



Document No.	GP 43-35
Applicability	Group
Date	27 April 2006

Guidance on Practice for Valves for Pipelines

GP 43-35

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 43-35. This Guidance on Practice (GP) is based on parts of heritage documents from the merged BP companies as follows:

British Petroleum

GS 130-6	Actuators for Shutoff Valves.
RP 30-3	Selection and Use of Control and Shut-Off Valves.
RP 43-1	Onshore Transmission Pipelines to BS 8010.
RP 62-1	Guide to Valve Selection.

Amoco

A PN-PLV-CODE-S	Piping—Pipeline Valve—Codes—Specification.
A PN-PL-VA-P	Piping—Pipeline—Gate, Ball and Check Valves—Procurement Specification.
A PN-PL-VA-G	Piping—Pipeline—Gate, Ball and Check Valves—Guide.
A PN-OFS-HOP-C	Piping—Offshore—Hydrotesting Offshore Pipelines—Construction Specification.

ARCO

ES 203-92	Ball Valve Procurement Specification.
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Introduction

This Guidance on Practice is intended to be supplemental to GP 62-01 that incorporates the BP guidance for valves and it is meant to furnish additional requirements for valves to be used in pipeline service. Refer to BP PR 43 for directions in the use and applications of this standard. More detailed information on valve specifications is contained in GIS 43-351 for onshore pipelines and the risers of offshore platforms and in GIS 43-352 for subsea pipelines.



1. Scope

This GP provides guidance for piggable valves in gas and liquid hydrocarbon service for both onshore and offshore pipelines. It is supplementary to GP 62-01 that also addresses non-piggable valve requirements. Requirements for location and spacing of valves are presented in GP 43-20 (for onshore pipeline valves) and GP 43-21 (for offshore pipeline) valves.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

BP

GIS 43-351	Guidance on Industry Standard for Onshore Pipeline and Offshore Platform Riser Valves.
GIS 43-352	Guidance on Industry Standard for Subsea Pipeline Valves.
GP 43-20	Guidance on Practice for Onshore Pipeline Design.
GP 43-21	Guidance on Practice for Offshore Pipeline Design.
GP 43-50	Guidance on Practice for Pigging, Pig Launchers, and Receivers.
GP 62-01	Guidance on Practice for Valves.

Engineering Equipment and Materials User's Association (EEMUA)

EEMUA Publication 192 Guide for the Procurement of Valves for Low Temperature (Non-Cryogenic) Service.

European Pressure Equipment Directive (PED)

[97/23/EC](#) [Pressure Components Fatigue Design.](#)

International Organization for Standardization (ISO)

ISO 5208	Industrial valves - Pressure testing of valves.
ISO 14313	Petroleum and natural gas industries — Pipeline transportation systems - Pipeline valves.
ISO 15156	Petroleum and natural gas industries — Materials for use in H ₂ S-containing environments in oil and gas production (NACE MR0175) — Part 1: General principles for selection of cracking-resistant materials. Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons. Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys.

3. Symbols and abbreviations

FAT	Factory Acceptance Test.
HIPPS	High Integrity Pressure Protection System.



SIL	Safety Integrity Level.
SSIV	Subsea Isolation Valve.

4. Connection to pipeline

4.1. Welding of valves

- a. The ends of pipeline valves should be provided with pipe extensions or “pups” that can be welded to the valve body and post weld heat treated prior to assembly of the internal parts.
- b. The length of each pipe pup should be at least as long as the nominal diameter of the valve.

The common practice is for line isolation valves to be welded to the pipe except if they interface with a pig trap etc. The minimum pup length protects the soft seals etc. within the valves.

- c. The pipe pups should be free issued to the valve manufacturer from the line pipe stock and this material should be provided in a timely manner to meet the valve manufacturer’s schedule for welding procedure qualification.

BP project experience has shown that problems have arisen if the valve manufacturer supplies the pipeline pups. On a recent project where grade X70 linepipe was used, the valve manufacturer inadvertently procured low-grade pup material that failed during the valve hydrotest. This delayed the valve supply, with the attendant impact on the construction schedule.

4.2. High strength pipe

If high strength pipe (X70 +) means that it may be impossible to weld a valve having relatively low strength directly to the pipe (because of the disparity in wall thickness), the valve manufacturer shall weld on an intermediate forged adaptor piece in a material having a strength between that of the valve and that of the pipe.

4.3. Non-welded connections

If non-welded connections are required, proprietary or Norsok compact flanges and (in the smaller sizes) clamp type connectors should be considered.

Compact flanges and clamp type connectors save weight and cost, which is particularly important for subsea applications where weight is often critical.

5. Valve type selection

5.1. General

- a. For piggable applications, one of the following three basic block valve types should be installed:
 1. Slab-type through conduit gate valves.
 2. Expanding-type (parallel) through conduit gate valves.
 3. Trunnion mounted ball valves.
- b. Check valve choice should be restricted to special piggable designs of swing check.

For discussion of the merits of each see GP 62-01

- c. If pigging is not required, balanced, lubricated plug valves (or, in liquid and low pressure gas service only, expanding plug valves) may also be used for isolation service.



- d. Axial flow type check valves and duo disk checks may also be used and usually have better dynamic characteristics than swing check valves.

5.2. Pre-service conditions

- a. Even if the normal operating conditions are clean, metal seated valves suitable for dirty service should be chosen for critical isolation service.

Conditions during construction, line clearing, dewatering, and start-up are frequently the most severe that a valve sees and this can cause permanent damage to soft seated valves.

- b. Soft-seated valves should be installed after line clearing/dewatering is complete unless appropriate steps are taken to protect them prior to normal operation.

In the case of soft-seated ball valves, protection by means of silicone sealant application to the circumferential gaps in the bore has been shown to provide effective protection. An effective management procedure is required to prevent premature closure of treated valves.

6. Maintenance considerations

6.1. Effect of maintenance strategy

The maintenance strategy being adopted for valves should be established early in the selection process.

The maintenance strategy can affect both the ultimate choice of valve type and the spares requirements. Top entry access (gate valve, top entry ball valve) offers the possibility of maintenance in situ and replacement of valve internals regardless of pipe connections. The lack of local skills/facilities or the inadequacy of lifting/handling facilities means that this is rarely achievable in practice.

If the intention is to remove valves to a workshop for maintenance, maximum flexibility of valve selection is possible, allowing top entry gate and ball valves along with all welded or split body ball valves. In this case, sparing policy needs to take account of the necessity to provide complete replacement valves. The choice of end connections needs to balance the inconvenience of cutting out welded-in valves against the convenience, increased cost, and negative environmental potential of flanged etc. connections.

6.2. Welded body valves

The benefits/limitations of welded body versus non-welded body valves should be carefully evaluated.

Welded body ball valves minimise the risk of leakage to the environment and, if installed in the main line using welded connections, may allow continued operation when the valve is functioning only as part of the pipe. However, they cannot be maintained in situ nor (usually) in a local workshop and normally have to be returned to the manufacturer for any significant maintenance.

6.3. Hard metal seated ball valves

If hard metal-seated ball valves are specified, an all-welded body construction should not be used.

Hard metal-seated valves are more likely to suffer problems during the factory acceptance test than is the case with soft-seated valves. Any such problems may involve the necessity of cutting open the valve body welds and this can add significantly to the delivery time.



7. Isolation

GP 62-01 should be referred to for the general case. Aspects of particular importance to pipeline valves are emphasised here. GP 62-01 should be referred to for the characteristics and service suitability of the different valve types referred to.

7.1. Terminology

7.1.1. “Double isolation” and “double block and bleed”

There is much confusion over terminology, particularly the term “double block and bleed valve” – refer to the definitions in GP 62-01. As used in ISO 14313 (API 6D) this relates to blocking of two opposing sources of flow/pressure and being able to vent the space (i.e. the valve cavity) between them.

Any trunnion mounted ball valve or expanding type gate valve and most slab type gate valves can offer this capability in standard form and it is not addressed further here.

A more frequent requirement in pipeline practice is a double block isolation of equipment (etc.) from a single source of flow/pressure (for the purpose of breaking containment) using two valves (or a single valve incorporating two isolations) with a vent between them. ISO 14313 (API 6D) does not specifically address this at present, although test protocols for single valves that incorporate such a facility are included. A valve offering this feature is termed a “double isolation valve” or “double isolation and bleed valve” to avoid confusion. See GS 62-012 for definitions.

7.1.2. Positive and passive isolation

It is necessary to distinguish between those valves that rely primarily on the presence of differential pressure to affect a seal (trunnion mounted ball, slab type gate) and those where the sealing force is applied mechanically as part of valve operation (expanding type gate valve). These are referred to as “Passive isolation” and “Positive isolation” respectively. The lubricated balanced plug valve probably falls somewhere between the two but is assumed to be “passive” here. See GS 62-01.

7.2. Positive versus passive isolation (see GP 62-01)

The theoretical advantage of valves that make a “positive” isolation is that they maintain shut-off tightness regardless of the presence or absence of a pressure differential and are not sensitive to the speed with which a pressure differential is established. In practice this depends on how well seating surfaces are preserved, etc.

In all cases, the operating force requirements (size for size) of “positive” isolation valves is greater than comparable “passive” isolation valves – a significant consideration as size and pressure increase. By far the majority of isolation valves in pipeline service (with BP and other operators) are “passive” type.

7.3. Double block isolation (see GP 62-01)

- a. If double block isolation is required by the isolation philosophy (e.g. before opening pig launchers/receivers) it should be achieved in one of the following three ways:
 1. Two single seated valves in series with a vent connection from the connecting pipe.
All block valve types may be used in this arrangement.
 2. An integral manifold block incorporating two isolating valves and a vent valve.

