

DEP SPECIFICATION

BITUMINOUS ENAMEL COATING OF STEEL LINEPIPE

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DESIGN AND ENGINEERING PRACTICE



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the factory application of hot-applied, external, bituminous enamel coating to linepipe and includes the material, application, inspection, repair, handling and storage requirements. Bituminous enamel coatings may be based on conventional "oxidised bitumen" or "modified bitumen".

Bituminous enamel coatings may be used for the corrosion protection of subsea steel pipelines that are to be concrete weight-coated, for buried landfall sections of a pipeline, and for onshore buried pipelines.

Oxidised bitumen enamel is suitable for use when the design temperature of a subsea pipeline does not exceed 70 °C (160 °F). It may also be used for buried landfall sections of a pipeline provided that the pipeline temperature does not exceed 60 °C (140 °F). It is suitable for use at temperatures down to -10 °C (14 °F).

Modified bitumen enamel is suitable for use when the design temperature of the line does not exceed 90 °C (194 °F). It is suitable for use at temperatures down to -20 °C (-4 °F).

Bituminous enamel coatings are not suitable for pipelines that pass through locations that have been or are likely to be contaminated by fuel spillages, e.g., aviation fuel. Bituminous enamel coatings are not suitable for pipelines that are to be laid by reel barge.

This DEP is based on the European Standard BS EN 10300 and AWWA C203.

This is a revision of the DEP of the same number dated October 2001; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorisation to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Batch	The amount of materials produced during one uninterrupted production run of maximum 8 hours under constant production conditions.
Bitumen	A very viscous liquid or a solid, consisting of hydrocarbons and their derivatives, which is soluble in carbon disulphide or trichloroethylene. It is substantially non-volatile and softens gradually when heated. It is black or brown in colour and possesses waterproofing and adhesive properties. It is obtained by refinery processes from petroleum.
Bituminous Enamel	A coating material which comprises oxidised or modified bitumen and filler (formerly also called "asphalt enamel").
Bleed Through	The process that allows bitumen enamel to pass through the outerwrap to form a mechanical bond between glass fabric and the enamel.
Coating Applicator	The party that applies the bituminous enamel coating system in the coating plant.
Coating Contractor	The party ultimately responsible for the coating operation, which may include supply of coating materials, application of the coating, and transport of uncoated and coated linepipe as specified in the relevant contract. The coating Contractor may be the coating Applicator, the linepipe Manufacturer or the pipeline construction Contractor.
Coating Manufacturer /Supplier	The party that manufactures or supplies materials, equipment and/or services to perform the duties specified by the coating Contractor.
Composite Glass Fabric	One layer of glass fibre tissue and one layer of woven or lock welded glass mesh held together by a binder.
Composite Polyester/ Glass Fabric	A woven polyester/glass mesh with a layer of glass fibre tissue held together by a binder.
Inert Filler	Finely divided mineral powder, which is not hygroscopic, is not electrically conductive, and does not react with other ingredients of the coating material or with the environment in which it will be used.
Innerwrap	An inert porous reinforcement which is intended to be saturated and buried within the bituminous enamel coating in order to improve its mechanical performance.
Modified Bitumen	Bitumen which has been rheologically changed by the addition of a polymer or polymers.
Non-Woven Glass Fabric	A continuous sheet of randomly arranged glass fibres in an open porous structure bonded by a suitable resin and reinforced by continuous longitudinal glass yarns.
Outerwrap	A continuous sheet of reinforced glass fibre fabric or glass fibre/polyester composite fabric impregnated by a suitable bituminous material which is compatible with the bituminous enamel coating and fused into the outer surface to improve its mechanical performance.

Oxidised Bitumen	Bitumen which has been rheologically changed by the action of blowing air through it.
Primer	A material applied as a thin film to metal in order to ensure adhesion of the subsequent protective coating.
Shift	A set of pipes coated in one production run of which the beginning and end coincide with a change in personnel. In the context of the quality control procedures of this DEP, the maximum duration of a shift is 10 hours.
Woven Glass Fabric	A regular woven glass fabric made from glass yarns held together by a binder.

1.3.3 Abbreviations

Term	Definition
ASTM	American Society for Testing & Materials
AWWA	American Water Works Association
BS	British Standards Institution
DFT	Dry film thickness
EN	European Standard
HSE	Health, safety and environment
IR	Infra-red
ISO	International Organisation for Standardization
WFT	Wet film thickness

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets (). Other documents referenced by this DEP are listed in (11).

1.5 SUMMARY OF CHANGES IN THIS DEP

This DEP is a revision of the DEP of the same number dated October 2001. The following are the main, non-editorial changes.

Section	Change
Tables 2a, 2b, 3, and 4	Reference of test methods changed to BS EN 10300 standard from BS 4147, which is now obsolete

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
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DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://sww.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (Other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

2. COATING SYSTEM DESCRIPTION

Bituminous enamel coating system shall be comprised of layers as follows:

a) Primer	Shall be compatible with the bituminous enamel coating
b) Enamel	Comprising a bitumen containing an inert filler
c) Innerwrap	Reinforcing glass fabric wrap (oxidised bituminous enamel only)
d) Outerwrap	Glass fabric wrap (oxidised bituminous enamel only)
e) Solar protection	Weather-resistant material to protect the coating from sunlight
f) Other	In special cases (for example, for onshore use due to the nature of backfill material or for offshore use) additional mechanical protection or a concrete weight coat may be applied by agreement. The type and grade of outerwrap may be influenced by the presence or absence of the additional mechanical protection.

3. INFORMATION TO BE SUBMITTED BY THE PRINCIPAL

The Principal shall submit all technical information to the coating Contractor regarding the project, in particular the installation and operating conditions.

This information shall include the following as a minimum:

- a. project name;
- b. the type of coating required;
- c. the minimum and maximum operating temperature of the pipeline;
- d. the pipeline diameter and wall thickness including minimum required wall thickness;
- e. the applicable linepipe specification;
- f. the geographical area (offshore/onshore);
- g. expected ambient temperatures during installation;
- h. installation method;
- i. soil and backfill conditions for land pipelines;
- j. seabed trenching, laying and burial conditions for sub-sea pipelines;
- k. subsequent coatings to be applied (e.g., weight coating);
- l. requirements for temporary protection of pipe ends;
- m. type(s) of cathodic protection.
- n. extent of Principal witnessing of coating application and quality control.