

DEP SPECIFICATION

SUBSEA PIPELINE VALVES
(AMENDMENTS/SUPPLEMENTS TO ISO 14723)

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DESIGN AND ENGINEERING PRACTICE

DEM1



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PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, manufacture, inspection and testing of subsea pipeline valves.

This DEP is based on ISO 14723, Second Edition, December 2009. Part III of this DEP amends, supplements and deletes various clauses of ISO 14723. Part III follows the clause numbering of ISO 14723 for easy reference.

All clauses of ISO 14723 not modified by this DEP remain valid as written.

In this DEP, ISO 14723:2009 and API SPEC 6DSS:2009 are considered to be equivalent and to provide the same technical result for a particular provision.

Valves for pressure ratings exceeding PN420 (Class 2500) are not covered by this DEP.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

This is a revision of the DEP of the same number dated February 2013; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in offshore facilities related to oil and gas production. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

NOTE: The term **Manufacturer** means Manufacturer/Supplier when used in Part III of this document.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

NOTE: In ISO 14723, the term **Purchaser** is used. In this DEP, the term **Purchaser** shall be understood to mean the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicate a process safety requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.3 Abbreviations

Term	Definition
DBB	Double Block and Bleed
MESC	Materials and Equipment Standards and Codes
MSS	Manufacturers Standardization Society

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (Part IV).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a full revision of the DEP of the same number dated February 2013. The following are the main, non-editorial changes.

Section/Clause	Change
All	Restructured and clarified requirements, enforced shall/should
7.7	Restructured and updated SHALL [PS] statements
7.11	Restructured and updated SHALL [PS] statements
7.19	Restructured and updated SHALL [PS] statements
7.21	Restructured and updated SHALL [PS] statements
7.22	Restructured and updated SHALL [PS] statements
11.3.2	Restructured and updated SHALL [PS] statements

1.6 COMMENTS ON THIS DEP

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DEP Standard Form (other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 NON NORMATIVE TEXT (COMMENTARY)

Text shown in italic style in this DEP indicates text that is non-normative and is provided as explanation or background information only.

Non-normative text is normally indented slightly to the right of the relevant DEP clause.

PART II GENERAL

1. Part III of this DEP is written as amendments and supplements to ISO 14723, Second Edition, December 2009.
2. Wherever reference is made to ISO 14723, it shall be understood to mean ISO 14723, Second Edition, December 2009 as amended/supplemented by this DEP.
3. For ease of reference, the clause numbering of ISO 14723 has been used throughout Part III of this DEP.
4. Clauses in ISO 14723, which are not mentioned in this DEP, shall remain valid as written.

PART III AMENDMENTS/SUPPLEMENTS TO ISO 14723**6 Valve types and configurations****6.1 Valve types****6.1.1 Gate valves**

Add the following:

1. All designs shall be engineered to eliminate the possibility of the segments jamming and preventing operation of the valve.
2. The design shall be bi-directional.
3. The threshold galling stress of all sliding components shall not be exceeded in all designs.
4. Slab gate through conduit rising stem gate valve shall have a back seat.

6.1.2 Plug valves

Add the following:

1. Lubricated taper plug valves shall be of the inverted plug pressure balanced design.
"Pressure Balanced Design" in which the line pressure is used to keep the plug in a "balanced" condition.
2. Lubricated plug valves shall have a bottom entry design.
3. Sealing for lubricated taper plug valves shall be accomplished using a lapped tapered metal plug fitted to a lapped tapered metal body.
4. The valve shall be a metal-to-metal seated design.
5. Lubricated plug valves shall be furnished with an internal lubricating system that is capable of delivering lubricant to the body/plug contact surfaces in the seating and seal areas.
6. Grooves shall be provided in the body/plug surfaces.
7. The grooves shall be arranged so that lubricant under pressure will be transmitted to all parts of the system when the valve is fully open or closed, thereby sealing the ports and facilitating operation.
8. Lubricated plug valves shall be furnished with hydrocarbon-resistant lubricating sealant containing a non-hygroscopic fumed silica viscosity improver that has both proper plasticity for tight sealing and lubricity for ease of operation over the entire design temperature range of the valve.
9. The plug of lubricated valves shall be furnished with anti-friction treatment, either polytetrafluoroethylene (PTFE) or molybdenum disulfide.
10. For lubricated plug valves the stem and plug shall not be one integral piece.

6.1.3 Ball valves

Add the following:

1. The obturator shall be:
 - a. a one-piece casting or forging;
 - b. trunnion mounted.
2. The ball port shall be cylindrical.
3. To avoid flow erosion to seal surfaces, ball valves shall not be used for flow control nor be left in a part open position.

All operation is from full open to full close and vice versa and, wherever this is performed in a flow stream, it will be performed as quickly as practical.

6.1.4 Check valves

Add the following:

1. The clapper of swing check valves should be hung from the bonnet.
2. Unless ring joint faces are specified, gasket surfaces for retainerless dual plate check valves shall not be interrupted in excess of the allowances established for "Permissible Imperfections in Flange Facing Finish", as specified in ASME B16.5 or ASME B16.47, and with the following as applicable:
 - a. The restrictions to the interruptions shall be based on the potential eccentricity of gaskets after installation, resulting from the difference between bolt hole and bolt diameter as specified in the drilling template tables in ASME B16.5 and ASME B16.47;
 - b. May be (partially) interrupted by bolt holes with a cumulative area not exceeding 20% of the uninterrupted sealing area;
 - c. Shall be suitable for spiral wound gaskets for sizes $\leq$ DN 600 ($\leq$ NPS 24);
 - d. Shall be suitable for covered serrated metal (Camprofile) gaskets for sizes $>$ DN 600 ($>$ NPS 24) as specified in MESC SPE 85/100 and ASME B16.20.
3. When retainerless dual plate check valves are assembled and compressed by the mating flange, the seat retainer face shall not protrude beyond the body face.

6.2 Valve configurations

6.2.2 Reduced-opening valves

Delete the following sentence:

- valves above DN 600 (NPS 24): by agreement.

And replace with:

- valves above DN 600 (NPS 24): three sizes below nominal size of valve with bore according to Table 1.

Add the following:

The minimum and maximum internal bore dimensions shall be stated in the quotation.

Add new clause:

6.2.3 Integral double-block-and-bleed valves

1. Double-seated valves with one-piece closure members (e.g., gate, ball and plug valves) and a body bleed shall not be considered acceptable as double-block-and-bleed valves since a common mode failure may make both isolations ineffective.
2. For single-body, single-stem double-block-and-bleed applications, only the double expanding gate valve with body bleed valve shall be acceptable.
 - a. To be acceptable as a DBB valve, the double expanding gate valve shall achieve 2 times ISO 5208, Rate C, as specified in Annex B.8.

Note that Avoidance of common mode failure is achieved in a double expanding gate valve by independent alignment of closure member parts to mating seats. The single stem of the double expanding gate valve is in compression when closed. This eliminates the dominant stem failure modes. An additional advantage of the double expanding gate valve is that external seating forces can be applied to assist seat tightness, especially for the low differential pressure seat of the DBB configuration. However, internal obstruction of one of the closure member parts renders the entire valve dysfunctional. This aspect is to be carefully considered when choosing this concept over a double-block-and-bleed assembly made out of individual valves.

3. Other acceptable integral (single body) double-block-and-bleed valves are:
 - a. integral double ball valve with body bleed valve;
 - b. integral double plug valve with body bleed valve.

Only the valve body is shared in these designs. Therefore these valve concepts can be considered as similar to double-block-and-bleed assemblies made out of individual valves.

4. The bleed valve shall comply with all requirements of this standard.

7 Design

7.1 Design codes and calculations

Add the following:

1. The design shall satisfy all pressure/temperature ratings prescribed for the appropriate class.
2. The body to bonnet bolt sizing shall be in accordance with ASME VIII or ASME B16.34.
3. For bonnets/covers attached by bolting, the mating flange between the body and bonnet/cover shall provide adequate strength to withstand internal and external pressure loads, and any loads exerted on the bonnet by the Valve Operator, mounts/adapters and drive train.
4. Bonnet/cover flange bolting shall be of the stud or stud bolt type.
5. A minimum of four bolts shall be used in any flange.
6. Bolting shall be at least 10 mm (3/8 in) in diameter.
7. The Manufacturer shall inform the Principal of any limitations of its bonnet/cover design.

7.2 Pressure and temperature ratings

Add the following:

1. The pressure/temperature rating of the valve shall be in accordance with the appropriate class in ASME B16.5 or ASME B16.34 and temperatures up to 150 °C (302 °F).
2. At temperatures above 150 °C (302 °F), the Manufacturer shall specify the pressure/temperature ratings for valves containing polymeric seat or sealing materials.
3. The valve shall withstand vacuum drying at pressures of 500 Pa (0.07 psi).
4. The manufacturer shall specify the pressure/temperature ratings for pressure controlling parts of the valves where these are lower than the ratings of the pressure containing parts.
5. The manufacturer shall advise the nature of the limiting component (e.g., materials, seats, construction details of internals).
6. For non-metallic materials, the rated pressure at the upper and lower design temperatures shall be specified on the general arrangement drawing.
7. The Manufacturer shall specify the rated pressures for soft seals or non-metallic seats at temperatures above 150 °C (302 °F).

7.3 Cavity relief

Add the following:

1. Cavity pressure relief shall be provided by means of one of the following:
 - a. Self-relieving seat rings.
 - b. A pressure relief valve connected between the cavity and the upstream (high pressure) side of the valve.
2. The presence of pressure relief valve connected between the cavity and the upstream (high pressure) side of the valve shall be subject to approval by the Principal.
3. Pressure relief by means of a pressure-equalising hole in the obturator, connecting the body cavity to the High Pressure (HP) side of the closure member shall not be implemented.

Add the following:

- a. Valves having two single-piston effect seats shall internally relieve the excessive cavity pressure to the downstream (low pressure) side of the valve.
- b. Valves having two double-piston effect seats are not self-relieving and shall be fitted with a cavity relief valve.
- c. Valves having both a single and a double piston effect seat shall internally relieve excessive cavity pressure via the single-piston effect seat.
- d. The maintenance manual shall document:
 - i. The principle of operation of body cavity relief
 - ii. The assembly procedure of closure member.