



GS 143-1

PIG LAUNCHERS AND RECEIVERS

February 1994

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING											
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APPLICABILITY		Does not preclude adaptation for other applications									
Regional Applicability:		International									
SCOPE AND PURPOSE This document specifies the general requirements for the design, fabrication, inspection and testing of Pig Launchers and Receivers for onshore and offshore oil and gas pipelines. Its purpose is for the specification of fit-for-purpose Pig Launchers and Receivers at minimum cost.											
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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory Volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory Volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Guidance for Specification

This Guidance for Specification was developed under the BP Exploration XEU Simple Specifications Initiative. This initiative is intended to simplify the purchasing requirements through a minimum conditions of satisfaction approach in regions where there is a mature supplier resource.

Application

This Guidance for Specification is intended to guide the purchaser in the use or creation of a fit-for-purpose specification for enquiry or purchasing activity.

Text in *italics* is Commentary. Commentary provides background information which supports the requirements of the Specification, and may discuss alternative options.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Specification Ready for Application

A Specification (BP Spec 143-1) is available which may be suitable for enquiry or purchasing without modification. It is derived from this BP Group Guidance for Specification by retaining the technical body unaltered but omitting all commentary, omitting the data page and inserting a modified Foreword.

Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, BP International or the Custodian. See Quarterly Status List for contacts.



1. INTRODUCTION

1.1 Scope

This document covers the design, fabrication, inspection and testing of pig traps to be used in oil and gas pipeline systems in the UK. Such a pig trap is considered to be part of the pipeline system to which it is connected.

This document is intended for use in conjunction with a functional specification and associated data sheets and drawings which give specific project requirements. For non UK applications, supplementary or amending requirements may be necessary.

Additional functional requirements to this specification are given on a Data Sheet.

This specification does not cover any ancillaries such as pig carriers, valves, interlocks, pig alerts, etc.

The Vendor is required to focus on the concept of total life of field costs in respect to the selection of materials and components. It is essential that the design is safe, reliable, simple, contains all necessary maintenance aids and requires the minimum amount of maintenance time during its operating life. It is intended to purchase Vendor's standard equipment, in which case any deviations from this specification must be shown to be technically acceptable to the Purchaser.

1.2 Quality Assurance

Verification of the Vendor's quality system is normally part of the pre-qualification procedure, and is therefore not specified in the core text of this specification. If this is not the case, clauses should be inserted to require the Vendor to operate and be prepared to demonstrate the quality system to the Purchaser. The quality system should ensure that the technical and QA requirements specified in the enquiry and purchase documents are applied to all materials, equipment and services provided by sub-contractors and to any free issue materials.

Further suggestions may be found in the BP Group RPSEs Introductory Volume

2. GENERAL DESIGN REQUIREMENTS

2.1 Pig traps shall be designed to meet the requirements of the pipeline design code [BS 8010](#).

For onshore pipelines use [BS 8010](#) Part 2.8, and for offshore pipelines use [BS 8010](#) Part 3.



BS 8010 refers to the use of [BS 5500](#) for fabrication and certain design details.

- 2.2 Trap diameter, length, design, test data and arrangements are specified on the Data Sheet.

The length should take account of any intention of using intelligence pigs and to consider the use of the longest intelligence pig currently available. The neck bore should match the pipeline inside diameter.

Vertical pig traps can realise useful savings in offshore applications. However, the vertical orientation of the pig receiver is not recommended as debris can fall and accumulate in the isolating valve.

Vent nozzles and balance bridle should normally be provided to prevent the trapping of high pressure on the pipeline side of the pig.

- 2.3 The general membrane stress in any part of the trap during hydrotesting shall not exceed 90% of the specified minimum yield stress of the material.

The design should be suitable for a hydrostatic test pressure not less than the pipeline test pressure.

- 2.4 Cyclic loading shall be considered in the pig trap design. The complete trap shall be demonstrated as being suitable to meet the requirements of [BS 5500](#) for the number of cycles stated on the Data Sheet.

Unless better information is available a base case would be one full pressure cycle per day for the nominal design life of the trap.

- 2.5 Consideration shall be given to pressure increases arising from thermal gain in the event of shut-in conditions.

- 2.6 The corrosion allowance shall be as indicated on the Data Sheet.

A corrosion allowance should be included if such an allowance has been made for the pipeline to which it is connected. In any event, corrosion allowance may be required because of the different internal and external conditions associated with the vessel.

- 2.7 Fittings as permitted by the pipeline code may be used in the construction of pig traps. Fittings shall comply with [ANSI B16.9](#), [MSS SP-75](#) or [BS 1640](#) as appropriate. Threaded pipe connections shall not be used.

- 2.8 For offshore traps any branch connection reinforcement shall be designed for minimum weight.



- 2.9 Flange sizes, pressure class and facing shall be as stated on the Data Sheet.

Flanges should be specified to [ANSI B16.5](#) or [MSS SP-44](#) as appropriate, according to size, and be the same as those of the connecting pipeline.

Flange facings shall be as follows -

The facings of class 150, 300, 600 and 900 flanges shall be raised face except where ring type joints are otherwise required.

The facings of flanges in classes 1500 and 2500 shall be of ring joint type.

- 2.10 Sliding or fixed supports shall be provided as shown on the Data Sheet, which also shows the required slope of the pig trap.

The design of the supports shall be based on the combined loading of the trap full of water together with the heaviest pig (intelligence pig) and external loads.

The slope of the pig trap should be such that fluids can be drained off at the lowest point of the trap.

3. DESIGN REQUIREMENTS FOR END CLOSURES

- 3.1 Proprietary end closures shall be designed to meet the applicable requirements of [BS 5500](#) and the functional and safety requirements of [ASME VIII Division 1](#) UG-35.

Reference may also be made to API Spec 6H - Specification on End Closures, Connectors and Swivels.

- 3.2 The design shall be fully justified by proof testing and design calculations.

Test reports and evidence of successful relevant operational experience should be established.

- 3.3 At least one positively located safety bleed device shall be provided on the door, which shall be designed to relieve any residual pressure before the door can be opened. Any release of residual pressure shall be directed away from the operator.

- 3.4 Closure hinges and locking mechanisms shall be robust and suitable for repeated operation.

Fatigue calculations should include the end closure.

- 3.5 The locking and holding mechanism shall be designed such that failure of any single component shall not lead to release of the closure.



This requirement may be achieved by only a very limited number of available designs. It is recommended that closures offered are fully investigated in this respect and any relaxation of this requirement be made only after due consideration.

Designs which utilise a thread as the prime means of retaining the end closure are not normally acceptable.

- 3.6 The closure shall be designed to enable visual examination of the security and integrity of the locking and holding elements when in the closed position
- 3.7 Manually operated closures shall be easy to operate by one person using hand tools only.
- 3.8 The design shall allow for maintenance, including any greasing and re-alignment in-situ.
- 3.9 Materials for appurtenances including bleed valve, hinges, locking and holding mechanisms shall be selected to provide good environmental corrosion resistance as well as long term reliable operation.
- 3.10 Where indicated on the Data Sheet, the end closure shall be suitable for a vacuum condition.

This is to permit the pipeline to be vacuum dried.

- 3.11 Where indicated on the Data Sheet any non-metallic seals shall be resistant to explosive decompression and be suitable for hydrocarbon service. Any O-ring type seals shall be fully moulded.

For special section elastomeric seals, fully moulded types may not be readily available, and therefore jointed seals may have to be used. Because problems have occurred due to the failure of jointed seals, particular attention should be paid to their design and quality.

- 3.12 Requirements for door interlocks shall be as indicated on the Data Sheet.

System interlocks or special provisions should normally be incorporated to prevent accidental opening of both the end closure and any valves (particularly remotely operated pig trap valves and isolating valves) exposed to pipeline pressure whilst the vessel is open.

- 3.13 A stainless steel plate shall be fitted to the end closure with permanent marking stating that the Operator shall refer to the manufacturer's instructions for the safe operation of the closure.



4. MATERIALS OF CONSTRUCTION

- 4.1 Basic materials of construction shall be as indicated on the Data Sheet or alternatives agreed with the Purchaser. Where the pig trap is for sour service the additional requirements of BP Group [GS 136-1](#), Materials for Sour Service to [NACE Std 01-75-90](#) shall be met.

Reference may be made to BP Group [GS 146-1](#) Vessels to [BS 5500](#), for guidance on materials selection and specification. It is recommended that materials (including good quality line pipe steels) meeting the requirements of [BS 5500](#) are specified.

If thick materials e.g. greater than 30 mm, or materials for low temperature e.g. less than -6°C, are required it is recommended that the applicable requirements of BP Group [GS 146-1](#) and BP Group [GS 136-1](#) are specified.

- 4.2 Other than plate, materials for pressure retaining and load bearing parts shall be forged unless approved otherwise by the Purchaser. If load bearing components in cast form are proposed then additional inspection requirements shall be agreed with the Purchaser.

It is recommended that additional surface and volumetric inspection be applied to castings. The extent of additional inspection should be appropriate to the casting process, complexity and thickness.

5. FABRICATION

- 5.1 Fabrication and welding (including the qualification of welding personnel) shall meet the requirements of [BS 5500](#). The Construction Category shall be as stated on the Data Sheet.

Construction Category 1 will normally apply as per the UK Submarine Pipelines Guidance Notes. Category 2 may be acceptable for non-hydrocarbon lines with low MAOP e.g. less than 50 barg.

Traps for low temperature operation will require special consideration regarding welding, reference may be made to BP Group [GS 146-1](#).

Traps for sour service shall meet the requirements of BP Group [GS 136-1](#).

- 5.2 If the end enclosure has been fully machined prior to its attachment to the vessel then, because of the potential effects of welding and post weld heat treatment operations on its dimensional stability, metallurgical and surface condition, all subsequent operations of this type shall be subject to approval by the Purchaser.

Alternatively, if the end enclosure is initially part machined, then any weld or heat treatment operations after its attachment to the vessel and



its finish machining shall also be subject to approval by the Purchaser, for the same reasons.

The alternative of supplying the end closure in a part machined condition, more readily allows subsequent welding and heat treatment operations on the vessel, so long as these are completed prior to finish machining of the end enclosure mating and sealing surfaces i.e. holding/locking ring, mating groove, ring gasket groove and all gasket mating and sealing surfaces.

- 5.3 All main seam welds shall be full penetration and where possible double sided. All nozzle to shell welds shall be full penetration.
- 5.4 Hot formed ferritic steel material shall be normalised after forming at a temperature not exceeding 1050°C.
- 5.5 Welding shall be carried out using procedures and operators qualified in accordance with [BS 5500](#) and approved by the Purchaser.
- 5.6 The inside of the trap barrel shall be free from obstructions which could prevent the free rolling of spheres, or travel of pigs or carriers.

6. INSPECTION

- 6.1 Inspection shall be carried out to meet the applicable requirements of [BS 5500](#).

For sour service, thick material or low temperature operation additional requirements per BP Group [GS 146-1](#) are recommended.

- 6.2 The parent material for the main barrel, reducer and neck shall be subject to 100% visual inspection.

Ultrasonic examination in accordance with [BS 5996](#) Quality Grade L4 is recommended for materials for pig traps for onerous service conditions.

- 6.3 Radiographic examination shall be by X-ray unless otherwise agreed by the Purchaser.

For thick material e.g. greater than 30 mm, ultrasonic examination is recommended.

- 6.4 Surface examination shall be by wet magnetic particle unless agreed otherwise by the Purchaser.

- 6.5 For the end closure, all mating clamp and flange machined surfaces, door hinges, hinge attachments and locking mechanisms shall be subject to magnetic particle inspection (or dye penetrant inspection if fabricated from non-magnetic material).



Any defects shall constitute a basis for rejection.

This provides the Purchaser's inspector with discretionary powers for such important components.

7. SHOP HYDROSTATIC TEST

7.1 The shop hydrostatic test pressure shall be as stated on the Data Sheet.

The shop test shall be at a pressure not less than the test pressure of the installed pipeline.

7.2 The test shall be carried out with clean fresh water, at a temperature not lower than that permitted by [BS 5500](#).

7.3 The duration of the test shall be as stated on the Data Sheet.

It is recommended that the test duration be not less than 1 hour.

7.4 Any gaskets to be supplied with the pig trap shall be replaced with new ones following the hydrotest.

8. SURFACE PROTECTION

8.1 All external non-machined surfaces shall be coated in accordance with the Data Sheet, applicable project specifications or Vendor standard where approved by the Purchaser.

8.2 Machined surfaces shall be suitably coated to prevent corrosion, and be protected against damage during transport, storage and installation.

9. NAME PLATE

9.1 Each pig trap shall be fitted with a name plate with the following information:-

Name of the pipeline in which the trap is installed

Supplier's name

Order number and date

Year of manufacture

MAOP

Maximum and minimum operating temperatures

Test pressure

Weight empty

Class of flange connections



DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory Volume.

Abbreviations

MAOP	Maximum allowable operating pressure
RF	Raised face
RTJ	Ring type joint

LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

BS 1640	Steel butt-welding pipe fittings for the petroleum industry
BS 5500	Unfired fusion welded pressure vessels
BS 5996	Methods for Ultrasonic testing and specifying quality grades of ferritic steel plate.
BS 8010 Part 2.8	Pipelines: Steel for Oil and Gas
BS 8010 Part 3	Pipelines Subsea: Design, Construction and Installation
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ASME VIII Div. 1	Boiler and Pressure Vessel Code
MSS SP-44	Steel Pipe Line Flanges
MSS SP-75	High Test Wrought Butt Welding Fittings
API Spec 6H	Specification on End Closures, Connections and Swivels.
BP Group GS 136-1	Materials for Sour Service to NACE Std 01-75-90 (replaces BP Std 153)
BP Group GS 146-1	Vessels to BS 5500

