

GENERAL SPECIFICATION

CORROSION

GS EP COR 560

Physical and chemical treatment of hydrostatic test water
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10	10/2015	Extension of limits of use of sea water with CRA pipelines without treatments
09	05/2015	Organisation change – January 2015
08	09/2013	Removal of all treatments based on quaternary ammonium. Adjustment of exposure times to non treated waters to CRA pipelines. Inclusion of possible UV treatments
06	01/2012	Application restricted to pipelines. Major modifications of applicable treatments
00	02/2001	First issue
Rev.	Date	Purpose of the revision

Owning entity: DSO/TEC	Managing entity: DSO/TEC/COR
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1. Scope

This document defines the minimum requirements for physical and chemical treatments of water used for hydrostatic testing of pipelines as per **GS EP PLR 501**. It does not cover the treatment requirements for the dewatering and drying phases following the hydrotest, which are fully included in **GS EP PLR 502**.

2. Application

It applies to all production and injection pipelines whatever the fluid contained in service and can be extended to subsea manifolds as they are often included in subsea loops. On the other hand it does not apply to surface piping, vessels tanks, subsea jumpers and christmas-tree.

It is limited to treatments required to prevent:

- Corrosion of materials during pressure testing, or after resuming operations, due to the presence of this water
- Massive contamination of the tested equipment by bacteria, which are likely to remain in the circuits after dewatering, in any case where these bacteria may have any further detrimental effect.

It does not cover specific pipeline treatments such as cleaning, decontamination, long term preservation, drying...

It complements **GS EP PLR 501** for the sole part of physical and chemical treatments of hydrotest waters (§ 7.1).

3. 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 supplements, is the latest revision published at the effective date of this document.

Reference	Title
Not applicable	

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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 PLR 501	Hydrostatic testing of pipelines
GS EP PLR 502	Precommissioning of gas pipelines

4. Treatment required

4.1 Water qualities

The following waters can be considered for pressure testing:

- Potable water, either from natural sources or dedicated processes,
- Water from wells or open laguna
- Sea water from open seas.

The use of the following waters shall be avoided unless no other possibility exists:

- Brackish water
- Water from shallow lakes, ponds, rivers, closed laguna
- Sea water from harbours.

If there are no other possibilities than to use one of these waters, they shall be subjected to reinforced filtration and anti-bacterial treatments and to the approval of Company.

4.2 Physical treatment

4.2.1 Filtration

Unless otherwise specified, all the water used shall be filtered to a maximum particle size of 50 µm before use.

4.2.2 Water pumping

Unless incompatible with the water depth, the water shall be pumped at a depth below 20 m from surface and above 15 m from bottom. *This aims at minimizing in the water the amount of solid particles, bacteria and organic carbon acting as nutrients for micro-organisms.*

A filtration to 25 µm shall be done if these criteria cannot be fulfilled.

4.3 Chemical treatment

Applicable chemical treatments may consist in one or several of the following solutions, depending on the material of the pipeline, its function and the fluid it will contain, the

temperature of the hydrotest water and how long the hydrotest water is maintained inside the pipeline:

- Treatment 1: Biocide treatment only
- Treatment 2: Oxygen scavenger treatment
- Treatment 3: Dual oxygen scavenger and biocide treatment
- Treatment 4: Chloride control
- Treatment 5: pH control of the water
- Treatment 6: Chlorination.

Specifications applicable to these six treatments are given in Appendix 1.

4.3.1 Choice of the base case treatment

Among the six treatments listed here above, Table 1 here after defines the base case one to be used, depending on the pipeline type and its inner material. As "base case" treatments they shall be applied by default, unless additional conditions defined in the following paragraph allow simplifying/ modifying them under specific conditions.

Table 1 - Base case treatments

Type of pipe & Inner material	Treatment mode	Comments	Alternate or modified solutions
Rigid, C Steel	3	Considering sea water or utility water	See § 4.3.2.1
Rigid, CRA	4	No sea water permitted	See § 4.3.2.2
Flexible, CRA carcass	4	No sea water permitted	See § 4.3.2.3

4.3.2 Alternate or modified treatments

In the following sub-paragraphs, alternate or modified treatments from those defined in Table 1 are defined in order to simplify field operations, under specific conditions regarding either:

- The total duration of the exposure with the hydrotest fluid
- The fluid which the pipeline is expected to transport during its field life (e.g. gas, oil, water...)
- The maximum temperature which the pipeline is expected to experience during its hydrotest.

Duration of exposure: This estimated maximum duration must include all possible planning contingencies such as operational delays related to drilling or installation operations. The end of exposure is the time when the hydrotest water is dumped out of the pipeline and replaced by an inert fluid with respect to corrosion modes prevented by the hydrotest fluid (e.g. replacing a treated sea water used as hydrotest water by a fresh non treated sea water does not represent the end of exposure).

Transported fluids during service life: The pipeline(s) under consideration shall be classified either as:

- **MIC susceptible:** Pipelines classified as such are those which are susceptible to experience Microbial Induced Corrosion (MIC) during their service life, i.e. requiring prevention of bacterial contamination from the hydrotest water. Included in this category are normally but not strictly restricted to: oil export pipelines, oil- water pipelines, multiphase oil pipelines, produced water pipelines, water injection pipelines, wet gas-condensate pipelines likely to contain reservoir water.
- **No MIC:** Pipelines classified as such are those which are not significantly susceptible to experience Microbial Induced Corrosion (MIC) during their service life, i.e. not requiring prevention of bacterial contamination from the hydrotest water. Included in this category are in general: Dry gas pipelines, wet gas - condensate pipelines only susceptible to transport condensed water, wet gas pipelines downstream a gas- liquid separation or downstream a compression process, gas-lift and gas injection pipelines, Methanol and glycol pipelines, condensate export pipelines.

The classification shall be submitted to Company's approval.

Maximum temperature during the hydrotest: This temperature is the stabilized maximum temperature during the hydrotest period, due to either the maximum sea water temperature if fully immersed, the maximum soil temperature if fully buried or the maximum temperature of the aerial section, if any. No transient temperature due to water filling or any other temporary condition is considered.

4.3.2.1 Alternate or modified treatments for C Steel pipelines

Table 2 defines alternate treatments which can be applied instead of the base case treatments if particular conditions of temperature, MIC susceptibility and duration are fulfilled.

Table 2 - Alternate treatments for C Steel pipelines

MIC susceptibility?	Duration < 1 month	1 to 6 months	>6 months
MIC susceptible	Treatment 6	Treatment 6	Treatment 3
No MIC & T ≤ 15°C	No treatment	No treatment	Treatment 2 or 5
No MIC & T > 15°C	No treatment	No treatment	Treatment 3 or 6

Additional modifications/ relaxation can also be envisaged on a case by case basis and subject to Company approval in specific conditions described here after:

- **Removing the oxygen scavenger treatment, i.e. cancelling treatment 2 or moving from treatment 3 to 1:** This situation is acceptable if the following conditions are all fulfilled:
 1. No stainless steel section is present along the pipeline
 2. No internal coating present inside the pipeline
 3. The process downstream of the pipeline is not susceptible of being disturbed by iron oxide particles which may be formed inside the pipeline: As a base case an acceptable