طرح نگهداشت و افزایش تولید 27 مخزن

SPECIFICATION FOR CONTROL VALVES

نگهداشت و افزایش تولید میدان نفتی بینک

D02	APR. 2022	IFA	P.Hajisadeghi	M.Fakharian	M.Mehrshad	
D01	SEP. 2021	IFA	P.Hajisadeghi	M.Fakharian	Sh.Ghalikar	
D00	JUL. 2021	IFC	M.Asgharnejad	M.Fakharian	Sh.Ghalikar	
Rev.	**Date**	**Purpose of Issue/Status**	**Prepared by:**	**Checked by:**	**Approved by:**	**CLIENT Approval**

Class:2 | **CLIENT Doc. Number: F9J-707183**

Status:

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

REVISION RECORD SHEET

PAGE	D00	D01	D02	D03	D04
1	X	X	X		
2	X	X	X		
3	X				
4	X				
5	X	X	X		
6	X	X			
7	X				
8	X	X	X		
9	X	X	X		
10	X	X			
11	X	X	X		
12	X	X			
13	X				
14	X				
15	X	X			
16	X				
17	X				
18	X				
19	X	X			
20	X				
21	X	X			
22	X	X			
23	X	X			
24	X	X			
25	X				
26	X				
27	X				
28	X				
29	X	X			
30	X				
31	X	X			
32	X				
33	X				
34					
35		X			
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					
64					
65					

PAGE	D00	D01	D02	D03	D04
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99					
100					
101					
102					
103					
104					
105					
106					
107					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					
121					
122					
123					
124					
125					
126					
127					
128					
129					
130					

CONTENTS

1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

D02

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR(GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

D02

This document covers minimum necessary requirements for the design, selection, manufacture, inspection, testing and delivery of Control and Regulator Valves of Binak Oil field (Compressor

station/ Extension of manifold and Gas-condensate Pipeline as project work packages).

It shall be used in conjunction with data/requisition sheets for present document subject.

All instrumentation systems and components, as far as mechanical and electrical characteristics and performances are concerned, shall conform to the present general Specification and to the Specifications issued for each system and/or components.

Any omission in these requirements shall not relieve the Vendor of his obligation to provide a fully functional and dependable system.

Any deviation from the present specification at any stage of the project shall be subject to Client approval.

3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS-E-IN-100 Engineering standard for general instrumentation
- IPS-E-IN-160 Engineering Standard for control valves
- IPS-C-IN-160 Construction and Installation Standard for Control Valves
- IPS-G-IN-210 Engineering and Material Standard for Instrument Protection
- IPS-C-IN-100 Construction and Installation Standard for General Instruments, Field Inspection, Calibration & Testing of Instrument System
- IPS-I-IN-100 Inspection Standard for General Instrument Systems
- IPS-G-IN-100 Engineering Standard for Units
- IPS-M-IN-160 Material Standard For Control Valves

3.2 INTERNATIONAL CODES AND STANDARDS

American Petroleum Institute (API)

- RP-500 Recommended Practices for Classification of Locations for Electrical Installations at Petroleum Facilities
- API 553 Refinery control valves
- API 598 Valve Inspection and testing

American Society of Mechanical Engineers (ASME)

- ASME B16.34 Valves-Flange, threaded, and welding end

- ASME B16.5 Pipe flanges and flanged fitting NPS ½ through NPS 24
- ASME B16.47 Large Diameter steel flanges NPS 26 through NPS 60
- ASME B16.10 Face - to - Face and End - to - End dimensions of valves

American National Standards Institute (ANSI)

- ANSI B16.104 (FCI-70-2) Standard for seat leakage
- ANSI B16.5 Pipe flanges and flanged fitting NPS ½ through NPS 24
- ANSI B16.37 Hydrostatic test
- ANSI B16.34 Hydraulic Test for Control Valves
- ANSI /FCI 70-2 Control Valve Seat Leakage

American Society for Testing and Materials (ASTM)

- ASTM A 105 Standard specification for carbon steel forgings
- ASTM A 193 Standard specification for alloy steel and stainless steel for bolting material for high temperature services
- ASTM A 194 Standard specification for carbon and alloy steel nuts for bolts for high temperature or high pressure or both
- ASTM A 320 Standard specification for alloy steel bolting material for low temperature service

International Electro Technical Commission (IEC)

- IEC-504-8-3 Control Vales Noise Calculation
- IEC-60079-0 Explosive atmospheres
- IEC-60079-1 Construction and test; flameproof enclosure of electric apparatus
- IEC-60079-8 Classification of maximum surface temperature
- IEC-60079-10 Classification of hazardous areas
- IEC-61000-4-3 EMI and RFI immunity
- IEC-60364 Earthing arrangement
- IEC-60529 Classification of degrees of protection provided by Enclosures

Instrument Society of America (ISA)

- ISA-S 5 Instruments symbols and identification
- ISA 75.01.01 Flow equations for sizing control valves

- ISA 75.03 — Face to face dimensions for integral flanged globe style control valve bodies (ANSI classes: 125, 150, 250, 300, 600)
- ISA 75.04 — Face to face dimensions for flangeless control valves
- ISA 75.16 — Face to face dimensions for integral flanged globe style valve bodies (ANSI classes: 900, 1500, 2500)
- ISA S75.01 — Control Valve Sizing Equation
- ISA S75.02 — Capacity test

Manufacturing Society Standard (MMS)

- MSS-SP-61 — Pressure Testing Of Steel Valves
- MSS-SP-25 — Standard Marking system For Valves

National Association of Corrosion Engineers (NACE)

- NACE MR-01.75 — Sulfide stress cracking resistance metallic materials for oilfield equipment

Vendor shall state the additional Codes and Standards if necessary. The latest published issue or amendment shall apply unless otherwise stated.

3.3 THE REFERENCE DOCUMENTS

D02

Process Basis of Design	BK-GENRL-PEDCO-000-PR-BD-0001
Specification For Instrumentation	BK- GENRL-PEDCO-000-IN-SP-0001
Spec. For Hazardous Area Classification	BK- GENRL-PEDCO-000-SA-SP-0002
Piping & Pipeline Material Specification	BK- GENRL-PEDCO-000-PL-SP-0001
Instrument & Control System Design Criteria	BK-SSGRL-PEDCO-110-IN-DC-0002
Instrument & Control System Design Criteria	BK-PPL-PEDCO-320-IN-DC-0002
Instrument & Control System Design Criteria	BK-GCS-PEDCO-120-IN-DC-0002
Symbol & Legend For PFD and P&ID	BK-SSGRL-PEDCO-110-PR-PI-0001
P&ID - W018S	BK-W018S-PEDCO-110-PR-PI-0001
P&ID - W028	BK-W028-PEDCO-110-PR-PI-0001
P&ID - W0046S	BK-W046S-PEDCO-110-PR-PI-0001
P&ID for Diesel Oil Drum- W0046S	BK-W046S-PEDCO-110-PR-PI-0002
P&ID for Potable Water Tank - W0046S	BK-W046S-PEDCO-110-PR-PI-0003
P&ID - W035	BK-W035-PEDCO-110-PR-PI-0001
P&ID - W008N	BK-W008N-PEDCO-110-PR-PI-0001
P&ID - Extension of Binak B/C Manifold	BK-W007S-PEDCO-110-PR-PI-0001
P&ID - W007S	BK-W007S-PEDCO-110-PR-PI-0002
P&ID for Diesel Oil Drum- W007S	BK-W007S-PEDCO-110-PR-PI-0003
P&ID for Potable Water Tank - W007S	BK-W007S-PEDCO-110-PR-PI-0004

P&ID for Diesel Oil Drum- BK14	BK-BK14-PEDCO-110-PR-PI-0001
P&ID for Potable Water Tank - BK14	BK-BK14-PEDCO-110-PR-PI-0002
P&ID for Diesel Oil Drum- BK12	BK-BK12-PEDCO-110-PR-PI-0001
P&ID for Potable Water Tank - BK12	BK-BK12-PEDCO-110-PR-PI-0002
P&ID for Diesel Oil Drum- BK15	BK-BK15-PEDCO-110-PR-PI-0001
P&ID for Potable Water Tank - BK15	BK-BK15-PEDCO-110-PR-PI-0002
P&ID for Diesel Oil Drum- BK05	BK-BK05-PEDCO-110-PR-PI-0001
P&ID for Potable Water Tank - BK05	BK-BK05-PEDCO-110-PR-PI-0002
Symbol & Legend For PFD and P&ID	BK-PPL-PEDCO-320-PR-PI-0003
P&ID - Gas Pipeline (to Siahmakan G.I. Station)	BK-PPL-PEDCO-320-PR-PI-0001
P&ID - Condensate Pipeline (to Binak PU)	BK-PPL-PEDCO-320-PR-PI-0002
Symbol & Legend For PFD and P&ID	BK-GCS-PEDCO-120-PR-PI-0001
P&ID- Gas Compression Inlet Gas Pipeline (Binak)	BK-GCS-PEDCO-120-PR-PI-0002
P&ID- Gas Compression Inlet Gas Pipeline (Golkhari)	BK-GCS-PEDCO-120-PR-PI-0003
P&ID - Slug Catcher System	BK-GCS-PEDCO-120-PR-PI-0004
P&ID - Gas Compression Inlet Knock Out Drum	BK-GCS-PEDCO-120-PR-PI-0005
P&ID - 1st Stage Gas Compression Suction Drums	BK-GCS-PEDCO-120-PR-PI-0006
P&ID - 1st Stage Gas Compression Compressors	BK-GCS-PEDCO-120-PR-PI-0007
P&ID - 1st Stage Gas Compression Air Coolers	BK-GCS-PEDCO-120-PR-PI-0008
P&ID - 2nd Stage Gas Compression Suction Drums	BK-GCS-PEDCO-120-PR-PI-0009
P&ID - 2nd Stage Gas Compression Compressors	BK-GCS-PEDCO-120-PR-PI-0010
P&ID - 2nd Stage Gas Compression Air Coolers	BK-GCS-PEDCO-120-PR-PI-0011
P&ID - 2nd Stage Gas Compression Discharge Drum	BK-GCS-PEDCO-120-PR-PI-0012
P&ID - Gas Compression Dehydration Package	BK-GCS-PEDCO-120-PR-PI-0013
P&ID - Lean Glycol Storage Tank	BK-GCS-PEDCO-120-PR-PI-0014
P&ID - Instrument & Plant Air System	BK-GCS-PEDCO-120-PR-PI-0015
P&ID - Nitrogen Generation System	BK-GCS-PEDCO-120-PR-PI-0016
P&ID - Close Drain System	BK-GCS-PEDCO-120-PR-PI-0017
P&ID - Corrosion Inhibitor Package	BK-GCS-PEDCO-120-PR-PI-0018
P&ID - Methanol Injection Package	BK-GCS-PEDCO-120-PR-PI-0019
P&ID - LP Flare System	BK-GCS-PEDCO-120-PR-PI-0020
P&ID - Oily Water Sewer	BK-GCS-PEDCO-120-PR-PI-0021
P&ID - Fuel Gas System	BK-GCS-PEDCO-120-PR-PI-0022
P&ID - Diesel Oil System	BK-GCS-PEDCO-120-PR-PI-0023
P&ID - Potable Water System	BK-GCS-PEDCO-120-PR-PI-0024
P&ID - Glycol Sump Drum	BK-GCS-PEDCO-120-PR-PI-0025

3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No.BK-GNRAL-PEDCO-000-PR-BD-0001.

4.0 ABBREVIATIONS

CV	Control Valve
EMI	Electromagnetic Interference
EMC	Electromagnetic Compatibility
FAT	Factory Acceptance Test
HART	Highway Addressable Remote Transmission
IEC	International Electro technical Commission
IS	Intrinsically Safety
MCC	Motor Control Center
NISOC	National Iranian South Oil Company
PTFE	Poly Tetra Fluoro Ethylene (Teflon)
QA	Quality Assurance
QC	Quality Control
RF	Radio Frequency
RTU	Remote Terminal Unit
SAT	Site Acceptance Test
SIL	Safety Integrity Level
SPDT	Single Pole Double Throw
TÜV	Technical Überwachungs Verein
UPS	Uninterruptible Power Supply

5.0 ORDER OF PRECEDENCE

D02

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

6.0 VENDOR RESPONSIBILITY

VENDOR shall be responsible for the correct design and operation of all the provided equipment, the quality of all materials and workmanship, and in compliance with these specifications. Approval of the test by CONTRACTOR SHALL not relieve the VENDOR of responsibility for conforming with the provisions of this specification when the equipment is installed.

6.1 VENDOR'S COMPLIANCE

Vendor shall submit his bid(s) in full compliance with the requirements of the MR and relevant attachments.

Any exceptions or deviations to/from the MR SHALL be clearly stated and quoted in an optional part of the bid, as an alternative.

If no exceptions are specified, CONTRACTOR will intend that the bid is completely in accordance with the MR and relevant documents.

Vendor shall quote separately and comparatively, the alternatives requested in MR by contractor.

VENDOR is requested to include in his proposal the enclosed form "VENDOR'S CERTIFICATE" duly filled in & signed.

Compliance with this requisition in any instance SHALL not relieve the VENDOR of his responsibility to meet the specified conditions.

VENDOR SHALL include in the bid copies of technical forms that will allow, through the proposed model number, a check of technical characteristics of the instruments including the spare parts.

6.2 DATA SHEETS

It is mandatory that project required specification, specified by contractor on project documents, shall be confirmed /filled by the bidders and attached to the bids.

Bids without CONTRACTOR's required specifications, properly completed/ confirmed by vendor, will be considered technically incomplete and therefore, technically unacceptable.

7.0 CALCULATION REFERENCES AND CRITERIA

7.1 GENERAL

Valve sizing and Cv calculation shall be done by Consultant, and any discrepancy shall be submitted accordingly by Vendor. Size of control valve and Required Cv shall be recalculated by Vendor.

D02 Sizing calculation sheets are required for control valve sizing. The calculations will be executed according to either ISA S75-1 Control valve sizing equation or standard method of valve Vendor.

Vendor shall select such that the CV value of the control valve for maximum process flow with the pressure drop across the control valve at maximum process flow is approximately 80% of the maximum CV value for that control valve. Furthermore, the control valve shall never have less than 25% lift for minimum process flow at the specified pressure drop.

Valves shall generally be selected to pass at least 110% of the maximum design flow rate (rated plant capacity) at normal pressure drop. Service such as venting, pump and compressor minimum flow, etc., should be considered as special exceptions to this sizing criteria.

Butterfly-type valves shall normally be sized for a maximum travel of 60°, unless the valve characteristics allow control over a wider range of opening.

For fluid mixtures (gas/gas or liquid/liquid) the total composite density shall be used for the calculation of the Cv value.

Vendor shall advise where any fluid velocity for a specified valve would exceed the recommended limit and where cavitation, flashing, erosion or fouling may occur.

For all valves in gas, vapor, steam and flashing liquid services subject to a pressure drop equal to or above 0.4 time the upstream pressure, as well as for valves subject to cavitation, a noise calculation has to be supplied.

7.2 UNITS OF MEASUREMENT

Engineering units shall be generally based on the International System (SI). Specifically, the following units of measurement shall be used:

- Dimension — mm (inch)
- Mass flow — kg/hr
- Volumetric flow — m^3/hr
- Pressure — bar, mbar, mmH2O
- Viscosity — cP
- Temperature — ^oC

8.0 VALVE TYPE SELECTION CRITERIA

8.1 GENERAL

All field instruments shall be protected to IP65 as a minimum and finished to VENDORs' standard suitable for the environmental conditions. Particular attention shall be paid to possible effects of corrosion, vibration, humidity, and extremes of temperatures.

Valve types shall be selected by taking into account such factors as differential pressure, operating and design conditions, fluids being handled, rangeability required, allowable leakage, noise and other special requirements.

Unless otherwise required in the instrument data sheets or dictated by its application, the selection of a type of valve should be done under the following order of preference:

- Eccentric rotary plug valve,
- Globe valve,
- Ball valve,
- Butterfly valve,
- Other types.

Special body types such as angle, split body, "Y", etc., shall be considered when the process fluid may be erosive, viscous or carrying suspended solids.

Angle body valves should be considered for hydrocarbon services with a tendency for high pressure drop or coking.

Control valves on high pressure steam reducing services with internal water injection for de-superheating purpose are permitted.

8.2 ECCENTRIC ROTARY PLUG VALVES

When eccentric rotary plug valves are used for general purpose control and shutoff, valve selection is limited to the obtainable valve size, the required pressure/temperature rating and the required allowable leakage rate.
For specific shut-off purposes, special attention will be paid to the valve tight shut-off features.

8.3 GLOBE VALVES

Globe valves (reciprocating) shall be used on all services, except on very low or very high pressure drop, and/or high flow rates. Cage guided globe valves and balanced type valves, with the exception of double seated control valves, shall not be used on services with a tendency towards cocking.

Cage guided globe valves shall not be used with fluids, containing solid particles.

Heavy duty plug guiding is acceptable for single seat valves.

Double seat globe valves shall have top and bottom guided construction preferably.

Split-body globe valves may only be applied after Client approval.

Three ways globe valves are prohibited.

8.4 BALL VALVES

Ball valves may be considered for On-Off service and for large sizes on throttling service.

Unless equipped with a special trim, i.e. anti-cavitation or low-noise design, ball valves should not be used on throttling services with a differential pressure of more than 10 bar.

Ball valves should be considered as throttling valve for:

- Hydrocarbon services, having a tendency towards coking,
- Erosive service, such as slurries,
- Applications, where solid contaminants might settle in the body of a standard globe valve.

Use of ball valves on other throttling services requires the Client approval.

Ball valves should be considered for On/Off services:

- In line sizes up to 6” when the required leakage rate cannot be met with a conventional globe body valve, in fuel gas lines for shut-off purposes.

Ball valves used in throttling service may have reduced ball trim. Ball valves used in shut-off service shall have full line-size trim.

8.5 BUTTERFLY VALVES

Butterfly valves should generally not be used for shut-off purposes.

Butterfly valves (60° or 90° opening) should be considered for throttling control functions as follows:

- When the required size (larger than 6"), with a low pressure drop, would make it economically Attractive or when it is impossible to apply globe type valves.
- On corrosive services, where body lining in standard globe valves becomes economically unattractive.

Butterfly valves shall be of the heavy-pattern flangeless type. Butterfly valves drilling shall comply with the appropriate pipeline flange drilling.

They shall normally be furnished with long stroke diaphragm actuators.

Where a hand wheel is required, the shaft-mounted declutchable type shall be furnished. “Fishtail” disc should be considered on all high torque requirements.

Note: Spring-opening butterfly valves shall not have a valve body of the wafer type or lug type, this to be able to remove the valve from the piping system. Alternatively a spool piece up and down stream may be specified to permit removal of the valve.

8.6 ANGLE BODY VALVES

Angle type valves may be applied for:

- High noise level, where a conventional type globe valve is not suitable (special designed trims may be used),
- Liquid flows where cavitation in the valve may occurs (special uncavitation trims may be used),
- Hydrocarbon services, having a tendency towards coking,
- Erosive services, e.g. slurries,
- Applications, where solid contaminants might settle in the body of a standard globe valve Angle valves shall have full venturi throat.

8.7 SELF ACTING REGULATORS

Where applicable, for secondary services within capacity and service limitations, for low pressure padding systems, etc., self acting valves may be used instead of externally actuated control valves.

8.8 SELF ACTING PRESSURE REDUCING REGULATORS

Direct operating pressure reducing regulators shall only be applied on simple applications, such as for reducing instrument air supply pressure or for inert gas blanketing of storage tanks. Regulators on inert gas blanketing service shall be installed on the blanketing inlet connection of the relevant tank. External connection shall be used for pressure signal. For details of tank blanketing, refer to API-2000 Venting atmospheric and low pressure storage tanks, non refrigerated.

8.9 SELF ACTING BACK PRESSURE REGULATORS

Direct operating back pressure regulators shall only be considered for clean fluids and on simple applications, such as for maintaining a uniform back pressure on utility distribution systems, for example nitrogen systems. External connection shall be used for pressure signal.

8.10 SELF ACTING DIFFERENTIAL PRESSURE REGULATORS

Direct operating differential pressure regulators shall only be considered for clean fluids and on simple applications, such as for secured instrument air systems or for compressor bearing sealing services.

8.11 SELF ACTING TEMPERATURE REGULATORS

Self acting temperature regulators shall only be considered for simple heating application, where instrument air supply is not available.

9.0 TECHNICAL REQUIREMENTS

9.1 DESIGN BASIS

Control valves are to be used for throttling service. They may be used also for shut-off purposes.

9.2 BODY SIZE

The body size of a control valve in throttling service should have the same size as the calculated trim size, however oversized bodies may be required up to the size of the adjacent piping (for example, to reduce the outlet velocity).

For shut-off valves, the pressure drop needs to be kept to a minimum, therefore these valve bodies shall be of line size.

The nominal sizes of control valve bodies shall be limited to the following series: 1", 1 ½", 2", 3", 4", 6", 8", 10", 12", and larger.

The use of odd sizes such as 1¼", 2½", 5", 7", 9" etc., shall be avoided. 1½ "and 3" valves are less common.

1" valve shall be used for line size smaller than 1", with reduced port when required. Valves that are smaller than 1" may be used only in special applications.

9.3 BODY CONNECTIONS

Control valves shall have flanged ends. Flangeless (wafer type) valves may be considered only for butterfly valves and for valve body requiring special and/or expensive body materials.

Lap-joint flanges are not permitted.

Butt welding-end control valves shall be considered if mandatory by the Piping Specification.

The flange rating for flanged control valves shall be in accordance with the piping class, with the minimum rating of 300 lbs. Authorized deviations to this requirement are :

- valve bodies made out of special and/or expensive materials,
- a flange rating of 150 lbs for carbon steel valves may be considered for systems having a large number of identical valves (e.g. control valves for automatic fire protection systems).

The Client's approval for flange rating lower than 300 lbs is required.

Flanged bodies shall have face-to-face dimensions in accordance with ISA RP 4.1 and ANSI B 16.5.

Valve bonnet and bottom flange if any, shall be of bolted construction with fully retained retained gaskets.

Flushing connections shall be provided on slurry service.

Bottom drain plugs in control valve bodies are not allowed.

9.4 TRIM

The term TRIM covers all those parts of the valve assembly that are in contact with the line medium consisting of, but not limited to, the seat ring, plug, stem, plug guide bushing and cage.

9.4.1 FLOW CHARACTERISTIC

The flow characteristic shall be specified in order to obtain a linear characteristic over the operating range. To achieve this requirement the characteristic shall normally be:

- Linear, when the major part of the energy loss in the system is across the control valve over its range of operation,
- Equal percentage, ported or contoured, in the other cases.

This usually results in using:

a. Equal percentage characteristic on flow and temperature services,
b. Linear characteristic on level services,
c. Linear characteristic usually for pressure control application, however it requires consideration about energy loss as stated here above.

Linear characteristics shall be applied when specifically so required by the process and/or control application as follows:

- Compressor anti-surge control,

- Split range control,
- Control valves that are only operated via manual control,
- Minimum flow protection for pumps.

Quick opening characteristic shall only be used when the quick opening feature is considered to be necessary for process control reasons.

9.4.2 FLOW DIRECTION AND SEAT LEAKAGE

For throttling control application with unbalanced valves, the direction should be "flow tending-to-open", to avoid a very large unstable force in the nearly closed position. For angle-body type, the direction should be "flow-tending-to-close" to avoid high velocity and turbulence in the valve body.

Unless otherwise required, On-Off and shut-off valves should be specified and installed as "flow tending-to-close".

The requirements for "tight shut-off" and the tight shut-off direction (one or both direction), shall be indicated on the relevant P&ID.

9.4.3 CONSTRUCTION

The trim and particularly the seat ring(s) shall be of the easy/quick replaceable type.

A bottom flange shall be provided for those valves that require access from the bottom, for trim removal. But it is not permitted on service below 0°C.

In butt welding-end control valves the entire assembly of trim and seat shall be removable from the top.

For valves that operate at high or low process temperatures, special attention shall be paid to the clearances between plug and guide bushing, and in addition for cage type trims to the clearance between plug and cage, in order to prevent the valve from sticking.

For valves operating on fluids with a tendency towards coking, special attention shall be paid to the trim construction to prevent the valve from sticking. When ball valves are used on slurry services, they should be equipped with a scraper type of seat construction.

For trims that are not of the one piece plug type and stem assembly, the plug/stem construction shall be provided with a locking device to prevent accidental separation. The locking device may be either a special fluted pin, driven through a hole that is simultaneously drilled in the plug guide section and stem, or a welded construction.

Screwed seat ring(s) shall be provided with a locking facility. The seat-ring(s) may be clamped or backed-up via a seat ring retainer. The locking of seat ring(s) with compounds is not permitted.

Trim components shall not be screwed or welded to the valve body for globe or cage style trim. They shall not be welded for eccentric style trim.

The valve stem connection to the actuator stem shall be adjustable with positive locking of the adjustment.

The trim for butterfly valves should be of the balanced type, which can be used-up to the fully open position. The shaft and disc shall be capable of withstanding a pressure drop across the valve of at least 1.25 times the pressure drop in the closed position. For valve, operating on fluid that solidifies at ambient temperature, attention shall be paid that the fluid cannot penetrate the clearance between stem and bushing in order to prevent sticking of the stem after a plant shutdown.

10.0 Special Requirements

10.1 ANTI-CAVITATION VALVES

When, after proper selection of the control valve and its location, cavitation is unavoidable, preference should be given to hardened trim materials. Where hardened trim materials and/or a change in flow direction are not adequate or feasible, valves with special anti-cavitation trims should be considered.

For applications, where anti-cavitation trims are not available, two valves in series may also be considered. This solution requires the Client approval.

The application of restriction orifice (s) downstream the control valve to reduce the pressure drop across the valve requires the Client approval.

10.2 NOISE REDUCTION

Noise calculation shall be detailed by the Vendor.

If the predicted noise level exceeds 85 dBA at 1 meter, noise attenuating device shall be provided such as special trim, diffusers, resistance plates, in-line silencer, etc.

Some alternatives or additional equipment are acceptable such as insulating the pipe, relocating the valve, reversing the flow direction through the valve, etc.

Special “low-noise” valve (multistage) may also be considered.

The application of restriction orifice (s) downstream the control valve to reduce the pressure drop across the valve requires the Client approval.

10.3 LEAKAGE

Tight shut-off classification shall be in accordance with ANSI / FCI 70-2, classes I through VI. If there is no more requirement than Tight shut-off the class V is to be applied.

Where tight shutoff is required, metal to metal contact with single seated valves shall be used. If not applicable a soft-seated ring, for example Teflon or Viton A, may be provided if permitted by the process.

11.0 Materials

Materials to be used shall be in accordance with project piping material specification. NACE MR0175/ISO 15156 shall be considered where specified in project data sheet and project piping material specification.

11.1 BODY

General

Materials to be used shall be in accordance with the relevant particular specifications and Control Valve Data Sheets and the following additional requirements.

The material selection of the body (including bonnet and/or bottom flange), external bolts, studs and nuts, etc., shall be in accordance with the requirements of the corresponding piping class specification.

Particularly on sour service, Vendor shall certify that his supply is fully in accordance with the NACE MR 01-75 requirements.

Bonnet, cooling fin and extension materials shall normally be the same as the valve body.

Lining

Where operational conditions require special materials, consideration should be given to a composite construction.

Internal lining of the fluid impact area may be required for:

- Fluids containing erosive particles (slurries).
- Ported plugs for wet gas or wet steam service with a pressure drop across the valve above 10 bar.
- Other services when the pressure drop is above 40 bar.

Internal lining of the whole body shall be considered for valves in sea water services.

Client approval is required for the applications of internal metallic or non-metallic lining.

11.1.1. Trim

The trim shall, as a minimum, be of AISI 316 type stainless steel, unless other material is required for the process conditions.

For fluids that become corrosive when in contact with the atmosphere, suitable trim materials shall be considered, or precautions to prevent contact with air shall be taken.

Where soft (resilient) inserts are required for meeting the specified leakage rate, the inserts should preferably be of glass-fiber filled or graphite filled PTFE. The selection shall be based on the suitability for the specified process conditions. The resilient insert shall be properly clamped between metal parts and/or locked in position to prevent blow-out in the closed position.

Hardened stainless steel or stellited facing shall be supplied for valve plugs and guides with solid stellited seat rings for the following applications:

- erosive services,
- flashing, cavitation services,
- fluids above 315°C,
- wet gas or wet steam service with a pressure drop greater than 5 bar,
- when the pressure drop is greater than 10 bar at design conditions.

11.1.2. Gaskets

Body/bonnet and, if required, body/bottom flange gaskets shall be of the spiral wound type. Material shall be AISI 316 stainless steel, graphite filled, unless otherwise dictated by the process conditions.

11.1.3. Packing

Recommended packing materials:

- Teflon-chevron packing, suitable for operating temperatures less than 230 °C, unless a specific valve construction permits higher limits. Vendor's standard may also be considered.
- High-temperature packing, graphite for temperatures above the limit for Teflon.
- Depending upon design of the valve, an extension bonnet may be required to keep the temperature at the stuffing box to an acceptable value for the applied packing. An extension bonnet may also be required, when the operating differential pressure across

the valve may cause freezing of the stuffing box/packing and/or ice formation on the trim. This may be the case, for instance, on compressor recycle (anti-surge) valves.

For valves in vacuum service, the bonnet shall have an extended stuffing box, a lantern ring and a number of packing rings. Special attention shall be paid to the type of stem packing/sealing facilities as well as stem surface finish.

Packing lubrificators with steel isolating control valve shall be provided if required.

11.2 BELLOWS SEAL

Bellows seal bonnets shall be applied for services with toxic fluids. The valve stem part, which is exposed to the surrounding atmosphere, shall be completely covered by the protection bellows. The bellows shall be of AISI 316 type stainless steel, unless otherwise demanded by the application. An additional stuffing box with the appropriate packing material shall be included. The seal extension shall be provided with a screwed connection between the bellows seal and the packed gland for leak detection and venting facilities.

11.3 BOLTING

The Vendor shall indicate in the relevant manuals, the torque figures for bolting the body/bonnet and body/bottom connection for control valves on high pressure service.

12.0 ACTUATOR

12.1 GENERAL

The valve and actuator shall be from the same manufacturer.

Valves shall be pneumatically operated and fitted with a spring return mechanism.

Consideration of piston-type actuators, with or without helper springs and/or fail-safe capacity tanks, shall only be given if the force required falls beyond the normal range of diaphragm operators. The piston-type actuator should be of the spring-opposed diaphragm or of the spring-opposed short stroke type. Long-stroke springless piston actuators shall be opposed via a secured instrument air system or provided with lock-up valves to achieve the required action in the event of instrument air failure.

Spring range shall be 0.2~1 barg.

Actuator bench range shall be 0.2 to 1.0barg.

Instrument air will be supply by contractor as per Process basis of design Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001 in the following manner:

Operating Conditions at User's Battery limit

System	Temperature (°C)			Pressure (bar g)		
	Min	Norm.	Max	Min	Norm.	Max
Instrument Air	-	65	-	4	7.5	8.5
Plant Air	-	65	-	4.5	8.5	9

Design Conditions

System	Temperature (°C)	Pressure (bar g)
Instrument Air	85	12.5
Plant Air	85	12.5

- Dew point at operating pressure: -40°C maximum at 8 barg.
- Oil content : nil
- Max. Particle size : 3µ

Control valves shall be such that on air failure the valve takes automatically a safe position either open, or close, or locked in position, depending upon the process requirements.

Shut-off valves shall be kept in their normal operating position by means of a standard air supply signal (or control air signal). Interruption of that signal and venting of the valve actuator, by means of a solenoid valve mounted in the signal or supply air line, shall cause valve action to the safe position.

Safety shut-off valves shall be fitted with a fail-safe spring return mechanism.

For butterfly valves, the rotary intermediate linkages between valve and actuator shall be of the integral type and enclosed in a protected metal housing.

Cylinder actuators shall be provided with adjustable end-limit travel stops in both directions. Bolt adjustment type limit stops shall be applied with a locking facility, by example a locking nut, to prevent tampering.

Piston and cylinder actuators shall have O-ring sealing and shall be designed for low shaft and piston friction.

Actuators shall be equipped with a direct coupled adjustable travel or position indicator for local status indication and transmitig this parameter to system. The position shall be indicated by a

permanent mark on a reversible scale with the words ‘open’ and ‘shut’ at the travel limits or by unambiguous symbols.

12.2 ACTUATOR MATERIAL

The material of actuator case/housing shall be steel, unless otherwise specified. Different parts of Actuator Material shall be considered based on IPS-M-IN-160. Aluminum actuators are not permitted on valves that are part of safety systems. The yoke material shall be high tensile strength cast or ductile iron, as a minimum. The yoke shall be of the open type to allow access for (re-)adjustment of packing gland follower. The diaphragm material shall be nylon-reinforced neoprene or Buna N rubber. The actuator spring shall be fully enclosed in a metal housing and permanently treated to resist atmospheric corrosion. Cadmium plating of actuator housing and spring is not permitted.

12.3 ACTUATOR FORCE

The Vendor shall carry out actuator sizing calculations based on the data given in the requisition and in particular:

- Control valve actuators shall be sized to fully stroke the valve against the unbalanced force on the valve plug that results from a pressure drop across the valve equal to the upstream pressure.
- Actuators shall be sized for a minimum air pressure of 3 barg. The normal operating pressure is 4 barg, and the maximum operating pressure is 10 barg.
- Where not specified on control valve datasheet clearly, the stroking time shall be lower than 5 second for valves up to 4” and 1 second per inch diameter for bigger ones.

12.4 ACTUATOR PAINT

The actuator shall be painted as below:

Direct acting (open on air failure) – green

Reverse acting (close on air failure) – red

13.0 ACCESSORIES

All accessories specified with the valve will be supplied, installed, connected / wired, to the valve by the Vendor. All accessories enclosures shall be dust and waterproof to at least IP65 according to IEC560529.

13.1 VALVE POSITIONERS

Please note that all Control Valves shall be supplied with pneumatic positioners.

Positioner signal can be electronic 4-20 mA with HART capability or pneumatic.

Positioners shall be certified intrinsically safe and suitable for use in hazardous area as per EEx'ia' protection Classification.

Valve positioners shall be supplied with the requisite number of pressure gauges, the controller output pressure, positioner output pressure, and supply pressure to the positioner.

Positioners shall be force balance type, with integral by-pass and output signal gauge. An electro-pneumatic converter with pneumatic booster shall be provided for special application when a positioner shall be avoided and when the signal to actuator is not standard.

The positioner shall have a weatherproof enclosure in accordance with IEC-529, IP65 as a minimum.

Positioners shall be designed for 1.4 barg supply pressure

Direct or reverse action should be readily obtained without disassembly

Valve positioners with selectable characterizing cam shall be properly adjusted by the Vendor.

The valve positioner shall be provided an identification plate, marked with air supply pressure and air signal. The Vendor shall specify the air consumption.

13.2 HANDWHEELS

Control valves shall be provided without a handwheel, unless otherwise indicated on the piping and instrument diagrams (P&ID).

Except for eccentric rotary plug valves, when a handwheel is required, it shall be of the declutchable side mounted type. Re-orientation of side-mounted handwheel should be possible in the field without the use of additional component.

Manual handwheel operators should be supplied only on specific request by the Project, or where bypass facilities are not installed. Side-mounted, lockable, screw or gear drive manual operators, continuously connected and operable through an integral declutching mechanism, are preferred.

Handwheels can be supplied with most types of valves. They provide the operator with the means to override the control system and to operate the valve manually. Various designs are available, including those that can stroke the valve in either direction and those that stroke the valve in one direction, relying on the valve spring for the return stroke. Some handwheels are continuously connected. Others use a clutch, pin, or other means of engagement, and must be disengaged when not in use or damage may result.

Handwheels when specified shall be mounted and designed to operate in the following manner:

- For globe valves, handwheels shall be mounted on the yoke, arranged so that the valve stem can be jacked in either direction.
- b) Neutral position shall be clearly indicated.
- c) Handwheel operation shall not add friction to the actuator.
- d) Clutch/Linkage mechanisms for handwheels on rotary valves shall be designed such that control of valve position is not lost when engaging the handwheel.
- e) Handwheels shall not be used as a travel limit stop.

Top mounted handwheels shall be for the valves mounted relatively low elevations.

Side mounted handwheels should be chosen for valves at higher elevations.

If necessary the side mounted handwheels may also be operated by a chain fall plus chains to release and rest the locking levers. The valve chains and handwheel on the piping should be oriented away from the fire hazardous location.

Where specified the actuator shall be equipped with a permanently attached handwheel of the automatic declutching type that precludes mechanical engagement of the handwheel while the drive is in operation.

The declutching device shall:

a) Allow power-override of the handwheel operation at all times.

b) Permit manual handwheel operation of the valve in the event of a frozen or seized drive.

Handwheel drive shall permit the valve to be stroked open or closed in 15 minutes or less.

Handwheel clockwise rotation shall close the valve.

When a handwheel is used for a piston actuator, a cylinder bypass valve should be included.

When a control valve is equipped with a handwheel, the handwheel should be easily operable from normal personnel access paths or platforms. For ergonomic reasons, handwheels should face the operator access area, and the shaft center should be 1 m to 1.5 m above the elevation of the access area.

13.3 LIMIT STOPS

Limit stops shall be specified, only when indicated on the P&ID. Limit stops shall be mechanical devices mounted on the actuator, screwed bolt-type on the control valve stem, adjustable over the full length of the stroke.

To prevent tampering, they shall be fitted with a locking facility, for example a locking nut.

To prevent unauthorized adjustments, the limit stops shall be provided with a protective cap. The removal of the cap and (re-) adjustment of the limit stop shall require the use of a special tool, such as a triangle-shaped key.

The Vendor shall set the limit/travel stops at the required minimum or maximum valve opening.

Limit stop shall not form part of the handwheel mechanism.

Bolts screwed in the body are not authorized as limit stop.

13.4 LOCK-UP VALVES

Air lock-up valves shall be provided when the control valve shall remain in the last position in case of failure of the instrument air supply.

The lock-up valves shall have a bolt adjustment provided with a locking facility, for example a locking nut, to prevent tampering.

A separate name plate shall be provided to indicate the set values.

The lock-up valves shall be set at 0.5 bar above the required control valve air supply pressure, unless some other set value is required for a particular actuator. The lock-up valves shall be properly adjusted by the Vendor.

For control valves with a valve positioner, the lock-up valve shall be installed between the positioned output and the actuator. Where lock-up valves are applied on valves operated by a solenoid valve, this solenoid valve shall be installed between the lock-up valve and the actuator.

13.5 LIMIT SWITCHES

“Open” and/or “close” limit switches shall be specified only, when indicated on the P&ID.

Limit switches shall be EExd certified. SPDT contact rating shall be 2Amp/24A DC.

Mechanically operated switches are not acceptable, except for pneumatic signal. Mercury switches are prohibited. Use of proximity switches shall be subject to Client's approval.

The electrical connections shall be M20 x 1.5 ISO female thread.

13.6 AIR BUFFER

Secured instrument air shall be applied for springless actuators, to drive the control valve to a safe position, in the event of an air failure. The secured instrument air supply shall maintain sufficient air pressure in the buffer vessel for at least 30 minutes or 3 full valve strokes, whichever takes longer.

The capacity of the secured instrument air buffer vessel shall be sized for a minimum instrument air supply pressure of 3 barg.

Buffer vessel shall be fabricated from carbon steel and painted according project painting specification. Buffer vessel shall be provided fully instrumented by the Vendor.

13.7 AIR LUBRICATORS

Air lubricators shall be considered for pneumatic long-stroke cylinder actuators.

Air lubricators shall be of the oil-mist type, suitable for installing on a mounting plate and shall have facilities for oil refilling under pressure. They shall be provided with oil level indication. The oil flow shall be externally adjustable. The oil buffer capacity shall be sufficient for one month continuous operation.

Where air lubricators are applied for valves operated by a solenoid valve, the lubricator shall be installed upstream of the solenoid valve.

Spherical glass (bowl type) air lubricators shall not be used.

13.8 SOLENOID VALVES

Solenoid valve may be installed:

- In the air-supply line of On/Off, valve. In that case, care will be taken that the trim of solenoid valve is adequately sized according to the air supply,
- In the air signal line of control valve, when required on the P&ID.

The solenoid valves shall be suitable for installing on a mounting plate. They shall be mounted as close as practicable from the valve actuator, always downstream of the control valve positioner.

The solenoid valves shall have a weatherproof enclosure in accordance with IEC-529, IP65 as a minimum.

Solenoid valves shall never be mounted directly in process or utility lines.

Three ways or four ways body shall be used.

Pilot operated solenoid valves shall not be used.

The valve body material shall be AISI 316 stainless steel suitable for the environment and the required service.

The air passages in the solenoid valve shall be large enough to achieve the valve opening or closing in the required time. Exhaust port shall be provided with a piece of tubing bent downwards with the end cut off at an angle of 45 degrees to prevent plugging.

Solenoid valves shall be of the continuous type (continuously powered) and be equipped with capsular (potted) coils suitable for relevant hazardous area. Coil electric power supply shall be 24 VDC low consumption (~ 10 Watts max.).

Solenoid coil shall operate the valves by ±10% of voltage variation, unless otherwise specified in data sheet.

Solenoid valves shall be EExd certified.

Solenoid valves with “flying leads”, shall be terminated in a junction box, part of the valve. The flying leads shall be armored or protected by a flexible conduit.

Solenoid valves may be equipped with an integrated manual reset feature when required, or with a remote reset feature (by other).

Pneumatic connections shall be 1/4" NPTF minimum.

The electrical connections shall be M20 x 1.5 ISO female thread.

External grounding shall be provided for each solenoid valve.

13.9 FILTER-REGULATORS

Separate air filter regulators shall be installed in the instrument air supply lines to the actuator or positioner.

They shall be of the reducing-relief valve type, with drainage facility and bolt adjustment provided with a locking facility, for example locking nut, to prevent tampering.

When a control valve is used for shutdown function, an air set shall be provided with integral pressure safety valve to insure overpressure protection and increase the integrity of the system.

13.10 FILTERS

Air filters may be considered instead of air filter regulators, in the instrument air supply lines to those long-stroke cylinder actuators that can withstand the maximum air pressure.

13.11 QUICK EXHAUST VALVES

Quick exhaust valves shall be provided for service that requires a non standard opening or closing time.

The quick exhaust valves shall be of the non-spring return type. Pilot operated quick exhaust valves shall not be used.

Quick exhaust valves shall be installed on the actuator.

13.12 VOLUME BOOSTERS

Volume boosters shall be provided for the service that requires a non-standard stroking time.

Volume boosters for pneumatic actuators shall be of the high capacity type with fast throttling facilities to control the required capacity.

Volume boosters shall be installed on the actuator.

13.13 RESTRICTORS

Instrument air flow restrictor shall be provided for service requiring a slow opening and/or slow closing time.

The flow restrictor shall be provided with a lockable, variable restriction adjustment facility. The direction(s) of restricted flow shall be indicated by a permanent mark on the body.

The capacity of the flow restrictor shall be sized (and tested) for a normal air supply pressure.

13.14 TUBING AND FITTINGS FOR ACCESSORIES

The tubing material will be AISI 316 stainless steel, 1/4" NPT connection for outside diameter tubing = 1/4” OD (as a minimum).

The fittings for air piping will be of the AISI 316 stainless steel compression type, with double ferrule and complete with coupling nuts.

All control valves shall be equipped with a mechanical position indicator.

14.0 SPARE PARTS AND SPECIAL TOOLS

The VENDOR shall provide lists of recommended spare parts, which shall include the original part numbers with prices for commissioning, start-up and two years operation. All spare parts shall be identified individually.

Spare parts for commissioning and start-up; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

Spare parts for two years operation; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

The VENDOR shall be able to provide spares back up and support for the plant life of at least 20 years.

SPIR form shall be approved by CLIENT prior to procurement.

14.1 SPECIAL TOOLS

Special Tools (as option / if any; to be recommended by Vendor)

15.0 INSPECTION AND TEST

The valves/actuators shall be subject to the tests and check according to the mentioned codes, procedures and acceptance criteria.

Such inspections shall not relieve the Vendor/Manufacturer from his responsibilities concerning materials, work affected and the performance of the equipment supplied.

Inspections and tests shall be performed by VENDOR at his works using his inspection and test facilities.

Cost of performing all inspections and tests (including FAT), supply of necessary personnel and facilities shall be borne by Vendor.

Should the inspections and tests be made at separate locations, due to sound technical reason, the Vendor shall notify the Client in his quotation.

Client inspectors shall be allowed to be involved in each and every stage of inspections and shall be free to request any specify test included in the approved inspection and test procedure, the inspectors shall have access right to all facilities involved in the manufacturing of the equipment purchased under this specification.

Note: FAT and SAT tests shall be performed according to the relevant inspection test plan (ITP) document.

15.1 ACCEPTANCE CRITERIA

Casting shall be free from injurious blowholes, porosity, shrinkage faults, cracks or other defects.

Casting with defects that are plugged, welded, burned or impregnated are unacceptable.

Visual and dimensional check shall be realized in factory and shall consist of checking that nameplate data materials, dimensions and the integrity of the valves are in accordance with specifications, drawings and certificates issued by Manufacturer.

Non destructive tests shall be done when required in Valves data sheet.

Upon completion of the inspection/tests, the Vendor shall produce the internal inspection certificate to prove that all valves have been tested.

The full details of the intended test procedure shall be included in the offer of the Vendor.

Acceptance of shop tests shall not constitute a waiver of requirements to meet field tests under specified conditions, nor does inspection relieve the Vendor of his responsibilities in any way whatsoever.

15.2 GENERAL INSPECTIONS AND TESTS

Unless otherwise specified in the requisition, inspection of control valves should be carried out “at random” with a minimum of one valve per type/size.

Any valve with a specification more stringent than the standard requirements, for example low noise valves, depressurizing valve, anti-surge valve, emergency shut-off valve, etc., shall be individually inspected/tested and the results recorded.

All control valves together with all related accessories, when part of supply, shall be subjected to the following checks/tests as a minimum:

- Dimensional check,
- Hydrostatic test,
- Performance and mechanical operation test,

Following tests should be executed on a selection of control valves, as indicated by the Client:

- Seat leakage test,
- Capacity test,
- Low-temperature test,
- Helium test,
- Vacuum test

The test results shall be made available by the Vendor as part of the package of final certified document and drawings.

15.3 DIMENSIONAL CHECK

The face-to-face dimensions of flanged globe-body control valves shall be as given in the relevant standard. Other dimension such as overall height, etc., face-to-face dimensions of other valve types and of other ratings, for which standards are not available, shall be as shown on Vendor’s drawings within the given tolerances.

The flange face finish shall be considered in accordance with ANSI B 46.1and ANSI B16.5 standard.

15.4 HYDROSTATIC TEST

Control valves shall be hydrostatically tested in accordance with the requirements of ANSI/ASME B16.34 or in accordance with the standards, as applied for the particular type of valve.

15.5 SEAT LEAKAGE TEST

The seat leakage test shall be executed for all control valves specified with tight shut-off requirements.

Unless otherwise specified, the leakage rate of a single seated control valve shall not exceed the requirements as per Class IV. For a double seated control valve, the leakage rate shall not exceed the requirements as per Class III.

The Vendor shall perform for each control valve in the shut-off position a leakage calculation, at the test conditions as defined in the test procedure, and at operating conditions with the specified fluid.

The control valve shall be tested under the thrust or torque applied by the actuator with the signal pressure that will be available to close the valve, for example 0.2 bar or 0.2 to 1.0 bar bench setting as required.

For each valve tested, the Vendor will state the following data:

- flow direction,
- test medium,
- test differential pressure,
- duration of test,
- seat leakage flow rate measured,
- allowable seat leakage flow rate,
- seat leakage class (if applicable).

15.6 PERFORMANCE AND MECHANICAL TEST

The control valve shall be completely assembled and fitted with all accessories such as positioner, solenoid valve (s), etc. The packing box shall be correctly packed to the tightness as needed for the hydrostatic test (when necessary packing shall be renewed after testing). The valve stem may be lightly lubricated.

The performance and mechanical test shall, as a minimum, consist of a hysteresis, dead band test and a stroking time test.

The dead band test is expressed in percentage of the input span and shall be measured at

approximately 5%, 50% and 95% of the input span. The maximum dead band found shall not exceed 1% of rated input signal.

In case of special requirement the stroking time shall comply with the time stated in the requisition.

Testing shall be performed under ambient temperature and with the minimum specified air supply pressure.

If the control valve is equipped with a handwheel, the fully open and closed position of the valve shall be tested with handwheel operation.

If the control valve is equipped with limit switches, they shall be checked for functional operation with a proximity tester.

15.7 VACUUM TEST

A vacuum test shall be made on selected control valves as indicated by the client.

15.8 HELIUM TEST

Helium test shall be made on selected control valves used on hydrogen service, vinyl chloride service and on other services, as specified in the requisition.

15.9 MATERIAL TEST

Toughness tests

The toughness tests to be carried-out on the valves (if required) are normally shown on the data sheets or in the requisition. These tests shall be carried out in conformity with the requirements of ASTM standard and the temperature required for the grade of material.

Hardness tests

If specified in the requisition, hardness tests shall be carried out on each valve body,

Special examinations

For all valves 6” and larger in class 600 and higher, castings shall be examined in accordance with ANSI B 16.34 (Requirements for special class valves, examination of steel castings).

For ferrous materials, Magnetic Particle examination shall be used in preference to Dye Penetrant.

A full radiographic inspection shall be carried out on 100 % of the beveled areas of all weld-end valves of sizes 2" and above, and on all butt-welded joints, to prove that these areas are free from any defects.

Additionally, any weld (including fillet welds) on valve bodies, regardless of size or rating, shall be 100 % examined by dye penetrant testing.

15.10 DOCUMENTATION

The test results from the factory test shall be made available to the Client as part of a package of final certified documents and drawings.

16.0 DRAWINGS AND DOCUMENTS

All documents shall be in English. The following drawing and documents shall be delivered:

- Part list and actuator specification sheets
- Vendor's specification and technical catalogue. (Model no. of valve and accessories shall be specified in the technical catalogue)
- Actuator and body sizing calculation sheet and curves
- General arrangement drawing with dimension, weight and material list
- Detail supply list
- Shop test procedure
- Welding procedure
- Spare part list for commissioning and two years operation
- Instruction, maintenance and operation manuals
- Data sheets completer by vendor
- Inspection, test and calibration report / certificate
- Other necessary drawing
- Limit switch arrangement, wiring…
- Solenoid installation tubing and wiring
- Control valve noise calculation.
- Control valve and actuator sizing calculation

17.0 NAME PLATE

All valves shall be provided with data listed below on valve body or stainless steel name plate fastened by 316 S.S. screws. The following information shall be engraved on the nameplate or valve:

a) Tag No.
b) Body material.
c) Trim material.
d) Valve Cv.
e) Body/Trim sizes.
f) Actuator Power to open / close.
g) Actuator operating pressure.
h) Manufactures name and model No. and serial No.
i) Pressure rating.
j) Maximum differential pressure.
k) A tag indicating type of packing and lubricant.
l) The arrow indicating direction of valve flow on the body.
m) Bench set pressure.
n) Valve characteristics.
o) Instrument air supply pressure.
p) Ingress protection class (IP).
q) Hazardous area classification for electrical parts.

18.0 DELETED

19.0 PRESERVATION AND PACKING

All necessary precautions shall be taken for adequate protection of the valve, including accessories, during shipment and outdoor storage at their destination. These precautions shall comprise, but not necessarily be limited to the following:

- Before leaving the factory, all openings in the valve body shall be provided with temporary closures to prevent entry of dirt.
- During transport and storage, the valve ends shall be protected with suitable close fitting protectors (e.g. plastic caps) or covers of at least 3 mm thick and securely fastened by an adequate number of bolts.
- Air connections of actuators, positioners and accessories shall be protected by thread protectors;

The stuffing box of valves with a graphite based packing shall be protected against the ingress of water.