

Specification for

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

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- British Tar Industry Association
- Institution of Gas Engineers
- Institution of Structural Engineers
- Road Emulsion Association Ltd
- The Pipeline Industries Guild
- Society of Chemical Industry
- Individual manufacturers

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Foreword

This British Standard has been prepared under the direction of the Elements and Components (of Diverse Materials) for Buildings Standards Committee and it supersedes BS 4164:1980, which is withdrawn.

Since publication of the 1980 edition it has become clear that there is little demand for the type A primer and so it has been omitted from this edition. Modified coating materials, which are the most widely used, are now designated type A and the unmodified coating materials type B, instead of types 2 and 1 respectively. The procedures and limits for the impact test, when carried out at 0 °C, and the cathodic disbonding test, which were introduced in the 1980 revision, have been amended in the light of subsequent experience.

The opportunity has been taken to make some minor changes, in particular the raising of upper penetration limits at 45 °C, bringing them in line with the corresponding widely used standard of the American Water Works Association. Cognizance has also been taken of the greatly increased use of coating materials on off-shore pipelines.

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.

It should be emphasized that the protective system can be ineffectual if the coating materials are not correctly applied, or if they are applied to an unsatisfactory surface. BS 8010-2.1¹⁾ and BS 8010-2.2²⁾ give guidance on application to steel and iron pipelines.

The use of hot-applied coal-tar-based coating materials is mentioned in a number of British Standards; BS 416 and BS 437 refer to cast iron pipes and fittings, BS 534 refers to steel pipes, fittings and specials, while BS 4508-1 and 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, an amendment to which is published simultaneously with this British Standard.

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

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Revision of CP 2010-3.

²⁾ In preparation. Revision of CP 2010-2.

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.

Methods of test are given in Appendix A to Appendix Q, recommendations on the use of coating materials are given in Appendix R and guidance on the application and service temperatures of coating materials is given in Appendix S.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1 coal-tar-based

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

2.2 hot-applied

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

2.3 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 will be used

2.4 modified coal-tar

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

2.5 primer

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

3 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.

3.1 General

The primer shall be applied in accordance with the manufacturer's instructions.

3.2 Composition

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

3.3 Characteristics

The synthetic primer shall comply with the requirements given in Table 1.

In addition, the primer shall provide a bond between the metal and the coating material that will enable the requirements given in Table 3 to be complied with if all the qualities of the coating material are adequate.

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 3900-A6
Flash point (Abel closed cup), minimum	23 °C	BS 2000-170
Volatile matter (105 °C to 110 °C), maximum	75 % loss by mass	Appendix A

4 Type A. Modified coating materials with inert non-fibrous fillers

4.1 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 by the method described in clause 6 of BS 1796:1976:

passing 90 µm test sieve complying with the appropriate requirements of BS 410: not less than 93 %;

passing 250 µm test sieve complying with the appropriate requirements of BS 410: not less than 99 %.

Table 2 — Characteristics of type A 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	Appendix B
Density at 25 °C, g/cm ³	1.4 to 1.6	1.4 to 1.6	1.4 to 1.6	Appendix C
Softening point (ring and ball), °C	105 to 116	105 to 116	120 to 130 ^a	Appendix D
Penetration (total moving mass), 10 ⁻¹ mm				
25 °C, 100 g	10 to 20	5 to 12	1 to 9	Appendix E
45 °C, 50 g	15 to 55	8 to 30	3 to 16	
Flow time, s				
230 °C	9 to 16	9 to 16	—	Appendix F
240 °C	—	—	9 to 24	

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

4.2 Characteristics

The coating materials shall comply with the requirements for the appropriate grade given in Table 2.

NOTE Guidance on the application and service temperatures of coating materials is given in Appendix S.

4.3 Tests

4.3.1 General. The coating materials, in conjunction with the appropriate primer, shall also comply with the requirements for the appropriate grade given in Table 3.

4.3.2 Impact tests. If the test specimen fails the impact test (see Table 3) at 0 °C, two further test specimens shall be prepared from the same sample as the failed test specimen and both shall be tested at 0 °C. The material shall be deemed to comply with the requirements of the impact test provided both the test specimens pass the test.

5 Type B. Unmodified coating materials

5.1 Composition

Type B coating materials shall consist of refined coal-tar of a viscosity within the limits found by experience to give a coating of the desired quality.

Evaporation of oil occurs in the dipping bath as well as on the coated articles after dipping, thus changing the composition of the material. The refined tar and coal-tar distillate oil specified in 5.2 shall be used to replenish the bath and to maintain the viscosity of the coating material within the required limits.

5.2 Characteristics

Coating materials shall comply with the requirements for the appropriate grade given in Table 4 when tested by the methods specified.

6 Packaging

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

- a) in paper bags, with easily strippable lining, containing approximately 50 kg;
- b) in steel drums containing not more than 200 L;
- c) in bulk, as hot liquid.

Primers shall be packed in steel drums containing not more than 210 L. The supplier shall provide instructions for storing and handling the material.

7 Marking

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

- a) the number and date of this British Standard, i.e. BS 4164:1987³⁾;
- b) the grade number of the material (e.g. grade 120/5),
- c) the manufacturer's identity;
- d) the manufacturer's batch number.

³⁾ Marking BS 4164:1987 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 therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Table 3 — Tests for type A 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	—	Appendix G
80 °C, 24 h	—	—	1.5	
Low temperature cracking and disbonding				
– 30 °C	None	—	—	Appendix H
– 25 °C	—	None	—	
– 20 °C	—	—	None	
Bend at 0 °C				
First crack, minimum, mm				Appendix J
Initial	20	15	—	
After heating	15	10	—	
Disbonded area, maximum, mm ²				
Initial	2 000	3 000	—	
After heating	3 000	5 000	—	
Impact				
Disbonded area, maximum, mm ²				Appendix K
0 °C ^a	15 000	—	—	
25 °C	—	10 000	—	
Peel, initial and delayed, maximum, mm				
30 °C	3.0	—	—	Appendix L
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	Appendix M
^a See 4.3.2.				