

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 501

Hydrostatic testing of pipelines

13	12/2018	General review
12	12/2017	General review
11	10/2015	General review
10	10/2013	General review to match updates of GS EP COR 560
00	10/2006	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/IP/TEC	Managing entity: DSO/IP/TEC/PLR
Other Approving entity(ies):	

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1. Scope

The scope of this General Specification covers the Company requirements for performing the pressure testing of a pipeline system. It applies to liquid or gas pipelines, both onshore and offshore, including their components.

This specification shall be read in conjunction with [ASME B31.4](#), [ASME B31.8](#), [DNVGL-ST-F101](#) and [ISO 13623](#) as applicable.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
API RP 1110	Recommended practice for the pressure testing of steel pipelines for the transportation of gas, petroleum gas, hazardous liquids, highly volatile liquids or carbon dioxide
ASME B31.4	Pipeline transportation systems for liquid and slurries
ASME B31.8	Gas transmission and distribution piping systems
DNVGL-ST-F101	Offshore standard - Submarine pipeline systems
ISO 13623	Petroleum and natural gas industries - Pipeline transportation systems

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP COR 560	Physical and chemical treatment of hydrostatic test water
GS EP EXP 101	Pre-commissioning and commissioning specification
GS EP EXP 103	Pre-commissioning and commissioning engineering and preparation
GS EP EXP 105	Pre-commissioning execution
GS EP EXP 107	Commissioning execution
GS EP PLR 100	Submarine pipeline systems
GS EP PLR 104	Onshore pipeline systems

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Reference	Title
GS EP PLR 502	Pre-commissioning of pipelines
GS EP PVV 211	Design and fabrication of pressure vessels according to ASME VIII

3. Applicability

This specification applies to offshore and onshore applications.

4. Definitions of terms

For the purpose of this document, the following terms and definitions apply:

Commissioning:	All activities performed on the pipeline and components subsequent to Pre-commissioning and prior to the introduction of hydrocarbon products in the pipeline (start up).
Company:	Any entity of the TOTAL Group mentioned in the contract or the order.
CRA	Corrosion Resistant Alloy
Equipment:	Is used for all ancillary items of the Pre-commissioning, not part of the permanent facilities.
ESDV	Emergency Shut Down Valve
Golden weld:	A weld which has not been pressure tested, and is therefore subject to additional non-destructive testing.
Leak test:	A pressure test performed on completion of installation work to test the pipeline system for tightness.
MAOP:	Maximum Allowable Operating Pressure.
MEG:	Mono Ethylene Glycol
MSL:	Mean Sea Level
NDT:	Non-destructive testing
Operator:	Entity of the Company who will receive the installations after Pre-commissioning and will operate them with a view to commercial production.
PPS:	Particular Project Specification gives the specific requirements for execution of the work, subject of a contract.
Pipeline System:	The pipeline system is used for the transport of products. It can be onshore or offshore, and extends generally from pig trap to pig trap, including: • Risers and their supports, when they exist • All permanent items, such as header, piping, pig trap, valves, isolating joints, etc., when they exist.

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The system battery limits are identified in the PPS.

Pre-commissioning: All tasks and operations performed on the pipeline subsequent to the pipeline construction and prior to commissioning activities.

PSV: Pressure Safety Valve.

ROV: Remotely Operated Vehicle

SRB: Sulphate Reducing Bacteria

Start up: All tasks and operations performed on a pipeline system which concern the initial introduction of hydrocarbon fluids in the pipeline system.

Strength test: A pressure test which aims at demonstrating the integrity of welds and material, as required by the design code for establishing the design pressure or the MAOP.

Test Pack: All the documents required by this specification and the PPS.

UHB: Upheaval Buckling

5. General

The land pipelines, the submarine pipelines and their risers, shall be hydrostatically pressure tested as soon as practicable after completion of construction, installation and all anti-corrosion works. This pressure test shall be performed with water or suitable liquid; use of gas medium is not acceptable, for safety reasons.

Hydrostatic testing may require local authority approval, PPS shall be adapted to ensure full compliance with local rules or regulations.

Based on PPS, local regulations and design code requirements, two hydrostatic pressure tests shall be performed:

- **Strength test:** this hydrostatic pressure test is used to demonstrate the integrity of welds and establish the operating pressure limit of a pipeline segment or component. Typically, the test pressure ratio is higher than for leak test, although these tests may be combined. The values of pressure and minimum duration are given in the design code, PPS and/or local regulations, but shall not be less than 8 h.
- **Leak Test:** this pressure test is used to determine the tightness of a pipeline system. The test pressure ratio is generally lower than for a strength test, although these tests may be combined. Typically, the leak test is performed on the complete pipeline system, from pig trap to pig trap, after each of its components has been strength tested and assembled, with a special attention paid to tie-in flanges, mechanical connectors, valves, etc. The values of pressure and minimum duration are given in the design code, PPS and/or local regulations, but shall not be less than 8h. This leak test is required in all cases, including if not referenced in the design code, unless golden welds or specific short section testing equipment, such as internal flange tester tool, is used. In some specific cases, this test can be performed with gas medium, on limited volumes (flange and connector internal testing for example). Typical back-seal test shall not be considered as replacement of leak test.

The Leak Test and Strength Test are also to comply with the requirements stated in **GS EP PLR 100** and **GS EP PLR 104**.

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The pressure test is the second phase into the Pre-commissioning sequence, and is performed just after the flooding, cleaning and gauging operations.

The remaining Pre-commissioning activities are described in [GS EP PLR 502](#).

The typical sequential phases of Pre-commissioning are:

- Phase 1 - Flooding and initial cleaning of the pipeline
- Phase 2 - Strength test / leak test of the pipeline
- Phase 3 - Cleaning of the pipeline
- Phase 4 - Dewatering and optional swabbing
- Phase 5 - Drying and flushing the pipeline
- Phase 6 - Stabilisation at the final dew point
- Phase 7 - Filling with nitrogen.

The first two phases are performed as per this document, while the following phases are described in [GS EP PLR 502](#). Phase 3 is described partly in the present document and partly in [GS EP PLR 502](#). Phases 4, 5, 6 and 7 shall be done in accordance to [GS EP PLR 502](#).

The overall pre-commissioning sequence shall comply with section 9 of [GS EP EXP 105](#), in particular for the use of test sheets.

In the case of an offshore pipeline, the following shall be completed prior to the pressure tests:

- As-built survey, to verify that the pipeline has been laid within the specifications for route, alignment, pipeline crossings, length of free spans, etc.
- Freespans, corrected to acceptable length.

In the case of buried pipeline, Upheaval Buckling (UHB) mitigation work shall be completed prior to the pressure test.

The different test sections may be connected by golden welds, if accepted by Company. The number of golden welds shall be kept to the minimum and shall be limited to two (2) at each end of the pipeline.

The golden weld location is imposed by the sectioning linked to the profile of the line, or by specific requirements for keeping the pipeline valves out of the pre-commissioning activities.

The golden welds shall be 100% inspected by radiography, ultrasonic testing and magnetic particles and the connecting spool shall have been pressure tested to the PR requirements prior to be welded in place.

5.1 Strength test

The pipeline may be strength tested as separate sections, provided the sections are isolated from each others, but the test shall never be performed against closed in-line valve.

The pipeline in-line valves shall be kept out of the pressure test / pre-commissioning sequence, to avoid damages to their internals by debris. The pipeline sectioning shall therefore take into account the valve location, either by replacing the valve by a testing spool, or by testing separately the sections on either side of the valve.

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In the particular case of branches with small sizes valves, they can be included in the pressure test in closed position, provided their rating and body construction is suitable for the test pressure.

When the valves cannot be easily removed, as for subsea valves, derogation from Company shall be obtained, with adequate mitigation measures: precautions taken not to damage the valves, such as pipeline cleaning to be performed before the valves are installed, valves cavities filled with MEG gel and valves not operated until the pre-commissioning is completed. Flushing of the seats should also be considered, if the valve was designed for it.

Temporary items, such as pig traps and temporary spool pieces, shall be designed, constructed and tested for the test pressure as per **GS EP PVV 211** requirements and shall have been pressure tested separately, in the fabrication yard.

5.2 Leak test

When different sections of the pipeline are tied-in, a final pressure test may be performed on the complete pipeline system, typically from pig trap to pig trap, to check the tightness of the pipeline system:

- The applied leak test pressure shall be in accordance with the design code, as set in the PPS.

It should be conducted before water disposal of the main pipeline section and re-installation of valves.

All flanges / connectors of the pipeline system shall be leak tested. Considering the numerous configurations possible, agreement of Company shall be obtained for the leak test strategy, in particular:

- If the flange / connector is located close enough to an access point, the leak test can be made locally using an internal flange tester tool.
- If the flanges / connectors is subsea, the connection can be monitored by ROV for presence of dye in the surrounding water.
- When a closed in-line valve is in the pipeline system, with the associated risk of internal passing, instead of monitoring the pressure, each connection can be inspected for leakage while pressure is maintained at the required value by pumping.
- Some pipeline system sections may be designed either to pipeline or piping codes (typically pig launchers / receivers, section between ESDV and pig trap, slug catchers).

After all sections have been successfully strength and leak tested as per design code requirements, flange / connector leak testing shall be performed as part of commissioning activities.

Flange / connector leak testing shall be performed as per **GS EP EXP 107**.

Commissioning of ancillary equipment (PSV, instrumentation, ESDV actuator, etc.) are not the purpose of this document.

They shall comply with the requirements stated in the **GS EP EXP 101**, **GS EP EXP 103** and **GS EP EXP 107**.