

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 502

Pre-commissioning of pipelines

08	10/2015	General review
07	06/2013	General review to match updates of GS EP COR 560
06	01/2012	General review
05	01/2011	General review
00	02/2001	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/TEC

Managing entity: DSO/TEC/PLR

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1. Scope

This general specification gives the requirements of Company for the Pre-commissioning of pipelines in term of cleaning, dewatering and drying the pipeline, if so required.

The Pre-commissioning will start at the end of construction activities and will allow the subsequent commissioning and start-up of the pipeline, without risk of internal corrosion, hydrate formation or fluid contamination.

This specification applies to all pipelines, transporting gas or liquid, either onshore or offshore, in carbon steel with or without internal coating. For CRA or cladded/lined pipelines, additional requirements are set for in Appendix 6.

This general specification must be completed by a PPS, which detail the activities to be performed and the acceptance criteria of each of the Pre-commissioning phases. In particular, the PPS will define if pipeline is to be dried or not.

2. Reference documents

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

All work specified in the present document must be in conformance or in accordance with the following codes and regulations.

In addition, the Contractor must perform his work in accordance with the PPS requirements.

External Documents

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

Reference	Title
ASME B31.4	Pipeline Transportation Systems for Liquid and Slurries
ASME B31.8	Gas Transmission and Distribution Piping System
DNV-OS-F101	Submarine pipeline systems

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

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
GS EP EXP 105	Pre-commissioning Execution
GS EP EXP 107	Commissioning Execution
GS EP EXP 311	Plant integrity - Minimum inspection requirements
GS EP PLR 100	Submarine pipeline systems
GS EP PLR 104	Onshore pipeline systems
GS EP PLR 501	Hydrostatic testing of pipelines

3. Definitions

In the present specification, and for its application, the following definitions will be used:

APR	Applicable Prime Reference, is the main pipeline design code used.
PR	Prime Reference, is the pipeline design code that could be used.
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).
CRA	Corrosion Resistant Alloy.
Equipment	Is used for all ancillary items of the Pre-commissioning, not part of the permanent facilities.
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.
May	Is used to indicate that a provision is optional.
MEG	Mono-Ethylene Glycol.
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.

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PPS	Particular Project Specification gives the specific requirements for execution of the work, subject of a contract.
Pipeline System	The pipeline is a section of a system or the entire system, used for the transport of hydrocarbon products. It can be onshore or offshore, and pipeline system extends from pig trap to pig trap, including: • Risers and their supports, when they exist • Rigid or flexible jumpers and spools • All permanent items, such as header, piping, pig trap, valves, isolating joints, flanges, mechanical connectors, etc., when they exist. The system battery limits are identified in the Particular Project Specification.
Pre-commissioning	All tasks and operations performed on the pipeline subsequent to the pipeline construction and prior to commissioning activities.
PSV	Pressure Safety Valve.
Start up	All tasks and operations performed on a pipeline system which concern the use 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 PR for establishing the design pressure.
Shall	Is used to indicate that a provision is mandatory.
Should	Is used to indicate that a provision is not mandatory, but is recommended as good practice.
Test Pack	All the documents required by this specification and the PPS.

4. Pre-commissioning philosophy

4.1 General

In all that follows, it will be assumed that the pipeline has been flooded, cleaned, gauged and pressure tested (see [GS EP PLR 501](#)) and was left full of treated water as per [GS EP COR 560](#) requirements. It may remain in this condition for a certain time, though generally not more than six months for carbon steel.

The dewatering / drying operations will generally start immediately after the pressure test, or just before the Commissioning/Start-up, based on PPS requirements.

In case of conflict in requirements between this general specification and the PPS, the latest shall prevail.

In order to protect the in-line valves during the pigging operations associated with cleaning/dewatering, those valves shall have been removed prior to the water fill for the hydrotest. Similarly, no pigging associated with cleaning/dewatering shall be performed with the pipeline in-line valves in place. They shall have been replaced by dedicated spool pup pieces, or alternatively, the cleaning/dewatering activities shall be performed separately for the different pipeline sections and these sections then tied in by golden weld prior to the drying phase (see

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Appendix 1). The pipeline isolation valves shall be re-installed in the pipeline prior to the final drying.

The only exception is for subsea valves, where the removal and reinstallation of valves is not practical. In this case, the valve cavity shall be filled with glycol gel or equivalent (to be approved by Project valve specialist), before installation subsea, and the valve shall not be operated during all the Pre-commissioning, in order to avoid debris entrapment in the seals.

It should be noted that the effectiveness of pigging, and therefore of cleaning, dewatering and drying activities, is dependent on the condition of the inner pipe wall surface: to be efficient and meet the cleanliness acceptance criteria, each pipe joint shall be cleaned individually before welding on-line.

Gas export pipelines shall be internal coated, as per **GS EP PLR 100** and **GS EP PLR 104**, to:

- Minimize the corrosion/deposits during storage and therefore the amount of corrosion products in the pipeline
- Improve the performance of the dewatering/drying process
- Limit the quantity of debris left in the pipeline in operation, which will impact intelligent pig run, may damage the in-line valves and interfere with Operations.

All the products to be introduced in the pipeline during the Pre-commissioning:

- Shall be free from oil and contaminants (compressors to be fitted with oil filters)
- Nitrogen gas used shall comply with the maximum oxygen content stated in section 7.2.1.7 and Appendix 6 of this present document
- Methanol, glycol, etc. shall have a purity of 99% minimum
- Their temperature when introduced in the pipeline shall be between 0 and 50°C, or limited by the pipeline design temperature.

All the measurements and acceptance criteria shall be in SI units and pressure shall be in bar.

Base line survey using an ILI pig (In Line Inspection) should be run during the dewatering phase, as per the **GS EP EXP 311** requirements. For gas pipelines, it is generally a MFL pig (Magnetic Flux Leakage), so as to be compared in the future with records in operation. For a liquid pipeline, both types of ILI pigs are suitable (MFL or ultrasonic). As a minimum base line, a calliper pig shall be run after the tie-ins, either in phase 3 or 4 (see section 4.2 of this document).

Commissioning activities of a pipeline system are limited (valves Commissioning) and are not covered by this GS. Those shall be carried out as per **GS EP EXP 101**, **GS EP EXP 103** and **GS EP EXP 107**. Pipeline Pre-commissioning standard test and check sheets in **GS EP EXP 105**, shall be used.

4.2 Pre-commissioning phases

The typical sequential phases of Pre-commissioning are:

- Phase 1 - Flooding and initial cleaning of the pipeline (in [GS EP PLR 501](#))
- Phase 2 - Strength test / leak test of the pipeline (in [GS EP PLR 501](#))
- Phase 3 - Cleaning of the pipeline (initial cleaning in [GS EP PLR 501](#))
- Phase 4 - Dewatering and optional swabbing (when required)
- Phase 5 - Drying and flushing the pipeline (when required)
- Phase 6 - Stabilisation at the final dew point (when required)
- Phase 7 - Filling with nitrogen (when required).

The first two phases will be performed as per [GS EP PLR 501](#), while the following phases are described in the present document. Phase 3 is described partly in [GS EP PLR 501](#) (initial cleaning during flooding) and partly in the present document. Activities in phase 4 to 7 are project specific and described in the PPS.

The strength and leak tests in phase 2 shall also follow the requirement of the **APR**, either [ASME B31.4](#), [ASME B31.8](#) or [DNV OS-F101](#).

4.3 Pre-commissioning strategy

The Pre-commissioning is a complex activity, involving numerous steps, equipments, measurements and acceptance criteria. As such, a Pre-commissioning strategy has to be prepared sufficiently in advance by Contractor, listing the following:

- Programme of work, with list of sequence of activities and corresponding planning
- Organisation chart of Contractor, with names and CV of key personnel, and list of Sub-Contractors with their scope
- List of interfaces in the project, with lines of communication
- Risk analysis and corresponding contingency/emergency plans and procedures
- Procedure for each activity, with its description, list and layout of equipment, required personnel, pre-requisites to be completed, certification records of equipment, calculations, record and approval forms
- Quality plan, listing all the points (Hold, Witness or Monitoring) where Company representative will be involved
- The range and accuracy of all the instruments shall follow the requirements in 9.

This Pre-commissioning package shall be approved by Company before any site activity can be started.

4.4 Safety

The risks associated with the Pre-commissioning activities must be assessed and mitigated beforehand.

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In particular, the following points are to be addressed:

- Equipment, pipeline under pressure (positive or negative) shall be isolated by locking devices and warning tapes, preventing unauthorised access / operation
- Handling of chemical
- Risk associated with vacuum operations
- Disposal of contaminated liquids, sludge's or solids shall be managed in an environmentally sound manner and in compliance with local regulations
- Noise emission levels shall be kept as low as possible
- All equipment, shall have been inspected, tested and if necessary certified
- The test cabin shall be located at 10 m minimum from pipeline.

5. Pipeline Cleaning

5.1 General

Cleaning is not limited to the pigging activity: to be efficient and meet the cleanliness acceptance criteria, it is essential that each pipe joint is cleaned individually before and after welding on-line.

The extent of the cleaning operation and the number of pig run will be adjusted, based on the quantity of debris obtained or estimated by Company, when the pipeline is initially filled (see [GS EP PLR 501](#), section 7). Use of a Debris Mapping pig may be specified by Company in the PPS, when cleanliness of the pipeline is critical.

As a general rule, the cleaning programme includes one of the following combinations of processes:

- Mechanical cleaning with brush pigs or foam pigs, coated with brushes. If the pipeline is flow coated, soft brushes are to be used. In addition, the cleaning pigs are to be fitted with magnets, to collect metallic debris.
- Hydraulic cleaning with jetting effect pigs, and/ or special cleaning gels
- Combination of mechanical cleaning and/or hydraulic cleaning using various scraper pigs and treated seawater.

Initial cleanliness results during the initial flooding (phase 3) must be carefully recorded, so that the cleaning process could be adjusted phase 4 to achieve the acceptance cleanliness criteria.

Pig shall be capable to pass through the pipeline, including minimum bore tolerance on pipe and bends.

For long pipelines (> 300 km), or for pipe ID variations, the use of solid gel slugs to seal around the pigs may be considered.

The gel slugs shall be compatible with the other fluids used during Pre-commissioning and with future operation of the pipeline. A procedure shall describe the gel characteristics and its instructions for use.