MATERIALS AND EQUIPMENT STANDARD

FOR

COAL TAR ENAMEL (HOT APPLIED)

ORIGINAL EDITION

MAY 1993

This standard specification is reviewed and updated by the relevant technical committee on Jan. 1999(1) and May 2015(2). The approved modifications are included in the present issue of IPS.

FOREWORD

The Iranian Petroleum Standards (IPS) reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS are based on internationally acceptable standards and include selections from the items stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement of each project. For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The IPS is reviewed and up-dated approximately every five years. Each standards are subject to amendment or withdrawal, if required, thus the latest edition of IPS shall be applicable

The users of IPS are therefore requested to send their views and comments, including any addendum prepared for particular cases to the following address. These comments and recommendations will be reviewed by the relevant technical committee and in case of approval will be incorporated in the next revision of the standard.

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GENERAL DEFINITIONS

Throughout this Standard the following definitions shall apply.

COMPANY :

Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company and National Iranian Oil Refinery And Distribution Company.

PURCHASER :

Means the “Company" where this standard is a part of direct purchaser order by the “Company”, and the “Contractor” where this Standard is a part of contract document.

VENDOR AND SUPPLIER:

Refers to firm or person who will supply and/or fabricate the equipment or material.

CONTRACTOR:

Refers to the persons, firm or company whose tender has been accepted by the company.

EXECUTOR :

Executor is the party which carries out all or part of construction and/or commissioning for the project.

INSPECTOR :

The Inspector referred to in this Standard is a person/persons or a body appointed in writing by the company for the inspection of fabrication and installation work.

SHALL:

Is used where a provision is mandatory.

SHOULD:

Is used where a provision is advisory only.

WILL:

Is normally used in connection with the action by the “Company” rather than by a contractor, supplier or vendor.

MAY:

Is used where a provision is completely discretionary.

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1. SCOPE

This Standard Specification which is generated from AWWA C203, SSPC-PS No. 10.01 and BS 4164 covers the minimum requirements for the composition, quality of enamel, properties, storage life and packaging, inspection and labeling of Coal Tar Enamel (Hot-Applied).

Note 1:

This standard specification is reviewed and updated by the relevant technical committee on Jan. 1999. The approved modifications by T.C. were sent to IPS users as amendment No. 1 by circular No. 50 on Jan. 1999. These modifications are included in the present issue of IPS.

Note 2:

This standard specification is reviewed and updated by the relevant technical committee on May 2015. The approved modifications by T.C. were sent to IPS users as amendment No. 2 by circular No. 456 on May 2015. These modifications are included in the present issue of IPS.

2. REFERENCES

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

SSPC (STEEL STRUCTURES PAINTING COUNCIL) VOLUME 2

SSPC-PS 10.01(Discontinued)	"Hot-Applied Coal Tar Enamel Painting System"
SSPC-PA Guide 3	"A Guide to Safety in Paint Application"

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

(Specification for Ingredients)

D388	"Classification of Coals by Rank"

(Test Methods for Properties)

D 36	"Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)"
D 71	"Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)"
D 546	"Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures"
D 1296	"Standard Test Method for Odor of Volatile Solvents and Diluents"
D 2415	"Test Method for Ash in Coal-Tars and Pitches"

UFS (US FEDERAL STANDARDS)

(Federal Test Method Standard No. 141)

ANSI (AMERICAN NATIONAL STANDARDS INSTITUTE)

Z 400.1/Z 129.1	"Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation"
ANSI/AWWA C203	"Standard Specification for Coal-Tar Protective Coatings and Lining, for Steel Water Pipe lines Enamel and Tape-Hot-Applied"

BSI (BRITISH STANDARDS INSTITUTION)

BS 1796-1	"Method using Test Sieves of Woven Wire Cloth and Perforated Metal Plate"
BS 4164	"Specification for Coal-Tar-Based Hot Applied Coating Materials for Protecting Iron and Steel Including a Suitable Primer"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-E-TP-270	"Engineering Standard for Protective Coatings for Buried and Submerged Steel Structures"
IPS-E-GN-100	"Engineering Standard for Units"
IPS-M-TP-275	"Material and Equipment Standard for Fast Drying Synthetic Primer to be used with Hot Applied Coal Tar or Bitumen (Asphalt) Enamel"
IPS-M-TP-280	"Material and Equipment Standard for Coal Tar Primer (Cold Applied) for use with Hot Applied Coal Tar Enamel (IPS-M-TP-290)"

3. UNITS

This standard is based on international system of units (SI), as per IPS-E-GN-100 except where otherwise specified.

4. COMPOSITION

4.1 Ingredients and Proportions

The coal-tar enamel of either grades (see Table 1), as specified by the purchaser shall consist of a uniform mixture of modified coal-tar and inert non-fibrous filler. The fineness of the inert non-fibrous filler shall be as follows when tested in accordance with BS 1796-1: 1989, 7.3:

- Passing 90 µm test sieve in accordance with the relevant requirements of BS 410-1: 2000 not less than 93%.
- Passing 250 µm test sieve in accordance with the relevant requirements of BS 410-1: 2000 not less than 99%.

4.2 Percentage

The enamel shall contain 100% by weight of nonvolatile film forming solids (coal-tar and filler).

5. QUALITY OF ENAMEL

The quality of coal-tar enamel is affected by the quality of the coal that is carbonized and by the temperature of carbonization, as well as by the subsequent methods of pitch processing and by the particulars of formulation. To meet the basic quality requirements, coal-tar shall be produced from coal that has a minimum heating value of 30000 Jul/g (13000 Btu/Lb) on a moisture-and mineral-mater-free basis (ASTM D388) and that has been carbonized in a slot-type coke oven at a

temperature of not less than 900°C.

6. PROPERTIES

6.1 Requirements

The coal-tar enamel shall comply with the requirements for the appropriate grade given in Table 1 and, in conjunction with appropriate primer, (IPS-M-TP-280 coal-tar primer (Cold Applied) and/or IPS-M-TP-275 fast drying synthetic primer for use with hot applied coal tar & asphalt enamels), shall also comply with the requirements for the appropriate grade given in Table 2. The coal-tar enamel shall also meet the requirements of sections 6.2 through 6.7.

6.2 Odor

The odor shall be normal for the materials permitted (ASTM Standard D1296).

6.3 Color

The color shall be black.

6.4 Compatibility

There shall be no evidence of incompatibility of any of the ingredients of enamel when two parts of the enamel are melted together.

6.5 Pot Life

The pot life of the enamel in molten state shall be 12 hours minimum.

6.6 Application Temperature

The application temperature of enamel shall be within 220 to 260°C.

6.7 Other Properties

The enamel and primer shall also meet all the requirements specified in AWWA C203 and BS 4164 latest editions.

TABLE 1 - PROPERTIES OF ENAMEL

Characteristic	Grade 105/15	Grade 105/8	Grade 120/5	Method of test [b]
Filler content by ignition, % by mass	25 to 35	25 to 35	25 to 35	Annex I
Density at 25 °C, g/cm^3	1.4 to 1.6	1.4 to 1.6	1.4 to 1.6	Annex J
Softening point (ring and ball), °C	105 to 116	105 to 116	120 to 130[a]	BS EN 1427
Penetration (total moving mass), 10^{-1} mm				
25 °C, 100 g	10 to 20	5 to 12	1 to 9	Annex K
45 °C, 50 g	15 to 55	8 to 30	3 to 16	
Flow time, s				
230 °C	9 to 16	9 to 16		Annex L
240 °C			9 to 24	

[a] The softening point range for this grade may be exceeded by agreement between the manufacturer and the purchaser.

[b] According standard BS 4164

TABLE 2 - PROPERTIES OF ENAMEL ON PRIMED METAL

Test	Grade 105/15	Grade 105/8	Grade 120/5	Method of test BS 4164
Sag, maximum, mm				
70 °C, 24 h	1.5	1.5	--	Annex B
80 °C, 24 h	--	--	1.5	
Low temperature cracking and disbonding				
-30 °C	None	--	--	
-25 °C	--	None	--	Annex C
-20 °C	--	--	None	
Bend at 0 °C				
First crack, minimum, mm				
Initial	20	15	--	
After heating	15	10	--	
Disbonded area, maximum, mm^2 Initial				Annex D
After heating	2000	3000	--	
	3000	5000	--	
Impact				
Disbonded area, maximum, mm^2				
0 °C	15000	--	--	Annex E
25 °C	--	10000	--	
Peel, initial and delayed, maximum, mm				
30 °C	3.0	--	--	
40 °C	3.0	3.0	--	
50 °C	3.0	3.0	--	Annex F
60 °C	--	3.0	3.0	
70 °C	--	--	3.0	
Cathodic disbonding in 28 days maximum, mm	5	5	5	Annex G

7. STORAGE LIFE AND PACKAGING

7.1 Condition in Container

The properties of enamel (see Section 6) shall not change after storage of at least 12 months from date of delivery, in a full tightly covered container.

7.2 Packaging

The coal-tar enamel shall be supplied in non contaminated steel drums containing not more than 200 liters.

8. INSPECTION

8.1 All materials supplied under this Specification shall be subject to timely inspection by the purchaser or his authorized representative. The manufacturer shall replace such material as is found defective under this Specification. In case of dispute the arbitration or settlement procedure established in the procurement documents shall be followed.

8.2 Samples of any or all ingredients used under this coating system should be supplied upon request along with the supplier's name and identification for the materials.

8.3 Unless otherwise specified, the methods of sampling and testing should be in accordance with US Federal Test Method Standard No. 141, or applicable methods of the American Society for Testing and Materials, or BS 4164.

9. LABELING

9.1 Labeling Standard

Labeling shall be in accordance with ANSI Z129-1 "Precautionary Labeling of Hazardous Industrial Chemicals".

9.2 Marking of Containers

Each container shall be legibly marked with the following information:

Name: Coal-Tar Enamel (Hot-Applied) ….....

Specification: IPS-M-TP-290 .....

MESC No.: .....

Maximum temperature resistance: .....

Pot life (hours): .....

Color: .....

Grade Number of Enamel (e.g. grade 120/5)

Lot Number: .....

Stock Number: ……..…..

Date of Manufacture: .....

Quantity of Enamel in Container: .....

Information and Warning, if Required: .....

Manufacturer's Name and Address: .....

MSDS: .....

Inspection Date: .....

Shelf Life: .....

Design guide: For the guidance on the usage of this coating for various applications/environments reference shall be made to IPS-E-TP-270.

9.3 Directions for Use

In addition to the manufacturer's instructions for use, the following directions shall also be supplied with each container of coal-tar enamel:

These materials are heavy-duty products for application at a minimum thickness of 2.4 mm to provide long term protection underground and in submarine installations.

They are applied to iron and steel used over a range of service temperatures specified by manufacture data sheet. They are particularly suitable for flood-coating previously primed products. Agitation of enamel materials in the molten state is necessary to prevent settling of the filler. When these materials are applied externally to pipes it is usual to incorporate one or more reinforcing layers of inert fabric.

All materials should be applied in accordance with the manufacturer's instructions. The Enamel used shall provide a bond between the metal and the coating material that will enable the requirements given in Table 2 of the IPS-M-TP- 290 Standard to be complied with if all the qualities of the coating material are adequate. Care should be exercised to ensure there is no mixing of materials from different sources or different types. In particular, it should be recognized that the chemical and physical characteristics of bitumen-based coatings differ from those of coal-tar based coatings and that the two kinds of coating should not be blended in protective coatings.

It is also essential to clean out plant thoroughly when the use of coal-tar coating materials follows that of bitumen coating materials or vice versa.

9.4 Direction for Safety

The following directions for safety shall be supplied with each container of enamel.

- The Coatings are hazardous because of their flammability and potential toxicity. Proper safety precautions shall be observed to protect against these recognized hazards. Safe handling practices are required and should include, but not be limited to, the provisions of SSPC-PA Guide 3, "A Guide to Safety in Paint Application".

- The coatings specified herein may not comply with some air pollution regulations because of their hydrocarbon solvent content.

- Ingredients in this coating which may pose a hazard include hydrocarbon solvent and coal tars. This coating may contain low concentrations (less than 1% by weight) of materials that are suspected carcinogens. Applicable regulations governing safe handling practices shall apply to the use of this coating.

- Hot enamels are applied at temperatures ranging from 220 to 260°C and extreme care must be used when melting and handling.