
Specification for

Manhole covers, road gully gratings and frames for drainage purposes

Part 1. Cast iron and cast steel

Spécification concernant les cadres et tampons de voirie
pour trous d'homme utilisés pour le drainage
Partie 1. Fonte de fer et fonte d'acier

Schachtabdeckungen, Straßenabläufe-Roste und Rahmen
(für Entwässerungszwecke)
Teil 1. Gußeisen und Stahlguß

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Foreword

This British Standard has been prepared under the authority of the Road Engineering Standards Policy Committee.

As part of the new approach to harmonization and standards in Europe, work on manhole covers is being undertaken by CEN/TC 165, Drainage, who are revising EN 124 : 1986, 'Gully tops and manhole tops for vehicular and pedestrian areas; design requirements, type testing, marking'. It is therefore envisaged that the next edition of this standard will be a dual British/European Standard.

Since the 1976 edition of this standard, traffic growth has significantly exceeded forecasts and it is likely that rapid growth will continue into the next century. In addition the maximum permitted weight of heavy goods vehicles has increased and will increase still further during the 1990s.

Concern has been expressed by various highway authorities about the durability of certain grade A products under high speed, heavily trafficked conditions such as on motorways and other primary routes. An increasing amount of maintenance is required on covers and frames to ensure their continued satisfactory performance. These maintenance works can be hazardous to motorists and operatives as well as causing congestion and serious delays. It was therefore agreed to supplement the existing range of grades in BS 497 to cater for these circumstances.

In view of the move towards product standard harmonization in Europe it was decided to introduce a new grade equivalent to Class D 400 of the draft revision of EN 124. The new BS grade (called D for consistency with draft EN 124) has a 400 kN design load and stipulates minimum frame dimensions to improve stiffness.

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

* See reference in CP 301: 1971 (note at end of table 6).

British Standard Specification for

Manhole covers, road gully gratings and frames for drainage purposes

Part 1. Cast iron and cast steel

1. Scope

This British Standard specifies requirements for:

- (a) cast iron manhole covers, inspection covers and frames;
- (b) cast iron and cast steel road gully gratings in cast iron frames;
- (c) cast iron kerb-type gully covers and frames.

The standard falls into four main parts as follows.

Clauses 2 to 11 specify general requirements applicable to the articles covered in clauses 12, 13 and 14.

Clause 12 deals with manhole covers, inspection covers and frames.

Clause 13 deals with road gully gratings and frames.

Clause 14 deals with kerb-type gully covers and frames.

2. References

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

3. Materials

3.1 Cast iron units. The metal used for the manufacture of castings included in this standard shall be suitable for the method of manufacture and shall be either

flake graphite iron (hereafter called grey iron) of a quality not less than that specified as grade 10 in BS 1452: 1961, or

spheroidal or nodular graphite iron (hereafter called ductile iron) complying with the requirements specified in BS 2789: 1973 for grade 500/7, 600/3 or 700/2, as selected by the manufacturer to suit the design and dimensions of the unit.

3.2 Cast steel gully gratings. The metal used for the manufacture of cast steel gratings shall comply with the requirements for BS 592 grade A given in BS 3100: 1967

3.3 Bolts. Bolts supplied for loosely coupling separate sections of covers and gratings shall be steel, hexagon headed, complying with the requirements of BS 4190: 1967 and not less than size M16, complete with hexagon nut; these shall be provided with means to prevent undue tightening of the unit sections. Alternative coupling devices, if used, shall be of steel, have a minimum cross-sectional area of 140 mm², and be removable and incapable of undue tightening or loosening.

4. Manufacture and workmanship

All cast units shall be cleanly cast and shall be free from air holes, sand holes, cold shuts and chill. They shall be neatly dressed and carefully fettled. All castings shall be free from voids, whether due to shrinkage, gas inclusions or other causes.

5. Protective coating

Unless otherwise specified by the purchaser, all units shall be supplied coated by dipping, or other equivalent means, using a hot-applied coal-tar-based material complying with the requirements specified in BS 4164. Alternatively, at the option of the manufacturer, a cold-applied black bitumen material complying with the requirements specified in BS 3416 may be used. No coating shall be applied to any casting unless the surfaces of the casting are clean, dry and free from rust.

6. Design requirements

Products manufactured to the requirements of this standard shall be capable of supporting, without fracture, the following design loads:

Grade of cover or grating	Design load
	kN
D	400
A	350
B	150
C	10

Bearing blocks shall be of the same size as those used for the relevant quality control tests (see 12.3, 13.3 and 14.3) and the cover or grating shall be capable of supporting the specified design load with the bearing block placed at any position wholly within the perimeter of the cover or grating section(s).

The manufacturer shall verify the design of each type of unit by submitting a sufficient number of prototypes to the loading tests specified in this clause and in clause 7.

7. Quality control

7.1 Quality control tests. The manufacturer shall test sample units, by the method given in appendix A, for compliance with the requirements given in 7.2. Apart from the initial design proving tests that shall be carried out by the manufacturer, routine sampling tests will be at the discretion of the manufacturer, to suit his rate and method of production, in order to ensure continuing compliance with the requirements of this standard. Records of such quality control tests shall be available to the purchaser or his representative.

7.2 Acceptance requirements. Products shall be deemed to comply with the loading test requirements of this standard if, when tested in accordance with the procedures described in appendix A, the following requirements are satisfied.

- (a) Grey iron units sustain the loads specified in 12.3, 13.3 and 14.3 without fracture.

(b) Ductile iron and cast steel units sustain the loads specified in 12.3, 13.3 and 14.3 without fracture and any resultant permanent set, measured at the midpoint between any two selected supporting seatings after removal of the test load, is not greater than one five-hundredth (0.2 %) of the distance between these selected seatings.

7.3 Testing of recessed covers. Recessed covers shall be tested before they are filled with concrete.

8. Additional tests specified by the purchaser

If the purchaser requires additional tests to be carried out, this shall be stated in his enquiry and order. The manufacturer shall provide every facility for the purchaser to select such samples as he may require from a consignment prior to delivery and the tests shall be carried out in the presence of the manufacturer and the purchaser, or his representative, if he so desires.

The allocation of costs of additional tests should be agreed between the manufacturer and the purchaser.

9. Inspection

The manufacturer shall afford all reasonable facilities for carrying out inspection during the course of manufacture. Should the purchaser desire to witness the tests specified in 7.2 he shall inform the manufacturer accordingly and the latter shall give reasonable notice of the date or dates on which the tests will be carried out. The purchaser shall, if he so desires, be enabled to carry out inspection of covers, gratings and frames prior to the application of any coating.

10. Certificate of compliance

The purchaser shall, on request, be supplied with a certificate in respect of each delivery certifying that the articles comply with the requirements of this specification.

11. Marking

All covers, gratings and frames shall have clearly cast thereon the number of this British Standard and the appropriate grade, e.g. 'BS 497, Grade A', and such other markings as may be agreed between the manufacturer and the purchaser.

12. Manhole covers, inspection covers and frames

12.1 Grades. Manhole covers, inspection covers and frames complying with the requirements of this British Standard shall be graded as follows:

Grade A Manhole covers and frames, capable of bearing wheel loads up to 11.50 tonnes, for use in carriageways. These covers and frames shall incorporate a permanent non-rock design feature such as triangular point suspension or machined faces.

Grade B Manhole covers and frames, capable of bearing wheel loads up to 5.00 tonnes, for use in carriageways carrying relatively slow-moving normal commercial vehicles (e.g. cul-de-sacs and minor residential roads; see table 1 in Road note 29*). These covers and frames shall incorporate a permanent non-rock design feature such as triangular point suspension or machined faces.

Grade B Sealed manhole covers and frames (see 12.4.8)

class 2 capable of bearing wheel loads up to 5.00 tonnes, for use in areas to which vehicles would have only occasional access (e.g. pedestrian precincts).

Grade C Sealed inspection covers and frames (see 12.4.8)

for use in situations inaccessible to motor vehicles.

Grade D Manhole covers and frames, capable of bearing wheel

loads up to 11.50 tonnes, for use in carriageways carrying fast-moving heavy vehicles, such as motorways, trunk roads and other primary routes. These covers and frames shall incorporate a permanent non-rock design feature such as triangular point suspension or machined faces.

12.2 Shape and size. Only minimum clear-opening sizes and certain frame dimensions are stipulated (see 12.5), shape (e.g. square, rectangular, circular) and size being the product of the individual manufacturer's design. If a purchaser desires to specify a particular shape this shall be stated on the enquiry and/or order.

The minimum clear-opening dimensions that relate to rectangular designs in tables 3, 4 and 5 shall be deemed not to be contravened by projections at the corners, required for manufacturing purposes, provided that the resulting reduction of minimum clear-opening area does not exceed 15 cm² at each of the corners.

For grade D frames, slots within the 75 mm minimum bedding width are permissible in any side of the frame but there shall be an increase in width to give a corresponding increase in solid flange area for that side of the frame.

12.3 Test loads for quality control purposes (see also clause 7 and appendix A). The loads and sizes of the bearing blocks for the test specified in clause 7 shall be as follows:

Grade of cover	Test load		Size of block
	Grey iron	Ductile iron	
Grade D manhole covers	kN	kN	mm
	400	267	250 dia.
Grade A manhole covers	350	235	300 dia.
Grade B classes 1 and 2 manhole covers	150	100	300 dia.
Grade C inspection covers	10	7	300 dia.

12.4 Design features

12.4.1 Registers. Where the directional installation of the cover relative to the frame is an essential feature of a non-rock design, a register shall be provided.

12.4.2 Displacement by traffic. The design of covers shall be such that they cannot be displaced by normal traffic. Grade A and grade B frames of less than 100 mm depth shall be provided with means of additional anchorage (e.g. openings and/or holes for anchor bolts in the flange).

* Department of the Environment — Road Research Laboratory. Road note 29, third edition. 'A guide to the structural design of pavements for new roads'.