

**SECTION 'C'**  
**TECHNICAL SPECIFICATIONS**  
**OF**  
**STORES AND DRAWINGS**

# Institute for Plasma Research

(An Aided Institute of Dept. of Atomic Energy)

Bhat, Gandhinagar

## Eligibility Criteria (Annexure-A)

ITEM DESCRIPTION	<b>Design, Fabrication, Inspection, Testing, Supply and Installation of High temperature DN 1000 gate valve including insulated sliding gate plate and essential spares and water jacketed chamber assembly as per the detailed specifications mentioned in the tender documents.</b>	
Sr. No.	Criteria	Documents required to submit / upload
1	The bidder shall be the Original Equipment Manufacturer (OEM) of Valves.	Bidder should provide copy of valve manufacturer certificate/Self-declaration. (In case of self-declaration, bidder should fill the detail as asked in self-declaration format attached as Annexure-VI)
2	The bidder should have supplied gate valves of size above 750 mm clear bore on opening for service temperature ( $\geq 550^{\circ}\text{C}$ ) in last five years from the date of publication of the tender.	Bidder should provide details of orders executed for similar size items in last five years. The detail of orders include copies of P.O. with technical specification, name of client (with name, email-id & contact no. of concerned engineer/officer of the client for reference), and documentary proof of acceptance/installation/performance certificate from end user.
3	The bidder shall have a) In-house facilities for design, fabrication, inspection and testing of Gate valve or b) Outsourced vendors/sub-vendors for design, fabrication, inspection and testing of Gate valve	Bidder should submit the; a) Self-certificate certifying the details of in-house facilities; or b) Copy of the agreement with the vendors/sub-vendors or the self-certificate by the vendor/sub-vendor certifying the details of facilities with them.
	<b>Note:</b>	
a	The response to tender without submission of proof of above points will summarily be rejected without further communication	
b	The bidder shall not be under a declaration of ineligibility for corrupt or fraudulent practices or blacklisted with any of the Government agencies	
c	Original documents shall be produced for verifications, if required	

# Technical Specifications

**Design, fabrication, inspection, testing, supply and installation of High temperature gate valve including Insulated sliding gate plate and essential spares and Water jacketed chamber assembly.**

## **Introduction:**

1. These gate valve assemblies are to be used to isolate high temperature furnace (up to 800°C) from waste feeder line # 1 & line # 2 respectively that has to be maintained at temperature  $\leq 60^\circ\text{C}$ .
2. The inside diameter of waste feeder line and high temperature furnace between which this gate valve assemblies are to be connected is 1000 mm. The structural material of waste feeder and furnace is SA-516 Grade 70 respectively.
3. Biomedical waste packets of ~ 08 to 12 kg weight and approx.  $0.1 \text{ m}^3$  volume will be fed in every 03 minutes cycle during which gate valves are be opened/closed.
4. There is a provision for nitrogen gas flow at 200 lpm at one side of the gate valve which faces high temperature (up to 800°C) radiation from the furnace.
5. Water jacketed chamber (Double walled chamber) shall be connected between 40 inch knife gate valve and 40 inch high temperature gate valve as shown in Figure 1(a).
6. The approximate height at which high temperature gate valve and water jacketed chamber assemblies are to be assembled with high temperature furnace is shown in Figure 1(b).

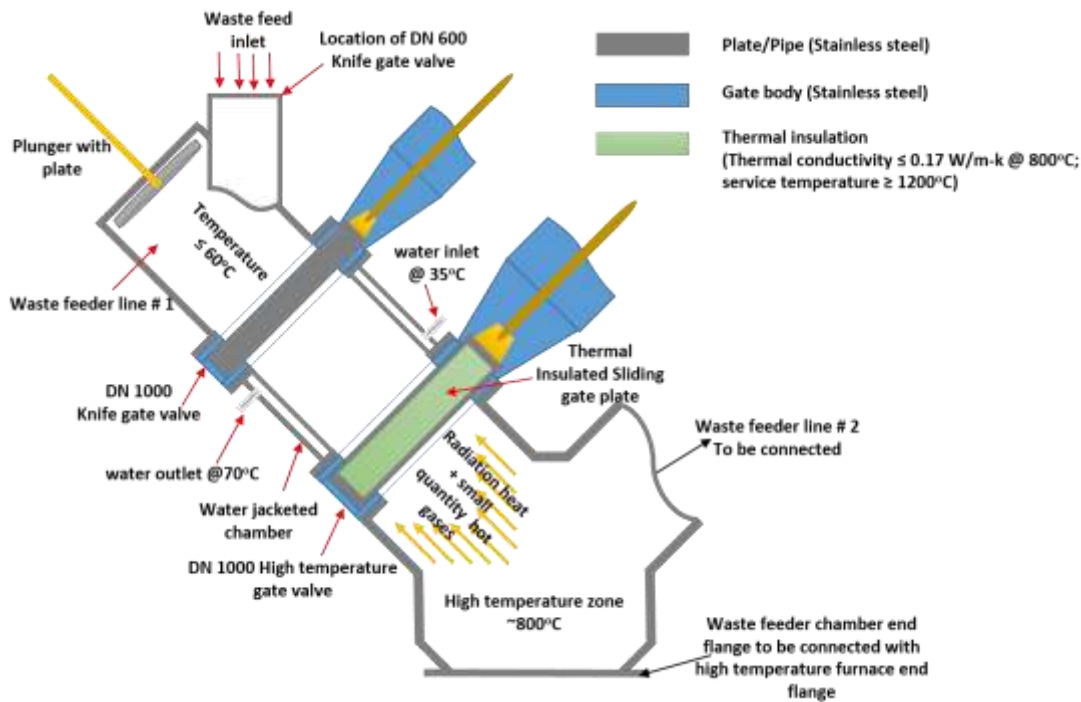


Figure 1(a): location of high temperature gate valve and water jacketed chamber assembly between waste feeder line # 1 and high temperature furnace. Note: waste feeder line # 2 is not shown here which is at 90 degree from waste feeder line # 1.

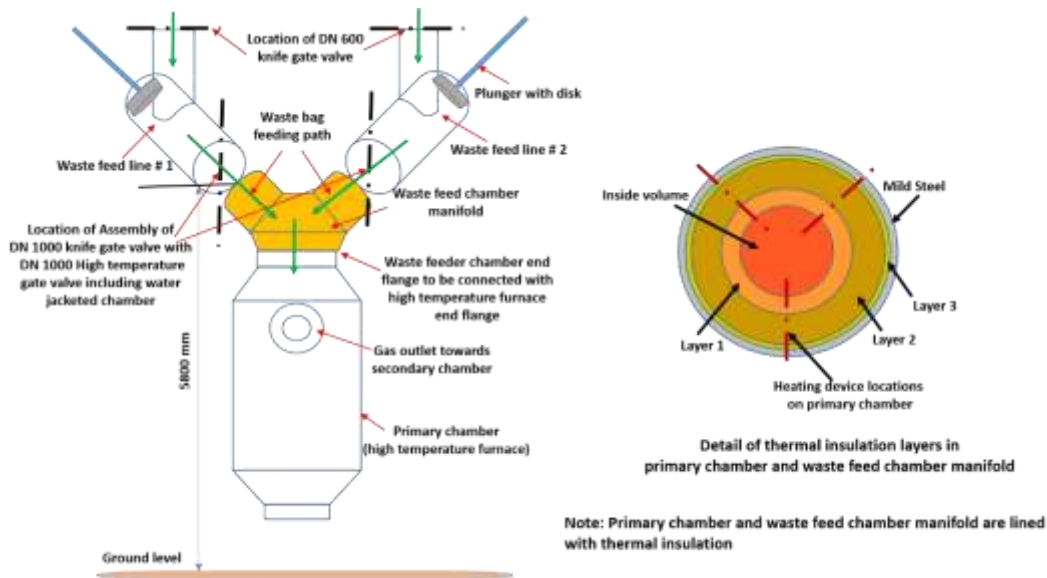


Figure 1(b): Schematic of Waste feeder lines and high temperature furnace (Primary chamber) assembly

## I. Technical Specifications for high temperature gate valve including insulated sliding gate plate

Sr. no.	Description	IPR Specifications
01	Quantity	Gate valve DN 1000 along with pair of blanked flanges - 02 sets.
02	Valve design standard	The gate valve shall be designed with knife gate plate and bonnet as per API 600/603 or ISO 10434 or MSS-SP 81 standard. [Valve shall be designed and fabricated for the desired frequency cycles (min. 15000 cycles)]. <b>Note:</b> To ensure the life of the moving components necessary low friction, high wear resistance and high temperature compatible materials must be selected.
03	Working environment	Carbon dust in the form of soot may come from primary chamber during the process at temperature nearly 800 °C.
04	Pressure	At one side of the gate valve pressure is ~20mm negative water column i.e. nearly atmospheric pressure (750 mmHg) while at another side it faces atmospheric pressure.
05	Temperature compatibility for the valve body, seals, sliding gate plate and mechanism	Up to 800°C.
06	Temperature gradient on gate valve during operation	High temperature side of the gate valve faces up to 800°C while another side of the gate valve has to be maintained at ≤350°C. Suitable temperature sensors (K-type thermocouple with 20 meter cord length) to be mounted on both end flanges at two locations 180 degree apart.

07	<b>Thermal insulation lining on the sliding gate plate</b>	20 mm ( $\pm$ 1 mm) thickness thermal insulation lining having Thermal conductivity $\leq 0.17$ W/m-K & service temperature $\geq 1200^{\circ}\text{C}$ is sandwiched between SS plates of 10 mm ( $\pm$ 1 mm) thickness with ceramic paper/fiber gasket is preferable.
08	<b>Valve clear bore on opening</b>	1000 $\pm$ 5 mm
09	<b>Valve body and bonnet material</b>	Option-1: manufactured using fabrication/welding process: ASTM A516 Gr. 70 or equivalent. <b>or</b> Option-2: manufactured using casting process: ASTM A216 Gr. WCB or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength) should be equal or better than specified materials under option-1 & option-2 respectively for equivalent material].
10	<b>Sliding gate plate material</b>	ASTM A240 Gr. 304H/304 or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength) should be equal or better than specified materials for equivalent material].
11	<b>Seal material</b>	For Bonnet - Metal/ceramic/graphite/compliant For Gate seat - Metal/ceramic/compliant material
12	<b>End Flange Dimensions</b>	Outside diameter, Pitch Circle diameter, No. of holes, holes diameter, etc. are in line with dimensions as given for NPS 1000 mm in ASME B16.47C1 150 Series B (API 605) except thickness which would be selected as per gate valve manufacturer's standard practice.
13	<b>Mounting</b>	Gate valve should work in any mounting position from 45 to 90 degree w.r.t. horizontal position.
14	<b>Allowable Leak Rate</b>	$\leq 6$ lpm at Room Temperature (RT) [After soaking for 02 hours at $\sim 350^{\circ}\text{C}$ followed by cooling down from $\sim 350^{\circ}\text{C}$ to RT].
15	<b>Shell leakage test and seat closure test standard</b>	Shell leakage test and Seat closure test shall be performed followed by procedure as described in MSS-SP 61/API-598/ISO 5208/MSS-SP 151 except leak rate which is as mentioned under point # 14 above.
16	<b>Gate valve fully Opening time</b>	Maximum 25 seconds fully opening from fully closed position (Noiseless, Smooth operation)
17	<b>Gate valve fully Closing time</b>	Maximum 25 seconds fully closing from fully opened position (Noiseless, Smooth operation)
18	<b>Actuator</b>	Double Acting Hydraulic Actuator (Electro-Hydraulic actuation). In addition, manual rescue feature shall be incorporated which can bring sliding gate plate to fully closed position in case of failure of electro-hydraulic actuator.
19	<b>Valve position indicator</b>	The mounting of Electrical sensor at the appropriate locations with an indication of valve fully opened and fully closed position shall be provided and these proximity sensors should be compatible for 24V supply. Also, provision for interlock signal (24V to be connected to control panel) at fully opened and fully closed position to be provided by vendor.
20	<b>Total no. of cycle/day</b>	Minimum 240 cycles/day operation of the gate valve (Typically 03 minute per cycle).
21	<b>Seal replacement</b>	Seal replacement shall be carried out only after completion of typically 15000 cycles.
22	<b>Weight</b>	$\leq 3500$ kg.
23	<b>Essential Spare</b>	Please quote separately for a) seal set for gate valve (08 sets) and

		b) hydraulic solenoid valves (02 sets)
24	<b>Fabrication/ Manufacturing Drawing</b>	2D drawings and 3D CAD model of the valve including all relevant details shall be provided by manufacturer [Soft copy (1 no.) and hard copy (2 nos.)].
25	<b>Acceptance test at Vendor Site (FAT)</b>	<p>Following operation and functional tests will be carried out by the vendor in the presence of IPR representatives:</p> <p>a) Shell leakage test at 0 or 90 degree and seat closure test at various mounting position (45, 60 and 90 degree) at Room Temperature (RT) [After soaking for 02 hours at ~ 350°C followed by cooling down from ~ 350°C to RT] as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151. Leakage rate not to exceed 6 lpm at room temperature. This test to be performed with blank flanges on both the ends.</p> <p>b) Valve's full Opening or full Closing time shall be demonstrated to be maximum 25 seconds.</p> <p>c) Minimum 240 cycle operation of gate valve to be demonstrated.</p> <p>d) Electrical sensors indication for valve opened and closed position to be checked.</p> <p>e) Gate valve clear bore on opening and End Flange dimensions shall be verified from drawings provided by vendor in respect of this technical specification.</p>
26	<b>Acceptance test at FCIPT, Gandhinagar site (SAT)</b>	<p>Following operation and functional tests will be carried out by the vendor in the presence of IPR representatives:-</p> <p>a) Shell leakage test at 0 or 90 degree and seat closure test at various mounting position (45, 60 and 90 degree) at Room Temperature (RT) [After soaking for 02 hours at ~ 350°C followed by cooling down from ~ 350°C to RT] as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151. Leakage rate not to exceed 6 lpm at room temperature. This test to be performed with blank flanges on both the ends. (<b>Note:</b> Heating element and K-type thermocouple along with the power supply shall be provided by IPR for SAT. However, vendor shall submit the requirement).</p> <p>b) Valve's full Opening or full Closing time shall be demonstrated to be maximum 25 seconds.</p> <p>c) Electrical sensors indication for valve opened and closed position shall be checked.</p> <p>d) Gate valve clear bore on opening and End Flange dimensions shall be verified from drawings provided by vendor in respect of this technical specification.</p>
27	<b>Test certificate</b>	<p>The following test certificates, where applicable, for the body, bonnet, seal and sliding gate plate shall be submitted by vendor.</p> <p>(1) Chemical Analysis of materials from NABL accredited lab.</p> <p>(2) Mechanical properties of materials from NABL accredited lab.</p> <p>(3) Certificate for life cycle of seal and moving components (Stem, gate, etc.) to be operated without failure up to 15000 cycles.</p> <p>(4) Non-Destructive examination, where applicable, as per ASME B 16.34 [LPT/MPD/UT/RT].</p>

		(5) Shell leakage test as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151 & in compliance of point # 14. (6) Seat closure test as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151 & in compliance of point # 14.
28	<b>Warranty</b>	One year warranty from the date of acceptance against all sorts of manufacturing defects, faulty materials and poor workmanship for gate valve and actuator components.
29	<b>Post Warranty Support</b>	The vendor shall confirm that they will provide the post-warranty support for additional five (05) years after expiry of warranty period at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city. However, the cost for such post warranty support is "Not To Be Included" in the quotation against the present tender.
30	<b>Packing</b>	a) The valves shall be dried and cleaned thoroughly after testing. b) The valves shall be shipped in closed condition, glands fully packed and all opening properly closed. c) End flanges and/or welding ends shall be blanked over entire surface. End protector to be attached to the valve end by suitable friction lending devices. d) All machined and threaded parts shall be suitably protected with approved rust preventive. e) The individual valve shall be wrapped in polythene & packed in individual box with inner lining of bubbled packing. f) The packed box/s shall be shipped in wooden crates.
31	<b>Disassembly of gate valves at FCIPT, Gandhinagar site and packing, safe transportation &amp; re-installation of gate valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city.</b>	a) Vendor shall give assurance for the technical support during disassembly of gate valves at FCIPT, Gandhinagar site as and when informed by IPR representative. b) Vendor shall give assurance for the technical support during re-installation of gate valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city. c) However, the cost for above activities "Not To Be Included" in the quotation against the present tender.
32	<b>Delivery Period</b>	Within Eight (8) months from the date of approval of drawings by IPR.

## II. Technical Specifications for water jacketed chamber connected with High Temperature Gate Valve (HTGV)

Sr. no.	Description	IPR Specifications
01	<b>Quantity</b>	02 nos.
02	<b>Temperature</b>	One end of jacketed chamber has to be maintained at $\leq 60^{\circ}\text{C}$ while another end is heated up to $350^{\circ}\text{C}$ .
03	<b>Pressure and Axial gravity load</b>	Pressure: 1.5 bar (absolute) Axial gravity load: 5 ton acting on water jacketed chamber end flange high temperature gate valve assembly.
04	<b>Construction</b>	Double wall with internal baffles
05	<b>Length of the chamber</b>	Maximum 500 mm including end flanges.
06	<b>Design &amp; Testing standard</b>	ASME Sec. 8 Division I or Division II

07	<b>Material</b>	ASTM A516 Gr. 70 or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength) should be equal or better than specified materials for equivalent material].
08	<b>End Flange dimensions</b>	Outside diameter, Pitch Circle diameter, No. of holes and holes diameter, etc. are in line with dimensions as given for NPS 1000 mm in ASME B16.47Cl 150 Series B (API 605). [Note: This water jacketed chamber is connected with above mentioned HTGV)].
09	<b>Cooling Water Temperature</b>	Inlet = 35°C maximum and Outlet = 70°C maximum
10	<b>Thermal sensors</b>	Six numbers (06 nos.) thermal sensors (K-type thermocouple with 20 meter cord length) for indication of water inlet temp. (01 no.), water outlet temp. (01 no.) and temperature of water jacketed end flanges (02 nos. each, 180 degree apart) are to be provided.
11	<b>Weight</b>	≤ 550 kg
12	<b>Acceptance test at Vendor site</b>	Following operation and/or functional test will be carried out by the vendor in the presence of IPR representatives:- a) Temperature ≤ 60°C to be ensured at one end of the jacketed chamber by heating another end up to 350°C using suitable means of heating source and controlled flow of water circulation through the jacketed chamber. This test to be performed with blank flanges on both the ends. b) Calibration certificate for thermal sensors from NABL accredited laboratories to be provided. c) Chemical Analysis of materials from NABL accredited lab. d) Mechanical properties of materials from NABL accredited lab.
13	<b>Acceptance test at FCIPT, Gandhinagar site (SAT)</b>	Following operation and/or functional test will be carried out by the vendor in the presence of IPR representatives:- e) Temperature ≤ 60°C to be ensured at one end of the jacketed chamber by heating another end up to 350°C using suitable means of heating source and controlled flow of water circulation through the jacketed chamber. This test to be performed with blank flanges on both the ends. Heating element and K-type thermocouple along with the power supply shall be provided by IPR for SAT. However, vendor shall submit the requirements.
14	<b>Disassembly of water jacketed chamber at FCIPT, Gandhinagar site and packing, safe transportation &amp; re-installation at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city.</b>	a) Vendor shall give assurance for the technical support during disassembly of water jacketed chamber at FCIPT, Gandhinagar site as and when informed by IPR Representative. b) Vendor shall give assurance for the technical support during re-installation of water jacketed chamber with High temperature gate valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city. c) However, the cost for above activities " <b>Not To Be Included</b> " in the quotation against the present tender.
15	<b>Delivery Period</b>	Within Eight (8) months from the date of approval of drawings by IPR.



**Vendor compliance sheet for design, fabrication, inspection, testing, supply and installation of High temperature gate valve including Insulated sliding gate plate and essential spares and Water jacketed chamber assembly.**

*Note: Please provide your confirmation and/or clarification for any deviation against each point.*

**I. Technical Specifications for high temperature gate valve including insulated sliding gate plate**

Sr. no.	Description	IPR Specifications	Vendor Compliance/Deviation
01	Quantity	Gate valve DN 1000 along with pair of blanked flanges - 02 sets.	
02	Valve design standard	The gate valve shall be designed with knife gate plate and bonnet as per API 600/603 or ISO 10434 or MSS-SP 81 standard. [Valve shall be designed and fabricated for the desired frequency cycles (min. 15000 cycles)]. <b>Note:</b> To ensure the life of the moving components necessary low friction, high wear resistance and high temperature compatible materials must be selected.	
03	Working environment	Carbon dust in the form of soot may come from primary chamber during the process at temperature nearly 800 °C.	
04	Pressure	At one side of the gate valve pressure is ~20mm negative water column i.e. nearly atmospheric pressure (750 mmHg) while at another side it faces atmospheric pressure.	
05	Temperature compatibility for the valve body, seals, sliding gate plate and mechanism	Up to 800°C.	
06	Temperature gradient on gate valve during operation	High temperature side of the gate valve faces up to 800°C while another side of the gate valve has to be maintained at ≤350°C. Suitable temperature sensors (K-type thermocouple with 20 meter cord length) to be mounted on both end flanges at two locations 180 degree apart.	
07	Thermal insulation lining on the sliding gate plate	20 mm (± 1 mm) thickness thermal insulation lining having Thermal conductivity ≤0.17 W/m-K & service temperature ≥ 1200°C is sandwiched between SS plates of 10 mm (± 1 mm) thickness with ceramic paper/fiber gasket is preferable.	
08	Valve clear bore on opening	1000 ± 5 mm	
09	Valve body and bonnet material	Option-1: manufactured using fabrication/welding process: ASTM A516 Gr. 70 or equivalent. <b>or</b> Option-2: manufactured using casting process: ASTM A216 Gr. WCB or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength)]	

		should be equal or better than specified materials under option-1 & option-2 respectively for equivalent material].	
10	<b>Sliding gate plate material</b>	ASTM A240 Gr. 304H/304 or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength) should be equal or better than specified materials for equivalent material].	
11	<b>Seal material</b>	For Bonnet - Metal/ceramic/graphite/compliant For Gate seat - Metal/ceramic/compliant material	
12	<b>End Flange Dimensions</b>	Outside diameter, Pitch Circle diameter, No. of holes, holes diameter, etc. are in line with dimensions as given for NPS 1000 mm in ASME B16.47Cl 150 Series B (API 605) except thickness which would be selected as per gate valve manufacturer's standard practice.	
13	<b>Mounting</b>	Gate valve should work in any mounting position from 45 to 90 degree w.r.t. horizontal position.	
14	<b>Allowable Leak Rate</b>	≤ 6 lpm at Room Temperature (RT) [After soaking for 02 hours at ~ 350°C followed by cooling down from ~ 350°C to RT].	
15	<b>Shell leakage test and seat closure test standard</b>	Shell leakage test and Seat closure test shall be performed followed by procedure as described in MSS-SP 61/API-598/ISO 5208/MSS-SP 151 except leak rate which is as mentioned under point # 14 above.	
16	<b>Gate valve fully Opening time</b>	Maximum 25 seconds fully opening from fully closed position (Noiseless, Smooth operation)	
17	<b>Gate valve fully Closing time</b>	Maximum 25 seconds fully closing from fully opened position (Noiseless, Smooth operation)	
18	<b>Actuator</b>	Double Acting Hydraulic Actuator (Electro-Hydraulic actuation). In addition, manual rescue feature shall be incorporated which can bring sliding gate plate to fully closed position in case of failure of electro-hydraulic actuator.	
19	<b>Valve position indicator</b>	The mounting of Electrical sensor at the appropriate locations with an indication of valve fully opened and fully closed position shall be provided and these proximity sensors should be compatible for 24V supply. Also, provision for interlock signal (24V to be connected to control panel) at fully opened and fully closed position to be provided by vendor.	
20	<b>Total no. of cycle/day</b>	Minimum 240 cycles/day operation of the gate valve (Typically 03 minute per cycle).	
21	<b>Seal replacement</b>	Seal replacement shall be carried out only after completion of typically 15000 cycles.	
22	<b>Weight</b>	≤ 3500 kg.	
23	<b>Essential Spare</b>	Please quote separately for a) seal set for gate valve (08 sets) and b) hydraulic solenoid valves (02 sets)	
24	<b>Fabrication/ Manufacturing</b>	2D drawings and 3D CAD model of the valve including all relevant details shall be provided by	

	<b>Drawing</b>	manufacturer [Soft copy (1 no.) and hard copy (2 nos.)].	
25	<b>Acceptance test at Vendor Site (FAT)</b>	<p>Following operation and functional tests will be carried out by the vendor in the presence of IPR representatives:</p> <ol style="list-style-type: none"> <li>Shell leakage test at 0 or 90 degree and seat closure test at various mounting position (45, 60 and 90 degree) at Room Temperature (RT) [After soaking for 02 hours at ~ 350°C followed by cooling down from ~ 350°C to RT] as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151. Leakage rate not to exceed 6 lpm at room temperature. This test to be performed with blank flanges on both the ends.</li> <li>Valve's full Opening or full Closing time shall be demonstrated to be maximum 25 seconds.</li> <li>Minimum 240 cycle operation of gate valve to be demonstrated.</li> <li>Electrical sensors indication for valve opened and closed position to be checked.</li> <li>Gate valve clear bore on opening and End Flange dimensions shall be verified from drawings provided by vendor in respect of this technical specification.</li> </ol>	
26	<b>Acceptance test at FCIPT, Gandhinagar site (SAT)</b>	<p>Following operation and functional tests will be carried out by the vendor in the presence of IPR representatives:-</p> <ol style="list-style-type: none"> <li>Shell leakage test at 0 or 90 degree and seat closure test at various mounting position (45, 60 and 90 degree) at Room Temperature (RT) [After soaking for 02 hours at ~ 350°C followed by cooling down from ~ 350°C to RT] as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151. Leakage rate not to exceed 6 lpm at room temperature. This test to be performed with blank flanges on both the ends. (<b>Note:</b> Heating element and K-type thermocouple along with the power supply shall be provided by IPR for SAT. However, vendor shall submit the requirement).</li> <li>Valve's full Opening or full Closing time shall be demonstrated to be maximum 25 seconds.</li> <li>Electrical sensors indication for valve opened and closed position shall be checked.</li> <li>Gate valve clear bore on opening and End Flange dimensions shall be verified from drawings provided by vendor in respect of this technical specification.</li> </ol>	

27	<b>Test certificate</b>	<p>The following test certificates, where applicable, for the body, bonnet, seal and sliding gate plate shall be submitted by vendor.</p> <ol style="list-style-type: none"> <li>(1) Chemical Analysis of materials from NABL accredited lab.</li> <li>(2) Mechanical properties of materials from NABL accredited lab.</li> <li>(3) Certificate for life cycle of seal and moving components (Stem, gate, etc.) to be operated without failure up to 15000 cycles.</li> <li>(4) Non-Destructive examination, where applicable, as per ASME B 16.34 [LPT/MPD/UT/RT].</li> <li>(5) Shell leakage test as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151 &amp; in compliance of point # 14.</li> <li>(6) Seat closure test as per MSS-SP 61/API-598/ISO 5208/MSS-SP 151 &amp; in compliance of point # 14.</li> </ol>	
28	<b>Warranty</b>	<p>One year warranty from the date of acceptance against all sorts of manufacturing defects, faulty materials and poor workmanship for gate valve and actuator components.</p>	
29	<b>Post Warranty Support</b>	<p>The vendor shall confirm that they will provide the post-warranty support for additional five (05) years after expiry of warranty period at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city. However, the cost for such post warranty support is "Not To Be Included" in the quotation against the present tender.</p>	
30	<b>Packing</b>	<ol style="list-style-type: none"> <li>a) The valves shall be dried and cleaned thoroughly after testing.</li> <li>b) The valves shall be shipped in closed condition, glands fully packed and all opening properly closed.</li> <li>c) End flanges and/or welding ends shall be blanked over entire surface. End protector to be attached to the valve end by suitable friction lending devices.</li> <li>d) All machined and threaded parts shall be suitably protected with approved rust preventive.</li> <li>e) The individual valve shall be wrapped in polythene &amp; packed in individual box with inner lining of bubbled packing.</li> <li>f) The packed box/s shall be shipped in wooden crates.</li> </ol>	
31	<b>Disassembly of gate valves at FCIPT, Gandhinagar site and packing, safe transportation &amp; re-installation of gate</b>	<ol style="list-style-type: none"> <li>a) Vendor shall give assurance for the technical support during disassembly of gate valves at FCIPT, Gandhinagar site as and when informed by IPR representative.</li> </ol>	

	<b>valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city.</b>	b) Vendor shall give assurance for the technical support during re-installation of gate valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city. c) However, the cost for above activities "Not To Be Included" in the quotation against the present tender.	
<b>32</b>	<b>Delivery Period</b>	Within Eight (8) months from the date of approval of drawings by IPR.	

## II. Technical Specifications for water jacketed chamber connected with High Temperature Gate Valve (HTGV)

<b>Sr. no.</b>	<b>Description</b>	<b>IPR Specifications</b>	<b>Vendor Compliance/Deviation</b>
<b>01</b>	<b>Quantity</b>	02 nos.	
<b>02</b>	<b>Temperature</b>	One end of jacketed chamber has to be maintained at $\leq 60^{\circ}\text{C}$ while another end is heated up to $350^{\circ}\text{C}$ .	
<b>03</b>	<b>Pressure and Axial gravity load</b>	Pressure: 1.5 bar (absolute) Axial gravity load: 5 ton acting on water jacketed chamber end flange high temperature gate valve assembly.	
<b>04</b>	<b>Construction</b>	Double wall with internal baffles	
<b>05</b>	<b>Length of the chamber</b>	Maximum 500 mm including end flanges.	
<b>06</b>	<b>Design &amp; Testing standard</b>	ASME Sec. 8 Division I or Division II	
<b>07</b>	<b>Material</b>	ASTM A516 Gr. 70 or equivalent. [Note: Chemical composition and Mechanical properties (Ultimate tensile and Yield strength) should be equal or better than specified materials for equivalent material].	
<b>08</b>	<b>End Flange dimensions</b>	Outside diameter, Pitch Circle diameter, No. of holes and holes diameter, etc. are in line with dimensions as given for NPS 1000 mm in ASME B16.47Cl 150 Series B (API 605). [Note: This water jacketed chamber is connected with above mentioned HTGV].	
<b>09</b>	<b>Cooling Water Temperature</b>	Inlet = $35^{\circ}\text{C}$ maximum and Outlet = $70^{\circ}\text{C}$ maximum	
<b>10</b>	<b>Thermal sensors</b>	Six numbers (06 nos.) thermal sensors (K-type thermocouple with 20 meter cord length) for indication of water inlet temp. (01 no.), water outlet temp. (01 no.) and temperature of water jacketed end flanges (02 nos. each, 180 degree apart) are to be provided.	
<b>11</b>	<b>Weight</b>	$\leq 550$ kg	
<b>12</b>	<b>Acceptance test at Vendor site</b>	Following operation and/or functional test will be carried out by the vendor in the presence of IPR representatives:- a) Temperature $\leq 60^{\circ}\text{C}$ to be ensured at one end of the jacketed chamber by heating another end up	

		<p>to 350°C using suitable means of heating source and controlled flow of water circulation through the jacketed chamber. This test to be performed with blank flanges on both the ends.</p> <p>b) Calibration certificate for thermal sensors from NABL accredited laboratories to be provided.</p> <p>c) Chemical Analysis of materials from NABL accredited lab.</p> <p>d) Mechanical properties of materials from NABL accredited lab.</p>	
13	<b>Acceptance test at FCIPT, Gandhinagar site (SAT)</b>	<p>Following operation and/or functional test will be carried out by the vendor in the presence of IPR representatives:-</p> <p>e) Temperature <math>\leq 60^{\circ}\text{C}</math> to be ensured at one end of the jacketed chamber by heating another end up to 350°C using suitable means of heating source and controlled flow of water circulation through the jacketed chamber. This test to be performed with blank flanges on both the ends. Heating element and K-type thermocouple along with the power supply shall be provided by IPR for SAT. However, vendor shall submit the requirements.</p>	
14	<b>Disassembly of water jacketed chamber at FCIPT, Gandhinagar site and packing, safe transportation &amp; re-installation at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city.</b>	<p>a) Vendor shall give assurance for the technical support during disassembly of water jacketed chamber at FCIPT, Gandhinagar site as and when informed by IPR. Representative.</p> <p>b) Vendor shall give assurance for the technical support during re-installation of water jacketed chamber with High temperature gate valves at site recommended by Homi Bhabha Cancer Hospital (HBCH) in Varanasi city.</p> <p>c) However, the cost for above activities "<b>Not To Be Included</b>" in the quotation against the present tender.</p>	
15	<b>Delivery Period</b>	Within Eight (8) months from the date of approval of drawings by IPR.	