

GENERAL SPECIFICATION

CORROSION

GS EP COR 250

**Friction-reduction internal coatings for pipelines
transporting non-corrosive gases**

03	10/2012	Internal coating is compulsory in dry gas trunk lines
02	10/2008	Minor changes
01	10/2005	General review – Addition of "EP" root to GS identification
00	10/2003	First issue
Rev.	Date	Purpose of the revision

Owning entity: DEV/TEC

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Friction-reduction internal coatings for pipelines transporting non-corrosive gases		
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1. Scope

This specification covers requirements and methods of tests for liquid epoxy paints and internal coatings of such paints in pipes and fittings for the conveyance of non corrosive gas. It also deals with the application and inspection of the paint. Other paints or paint systems are not excluded provided they comply with the requirements given in this specification.

The coating consists of one layer, which is normally shop applied on blast cleaned steel by airless spray or conventional spray techniques. **The applied and cured paint film must be smooth to give the desired reduction in friction. To that respect and if needed, more specific requirements will be documented for each project leading to more stringent application procedure (with regards to surface preparation and/or dry film thickness).**

Brush application shall be used only for repairs. Unless otherwise agreed, the coating shall be suitable for operating temperatures between –20°C and +110°C.

The present general specification makes reference to and fully endorses the [ISO 15741](#), with the restrictions listed below.

Internal flow coating in dry gas trunk lines is mandatory (ref [GS EP PLR 100](#) and [GS EP PLR 502](#)) for the following reasons:

- Reduce internal corrosion in the pipeline during transport and storage and thereby reduce the amount of particles which can create production upsets during start-up
- Improve the dewatering and drying process
- Improve flow rates by reducing the friction

For other types of dry gas pipelines, such as for instance gas injection pipelines, internal flow coating may be applied.

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

Reference	Title
ASTM D4940	Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives
ISO 15741	Paints and varnishes : Friction-reduction coatings for the interior of on and off shore steel pipelines for non corrosive gases
ISO 2409	Paints and varnishes - Cross cut test
ISO 2431	Paints and varnishes - Determination of flow time by use of flow cups

Reference	Title
ISO 2808	Paints and varnishes - Determination of film thickness
ISO 2815	Paints and Varnishes - Buchholz Indentation Test
ISO 6860	Paints and varnishes Bend test (conical mandrel)
ISO 8501-1	Preparation of steel substrates before application of paints and related products - Visual assessment of surfaces cleanliness - Part 1: Rust grades and preparation grades of uncoated substrates and steel substrates after overall removal of previous coatings
ISO 8502-3	Preparation of steel substrates before application of paints and related products - Tests for the assessment of surface cleanliness - Part 3: Assessment of dust on steel surfaces prepared for painting (pressure sensitive tape method)
ISO 8503 (Parts 1; 2; 4)	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast cleaned steel surfaces - - Parts 1; 2; 4

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 PLR 100	Submarine pipeline systems
GS EP PLR 502	Precommissioning of gas pipelines

3. Terms and definitions

As per ISO 15741.

4. Coating materials

As per ISO 15741

In order to get CY approval, a full qualification dossier shall be submitted to CY for approval at an early stage. This dossier shall include all tests references within ISO 15741, plus track record and field proven experience of the coating. Coatings with no field experience will not be accepted.

4.1 Resistance to gas pressure variations

As per ISO 15741 except that the adhesion value shall fulfil the requirements as given in 4.3.4 after conditioning for 24, 48 and 72 hrs at 18 to 25°C and lower or equal to 80% RH.

4.2 Resistance to water immersion

As per [ISO 15741](#) with the following additional requirements:

In complement, after removal from the chamber and then after conditioning for 24 hrs at 23°C +/- 2°C, the coating shall have an adhesion value conforming to paragraph 4.3.4 of the ISO standard.

5. Application of the coating material

As per [ISO 15741](#), except for the following paragraphs:

5.1 General

During application of the coating material, all steps in the coating process shall be assessed and recorded. The parameters listed in Table 1 shall be included:

During the PQT, all process parameters shall be recorded. They shall then be checked during production and remain within 5% of PQT parameters.

Of special interest here is the pipe travel speed for blasting and coating process. This shall be strictly monitored to fall within the above mentioned requirement.

Table 1: Minimum items to be checked and recorded during coating process

Items	Method	Frequency	Acceptance criteria
Coating material			
Name of product	Visual examination	Once per shift	As specified
Name of manufacturer	Visual examination	Once per shift	As specified
Batch number	Visual examination	Once per shift	As specified
Surface condition prior to surface preparation	Visual examination	Every pipe	As specified
Surface condition after surface preparation			
Surface cleanliness	ISO 8501-1	Every pipe	As specified
	ISO 8502-3	Twice per shift	As specified
Surface profile	ISO 8503-1	Twice per shift	As specified
Salt contamination	ISO 8502-6 & 8502-9	Once per shift	As specified
Surface imperfections (dents, laps...)	Visual examination	Every pipe	Subject to agreement
Wet paint (mixed)			
Viscosity and temperature	ISO 2431	Every time paint is mixed and every	As specified

Items	Method	Frequency	Acceptance criteria
		time painting is interrupted	
Environmental conditions in the painting area			
Ambient temperature	Instrumental	Continuously	As specified
Steel temperature	Instrumental	Twice per hour	As specified
Relative humidity	Instrumental	Continuously	As specified
Dew point	Instrumental	Once per shift	As specified
Cured paint film on pipes			
Appearance and continuity	Visual examination	Every pipe	No sagging
Dry film thickness	ISO 2808:1997, method 10	3 per shift	As specified
Porosity (pinholes)	Wet sponge test Annex G of ISO 15741	The test shall be carried out only if porosity test on glass panels constitute a failure	As specified
Cured paint film on steel panels			
Adhesion	ISO 2409	3 per shift	Classification lower or equal to 1
Bend test	ISO 6860	3 per shift	No loss of adhesion
Buchholz hardness	ISO 2815	3 per shift	Hardness higher or equal to 94
Curing test	Annex F of ISO 15741	3 per shift	No softening, wrinkling, blistering
Paint film on glass test panel			
Porosity (pinholes)	Annex E of ISO 15741	3 per shift and every new batch	Max 5 pores

5.2 Surface preparation

First check that the surfaces are free from any foreign matter such as welding flux, welding spatter, salts, oil or grease. If necessary, wash the surfaces with a high pressure jet of fresh water. Remove organic contaminants using detergent or suitable organic solvents.

Salt contamination shall be checked as per ISO 8502-6 and ISO 8502-9. Salt content shall not be higher than 2 micrograms per square centimetre.

Then blast clean the surfaces to surface preparation grade Sa 3 in accordance to ISO 8501-1.

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Remove, using suitable methods, any surface irregularities or imperfections which may have become visible.

The dust level shall be 2 maximum as per [ISO 8502-3](#).

Check the surface profile. Unless otherwise agreed, it shall correspond to “G medium” as per [ISO 8503-2](#). No values of Ry5 measured as per [ISO 8503-4](#) shall be lower than 40 microns. The use of replica tape to assess the roughness is not allowed. At start of production, cleanliness and salt contamination of abrasives shall be checked as per [ASTM D4940](#): Conductivity shall be lower than 1000 microSiemens/cm and no oil visible after 30 minutes. No Silica grit is allowed.

During and after blast cleaning and prior to application of the coating material, the temperature of the steel surface shall be at least 3°C above the dew point or the minimum curing temperature given by the coating material manufacturer, whichever is the highest.

6. Production control

As per [ISO 15741](#) with frequency reported in table 1.

7. Repairs

As per [ISO 15741](#).

8. Handling, transporting and storage

As per [ISO 15741](#).

9. Annexes

Refer to [ISO 15741](#) (annexes A to G apply).