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Guidance on Practice for Pipeline Coating Selection

GP 06-40

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GP 06-40. This Guidance on Practice (GP) is based on parts of heritage documents from the merged BP companies as follows:

Amoco

A CP-COAT-00-E	Corrosion Protection—Coatings—General—Selection Specification.
A CP-COAT-00-G	Corrosion Protection—Coatings—General—Guide.

ARCO

ES 503	Coatings for Buried Steel Piping.
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Introduction

This Guidance for Practice covers the selection of external line pipe and compatible field joint coatings for new pipelines both onshore and offshore. Coating options for the refurbishment of coatings on onshore pipelines are more limited and are covered by GIS 06-405. For the purposes of this document the term “line pipe” refers to sections of manufactured pipe normally 12 metres (40 feet) in length and usually prepared and externally coated under factory conditions, except for the “cutback” at either end. The coating is stopped short of the pipe ends to facilitate butt welding of adjacent sections of line pipe together without causing coating damage to the line pipe coating. The “field joint” encompasses the butt weld, the cutback area and an area of overlap onto the line pipe coating.

The guidance provided is based upon the experience of BP and other major pipeline operators plus information gathered from a number of documented sources. These documents include; independent test reports, national and international standards, published papers, coating manufacturers’ published data, and private communications.

A significant amount of the guidance provided in this document is based upon the results from laboratory tests, either directly in accordance with, industry, national, and international standards or slight modifications to them to more accurately represent the conditions experienced in practice. It should be borne in mind that the range of external pipeline coatings that are commercially available covers a number of diverse generic types. As many of the test methods are not universally applicable to every available pipeline coating system, the comparative assessments based on the results of these tests alone are subjective. The most reliable testament to satisfactory performance can only be provided by investigation under the specific conditions to be encountered in practice. Such testing and/or the accumulation of reliable on site performance data is expensive and time consuming and has been very limited to date.

It is the responsibility of the reader to ensure that the information used is relevant to his or her specific requirements.



1. Scope

- a. This GP provides guidance for the selection of shop applied and field applied external flowline and pipeline coatings for new construction, hereafter referred to as pipeline coatings. The primary purpose is to prevent external corrosion. Coatings which provide thermal insulation are outside the scope of this document.
- b. This document considers the following line pipe coating systems as they are the ones most widely used throughout BP's pipeline operations:
 1. Coal tar enamel.
 2. Asphalt enamel.
 3. Cold applied tape wraps.
 4. Single layer fusion bonded epoxy.
 5. Dual layer fusion bonded epoxy.
 6. Two layer polyethylene.
 7. Three layer polyethylene.
 8. Three layer polypropylene.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

Deutsches Institut Fur Normung E.V. (DIN)

DIN 30670	Polyethylene coatings of steel pipes and fittings; requirements and testing.
DIN 30678	Polypropylene coatings for steel pipes.

3. Symbols and abbreviations

For the purpose of this GP, the following symbols and abbreviations apply:

C.D.	Cathodic disbondment
FBE	Fusion bonded epoxy
SCE	Standard Calomel Reference Electrode

4. Surface cleanliness and surface preparation

- *The importance of surface cleanliness and preparation standard to the long term performance of a pipeline coating cannot be stressed too highly.*
- *Poor surface preparation quality resulting from either one, or a combination of the following: inadequate removal of dirt and grease, inadequate removal of mill scale and rust, dust contamination, lack of surface profile angularity, etc. is*



the major cause of premature coating failure. This is true regardless of the generic coating type selected and the specific conditions under which the coating is applied.

5. Pipeline coating systems selection

Each pipeline shall be considered on its own individual merits in respect of coating systems selection.

Under normal circumstances, the selection of an external line pipe coating system is influenced by five principle factors:

- *Health and safety.*
- *Resistance to mechanical damage.*
- *Resistance to the operating environment and corrosion protection capability, with specific reference to temperature.*
- *Compatibility between the line pipe coating, the field joint coating, and the coating used on the bends and fittings.*
- *Compatibility of the coating with cathodic protection.*

With the exception of health and safety, which is of paramount importance, these factors are not given in order of priority.

6. Line pipe coatings

6.1. General

The selection of the most appropriate line pipe coating is a first priority to ensure the long term integrity of the pipeline.

Typically the coating applied to the line pipe protects 98% of the external surface of the pipeline; the field joint coating protects 2%.

6.2. Health and safety considerations

Coal tar enamel and asphalt coatings should not be used unless exceptional circumstances exist which mitigate otherwise.

- *At one time, coal tar and asphalt enamels were the mainstay of the pipeline coatings industry. The development of pipeline coatings which are more environmentally friendly and less hazardous during application has seen a dramatic reduction in the use of hot applied enamels over the last 10 to 20 years.*
- *Fumes given off during the heating of coal tar contain polycyclic aromatics which are known carcinogens. These are also present during the heating of asphalt enamels, but to a smaller extent.*
- *Health and safety concerns have led to some countries prohibiting the use of coating products containing coal tar, while a number of leading paint manufacturers have eliminated coal tar from their liquid coating formulations.*

6.3. Resistance to mechanical damage

- a. Many cases of premature coating failure can be ascribed to mechanical damage to the applied coating system and the coating system either going unrepaired or the repair being of substandard quality. The figures for “relative resistance to mechanical damage” are given in Table 1.

