

Specification for coal-tar-based hot-applied coating materials for protecting iron and steel, including a suitable primer

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Committees responsible for this British Standard

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- British Coatings Federation Ltd
- CMF — Cast Metals Federation
- Institute of Corrosion
- Pipeline Industries Guild
- Society of British Water Industries
- Society of Chemical Industry
- UK Steel Association

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Foreword

This British Standard has been prepared by ISE/16/-/10. It supersedes BS 4164:1987, which is withdrawn. This new edition of BS 4164 incorporates technical changes only. It does not reflect a full review or revision of this standard, which will be undertaken in due course.

Protection by coal-tar-based materials is the most extensively used method of protecting buried and submerged steel pipes. Materials used in coating have to be properly chosen for performance and compatibility; these and many other requirements that apply are specified in ISO 5256 published by the International Organization for Standardization (ISO). It is evident that materials and practices vary widely in the countries represented on the ISO committee, and a common standard has to allow for the well established practices of the various countries. In this British Standard the aim has been to produce a document that is compatible with the international standard but that also prescribes closer limits for many properties, which experience in the UK has shown to be advantageous.

The use of hot-applied coal-tar-based coating materials is mentioned in a number of British Standards; BS 534 refers to steel pipes, fittings and specials, while BS 4508-1, BS 5834-2 and BS 5834-3 also specify these coating materials for specialized iron and steel articles. Hot-applied bitumen-based coating materials for protecting iron and steel are specified in BS 4147.

WARNING. The coatings specified in this British Standard are not to be used where they will come into contact with water for human consumption.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 21 and a back cover.

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1 Scope

This British Standard specifies requirements for hot-applied coal-tar-based materials, reinforced with inert non-fibrous fillers, which are used to protect iron and steel against corrosion. Requirements for a primer are included because the performance of hot-applied coating materials depends on its use.

Different grades of material are used for different substrates, conditions of application and service. This standard indicates factors that need to be taken into account in selecting the grade for a particular use.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 410-1:2000, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth* (ISO 3310-1:2000).

BS 593, *Specification for laboratory thermometers*.

BS 1796-1:1989, *Test sieving — Method using test sieves of woven wire cloth and perforated metal plate* (ISO 2591-1:1988).

BS 7079-A1:1989, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Specification for rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings* (ISO 8501-1:1988).

BS EN 1426:2000, *Methods of tests for petroleum and its products — Bitumen and bituminous binders — Determination of needle penetration* (BS 2000-49:2000).

BS EN 1427, *Methods of test for petroleum and its products — Bitumen and bituminous binders — Determination of softening point — Ring and ball method* (BS 2000-58).

BS EN ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups* (BS 3900-A6).

BS EN ISO 13736, *Petroleum products and other liquids — Determination of flash point — Abel closed cup method* (BS 2000-170, ISO 13736).

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1

coal-tar-based material

material derived from crude coal-tar, produced only by the high-temperature carbonization of coal in coke ovens

3.2

hot-applied

process of application for materials of such a consistency at ambient temperature that heating is required before application

3.3

inert filler

finely divided mineral powder which is not substantially hygroscopic, not electrically conducting and does not react with other ingredients of the coating material or with the environment in which it is used

3.4

modified coal-tar

material manufactured by the hot dispersion of powdered coal in coal-tar or in suitable coal-tar oils

3.5

primer

material applied as a thin film to metal in order to ensure maximum adhesion of the subsequent protective coating

4 Synthetic primer for cold application

NOTE A synthetic primer for cold application is used with coating materials. This is quick drying and application of the subsequent coating is possible within a short time. The primer should be applied in accordance with the manufacturer's instructions.

4.1 Composition

The synthetic primer for cold application shall consist of chlorinated rubber and plasticizer and colouring matter, together with solvents needed to give a consistency suitable for application by spray, brush or other appropriate method, for example roller or sponge.

4.2 Characteristics

The characteristics of the synthetic primer shall be in accordance with Table 1 when tested in accordance with the given methods of test.

In addition, the primer should provide a bond between the metal and the coating material so that the coating material shall be in accordance with Table 2 when tested in accordance with the given methods of test.

Table 1 — Characteristics of synthetic primer for cold application

Characteristic	Limits	Method of test
Flow time (4 mm flow cup) at 23 °C	35 s to 60 s	BS EN ISO 2431
Flash point (Abel closed cup), minimum	23 °C	BS EN ISO 13736
Volatile matter (105 °C to 110 °C), maximum	75 % loss by mass	Annex A

5 Modified coating materials with inert non-fibrous fillers

NOTE The protective system can be ineffectual if the coating materials are not correctly applied, or if they are applied to an unsatisfactory surface. Guidance on the application of coating materials to iron and steel pipes is given in BS 7873. Guidance on the use of coating materials is given in Annex H.

5.1 Composition

The coating materials 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 %.

Table 2 — Tests for coating materials on primed metal

Test	Grade 105/15	Grade 105/8	Grade 120/5	Method of test
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	—	—	Annex C
–25 °C	—	None	—	
–20 °C	—	—	None	
Bend at 0 °C				
First crack, minimum, mm				
Initial	20	15	—	Annex D
After heating	15	10	—	
Disbonded area, maximum, mm ²				
Initial	2000	3000	—	
After heating	3000	5000	—	
Impact				
Disbonded area, maximum, mm ²				
0 °C ^a	15000	—	—	Annex E
25 °C	—	10000	—	
Peel, initial and delayed, maximum, mm				
30 °C	3.0	—	—	Annex F
40 °C	3.0	3.0	—	
50 °C	3.0	3.0	—	
60 °C	—	3.0	3.0	
70 °C	—	—	3.0	
Cathodic disbonding in 28 days maximum, mm	5	5	5	Annex G

^a See 5.3.2.

5.2 Characteristics

The characteristics of the coating materials shall be in accordance with the appropriate grade given in Table 3 when tested in accordance with the given methods of test.

NOTE Guidance on the application and service temperatures of coating materials is given in Annex M.

5.3 Tests

5.3.1 General

The coating materials, in conjunction with the appropriate primer, shall be in accordance with the appropriate grade given in Table 3 when tested in accordance with the given method of test.

5.3.2 Impact tests

If the test specimen fails the impact test (see Table 2) at 0 °C when tested in accordance with Annex E, two further test specimens shall be prepared from the same sample as the failed test specimen and tested at 0 °C. The material shall be deemed to have passed the impact test provided both the additional test specimens pass the test.

Table 3 — Characteristics of coating materials

Characteristic	Grade 105/15	Grade 105/8	Grade 120/5	Method of test
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.

6 Packaging

Primers shall be packed in airtight containers.

The coating material shall be supplied in one of the following forms:

- a) as a solid — packed in easily strippable containers or in steel drums;
- b) as a hot liquid — in bulk tankers.

The manufacturer shall provide instructions for storing and handling of their material.

7 Marking

Containers of coal-tar-based hot-applied coating materials shall be legibly and permanently marked with the following information:

- a) the number and date of this British Standard, i.e. BS 4164:2002¹⁾;
- b) the grade number of the material (e.g. grade 120/5),
- c) the manufacturer's identity;
- d) the manufacturer's batch number.

8 Sampling

NOTE When samples of coating material or primer are required for testing, the purchaser and the supplier should agree on the number of packages to be sampled and the procedure to be adopted. The samples so taken should be identified by the supplier and one-half retained by the purchaser for the purpose of making such tests as they require.

During the cooling period after manufacture, some settling of the filler in the coating materials can occur. In order to ensure that they are representative, test samples shall be made up of equal amounts taken from the top, middle and bottom of the container.

A sample of primer shall be obtained by drawing not less than 1 L either at the filling stage or from one or more previously unopened containers. A suitable clean, dry, airtight container shall be filled with the sample so as to leave an ullage of approximately 5 %. Each sample container shall be sealed and marked with full details and the date of sampling.

¹⁾ Marking BS 4164:2002 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.