BS EN 124-5:2015

BSI Standards Publication

Gully tops and manhole tops for vehicular and pedestrian areas

Part 5: Gully tops and manhole tops made of composite materials

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National foreword

This British Standard is the UK implementation of EN 124-5:2015. Together with BS EN 124-1:2015, BS EN 124-2:2015, BS EN 124-3:2015, BS EN 124-4:2015 and BS EN 124-6:2015, it supersedes BS EN 124:1994 which is withdrawn.

BSI, as a member of CEN, is obliged to publish EN 124-5 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

The reasoning behind the response relates to the application of the Construction Products Regulations in respect to subclause 7.3.2.6, as a result of the AVCP Level 1 requirement.

The UK participation in its preparation was entrusted by Technical Committee B/505, Wastewater engineering, to Subcommittee B/505/4, "Manhole Covers, Surface Boxes And Other Road Fittings".

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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

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Dispositifs de couronnement et de fermeture pour les zones de circulation utilisées par les piétons et les véhicules - Partie 5: Dispositifs de couronnement et de fermeture en matériaux composites

Aufsätze und Abdeckungen für Verkehrsflächen - Teil 5: Aufsätze und Abdeckungen aus Verbundwerkstoffen

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CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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Foreword

This document (EN 124-5:2015) has been prepared by Technical Committee CEN/TC 165 “Wastewater engineering”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2015 and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the Regulation (EU) No. 305/2011.

For relationship with EU Regulations, see informative Annex ZA, which is an integral part of this document.

Together with EN 124-1:2015, EN 124-2:2015, EN 124-3:2015, EN 124-4:2015 and EN 124-6:2015, the document will supersede EN 124:1994.

EN 124, *Gully tops and manhole tops for vehicular and pedestrian areas*, consists of the following parts:

— *Part 1: Definitions, classification, general principles of design, performance requirements and test methods*;

— *Part 2: Gully tops and manhole tops made of cast iron*;

— *Part 3: Gully tops and manhole tops made of steel, aluminium alloys*;

— *Part 4: Gully tops and manhole tops made of steel reinforced concrete*;

— *Part 5: Gully tops and manhole tops made of composite materials*;

— *Part 6: Gully tops and manhole tops made of polypropylene (PP), polyethylene (PE) or unplasticized poly(vinyl chloride) (PVC-U)*.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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1 Scope

This European Standard is applicable to manhole tops and gully tops made of composite materials C1, C2 and C3 by using suitably controlled automatic processes that produce a single structure and that do not contain multiple pieces bonded together, with a clear opening up to and including 1 000 mm for covering gullies, manholes and inspection chambers for installation within areas subjected to pedestrian and/or vehicular traffic.

It is applicable to manhole tops and gully tops for use in

— areas which can only be used by pedestrians and pedal cyclists (class A 15),

— pedestrian areas and comparable areas, car parks or car parking decks (class B 125),

— the area of kerbside channels of roads which, when measured from the kerb edge, extends a maximum of 0,5 m into the carriageway and a maximum of 0,2 m into the pedestrian area (class C 250),

and in addition to manhole tops for use in

— carriageways of roads (including pedestrian streets), hard shoulders and parking areas, for all types of road vehicles (class D 400).

This European Standard is not applicable in isolation but only in combination with EN 124-1 and gives guidance for combinations of covers/gratings made of composite materials with frames according to EN 124-2, EN 124-3, EN 124-4 or EN 124-6.

This document is not applicable to:

— manhole tops and gully tops manufactured by means of hand lay-up method;

— gratings/covers as part of prefabricated drainage channels according to EN 1433;

— floor and roof gullies in buildings which are specified in EN 1253 (all parts); and

— surface boxes.

2 Normative references

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

EN 59, *Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor*

EN 124-1:2015, *Gully tops and manhole tops for vehicular and pedestrian areas — Part 1: Definitions, classification, general principles of design, performance requirements and test methods*

EN 124-2:2015, *Gully tops and manhole tops for vehicular and pedestrian areas — Part 2: Gully tops and manhole tops made of cast iron*

EN 124-3:2015, *Gully tops and manhole tops for vehicular and pedestrian areas — Part 3: Gully tops and manhole tops made of steel or aluminium alloys*

EN 124-4:2015, *Gully tops and manhole tops for vehicular and pedestrian areas — Part 4: Gully tops and manhole tops made of steel reinforced concrete*

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EN 124-6:2015, *Gully tops and manhole tops for vehicular and pedestrian areas — Part 6: Gully tops and manhole tops made of polypropylene (PP), polyethylene (PE) or unplasticized poly(vinyl chloride) (PVC-U)*

EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 62:2008, *Plastics — Determination of water absorption (ISO 62:2008)*

EN ISO 175:2010, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:2010)*

EN ISO 527-2:2012, *Plastics - Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)*

EN ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2:2013)*

EN ISO 4892-3:2013, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3:2013)*

ISO 1268-7, *Fibre-reinforced plastics — Methods of producing test plates — Part 7: Resin transfer moulding*

ISO 1268-8, *Fibre-reinforced plastics — Methods of producing test plates — Part 8: Compression moulding of SMC and BMC*

ISO 2878, *Rubber, vulcanized or thermoplastic — Antistatic and conductive products — Determination of electrical resistance*

ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 124-1:2015 and the following apply.

3.1
composite material
complex material, in which two or more constituent materials (with significantly different physical or chemical properties), are combined to produce structural or functional properties not present in any individual component

4 Materials

4.1 General

Composite materials in accordance with this European Standard shall consist of a reinforcing fibre encapsulated within a thermoset matrix resin and shall be moulded as a single structure. They shall be produced by using suitably controlled automatic processes that produce a single structure and that do not contain multiple pieces bonded together.

The reinforcing fibre shall be an E-, ECR-, R- or S-Type glass or carbon fibre. The use of aramid fibres is not permitted. The matrix resin shall be based on a polyester, methacrylate, vinylester, epoxy, phenolic or polyurethane resin system. Hybrid resin systems that contain a blend of resins are permitted. Only materials certified as UV resistant shall be used.

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The inclusion of metal components that contribute to the structural performance of the manhole top shall not be permitted.

The addition of materials that can be incorporated within and are part of the moulding process shall be permitted. These may include materials to improve surface properties such as surface resistivity or skid resistance. Components such as metal key and lifting housing can be incorporated within the composite structure and shall not be part of the structural design.

Manhole tops and gully tops shall not be machined, drilled, cut, ground after manufacturing.

NOTE Neither the matrix resin nor the fibres are specified in European Standards. Compliance with the performance of the materials is ensured by fulfilling the requirements of the tests according to Clause 4 and Clause 5.

Any element made of the materials specified in 4.2 can be used in combination with elements of materials specified in EN 124-2, EN 124-3, EN 124-4 or EN 124-6. In such cases the manhole tops or gully tops shall comply with the relevant design and performance and testing requirements as listed in Table 3.

In addition elements shall comply with the requirements for the material related EN 124-2, EN 124-3, EN 124-4 or EN 124-6, as applicable. Each element shall be marked accordingly. The class to be declared for the combined product shall be restricted to the lower class determined for any constituent element according to the relevant part of EN 124 series.

EXAMPLE Where a cover is made of composite materials, class C 250, and the frame is made of steel, class D 400, the manhole top or gully top is marked with EN 124–5 and the class to be declared for the combined product is the class of the cover according to EN 124–5.

4.2 Types of composite materials

4.2.1 General

Depending on the production process, the composite materials shall be distinguished in composite material C1, composite material C2 or composite material C3. The formulation of matrix resin and design of the fibre architecture shall be determined by the manufacturer of the manhole top or gully top.

4.2.2 Composite material C1

Composite material C1 shall consist of long continuous fibres that are constructed in order to optimize the fibre reinforcement within a given macro structure. The macro structure can be both two and three dimensional and can contain non-structural formers to aid construction of the three dimensional elements of the structure. The composite shall have a typical fibre volume fraction of 40 % to 60 % and mechanical performance values, for example tensile strength, shall be highly directional. The matrix resin shall not contain fillers.

4.2.3 Composite material C2

Composite material C2 shall be solid and moulded as a single monolithic product, consisting of long fibres within a matrix resin having a degree of fibre alignment within the structure. The composite solid element shall have a typical fibre weight fraction of 30 % to 60 %. The matrix resin shall not contain fillers.

4.2.4 Composite material C3

Composite material C3 is typically known as fibre reinforced moulding compound. This material consists of a matrix resin, particulate fillers and short reinforcing fibre. The formulation of matrix resin, particulate fillers and fibre combinations shall be determined by the manufacturer of the manhole top or gully top.

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4.3 Requirements for composite materials

4.3.1 General

The composite materials shall be tested for the properties listed below prior to the introduction of the product to the market. These tests shall be repeated if the composition of the raw materials or the raw material itself is changed.

4.3.2 Hardness

The mean Barcol hardness shall be equal to or greater than 35 when tested in accordance with EN 59.

For composite materials C1 and C2, samples shall be cut from an area of the manhole top that does not contain additional surface material.

For Composite C3 material samples shall either be cut from an area of the manhole top that does not contain additional surface material or prepared according to ISO 1268-7 or ISO 1268-8.

4.3.3 Water absorption

When tested in accordance with EN ISO 62:2008, Method 1, the water absorption of manhole tops or gully tops shall be less than 0,3 %.

At the end of the test the manhole top or gully top shall meet the requirements of permanent set specified in EN 124-1:2015, Table 5, and of the test load according EN 124-1:2015, Table 4. There shall be no visible evidence of cracking after the test.

Differently from EN ISO 62:2008, Method 1, weighing of the samples before and after immersion in water shall be done at the nearest ± 1 g.

4.3.4 Resistance to vehicle fuels

A complete manhole top or gully top shall be conditioned according to EN ISO 175 in either (60 % volume toluene, 40 % volume n-heptane) or diesel at (23 ± 2) °C for (168 ± 2) h. When compared with the original properties the change in mass shall be not more than 0,5 %.

At the end of the conditioning the manhole top or gully top shall meet the requirements of permanent set specified in EN 124-1:2015, Table 5, and of the test load according EN 124-1:2015, Table 4. There shall be no visible evidence of cracking after the test.

Weighing of the samples before and after conditioning in fuel shall be done at the nearest ± 1 g.

4.3.5 Surface resistivity

In the event that safety considerations require that a manhole top or gully top is capable of dispersing a static electrical charge the value of surface resistivity shall be less than 1×10^8 Ohms.

The test shall be carried out according to ISO 2878 where the outer surface of a manhole top shall be tested at a point which provides a flat surface of sufficient surface area to accommodate the electrodes to two areas in accordance with ISO 2878.

NOTE A typical application is the forecourt of a refuelling station.

4.3.6 Weathering resistance

Manhole tops and gully tops shall be resistant to artificial weathering. This shall be ensured by testing specimens with the dimensions (50 ± 3) mm wide, (6 ± 1) mm thick and (150 ± 20) mm long made of pure

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resin from the same formulation used for the manufacturing of the manhole top or gully top in accordance with Table 1 or Table 2. After the test, the variation of the tensile modulus measured according to ISO 527-2 shall be no more than 50 %.

If there is no test of pure resin available, the complete manhole top or gully top shall be tested in accordance with Table 1 or Table 2. The requirements of permanent set specified in EN 124-1:2015, Table 5, and of the test load in accordance with EN 124-1:2015, Table 4, shall be achieved.

In case of dispute the Xenon test of the pure resin according to Table 2 shall be applied.

Table 1 — Artificial weathering resistance (QUV)

Parameter		Test method
Exposure time using UVA 351 lamp	Radiation energy 1 600 h	EN ISO 4892-3 (QUV test)
Irradiation	6 h at (50 ± 2) °C	
Condensation	2 h at (40 ± 2) °C	

Table 2 — Artificial weathering resistance with Xenon arc lamps

Parameter		Test method
Exposure time using xenon-arc lamps with daylight filters	Radiation energy 2,6 GJ/m^2	EN ISO 4892-2 (xenon-arc lamps) - Method A
Exposure period	102 min dry 18 min water spray	

5 Requirements

5.1 Design and performance requirements

Manhole tops and gully tops made of composite materials C1, C2 and C3 shall conform to the relevant design and performance and testing requirements in accordance with EN 124-1:2015 as listed in Table 3.

Table 3 — Design, performance and testing requirements of characteristics specified in EN 124–1 for manhole tops and gully tops made of composite materials

Characteristic	Requirements according to EN 124-1:2015, Clause	Testing according to EN 124-1:2015, Clause	Relevant for class			
			A 15	B 125	C 250	D 400 [a]
Related to the design						
Vents in covers	6.1	8.4.1	x	x	x	x
Clear opening of manhole tops for man entry	6.2	8.4.2	x	x	x	x
Depth of insertion	6.3	8.4.3	–	–	–	x
Clearance	6.4	8.4.4	x	x	x	x
Compatibility of seatings	6.5	8.4.5	–	–	–	x
Handling of covers and gratings	6.7	8.4.7	x	x	x	x

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Characteristic	Requirements according to EN 124-1:2015, Clause	Testing according to EN 124-1:2015, Clause	Relevant for class			
			A 15	B 125	C 250	D 400 [a]
Slot dimensions of gratings	6.8	8.4.8	x	x	x	x
Dirt pans and dirt buckets	6.9	8.4.9	x	x	x	x
Positioning of covers and gratings	6.10	8.4.10	x	x	x	x
Flatness of manhole covers and gratings	6.11	8.4.11	–	–	–	x
Concaveness of gratings	6.12	8.4.12	x	x	x	x
Surface conditions	6.13	8.4.13	x	x	x	x
Manhole tops with sealing feature	6.14	Visual inspection of presence of anchors	x	x	x	x
Frame bearing area	6.15	8.4.14	x	x	x	x
Frame depth	6.16	8.4.15	–	–	–	x
Opening angle of hinged covers/gratings	6.17	8.4.16	x	x	x	x
Appearance	7.1	Visual inspection	x	x	x	x
Related to the performance						
Load bearing capacity	7.2	8.3	x	x	x	x
Permanent set	7.3	8.2	x	x	x	x
Securing of the cover/grating within the frame	6.6 a) or c)	8.4.6	x	x	x	x
Skid resistance	7.4	8.4.13	x	x	x	x
Child safety	7.5	8.5	x	x	x	x
x To be applied.						
[a] For manhole tops only.						

5.2 Material specific characteristics for gully tops and manhole tops made of composite materials

5.2.1 Reinforcement

The dimensions, position, spacing and jointing of the reinforcement and foam, if applicable, shall be in accordance with the design.

5.2.2 Deflection under load

When tested the complete composite manhole top and gully top in accordance with 6.2 and when subject to F_D = 1/3 F_T, the maximum deflection under load shall be ≤ *CO*/360 for covers to be filled with brittle materials other than concrete. For covers to be filled with concrete, the maximum deflection under load shall be ≤ *CO*/250. For all other covers according to this standard, the maximum deflection under load shall be declared as mm per mm of clear opening (mm/*CO*).

The load deflection curve shall be smooth and progressive without sudden deviations up to the test load.

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NOTE During the load testing of composite materials in particular during the first application of load, the composite will make audible cracking noises. These sounds are caused by errant fibres within the structure breaking and do not represent failure of the structure. Cracking noises disappear when further test loads are applied.

5.2.3 Resistance to fatigue

Upon completion of the test according to 6.3, the manhole top or gully top shall meet the requirements of permanent set specified in EN 124-1:2015, 7.3, and of the test load according EN 124-1:2015, 7.2. There shall be no visible evidence of cracking after the test without magnification.

5.2.4 Creep resistance

When tested according to 6.4 the creep resistance of a manhole top or gully top shall meet the requirements for permanent set specified in EN 124-1:2015, 7.3.

5.2.5 Impact resistance

After carrying out the low temperature impact test according to 6.5 there shall be neither visible cracking nor delamination when viewed without magnification at the impacted cover.

5.2.6 Effect of heating

When tested according to 6.6 there shall be no visible defects, blistering, cracks or delamination at the test sample.

5.2.7 Reaction to fire

5.2.7.1 General

Where use of manhole tops or gully tops in accordance with this standard is subject to national regulatory requirements on reaction to fire, their reaction to fire performance shall be considered as that of its components (i.e. material approach). Conversely, where the use of such a unit is not subject to national regulatory requirements on reaction to fire, either the class, determined according to the result of testing, or NPD may be declared.

5.2.7.2 Units classified according to test results

Manhole tops and gully tops shall be classified on the basis of their main elements (cover and frame), meaning regardless of other components (their cushioning inserts or coating).

For the purpose of the reaction to fire performance of the unit each of its constituent materials, shall be classified according to EN 13501-1 and only the lowest class of such materials shall be declared. The class of an individual constituent material shall be obtained as the result of the test method(s), relevant to this class, and as specified in the standards referred to in EN 13501-1.

NOTE 1 A constituent material of the unit is considered as one which has a significant effect on the reaction to fire performance of such a unit. According to the definitions given in EN 13501-1, this can be in the case of:

— a homogeneous unit, its material, or

— a non-homogeneous unit, its substantial component (i.e. a material that constitutes a significant part of such unit). A layer with a mass per unit area ≥ 1,0 kg/m^2 or a thickness ≥ 1,0 mm is considered to be a substantial component.

Test specimen used for the test methods applicable for this classification shall be prepared according to EN 13501-1 and to the relevant standards referred therein. In addition with regard to the SBI test according to EN 13823, when applied, the test specimen used for the test methods, applicable for the classification, shall be prepared according to EN 13501-1 and the relevant standards referred therein.

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