steel valves and less than 50 ppm for stainless steel valves.
b. Valves with gear operators shall be seat tested after the assembly of the operating mechanism.

3.5 All grease / sealant / flushing injection fittings shall be SS 316 minimum except where the service does not allow use of SS 316, in which case UNS N06625 shall be used.

3.6 All valves shall have locking facility to allow locking in the open or closed position.

3.7 The minimum thickness requirements shall be as per B16.34 + the corrosion allowance indicated in the PMS for the respective piping class, but in no case less than the thicknesses indicated in the respective governing standard. In the event the valves have tapped holes on the pressure envelope the minimum thickness requirement shall be applicable from the bottom of the tapped hole to the inside wall of the valve pressure envelope. In the event vendor offers thickness that are lesser than the above then the bidder shall demonstrate through FEM calculations that the corrosion allowance is preserved.

3.8 Gate and globe valves shall be OS & Y (Outside Screw & Yoke) type.

3.9 Bonnet gaskets for gate and globe valves:
a) ASME Class 150 valves: flexible graphite reinforced with a corrugated metal insert (plain flat metal gaskets are not acceptable).
b) ASME Class 300 and higher valves: SS spiral wound gasket with graphite filler for valves with raised face body to bonnet joint or soft iron ring (per ASME B16.20) for valves with ring type body to bonnet joint.

3.10 Seat rings for valves less than or equal to DN40 shall be pressed and or rolled into the body. Screwed in seat rings are acceptable only when they are properly secured against loosening.

3.11 When specified in the purchase order, gate valves shall be provided with equalising globe valve bypass. To permit field retrofit of bypasses, valves as specified in the Clause A.3.4.1 shall have auxiliary connections per ASME B16.34, Clause 6.3.6 in the valve bodies (c/w bull-plug of the same material as the valve body)
Auxiliary connections shall meet the requirements of ASME B16.34 and MSS SP-45 and shall be located at positions A and B of Figure 1 of ASME B16.34.

3.12 Valves shall be provided with back seating facility. Valves shall be provided with stem back seating facility. All body & backseat sealing surfaces on steel and high nickel alloy valves shall be hard faced. The minimum thickness of any hard facing shall be 1.5mm and all hard-facing deposition procedures, together with relevant heat treatments, shall be subject to BHEL approval.

3.13 Flanged valves should be provided with renewable seats.

4. TECHNICAL REQUIREMENTS:

TABLE - I

CL	REQUIREMENTS	COMPLIANCE
4.1	Pressure Temperature ratings	ASME B16.34
4.2	Materials	As specified in Table - II
4.3	Construction	API 600
4.4	End Connections	Flanged
4.4.1	Flanged	ASME B16.5
4.5	Face to Face and End to End dimensions	ASME B16.10
4.6	Schedule	As per PR
4.7	Hydraulic test pressure	1.5 times of maximum working pressure corresponding to valve class
4.7.1	Body	As per pressure class
4.7.2	Seat	As per pressure class
4.7.3	Low Pressure Test	As per relevant standard
4.7.4	Additional requirement	H2 service as per Annexure-1 and NACE MR0103
4.8	Pressure Drop across the Valve	Vendor to specify
4.9	Fugitive Emission	As per ISO 15858 Part-1: Tightness class C
4.10	Mode of Operation	Motor Operated
4.11	Special requirements	PWHT+SOUR Service. Valve shall be fire safe with fire proof actuator. Power and control cables shall be fire proofed
4.12	Fire test	API 607

TABLE - II

DESCRIPTION	CONSTRUCTION	MATERIAL
BODY	CAST	ASTM A216 GR. WCB
BONNET	BOLTED	ASTM A216 GR. WCB
API TRIM #		Trim No. 5
Wedge	FLEXIBLE	As per Trim #5
Yoke	SEPARATE	As per Trim #5
Stud Bolts & Nuts		A193: Gr.B7 & A194: Gr.2H
Bonnet Gasket		SPW AISI 316L/Graphite
Body Seat Ring	Renewable	As per Trim #5
Packing		Graphited with Corrosion Inhibitor & Inconel Wire Reinforcement
Hand wheel	Non-rising	
STEM	OS &Y	As per Trim #5

NOTES:

1. 100% valve castings shall undergo radiographic examination.
2. Testing shall be as per API 598. Valve testing as per BS EN-12266-1 and BS 6755 (Part-1) is also acceptable.
3. Supplier shall strictly comply with this standard in all respects. No deviation shall be allowed unless written permission of BHEL is obtained before finalization of the order
4. IGC test shall be done for all SS parts.
5. Solenoid valve and other tube fittings shall be as per customer approved vendor list.

Customer Approved Vendor list for Actuator

	5.163 ACTUATORS – MOV		
1		AUMA INDIA PVT LTD	INDIA
2		EMERSON PROCESS MANAGEMENT INDIA PVT LTD	INDIA
3		FLOWSERVE	INDIA
4		LIMITORQUE INDIA LTD	INDIA
5		MARSH AUTOMATION PVT LTD	INDIA
6		ROTORK CONTROLS INDIA LTD	INDIA

5.0 Actuator Design Basis

5.1 Each MOV actuator shall include the motor, actuator unit, gears, position indicators, limit switches, hand wheel, electrical starter and controls, terminal box etc. as a self-contained unit.

5.2 The actuator shall be sized to provide adequate torque and/or thrust to ensure the complete intended travel of the valve under the worst operating and electrical power supply conditions.

5.3 The enclosure of complete MOV actuator including motor, integral starter, control transformer unit and all control devices shall be Ex d certified and shall have minimum IP-67 degree of protection which shall include the 'O' ring for complete environmental protection.

5.4 When specified, Smart MOV and Field Control Unit to be supplied.

5.5 Actuators shall be capable of applying a torque / force of at least 1.5 times maximum requirement advised by the manufacturer at all points of the open / close cycle. Valve actuators shall be mounted on the valves by the manufacturer at the factory unless otherwise advised.

5.6 All Actuated On/Off Valves

5.6.1 Stem and stem to obturator connection shall be designed for the maximum torque during valve operation by the higher of:

- Spring load
- Specified maximum air supply pressure

5.6.2 The safety factor against specified minimum yield strength of any part of the stem and stem to ball connection shall be minimum 1.2.

5.6.3 The value for maximum required torque to open/close valve shall be based on original documentation from the valve manufacturer.

5.6.4 All On/Off valve actuator shall be designed, manufactured and tested in the actuator manufacturer's shop as per API 6DX. After the actuators are tested and witnessed by Valve manufacturer and by the EPC contractor's inspector the actuator shall be mounted to the respective valves at the valve assembly shop and the valve seat test shall be carried out (all seat tests) using the job actuator.

5.6.5 The actuator drawing shall provide the dimension of the actuator (maximum in all directions) and all connection dimension, mounting dimension, mounting kits dimension and material of construction of all items with corresponding ASTM specification and UNS number or IS standard or full ISO standard. All pressure bearing parts shall be supplied with IS/ISO 10474-3.1B (3.1) certificate or EN 10204-3.1 certificate.

5.6.6 The following information shall be submitted by the Valve/actuator manufacturer (for On/Off Valves) as a minimum

a. Maximum design temperature
b. Minimum design temperature
c. Design pressure to be used for the design of the pressure-containing parts
d. Maximum rated pressure
e. Torque-stroke profile of scotch-yoke gearbox
f. Valve torque and/or thrust data
g. Other specific torque or thrust data
h. Input thrust and/or torque for linear valves
i. Recommended means of limiting supply pressure

5.7 **Master Control Unit**

5.7.1 Central control unit shall be microprocessor-based unit complete with a dedicated keyboard and a display unit. It shall be possible to operate the actuators and configure the network devices from the keyboard/display unit. Protection shall be provided in the central control unit for selecting configuration mode.

5.7.2 Central control unit shall be with dual redundant configuration in such a way that failure of one unit shall automatically transfer the control to the redundant unit. The switch over time shall be of the order of 100 msec. The output shall hold to the last state during switch over.

5.7.3 The system software shall include all software necessary for operation, displays and configuration of the complete system, along with software for communication with DCS/ Host computer. Software shall also be provided for the detailed diagnostics within the system including in the master control unit and in the network. The system shall also be capable to display all diagnostic alarms including those for field control units, network and of central control

unit. Diagnostics shall also identify and display the exact location of network fault.

5.7.4 The system shall operate satisfactorily at 415 V ± 10% 50 Hz ± 3% power supply, unless specified otherwise elsewhere in the document.

5.7.5 The system configuration shall be stored in the retentive memory. Communication with Distributed Control System /HOST computer.

5.7.6 The master control unit (Slave) shall provide RS 485 port with MODBUS protocol for transferring data to DCS / host computer (Master). Redundant ports shall be provided for this connectivity.

5.7.7 It shall be possible to transfer data to and from the DCS to master control unit through this connectivity.

5.7.8 It shall be possible to include or delete any of the MOV from the system from Master Control Station.

5.8 **Motor**

5.8.1 The Motor shall be 3-phase squirrel cage induction type unless otherwise specified. It shall have totally enclosed non-ventilated and surface cooled construction.

5.8.2 The motor shall be designed for valve actuator service with high starting torque and shall be suitable for direct on line starting. It shall be rated for S2- 15-minute duty and shall conform to IS 325 or equivalent international standards.

5.8.3 The actuator assembly shall be provided with thermostat(s) embedded in it to achieve protection of motor against over-temperature.

5.8.4 The motor shall be suitable for starting under required torque with 75% of rated voltage at motor terminals

5.8.5 The motor shall have class 'F' insulation with temperature rise limited to class 'B' limits. Motor winding shall be treated to resist corrosive agents and moisture.

5.8.6 Motor fault may hold the valve in last position(Stayput).

5.8.7 System shall be solidity earthed.

5.8.8 Motor rotor shall preferably be of die-cast aluminum and, if brazed, shall be free from phosphorous.

5.8.9 Motor installed in actuator shall be rated for minimum of 60 starts/stop per hour. This is minimum requirement of actuator envisaged for On-OFF duty only.

5.8.10 In case of intrusive type actuator, anti-condensation heater shall be provided irrespective of IP-66/68 enclosure. However, in case of non-intrusive type actuator, space heater is not required.

5.9 Integral Starter and Control Transformer

5.9.1 The reversing starter, control transformer and local controls shall be integral with the valve actuator, unless specified otherwise. Solid state control of valve actuator and electrically isolated interface for remote control requirement shall be provided, wherever these features exist in manufacturer's design.

5.9.2 The integral starter shall be supplied with the following devices:

a. Electrically and mechanically interlocked reversing contactors for opening and closing operations
b. Control transformer with necessary tapping and protected with suitable easily replaceable fuses.
c. Terminal block for external cable connection fully prewired for internal devices of valve actuator.
d. MOV actuators operating with AC power supply shall be provided with Instantaneous Phase reversal protection.

5.10 **Integral Push Button, Selector switches, Indications and Control devices**

5.10.1 The following local control device shall be provided integral with the MOV actuator:
a. Push buttons for 'Opening/Closing/Stop' or alternatively 'Open/Close' selector switch
b. 'Local/Off/Remote' selector switch, pad-lockable in each position
c. Local continuous position indication from 'Valve fully open' to Valve fully closed' position, which may be of analogue or digital type using mechanical indication/Indicating lamps/LEDs.

5.11 **Torque and Travel Limit Switches**

Torque limit switches shall be provided to protect the motor from over-loading by cutting-off the power supply to motor during opening and closing operations. The limit switches shall be preset, However, it shall be possible to set the value of maximum torque during closing from 50% to 100% of rated torque of actuators. Travel limit switch shall be provided to cut-off the power supply to the motor at the end of preset limit of valve travel. The switches shall be provided with requisite number of potential-free contacts for valve actuator operation and for indication on remote panels. Instead of mechanical torque limit switches, magnetic pulse counter/encoders to measure and control the stroke of actuator may be provided, wherever this feature exists in manufacturer's design.

5.12 **Control Facilities**

The internal controls and monitoring circuits shall be incorporated within the integral starter along with transformer and control unit of valve actuator.
Remote control facility shall be provided as a standard feature. The remote control circuits shall be powered from internally derived control supply voltage. Common status contact indicating the availability of the MOV actuator for remote control shall be provided by monitoring the following:
a. Loss of one or more phases of power supply
b. Loss of control circuit supply
c. Selector switch in local mode
d. Local stop push button set to 'Off'
e. Motor thermostat tripped
f. Any other local fault/abnormal condition.

Where applicable, one number hand-held infrared/blue tooth remote programming device required for site commissioning and reconfiguring (without the need of removal of the MOV cover) shall be supplied for each group of 10 valve actuators (subject to

minimum one infrared/Bluetooth remote setting device, even if number of valve actuators are less than ten)

5.13 **Interface with Owner's DCS/Remote Pushbutton Station**

5.13.1 As a minimum as specified in project requirements, PID and licensor document, Potential free contact for the following shall be provided in actuator assembly for hardwire interface with Owner's DCS and/or Remote Push button station.

a. Run indication
b. Trip indication -
c. Open status - 2 Nos.
d. Close status - 2 Nos.
e. Ready to start indication
f. Torque high indication
g. Thermostat status
h. Open command
i. Close command
j. Local/Remote

5.13.2 MOVs should be operated with 4 hand switches each. One open/stop/close switch at the valve, one at the Local Compressor panel, one close switch 30 meters (100 feet) away from the Compressor for stopping flow to the compressor in case of compressor fire, and One close switch in the control room.

5.14 **Hand Operation**

A hand wheel with hand/auto lockable lever shall be provided for emergency operation of the MOV. the energization of the motor shall automatically re-engage power operation.

5.15 **Remote Position Indicator**

A 4-20 mA remote position transmitter shall be provided in the valve actuator and a continuous position indicator for mounting in remote panel shall be supplied as a loose item, the remote position indicator shall continuously indicate the position of travel of the valve.

5.16 **Wiring and Terminals**

All devices provided in the actuator shall be wired up to the terminal block. The contacts for remote operation and indication shall also be wired up to the terminal block. Minimum 10% spare terminals shall be provided for future interlocks. internal wiring for power and control circuits shall be appropriately sized for MOV actuator rating. Each wire shall be identified at both ends using PVC ferrules. The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight seal so that the actuator electrical components are protected from the ingress of moisture and foreign materials when the terminal cover is removed during installation and maintenance.

The actuator shall be provided with minimum five adequately sized cable entries viz., one for power cable and two for control cables. Suitable double compression cable glands shall be provided with each actuator for all cable entries and sealing plugs for all control cable entries. The cable glands and plugs shall be made of SS 316. Plastic plugs shall not be acceptable.

5.17 **Partial Stroke Testing**

Where ever PST is specified, proprietary partial valve stroke testing mechanisms shall be provided. This mechanism shall include the use of an intelligent valve positioner and shall enable the valve to be stroked partially (adjustable set point) without upsetting normal process operation.

Partial stroke testing shall be from the DCS and shall also be capable of transmitting full valve diagnostics and predictive maintenance data to the Asset Management System. All necessary licenses on software shall be supplied by vendor. Partial stroke test shall be complete with all hardware and software which shall Include but not limited to valve positioner and logic solver etc.,

5.18 **Noise**

Vendor shall examine each valve for noise generation possibilities. Noise generated by valve during operation shall be limited to OSHA specified levels i.e. the maximum allowable noise shall be less than 85 dBA, as measured at a distance of one meter from the valve.

6.0 SPECIAL INSTRUCTIONS

Selection of the correct model numbers for the valve, actuator, solenoid valves shall be entirely the responsibility of the vendor, if any discrepancies are found between model numbers and specifications of offered devices at any stage after placement of LOI/order, same shall be rectified by vendor without any price and time implications.

Unused electrical cable entries shall be plugged with recessed head screw in full compliance with the applicable explosion proof classification and ingress protection level of the respective component.

6.1 Valve NDE & NDT Requirements

All valves shall be subject to NDE/NDT in accordance with ASME B16.34. Piping specification shall be followed for NDE requirement like Radiography (RT), Ultrasonic Testing/magnetic Particle Testing (MT), Dye Penetration Test etc.

6.2 PMI Requirements:

PMI shall be performed for alloy metal valves as per approved Positive Material Identification Procedure.

6.3 Sour and HIC service / NACE Requirements

In case of Sour and HIC service, the valve materials must meet the specific requirements hardness, radiography and other testing requirements, as per NACE MR-0103 latest edition.

6.4 Hydrogen Service Requirement

For valve used in Hydrogen Service, the valve must be certified for the use in Hydrogen service, specifically Hydrogen diffusion problems. Reference list, along-with performance feedback shall be furnished.

For hydrogen service the valve shall meet all the material and testing requirements such as Helium leak test etc. The leakage class for valve shall be in accordance with ISO 15848-1. Stem and body leakage should be as per table 1 and table 2 respectively of ISO 15848-1 with test fluid of min. 97% pure Helium.

6.5 Bolting and Gasket

Bolting and Gaskets shall conform to the following Specifications:

6.5.1 All bolts shall conform to ASME/ANSI B18.21, Nuts to be ASME/ANSI B18.22.

6.5.2 Stud bolts shall be threaded full length with two heavy hex nuts. Length tolerance shall be in accordance with the requirement of table F2 of Annexure F of ASME B16.5.

6.5.3 Threads shall be to coarse Thread series, ANSI B1.1 having class 2A tolerance for Bolts and Studs and class 2B for nuts.

6.5.4 The gasket used shall be of spiral wound type only with suitable filler material and conform to ANSI/ ASME B 16.20. Compressed asbestos fiber (CAF) gaskets shall not be used.

7.0 NAME PLATE

Each valve shall have a stainless-steel nameplate attached firmly to it at a visible place, furnishing the following information:

a. Tag number.
b. Body and port sizes in inches.
c. Max Valve body pressure rating
d. Max shut off pressure
e. Action on air failure.
f. Spring range.
g. Air supply pressure.
h. Electrical supply voltage, phase, frequency (for MOV)
i. Motor Type and rating (for MOV)
j. Manufacturer's name.
k. Manufacturers serial no. and model no. for Valve body, Actuator.
l. Hazardous area classification and IP protection class
m. Certifications (ATEX/BASEEFA/CMRI/ERTL/etc., CCOE/PESO, TUV/FMEDA etc.)

8.0 INSPECTION AND TERSTING

8.1 **INSPECTION AGENCY -** The inspection agency shall be authorized inspector of BHEL and Lloyds /TUV or any other inspection agency approved by BHEL.

8.2 Testing and inspection for all items shall be carried out as per approved factory testing procedures.

8.3 Unless otherwise specified, BHEL reserves the right to test and inspect all the items at the vendor's works, in line with inspection test plan for valves.

8.4 Vendor shall submit following test certificates and test reports:

8.4.1 Material test certificate as per clause 3.1 of EN 10204 for each valve body, bonnet castings/ forgings and as per clause 9.4 for trim.

8.4.2 Certificate of radiography/X-ray for valve castings. 100% radiography shall be carried out for the following valve castings as a minimum:

a. As per piping material specification.
b. Body rating ANSI 600 pounds and above.

c. Radiography procedure for casting shall be as per ANSI B16.34 and acceptance shall be as per ANSI B16.34 Annexure-B.
d. Radiography procedure for welded parts shall be as per Piping Material Specifications /ASTM – ASME 31.3

8.4.3 Post-weld heat treatment shall be provided for welds, as per piping material specification.

8.4.4 Dimensional, hydrostatic test reports for all valve bodies and functional test reports for all valves as per clause given below of this specification.

8.4.5 Type test certificate for fire safety for fire safe valves and its actuator and controls.

8.4.6 Certificate from statutory body for intrinsic safety/explosion proof for limit switches, solenoid valves etc. and type test certificate for weatherproof for these items.

8.4.7 Following type test certificates of offered model of actuator (MOV) shall be submitted for review and approval

a. Life test.
b. Test on motor terminal box.
c. Damp heat recycling test.

8.5 Hydrostatic Test

Each valve body shall be subjected to hydrostatic test pressure equal to 1.5 times the maximum working pressure at ambient temperature in accordance with ANSI B16.34. All valve bodies covered under IBR, shall be tested as per IBR regulations. There shall not be any visible leakage during this test.

8.6 Functional Tests

Following tests shall be done as minimum as part of functionality check for MOVs.

8.6.1 Seat Leakage Test

All valve shall be seat leak tested against standard ANSI/ FCI 70.2 / ISO 5208

8.6.2 Tubing Leak Check

Pneumatic tubes shall be bubble tested for leaks.

8.6.3 Stroke test

Pneumatic actuated valves shall be stroke tested (full open to full close and vice versa) with minimum instrument air supply pressure and maximum DP across the valve. Open and close timing shall be recorded in test report.

8.6.4 MOV Actuator

a. Functional and calibration test for torque and limit switches
b. Response time test
c. Variation of supply voltage
d. Variation of frequency
e. Test on output shaft at 100% torque
f. Tests for motor (As per relevant IS/IEC)

8.7 **Witness Inspection**

Pre-dispatch inspection for all valves shall be performed and following tests/checks shall be carried out as a minimum.

8.7.1 Physical dimensional verification and workmanship.

8.7.2 Hydrostatic test of this specification on representative samples.

8.7.3 Functional tests of this specification on representative samples.

8.7.4 Pneumatic test on actuator on representative samples.

8.7.5 Review of all certificates and test reports of this specification.

In the event when no witness inspection is carried out by BHEL/TPIA, the tests shall anyway be completed by vendor and documents for the same shall be submitted to BHEL/TPIA for scrutiny.

8.8 Certification requirement for valve components:

8.8.1 For all material, all sizes and all rating in H2, Lethal, Toxic Service IS/ISO 10474 3.2, EN 10204 3.2 certificate by BHEL Authorized inspector, appointed by valve vendor.

8.8.2 For CS (other than IBR) up to and including 600 Rating in non-sour service irrespective of size: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.3 CS in Sour Service up to and including size 1.5" irrespective of rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.4 CS in wet H2S service irrespective of the rating, for sizes 2" and above IS/ISO 10474 3.2, EN10204 3.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.5 For LAS (other than IBR) irrespective of size and rating IS/ISO 10474 3.2, EN 10204 3.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.6 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M up to and including 1.5" irrespective of size and rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204- 3.1 certification.

8.8.7 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M up to and including 6" in nonlethal and non-toxic service and non-sour service and non-IBR service up to and including 300 rating: IS/ISO 10474 (3.1) 3.1.b or EN 10204 3.1 certification.

8.8.8 For all sizes and rating SS 321, CF8C, CF10C, SS 347H, SS347 IS/ISO 10474 3.2, EN 102043.2 certificate by authorized BHEL inspector, appointed by valve vendor.

8.8.9 For SS 304, CF8, 304L, CF8M, SS 316, CF3, SS316L CF3M >= 8" in non-lethal and non-toxic service and non-sour service and non-IBR service up to and including 300 rating and all sizes of 600 rating and above irrespective of service: IS/ISO 10474 3.1, EN 10204-3.1 certification

9.0 SPARES

9.1 Two years Operation spares and commissioning spares shall be supplied by the vendor for all valves and its accessories, which shall include plug, seat ring, gasket set, packing set, diaphragm/ O-ring set etc. as a minimum.

9.2 Any special tools needed for maintenance work shall be supplied. Vendor must certify in their offer in case no special tools are necessary for the offered control valves and their accessories

10.0 SHIPPING

10.1 It is the responsibility of the vendor to ensure that the valve is adequately protected and packed to meet the shipping and delivery requirements. The valve may be stored outdoor for long period before installation. Packing shall be suitable for outdoor storage in the area with heavy rains and high ambient temperature.

10.2 Machined surface which may be exposed to the atmosphere in the transit and subsequent storage shall be properly protected with an easily removable rust preventing coating of the proper consistency applied by the manufacturer, but not until inspection.

10.3 The valve and its accessories shall be supplied pre-assembled and pre-tubed.

10.4 All threaded and flanged openings shall be suitably protected to prevent entry of foreign material. Temporary plugs used should be readily distinguishable from permanent metal plugs.

10.5 Valves with external lubricators shall be lubricated prior to shipment.

11.0 DOCUMENTATION

11.1 Following are the drawings and documents required to be submitted for the Valve, as a minimum:

- 11.1.1 Specification sheet for each valve and its accessories.
- 11.1.2 General Arrangement drawing for each valve providing the complete dimension of valve assembled with actuator and other accessories, weight of the valve assembly
- 11.1.3 Dimensions of clearance space required for maintenance work
- 11.1.4 Lifting Instruction for the valves.
- 11.1.5 Wiring diagram for the accessories like solenoid valve, limit switches including terminal numbers and cable type.
- 11.1.6 Wiring diagram for MOV actuator terminal compartment showing power supply, control signals and other contacts including spares with terminal numbers and cable type.
- 11.1.7 Copy of type test certificates including SIL certificate.
- 11.1.8 Copy of the test certificates for all tests.
- 11.1.9 Installation procedure.
- 11.1.10 Calibration and maintenance procedure including replacement of its parts/internals wherever it is applicable.

11.2 All the documents shall be A4 or A3 size only; all the document prints larger than A4 shall be folded to A4 size with identification data visible at the bottom right.

12.0 GUARANTEE/WARRANTY:

A guarantee certificate for trouble free service for a period of 12 months from the date of commissioning or 24 months from the date of dispatch shall be submitted.

VARIANT TABLE

Var. No	Description
01	Motor Operated Gate valve 18"#300RF NACE +H2
02	
03	
04	

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised	Checked	Approved
00	15.07.2022	First Issue	BKK	CHANDU	CLT

ANNEXURE-1

1. PURPOSE AND SCOPE

1.1 This specification covers additional requirements relating to components intended for operation in Hydrogen service.

1.2 Applicability : This specification applies to all components for which Hydrogen Service requirement is indicated on the component technical data sheets.

2. REQUIREMENTS FOR PIPES, FITTINGS & FLANGES :

2.1 **GENERAL** (applicable to all pipes, fittings, flanges & special parts)

2.1.1 Material identification stamps (cold stamping) including punch marks and large hardness impressions are not permitted on hydrogen contacted surfaces.

2.1.2 Cold stamping on the outside surface shall be performed before heat treatment. Depth and sharpness of indentation shall be compatible with wall thickness of the component. These requirements do not apply to the stamping of flanges on their circumference.

2.1.3 Stamping of fittings after heat treatment is not permitted.

2.1.4 For steels which need to be preheated for welding, the preheat temperatures shall be maintained in all cases such as temporary welding, auxiliary welds and thermal cutting. Preheating shall penetrate the entire cross-sectional area of the material and shall extend over a width of 300 mm on both sides of the weld. Thermocouples shall be attached to the item being heat treated and the temperature shall be recorded for confirmation of the heat treatment.

2.1.5 Evidence shall be furnished for the base metal, heat affected zone and weld metal that hardness limitations have been satisfied. For this purpose, measurements shall be taken on the procedure qualification specimens and on the item concerned. Hardness values shall be checked at least at three locations in a direction perpendicular to the weld.

2.1.6 Serrations on the flange face shall be concentric for hydrogen service. Spiral serration is not acceptable.

2.2 APPLICABLE TO CARBON STEEL (CS) PIPES, FITTINGS, FLANGES & SPECIAL PARTS:

2.2.1 All pipes, forgings and fittings having wall thickness 9.53 mm and thicker shall be normalized. Cold drawn pipes & fittings shall be normalized after the final cold draw pass for all thickness. The normalizing shall be a separate heating operation and not a part of the hot forming operation. In addition, fittings made from forgings shall have carbon – 0.35 % Max. and Silicon – 0.35 % Max.

2.2.2 Carbon equivalent shall not exceed the following value:

$$Ceq = \%C + \frac{\%Mn}{6} + \frac{\%(Cr + Mo + V)}{5} + \frac{\%(Ni + Cu)}{15} \leq 0.42$$

Under no condition Ni content shall be in excess of 1%.

ANNEXURE-1

2.2.3 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIV.-I,UW-51 & ASME SECTION-V. Radiography shall be done before PWHT and 100% UT shall be done after PWHT.

2.2.4 The hardness of any pressure containing component, weld & heat affected zone (after heat treatment) shall be limited to 200 BHN max.

2.3 APPLICABLE TO ALLOY STEEL (Cr-Mo) PIPES, FITTINGS, FLANGES & SPECIAL PARTS :

2.3.1 All pipes, flanges and fittings shall be normalized and tempered. The normalizing and tempering heat treatment shall be a separate heating operation and not a part of hot forming operation.

2.3.2 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIV.-I, UW-51 & ASME SECTION V. 100% radiography & UT shall be performed after PWHT.

2.3.3 The hardness of any pressure containing component, weld & heat affected zone (after PWHT) shall be limited to 225 BHN max.

2.3.4 The alloy content of welds shall be verified by chemical analysis. Tests shall be conducted when changes in weld wire and/or weld flux are made, or when a new set of electrode is used.

2.3.5 Maximum room temperature tensile strength of all pressure containing components and welds shall not exceed 100,000 PSI.

2.3.6 Under no condition Ni content shall be in excess of 1%.

2.4 APPLICABLE TO STAINLESS STEEL PIPES, FITTINGS, FLANGES & SPECIAL PARTS :

2.4.1 All pipes, flanges & fittings shall be solution annealed after welding and pickled.

2.4.2 All stabilized grades of stainless steel (SS321, SS321H, SS347, SS347H) shall be given a stabilizing heat treatment in addition to solution heat treatment at 900 ±10 Deg.C for 4 hours. For "H" grades C content shall be 0.04% minimum. 01

2.4.3 All full penetration weld joints shall be 100% radiographed in accordance with ASME SECTION-VIII, DIVISION I, UW-51 and ASME SECTION V.

2.4.4 For all austenitic stainless steels, weld deposits shall be checked for ferrite content. A ferrite number (FN) of not less than 3% and not more than 10% is required to avoid sigma phase embrittlement during heat treatment and high temperature service. FN shall be determined by use of a ferrite scope. Ferrite scope measurements must be made prior to post weld heat treatment to be meaningful.

2.4.5 The maximum hardness of any pressure containing component, weld & HAZ shall be 200 BHN.

ANNEXURE-1

3 REQUIREMENTS FOR VALVES:

3.1 GENERAL (applicable to all valves)

3.1.1 Each valve body, bonnet & cover casting shall be subjected to examination by radiography in accordance with ASME SECTION VIII,DIVISION I, APPENDIX 7.

3.1.2 Valves shall be labelled "SUITABLE FOR HYDROGEN SERVICE"

3.1.3 Helium Leakage Test :

Body/bonnet/cover joints & stuffing box of all valves and special parts (both forged and cast) shall have low emission. One valve per metallurgy, per rating and per size shall be helium leak tested as per ASME SECTION V, SUBSECTION A, ARTICLE 10, APPENDIX IV. (Detector Probe Technique) at a minimum of 25% allowable cold (rated) working pressure. Selection of valve for test shall be random. Test duration shall be as follows.

TEST DURATION IN MINUTES				
Nominal Size (mm)	**PRESSURE CLASS**			
	Upto 300	**600**	**800, 900**	**1500**
Upto 2"	3	6	9	12
3" to 6"	6	9	12	15
8" to 16"	9	9	12	15
18" to 24"	9	12	15	18

Leakage rate shall be less than 0.0001 ml/sec of helium.

3.1.4 The design & geometry of valve internals shall remove crevices & stagnant areas.

3.1.5 Valves shall be internally cleaned & free from moisture and grease.

3.2 APPLICABLE TO CARBON STEEL & ALLOY STEEL VALVES :

3.2.1 Carbon steel castings / forgings shall be normalized & alloy steel castings / forgings shall be normalized and tempered.

3.2.2 Critical body, bonnet, cover casting sections, typically defined by ASME B16.34, shall be radiographed and shall meet ASTM E446 (up to 2" thick) Category A, B & CA-Level 2, Category CB, CC & CD-level 3, Category D, E & F level 0. For wall thickness 2" to 4.5" comparable plates of ASTM E186 shall be used. ASTM E94 shall be used for recommended practice & controlling quality of radiography as guide. The entire surface of the castings shall be dye penetrant inspected.

3.2.3 Bend tests and magnetic particle inspection of the entire surface of body and bonnet castings shall be carried out in accordance with ASTM A217 supplementary requirements S3 & S4. Evaluation of magnetic particle inspection shall be in accordance with MSS SP-53 except that no linear discontinuities shall be allowed.

ANNEXURE-1

3.2.4 The brinell hardness of heat treated casting shall not exceed 200 BHN for carbon steel and 225 BHN for alloy steel.

3.2.5 The tensile stress for A.S. shall be less than 100,000 PSI for alloy steel.

3.2.6 Repair of defective casting shall be outlined in writing to the purchaser before repair starts. Repair method to be approved prior to welding.

Castings shall be preheated to a minimum of 400F prior to welding and all Chromium-molybdenum alloys shall be postweld heat treated after welding is complete. Stress relieving is essential for welds.

Dye penetrant test of welds shall be in accordance with ASTM B165 procedure B-2. Interpretation as per appendix-8 of ASME – VIII Div.1.

Repair welds shall be 100% radiographed and evaluated in accordance with paragraph 344.5 of ASME B31.3 with a minimum casting quality factor of 0.95. Dye penetration test shall be as per ASTM E165 procedure B-2, interpretation as per Appendix -8 of ASME-VIII Div.1.

3.3 APPLICABLE TO STAINLESS STEEL VALVES:

3.3.1 Casting shall be in the solution heat treated and pickled condition. All castings and test bars shall be heat treated together.

3.3.2 Critical body and bonnet casting sections, typically defined by ASME B16.34, shall be radiographed and shall meet ASTM E446 (up to 2" thick) Category A, B & CA-Level 2, Category CB, CC & CD-level 3, Category D, E & F level 0. For wall thickness 2" to 4.5" comparable plates of ASTM E186 shall be used. ASTM E94 shall be used for recommended practice & controlling quality of radiography as guide. The entire surface of the castings shall be dye penetrant inspected after pickling.

Repair welds shall be 100% radiographed and evaluated in accordance with paragraph 344.5 of ASME B31.3 with a minimum casting quality factor of 0.95. Dye penetration test shall be as per ASTM E165 procedure B-2, interpretation as per Appendix -8 of ASME-VIII Div.1.

4 IMPACT TESTING:

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4.1 For all carbon steel and alloy steel pipes, flanges and fittings with thickness over 19 mm, Charpy V-notch impact testing shall be carried out in accordance with paragraph UG-84 of ASME Section VIII, Div.-1 for weld metal and base metal from the thickest item per heat of material and per heat treating batch. Impact test specimen shall be in complete heat treated condition and in accordance with ASTM A370. Impact energies at 0 Deg. C shall average greater than 27J (20ft-lb) per set of 3 specimens with a minimum of 19J (15 ft-lb)

If welding is used in manufacturing, impact test of heat affected zone (HAZ) and weld metal shall also be carried out.

Charpy V notch impact testing is to be done for all CS & AS valves material (average 20 ft-lb for set of 3 [minimum value 15 ft-lb] at 30 F).