OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT, ISLAMABAD
FOREIGN SECTION B

(To be completed, filled in, signed and stamped by the principal)

ANNEXURE 'A'

Material PROCUREMENT OF PCV & ISOLATION VALVES FOR UCH.

Tender Enquiry No PROC–FB/CB/PROD–4687/2020

Due Date

Evaluation Criteria GROUP WISE

SCHEDULE OF REQUIREMENT

Sr No	Description	Unit	Quantity	Unit Price (FOB)	Total Price (FOB)	Unit Price C & F BY SEA	Total Price C & F BY SEA	Deviated From Tender Spec. If Any
Group A								
1	ACTUATED PRESSURE CONTROL VALVE (PCV) 14" 600 CLASS RF WITH COMPANION FLANGES,GASKETS,STUDS,AS PER DATA SHEET/SPECIFICATIONS ATTACHED AT ANNEXURE AA	Number	1					
Group B								
2	BALL VALVE 24"X20" (600 CLASS,RF,MANUAL GEAR OPERATED,MR–0175,REDUCED BORE,SIDE ENTRY,3–PIECE) WITH COMPANION FLANGES,GASKETS,STUDS AS PER DATA SHEET/SPECIFICATIONS ATTACHED AT ANNEXURE A	Number	2					

Note: A BID BOND AMOUNTING TO US$ 1,000/–(GROUP–A) & 1,500/–(GROUP–B) MUST BE SUBMITTED WITH THE TECHNICAL BID AND IT MUST BE VALID FOR 150 DAYS FROM THE DATE OF OPENING OF THE BID. .DELIVERY PERIOD IS 04 MONTHS FROM THE DATE OF L/C ESTABLISHMENT.

Ahmad.
vetted.
Hammad Ahmed
J.E (Mech) - PE & FD
OGDCL, Isiamabad.
Ext: 2632

Bidder's eligibility

1. Complete bid to be submitted in duplicate hard copy.
2. CD of the bid with all the documents must be provided as well.
3. Four (04) months of delivery period for the deliverables to be confirmed as per SOR.
4. OEM / manufacturer to be confirmed from API 609 for PCV with valid and last 5 years consecutive API certificate.
5. API 6D certificates for last 5 years for the ball valves of similar size and rating to be provided with the bid.
6. Supplier would submit technical drawing with technical literature.
7. O&M manual to be provided with spares illustration with the bid.
8. Valve inspection for ball valve and PCV must be under API **Std 598** Valve Inspection and Testing must be provided with required documents under Quality Inspection Plan QIP.
9. Bidder/manufacturer to confirm end to end flange dimension as per Check List.
10. Five purchase orders to E&P companies must be shared for similar size and rating must be attached with bid.
11. Financial info/audited reports to be shared for 3 years.
12. List of six Annexures E (Corporate, HSEQ etc.) to be confirmed.
13. Documents Submission "Check List" as to be confirmed.

Bidder Document submission after Contract Award

1. Quality Inspection Plan (QIP) is to be submitted by the vendor after award of the contract.
2. Necessary grease / compound for the PCV and Ball Valve must be provided as free issue item for five use with MSDS.
3. OGDCL approval for the final manufacturing plan/ schedule after contract award.

Check List

#	Parameter	PCV	Ball Valves	Bidders compliance
1	Valves Standards	API 609	API 6D for Ball Valve with API 6FA (fire safe)	
2		**Std 598** Valve Inspection and Testing		
3	Matching Flanges (two number each with one valve) ASME 16.5	Required	Required	
4	Two sets for each of the flange (2x6) Ring Gasket	Required	Required	
5	Matching Chrome plated Nut Bolts as per Code	Required	Required	
6	Quality Inspection Plan (QIP)	To be provided before manufacturing		
7	Inspection & Test Plan	To be followed as per **Annexure B**		

8	Service Conditions	As per data sheet		
9	Gas Composition	As per data sheet		
11	Operating Pressure / Temperature	As per data sheet		
12	OEM or authorized dealer with AUTHORITY Letter to bid	Required	Required	
13	Actuator DATA Sheet / inputs	Required	-	
14	Data Sheet	**Attached at C**	**Attached at D**	
15	Free of charge service for installation, commissioning and calibration at site by PCV provider. All costs and arrangements would be on part of the PCV supplier; OGDCL would only provide security and on-site field transport to OEM Service Engineer.	**Bidder to confirm**	-	
16	Service Engineer: **Services in Pakistan with established base over 10 years existence and at least 05 service engineers on payroll** Mandatory requirement for PCV	(documentary evidence to be provided)	-	
17	**Quality certificates**	UL mark valid & past 5 years certificates		
18		CE mark with valid & past 5 years certificates		
19	**Flange to Flange (End to End) dimension for PCV**	972 mm	1403 mm	
20	**Nameplate Tag**	Stainless tag highlighting all technical specification as per CODE & Standard, with material of construction, manufacturer date / YoM and serial number		
21	**Mandatory Annexures to be filled in (3 pages)**	Required	Required	
22	**Compliance of All annexure A to E**	Required	Required	
23	**Valves Data Sheet is the basic document, it supersedes all other requirements in case of contradiction.**	Mandatory	Mandatory	

File No: JV05-011.XLS

ANNEXURE-AA

1	**GENERAL INFORMATION:**						
2	Tag Number:		PCV-2257				
3	Service Description:		GAS DELIVERY PRESSURE		CASE 2		
4	Location:		GAS DELIVERY STN				
5	Line; Vessel; Equipment No:	Piping Class:					
6	P &ID No:						
7	R.F.Q. No:	Purchase Order No:					
8	Item No:						
9	Manufacturer:						
10	Vendor:						
11	Model No:						
12	Serial No:						
13	Electrical Area Classification:		CL 1 ZN 2 GRP IIA				
14	Electrical Certification:		SAA 'Exd'				
15	**PROCESS SERVICE CONDITIONS:**						
16	Fluid:	State:	HC GAS	GAS	HC GAS	GAS	
17	Pressure Units:		PSIG		PSIG		
18	Pressure Inlet:	Outlet:	800	450	570	450	
19	Inlet Pressure: Maximum:	Shutoff dp:	900	1000	900	1000	
20	Gas Flowrate: Maximum:	Units:	312	MMSCFD		MMSCFD	
21	Gas Flowrate: Minimum:	Normal:	88	250	88	450	
22	Liquid Flowrate: Maximum:	Units:	-----	-----	-----	-----	
23	Liquid Flowrate: Minimum:	Normal:	-----	-----	-----	-----	
24	Temperature: Maximum:	Units:	120	° F	120	° F	
25	Temperature: Minimum:	Normal:	50	77	50	77	
26	Valve Pressure Ratio: Xt:	Pipe Factor Fp:	1.75	0.96	1.26	0.96	
27	Viscosity (Mixture): cP		0.016		0.015		
28	Gas Compressibility Factor:		0.896		0.886		
29	Isentropic Exponent: *k:*	MW:	1.21	30.3	1.24	30.3	
30	Liquid Density at Upstream Conditions: lb/ft³		-----		-----		
31	Liquid Vapour Pressure:	Critical Pressure:	-----	-----	-----	-----	
32	Liquid Pressure Recovery Factor: fl/flp		-----		-----		
33	Reynolds No. (Liquids):		-----		-----		
34	Flow Type (Choked/Flashing etc.):						
35	Calculated Cv Maximum Flow:		477		1266		
36	Calculated Cv Minimum Flow:	Normal Flow:	130	382	247	-----	
37	**CONSTRUCTION - VALVE BODY:**						
38	Manufacturer:						
39	Body Type:	Model No:	GLOBE	SERIES 12			
40	End Connection:	Rating:	FLANGE	600# RF			
41	Body Size:	Port Size:	14"	14"			
42	Guiding:	No of Ports:	CAGE	ONE			
43	Trim Form:		=%				
44	Maximum Possible Cv:	Actual CV:	1940	507			
45	Maximum Flow for Actual Cv:		-----				
46	Flow Action to Open/Close:		CLOSE				
47	Lubricator & Isolation Valve:	Bonnet Type:	YES	STD			
48	Body Material:	Packing Material:	A216 WCB	TECHEV			
49	Trim Material - Seat:	Plug:	316L(STEL)	316L(STEL)			
50	Trim Material - Shaft:	Guiding:	316L(STEL)	316L(STEL)			
51	Shutoff Class:		IV				
52	SPL Allowed:	Calculated:	90 dBA	88			
53	**CONSTRUCTION - VALVE ACTUATOR:**						
54	Manufacturer:						
55	Model No:		G4-300				
56	Actuator Type:	Fail Open/Closed:	DIAPHR	CLOSED			
57	Handwheel:	Location:					
58	**CONSTRUCTION - VALVE POSITIONER:**						
59	Manufacturer:						
60	Type:	Model No:	E/P	P3300i			
61	Positioner Type:	Input Signal:	-----	4-20mA			
62	Filter Regulator & Gauge:	Air Supply:	YES	30			
63	Connections: Pneumatic:		¼" NPT				
64	Enclosure Type:	IP Rating:	WP	IP65			
65	Entry: Size:	Termination:	20mm	TERMINALS			
66							

GENERAL NOTES:

* = Information to be provided by VENDOR

1. The VENDOR shall provide all instruments with a stainless steel tag plate stamped with the INSTRUMENT TAG No. in 5mm high characters permanently attached to the instrument with either stainless steel wire or screws.
2. All permanent instrument fixings shall be stainless steel.
3. The VENDOR shall provide a valve conforming to the material requirements for sour gas service in accordance with NACE standard MR-01-75.

Rev	REVISION DESCRIPTION	DATE	PREPARED	CHECKED	APPROVED
1	AS-BUILT	27-May-97	AST	YYU	AST
0	ISSUED FOR PURCHASE	19-Jul-96	AST	YYU	AST
B	ISSUED FOR TENDER	6-May-96	AST		
A	ISSUED FOR PROCESS INFORMATION	22-Mar-96	AST		

CLOUGH

INSTRUMENT DATA SHEET

CONTROL VALVES GLOBE TYPE

Client:	Oil & Gas Development Corp
Project:	Uch Gas Pipeline
Data Sheet No:	DS-00-JV-0005.01
Job No: 1846	Revision: 1

CONTROL VALVE

SPECIFICATIONS

ANNEXURE - AA

Table of Contents

1 Scope

This standard prescribes the minimum mandatory requirements governing the design, specification, sizing, selection and installation of control valves and regulators.

2 Conflicts and Deviations

2.1 Any conflicts between this standard and other applicable industry standards, codes, and forms shall be resolved in writing by the Company.

2.2 Direct all requests to deviate from this standard in writing to the Company.

3 References

The selection of material and equipment, and the design, construction, maintenance, and repair of equipment and facilities covered by this standard shall comply with the latest edition of the references listed below, unless otherwise note

3.1 Industry Codes and Standards

American Petroleum Institute

API STD 609	*Butterfly Valves: Double Flanged, Lug- and Wafer-Type*

American Society of Mechanical Engineers

ASME B1.20.1	*Pipe Threads, General Purpose (Inch)*
ASME B16.5	*Pipe Flanges and Flanged Fittings*
ASME B16.20	*Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral Wound and Jacketed*
ASME B46.1	*Surface Texture (Surface Roughness, Waviness and Lay)*
ASME VIII D1	*Rules for Construction of Pressure Vessels*

American Society for Testing and Materials

ASTM A105	*Standard Specification for Carbon Steel Forgings for Piping Applications*
ASTM A193	*Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and other Special Purpose Applications*

ASTM A194	*Standard Specification for Carbon and Alloy-Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both*
ASTM A216	*Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service*
ASTM A217/A217M	*Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service*
ASTM A320	*Standard Specification for Alloy-Steel Bolting Materials for Low-Temperature Service*
ASTM A351	*Standard Specification for Castings, Austenitic, for Pressure-Containing Parts*
ASTM A352	*Standard Specification for Steel Castings, Ferritic and Martensitic for Pressure-Containing Parts, Suitable for Low-Temperature Service*
ASTM A743	*Specification for Castings, Iron Chromium, Iron Chromium Nickel, and Nickel Base Corrosion Resistant for General Application*

Fluid Control Institute

ANSI/FCI 70-2	*Control Valve Seat Leakage*

The Instrumentation, Systems and Automation Society

Commentary Note:

IEC standards equivalent to the ISA standards referenced herein are also acceptable.

ANSI/ISA 51.1	*Process Instrumentation Terminology*
ANSI/ISA 75.01.01	*Flow Equations for Sizing Control Valves*
ANSI/ISA 75.05.01	*Control Valve Terminology*
ANSI/ISA 75.11.01	*Inherent Flow Characteristic and Rangeability of Control Valves*
ANSI/ISA RP75.23	*Considerations for Evaluating Control Valve Cavitation*
ANSI/ISA TR75.25.02	*Control Valve Response Measurement from Step Inputs*

ANSI/ISA 75.19.01	*Hydrostatic Testing of Control Valves*

International Electro Technical Commission

IEC 60534-2-5	*Industrial Process Control Valves, Part 2-5: "Flow Capacity – Sizing Equations for Fluid Flow through Multistage Control Valves with Inter-Stage Recovery"*
IEC 60534-8-3	*Industrial Process Control Valves, Part 8-3: Noise Considerations: Control Valves Aerodynamic Noise Prediction Method*
IEC 60534-8-4	*Industrial Process Control Valves, Part 8-4: Noise Considerations: Prediction of Noise Generated by Hydrodynamic Flow*

International Organization for Standardization

NACE MR0175/ ISO 15156	*Petroleum and Natural Gas Industries, Materials for Use in H_2S-Containing Environments in Oil and Gas Production*

National Fire Protection Association

NFPA 70	*National Electrical Code*

3.2 Terminology

The terminology and nomenclature used in ANSI/ISA 51.1 and ANSI/ISA 75.05.01 apply to this standard.

4 Design

Control valves shall not be used as emergency shutdown valves (ZVs), or as emergency isolation valves (EIVs). Control valves may be used as Emergency Vapor Depressurizing valves and may also be used in process interlock systems.

4.1 General

4.1.1 Minimum Rating

a) The flange rating for control valve bodies shall be minimum Class 150.

b) The body rating shall never be lower than the flange rating.

4.1.2 End Connections

a) Control valve sizes 24" and smaller shall be integrally flanged. Flanged connections shall comply with ASME B16.5.

Raised-face (RF) flanges shall be used for lines rated up to and including Class 600 and up to a design temperature of 480°C.

Ring-joint (RJ) flanges shall be used for lines rated Class 900 and above, and for design temperature conditions exceeding 480°C. Ring grooves shall comply with ASME B16.20.

Separable flanges, flanges with tag welds, or flanges with partial penetration welding are not acceptable.

Class 400 carbon steel flanges for sizes smaller than 30-inch shall not be used.

b) Flangeless sliding stem control valves shall not be used. Flangeless rotary control valves may only be applied when a flanged body is not available for the selected type of control valve.

Flangeless rotary control valves shall not be used in:

- hydrogen services
- thermal cycling services
- fire-safe services
- systems rated above Class 600
- services with design temperatures above 480°C.

For design temperatures above 205°C, bolting material for flangeless control valves shall have the same nominal coefficient of thermal expansion as the body and adjacent flanges. Flangeless control valves shall have centering means (e.g., lugs, holes, bolting, or equal) to ensure proper alignment of the control valve, gasket, and piping flange. Wafer-type butterfly control valves shall not be used.

c) Threaded control valves shall not be used.

4.1.3 Face-to-Face Dimensions

Face-to-face dimensions of control valves shall conform to one of the standards listed in Section 3

4.1.4 Gasket Contact Surface Finish

The gasket contact surface of raised-face flanged valves, and flangeless

control valves, up to and including Class 600 ratings shall be smooth machine-finished between 3.2 to 6.4 micrometers Ra conform to ASME B46.1. For hydrogen or hydrogen effluent service, the gasket contact surface finish shall not exceed 3.2 micrometers Ra.

4.1.5 Materials

The appropriate ANSI/ASTM specifications to which the valve bodies and bonnets need to be manufactured from shall be specified on the Instrument Specification Sheet (ISS).

The maximum system pressure and temperature shall be specified on the ISS. All materials used in the valve shall be compatible with the specified process conditions.

For steam and boiler feedwater services over 400°C and for flashing water services the body material shall be minimum ASTM A217/A217M grade WC9.

Bronze, aluminum, plastic, cast iron and ductile iron bodies are not acceptable.

Downstream temperature conditions shall be calculated and specified on the Instrument Specification Sheet (ISS) for all control valves in gas pressure letdown services where the downstream temperature conditions may be reduced to below 0°C due to the Joule-Thompson effect. Body and trim materials shall meet the lowest temperature requirements. Standard carbon steel materials (e.g., ASTM A216, ASTM A105, WCB, WCC, etc.) shall not be used below 0°C service temperatures. ASTM A352 grade LCB or LCC shall be specified for temperatures from 0°C to -46°C. ASTM A351 or ASTM A743 grade CF8 shall be selected for temperatures below -46°C.

NACE MR0175/ISO 15156, *"Petroleum and Natural Gas Industries Materials for Use in H_2S-Containing Environments in Oil and Gas Production"* shall be applied for all materials in sour fluid services.

Trim materials shall be selected to withstand corrosion, erosion and wear. Trim material combinations shall not be susceptible to galling. AISI 300- and 400- series stainless steel shall be used as a minimum.

Hard faced trims, or solid Stellite or Colmonoy type trims shall be used in erosive, cavitating and flashing type services, including steam, wet gas and water applications with pressure drop conditions exceeding 350 kPa (51 psi), other applications with pressure drop conditions exceeding 4000 kPa (580 psi) and as per manufacturer's recommendation. Such hard or hardened trims shall have a hardness of at least 38 HRC (hardness Rockwell C).

For black powder services, solid trim materials shall be specified. A complete package for trim details (such as material selection, cladding or material deposits specification, sleeve or insert dimensions...etc) for every component of the trim, shall be submitted for evaluation and approval before proceeding with order placement.

Monel, nickel, titanium and Hastelloy trim materials shall be considered in very corrosive type services to ensure acceptable service life.

Valve actuator springs shall be minimum carbon steel with standard factory applied corrosion resistant coating or be hot oil dipped. Alloy springs shall be considered for near shore and offshore locations.

4.1.6 Packing Systems

4.1.6.1 General

Control valve packing systems shall enable plant operations to effectively maintain minimum leakage and travel performance within the inaccuracy limits specified in paragraph 7.1. All proposed packing systems and bellows seals shall be field proven for a minimum of 3 years and references of other users shall be made available upon request.

Specific cyclic, thermal cyclic operations of control valves or valves in auto ignition services shall be specified to the control valve manufacturer in the Request for Quotation (RFQ) and Purchase Order (PO).

Packing systems shall not require lubrication.

4.1.7 Gaskets

Body gaskets shall be fully retained 316 SST, or other appropriate alloy, spiral wound, with PTFE or graphite compound fillers.

4.1.8 Bonnet

Bolts, studs and nuts shall meet the applicable ASTM A193, ASTM A194 or ASTM A320 specifications.

Threaded connections shall be NPT and comply with ASME B1.20.1.

For cryogenic services, an extended bonnet shall be used. The minimum required length of the bonnet shall be specified in the purchase order. The packing arrangements shall be on the top of the bonnet.

4.1.9 Seat Leakage

Seat leakage classification shall be in accordance with ANSI/FCI 70-2. The leakage class shall be determined by the service and valve-type used.

Tight-Shut-Off (TSO) control valves shall be identified on the Process & Instrument Diagrams (P&ID's) as "TSO". TSO control valves shall be class V or better. The TSO class and maximum differential pressure under shut-off conditions shall be specified on the ISS.

In order to minimize product loss or to maximize energy conservation and to minimize seat erosion Leakage Class V, or better, metal-to-metal TSO shall be applied for:

- Compressor anti-surge and spill-back services and for gas to flare pressure letdown services

- vapor, wet gas, steam and water services with shut-off pressure drop exceeding 2500 kPa (363 psi)
- cavitating services where the valve size is 8" or more or when shut-off pressure drop exceeding 2500 kPa (363 psi).
- black powder applications

Soft-seated shut-off trim designs shall not be applied in services with design temperature conditions over 230°C nor in flashing liquid or other erosive type services.

If pipe provisions allow, TSO control valves shall be tested at site for acceptable leakage with water containing a corrosion inhibitor. Class V shutoff shall be tested at the shutoff pressure conditions specified on the ISS.

4.1.10 Hydrostatic Testing

New control valves are hydro-tested at the factory and there is no need to hydro-test them in the field.

For control valves in existing facilities, hydrostatic testing of the valve body shall be done without trim parts per ANSI/ISA 75.19.01.

4.2 Sliding Stem Type Control Valves

Bottom flanges on globe type control valves shall not be used unless they are justified and approved by the proponent.

Split type bodies shall not be used unless they are justified and approved by the proponent.

Three-way diverting or mixing type control valve bodies shall not be used and these requirements shall be accomplished by using two standard control valves.

Exception:

This does not apply to de-superheaters, licensed process designs or other special control valve applications.

Axial body design shall be used for recycle valves in salt water disposal pump applications per SABP-J-711, "Selection of Recycle Valves for Salt Water Disposal Pumps." Body or trim material deviations shall be submitted for approval to Supervisor, Instrumentation Unit, Process Automation Systems Division, Process & Control Systems Department, Dhahran.

4.3 Rotary Motion Control Valves

The shaft design shall prevent excessive shaft deflection for the process conditions specified on the ISS. The shaft design shall eliminate the possibility of blowout.

Conventional flat disk/vane type butterfly valves shall be sized for a maximum travel of 60° opening. Travel in excess of 60° opening may only be applied when the butterfly disk/vane is specifically designed for stable control services above 60° opening under low dynamic torques. Butterfly valve trims enabling stable control beyond 60° opening include a fishtail disk/vane, angular offset disk/vane, cambered disk/vane, fluted disk/vane and S-DISK designs.

Clearance requirements for the disk shall be sufficient and meet API STD 609 to eliminate any interference between the disk and the heavy wall piping.

4.4 Trim Design

To prevent damage on cage type trims and to minimize body erosion through direct particle impingement, the flow outwards configuration (or flowing from the inner diameter to the outer diameter of the cage) shall not be used for fluids containing sand, pipe scaling, or other particulate matter. Anti-cavitation type trims and low noise type trims used in fluid services with entrained particulate matter shall be of solid cage type design (i.e., multi-plate, labyrinth or disk stack type trims shall not be used in fluid services containing dirt, debris or other particulate matter).

4.5 Regulators

The use of all self-acting regulating type valves including pressure regulators, level regulators, temperature regulators, pump minimum flow regulators, etc, shall be approved by the proponent.

Self-acting regulating valves may be used only for services where setpoint adjustments are not required, where limited rangeability is acceptable and where control performance within ±20% is acceptable. Self-acting regulating valves shall not be used in applications where any failure, or plugging, of the sensing element or actuating system can result in unsafe operating conditions. Regulators shall not be used in sour gas, toxic gas, cavitating, flashing, high noise and erosive services. Venting type regulators shall not be used where the vented combustible gas can create hazardous conditions.

A strainer or filter shall be used for regulators that are susceptible to plugging.

Actuator systems for self-acting regulating valves shall be capable of withstanding 150% of the maximum upstream design pressure. Pilot-operated regulators may only be used in clean fluid applications. All sensing element and actuator system

materials shall be fully compatible for the process fluid application. The correct gain and operating range shall be provided for self-acting regulating valves through proper selection of the diaphragm, spring or pilot system.

5 Specification

5.1 Process Data Specification

5.1.1 Process Data Operating Window

For each control valve, the process data for the following three flow conditions shall be specified as a minimum:

- Normal Flow Rate
- Maximum Flow Rate
- Minimum Flow Rate

5.1.2 Process Data for Flashing and Two-Phase Flow

For flashing services, the downstream vapor phase shall be specified on the ISS in percentage (%) weight together with the average MW.

For two-phase flow services the upstream and downstream vapor phase shall be specified on the ISS in percentage (%) weight together with the average MW.

5.1.3 All Fluids

- wellhead flow line applications
- oxygen services
- compressor anti-surge control valves
- erosive fluid applications including fluids with black powder
- de-superheater (steam conditioning) applications
- temperature cycling applications
- all applications considered special, difficult, or severe by the proponent

5.4.2 Dry Gas and Superheated Steam

- control valve body outlet velocities greater than 0.4 Mach
- all services with a pressure ratio greater than 15 (P1/P2 > 15, pressures expressed in absolute pressure units)

5.4.3 Wet Vapor and Saturated Steam

- control valve body outlet velocities in greater than 0.3 Mach
- all services with a pressure ratio greater than 10 (P1/P2 > 10; pressures expressed in absolute pressure units)

5.4.4 Gas or Vapor with Entrained Particulates (including the black powder)

- control valve body outlet velocities greater than 0.2 Mach (for black powder greater than 0.15 Mach)
- all services with a pressure ratio in greater than 3 (P1/P2 > 3; pressures expressed in absolute pressure units)

5.4.5 Liquids

- flashing services with downstream vapor content exceeding 10% weight
- cavitating services, where more than a two stage let-down trim is required to meet the noise limits without application of path-treatment
- two-phase flow services with downstream vapor content exceeding 10% weight
- water injection services
- boiler feed water services
- entrained solid or particulate services

5.5 Control Valve Acceptance

Prior to placing the order, the Contractor shall submit a technical proposal for each control valve for acceptance to OGDCL. The technical proposal shall include a completed ISS, vendor capacity and noise calculation, complete technical specification of the proposed control valve covering all material selections and trim performance data.

6 Engineering

6.1 Sizing

Control valve sizing shall be based on ANSI/ISA 75.01.01 and IEC 60534-2-5. Manufacturer may deviate from the standard formulas provided that the reason and the formulas used are detailed in the technical quotation. Proposed deviations from these standards shall be submitted for approval to Supervisor, Instrumentation Unit, Process Automation Systems Division, Process & Control Systems Department, Dhahran.

The manufacturer shall be provided with all data necessary to select and size the control valve and actuator assembly and to accurately evaluate the minimum trim performance requirements.

All factors used in sizing per ANSI/ISA 75.01.01 shall be presented on sheet 2 of the ISS. These include Reynolds Number Factor F_R, piping geometry factor F_P, calculated F_{LP} and/or X_{TP} factors and manufacturer's correction factors.

Control valve noise calculations shall be in accordance with the IEC 60534-8-3 and IEC 60534-8-4. Capacity and noise level calculations for all operating conditions shall be specified on sheet 2 of the ISS. The calculation basis and results shall be shown for manual or computer calculations. The calculated Cv capacities for the minimum, normal and maximum flow conditions and the highest calculated noise level shall also be specified on sheet 1 of the ISS.

6.2 Selection

6.2.1 Minimum Body Size

The minimum control valve nominal body size shall be 1". The control valve nominal body size shall not be smaller than half of the upstream nominal line size.

Control valve bodies with reduced trims shall be considered for the following applications:

a) Pressure drop application in excess of 5170 kPa (750 psi)

b) Choked flow service

c) Flashing service exceeding 10 % weight of liquid being vaporized

d) Erosive service

e) Services where future capacity increase is anticipated

Nominal body sizes 1¼ inch, 2½ inch, 3½ inch, 5 inch or higher odd numbers shall not be used.

6.2.2 Minimum Cv Capacity (Cv Required)

The selected control valve trim capacity (Cv selected) shall meet the following:

a) An equal percentage trim shall operate below 93% travel at maximum flow condition. If no maximum flow condition is specified on the ISS, then the trim shall operate below 85% travel at normal flow condition.

b) A linear trim and quick opening trim shall operate below 90% travel at maximum flow condition. If no maximum flow condition is specified on the ISS, then the trim shall operate below 75% travel at normal flow condition. Anti-surge control valves shall operate below 55% travel at maximum flow condition.

c) A modified parabolic trim shall operate below 90% travel at maximum flow condition. If no maximum flow condition is specified on the ISS, then the trim shall operate below 80% travel at normal flow condition.

Commentary Note:

The specified percentage (%) travel positions are for sliding stem type valves and need to be converted to degrees opening for rotary type control valves.

A control valve affecting the load of a downstream safety/relief valve system can only be reduced in capacity by using a smaller valve or a reduced trim.

When the capacity of a control valve affects the load of a safety/relief valve system, then the following shall be specified on the ISS: "Valve Trim Size Affects Safety/Relief Valve System Load." The bypass of this control valve shall be "car-sealed closed".

6.2.3 Minimum Rangeability

The installed rangeability of each control valve shall meet all flow conditions specified on the ISS. The specified minimum flow condition shall operate above 10% travel for globe, angle and axial flow type control

valves, 5 degrees for ball and segmented ball type control valves and 10 degrees for butterfly, rotary plug/disk and cammed type control valves.

When the minimum required rangeability can not be met with one control valve, two or more parallel runs of control valves with split range control shall be provided.

6.2.4 Flow Characteristics

Manufacturer's control valve characteristics shall conform to ANSI/ISA 75.11.01.

The control valve flow characteristics shall be selected based on the following:

a) linear flow characteristic

- when the ratio of differential pressure across the control valve at minimum flow over the differential pressure across the control valve at maximum flow is equal to or less than 1.5
- when the differential pressure conditions across the control valve under all specified flow conditions are more than $^2/_3$ of the differential pressure across the control valve in the closed condition
- when two control valves are used in pairs as a 3-way valve
- for compressor recycle (spill-back) applications
- for compressor anti-surge control valves
- for centrifugal pump minimum flow bypass applications

b) equal percentage flow characteristic

- for all other modulating control applications, except for those under a), c) and d)

c) modified parabolic flow characteristic

- may only be substituted for equal percentage trim applications, provided that the smaller inherent rangeability is acceptable for the subject application

d) quick opening flow characteristic

- on/off control applications

Permissible deviations between actual and manufacturer-stated inherent flow characteristics shall not exceed the limits specified in ANSI/ISA 75.11.01.

If necessary, the contractor shall modify the installed control valve flow characteristic in the positioner to obtain constant controller gain over the required flow range. The installed flow characteristic shall provide stable process control for all specified operating conditions without the need to change controller tuning parameters.

6.2.5 Minimum Flow Capacity

Permanently welded mechanical limit stops may be used for minimum flow requirements in, e.g., furnace/boiler feed system, burner fuel system, heat exchanger bypass, etc.

Limit stops on compressor suction control valves shall be made permanent with either a disc undercut or a complete valve/disc weld. Jam-nut arrangements (either inside the valve or the actuator) or tack welding arrangements are not acceptable.

When limit stops are used on a control valve, the signal from the control system shall be limited to the same travel values.

Valves with limit stops shall be marked accordingly in the P&IDs and on the valve name plate at the field.

6.3 Compressor Anti-Surge Control Valves

Anti-surge control valves shall have a very fast and stable control capability. The control valve opening stroke time in control mode from closed to fully open shall be less than 2 seconds including dead time. Overshoot shall be less than 110% of the input step change. The valve dead time of the seat shall be less than 0.5 seconds. In order to stabilize the compressor flow after surge conditions the closing response time shall be delayed to approximately three times the opening response time. Closure time shall be user configurable. The maximum deadband for control valves in anti-surge applications shall not exceed 2%.

Anti-surge control valves for compressors rated at 20,000 HP or more shall incorporate a multi-stage trim design to effectively dissipate the required energy during any surge condition (i.e. single stage trims, such as a simple drilled hole cage design, shall not be used).

Anti-surge control valves shall have linear flow characteristics unless recommended otherwise by compressor vendor. Anti-surge control valves shall operate below 55% travel for any surge condition.

Anti-surge control valves shall be TSO to class V or better.

6.4 Critical Downstream Pressure Conditions

The downstream pressure conditions of the control valve shall be accurately calculated and specified on the ISS for each flow condition. To determine the worst-case service conditions, considerations shall be given to the different downstream pressures that can exist under various operating conditions.

6.5 Cavitation, Choked Flow and Flashing

ANSI/ISA 75.01.01 and ANSI/ISA RP75.23, together with the manufacturer's valve cavitation index data, shall be used for determining the severity of cavitation, choked flow or flashing conditions in a control valve.

If cavitation cannot be eliminated completely, (e.g., by providing more downstream pressure through relocating the valve in the piping system) then a special control valve shall be selected with a high liquid pressure recovery coefficient F_L and/or low anti-cavitation index σ that will provide maximum lifetime for the valve and piping system. Noise and piping vibration levels shall not exceed the limits defined in paragraph 6.6.

Control valves in potentially cavitating service conditions shall be analyzed in detail to ensure that the intensity, or degree, of cavitation of the selected trim is acceptable based on the recommendations of ANSI/ISA RP75.23. This requires the valve manufacturer to provide a recommended sigma (σ_{mr}) for the specific valve and a scaled and adjusted proposed sigma (σ_p). These factors shall be stated on sheet 2 of the ISS.

Contingencies on the minimum required control valve cavitation index shall be applied to compensate for inaccuracies in process data and inaccuracies in manufacturer's control valve cavitation index data.

The location and piping installation of a control valve in flashing services shall be designed to limit the outlet velocity in order to minimize erosion in the control valve outlet area and downstream piping section.

6.6 Noise and Vibration

6.6.1 Noise Limits

The maximum noise level emission measured 1 m (3 ft) downstream of the valve and 1 m (3 ft) away from the valve including noise contributions from the piping system, piping elbows and reducers, is not allowed to exceed:

a) 85 dB(A) for all services at offshore plant facilities and for continuous services at onshore plant facilities for any specified operating condition and for any other operating condition between the specified minimum and maximum flow conditions.

b) 90 dB(A) for intermittent services at onshore plant facilities for any specified operating condition and for any other operating condition between the specified minimum and maximum flow conditions. Intermittent services include compressor anti-surge and spill back services.

c) 95 dB(A) for infrequent services at onshore plant facilities in which the control valves are normally closed. Infrequent services include vent or gas-to-flare valves where the downstream pressures fall below 100 kPag (14.5 psig).

These maximum noise levels are specified in terms of equivalent continuous A-weighted Sound Pressure Levels (SPL) with a maximum inaccuracy of ±5 dB(A).

Manufacturers shall be required to include inaccuracies of their quoted noise levels and shall be requested to guarantee that the noise emission from the proposed control valve in the specific piping system shall not exceed above stated limit. Contingencies need to be included in the design to ensure that the actual noise levels will be not be exceeded.

For control valves in potential noise and vibrating type service conditions, the Contractor shall provide piping layout information (e.g., piping isometric drawings) with the Request for Quotation to the bidding control valve vendors.

Control valve noise shall be treated at the source through the provision of low-noise multipath trim designs. To ensure that excessive noise and piping vibration problems will not occur, a contingency in trim performance shall be provided in high energy dissipating type services (example highly cavitating services, high pressure letdown services...etc.)

When the noise limit can not be met by source treatment alone, application of diffusers, baffle plates and silencers may be considered, subject to approval by the Supervisor, Instrumentation Unit, Process Automation Systems Division, Process & Control Systems Department.

Acoustic or thermal insulation shall not be used for control valves in continuous or intermittent services.

6.6.2 Vibration Limits

The maximum vibration levels of the control valve, manifold and piping system shall be less than 12.5 mm/sec Root Mean Square (0.5 inch/sec RMS) under all specified operating conditions.

Proper control valve selection shall ensure that the required energy can be dissipated without exceeding the maximum vibration levels in the piping system. The control valve manifold piping layout and piping support design shall facilitate maximum reduction of control valve induced vibration.

6.6.3 Noise and Vibration Test

A control valve noise and vibration test shall be conducted for each control valve with a calculated noise level in excess of 85 dB(A) (e.g., as part of a plant performance test).

Outlet Velocity Limits

Body outlet velocity, defined as the fluid velocity at the discharge flange of a control valve, shall be limited to:

- 0.15 Mach for gas containing black powder
- 0.2 Mach for gas, vapor and steam services containing any particulate matter
- 0.3 Mach for wet gas, vapor and saturated steam services
- 0.4 Mach for dry clean gas and superheated steam services
- 0.5 Mach for dry clean gas in infrequent services. Infrequent services include vent or gas-to-flare valves where the downstream pressures fall below 100kPag (14.5 psig).

7 Actuators and Positioners

7.1 General

Actuators, positioners and other accessories shall be procured as part of the control valve purchase order. The control valve manufacturer shall be responsible for packaging and guaranteeing the whole control valve assembly.

The control valve manufacturer shall be responsible for correctly sizing the actuators based on the technical specification(s) and the data specified on the ISS.

The bench set (spring range) of actuators shall be specified on the ISS's. Actuator sizing shall be based on a minimum available instrument air pressure of 415 kPag (60 psig), including worst-case requirements for maximum force/torque. Maximum air supply system design pressure conditions are generally 862 kPag (125 psig) at 82°C, or less. Actuator systems shall be suitable for non-lubricated air. A regulator/filter (with adequate capacity) shall be used to provide a constant air supply pressure under all operating conditions. A regulator is not required for pneumatic piston type actuators with design pressure conditions in excess of 862 kPag (125 psig).

The total maximum inaccuracy of the valve travel position due to any limitation (e.g., repeatability, dead band, resolution, hysteresis, non-linearity, etc.) shall be:

	Valve with a positioner	Valve without a positioner
Valve size <12"	1.5%	3%
Valve sizes 12" & 16"	2.5%	4%
Valve size >16"	3%	4.5%

Actuator force/torque requirements shall be specified for the worst case condition. Type and size of actuator system shall develop minimum 110% of the required seat load to meet the leakage class and the shut-off pressure drop specified on the ISS.

The maximum shut-off differential pressure shall always be calculated and specified on the ISS. For TSO applications, actuator load calculations shall be made and shown on sheet 2 of the ISS.

7.2 Positioners

7.2.1 Digital positioners shall be applied for all new control valves, unless otherwise specified.

7.2.2 A double acting positioner shall be used for double acting type actuators (i.e., it is not acceptable to use a single acting positioner with a reversing relay).

7.3 Pneumatic Diaphragm Actuators

Spring-return pneumatic diaphragm actuators are preferred and shall be used whenever feasible.

7.4 Pneumatic Piston Actuators

Air failure position shall be accomplished without the aid of process pressure conditions. Air failure position shall be testable during inspection and during plant commissioning when piping systems are de-pressurized.

When the "air failure open" (AFO) or "air failure close" (AFC) action mode of a piston-operated actuator system can not be accomplished due to insufficient spring force, then a volume tank with fail-safe trip valves shall be provided (refer to paragraph 8.4 for volume tank requirements). Air failure mode movement of the control valve shall be prompt in the event of air supply failure.

When "air failure lock" (AFL) action mode is required, also referred to as "air failure steady" (AFS), for any critical valve operation, lock-up valves and if so required, a volume tank shall be provided to lock the actuator in the last operating position upon air supply failure for a minimum period of 30 minutes.

7.5 Actuator Systems other than Pneumatic Air Operated

Control valve actuator systems other than pneumatic may be applied if access to instrument air is impractical. Process Gas as Actuating Medium

For applications where instrument air supply cannot practically be made available, sweet, clean, dry process gas may be considered as the actuating medium. Sour gas shall never be used. Process gas operated actuator systems shall never be used at an indoor location or enclosed area. Electronic, smart or any positioners with potential ignition sources, shall not be used for such applications.

Actuator and positioner materials, specifically the elastomer seals, shall be suitable for the particular process gas application. All materials in the actuator and control instrumentation shall be certified for the particular process gas services.

The gas shall be properly conditioned through a fully redundant gas supply system each with a dedicated inlet and outlet block valve (e.g., dual regulators, dual liquid knock-out pots with drain valves, dual filtering systems, over-pressure relief valves, etc.) connected to a ring header to enable on-line maintenance on one system at the time.

The gas supply ring header piping shall be sloping, without pockets, towards the knock-out pots installed at the lowest point. The liquid knock-out system design shall be over designed such to ensure trouble-free operation even during upset conditions of the process.

Sweet gas venting shall be kept to a minimum (i.e., selecting instruments with the lowest venting rates available, minimizing the number of venting instruments, etc.). Sweet gas venting shall be elevated to direct the gas away from the immediate area around the control valve. Consideration shall be given to connecting individual instrument vents to a common vent manifold which is subsequently connected to an elevated vent stack.

All enclosures shall be metallic (i.e., non-metallic actuator systems shall not be used in sweet gas services).

Actuator Stroke Speed Requirements

For minimum control performance requirements, the minimum stroke speed in modulating modes of process operation shall be:

- 0.75 inch per second for time-critical gas/vapor control applications, including but not limited steam pressure, fuel gas pressure, etc.
- 0.15 inch per second for general control applications.

For example: The maximum stroke times in control mode, for a valve with a 6"stem travel, are:

- 8 sec's at a stroke speed of 0.75 inch per second and
- 40 sec's at a stroke speed of 0.15 inch per second

Note: *Anti-surge applications are specified in paragraph 6.3.*

All applications need to be verified for the actual stroke speed requirements by the contractor. The required stroke time shall be specified on the ISS for each control valve.

Stroke times shall be tested on a 50% control signal step change (i.e., on a 50% step change the resulting change in valve travel needs to be performed within 50% of the required stroke time) without the aid of process pressure conditions. Stroke times shall be tested during manufacturer's inspection and during plant commissioning when piping systems are de-pressurized. Boosters may be applied to meet stroke time requirements, but stroke movements shall remain stable at 20%, 50% and 80% control signal step changes (i.e., overshoot to be less than 120% of the input step change and be dampening as defined in ANSI/ISA 51.1, and ANSI/ISA TR75.25.02).

Fast-stroke time requirements under air failure conditions shall be separately specified on the ISS (e.g., stroke times faster than the manufacturer's standard; piston-type actuators may have prolonged stroke times under air failure conditions). Typical applications requiring fast stroke times on air failure conditions include vent and flare dump valves to prevent safety/relief valves from being lifted. Quick-exhaust valves may be used, provided that they do not interfere with the normal control operation of the actuator system.

Exception:

> *Prolonged stroke times shall be applied for control valves in liquid lines, when required to prevent hydraulic surge conditions to exceed the pipeline Maximum Allowable Surge Pressure (MASP). When the stroke time of a control valve affects the pipeline MASP, or the load of a surge relief valve system, then the following note shall be specified on the ISS: "Valve Stroke Time Affects Pipeline MASP or Surge Relief Valve System Load". Typical applications may include pipelines, loading lines, tankage transfer lines, etc.*

8 Accessories

8.1 Handwheels

A handwheel shall be provided on valves when local manual control is required by the Proponent. Handwheel installations shall meet the following requirements:

a) Neutral position shall be clearly indicated.

b) Handwheel mechanism shall not add friction to the actuator.

c) Handwheel shall not be used as travel stops.

d) Handwheel shall be fully accessible for operation.

8.2 Limit Switches

Limit switches shall be actuated by proximity sensors. Limit switch enclosures shall be hermetically sealed. Switch contact outputs shall be at minimum, Single-Pole, Double-Throw (SPDT). Contact rating shall be at minimum, 0.5 Amp inductive at 125 VDC.

8.3 Solenoid Valves

Requirements for solenoid valves shall be specified on the subject control valve ISS. High temperature class "H" coil insulation rated for continuous duty shall be used with viton elastomers. Class "F" coil insulation is acceptable for low power (<2 watt) solenoid valves. Solenoid valves shall not be used for in-process service applications.

8.4 Volume Tanks

Volume tanks shall be mechanically designed to withstand a maximum pressure of 862 kPag (125 psig) at 82°C. Volume tanks shall be manufactured in accordance with ASME VIII D1 (stamped UM) or PED requirements. Volume tanks shall have a minimum capacity for two complete stroke operation of the control valve at the minimum available instrument air pressure of 415 kPag (60 psig). When specified on the ISS, the volume tank shall be equipped with all required accessories to ensure that the control valve fails in the safe position.

Commentary Note:

The two strokes consist of the failure mode movement plus one movement in the opposite direction. So, if the control valve is AFC, the volume tank will be sized to move the valve from open to close and then from close to open.

8.5 Mechanical Limit Stops

When mechanical limit stops are required, they shall be of a permanently welded type. Screwed type, if seal-welding at the locking nuts, is acceptable.

Limit stop arrangements through: hand wheel mechanism, jam-nut arrangement, tack welding arrangement or positioner configuration, are not acceptable.

8.6 Position Indication

8.6.1 Valve Position Indicator

Each control valve shall be provided with a valve position indicator. The indicating pointer shall be directly connected to the stem or shaft. The valve position shall be indicated on a reversible scale, with clearly graduated markings at the 0%, 25%, 50%, 75% and 100% valve opening position and open and/or closed indication at the valve travel limits.

8.6.2 Valve Position Transmitter

For safety related applications, a dedicated electronic travel position transmitter, providing a proportional valve stem or shaft position signal, shall be specified for remote valve position indication.

8.7 Marking and Identification

8.7.1 Marking

The direction of flow shall be cast or steel-stamped on the valve body, or alternatively a stainless steel arrow shall be permanently fixed to the body by rivets, for all appropriate valves which have been designed or selected for a specific flow direction.

For butterfly valves and other rotary valves, the vane, disk, cam or ball position shall be indicated by an engraved marking on the shaft end.

8.7.2 Identification

Name plates shall be provided for all control valves. Name plates shall **be made of 316SS and permanently fastened to the valve (i.e., adhesive fastening is not acceptable).**

9 Installation

9.1 General

Control valves shall be installed in horizontal lines.

Control valves shall be installed such that they can easily be removed for maintenance (i.e., if necessary a piping spool shall be installed to prevent the need to remove major piping).

Control valves and their actuating systems shall be mounted such that all adjustments are accessible (and all indicators/gauges are readable) from grade, permanent platform, walkway or fixed ladder. Portable platforms and portable ladders shall not be used. Sufficient clearances shall be provided for the removal of any part of the control valve or actuator assembly. Access space for lifting equipment shall be provided for valve and actuator assemblies weighing over 50 kg.

Control valve actuating systems and cabling shall not be located in close proximity to high temperature sources. Thermal shielding shall be applied from surfaces exceeding 260°C (500°F) when less clearance than 1000 mm (40 inches) is provided.

To avoid damage on control valve trims during flushing and hydrotesting of the piping system all control valves shall be removed from the piping system (e.g., blind flanges or spool pieces can be used to close the piping system). If the valve cannot be removed during flushing and hydrotesting, a temporary spool-mounted strainer of adequate strength shall be installed upstream of control valves with a high performance type trim (e.g., multi-stage low noise type trims, anti-cavitation type trims, etc.).

A permanent, spool-mounted strainer of adequate strength shall be installed upstream of control valves in dirty and erosive services.

Electrical Systems for Instrumentation." The electrical area classification of the control valve location shall be specified on the ISS. Electrical installation shall comply with NFPA 70, National Electrical Code (NEC).

9.2 Manifold

9.2.1 Block and bypass valves shall be provided as standard for each control valve installation. However, the block valves and bypass valve arrangement are not mandatory for control valves installed in:

- identical pieces of equipment installed in parallel (e.g., pumps, compressors, heat exchangers, etc.) with one piece of equipment used for standby, spare or redundant capacity (e.g., one duty and one standby, two duty and one standby, etc.), enabling on-line maintenance of any one control valve at any one time without affecting the required capacity
- identical process systems installed in parallel (e.g., trains, modules, units, boilers, furnaces, etc.) with one process system used for spare or redundant capacity, enabling on-line maintenance of any one control valve at any one time without affecting the required capacity
- process or equipment which is only intermittently operated in association with a continuous process (e.g., during start-up, regeneration, etc.)
- control valves which are only intermittently operated including compressor anti-surge, compressor spill-back, pump minimum flow, emergency vent, etc.
- non-critical equipment which may be shut down without affecting the operation of the main process
- applications where, for safety reasons, a block and bypass valves arrangement is not desirable (e.g., to reduce leakage sources of hazardous fluids, such as hydrogen, phenol, hydrofluoric acid, etc.)
- applications where, for safety reasons, manual operation by means of the bypass valve is not desirable (e.g., turbine speed control, fuel control to boilers and process heaters, etc.)
- applications, for which the proponent specifically does not require block and bypass valves to be installed

Bypass manifolds shall be designed to prevent the accumulation of dirt or other solids or formation of sluggish materials in stagnant lines.

The capacity impact (i.e., friction losses) of the manifold need to be verified during detailed design of the control valve system. This is especially important for high-recovery-type control valves operating under low-pressure drop conditions.

9.2.2 Manifold Piping

The manifold piping shall be arranged to provide flexibility for removing control valves for maintenance (e.g., particularly where ring joint flanges are used).

The piping around control valves shall be self-supporting or shall be permanently supported so that when the control valve is removed, the lines will remain in place without the need for temporary supports. If required, a support directly under the control valve body shall be provided where the weight of the control valve will add significant stress to the piping system.

These fluid velocity limitations may only be exceeded for piping installed between the control valve and reducers provided that one schedule heavier piping is used for this piping than the schedule required by the piping code.

For control valve applications with body outlet velocities in excess of 0.2 Mach, a straight piece of piping shall be installed over a length of at least 2D upstream and 10D downstream of the control valve before any fitting (e.g., elbow, tee, thermowell, etc.) where D is the nominal size of the piping. Additionally, the angle of the reducer and expander shall be smaller than 30° ($\theta < 30°$).

Control valves in flashing services shall be located as close as practically possible to the downstream vessel.

When heavier schedule piping is installed for noise reduction, it shall be installed over a minimum length of 10 D upstream and 20 D downstream of the control valve before any fitting (e.g., elbows, tee, or reducer), where D is the nominal size of the piping.

Requirements for non-standard reducers and heavier wall piping shall be specified on the Piping & Instrument Diagrams.

9.2.3 Bypass Valve

The bypass valve shall be manually operable and have a correct trim and control characteristic suitable for meeting the service requirements without excessive noise or piping vibration, on a temporary basis. Additionally, the bypass valve shall have a capacity at least equal to the required Cv of the control valve, but not greater than twice the selected Cv of the control valve. When the line may be required to handle larger flows at a later date, the bypass valve capacity shall be selected to accommodate the future flow rate.

For applications where it is impractical, or unsafe to operate the process on a manual bypass valve, a control valve with an actuator system shall be installed as a bypass valve. A pneumatic valve arrangement shall then be provided to allow smooth transfer of the control signal between the main control valve and the bypass control valve. Alternatively, two smaller redundant control valves, each having 50% of the required flow capacity, may be provided. Such applications include, but are not limited to quench flow control and temperature control on an exothermic reactor, pressure control requirements above 80% of the PZV set pressure, boiler feed water control, steam drum pressure control, etc.

For applications requiring control valve body sizes in excess of 12", multiple parallel arrangements of identical smaller body size valves may be considered. A duplicate control valve, installed in between block valves, shall then be provided as a common bypass valve for any one control valve (e.g., the same type of control valve with a handwheel, but without an actuator). Alternatively, a duplicate control valve with switch arrangements may be provided such that it can replace anyone of the control valves.

For applications where the bypass valve must be able to remain in service for an extended period of time (including those where control valves with special low-noise and anti-cavitation-type trims are installed), a duplicate control valve, installed in between block valves, shall be provided as a bypass valve (e.g., the same type of control valve with a handwheel, but without an actuator). Alternatively, a duplicate control valve with switch arrangements may be provided such that it can replace anyone of the control valves.

9.2.4 Block Valves

Block valves shall generally be the same size as the line size and shall be full capacity type valves.

Inlet block valves shall be installed upstream (before inlet reducers). Outlet block valves shall be installed downstream (after outlet expanders).

9.2.5 Drain and Vent Valves

Both sides of a control valve in a manifold shall be provided with a drain **valve, unless otherwise specified by the proponent. Drain valves shall be installed on the bottom of each spool piece between the control valve and the block valves.**

Control valve installations without block and bypass valves shall also be provided with a drain valve on each side of the control valve.

The size of drain valve shall be large enough to drain the enclosed liquid within 2 hours under atmospheric conditions, but be ¾" minimum.

Vent valves shall be provided where required. Size of vent valve shall be ¾" minimum.

9.3 Anti-Static Devices

Control valve designs shall be evaluated for the presence of electrically isolated metal parts when used in non-conductive fluid services.

Anti-static devices shall be provided to ensure electric continuity between all isolated parts and the valve body. These shall fulfill the following requirements:

a) Provide a discharge path with an electrical resistance of not greater than 10 ohms.

b) Be of such a design that the valve cannot be assembled, or reassembled, without the device.

ANNEXURE - A

GENERAL INFORMATION:

Tag Number:			
Service Description:		INITIAL GAS STATION INLET	
Location:		INLET GAS STN	
Line, Vessel, Equipment No:	Piping Class:		
P &ID No:			
R.F.Q. No:	Purchase Order No:		
Item No:		1	
Manufacturer:			
Vendor:			
Model No:			
Serial No:			
Area Classification:			
Certification:			

PROCESS SERVICE CONDITIONS:

Fluid:		State:	HC	GAS
Flow:	Maximum:	Units:	450	MMSCFD
Flow:	Minimum:	Normal:	250	400
Temperature:	Maximum:	Units:	50	°C
Temperature:	Minimum:	Normal:		
Pressure:	Maximum:	Units:	900	PSIG
Pressure:	Minimum:	Normal:	600	750
Maximum Inlet Pressure:		Shutoff dp:	900	900

CONSTRUCTION - VALVE BODY:

Manufacturer:				
Body Type:		Model No:	Split	E3
End Connection:		Rating:	ANSI Flg	600 # RF
Body Size:		Port Size:	24 inch	20 inch
Body Material:		Ball:	CS A105N	A105N (1)
Trim Material - Seat:		Seat Insert:	A105N (1)	Nylon SMX
Trim Material - Stem:		O-Rings:	ANSI1040(1)	Viton A
Gaskets:		Springs:	F316+Grafoil	Inconel X 750
Valve Brake-Out Torque:		Units:	----	Nm
Valve Torque:	Minimum	Maximum:	10476	12882
Valve Maximum Cv:		Shutoff Class:	----	VI
Fire Safe: Note 3	Anti-Static: Note 4		YES	YES
Mechanical Position Indicator:			YES	
Piping Data Sheet:		Valve Code No:		

CONSTRUCTION - VALVE

MANUAL GEAR OPERATED

Fail Position (Open; Closed; Stayput):			Closed	
Orientation:	Actuation:	Handwheel:	Top	NA
Handwheel:		Handpump:	Yes	Yes
Speed of Operation:	Opening:	Closing:	----	----

GENERAL NOTES:

1. The VENDOR shall provide all instruments with a stainless steel tag plate stamped with the INSTRUMENT TAG No. in 5mm high characters permanently attached to the instrument with either stainless steel wire or screws.
2. All permanent instrument fixings shall be stainless steel.
3. Fire Safe to British Standard BS 6755 part 2, API Standard 6FA maybe offered if BS certification not available.
4. Construction shall be ANTI-STATIC by design.
5.
6.

Rev	REVISION DESCRIPTION:	DATE	PREPARED	CHECKED	APPROVED
1	AS BUILT				
0	ISSUED FOR PURCHASE				
B	LINE SIZE REVISED FROM 26 TO 24 INCH	01-Mar-06	AG		
A	ISSUED FOR TENDER				

DATA SHEET

BALL VALVES

Client: Oil & Gas Development Corp.

Project: Uch Gas Pipeline

Data Sheet No: UDS-00-JV-0002.1

Job No: 1646 Revision: 1

Hammad Ahmed
JE (Mech) PF & FD

SPECIFICATION

FOR METALLIC VALVES & SPECIAL PIPING (SP) ITEMS

APPROVED FOR BIDDING 23/10/2018

0	20/01/2006	Approved for Construction	SS	A.ALI	M.SC
REV	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED

CLOUGH

CONTENTS

1 SCOPE

1.1 This Specification states the minimum technical, manufacturing and inspection requirements for Prequalification of Valves and Speciality Piping (SP) Items for use on OGDCL Surface Facilities.

1.2 This Specification is an integral part of any Enquiry, Material Requisition or Purchase order package for Piping Valves and Components, and shall be read in conjunction with the documentation referenced in the Enquiry, Material Requisition or Purchase Order Package.

1.3 In case of conflict between any requirement specified herein and the requirements of any other referenced document, the hierarchy for resolving the conflict shall be:

1. The Material Requisition (Inquiry /SOR)
2. Data Sheets
3. This Specification

2 REFERENCES

The following documents and specifications shall be read in conjunction with this specification:

- Item Data Sheets

3 CODES AND STANDARDS

The latest editions of following Codes, Standards and Statutory Regulations (where applicable) shall be used:

3.1 American Society of Mechanical Engineers

ASME V	Boiler and Pressure Vessel Code Section V – Non Destructive Examination
ASME VIII	Boiler and Pressure Vessel Code Section VIII Div.1 & Div. 2 Rules for Construction of Pressure Vessels
ASME IX	Boiler and Pressure Vessel Code Section IX - Welding Qualifications
ASME B31.3	Process Piping
ASME B1.20.1	Pipe Threads General Purpose (Inch.)
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.20	Metallic Gaskets for Pipe Flanges – Ring-Joint, Spiral-Wound, and Jacketed
ASME B16.21	Non-Metallic Flat Gaskets for Pipe Flanges
ASME B16.25	Butt welding Ends
ASME B16.34	Valves – Flanged, Threaded and Welding End
ASME B16.47	Large Diameter Steel Flanges
ASME B46.1	Surface Texture, Surface Roughness, Waviness & Lay

3.2 American Petroleum Institute

API 6D	Specification for Pipeline Valves
API 6FA	Specification for Fire Test for Valves
API 594	Wafer Check Valves
API 598	Valve Inspection and Testing
API 600	Steel Gate Valves - Flanged and Butt welding Ends
API 602	Compact Carbon Steel Gate Valves – Flanged, Threaded, Weld Extended Body Ends
API 607	Fire Test for Soft-Seated Quarter-Turn Valves
API 608	Metal Ball Valves – Flanged, Threaded and Butt-Welding Ends
API 609	Butterfly Valves: Double Flanged, Lug - and Wafer-Type

3.3 American Society of Testing and Materials

ASTM A105	Specification Carbon Steel Forgings for Piping Applications
ASTM A106	Specification for Seamless Carbon Steel Pipe For High-Temperature Service
ASTM A182	Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Service
ASTM A193	Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A194	Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High Temperature Service, or Both
ASTM A216	Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
ASTM A320	Specification for Alloy / Steel Bolting Materials for Low Temperature Service
ASTM A350	Specification for Carbon and Low-Alloy Steel Forgings, Requiring Notch Toughness Testing for Piping Components
ASTM A351	Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure Containing Parts
ASTM A352	Specification for Steel Castings, Ferritic and Martensitic, for Pressure-Containing Parts, Suitable for Low-Temperature Service
ASTM A694	Specification for Carbon and Alloy Steel Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service.
ASTM A890	Specification for Castings, Iron-Chromium-Nickel-Molybdenum Corrosion-Resistant, Duplex (Austenitic/Ferritic) for General Application
ASTM B62	Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM B148	Standard Specification for Aluminium-Bronze Sand Castings
ASTM B150	Standard Specification for Aluminium Bronze Rod, Bar, and Shapes
ASTM B564	Standard Specification for Nickel Alloy Forgings
ASTM B584	Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM G48	Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by use of Ferric Chloride Solution.

3.4 British Standards Institution

BS 1414	Steel Wedge Gate Valves (Flanged and Butt welding Ends)
BS 1868	Flanged Steel Check Valves
BS 1873	Steel Globe, Globe Stop and Check Valves (Flanged and Butt welding Ends)
BS 2080	Face to Face, Centre to Face, End to End and Centre Dimensions of Valves
BS 3799	Steel Pipe Fittings, Screwed and Socket Welding
BS 5146	Inspection and Test of Steel Valves
BS 5154	Copper Alloy Globe Stop and Check, Check and Gate Valves
BS 5155	Butterfly Valves
BS 5351	Steel Ball Valves
BS 5352	Steel Gate, Globe and Check Valves ≤ 50mm
BS 5353	Plug Valves
BS 6755	Testing of Valves
BS EN 10204	Metallic Products – Types of Inspection Documents

3.5 Det Norske Veritas

DNV OS-F101	Offshore Standard - Submarine Pipeline Systems

3.6 Manufacturer's Standardisation Society of the Valves and Fittings Industry

MSS SP25	Standard Marking System for Valves, Fittings, Flanges and Unions.
MSS SP44	Steel Pipe Line Flanges
MSS SP55	Quality Standard for Steel Castings for Valves

3.7 National Association of Corrosion Engineers

NACE MR-01-75	Sulfide Stress Cracking Resistant Metallic Materials for Equipment.

4 GENERAL REQUIREMENTS

4.1 Units of Measure

- Nominal valve sizes are to be shown in inches and fractions. General dimensions shall be in millimetres.
- Pressure classes are to be shown as ASME Ratings (i.e. Class 150 etc.), pressures shall be expressed in kilopascals gauge (kPag).
- Temperatures shall be expressed in degrees Celcius (°C).

4.2 The welding of flanges on to valves to meet the requirements for a flanged end valve specification is not acceptable without prior approval.

4.3 The use of asbestos material for non-metallic gaskets, gasket components or gland packing is prohibited.

4.4 Valve and SP Item end requirements shall be as follows:

i) Butt welding ends shall conform to ASME B16.25.

ii) Socket welding ends shall conform to ASME B16.11.

iii) Threaded ends shall conform to ASME B1.20.1.

iv) Flanged ends shall conform to ASME B16.5 for sizes DN 15 to DN 600 and ASME B16.47 Series A for sizes greater than DN 600.

4.5 Flange facing shall be as follows:

i) Raised face serrated finish, Ra 3.2 to 6.3µm

ii) Ring type joint contact faces, Ra 0.4 to 1.6µm

4.6 Ring joint flange groves shall have the following minimum hardness:

i.	Carbon Steel	-	110 HB
ii.	Low Temperature Carbon Steel	-	110 HB
iii.	Austenitic Stainless Steel AISI 316	-	180 HB
iv.	Duplex Stainless Steel	-	200 HB
v.	Super Duplex Stainless Steel	-	200 HB

4.7 Valve dimensional details shall be in accordance with the design standard specified in the valve data sheet. SP item dimensional details shall be in accordance with the applicable SP item data sheet. Face to face dimensions are critical and must be confirmed with bid, top works and overall dimensions shall also be provided with bid.

4.8 Where stated on the valve data sheet, valves shall be 'Certified Fire Safe' in accordance with BS6755 Part 2, API 6FA or API 607 as applicable. All valves offered shall be qualified by applicable fire test certification, details of which shall be available for Purchaser review, if requested.

5 MATERIAL REQUIREMENTS

5.1 Carbon Steel and Impact Tested Carbon Steel

The chemical composition of carbon steel castings and forgings shall be limited as follows:

Carbon content 0.25% max (non-NACE Castings)
Carbon content 0.22% max (NACE Forgings and Castings)
Carbon equivalent 0.43% max by ladle analysis where:

$$CEV = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu + Ni}{15}$$

Maximum permitted sulphur content shall be as follows:

ASTM A216 Gr. WCB (Non NACE)	0.045% Max.
ASTM A216 Gr. WCB (NACE MR0175)	0.025% Max.
ASTM A105 Gr B (NACE and Non NACE)	0.025% Max.
ASTM A106 Gr B (NACE and Non NACE)	0.035% Max.
ASTM A350 Gr LF2 (NACE and Non NACE)	0.025% Max.
ASTM A352 Gr. LCC (NACE MR0175 & Non NACE)	0.025% Max.

NACE MR0175 specified material shall also have limitation on sulphur content of 0.010% max.

All castings for sour service (NACE MR0175) and impact tested carbon steel castings shall be suitably heat treated after all welding operations have been performed. This requirement also applies to the weld repair of defects irrespective of size.

All ASTM A105 materials shall be supplied in a normalised condition.

All impact tested carbon steel to ASTM A350 LF2 shall be Class 1.

5.2 1 ¼% Chrome ½ % Moly

Cast valve and SP items bodies / components shall be supplied in accordance with ASTM A216 Gr. WCB and shall be supplied in the normalised and tempered condition. Heat treatment shall be carried out after all welding operations have been performed including any Purchaser permitted weld repair.

Forged valves shall be supplied in accordance with ASTM A105. Weld repairs are not permitted.

5.3 Austenitic Stainless Steel

Austenitic stainless steel shall be supplied in a solution annealed condition. Solution annealing shall be carried out after all welding operations have been performed including any Purchaser permitted weld repair.

Butt weld valves and SP items specified as 316 / 316L stainless steel shall be supplied dual certified i.e. having the mechanical properties of 316 SS and the chemical composition of 316L SS.

Butt weld valves and SP items specified as 304/ 304L stainless steel shall be supplied dual certified i.e. having the mechanical properties of 304 SS and the chemical composition of 304L SS.

The use of stainless steel to UNS S30400 or equivalent is not permitted for any pressure containing or bolting application in an Offshore or saliferous environment.

5.4 Duplex and Super Duplex Stainless Steel

All materials shall meet the mechanical requirements and chemical composition defined by the following product specifications:

Duplex stainless steel (22 Cr.)
Cast Valves - ASTM A890 UNS J92205
Forged Valves - ASTM A182 F51 (UNS S31803)

Super Duplex stainless steel (25 Cr.)
Cast Valves - ASTM A890 UNS J93380
Forged Valves - ASTM A182 F53 (UNS S32750)

Alloy composition shall provide a minimum Pitting Resistance Equivalent (PRE) as defined by the equation:

PRE = %Cr + 3.3% Mo + 16% N (Calculated by % weight)
Duplex stainless steel (22 Cr.) PRE shall be 35

Super Duplex stainless steel (25 Cr.) PRE shall be 43

All components shall be supplied in a solution annealed condition. Solution annealing shall be carried out after all welding operations have been completed. Maximum hardness shall not exceed the following:

Duplex stainless steel (22 Cr.)	- 28 HRC
Super Duplex stainless steel (25 Cr.)	- 32 HRC

Micrographic examination is required for both Duplex and Super Duplex stainless steels and shall cover the mid-thickness region. The ferrite content shall be determined according to ASTM E562 or approved equivalent and shall be within 35 - 55 %. The microstructure, as examined at 400X magnification on a suitably etched specimen, shall be free from intermetallic phases and precipitates. For Procedure Qualification Records (PQR) of casting weld repairs, examination shall be carried out on both the base and weld material.

Corrosion Testing is required for both Duplex and Super Duplex stainless steels and shall be carried out on each heat and heat treatment batch of material to establish sigma phase intergranular attack in accordance with ASTM G48 Method A. The samples shall be exposed to 10% $FeCl_3$ solution at 25°C for 72 hours. Test specimens shall be in the 'as delivered / manufactured' condition, no surface preparation is permitted, except for cut edges. The test specimens shall include the full section thickness. Where thickness exceeds 50mm, the samples shall include at least one original surface and shall extend at least to the centre-section of the thickness. Visual examination shall be performed on all of the specimens with at least 20x magnification. No pitting is acceptable. Weight loss shall not exceed 4.0 g/m^2.

Vendors shall submit for review with bid, details of all Manufacturers and include any further standard production testing which demonstrates resistance to Pitting and Crevice Corrosion for evaluation.

Charpy impact testing is required for cast duplex and super duplex stainless steel components in accordance with ASTM A370 at minus 46°C. The minimum absorbed energy values shall be 45 Joules min average, 35 Joules min individual.
Test samples for impact testing, microstructure, hardness and corrosion testing shall be carried out for each heat and heat treatment batch. For forgings the test sample shall be taken from the 'rough forging' or a prolongation representing the heaviest wall thickness. Castings shall have integrally cast coupons or test blocks which shall be heat treated together with the castings they represent.

Cast duplex and super duplex valve bodies and SP items bodies shall have a pressure / temperature rating in accordance with ASME B16.34 material group 2.8.

5.5 17/4 PH Stainless Steel

17/4 PH stainless steel shall be heat treated in accordance with NACE MR0175 and be supplied with a maximum hardness of 33 HRC.

Where the minimum design temperature stated on the valve and SP item data sheet is below minus 29° C, Impact testing of 17/4 PH stainless steel is required in accordance with ASME B31.3

For valves with a minimum design temperature of minus 46°C, impact testing shall be carried out at minus 46°C. The minimum transverse absorbed energy values for a 10mm

x 10mm specimen shall be 38 Joules min average, 28 Joules min individual. Minimum lateral expansion shall be 0.38mm.

17/4 PH SS is not an acceptable substitute for 316 SS were valve or SP item body of 316 SS is specified.

5.6 NACE MR0175 Requirements

Valves and SP items specified to NACE MR0175 shall be certified as meeting all requirements for all parts which can be contacted by the sour environment. All materials shall be fabricated, tested and inspected in accordance with the requirements of NACE MR 0175.

Cast duplex not listed in NACE must be qualified and certified for use in sour service, with the requirements and hardness of wrought duplex UNS S31803 (28 HRC) being met. Vendor shall submit previous qualification data with bid, together with sour service history for material, from casting source offered.

5.7 Amine Service Requirements

In addition to the requirements of Para 6.1, carbon steel and impact tested carbon steel valves and SP items, specified for use in amine service, shall have all welds stress relieved by post weld heat treatment. The weld heat affected zone hardness shall be less than 248 HV10.

Copper and copper based alloys, monel and aluminium alloys shall not be exposed to amine service.

5.8 Soft Seat and Seat Materials

All seat and seal materials shall be suitable for the maximum design conditions and service fluids stated in the Valve and SP item Data Sheets. Material data sheets shall be submitted with the bid and detail pressure / temperature ratings for all non-metallic materials.

All non-metallic materials in hydrocarbon gas service shall be resistant to explosive decompression.

Vendor shall confirm suitability of seat and seal material where Methanol or Amine service is indicated on the Valve or SP Data Sheet.

5.9 Welding and Weld Repairs

Weld repairs are permissible for castings only, forgings shall not be weld repaired. No weld repair shall be completed until Purchaser approval of procedures has been obtained.

5.10 Corrosion Resistant Overlays and Plated Materials

Bidders shall provide details and extent of any corrosion resistant overlays provided or plating of internal components with their bid.

6 CORROSION ALLOWANCE

6.1 Valve and SP item bodies in carbon steel and impact tested carbon steel shall be of sufficient thickness to allow for a corrosion allowance of 3mm, unless specified otherwise in the data sheet.

6.2 Where a corrosion allowance of 6mm is specified in the data sheet, the Vendor shall confirm the valve or SP item includes this corrosion allowance over and above that - 0required for pressure containment and the component will be fully functional in the fully corroded condition.

7 VALVE DESIGN

Valves shall comply with the relevant standards and codes as specified herein and in the valve data sheets.

7.1 Ball Valves

All ball valves shall be of a fire tested design to BS6755 Pt 2, API 6FA or API 607. Test certification shall be provided by the manufacturer to verify the valves performance.

Valves shall be fitted with fire safe seals.

Valves shall be of anti-static design with 'blow-out' proof stems.

The design of all ball valves shall incorporate body cavity pressure relief, which shall be achieved through seat design. A hole drilled in the ball to achieve body cavity relief is not acceptable.

Ball valves shall be reduced bore pattern DN 50 and above, unless otherwise specified as full bore on the individual data sheets. Reduced bores shall be limited to one line size smaller than body size.

All balls shall be solid, one piece design.

Where a 6.0mm corrosion allowance is specified in the valve data sheet, valves shall include a 316 SS weld overlay on seat pocket areas.

7.2 Gate, Globe, Check and Needle Valves

Regular port design shall be supplied unless noted otherwise on the individual valve data sheets.

Gate, globe and needle valves shall be suitable for re-packing under pressure in the fully open position.

The direction of flow shall be cast or steel stamped on the globe valve and check valve bodies and on uni-directional valves. Low stress stamps must be used where required, but are not permitted on valves with a minimum design temperature below minus 46°C.

Valves DN 50mm and above with Outside Screw and Yokes shall be provided with stem protectors and visual position indicators.

Vendor shall submit CV values for Globe Valves with bid.

7.3 Butterfly Valves

All butterfly valves shall be fully lugged type with holes through drilled and tapped ASME B1.1 coarse thread series (UNC) 1" diameter and smaller and 8 thread series (UN) $1^1/_8$" diameter and greater. If valves are required to accommodate galvanised bolting, then this requirement will be stated on the individual valve data sheet.

The valve supplier shall stipulate the number and length of bolts required for each size and type of valve where partial penetration tapped holes are used in their design.

Valves shall be suitable for installation between ASME B16.5 RF flanges DN 80 to DN 600 and ASME B16.47 Series A RF flanges DN 650 and greater, up to and including Class 600.

For rubber lined valves the Vendor shall submit with bid, full details of how the liner is locked into the body, and how it is sealed around the valve stem.

The Vendor is responsible for checking the liner and seal rings suitability for the design conditions and service fluids stated on the valve data sheets. Confirmation of the suitability shall be stated in the Vendor's bid.

Where specified on the data sheet, valves shall be of a fire tested design to BS6755 Pt 2 or API 607, certified accordingly and fitted with fire safe seals.

7.4 Monoflange and Modular Valves

The technical requirements specified herein shall be applicable to valves of 'Monoblock' or 'Modular' construction where single block and bleed valve or double block and bleed service is required for instrument isolation or similar services in size DN15 to DN50.

Monoblock' or 'Modular' valves shall be in full compliance with the requirements of ASME B16.34.

The pressure and temperature rating of the valve body and pressure containing parts shall be in compliance with ASME B16.34. Resilient seats shall be fully rated to 150 deg. C.

Valve dimensions shall be in accordance with Manufacturer's written standard.

'Monoblock' or 'Modular' valves shall be integral single block and bleed valve or double block and bleed valves with one of the following types of assemblies as identified in the data sheets:

- Integral one piece forged body with one or two individual isolation valves with a bleed valve for vent / drain the isolated section.
- Slim-line type assembly, consisting of Monoflange body with one or two isolating valves and a bleed valve.

All Isolation and Bleed valves shall have bolted bonnets.

Needle valves shall have non-rotating tip and open from the flow side.

Gate valves shall be of conical plug or solid wedge type.

Pressure passage hole in the monoflanges shall be minimum 6.0mm and maximum 6.5mm.

End connections shall be as indicated in the data sheets. Vent connection shall be anti-tamper type. Vent port shall be fitted with a plug.

Stems shall be blow out proof.

The monoblock valve shall provide for instrument connections as indicated in the data sheets. Where threaded connection for instrumentation are indicated, the threading shall be ½" NPTF.

Fully assembled valves shall be production shell hydrostatic tested and seat hydrostatic tested in accordance with BS 6755 Part 1 or similar. Leakage rate shall be zero.

7.5 Hot Oil Service Requirements

Where specified on the valve data sheet, valves shall be suitable for hot oil service and have a previous history of use in this service, details of which shall be submitted with bid.

8 VALVE OPERATOR REQUIREMENTS

8.1 Levers and hand wheels on valves including gear operators shall be permanently marked "OPEN" or "CLOSE" with an arrow to indicate direction of rotation.

8.2 Where stated on the valve data sheet, valves shall be fitted with a facility for locking in the open or closed position. Locking shall be achieved by the insertion of the shank of a standard padlock. Keys and padlocks will be supplied by 'others'.

8.3 All valves shall be suitable for the retrofitting of Valve Interlocks after installation at site, by others, without affecting the pressure envelope of the valve or valve manufacturers warranty. The Vendor shall be responsible for liaison with the selected interlock manufacturer to ensure compatibility of valve and locking device. All valve topworks details required by interlock manufacturer shall be supplied by Vendor free of charge.

8.4 Valves shall be capable of satisfactory operation with the valve stem in any position i.e. vertical, horizontal or inclined.

8.5 Valve operators shall be as stated on the valve data sheets provided the torque or direct force does not exceed 350N under maximum differential pressure. Where this torque is exceeded the Vendor shall highlight this in the bid.

8.6 Wrench and Lever Operators

8.6.1 Wrench and lever operators shall be fitted with stops at the fully open and closed positions to prevent the ball or blades moving through more than 90°. These stops may be raised bosses, integrally cast or forged with the valve body. Preferred location for the plate, which strikes the stops, is permanently attached to the stem as opposed to attached to the wrench, which may be removed allowing mal-operation.

8.6.2 Butterfly valves shall have lever locating spigots and holes at intermediate points of their travel to regulate the flow as well as at the fully-open & fully-closed positions, this is not a locking device unless otherwise called for in the valve data sheet.

8.6.3 Valves shall be fitted with the facility of a stem extension to clear insulation if stated in the valve data sheet. Valves shall also be suitable for retro-fitting vendor's extension devices at site.

8.7 Gear Operators

8.7.1 Bevel or worm gear types shall be complete with handwheels and position indicators. The operators shall be weatherproof, totally enclosed and packed with suitable lubricant. Where the units are not "sealed for life" they shall be suitable for re-packing with grease whilst the valve is installed in line. Gear operators shall be mounted in such a way that they can be easily unbolted from the valve body and subsequently be re-positioned in 90° increments.

8.7.2 Bevel or worm gear types shall be complete with handwheels and position indicators. The operators shall be weatherproof, totally enclosed and packed with suitable lubricant. Where the units are not "sealed for life" they shall be suitable for re-packing with grease whilst the valve is installed in line. Gear operators shall be mounted in such a way that they can be easily unbolted from the valve body and subsequently be re-positioned in 90° increments.

8.8 Cryogenic Service

8.8.1 Valves required for 'Cryogenic Service' shall have extended bonnets of with sufficient length and vapour space between body and stuffing box to maintain the gland packing and/or seals near ambient temperature and to keep them soft and pliable for optimum sealing. All valve extensions shall have a stuffing box packing or seal at the top.

8.8.2 Valves shall be provided with an insulating collar/drip plate welded around the extended bonnet. In case of a flanged bonnet construction, there shall be a sufficient distance between the drip plate and bonnet flange to facilitate mounting of the bonnet flange bolts.

9 SPECIALTY PIPING (SP) ITEM DESIGN

9.1 SP items shall be in accordance with the relevant Codes and Standards unless otherwise stated on the individual data sheets. If there is no relevant code or standard then these shall be in accordance with ASME B31.3 1999 – 'Process Piping'.

9.2 The Vendor is responsible for selecting all seats, seals or pressure-limiting component to ensure that these are of suitable grade to meet the design conditions specified on the data sheet. Confirmation of the suitability or limitation e.g. maximum pressure at the specified temperature shall be stated in the Vendor's bid.

10 PRESSURE RETAINING BOLTING REQUIREMENTS

10.1 **Body, bonnet and gland bolting on valves and SP items shall be as stated on the data sheet and shall generally comply with the following:**

Bolting Material	Bolting Material Specification	Nut Material Specification (Heavy)	Design Temperatur e °C	NACE MR01-75 Compliant
Alloy steel	ASTM A193 Gr. B7	ASTM A194 Gr. 2H	-46 to 350	No
Alloy steel	ASTM A193 Gr. B7M	ASTM A194 Gr. 2HM	-46 to 300	Yes
Low Temp Alloy steel	ASTM A320 Gr. L7M	ASTM A194 Gr.7M	-50 to 300	Yes
316 SS Note i	ASTM A193 Gr.B8M Class 2	ASTM A194 Gr.8MA	-100 to 200	No
Duplex SS (22 Cr)	Duplex SS (UNS S31803)	Duplex SS (UNS S31803)	-50 to 100	Yes
Super Duplex SS (25 Cr) Note iii	Duplex SS (UNS S32750)	Duplex SS (UNS S33750)	-50 to 145	Yes

Note:

i) The use of stainless steel bolting to UNS S31600 (B8M or B8M Class 2) or equivalent is not permitted for any pressure containing application in an Offshore or saliferous environment were the operating temperature is above 60°C.

ii) The use of stainless steel bolting to UNS S30400 (B8) or equivalent is not permitted for any pressure containing application in an Offshore or saliferous environment.

iii) Pressure containing bolting to UNS S32750 (or approved equivalent) shall be supplied with mechanical properties equal to or greater than ASTM A193 B7. Pitting resistance equivalent shall be PRE 40 or greater.

11 TESTING

11.1 Floating ball, gate, globe, needle and piston check valves, shall be pressure tested in accordance with BS6755 Part 1, leakage rate 'A' (i.e. zero) unless specified otherwise in the data sheet.

11.2 Trunnion mounted ball, butterfly, swing check and dual plate wafer check valves, shall be pressure tested in accordance with API 598. Butterfly valves DN 350 and larger shall also be subjected to a disk strength test in accordance with BS5155.

11.3 See Table 1 and 2 for additional non-destructive testing requirements and Table 3 for specific pressure testing requirements.

11.4 SP items shall be tested in accordance with manufacturers and accepted industry standards. Vendor shall provide details of all testing offered for purchaser review with bid.

11.5 Valves and SP items shall be clean built, unpainted and free from preservatives and grease during testing.

11.6 Hydrostatic testing shall be completed using potable water containing 1% by volume of biodegradable wetting agent. Maximum chloride content shall be 25ppm and the pH value shall be between 6.0 and 8.0.

11.7 Castings shall not be impregnated with any material to prevent leakage.

11.8 Upon completion of satisfactory testing all components to be thoroughly drained and dried prior to preparation for packing.

12 PAINTING

12.1 All carbon steel valves, SP items and corrodible external parts shall be supplied finish painted to Purchaser approved manufacturers standard. Details of preparation and painting offered shall be supplied by Vendor at bid stage for review and shall include the following:

- Manufacturers data sheet for the paint system offered
- Manufacturers procedure for surface preparation and application of the paint system, including a repair procedure.

The paint system offered shall be suitable for final coating by others, using the manufacturers standard paint system as an intermediate coat. Finish colour shall be Pastel Grey.

12.2 Painting shall be carried out after successful completion of all testing and inspection.

13 MARKING

13.1 In addition to the markings required by MSS SP-25 each valve / SP item shall be provided with a stainless steel tag 50mm x 20mm x 3mm with the valve / SP item tag number, purchase order number and purchase order item number punched on. The tag shall be attached to the valve with stainless steel wire.

14 PREPARATION FOR SHIPMENT

14.1 Gate, globe, needle and butterfly valves shall be dispatched in the fully closed position. Ball valves shall be dispatched in the open position.

14.2 All valves and SP items shall be protected against corrosion and mechanical damage and the Vendors / Manufacturers procedures, a copy of which shall be supplied with bid for Purchaser review.

14.3 All flange faces shall be supplied with proprietary heavy duty plastic flange protectors or bolted on wooden covers. Butt weld and threaded ends shall be supplied with suitable bevel and thread protectors and plugs to prevent the ingress of dirt.

15 INSPECTION REQUIREMENTS

15.1 Typical Inspection & Test Plan shall be submitted for review with the bid. All valves and SP items will be subject to inspection in accordance with the Purchaser approved Vendor Inspection & Test Plan.

15.1 Bidder to submit manufacturing schedule with the bid in order arrange third party inspection during manufacturing process. All cost related to 3rd party will be borne by OGDCL. Bidder to provide accommodation and necessary support to 3rd party during manufacturing process.

16 GUARANTEE

16.1 Vendor shall guarantee all equipment as being suitable for the design conditions and service fluids stated on the valve & SP item data sheets. Confirmation of suitability shall be stated in the Vendors bid e.g. seats, seals etc.

17 CERTIFICATION & TRACEABILITY

17.1 All valves and SP items shall be certified and copies of all documentation shall be supplied for each valve and SP item. Blanket certification is not acceptable. Certificates shall be provided in accordance with material requisition Document Data Submittal Requirements (DDSR) covering each item supplied. All certificates shall be fully traceable to the item covered and shall be marked with the Purchasers order number, item number and tag/part number. They shall be clearly legible, in the English language.

17.2 Material Certificates for basic material i.e. plate, forgings, or castings used in the manufacture of flanges and valve/SP item bodies, bonnets and pressure retaining parts shall be furnished as test certificates of the EN 10204 3.1B type. Vendor shall confirm which parts are considered pressure retaining (see RFQ/PO Exhibit 'E' Attachment No 1) and shall include a list in the bid for Purchaser review.

17.3 The certificates shall be issued, stamped and signed by the material Manufacturer's inspector, who shall be independent of the Manufacturer's Production Department. This certificate shall also be stamped and verified by the valve Manufacturer's QA/QC Department.

17.4 Where basic material is further processed by the Vendor to form the valve/SP item body or internal components and such process may change the mechanical properties, etc., the Vendor shall also furnish EN 10204 -3.1B type certificates for the Manufacture of the furnished item.

17.5 For valve and SP item internals and non-pressure containing parts, works reports of the BS EN 10204 2.2 type shall be acceptable.

17.6 The valve/SP item supplier shall supply certificates of conformity for non-metallic components of valves/SP items.

18 DOCUMENTATION

18.1 Documentation shall be submitted in accordance with material requisition Document Data Submittal Requirements (DDSR).

TABLE 1 - NON-DESTRUCTIVE TESTING REQUIREMENTS

Material	Pressure Rating Class	Manufacturing Method	Visual Inspection	Radiography / Ultrasonic Inspection	Magnetic Particle Inspection	Liquid Penetrant Inspection	Liner Spark Test
All	150 to 2500	Forging	100%	N/A	N/A	N/A	N/A
LT Carbon Steel	150 to 600	Casting	100%	N/A	N/A	N/A	N/A
Carbon Steel	900		100%	10%	10%	N/A	N/A
Bronze	1500 to 2500		100%	100%	100%	N/A	N/A
Duplex SS	150 to 600	Casting	100%	N/A	N/A	N/A	N/A
Austenitic SS	900		100%	10%	N/A	10%	N/A
	1500 to 2500		100%	100%	N/A	100%	N/A
Rubber Lined Ductile Iron / Carbon Steel	All	All	100%	N/A	N/A	N/A	100%

1.1 All prototype castings shall have been subjected to 100% volumetric examination in accordance with ASME B16.34 Section 8.0.

1.2 Radiography shall be carried out on critical areas as defined by ASME B16.34.

1.3 MPI or DPI shall be carried on all accessible interior and exterior surfaces, including machined surfaces.

1.4 Ultrasonic examination of castings may be carried after specific approval by the Purchaser, where radiographic inspection is not feasible.

1.5 Testing to be carried on the percentage of casting quantity shown, within a minimum of one.

1.6 Refer to Table 2 for NDE method and acceptance criteria.

TABLE 2 - NON-DESTRUCTIVE TESTING STANDARDS

NDE Method	Standard & Acceptance Criteria
Visual Casting Forging	MSS SP 55 ASME V Article 9
Radiography Casting	ASME B16.34 ANNEX B
Ultrasonics Castings	ASME B16.34 ANNEX E
Magnetic Particle Casting	ASME B16.34 ANNEX C
Liquid Penetrant Casting	ASME B16.34 ANNEX D

TABLE 3 - PRESSURE TESTING REQUIREMENTS

Valve Type	Hydrotest Body (1.5 x DP)	Hydrotest Seat (1.1 x DP)	Hydrotest Backseat (1.1 x DP)	Pneumatic Test Seat (6 bar)	Disc Strength Test (1.5 x DP)
Ball	100%	100%	N/A	100%	N/A
Gate	100%	100%	100%	100%	N/A
Globe/Needle	100%	100%	100%	100%	N/A
Check	100%	100%	N/A	100%	N/A
Butterfly	100%	100%	N/A	100%	Valves 14" NPS & Larger

B

Inspection and Test Plan for Ball Valves & Globe Valve Part for PCV

REV	DATE	DESCRIPTION	ORIG	CHK	APPR

APPROVED BY:	COMPANY APPROVAL:
DATE:	DATE:

Document Control No.	Project Code	Area Code	Document Designation Code	Discipline Code	Serial Number	Revision

Revision History

REV	DATE	ISSUE PURPOSE	ORIGINATOR:	CHECKED BY:	APPROVED BY:

Holds:

Table of Contents

1.0 FUNCTION

1.1 Inspect by Verification (I)

It is defined as normal in-process monitoring/surveillance activities including detailed observations and measurements, including verifying compliance with the Supplier/Subcontractor's quality program requirements.

1.2 Observe Points (O)

They are defined as critical steps in manufacturing and testing, where, by materials management document requirements, the supplier is obligated to advise the Supplier Quality Representative a reasonable time in advance of the operation, each time the operation is performed, so that it may be observed. The Supplier/Subcontractor may proceed with the work past the observe point if the Supplier Quality Representative is not available at the appointed time.

1.3 Hold Points (H)

They are defined as critical steps in manufacturing and testing, where, by materials management documents requirements, the supplier is obligated to advise the Supplier Quality Representative a reasonable time in advance of the operation, each time the operation is performed, so that it may be witnessed. The Supplier/Subcontractor may not proceed with the work beyond the hold point without witness by the Supplier Quality Representative, except by documented agreement from Atlas International Engineering Services.

1.4 Documentation Review (R)

They are defined as an inspection process in which the Supplier Quality Representative checks documents for accuracy, relationship to object or items to which they pertain, and conformance with specifications codes and standards.

2.0 LEVELS OF INSPECTION

2.1 **Level 4** – No Inspection

2.2 **Level 3** – Specific Inspection. Random inspection visits and visits and witness tests. Specific instructions accompany the assignment defining those activities to be observed or characteristics to be verified.

2.3 **Level 2** – Limited inspection. This level includes limited progressive quality surveillance status checks; routine coverage of the observation and hold points as prescribed in the Inspection and Test Plan and progressively reviews of the associated documentation.

2.4 **Level 1** – Resident Inspection. This level entails the assignment of a Supplier Quality Representative to one facility on a full-time (40 hr/wk) basis. The scope of Quality Surveillance activities will be defined by the project(s) concerned.

3.0 CONTACT FREQUENCY

3.1	A	=	Daily
3.2	B	=	Twice Weekly
3.3	C	=	Once Weekly
3.4	D	=	Once Every Two Weeks
3.5	E	=	Monthly
3.6	F	=	Each Lot & Load
3.7	G	=	When Requested by Project
3.8	H	=	Other (As Specified)

4.0 INSPECTION AND TEST PLAN DETAILS

Project Name:	Description: **Ball Valves**	Inspection Level : **3**
		Contact Frequency: **D**
	Commodity/Item: **NA**	Criticality Code: **III**

No.	Activity	Function				Frequency / Percentage	Supplemental Information
		I	O	H	R		
	General Inspection Points						
1	Pre-Fabrication Meeting			X			
1A	Telephone Contact & Order Review				X		
2	Material Receiving	X					
3	Documentation Review				X		Review documentation for accuracy. Check calibration certificates for test equipment
4	Hydrostatic Testing		X		X		
5	Pneumatic Testing						
6	Radiograph Review				X		
7	NDE of Production Welds		X				
8	In-Process NDE of Major Repairs		X				
9	In-Process Welding for Compliance to WPS	X					
10	Welder Qualification Records				X		
11	TEMA Mock-Up Qualification						
12	Weld Rod Consumable Control				X		
13	Cleanliness Verification (Final)	-		X			
14	Main Dimensions	-		X	-		
15	Flange Face Finish			X			
16	Sandblast/Surface Profile						
17	Painting/Coating/Lining Application			X		100%	
18	Dry Film Thickness/Holiday Testing	X					
19	Hardness Test Results		X		X		
20	NACE Compliance Hardness Testing						
21	Heat Treatment Records/Charts				X		
22	Sub-orders for Main Materials				X		
	Specific Inspection Points						
A	Material Testing-Mechanical				X		
B	Material Testing-Non-destructive Testing				X		
C	Functional Testing						
D	Operational Testing						
E	Performance Test						
F	Mechanical Run Testing						
G	Standard Routine Test						
H	Routine and Special Testing		X		X		
I	Megger Test						In accordance to spec. of Ball Valves
J	NDE after Overspeed Run						
K	Shaft Run-out(s)						
L	Incremental Balancing						
M	Check Balancing						
N	Assemble of Major Components						
O	Tube to Tube sheet Rolling and Welding						
P	Template Check & Bundle Insertion						
Q	Continuity Checks						

Project Name:	Description: **Ball Valves**	Inspection Level : 3
		Contact Frequency: D
	Commodity/Item: NA	Criticality Code: III

No.	Activity	Function				Frequency / Percentage	Supplemental Information
		I	O	H	R		
	Specific Inspection Points						
R	Calibration Testing						
S	Flushing and Cleanliness						
T	Machining & Drilling	X					
U	Tube Hole Ovality						
V	Clad Removal & Sensitization Testing						
W	Refractory Mixing and Installation						
X	Refractory Anchor Dimensions & Testing						
Y	Tube Finning						
Z	Hot Dip Galvanizing Process						
AA	Termination, Wire , Cable/Conduit Installation						
AB	Instrument/Control Type & Enclosure						
AC	Bar Over Test						
AD	Hardness and Tooth Contact Check						
AE	Unit Dry Out Purge						
AF	Internals Installation/Welding & Dimensional						
AG	Visual(Surface) Inspection-Final						
AH	Dimensional/Thickness & Visual-Final			X			
AI	Post Test Tear Down/Bearing Inspection						
AJ	Installation of Ceramic Fiber Modules						
AK	Name Plates, Warning Sign(s),etc						
AL	Manual, Diagrams ,& Instructions						
AM	Spare Part List						
AN	Manufacturer's Standard Test						
AO	Field Connections						
AP	High Potential Test						
AQ	Corona Discharge Test						
AR	Positive Material Identification (PMI)	X		X			
AS	Load Testing						Review all documentation
AT	Factory/Site Acceptance Test (FAT/SAT)			X			
AU	Hot/Cold Settings						In accordance to spec. of Ball Valves
AV	Final Package & Identification Prior to ship						
AW	Torquing Operation						
	Special Project Specific Inspection Points						
	Handling and Shipping per procedure		X		X		Monitor load out

E

Mandatory Requirement

S. No.	DESCRIPTION	YES	NO
1	Has your firm been in **litigation /blacklisted** by OGDCL or any other firm? If yes, please provide details.		
2	**NTN** Certificate *(Please attach NTN Certificate copy)*		
3	**GST** Certificate *(Please attach GST Certificate copy)*		
4	**American Petroleum Institute API valid (and past 5 years) certificates to be provided** *(Please attach API certificate copies)*		
5	OEM with USD 1.5 million **annual turnover** for the last 3 years each. Project purchase orders to be shared or annual report duly vetted to be shared.		
6	OEM / Manufacturer authority letter for this tender with Tender Number and date (signed and stamped copy)		

1.0 STATUS OF FIRM & GENERAL REQUIREMENTS

Sr.	DESCRIPTION	DETAILS
1.1	**Type of Firm** ➢ Private Ltd ➢ Partnership ➢ Proprietorship	
1.2	**Average Annual Turnover in last three (3) years** ➢ More than USD 1.5 Million ➢ Between USD 1.0 to 1.49 Million ➢ Between USD 0.5 to 0.99 Million (Please provide audited financial reports of last three years)	
1.3	**Maximum number of purchase order of USD 0.1 million to E&P companies in one year.** ➢ Between 06 and above ➢ Between 04 to 05 ➢ Less than or equal to 03 (Please provide evidence)	
1.4	**Assets of the OEM / Manufacturer** 1. Over USD 1 billion 2. Between USD 0.50 to USD 0.99 Billion 3. Between USD 0.25 to 0.49 billion 4. Under USD 0.244 billion	

2. PAST EXPERIENCE

Sr.	DESCRIPTION	DETAILS
2.1	**Work Experience in Upstream E& P oil / gas industry (PEPCA or IOGP full members companies ONLY) with SATISFACTION CERTIFICATES (with name, contact person email, phone and postal address)** ➢ Over 5 Years ➢ Between 3 to 5 Years ➢ Between 1 to 3 Years ➢ Less than 1 year (Please provide evidence)	
2.2	**Work Done of Similar nature in last 5 years for orders above USD 0.50 million successfully completed** ➢ More than 5 Projects ➢ 4-5 works. ➢ 2 –4 works. ➢ Less than 2 (Please provide work orders)	
2.3	**Relevant Experience** ➢ Distribution only ➢ Manufacturer ➢ Supply & Installation ➢ Supply only	

3. HUMAN RESOURCE

Sr.	DESCRIPTION	DETAILS
3.1	**Engineer with status** ☐ More than 50 ☐ 40-49 ☐ 20-39 ☐ Under 20 *(Please provide evidence)*	
3.2	**Engineer Experience (Average)** ☐ More than 10 years ☐ 5-9 ☐ 3-4 ☐ Less than 3 *(Please provide evidence)*	
3.3	**Number of Technicians** ☐ More than 100 ☐ 50-99 ☐ 30-49 ☐ Under 30 *(Please provide list of Technicians on company letter head)*	

3.4	**Technician's Installation Experience (Average)** ☐ More than 15 years ☐ 10-14 ☐ 4-9 ☐ Less than 4 *(Please provide evidence)*	

4. HSE COMPLIANCE

Sr.	DESCRIPTION	DETAILS
4.1	**Compliance to HSE Booklets (Electrical and Construction, PPEs)** ☐ Yes ☐ No *(Please provide a signed and stamped copy of the mentioned HSE Booklets)*	
4.2	**HSE Policy & Procedures** Copies of following provided (Y/N) ☐ Singed HSE Policy (by CEO of the Contractor) ☐ Working at Height ☐ Dismantling ☐ Lifting Operations ☐ Confined Space Entry (Ducts Entry) ☐ Power Actuated Equipment Safety ☐ Welding, Cutting & Brazing ☐ PPE Procedure ☐ Electrical Lock out/Tag out system ☐ Welfare for employees (HSE, Drug abuse policy, Facilitation, Insurance) ☐ Emergency Preparedness ☐ Incident Reporting ☐ Job Hazard Analysis *(Important: Please provide relevant documents/Guidelines/Work Instructions in English)*	
4.3	**Does Company provide HSE Trainings on following:** **Job Specific Trainings:** ☐ Manual handling ☐ Lifting Operations ☐ Working at height ☐ Permit to work ☐ Welding, Cutting, Brazing ☐ Fork Lift Operations/ Hoist Crane Operations ☐ Power Tools ☐ Any Other (Please Specify)	
	☐ **Electrical Safety Training Emergency Preparedness** ☐ **Fire Extinguisher training** ☐ **First Aid** *(Important: Please provide documentary evidence i.e. Attendance sheet, course contents, external certificates, photographs, etc)*	