

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

(CORE)

TECHNICAL SPECIFICATION

INTERNAL COATING OF LINE PIPE FOR NON-CORROSIVE GAS TRANSMISSION SERVICE (AMENDMENTS/SUPPLEMENTS TO ISO 15741)

PTS 31.40.30.35

JANUARY 2010



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PTS Circular

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PTS No:	31.40.30.35
PTS Title:	Internal Coating of Line Pipe for Non-corrosive Gas Transmission Service (Amendments/Supplements to ISO 15741)

This revision of PTS 31.40.30.35: External Internal Coating of Line Pipe for Non-corrosive Gas Transmission Service (Amendments/Supplements to ISO 15741) (January 2010, Revision 1) has been updated to incorporate PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. All updates in the document are highlighted in *italic font*.

The previous version of this PTS 31.40.30.35, July 1998 will be removed from PTS binder / e-repository from herein onwards.

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PREFACE

PETRONAS Technical Standards (PTS) publications reflect the views, at the time of publication of PETRONAS OPUs/Divisions.

They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPUs in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardisation.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use PTS they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, it is expected of them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the PTS. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the owner.

The right to use PTS rests with three categories of users:

- 1) PETRONAS and its affiliates.
- 2) Other parties who are authorised to use PTS subject to appropriate contractual arrangements.
- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) and 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

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PART I INTRODUCTION

1.1 SCOPE

This new PTS specifies requirements and gives recommendations for the factory application of internal flow coat to bare or externally coated line pipe for use in single phase gas transmission pipelines with the objective of reducing surface roughness and pressure losses. The requirements for the application of coating to protect against internal corrosion by corrosive transported fluids are outside of the scope of this PTS.

Part II of this PTS provides amendments and supplements to ISO 15741, 2001 and shall be read in conjunction with that document. The clause numbering in Part II of this PTS follows that ISO 15741. Where clauses of ISO 15741 are not amended or supplemented by this PTS, they shall apply as written.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of PETRONAS group and to Contractors nominated by them.

This PTS is intended for use in gas plants and exploration and production facilities.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this PTS 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 with the object of obtaining agreement to follow this PTS as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

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

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor. The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. 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

Applicator - The party which applies the flow coating system in the coating plant

Coating Manufacturer - The party which manufactures the coating materials supplied to the Applicator.

Line Pipe Manufacturer - The party which manufactures or supplies the line pipe to be coated.

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 PTS, the maximum duration of a **shift** is 10 hours.

1.4 ABBREVIATIONS

NDFT Nominal Dry film thickness
WFT Wet film thickness

1.5 CROSS-REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section is shown in brackets. Other documents referenced in this PTS are listed in (Part III).

PART II AMENDMENTS/SUPPLEMENTS TO ISO 15741

1. SCOPE

Delete this clause.

3. TERMS AND DEFINITIONS

3.2 COATER

Delete the existing definition and replace with the following:

Where the term 'coater' has been used in this document it shall be taken to mean Applicator as defined in Part I –1.8.2.

3.3 COATING MATERIAL MANUFACTURER

Delete the existing definition and replace with the following:

The Coating Manufacturer as defined in Part I - 1.8.2

3.8 PAINT

Delete the existing definition and replace with the following:

Where the term 'paint' has been used in this document it shall be taken to mean 'coating', which is defined as:

total coating system, having the properties specified in this PTS.

3.11 PURCHASER

Delete the existing definition and replace with the following:

The Principal, as defined in Part I - 1.8.2.

4 COATING MATERIAL

Change the heading of this clause to:

4. COATING AND APPLICATOR QUALIFICATION

4.1 GENERAL

Add the following:

Before a coating system may be applied in a production run, the Contractor shall submit all the data specified in (4.6) and (4.7) and shall ensure that both the coating system and the Applicator have been qualified in accordance with the procedures in (4.3) and (4.9).

Delete the 6th and 7th paragraphs.

Add new clause:

4.1.1 Coating material qualification

Qualification shall be carried out according to the following procedures.

The Contractor or the coating Manufacturer shall show that samples of the coating system applied on panels of the specified material have been successfully subjected to the tests as specified in Table 6. The tests shall be carried out by an independent and certified test

laboratory or, if approved by the Principal, by the coating Manufacturer. The Principal shall witness the application and the tests.

The number of panels to be tested and the test procedures are also given in Table 6.

If agreed by the Principal, previous qualification data can be used provided that the referred tests have been carried out using the same coating system and the same coating process as specified in the contract.

With the approval of the Principal, tests carried out in accordance with other coating standards may be used insofar as their procedures are the same as or more stringent than the procedures in this PTS. Such information shall include full reports on test procedures and results and be signed by the laboratory representatives and certification body.

4.2.1 General

Delete the existing clause and replace with the following:

The following clauses describe the laboratory test methods and requirements for qualification of the individual coating components.

4.2.8 Infrared spectrograms

Delete the last two words of this clause.

4.2.9 Appearance

Delete this clause.

4.3 PARTICULAR REQUIREMENTS FOR QUALIFICATION OF THE CURED PAINT FILM

Change the heading of this clause to:

4.3 COATING REQUIREMENTS FOR THE QUALIFICATION OF THE APPLIED COATING SYSTEM

4.3.1 Preparation of test panels

Delete this clause and replace with:

Perform the tests specified in 4.3.3 to 4.3.12 on coatings applied to the required film thickness specified in 4.3.3 by spraying onto the test panels (steel or glass). Prepare the glass panels as specified in annex E.

The steel panels shall be grit-blasted to achieve a preparation grade meeting ISO 8501-1 SA 2.5. The surface profile shall be measured in accordance with ISO 8503-2 or ISO 8503-4 and shall be within 25 and 50 μm , unless otherwise agreed. Both the preparation grade and the surface profile of the test panels shall be included in the qualification test report.

Apply the coating in accordance with the instructions of the coating manufacturer.

The number of test panels to be tested are given in Table 6.

4.3.2 Conditioning of test panels

Delete this clause and replace with:

The test panels shall be air dried for 10 days at 25 °C, followed by 24 h drying in a circulating-air oven at 50 °C. Relative humidity during the drying shall not exceed 80 %.

After completing the schedule of conditioning outlined above, panels may be stored at room temperature until needed for testing, but not longer than 90 days.

All testing shall be performed on test panels conditioned according this clause.

4.3.3 Replace heading with: Film thickness

Add the following:

The WFT shall be as specified by the Coating Manufacturer's data sheet for the material, either directly or from calculation to achieve the specified DFT. WFT measurement shall be made in accordance with ISO 2808.

4.3.7 Replace heading with: Resistance to neutral salt spray

Delete the first paragraph and replace with:

The coating applied on steel panels with a dry film thickness of 60 µm to 100 µm and with an X-cut down to the substrate located at least 20 mm from any edge, shall be tested in accordance with ISO 7253 for 480 h.

4.3.7 Resistance to artificial ageing

Delete this clause and replace with:

The test panels shall be aged at 80 °C in a circulating oven for 100 h, followed by conditioning for 24 h at 18 °C to 25 °C and < 80 % relative humidity.

After ageing, subject the test panels to a bend test in accordance with 4.3.8.

Add new clause:

4.3.13 Curing test

The test is carried out on test panels that are immersed for 4 h at ambient temperature in the coating thinner recommended by its Manufacturer.

The coating is considered acceptable if:

- there are no coating blisters (Grade 0 or 1, in accordance with ISO 4628-2) observed on the surface of the coating examined within 3 min of the steel test panel being removed from the thinner;
- there are no wrinkles;
- there is no significant softening (rating from 0 to 2 in accordance with ISO 4628-1) observed 30 min after removal from the thinner.

4.3.14 Appearance

The coating shall be free from blisters, visual holidays, scratches or any other irregularities and shall have a uniform colour and gloss.

4.3.15 Coating roughness

The final cured coating shall have a maximum surface roughness of 10 µm over the specified blast cleaned surface profile. The surface roughness shall be determined in accordance with ISO 4287-1.

4.3.16 Porosity

The porosity of the coating shall be checked on glass panels by the method given in Annex E. The coating shall show no pinholes.

4.4 PACKAGING, LABELLING AND STORAGE

Delete the existing clause and replace with the following:

All material shall be supplied in the Coating Manufacturer's original containers, durably and legibly marked with the description of the contents. This shall include the specification

number, the colour reference number, the method of application for which it is intended, the batch number, date of manufacture, the shelf-life expiry date, HSE guidelines and the Coating Manufacturer's name or recognised trade mark. The storage and preparation of coating materials shall be in accordance with the Coating Manufacturer's instructions.

Different brands or types of coating materials shall be stored separately.

4.7 QUALIFICATION CERTIFICATE

Add the following properties to the table:

- Surface condition (cleanliness, profile) after blasting
- Dry film thickness
- Appearance
- Coating roughness
- Curing

Add new clause:

4.9 APPLICATOR QUALIFICATION

4.9.1 General

Before production application of a coating system may commence, the Applicator shall be qualified to apply the coating system. The qualification shall be carried out according to the following procedures:

4.9.2 Coating process and applicator selection

The Contractor shall submit to the Principal information on the required coating process and recommended applicators. The information shall include:

- description of the coating process for line pipe, bends and fittings;
- pipe cleaning and surface preparation (cleanliness, profile, chemical pre-treatment, etc.);
- required surface and material application temperatures;
- recommended applicators;
- coating repair procedures;

4.9.3 Coating plant

To demonstrate that the available equipment is capable of applying the specified coating according to the required standards, each recommended Applicator shall submit full details of the coating plant, including:

- layout diagram of the coating plant and plant flow scheme;
- general description of the equipment available to carry out the coating process;
- details of process control and inspection equipment required for the coating process such as temperature control, thickness control, holiday testers, laboratory equipment, etc.;
- details on the line pipe marking, handling, storage and transport equipment and procedures;
- Applicator's quality control procedures.

4.9.4 Qualification

With approval of the process and plant details (4.9.2) and (4.9.3) and before production starts, the Applicator shall submit evidence that he has successfully applied the coating system before on pipes of the specified material, and that the product complied with the requirements of this PTS for the tests indicated in Table 6.

The Applicator shall coat at least 5 pipes with the proposed coating system and shall subject samples from these pipes to the tests given in Table 6. These tests may be carried out in the Applicator's own laboratory, or by an independent laboratory. The Principal shall witness the application and the tests. The results of the tests shall be reported to the Principal, signed by the head of the laboratory and the witness.

The tests described in the last column of Table 6 shall be performed on panels which have been attached inside the sample pipes at both pipe ends. The test panels shall be prepared in accordance with (4.3.1).

The test panels shall be fixed on the inside of the pipes or on a temporary pipe extension specifically designed for holding the test coupons using appropriate adhesive tape, at a distance of between 100 mm and 300 mm from the pipe ends; the ground face of the glass panels shall face outwards. The adhesive tape shall overlap the long ends of the test samples by approximately 12 mm.

The test panels shall be removed 10 min after application of the coating on the pipe, with precautions being taken to prevent coating damage. The panel coating shall be dried and cured in an identical manner as the coating applied to the pipe.

When this specification is used for the coating of bends and/or fittings, the Applicator shall coat at least one fitting or bend as agreed with the Principal and subject this coating to the same qualification tests.

TABLE 6 Requirements and test samples required for qualification of coating system and applicator

Property	Requirement and test method	Coating System Qualification on panels	Applicator Qualification on pipes	Applicator Qualification on panels
Cleanliness of blast cleaned surface	5.2	5	5	3
Chloride and dust contamination	5.2	5	5	3
Surface profile	5.2	5	5	3
Appearance	4.3.14	5	5	3
Coating thickness	4.3.3	5	5	3
Porosity	4.3.16	5	5	3
Coating roughness	4.3.15	5	5	3
Bend testing	4.3.8	5		3
Adhesion	4.3.4	5		3
Hardness (Buchholz)	4.3.5	5		3
Curing test	4.3.13	5		3
Salt spray test	4.3.6	5		
Water immersion	4.3.10	5		
Resistance to chemicals	4.3.11	5		
Hydraulic blistering	4.3.12	5		
Resistance to gas pressure variations	4.3.9	5		
Artificial ageing followed by bend test	4.3.7	5		
System identification		Submit to Principal	-	
Manufacturer's data				
Coating process and plant data		-	Approved by Principal	

5. APPLICATION OF THE COATING MATERIAL

5.1 GENERAL

Replace Table 4 with the following table:

Property	Requirement and test method	Minimum frequency
Coating material Name of product Name of manufacturer Batch number		At every change of shift
Environmental conditions during blasting and coating Ambient temperature Steel temperature Relative humidity Dew point	6.1.2	Every 2 h
Surface condition before surface preparation	6.1.3	Every pipe
Surface condition after surface preparation Surface cleanliness Surface profile Surface contamination	6.1.4	Every pipe Three pipes per shift evenly spaced. Tests performed on both ends
Wet paint (mixed) Viscosity and temperature	5.3	Every time paint is mixed and every time painting is interrupted
Testing coating on pipes Appearance Dry film thickness Coating roughness Holiday detection (wet sponge)	 4.3.14 4.3.3 4.3.15 Annex G	Every pipe 10 pipes per shift, evenly spaced Three pipes per shift, evenly spaced a)
Testing coating on panels Adhesion Buchholz hardness Bend test Curing test Porosity (glass panels)	 6.2.2 6.2.3 6.2.4 6.2.5 6.2.6	Three pipes per shift, evenly spaced
a) The wet-sponge test shall be carried out if the porosity tests on glass panels constitute a failure		

5.2 PIPE SURFACE PREPARATION

Delete the existing clause and replace with the following:

Before blast cleaning and application of the coating system, the internal pipe surface shall be free of all surface contamination. Oil, grease, and other contaminants shall be removed, before blast cleaning, by a suitable solvent or detergent. Salt contamination, chemical cleaning agents and remaining detergents shall be washed off using potable water.

The pipe surface shall be cleaned of mill scale, rust and other foreign matter by a blast cleaning or another abrasive cleaning method to achieve a minimum surface cleanliness of Sa 2½ in accordance with ISO 8501-1. For stainless steel pipes, stainless steel abrasives or non-ferrous abrasives shall be used for blast cleaning. The surface profile shall be measured in accordance with ISO 8503-2 or ISO 8503-4 and shall be within 25 µm and 50 µm, unless otherwise agreed. During blast cleaning the pipe surface temperature shall be simultaneously higher than 5 °C and more than 3 °C above the ambient dew point. The ambient relative humidity shall not exceed 85 %.

The maximum residual chloride level on the blast-cleaned surface shall be 20 mg/m², in accordance with ISO 8502-2 or any other method approved by the Principal.

The dust level on the blast-cleaned surface shall be of Class 2 or better in accordance with ISO 8502-3.

Immediately after blast cleaning, all remaining weld spatter and irregularities shall be removed from the pipe surface by chiselling and/or grinding. Any treated surface with an area larger than 25 cm² shall be re-blasted to the cleanliness and roughness as specified above.

No repairs to the pipe shall be made without a procedure agreed by the Principal.

After any grinding or mechanical repairs, the remaining wall thickness shall be checked and compared with the minimum requirements of the code/specification. Pipes not meeting the minimum wall thickness shall be rejected.

Before coating, the pipe surface shall be cleaned from all dust and foreign matter using clean dry compressed air or vacuum cleaning. The compressed air shall be free of any trace of oil.

If heating is employed for pipe drying, the maximum pipe temperature shall be 50 °C. The temperature shall be monitored using digital contact thermometers.

Suitable abrasives shall be selected from those defined in ISO 8504-2. Each batch of abrasive shall be traceable and shall be certified as being in accordance with the appropriate part of ISO 11124 or ISO 11126. Batch certificates shall be available for review by the Inspector. Abrasives without batch certificates shall not be used.

Abrasives may be recycled only when indicated as being suitable for recycling by the abrasive Manufacturer.

Fresh abrasives shall be stored in the original packaging in suitable storage buildings, which will prevent them from becoming damp or contaminated. Damp or contaminated fresh and recycled abrasives shall not be used and shall be removed from the site.

5.3 PAINT PREPARATION

Add the following to this clause:

The Applicator shall batch-test the materials for:

- density, in accordance with ISO 2811;
- non-volatile content (mass), in accordance with ISO 3251 ;
- pigment dispersion (fineness of grind), in accordance with ISO 1524;
- viscosity (mixed), in accordance with ISO 2431.

The values shall be within the ranges specified by the Coating Manufacturer.

If either the Applicator or the Inspector finds the sample to be outside of the material specification, the Applicator shall remove all applied non-conforming coating from the pipe. The pipe shall then be recoated with a verified batch of material.

The sequence of use of the batches of coating materials should be in order in which they were manufactured, i.e. first-in/first-out from the warehouse to coating operation. All coating materials shall be used or discarded prior to the expiration date.

Coating material shall be rejected if any defective or contaminated material is found. The coating material shall be such that it can be easily mixed into a homogeneous state free from skinning, curdling and other irregularities.

Any material which has exceeded its pot life shall be rejected.

5.4 PAINT APPLICATION

Add to the 1st paragraph:

Pipes showing any visible rust or stains shall be blasted again.

Replace the 3rd paragraph with:

Coating application shall not be performed when the relative humidity exceeds 85 %, or when the substrate temperature is less than 5 °C, or less than 3 °C above the determined atmospheric dew point. Substrate temperature shall not exceed 50 °C. In locations with consistent high humidity, the Principal may agree atmospheric criteria based on ISO 8502-4; in which case, continued coating operations shall be subject to the agreement of the Inspector.

Add the following:

Unless a specific accelerated curing schedule is defined in the Coating Manufacturer's data sheet and qualified during laboratory testing, heating shall not be used to accelerate curing of the applied coating.

6. PRODUCTION CONTROL

6.1 ASSESSMENT OF THE COATING ON THE PIPES

Delete the existing clause and replace with the following:

6.1.1 General

During production application of the coating, the Applicator shall carry out all quality control activities needed to ensure that the coating is being applied in accordance with the approved coating application procedures and that the final product complies with the requirements of this PTS.

The minimum quality control tests to be performed shall be as indicated in Table 4. Records of all coating application and quality control test results shall be kept in accordance with (9).

6.1.2 Ambient conditions

The Applicator shall measure the ambient conditions at regular intervals during blasting and coating and keep records of prevailing temperature, humidity and dew point. If the conditions are outside the limits specified in this PTS, the process shall be suspended until the requirements are met.

6.1.3 Inspection of uncoated pipes before blasting

Before surface preparation starts, each pipe shall be visually examined for dents, laps, defective bevels and any other defects to avoid coating unusable pipes. Defective pipes shall be removed from the coating line for repair or, if repair is not possible, rejection.

The pipe surface shall be visually checked for contamination with salts, oil or grease. Contaminated pipes shall be cleaned again.

6.1.4 Inspection after blasting

Each pipe shall be inspected for surface cleanliness. Pipes that do not comply with the requirements of (5.2) shall be rejected and cleaned again.

The surface profile shall be measured on three pipes per shift (evenly spaced) and on the first 5 pipes following each change of blast-cleaning material. If the surface profile is outside the specified limits, the blasting material shall be checked and replaced as necessary. The affected pipes shall be re-blasted.

Three pipes per shift (evenly spaced) shall be checked for chloride and dust contamination on the blasted surface. If the surface is contaminated, the quality of the blast cleaning material and process shall be examined. If the conductivity of the blasting material is greater than 50 $\mu\text{S}/\text{cm}$, the blasting material shall be replaced.

Compressed air for drying and blast cleaning shall be free from water and aerosol oil when tested in accordance with ASTM D 4285. The testing frequency shall be once per day.

6.1.5 Appearance, thickness and holidays

Immediately following coating application, coated pipes shall be visually checked for imperfections and irregularities of the coating, for coating thickness and roughness and if required for the number of holidays. Pipes that do not comply with the requirements shall be marked and removed from the coating line for repair or recoating. If subsequent pipes do not comply with the requirements, the coating process shall be checked or stopped to eliminate the cause of the problem.

The maximum allowable area per repair is 40 cm^2 and maximum 6 repairs are allowed per single pipe. Pipes with damages area larger than the maximum permitted repair areas shall be rejected, stripped and recoated.

Each pipe shall be checked for cleanliness of the pipe ends and for damage to the bevelled ends. Damaged bevels shall be repaired by means of procedures approved by the Principal.

6.2 ASSESSMENT OF THE COATING ON STEEL PANELS

Add the following to this clause:

6.2.1 General

Three test panels per shift, from the start, middle, and end, shall be prepared and evaluated. Each test shall be performed at least twice.

6.2.2 Preparation of test panels

Delete this clause and replace with:

Metal test panels shall be used and shall receive identical surface preparation to that of the pipe using production equipment.

The panel coating shall be dried and cured in an identical manner to the coating applied to the pipe.

The test frequency as specified in Table 5 shall be changed as specified in clause 6.2.1

Add new clause:

6.2.3 Test failures

In the event of test panels failing to meet the specified acceptance criteria, the coating shall be removed from the pipe used to support the test panels and the pipe recoated. The Coating Contractor and the Principal shall then agree the further testing necessary to satisfy the Principal that the coating applied after the preceding acceptable test meets the requirements of this PTS.

Applied coating which fails to comply with this PTS shall be removed from the pipe. The pipe shall then be re-prepared and the coating re-applied and inspected in accordance with

this PTS. Application of a second coat for thickness build shall only be performed if a two-coat system has been qualified in accordance with (4.).

7. REPAIRS

Replace heading with "Coating repair".

Add the following:

Defective or damaged coating shall be repaired by the Applicator. The maximum allowable area per repair is 40 cm² and maximum 6 repairs are allowed per single pipe. Pipes with damaged areas larger than the maximum permitted repair areas shall be rejected, stripped and recoated.

The Contractor shall submit detailed procedures for coating repairs. All coating repair procedures shall be qualified.

8. HANDLING, STORAGE AND TRANSPORT

8.1 HANDLING

Add the following to this clause:

Instructions by the pipe Manufacturer and/or coating Manufacturer shall be strictly followed.

Bevel protectors and/or end caps as installed by the pipe Manufacturer shall be re-installed after coating and before handling of the pipes.

Pipes shall only be lifted using slings, hooks or vacuum lifters, fitted with suitable spreader bars. Chains shall not be used to lift pipes. Wire ropes shall not be used to lift externally coated pipes. Hooks shall be padded with soft material to prevent damage to the bevelled ends.

Lifting trucks or front-end loaders shall have soft padded forks or grips to prevent damage to pipes or pipe coating.

Externally coated pipes shall not be rolled or dragged over the ground.

Pipes shall not be lifted in bundles without prior approval by the Principal.

When more than one pipe is lifted, separate sling or hooks shall be used for each pipe and coated pipes shall be provided with soft padding between the pipes.

8.3 STORAGE

Add the following to this clause:

Instructions by the pipe Manufacturer and/or coating Manufacturer shall be strictly followed.

Pipes shall be stored in designated areas. Pipes shall not be stored with other consignments or pipes for other contracts.

Pipes shall be stacked only to such a height that damage or deformation due to the weight of other pipes cannot occur. Coated pipes shall be stacked only to such a height that no damage to the external or internal coating occurs.

Pipe supports shall be spaced so that no bending of pipes occurs. Pipe supports shall be made of soft padded wooden bolsters or sand rows, free of stones, covered with plastic sheets. The pipe surface shall be at least 150 mm clear of the soil.

Piles of pipe shall be secured by wooden wedges or ground pins, provided with adequate padding to prevent coating damage, and of sufficient size to prevent collapse of the piles.

Externally coated pipes shall be stacked using soft separators such as rubber pads or tyre tread.

When stored outdoors, pipes shall be placed at a small angle to allow drainage of any rainwater from the inside of the pipes. Pipe or external coating that is damaged by handling operations shall be repaired in accordance with the original specification.

8.4 TRANSPORT

Add the following:

Coated pipes shall be prepared for transport or shipment in accordance with API RP 5L1 or API RP 5LW, whichever is applicable.

During transportation, pipes shall be stacked and secured such as to prevent movement, abrasion and/or peening.

Add new clause:

8.5 RECORDS AND REPAIRS

The Contractor shall take receipt of the pipes delivered by the pipe Manufacturer/Supplier, and shall keep a record of the serial numbers of the delivered pipes. Upon receipt, the pipes shall be inspected for transport damage or other defects. Damaged pipes shall be separately stored and their damage shall be reported to the Principal.

Add new clause:

9. DOCUMENTATION

9.1 LANGUAGE

All documentation submissions required by this PTS shall be in the English language.

9.2 Pre-manufacturing documentation

The Coating Contractor's contract-specific quality plan shall be submitted to the Principal for agreement within an agreed time period.

NOTE: Review of a draft quality plan at the enquiry stage of the contract might assist the process.

The format and issue of the quality plan shall be consistent with the document control requirements of the Coating Contractor's quality system.

The content of the quality plan should be based on ISO 10005 and shall include the following:

1. Identification of the product and contract to which the plan is to be applied.
2. Reference to ISO 15741 and this PTS.
3. Location of coating application.
4. Identification of the individuals responsible for controlling the activities defined in the plan.
5. Identification of the individuals with the authority to interface directly with the Principal.
6. Identification of all subcontractors.
7. The quality plans of all subcontractors.
8. All sequenced activities for the contract, and references to the quality system procedures and work instructions which will be applied to these activities.
9. Copies of all the quality system procedures and work instructions covering production, test and inspection, special processes, control of non-conforming product, handling, storage, packing, and shipping as requested for agreement by the Principal.
10. Test and inspection frequency and acceptance criteria including the upper and lower process control limits where statistical process control is employed.

11. The location of each inspection and test point in the process sequence.
12. Points where the Principal has established witnessing or verification requirements.
13. Coating Manufacturer's data sheets and qualification test report.

9.2 Certification

The Coating Contractor shall provide the Principal with a certificate of compliance with the order prior to shipment of the pipe. If the Principal has deployed an Inspector, the certificate of compliance with the order shall be issued after the inspection records have been reviewed and approved by the Inspector.

The certificate of compliance with the order shall be drawn up on the basis of specific inspection and testing on the product supplied.

PART III REFERENCES

In this PTS, reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

PTS

Index to PTS publications and standard specifications

[PTS 00.00.05.05](#)

AMERICAN STANDARDS

Recommended practice for railroad transportation of line pipe

API RP 5L1

Recommended practice for internal coating of line pipe for non-corrosive gas transmission service,

Third edition (approved July 12, 1993)

API RP 5L2

Recommended practice for transportation of linepipe on barges and marine vessels

API RP 5LW

Issued by:

American Petroleum Institute

1220 L Street NW

Washington, DC 20005

USA

Standard test method for indicating oil or water in compressed air

ASTM D 4285

Issued by:

American Society for Testing & Materials

100 Bar Harbor Drive

West Conshohocken

PA 19428-2959

USA

INTERNATIONAL STANDARDS

Paints and varnishes - determination of film thickness

ISO 2808

Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness

- Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings

ISO 8501-1

Preparation of steel substrates before application of paints and related products - Tests for the assessment of surface cleanliness

- Part 2: Laboratory determination of chloride on cleaned surfaces

ISO 8502-2

- Part 3: Assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)

ISO 8502-3

- Part 4: Guidance on the estimation of the probability of condensation prior to paint application

ISO 8502-4

Preparation of steel substrates before application of paint and related products - Surface roughness characteristics of blast-cleaned steel substrates

- Part 2: Method for grading of surface profile of abrasive blast-cleaned steel-comparator procedure

ISO 8503-2

Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile - Stylus instrument procedure

ISO 8503-4

Preparation of steel substrates before application of paint and related products - Surface preparation methods

- Part 2: Abrasive blast-cleaning

ISO 8504-2

Quality systems - Model for quality assurance in design, development, production, installation and servicing

ISO 9001

Quality systems - Model for quality assurance in production, installation and servicing

ISO 9002

Quality management - Guidelines for quality plans

ISO 10005

Quality assurance requirements for measuring equipment

- Part 1: Metrological confirmation system for measuring equipment

ISO 10012-1

Preparation of Steel Substrates Before Application of Paints and related Products - Specifications for Metallic Blast-Cleaning Abrasives

- Part 1: General Introduction and Classification.

ISO 11124-1

Specifications for non-metallic blast-cleaning Abrasives

ISO 11126

Issued by:

International Organization for Standardization

Case Postale 56

Geneva, Switzerland CH-1211

Copies can also be obtained from national standards organizations