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English version

Drainage channels for vehicular and pedestrian areas - Classification, design and testing requirements, marking and evaluation of conformity

Caniveaux hydrauliques pour l'évacuation des eaux dans les zones de circulation utilisées par les piétons - Classification, principes de construction et d'essais, marquage et évaluation de la conformité

Entwässerungsrinnen für Verkehrsflächen - Klassifizierung, Bau- und Prüfgrundsätze, Kennzeichnung und Beurteilung der Konformität

This draft European Standard is submitted to CEN members for second formal vote. It has been drawn up by the Technical Committee CEN/TC 165.

If this draft becomes a European Standard, 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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document prEN 1433:2002 has been prepared by Technical Committee CEN /TC 165, "Wastewater engineering", the secretariat of which is held by DIN.

This document is currently submitted to the second Formal Vote.

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 EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Annexes A, B and C are normative. Annex D is informative.

This document includes a Bibliography.

This document defines the application and use of drainage channels both as single or multi-part assemblies. An assembly is defined as a single unit and can be used in conjunction with other similar units to provide a drainage system. Guidance is given on the location of units, the strength of the units and appropriate grating or cover. Fittings and other special adapters are excluded from the scope of this standard.

Installation does not form part of this standard but can form part of a future related standard. Drainage channels are installed so that sufficient support is provided to enable them to withstand proposed service loads.

Due regard has been taken of formalized Quality Assurance Systems and this standard details those specific and relevant quality control activities necessary for both manufacturer and external assessors (if applicable).

This standard specifies materials currently used in the manufacture of drainage channels. However, with some materials there are limited data currently available.

Rainwater forms the main application of drainage channels. Other liquids can be carried, subject to correct selection of the drainage channel.

1 Scope

This European Standard specifies requirements for linear drainage channels for the collection and conveyance of surface water when installed within areas subjected to pedestrian and/or vehicular traffic.

These channels are defined as either Type I, which requires no further support or Type M, which requires additional support to accommodate the vertical and horizontal loads in service, in accordance with the manufacturers' recommendations.

This standard specifies requirements for gratings and covers integral with a linear drainage system. This standard applies to grid units, slot units and kerb units up to a clear opening of 1000 mm.

This standard specifies definitions, classes, design and testing requirements, marking and quality control for drainage channels.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 476, *General requirements for components used in discharge pipes, drains and sewers for gravity systems.*

EN 1169, *Precast concrete products — General rules for factory production control of glass-fibre reinforced cement.*

EN 1170-5, *Precast concrete products — Test methods for glass-fibre reinforced cement — Part 5: Measuring bending strength, "Complete bending test" method.*

EN 10002-2, *Metallic materials — Tensile testing — Part 2: Verification of the force measuring system of the tensile testing machines.*

ENV 10080, *Steel for the reinforcement of concrete weldable ribbed reinforcing steel B 500 — Technical delivery conditions for bars, coils and welded fabric.*

EN 10088 -1, *Stainless steels — Part 1: List of stainless steels.*

EN 10088-2, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.*

EN 10088-3, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.*

EN 10142, *Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming — Technical delivery conditions.*

EN 10214, *Continuously hot-dip zinc-aluminium (ZA) coated steel strip and sheet — Technical delivery conditions.*

EN 10215, *Continuously hot-dip aluminium-zinc (AZ) coated steel strip and sheet — Technical delivery conditions.*

EN 12163, *Copper and copper alloys - Rod for general purposes.*

ISO 185, *Grey cast iron — Classification.*

ISO 630, *Structural steels — Plates, wide flats, bars, sections and profiles.*

ISO 1083, *Spheroidal graphite cast iron — Classification.*

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods.*

ISO 3755, *Cast carbon steels for general engineering purposes.*

ISO 4012, *Concrete — Determination of compressive strength of test specimens.*

ISO 8062*, Castings — System of dimensional tolerances and machining allowances.*

3 Terms and definitions

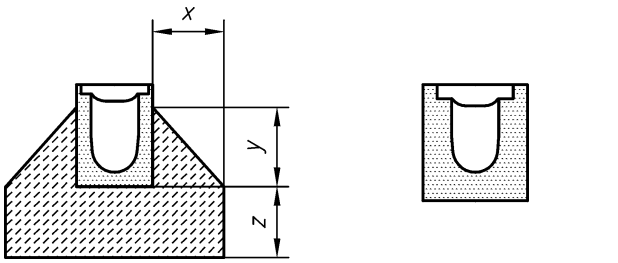
For the purposes of this European Standard, the following terms and definitions apply.

3.1
drainage channel
linear assembly composed of prefabricated units permitting the collection and conveyance of surface water along its total length for onward discharge

3.2
type I
drainage channel which requires no further support (see Figure 1)

Key

x, y and z Dimensions of additional support

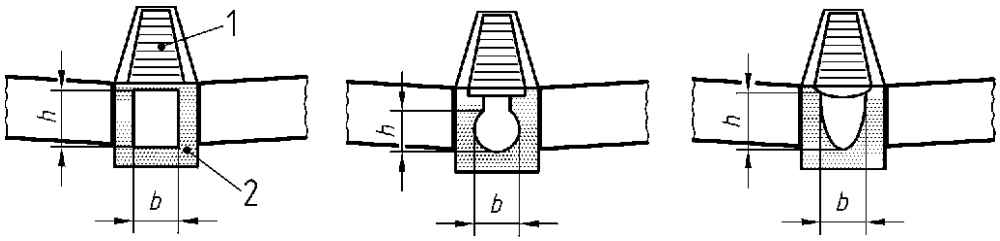


Example of Type M Example of Type I

Figure 1 — Example of Type M and Type I

3.3
type M
drainage channel which requires additional support to accommodate the vertical and horizontal loads in service (see Figure 1).

3.4
grid unit
prefabricated drainage channel unit with an open top with inserted gratings and/or covers (see Figure 2)



Key

1 Grating
2 Channel body

Figure 2 — Examples of grid units

3.5
grating/cover
removable parts of the grid unit which permits, in the case of gratings, the intake of water (see Figure 3)

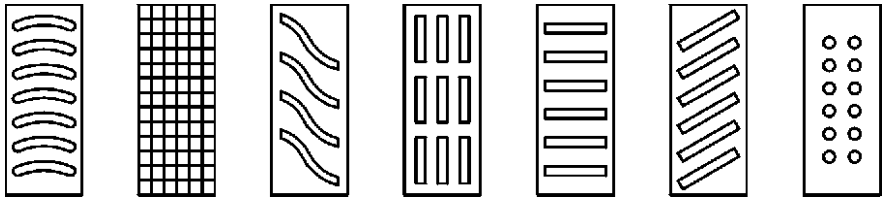
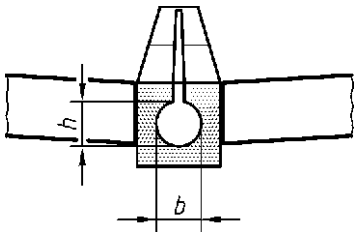


Figure 3 — Examples of gratings

3.6
slot unit
prefabricated drainage channel unit having closed profile and a continuous or intermittent inlet slot on top to permit the intake of surface water (see Figure 4)

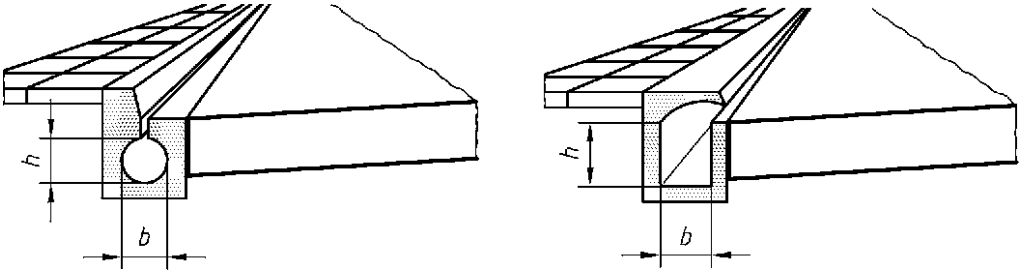


Key

h, b Dimensions of the internal (wetted perimeter)

Figure 4 — Example of slot unit

3.7
kerb unit
drainage channel with a kerb type profile and having continuous or intermittent drainage openings (see Figure 5)



Key

h, b Dimensions of the internal (wetted perimeter)

Figure 5 — Examples of kerb units

3.8
surface water
water drained from the surface of buildings, structures or the ground [EN 476]

NOTE Drainage channels can convey other liquids, for example oils and chemicals. In that case, their suitability should be checked with the manufacturer.

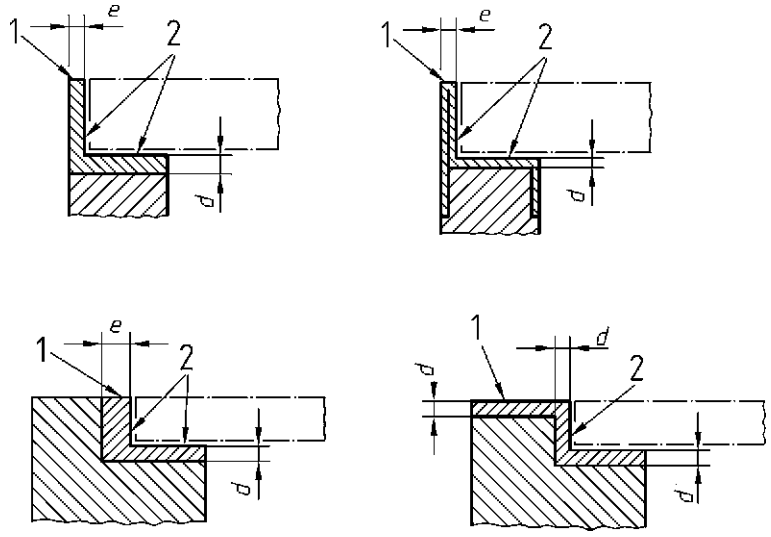
3.9
nominal size
numerical designation of size of components, which is a convenient integer approximately equal to the manufacturing dimensions in mm [EN 476]

NOTE For components conforming with this standard the nominal size corresponds numerically to the width *b* in millimetres (mm), i. e. the maximum horizontal drainage dimension see Figures 2, 4 and 5.

3.10
seating
surface on which the grating or the cover rests on the channel body of a grid unit

3.11
contact surfaces and trafficked edges
metal edges or similar components applied to or inserted into the channel body as seating for gratings and covers and as protection of the channel body against damage from traffic

NOTE Typical examples of contact surfaces and trafficked edges are shown in Figure 6.

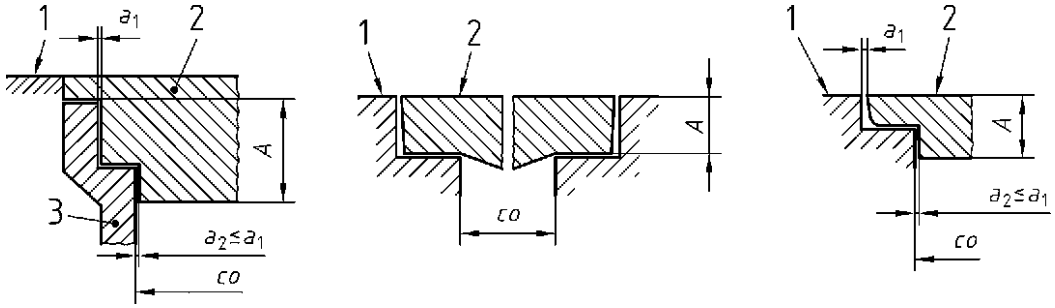


Key

1 Trafficked edge; e - Thickness of trafficked edge
2 Contact surface; d - Thickness of contact surface

Figure 6 — Examples of contact surfaces and trafficked edges

3.12
depth of insertion of gratings and covers
dimension *A*, shown in Figure 7, which is instrumental in securing the gratings or covers in the channel



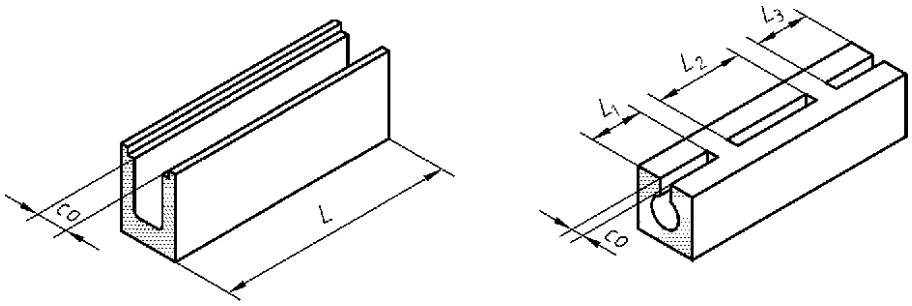
Key

1 Floor level
2 Overlay grating/cover
3 Channel wall
a_1, a_2 Clearances between channel body and grating or cover

Figure 7 — Examples of depth of insertion

3.13
clear area
unobstructed area between the seating or slot edges

NOTE The clear area is expressed in square millimetres (mm^2)



Key

Clear area = $CO \times L$ $L = l_1 + l_2 + l_3$

Figure 8 — Examples of clear areas

3.14
clear opening
CO
unobstructed width between the seating of grid units or slot edges of slot units. Examples of the dimension *CO* are shown in Figures 7 and 8

NOTE The clear opening is expressed in millimetres (mm).

3.15
mass per unit area
total mass of the grating or the cover in kg divided by the clear area in m^2 of the grid unit

NOTE The mass per unit area is expressed in kilograms per square metres (kg/m^2).

3.16
cushioning insert
material in a channel body, grating or cover used to provide a non rock seating

3.17
test load
load applied to a grating/cover or to a drainage channel unit during a test

NOTE The test load is expressed in kilo Newtons (kN).

3.18
ultimate (collapse) load
maximum load reached by the testing machine during a loading test (i.e. when the load-recording facility does not show any further increase)

3.19
pedestrian area
area reserved for pedestrians but which may also be trafficked occasionally by, for example, delivery, cleaning or emergency vehicles

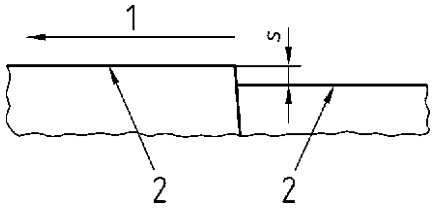
3.20
pedestrian street
area subjected to regular vehicular traffic but during controlled periods only e.g outside business hours

3.21
dirt bucket
removable component of a drainage channel system which collects debris

3.22
waterway area
total area of all slots and slots in gratings within the clear area, or other drainage inlet openings in kerb units

NOTE The waterway area is expressed in square millimetres (mm^2).

3.23
step of invert
s
difference in height between the inverts of adjacent channel units, as shown in Figure 9



Key

1 Direction of flow
2 Invert of channel units

Figure 9 — Example for step of invert

3.24
type test
test to prove the design and which is carried out once to demonstrate conformity with this standard and which is repeated after significant manufacturing, design, or material changes

4 Classification

Drainage channels shall be classified as follows according to their intended use (see also clause 5):

A 15, B 125, C 250, D 400, E 600, F 900.

5 Places of installation for drainage channels

The appropriate load class of drainage channel to chose depends upon where the channel is to be installed. Typical places of installation have been divided into groups numbered 1 to 6 as listed below. Figure 10 and Figure 11 show the location of some of these groups in a highway environment. An indication as to which minimum load class of drainage channel should be selected is shown in parenthesis for each group. The selection of the appropriate load class is the responsibility of the designer.

Where there is any doubt, a higher load class should be selected.

Groups of installation:

Group 1 (min. class A 15)
Areas which can only be used by pedestrians and pedal cyclists.

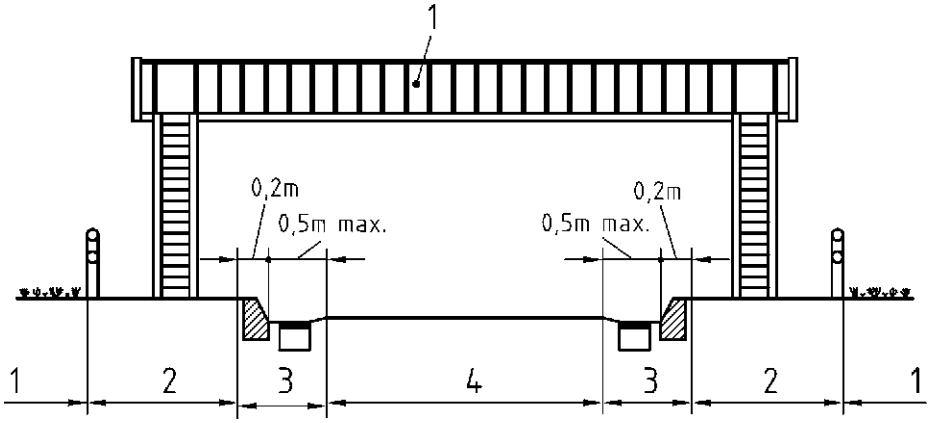
Group 2 (min. class B 125)
Footways, pedestrian areas and comparable areas, private car parks or car parking decks.

Group 3 (min. class C 250)
Kerb sides (Figure 10) and non-trafficked areas of hard shoulders and similar; Kerb units are always group 3.

Group 4 (min. class D 400)
Carriageways of roads (including pedestrian streets), hard shoulders (Figures 10 and 11) and parking areas, for all types of road vehicles.

Group 5 (min. class E 600)
Areas subjected to high wheel loads, e. g. ports and dock sides.

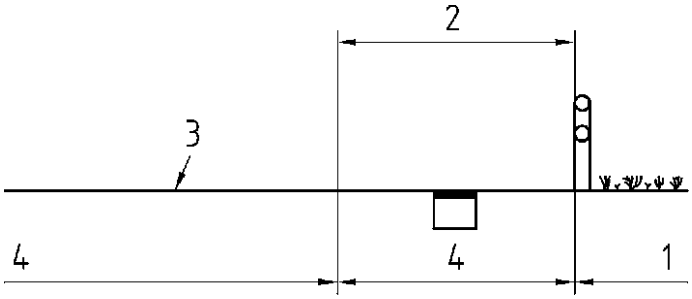
Group 6 (class F 900)
Areas subjected to especially high wheel loads e. g. aircraft pavements.



Key

1 Group 1 (e.g. on pedestrian bridges)
2 Group 2
3 Group 3
4 Group 4

Figure 10 — Typical highway cross section showing the location of some installation groups



Key

1 Group 1
2 Trafficked area of hard shoulder
3 Carriageway
4 Group 4

Figure 11 — Typical hard shoulder section showing the location of some installation groups

6 Materials

6.1 General

Drainage channels, or gratings and covers, may be made from materials listed in 6.1.1 and 6.1.2.

For materials other than those listed in 6.1.1 and 6.1.2 the product shall comply with any relevant provisions valid in the country of use of the product with regard to durability, e.g UV-resistance, abrasion resistance, fatigue.

NOTE Any revisions of this standard can specify requirements for durability for other materials.

6.1.1 Drainage channels

Drainage channels, with the exception of gratings and covers, may be manufactured from:

a) flake graphite cast iron

b) spheroidal graphite cast iron

c) cast steel

d) rolled steel

e) stainless steel

f) reinforced or unreinforced concrete

g) synthetic resin concrete

h) concrete with fibre

i) one of the materials a) to f) combined with concrete/synthetic resin concrete with fibre.

6.1.2 Gratings and covers

Gratings and covers may be manufactured from:

a) flake graphite cast iron

b) spheroidal graphite cast iron

c) cast steel

d) rolled steel

e) stainless steel

f) copper based alloys

g) reinforced concrete

h) synthetic resin concrete

6.1.3 Use of rolled steel

The use of rolled steel, except for contact and edge protection according to 7.8, is permissible only if sufficient corrosion resistance can be ensured. This can be achieved by hot-dip galvanizing on a clean surface in accordance with ISO 1461 and for continuously coated steel sheet and strip in accordance with EN 10142, EN 10214 and EN 10215.

6.2 Production, quality and testing

The production, quality and testing of the materials designated in 6.2.1 and 6.2.2 shall conform to the following International Standards and European Standards in addition to the requirements of this standard.

6.2.1 Metallic materials

Metallic materials designated below shall conform to the following International Standards and European Standards in addition to the requirements of this standard:

— Flake graphite cast iron	ISO 185
— Spheroidal graphite cast iron	ISO 1083
— Rolled steel	ISO 630
— Cast steel	ISO 3755
— Hot dip galvanizing	ISO 1461, EN 10142, EN 10214, EN 10215
— Tolerances for cast iron	ISO 8062
— Stainless steel	EN 10088-1, EN 10088-2, and EN 10088-3
— Copper based cast alloys	EN 12163
— Reinforcing steel	ENV 10080

6.2.2 Concrete and synthetic resin concrete

The production, quality and testing of materials designated below shall conform to the following requirements:

— Precast concrete according to 6.3.3,

— Synthetic resin concrete according to 6.3.4.

— Concrete with fibre according to 6.3.5.

6.3 Additional requirements

The following is required in addition to the International and European Standards requirements listed above.

6.3.1 Welding of rolled steel

The requirements of the standards in the country of use shall be applied.

6.3.2 Stainless steel

For acceptable corrosion resistance and stability against intercrystalline corrosion effects, only the following steels listed in the European Standards (see 6.2.1) shall be used:

— for austenitic range: all types,

— for ferritic and martensitic range: X 8CrTi 17 or X 8CrNb 17 only.

6.3.3 Precast concrete

6.3.3.1 Concrete

The characteristic compressive strength of concrete at 28 days shall not be less than

— 35 N/mm^2 when determined on cylinders with 150 mm diameter and 300 mm height or

— 45 N/mm^2 when determined on 150 mm cubes or

— 45 N/mm^2 when determined on (100 × 100 × 150) mm rectangular solid slabs.

When measured on cores or other test samples, a correlation with the above shall be established. Where a representative cube or core cannot be obtained from the unit then the whole or part of a unit may be tested and correlation established with the type test procedure described in 9.1.4.

6.3.3.2 Steel reinforcement

The concrete cover to steel reinforcement shall be based upon the national requirements of the country of use (specific to drainage channels or, in their absence, applicable to related products, e.g. pipes or manholes).

NOTE The national requirements remain valid until further harmonisation.

6.3.3.3 Weathering resistance

When tested for water absorption in accordance with the test method described in 9.2.1 drainage channels shall be graded and marked in accordance with Table 1 and clause 8.

Table 1 — Grades of weathering resistance

Grade	Marking[a]	Water absorption in % of mass
1	N	no performance measured
2	W	mean value ≤ 6,5; no individual result ≥ 7,0

[a] When specific conditions of use corresponding to those defined in annex B (frequent contact of a surface of drainage channel, partially or entirely made with concrete, with standing water containing de-icing salts in frost conditions or where regulations require), then the additional requirements defined in annex B shall be applied and, if appropriate, the product shall be marked with "+R".

National editions of this standard may state in their national foreword that only one of the grades may need to be specified as relevant to their climate conditions.

6.3.4 Synthetic resin concrete

For polyester resin concrete the flexural bending strength and the compressive strength at 7 days for test specimens in accordance with Table 3 shall conform to the values given in Table 2.

Table 2 — Strength requirements

Strength	Mean value of 3 test specimens N/mm^2	Lowest individual value N/mm^2
Flexural bending strength	≥ 22	≥ 18
Compressive strength	≥ 90	≥ 75

Table 3 — Test specimens

Dimensions in millimetres

Maximum aggregate size	Dimension of test specimens[a]	
≤ 8	40 × 40 × 200	manufactured in vertical direction
> 8 ≤ 16	80 × 80 × 400	
[a] tolerances shall not exceed ± 1 mm		

6.3.5 Concrete with fibre

The performance of concrete with fibre products shall be demonstrated prior to use. For fibre glass concrete without steel reinforcement the flexural bending strength at 28 days for test specimens in accordance with Table 5 shall conform to the values given in Table 4.

Table 4 — Strength requirements

Strength	Mean value of 3 test specimens N/mm^2		Minimum individual value N/mm^2	
Flexural bending strength	≥ 20		16	
Compressive strength	≥ 45 (cube)	≥ 35 (cylinder)	36 (cube)	28 (cylinder)

Table 5 — Test specimens

	Dimensions[a] 350 mm x 100 mm x 10 mm
Test plates	When manufactured separately the newly cast test plates shall be covered, for 24 h, by a wet cloth in a temperature of (20 ± 4) °C and thereafter they shall be kept under water at (20 ± 4) °C until the test. Alternatively test plates may be cut from finished products.
[a] tolerances shall not exceed ±1 mm	

7 Design and manufacturing requirements

7.1 General

Drainage channels shall be free of defects which might impair their fitness for purpose (e. g. holes, broken edges). Two or more materials may be combined to form a composite, sufficient to transfer the stresses between those materials. Drainage channel units shall possess adequate vertical and lateral strength in order to withstand normal transportation and handling loads and stresses when installed in accordance with the manufacturer's instructions (see clause 11).

Drainage channels shall resist external forces resulting from the place of installation e.g. traffic loading, thermal expansion, either by themselves or by a method of installation recommended by the manufacturer (see 7.17 and clause 11).

7.2 Dimensions and dimensional tolerances

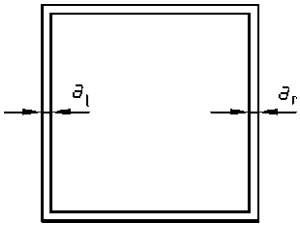
Unless otherwise specified in this standard the dimensions and dimensional tolerances of channel units and of their components shall be such as to ensure fitness for purpose and to ensure compliance with all other requirements of

this standard. The dimensional tolerances of the internal (wetted perimeter) dimensions *L, b*, and *h* shall not exceed those given in Table 6.

Table 6 — Dimensional tolerances

Dimensions in millimetres

Type of dimension	Nominal size	Tolerance
Length (*L*)	$L \leq 1000$	± 2
	$1000 < L \leq 4000$	± 4
	$L > 4000$	± 5
Width (*b*)	$b \leq 500$	± 2
	$500 < b \leq 1000$	± 3
Height (*h*)	$h \leq 200$	± 2
	$h > 200$	± 1 % with a maximum of ± 3 mm
NOTE For kerb and slot units the tolerance of the dimension *L* shall be ± 5 mm.		



$a = a_l + a_r$

Figure 12 — Total clearance

In order to limit the horizontal displacement of the grating or cover in the channel body, the relevant dimensions and dimensional tolerances of these units shall be such as to meet the total clearance *a* (see Figure 12) as follows:

— $CO \leq 400$ mm: $a \leq 7$ mm,

— $CO > 400$ mm: $a \leq 9$ mm.

7.3 Geometric design

In general, *h* shall be at least equal to *b* (see clause 3, Figures 2, 4 and 5). With respect to the hydraulic design of a drainage channel, the inlet capacity of the system, the flow capacity of the channel and the discharge capacity of the outlet(s) from the system, the manufacturer shall provide sufficient hydraulic data to enable selection of suitable products. At the point of discharge, an appropriate element may be installed for onward connection to a drainage system. The nominal size of discharge outlets and onward connections shall in general be not less than DN 100. Their dimensions shall correspond to those of a standard pipe and it shall be possible to form the connection to pipelines by means of joints which comply with the requirements specified for the respective pipe.

7.4 Gradient

Where an invert gradient is provided within a channel unit, it shall be not less than 0,5 %. Units shall be marked sequentially for identification to assist installation.

7.5 Jointing of drainage channel units

7.5.1 Watertightness

The joint between channel units shall be designed in such a way that it may be durably sealed. When tested in accordance with 9.3.6, the joint and the bodies shall not show leakage. The manufacturer shall state the method of installation in his instructions (see clause 11).

7.5.2 Step of invert

There should be a smooth transition at the joints of adjacent drainage channel units without constriction of the discharge cross section. The maximum step of invert *s* shall not be greater than 6 mm.

NOTE Certain drainage channel units can rely on manufacturer's written instructions in order to achieve this value.

7.6 Depth of insertion of gratings and covers

Drainage channels of classes D 400 to F 900 shall have a depth of insertion *A* as shown in clause 3, Figure 7 of at least 50 mm. This requirement does not apply if the covers or gratings are made secure against displacement by traffic by means of a locking device or a specific design feature or a combination of these arrangements (see 7.9).

The clearance dimensions shall be such that $a_2 \leq a_1$ (see Figure 7).

7.7 Seating

The seating between the grid unit body and the grating or cover shall be manufactured so as to ensure the compatibility of the components. For classes D 400 to F 900 these seatings shall be manufactured in such a way as to ensure stability and quietness in use. This may be achieved by the machining of the contact surfaces, the use of cushioning inserts or any other appropriate methods.

7.8 Trafficked edge and contact surface protection

Edge and contact surface protection is compulsory for grid units of classes D 400 to F 900 and recommended for class C 250 for materials g) to i) of 6.1.1. In the case of classes D 400 to F 900, the edge and contact surface protection shall be secured against disconnection from the channel units by traffic, e. g. by anchors. The protection of trafficked edges and contact surfaces between channel bodies and gratings or covers (see Figure 6) shall be either cast iron or galvanized steel and stainless steel (see 6.2.1) with thicknesses according to Table 7.

The difference in height between the top of the grating/cover and the top of the channel trafficked edge shall be ± 1 mm.

NOTE Other protection can be used provided that it has been shown to be suitable, see 6.1

Table 7 — Thickness of trafficked edge and contact surface protection by cast iron or steel (see Figure 6)

Class	Minimum thickness[a] mm	
	trafficked edges *e*	contact surfaces *d*
C 250	2	1
D 400	4	2
E 600; F 900	according to each design but not less than that required of class D 400	

[a] Without the thickness of additional corrosion protection to steel.

7.9 Securing of gratings or cover

The gratings and/or cover shall be secured within the channel body to meet the relevant traffic conditions at the place of installation listed in clause 5. This can be achieved by one of the following:

a) a locking device

b) sufficient mass per unit area

c) a specific design feature.

These arrangements shall be designed to allow opening of the covers or gratings by means of tools. Gratings or covers of classes D 400 to F 900 should have a locking device.

NOTE National requirements of the means of securing covers or gratings remain valid until harmonisation of the methods a) to c) listed.

7.10 Dimensions of inlet openings

The inlet dimensions shall comply with 7.10.1 to 7.10.3. The waterway area shall be provided by the manufacturer.

7.10.1 Straight slots

7.10.1.1 Classes A 15 and B 125

Grating slots of grid units and the slots of slot units for classes A 15 and B 125 shall comply with the requirements of Table 8.

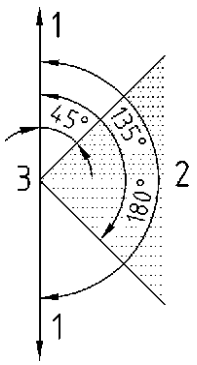
Table 8 — Dimensions for classes A 15 and B 125

Dimensions in millimetres

Width	Length
8 to 18	no limitation
> 18 to 25	≤ 170
NOTE In pedestrian streets and pedestrian areas the slot width can be reduced to 5 mm at the specifier's discretion.	

7.10.1.2 Classes C 250 to F 900

The dimensions of grating slots of grid units and the slots of slot units for classes C 250 to F 900 are dependent upon the orientation of the longitudinal axes of the slot in relation to the direction of traffic (see Figure 13 and Table 9).



Key
1 Orientation No 1; 2 Orientation No 2; 3 Direction of traffic

Figure 13 — Orientation of slots

Table 9 — Dimensions for classes C 250 to F 900

Orientation		Width mm	Length mm
No 1	from 0° to 45° and from > 135° to 180°	≥ 10 to 18	no limitation
		> 18 to 32	≤ 170
No 2	from 45° to 135°	≥ 10 to 42	no limitation
NOTE In pedestrian streets and pedestrian areas the slot width can be reduced to 5 mm at the specifier's discretion.			

7.10.2 Slots in other shapes

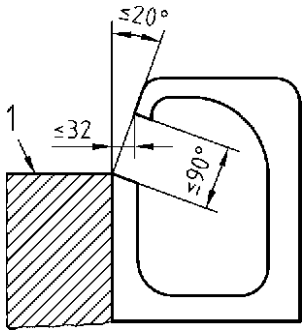
Slots in other shapes shall be designed so as to prevent a 170 mm x 170 mm x 20 mm gauge from entering the slot.

7.10.3 Other inlet openings

Other inlet openings are permissible provided that their longest effective opening dimension conforms to the requirements stated in Tables 8 and 9 and Figure 13 and with 7.10.2.

For side entry inlets the longest horizontal opening dimension shall be ≤ 170 mm and the greatest dimension parallel to the kerb face shall be ≤ 90 mm when measured from the carriageway surface level. The horizontal projection of the opening shall be ≤ 32 mm at an angle ≤ 20° (see Figure 14).

Dimensions in millimetres



Key

1 Carriageway

Figure 14 — Side entry inlet

For angles between 20° and 45° the horizontal projection shall be a maximum of 60 mm. These are intended for use in applications not subject to pedestrian traffic.

7.11 Dirt buckets

Where dirt buckets are specified they shall be designed to ensure that their drainage and ventilation efficiency is not impaired when they are filled completely with silt or other detritus.

NOTE The purchaser or specifying authority should state clearly in their enquiry, or in their order to the manufacturer, whether or not dirt buckets are required.

7.12 Correct positioning of gratings and covers

Where a grating or cover has to be installed in a predetermined position relative to a frame/edge protection/grid unit body, then this shall be ensured by an appropriate design.

7.13 Surface condition

Gratings and covers of classes D 400 to F 900 shall be manufactured with a flat top surface within a tolerance of 0,8 % of the length of the individual grating or cover with a maximum of 5 mm. An exception to this requirement is permitted in the case of D 400, which may have a concave surface if they are installed in parking areas as described in clause 5, group 4.

Cast iron and steel upper surfaces of covers shall be manufactured with a raised pattern of the following heights:

— for class A 15, B 125 and C 250: 2 mm to 6 mm

— for class D 400, E 600 and F 900: 3 mm to 8 mm

The surface area of the raised pattern shall not be less than 10 % and no more than 70 % of the total upper surface area.

7.14 Opening angle of hinged gratings and covers

The opening angle of a hinged cover or grating shall be at least 100° to the horizontal unless otherwise specified. Where hinged covers or gratings have a radial profiled edge on the hinged side, it shall be profiled so that the gauge of 170 mm x 170 mm x 20 mm, detailed in Figure 15, is prevented from entering the gap between the adjacent frame and the curved edge of the cover or grating by more than 13 mm of its 170 mm depth, the gauge being vertical with its length parallel to the profiled edge.

7.15 Strength testing

7.15.1 Channel bodies

Channel bodies of grid units, slot units and kerb units shall be tested in accordance with 9.1.4.1 to the appropriate class as follows:

Channel bodies of grid units, slot units and kerb units ≥ 500 mm in length shall be tested to the full test load shown in Table 10. For channel units < 500 mm in length l the test load shall be pro-rata.

$$\frac{l}{500} \times testload \tag{1}$$

For example a unit 300 mm in length shall be tested at 300/500 x test load.

7.15.2 Gratings and covers

Gratings and covers shall be tested in accordance with 9.1.4.2 to the appropriate class as follows:

Gratings or covers for grid units with clear openings $CO \geq 250$ mm (see clause 3, Figures 7 and 8) shall be tested to the full test load shown in Table 10. Gratings and covers for grid units with width $CO < 250$ mm shall be tested to

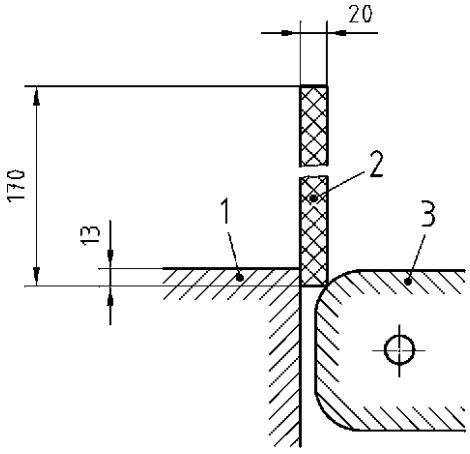
$$\frac{CO}{250} \times testload \tag{2}$$

with a minimum of 0,6 x test load.

Table 10 — Test loads

Class	Test loads kN
A 15	15
B 125	125
C 250	250
D 400	400
E 600	600
F 900	900

Dimensions in millimetres



Key

1 Frame;

2 Gauge;

3 Cover or grating

Figure 15 — Gauge

7.16 Permanent set

When tested in accordance with 9.1.4.2.1, the gratings and covers shall meet the requirements of Table 11 for the appropriate class.

Table 11 — Permissible permanent set of the grating/cover

Class	Permissible permanent set expressed as fraction of the width CO (see Figures 7 and 8) mm	
A 15 and B 125	$\frac{CO}{50}$ [a]	
C 250 up to F 900	$\frac{CO}{300}$ [b] When secured according to 7.9 a) or 7.9 c)	$\frac{CO}{500}$ [c] When secured according to 7.9 b)

[a] $\frac{CO}{100}$ when $CO \geq 450$ mm

[b] 1 mm max when $CO < 300$ mm

[c] 1 mm max when $CO < 500$ mm

For steel reinforced concrete or concrete with fibres, no cracks greater than 0,2 mm in width shall be permitted during this test.

7.17 Recommendations for installation

For all drainage channel types written instructions for general installation shall be provided by the manufacturer.

For drainage channels Type M the manufacturer shall provide instructions for specific haunching of drainage channel units and indicate the dimensions x, y, and z (see Figure 1). The manufacturer shall also indicate the concrete class required and reinforcement details if any, to meet the load classification of the product at the place of installation (see Table 10).

Documented instructions shall define at least:

— the support needed on site, according to the type, which shall be at least the support used for the loading test appropriate to the place of installation (see clause 5, 7.15, and 9.1);

— the jointing and sealing of adjacent drainage channels as used for the test of jointing channel units (see 7.5 and 9.3.6).

NOTE A product Type M, used in a lower class application (see clause 5), will not have the performance level marked on it, unless it is installed using the support appropriate to that marked class.

8 Marking

8.1 Marking of gratings and covers

Gratings and covers shall be marked as follows:

a) the number of this standard, EN 1433 (only if all the requirements of this standard are met) ;

b) the appropriate class (e. g. D 400);

c) the name and/or identification mark of the manufacturer, of the grating or cover and the place of manufacture which may be in code;

d) the name and/or identification mark of the manufacturer of the grid unit;

e) date of manufacture (coded or not coded).

and may be marked with:

f) additional markings relating to the intended application of the user,

g) the mark of a certification body, when applicable (see clause 10);

h) product identification (name and/or catalogue number).

8.2 Marking of channel bodies

Channel bodies shall be marked as follows:

a) the reference to this standard, EN 1433 (only if all the requirements of the standard are met);

b) the appropriate class (e. g. D 400);

c) the name and/or identification mark of the manufacturer of the channel body, which may be in code;

d) Type of product (Type M or Type I)

e) date of manufacture (coded or not coded).

f) for channel units with inbuilt gradients the sequence on each unit;

g) marking relating to the grade of weathering resistance for drainage channels made of concrete (N or W and, if relevant, +R);

and may be marked with:

h) additional markings relating to the intended application of the user,

i) the mark of a certification body, when applicable (see clause 10);

j) product identification (name and/or catalogue number).

NOTE 1 A product Type M, used in a lower class application (see clause 5), will not have the performance level marked on it, unless it is installed using the support appropriate to that marked class.

Concrete drainage channels, except channel units with inbuilt gradients, shall be marked according to 8.1 and 8.2 a) to g) on at least 10 % of products but with a minimum of one product per package.

Markings, e. g. stamping, casting, printing, labelling, shall be clear and, where possible, visible after the unit is installed.

NOTE 2 Where the marking requirements of ZA.3 require the same information as this clause, then the requirements of this clause will have been met.

9 Testing

Dimensions given in this clause shall be measured to an accuracy of ± 1 mm unless otherwise stated.

9.1 Loading test

9.1.1 Test loads

The test load for each class shall conform to 7.15.

9.1.2 Test apparatus

9.1.2.1 Test machine

The test machine, preferably a hydraulic test press, shall be capable of applying a load at least 25 % greater than the respective test load for classes A 15 to D 400, and at least 10 % greater than the respective test load for classes E 600 and F 900. The test machine shall be capable of applying the load evenly through the test block.

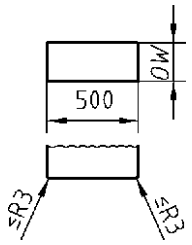
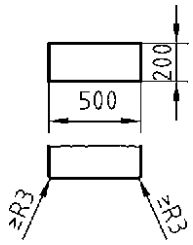
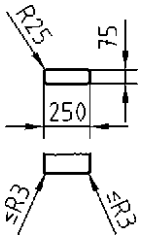
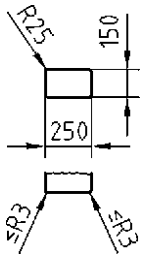
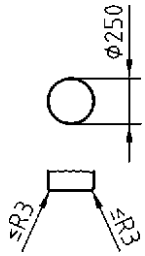
A tolerance of ± 3 % of the test load shall be maintained.

The dimensions of the bed of the test machine shall be greater than the bearing area of the unit to be tested.

9.1.2.2 Test blocks

The dimensions and shapes of test blocks are detailed in Table 12.

Table 12 — Dimensions of test blocks

For testing channel bodies (grid units, slot units and kerb units) with a nominal size		For testing gratings and covers of grid units with a clear opening CO [a]		
≤ 200 mm	> 200 mm	< 200 mm	200 mm ≤ CO ≤ 300 mm	> 300 mm
				
OW — overall width of the channel unit				
[a] see clause 3, Figures 7 and 8				

9.1.3 Preparation for the test

9.1.3.1 Channel bodies Type I

Test units of channel bodies Type I shall be placed on a levelling material to eliminate any irregularities in the channel body.

9.1.3.2 Channel bodies Type M

Test units of channel bodies Type M shall be bedded and haunched as required by the manufacturer's recommendations for the appropriate class of installation (see 7.15, 7.17 and Table 10). The dimensions x, y, and z, concrete class and reinforcement details, if any, shall be indicated.

9.1.3.3 Gratings and covers

The testing of gratings and covers shall be carried out either in the grid unit or in a suitable test frame which shall be placed on the bed of the testing machine so that it lies flush on it. Any irregularities shall be compensated for as described in 9.1.3.4.

9.1.3.4 Application of the test block

Place the test block, as specified in Table 12, on the test unit to ensure:

— the load is applied perpendicular to the surface of the test unit,

— the load is applied through the geometric centre of the test unit,

— the longer edge of the test block is parallel to the longer edge of the test unit.

The test load shall be uniformly distributed over the whole surface of the test block. Any surface irregularities shall be compensated for by means of an intermediate layer of e. g. wood, fibre board, felt, gypsum or similar material between the surface of the channel unit, the grating or cover and the test block. The plan dimensions of the intermediate layer shall be equal to those of the test block.

When testing channel units, gratings or covers with a non-flat surface the contact face of the test block shall be shaped to match the test unit. Patterns as defined in 7.13 and small deviations from a flat surface do not require a shaped contact face of the test block.

Channel units with a profile similar to Figure 5 shall be tested either on the upper part of the surface or on the lower part of the surface whichever is shown to sustain the lower test load.

9.1.4 Test procedure

9.1.4.1 Channel bodies (grid units, slot units and kerb units)

All units shall be submitted to the test load as specified in Table 10. With the exception of channel bodies made of concrete with fibre, the load shall be increased uniformly at a rate of (2 ± 1) kN/s until the test load is reached. The test load shall be held for 30 s, and then released. The unit shall not show any indication of a failure that might influence the load bearing capacity of the unit.

In the case of channel bodies made of concrete with fibre, the load shall be taken to the specified test load as specified in Table 10, held for one minute, and the channel body inspected for any crack. If no crack is found, the load shall then be taken to the ultimate (collapse) load and a record made of that load. After the sustained load has fallen to 95% (or less) of the recorded load it shall be released and re-applied up to 0,67 to the specific minimum crushing load in Table 10, held for one minute and a record made of whether or not the channel body withstood the re-applied load for that time.

For units manufactured from metallic materials a) to e) of 6.1.1, the test specimen shall not show cracks or any excessive deformation in the course of the entire test.

In the case of steel reinforced concrete or concrete with fibre units, the crack width shall not exceed 0,2 mm at 2/3 of the test load. Crack widths shall be measured by the insertion of feeler gauges. Where tested by optical means, cracks of 0,3 mm are permitted.

Additional tests may be required for materials not listed in6.1.1.

NOTE Where the test machine will not maintain a constant load then the test load can be increased during the 30 s period of hold.

9.1.4.2 Gratings and covers

All gratings and covers shall be submitted to the following tests:

— Measurement of the permanent set

— Application of the test load

— Additional tests as required for materials not listed in 6.1.2.

9.1.4.2.1 Measurement of permanent set

The permanent set of the grating or cover shall be measured after the application of 2/3 of the test load. The permanent set shall be measured to an accuracy of 0,1 mm.

The permanent set shall be measured at the mid point of the grating or cover. This point shall be marked and, where necessary, machined. Take an initial reading before the load is applied.

The loading shall be increased uniformly at a rate of (2 ± 1) kN/s up to 2/3 of the test load; the load on the test specimen shall then be released. This procedure shall be carried out five times. Then take a final reading.

The permanent set shall then be determined as the difference of the measured values before the first and after the fifth loading. The permanent set shall not exceed the values given in Table 11.

9.1.4.2.2 Application of the test load

Immediately following the test specified in 9.1.4.2.1 the load shall be increased uniformly at a rate of (2 ± 1) kN/s, until the test load is reached. The test load shall be held for a period of 30 s, then released and the grating or cover shall not show failure.

For gratings and covers manufactured from metallic materials a) to f) of 6.1.2 the test specimen shall not show cracks in the course of the test.

For those gratings and covers manufactured from non-metallic materials listed in 6.1.2 no cracks or flaking impairing the load bearing capacity shall appear on the test specimen until the test load is reached. In the case of steel reinforced concrete or concrete with fibre units the crack width shall not exceed 0,2 mm at 2/3 of the load.

9.2 Materials

9.2.1 Precast concrete

The compressive strength for cubes and cylinders given in 6.3.3.1 shall be tested in accordance with ISO 4012. The determination of water absorption shall be carried out according to the procedure given in 9.2.1.1 to 9.2.1.7.

The resistance to freeze/thaw cycles and de-icing salts shall be determined according to annex B (normative). The test result shall comply with the requirements of 6.3.3.1. and 6.3.3.3 as applicable.

9.2.1.1 Test specimens for determination of water absorption

The specimen shall have a volume of not less than 0,0001 m^3. It may be in the form of:

— an entire concrete element,

— a specimen cut from an element of cured concrete.

The plan of the specimen shall be a minimum of 100 mm $\times$ 100 mm and the thickness shall be that of the unit or shall be reduced to 50 mm, if greater. The sawn surfaces of the specimen shall be coated before the test.

NOTE It is recommended that the minimum age at test should be 28 days.

9.2.1.2 Principle

After conditioning to (20 $\pm$ 3) °C the specimen is soaked in potable water to constant mass and then oven dried to constant mass. The loss is expressed as a percentage of the mass of the dry specimen.

9.2.1.3 Apparatus

For testing the specimen the following apparatus shall be available:

— a ventilated drying oven with a capacity in litres to area of ventilation channels in cm^2 equal to or less than 20 in which the temperature can be controlled to (105 $\pm$ 5)°C. It shall have a volume at least 2 1/2 times greater than the volume of specimens to be dried at any one time;

— a flat based vessel having a capacity at least 2 1/2 times the volume of the samples to be soaked and a depth at least 50 mm greater than the height of the specimens in the attitude that they will be soaked;

— a balance reading in grams and accurate to 0,1 % of the reading;

— a stiff brush;

— a sponge or drying leather.

9.2.1.4 Preparation of the test specimens

All dust, flashing etc. shall be removed with the brush. It shall be ensured that each specimen is at a temperature of (20 $\pm$ 3)°C.

9.2.1.5 Procedure

The specimens shall be immersed in potable water at a temperature of (20 ± 2)°C using the vessel until constant mass M_1 is reached. The specimens shall be separated from each other by at least 15 mm and have a minimum of 20 mm water above them. The minimum period of immersion shall be 3 days and constant mass shall be deemed to have been reached when two weighings which have been carried out at an interval of 24 h show a difference in mass of the specimen of less than 0,1 %. Before each weighing wipe the specimen with the drying leather or sponge which has been moistened and squeezed to remove any excess of water. The drying is satisfactory when the surface of the concrete is dull.

Each specimen shall be placed inside the oven with a distance between each specimen which is at least 15 mm. The specimen shall be dried at a temperature of (105 ± 5)°C until it reaches constant mass M_2. The minimum period of drying shall be 3 days and constant mass shall be deemed to have been reached when two weighings performed at an interval of 24 h show a difference in mass of the specimen of less than 0,1 %. The specimens shall be allowed to cool to room temperature before they are weighed.

9.2.1.6 Calculation of the results

Calculate the water absorption of each specimen as a percentage of its mass:

$$\frac{M_1 - M_2}{M_2} \times 100 \qquad (3)$$

9.2.1.7 Test report

The test report shall give the values of water absorption for each of the specimens. Where other test methods are used, a correlation shall be established.

9.2.2 Synthetic resin concrete

9.2.2.1 Test specimen

Separately manufactured test specimens complying with the dimensions given in Table 3 shall be used. The compressive strength test shall be carried out first, followed by the flexural bending strength test, on both of the resulting parts of the specimen. The test may also be carried out on finished products e.g. plates, or on samples taken from finished products. In this case the dimensions of the test specimens may differ from those in Table 3 and the requirements of 9.2.2.2 and 9.2.2.3 shall apply by analogy.

9.2.2.2 Test apparatus

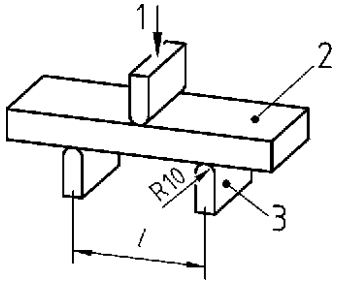
Test machines shall comply with the requirements of EN 10002-2 class 3 as regards accuracy.

When testing flexural bending strength the test machine shall be equipped with apparatus as shown in Figure 16, where the radius of the test indentor and of the supports is 10 mm. The distance l between the supports shall be 120 mm, for the 40 mm x 40 mm x 200 mm specimens, and 240 mm for 80 mm x 80 mm x 400 mm specimens.

When testing compressive strength the loading shall be applied to the test specimen by means of test plates having dimensions of

— 40 mm x 62,5 mm for the 40 mm x 40 mm specimen and

— 80 mm x 80 mm for the 80 mm x 80 mm specimen.



Key

1 Test load; 2 Test specimen; 3 Support

Figure 16 — Flexural bending test

9.2.2.3 Test procedure and determination of strength

The loading shall be applied to the test specimen at a uniform rate such that the strength requirements of Table 2 are reached within 1 min.

Using the actual dimensions of the test specimen the flexural bending strength σ_b and the compressive strength σ_c shall be calculated for each of the test specimens using the following equations:

$$\sigma_b = \frac{3 \times P \times l}{2 \times b \times d^2} \quad (4)$$

where

σ_b is the flexural bending strength, in Newton per square millimetres (N/mm^2)

P is the load at failure, in Newton (N);

b is the actual width of the test specimen, in millimetres (mm);

d is the actual thickness of the test specimen, in millimetres (mm);

l is the distance between the supports, in millimetres (mm).

$$\sigma_c = \frac{P}{F} \quad (5)$$

where

σ_c is the compressive strength, in Newton per square millimetres (N/mm^2)

P is the load at failure, in Newton (N);

F is the pressure area of the test specimen, in square millimetres (mm^2).

When type testing (see 9.5) the results of tests on three test specimens according to 9.2.2.1 shall comply with the requirements of Table 2.

9.2.2.4 Factory production tests

For production testing either flexural or compressive strength tests may be used. A correlation shall be established between flexural bending and compressive strength, this correlation being verified regularly but in any event not less than at 12 months intervals.

9.2.3 Concrete with fibre

For Glass fibre reinforced concrete (GRC) tests shall be carried out in compliance with EN 1170-5.

For all other types of concrete with fibre, test specimens according to Table 5 and measured to an accuracy of 0,5 mm shall be used and tested for flexural bending strength in accordance with Figure 16 but using two test indentors at a distance of 100 mm from each other. The distance between the supports shall be 300 mm and the radius of the test indentors and of the supports 10 mm. The testing machine shall conform to EN 10002-2, class 3 as regards accuracy.

Calculate the flexural bending strength σ_b of the specimens by means of the following formula:

$$\sigma_b = \frac{300 \times P}{b \times d^2} \qquad (6)$$

where

σ_b is the flexural bending strength, in N/mm^2;

P is the load at failure, in N;

b is the actual width of the test specimen, in mm;

d is the actual thickness of the test specimen, in mm;

300 is the distance between the supports, in mm.

The loading shall be increased at such a rate that failure occurs within approximately one minute. Within the region of elasticity (up to the first crack after about 0,5 min) the load may be increased uniformly. Later, in general, any deformations occurring will not allow a steady increase of load.

9.3 Design requirements

9.3.1 General inspection

Visual inspections for assessing the requirements of 7.1 shall be carried out at a distance of approximately 2 m in daylight conditions.

9.3.2 Dimensions

All dimensions shall be measured to an adequate accuracy or to the accuracy required by an appropriate clause.

9.3.3 Discharge cross section (see 7.3)

The dimensions of the discharge cross section shall be measured to an accuracy of 1,0 mm and the cross section shall be calculated and expressed to the nearest 100 mm^2.

9.3.4 Gradient (see 7.4)

To calculate the gradient $(h_1 - h_2)/l$, the dimensions h_1, h_2 and l shall be measured in mm in accordance with Figure 17.

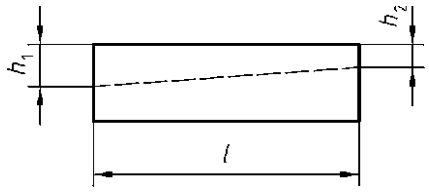


Figure 17 — Drainage channel unit with gradient

9.3.5 Discharge openings/connecting openings (see 7.3)

Openings shall be measured to an accuracy of 1,0 mm. In the event of a connection to onward pipelines then the openings shall be checked for conformity with 7.3.

9.3.6 Jointing of channel units (see 7.5)

The requirements of 7.5 shall be verified by visual inspection following the assembly and the sealing of the joint of two channel units in accordance with the manufacturer's recommendations. After closing and sealing both open ends, fill the units with water to the maximum designed wetted perimeter. No leakage shall appear at the joint or through the body of the channels in a period of 30 min ± 30 s.

9.3.7 Depth of insertion of gratings and covers (see 7.6)

The depth of insertion (A) shall be measured to an accuracy of 1,0 mm.

9.3.8 Seating (see 7.7)

The compatibility of the seating to ensure stability and non-rocking shall be inspected for conformity with the manufacturer's specification.

9.3.9 Trafficked edge protection (see 7.8 and 6.1)

The thickness of uncoated cast iron or steel trafficked edge protection shall be measured to an accuracy of 0,1 mm. The thickness of the hot-dip galvanizing shall be measured to an accuracy of 5 µm. For classes D 400 to F 900 the secure connection between the edge protection and the channel unit shall be visually inspected for conformity with the manufacturer's specification.

9.3.10 Securing of a grating and/or cover in a grid unit (see 7.9)

Where securing a grating and/or cover is achieved by mass per unit area (see 7.9 b)), the grating and/or cover shall be weighed to an accuracy of 1 % and the clear area shall be calculated and expressed to the nearest 100 mm^2. Where securing of a grating and/or cover is achieved by a locking device or by a specific design feature (see 7.9 a) or c)), then a visual inspection of the device or the design feature shall be performed.

9.3.11 Dimensions of inlet openings (see 7.10)

The slots shall be measured to an accuracy of 1,0 mm and the waterway area shall be calculated and expressed to the nearest 100 mm^2.

9.3.11.1 Straight slots (see 7.10.1)

The dimensions of straight slots shall be measured to an accuracy of 1,0 mm.

9.3.11.2 Slots in other shapes and other inlet openings (see 7.10.2 and 7.10.3)

The dimensions of slots, other than straight slots (see 7.10.1 and 9.3.11.1), shall be controlled by a gauge of 170 mm x 170 mm x 20 mm. The dimensions of other inlet openings shall be measured to an accuracy of 1,0 mm.

9.3.12 Dirt buckets (see 7.11)

The dirt bucket shall be filled with suitable material before a visual inspection to ensure that both drainage and ventilation is still possible.

9.3.13 Correct positioning of gratings and covers (see 7.12)

If an indelible mark or register is necessary to ensure a predetermined position of the grating and/or cover within the frame, this mark or register shall be visually inspected.

9.3.14 Surface condition (see 7.13)

The flatness shall be measured to an accuracy of 0,5 mm. The height of the raised pattern shall be measured to an accuracy of 0,5 mm. The total raised area of the cover and frame shall be determined either by reference to the drawing and subsequently controlled by visual inspection or by measuring the dimensions of the upper surface of the raised pattern to an accuracy of 1 mm. The percentage ratio of the raised surface to the total area shall be calculated.

9.3.15 Opening angle of hinged gratings and covers (see 7.14)

The opening angle shall be measured to an accuracy of 5°.

9.4 Marking (see clause 8)

The marking of gratings, covers and channel bodies shall be visually inspected.

9.5 Type testing

Three complete test samples of a channel unit including the appropriate gratings/covers shall be tested in accordance with clause 9, and each test sample shall comply with all requirements of clauses 4, 6, 7 and 8 before production of the unit or grating/cover commences.

Tests previously performed in accordance with the provisions of this standard (same product, same characteristic(s), test method, sampling procedure, etc.) may be taken into account. All design details, overall dimensions, functional dimensions, tolerances and material specifications shall be available. In the case of significant changes in the design of the product and/or in a manufacturing process then the relevant type tests shall be repeated.

The test samples shall be representative of normal production units.

9.6 Routine loading test

For the purpose of checking factory production control for conformity to this standard, following approval of type testing in accordance with 9.5, an alternative routine load test for channel units may be carried out. The routine load test may omit any support or concrete bedding and haunching of the channel units required for a load test. The manufacturer shall establish a defined relationship of the results between this routine test and the load test defined in 9.1.

Conformity of reinforced concrete units with a nominal size greater than DN 400 may be checked, at the manufacturer's discretion, by either structural calculation or by a loading test.

10 Evaluation of Conformity

10.1 General

To demonstrate conformity to this standard all manufactured products shall be subjected to the following procedures:

a) Initial testing (type testing) of the products (see 10.2)

b) Factory production control, based on a quality assurance system, (internal quality control, see 10.3).

If third-party control is carried out, for example based on national specifications, annex D (informative) is applicable.

NOTE In order not to prejudice the current quality level in those countries where a practice of third party control has been used to date, it is intended that such practices may be maintained provided the third party control in this standard retains its informative character.

10.2 Type testing (initial testing of the product)

Type tests described in 9.5 of this standard shall be carried out in order to demonstrate conformity with this standard. Full reports of these tests shall be retained by the manufacturer in order that they shall be available to a third party (if applicable) for examination.

10.3 Factory production control to be carried out by the manufacturer (internal quality control)

The manufacturer shall control the quality of products during their manufacture by a system of process control in order to comply consistently with the technical requirements of this standard. For concrete with glass fibre, the control shall in addition conform to EN 1169. Quality control shall be independent of production and shall be carried out by trained staff. The factory production control shall at least cover the main specific items listed in annex A and for this purpose the manufacturer shall have:

— a documented structure with an appointed management representative,

— skilled personnel,

— all the required control and testing equipment and facilities.

Furthermore the manufacturer shall establish and maintain a quality plan in which process and final inspections and testing are listed. The quality plans shall contain the method and frequency of inspection and the documentation required.

Production control operations and documentation shall include details of all stages of production from the arrival of the raw materials through to the final product leaving the factory. Documentation shall be retained so that it is available e.g. for inspection by a third party inspector (if applicable) for 1 to 5 years as shown in Tables A.1 to A.8.

Finally the manufacturer shall establish and maintain written procedures for:

— document control;

— control of non-conforming products, storage, packaging, handling and marking;

— dealing with complaints from customers;

— calibration and control of measuring and testing equipment.

NOTE Where the written procedures contain the information required by ZA 2.2, then the requirements of ZA.2.2 are met.

10.4 Non-conforming products

All non-conforming products shall be segregated and excluded from delivery, and instructions shall be given for further handling/administration (storage, marking).

If during the factory production control carried out by the manufacturer non-conforming products are detected the manufacturer shall investigate the cause of the defect and take appropriate corrective actions e. g. stop the production related to the failure(s) and/or quarantine the defective product.

11 Installation

Installation should be carried out in accordance with the relevant Code of Practice. Until such European Codes of Practice exist the National Code of Practice or the manufacturer's guide should be used.

Annex A
(normative)

Model procedure of internal quality control

Table A.1 — Receiving inspection and testing for Flake graphite cast iron (see 6.1.1 a) and 6.1.2 a)) Spheroidal cast iron (see 6.1.1 b) and 6.1.2 b)) and Cast steel (see 6.1.1 c) and 6.1.2 c))

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
— Raw material storage area	visually	regularly	—
— Iron ore	Supplier's Certificate [a]	every delivery	1 year
— Pig iron	Supplier's Certificate [a]	every delivery	1 year
— Scrap iron/steel (from third party)	Supplier's Certificate [a]	every delivery	1 year
— Scrap returns (manufacturer)	internal quality control	every delivery	1 year
Additives	refer to the order	every delivery	1 year
Energy for melting:			
— Electricity	—	—	—
— Gas	Supplier's Certificate [a]	regularly/when changed	1 year
— Coke	Supplier's Certificate [a]	every delivery	1 year
— Sand for moulds/ cores	Supplier's Certificate [a] and sieve analysis	regularly	1 year
— Cushioning inserts	Supplier's Certificate [a]	every delivery	1 year
— Elastomer for cushioning inserts	Supplier's Certificate [a]	every delivery	1 year
— Sealing material	Supplier's Certificate [a]	every delivery	1 year

[a] Supplier's Certificate:

— deliveries from suppliers having a certified quality assurance system shall be subject to random control;

— deliveries from suppliers having no certified quality assurance system shall be subject to a systematic control for each delivery.

Table A.2 — Process control for Flake graphite cast iron (see 6.1.1 a) and 6.1.2 a)); Spheroidal cast iron (see 6.1.1b) and 6.1.2 b)); and Cast steel (see 6.1.1 c) and 6.1.2 c))

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Moulding sand characteristics	laboratory	once per shift	1 year
Ductile iron additives	weigh/measure	each treatment ladle	1 year
Temperature of melt in the casting ladle/furnace	visually/pyrometer	regularly	1 year
Composition of metal/analysis			
— casting ladle	laboratory	each treatment or each furnace or each ladle	5 years
— continuous casting	laboratory	once/3 tonnes	5 years
Mould control	visually	regularly	—
Casting operation	visually	regularly	—
Standing time of each pouring ladle	visually	each cast	—
Mechanical properties			
— tensile strength	6.2	6.2	5 years
— elongation %	6.2	6.2	5 years
— nodularity	6.2	6.2	5 years
— other materials	6.2	as per materials standards	5 years

Table A.3— Final inspection and testing of products (all materials according to clause 6)

Clause No	Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
7.1	General — free of defects	visually	every unit	—
7.2	Dimensions	measure	1:5000 min[a]	5 years
7.2	Total clearance	measure	1:5000 min[a]	5 years
7.3	Geometric design	laboratory	type testing	5 years
7.4	Gradient	measure	1:5000 min[a]	5 years
7.5	Joining of channel units — sealing — smooth transition	laboratory	type testing	5 years
7.6	Depth of insertion and clearance $a_2 \leq a_1$	measure	1:5000 min[a]	5 years
7.7	Seating — compatibility, stability — cushioning inserts[b]	 try/measure measure	 1:5000 min[a] 1:5000 min[a]	 5 years 5 years
7.8	Edge protection[b] thickness	measure	1:5000 min[a]	5 years
7.9	Securing of grating or cover within the frame a) locking device b) mass c) design feature	 laboratory Weigh visual/measure[b]	 type testing regularly type testing	 5 years 5 years 5 years
7.10	Dimensions of inlet openings - size, orientation	measure	1:5000 min[a]	5 years
7.11	Dirt bucket[b] — ensure drainage and ventilation	visually	type testing	—
7.12	Correct positioning of gratings/covers - design feature	visually	type testing	—
7.13	Surface condition — flatness — height of pattern	measure	1:5000 min[a]	5 years
7.14	Opening angle of hinged gratings/covers	measure	1:5000 min[a]	5 years
8	Marking	visually	every unit	—
4	Classification	loading test (see 9.1) or routine loading test (see 9.6)[b]	1:5000 min[a]	5 years

[a] once per 5000 produced parts, at least once every two months (one month = 20 sequential days of production of the relevant product)

[b] if applicable

Table A.4 — Rolled steel (see clause 6)

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Receiving inspection and testing of materials and consumables		see Table A.1	
Process control		see Table A.2	
Final inspection and testing of products		see Table A.3	
— Welding of rolled steel[b]			
— Corrosion protection	6.3, measure	Once/hour or Supplier's Certificate [a]	1 year
Inspection, measuring and testing equipment		Table A.6	
Handling, storage, packaging and delivery		Table A.6	
Control of non-conforming product		Table A.6	

[a] see Table A.1

[b] In the absence of a European Standard, the national standard(s) will apply. If the country of the user has no national standard for the welding of rolled steel, the national standard of the manufacturer's country will be applicable

Table A.5 — Concrete and reinforced concrete (see clause 6)

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Receiving inspection:			
— cements and other cementitious materials	Supplier's Certificate or compliance with specified requirements for strength and setting time	Every 1000 tonnes with a minimum of twice per month	
— aggregates	Supplier's Certificate or visual inspection	Every delivery	
	Sieve analysis test	a) 1st delivery from new source b) In case of doubt following visual inspection c) Once per week	
	Test for organic impurities or shell content	a) 1st delivery from new source b) In case of doubt following visual inspection	1 year
— admixtures	Supplier's Certificate or visual inspection	every delivery	
— additions	Supplier's Certificate or visual inspection	every delivery	
— pigments	Supplier's Certificate or visual inspection	every delivery	
— steel bars for reinforcement	Supplier's Certificate or visual inspection	every delivery	
Water:			
— public distribution system	Visual inspection	every delivery	
— open water course or borehole	The strength of concrete or mortar cubes made with such water to be a minimum of 90 % of that strength made with deionised water	a) 1st use of new source b) Three times per year	1 year
Process control:	9.2.1	1 : 1000 parts[a]	5 years
— Mixers	Visual inspection	Weekly	—
Moulds	Visual inspection	Daily	—
Filling	Visual inspection	Daily	—
— Water absorption (only for products with weathering resistance "grade 2")	9.2.1	Once per month and concrete family/process	5 Years
— freeze/ thaw resistance[b] (only for products with weathering resistance "grade +R")	9.2.1 and annex B	Initial type testing then once per year and concrete family/process[c]	5 Years
— compressive strength	laboratory	Once per week (3 samples)	5 Years

[a] Once per 1 000 produced parts, at least once every week

[b] When products are classified grade +R on the evidence of previous tests, they may be submitted to water absorption tests as grade 2 but with a mean value ≤ 5,5 % and with no individual result > 6 % (in place of the initial type testing of freeze/thaw resistance)

[c] If for a concrete family, the result of a type test is lower than 50 % of the required value (see Table 1) the test frequency as given in Table A.5 may be reduced to once per two years, for as long as this condition is fulfilled. When this concrete family is also submitted to a water absorption test with a mean value ≤ 5,5 % and with no individual result > 6 % then the test frequency as given in Table A.5 may be halved.

Table A.6 — Stainless steel and copper based alloys (see clause 6)

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Receiving inspection: — stainless steel	Supplier's Certificate[a]	every delivery	1 year
— copper based alloys	Supplier's Certificate[a]	every delivery	1 year
Process control	Table A.2		
Product control	Table A.3		

[a] see Table A.1

Table A.7 — Synthetic resin concrete (see clause 6)

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Receiving inspection:			
— resin	Supplier's Certificate[a]	every delivery	1 year
— styrene	Supplier's Certificate[a]	every delivery	1 year
— accelerator	Supplier's Certificate[a]	every delivery	1 year
— hardener	Supplier's Certificate[a]	every delivery	1 year
— additions (fillers)	Supplier's Certificate[a] and sieve analysis, moisture content	every delivery	1 year
— pigments	Supplier Certificate [a] and visual	every delivery	1 year
Process control:			
— material testing	9.2.2	3 test samples per processing machine every two weeks of manufacture	5 years
— mould control	visually	regularly	—
— filling	visually	1 per 1000 parts[b]	—
— compressing	visually	1 per 1000 parts[b]	—
— final moulding	visually	1 per 1000 parts[b]	—
— preparation of moulds	visually	1 per 1000 parts[b]	—
— Final inspection and testing of products	Table A.3		

[a] see Table A.1

[b] once per 1000 products, but at least once every two months.

Table A.8 — Inspection, measuring and test equipment, handling, storage, packaging and delivery control of non-conforming products

Aspect of inspection	Method of inspection	Frequency of inspection	Document retention period
Inspection, measuring and test equipment:			
— Tensile load testing machine	certificate[a]	once a year	5 years
— Compression load testing machine	certificate[a]	once a year	5 years
— Other measuring equipment	certificate[b]	in accordance with the device, measuring equipment and manufacturer's recommendations	5 years
Handling, storage, packaging and delivery	visually	regularly	—
Control of non-conforming products			
— Segregation	according to manufacturer's approved documents	—	5 years
— Rejection			
— Reworking/retesting			

[a] this shall be done by an authorised institute

[b] may be carried out by the manufacturer, using calibrated gauges

Annex B
(normative)

Supplementary requirements for concrete products submitted to very severe freeze-thaw conditions with standing water containing de-icing salts

B.1 Scope

This Annex sets out supplementary requirements to which reference may be made when channels are used in the conditions defined in B.2.

B.2 Conditions of application

The requirements defined in B.3 are required when any surface (partially or entirely made with concrete) of the drainage channel system is exposed to frequent contact with standing water containing de-icing salts in frost conditions.

B.3 Resistance to freeze-thaw with de-icing salts

When tested in accordance with the test method described in annex C the concrete shall not show a mean mass loss higher than 1,5 kg/m^2 with no individual result higher than 2,0 kg/m^2.

B.4 Marking

Products complying with B.3 may receive the additional marking "+R".

Annex C
(normative)

Determination of freeze/thaw resistance with de-icing salt

C.1 Principle

The specimen is preconditioned and then subjected to 28 freeze thaw cycles while the surface is covered with a 3 % NaCl solution. The material that has scaled off is collected and weighed and the result expressed in kg/m^2.

C.2 Sampling

The specimen shall incorporate an upper face area greater than 7 500 mm^2 but less than 25 000 mm^2, which shall be the test surface and shall have a maximum thickness of 103 mm. If the specimen has to be cut from a channel unit to meet this requirement it shall be sawn when it is at least 20 days old.

C.3 Materials

The following materials shall be used:

— Potable water

— Freezing medium, consisting of 97 % by weight of potable water and 3 % by weight of NaCl.

— Adhesive for glueing the rubber sheet to the concrete specimen. The adhesive shall be resistant to the environment in question.

NOTE Contact adhesive has proved to be suitable.

— Silicon rubber or other sealant to provide a seal between the specimen and the rubber sheet and to fill in any chamfer around the perimeter of the specimen.

C.4 Apparatus

The following apparatus shall be used:

— Diamond saw for cutting concrete specimen.

— Climate chamber with a temperature of (20 ± 2)°C and a relative humidity of (65 ± 10) %. In the climate chamber the evaporation from a free water surface shall be (200 ± 100) g/m^2 in (240 ± 5) min. The evaporation shall be measured from a bowl with a depth of approximately 40 mm and a cross section area of (22 500 ± 2 500) mm^2. The bowl shall be filled up to (10 ± 1) mm from the brim.

— Rubber sheet, (3 ± 0,5) mm thick which shall be resistant to the salt solution used and sufficiently elastic down to a temperature of – 20°C.

— Thermal insulation. Polystyrene (20 ± 1) mm thick with λ between 0,035 and 0,04 W/mK or other equivalent insulation.

— Polyethylene sheet, 0,1 to 0,2 mm thick.

— Freezing chamber with time controlled refrigerating and heating system with a capacity and air circulation such that the time-temperature curve presented in Figure C.3 can be followed.

— Thermo-couples, or an equivalent temperature measuring device, for measuring the temperature in the freezing medium on the test surface with an accuracy within ± 0,5°C.

— Vessel for collecting scaled material. The vessel shall be suitable for use up to 120 °C and shall withstand sodium chloride attack.

— Paper filter for collecting scaled material.

— Brush, 20 mm to 30 mm wide paint brush with the bristles cut down to about 20 mm long for brushing off material that has scaled.

— Spray bottle, containing potable water for washing off scaled material and washing salt out of scaled material.

— Drying cabinet, for a temperature of (105 ± 5)°C.

— Balance, with an accuracy within ± 0,05 g.

— Vernier calipers, with an accuracy within ± 0,1 mm.

C.5 Preparation of test specimens

When at least 28 and, except for receiving inspection, not more than 35 days old remove any flashings and loose material and then cure the samples for (168 ± 5) h in the climate chamber with a temperature of (20 ± 2) °C, relative humidity of (65 ± 10) % and an evaporation rate in the first (240 ± 5) min of (200 ± 100) g/m^2 measured in accordance with C.4. There shall be a minimum 50 mm air spaces between the samples. During this time the rubber sheet is glued to all surfaces of the specimen except the test surface. Use the silicon rubber or other sealant to fill in the chamfer around the perimeter of the block and to provide a seal around the test surface in the corner between the concrete and the rubber sheet to prevent water penetration between the specimen and rubber. The edge of the rubber sheet shall reach (20 ± 2) mm above the test surface.

NOTE The adhesive is normally spread on the concrete surfaces as well as on the rubber surfaces. The manner of gluing the rubber sheet illustrated in Figure C.1 has proved suitable.

Key

1 Test surface
2 Specimen
3 Rubber sheet
4 Sealant ring
5 Overlap

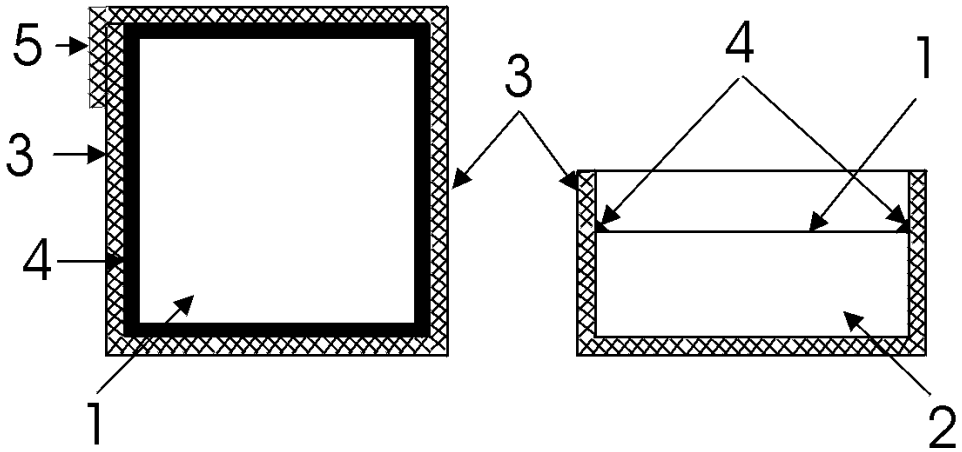


Figure C.1 — Example of the cross section of a specimen with the rubber sheet and a sealant string (right) and specimen seen above (left)

Key

1 Test surface
2 Polyethylene sheet
3 Freezing medium (salt solution)
4 Specimen
5 Rubber sheet
6 Thermal insulation
7 Temperature measuring device
8 Sealant string

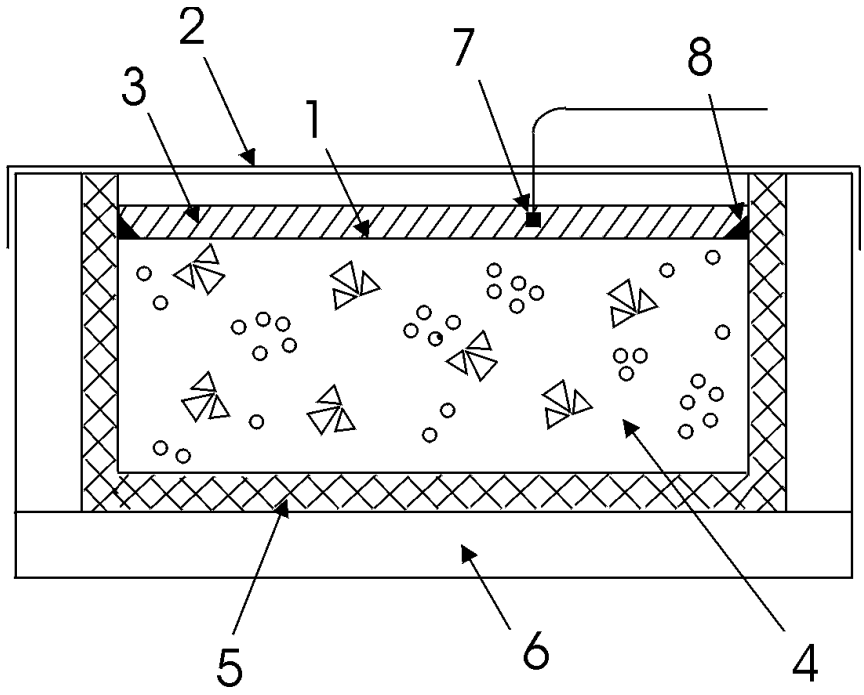


Figure C.2 — Principle of set-up for the freeze/thaw test

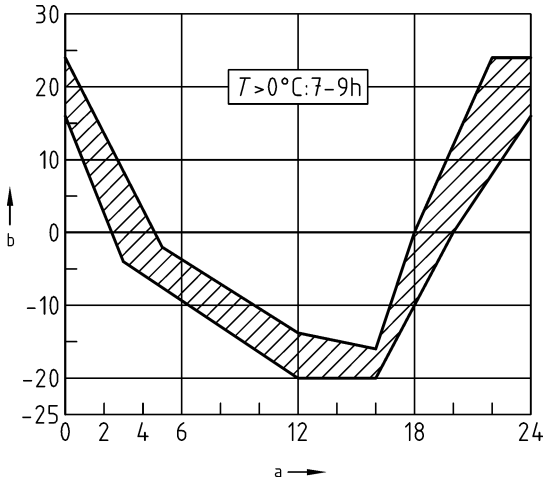
The tested area A is established from the mean of 3 measurements of its length and width to the nearest millimetre. After curing in the climate chamber, potable water with a temperature of (20 ± 2) °C is poured on the test surface to a depth of (5 ± 2) mm. This is maintained for (72 ± 2) h at (20 ± 2) °C and can be used to assess the effectiveness of the seal between the specimen and the rubber sheet.

Before the freeze/thaw cycling all surfaces of the specimen except the test surface are thermally insulated. This can be carried out during curing. The insulation shall be as described in C.4.

15 min to 30 min before the specimens are placed in the freezing chamber, the water on the test surface shall be replaced with a (5 ± 2) mm layer, measured from the top surface of the specimen of 3 % NaCl in potable water. This is prevented from evaporating by applying a polyethylene sheet as shown in Figure C.2. The polyethylene sheet shall remain as flat as possible throughout the test and not come into contact with the freezing medium.

C.6 Procedure

The specimens shall be placed in the freezing chamber in such a way that the test surface does not deviate from a horizontal plane by more than 3 mm per metre in any direction and than subjected to repeated freezing and thawing. During the test the time-temperature cycle in the freezing medium at the centre of the surface of all specimens shall fall within the shaded area in Figure C.3. Furthermore the temperature shall exceed 0 °C during each cycle for at least 7 h but not more than 9 h. The temperature shall be continually recorded in the freezing medium at the centre of the test surface for at least one specimen which shall be located in a representative position in the freezing chamber. The air temperature in the freezer during the test shall be recorded. The timing of the first cycle of the test on a specimen shall start within (0 ± 30) min of it being placed in the freezing chamber. If a cycle has to be interrupted the specimen shall be kept in the frozen state between – 16 °C and – 20 °C. If this interruption is for more than three days the test shall be abandoned.



Key

a Time (h)
b Temperature (°C)

Figure C.3 — Time-temperature cycle

The break points specifying the shaded area are given in Table C.1.

Table C.1 — Coordinates of break points

Upper limit		Lower limit	
Time h	Temp. °C	Time h	Temp. °C
0	24	0	16
5	-2	3	-4
12	-14	12	-20
16	-16	16	-20
18	0	20	0
22	24	24	16

To obtain the correct temperature cycle for all the specimens there shall be good air circulation in the freezing chamber. If only a few specimens are to be tested, the empty places in the freezer should be filled with dummies, unless it has been shown that the correct temperature cycle is achieved without them.

After 7 and 14 cycles, during the thaw period further 3 % NaCl in potable water is added if necessary in order to keep a (5 ± 2) mm layer on the surface of the samples.

After 28 cycles the following procedure shall be carried out for each specimen:

— Material which has been scaled from the test surface is collected by rinsing into the vessel using the spray bottle and brushing into the vessel until no further scaled material is removed;

— The liquid and scaled material in the vessel are carefully poured through a filter paper. The material collected in the filter paper is washed through a minimum of one litre of potable water to remove any remaining NaCl. The filter paper and collected material are dried for at least 24 h at (105 ± 5) °C and the dry mass of the scaled material, making due allowance for the filter paper, is determined to ± 0,2 g.

C.7 Expression of test results

The mass lost per unit area for the specimen shall be calculated as follows:

$$Mass\ lost\ \ per\ unit\ area = \frac{M}{A} \qquad \text{(C.1)}$$

where

M is the mass of the total quantity of material scaled after 28 cycles, in milligrams (mg);
A is the area of the test surface in square millimetres (mm^2).

C.8 Test report

The test report shall include the mass loss per unit area of the specimen, the mass of total quantity of material scaled after 28 cycles in milligrams and the area of the test surface in square millimetres.

NOTE Waiting for a European Standard for testing the freeze/thaw resistance of concrete, the interpretation of the results from the test method described in this annex allows for possible variations between laboratories, especially where a laboratory has little experience with this method.

Annex D
(informative)

Inspection control, carried out by a third party certification body (third party control)

D.1 Purpose and procedure of third party Inspection

The purpose of the third party Inspection is to demonstrate the ability of the manufacturer to produce products which consistently meet the requirements of this standard and to give independent certification to these products.

Third party Inspection:

— verifies the adequacy of the manufacturer's production control system, staff and equipment for continuous and orderly manufacture;

— verifies that quality control is independent of production;

— verifies that type testing has been satisfactorily carried out in accordance with the requirements of this standard;

— verifies that the manufacturer's production control results comply with the requirements of this standard and are representative of the production;

— randomly selects and tests finished products covering at least the main aspects listed in Table D.1.

Table D.1 — Third party Inspection

Aspect of inspection	Method of inspection	Frequency of inspection[a]
Receiving inspection	Tables A.1, A.4, A.5, A.6	Every visit
Process control	Tables A.2, A.4, A.5, A.6	Every visit
Final inspection and testing of products	Table A.3	Every visit
Drainage channels	Clause 9	3 different complete types per visit
Inspection, measuring and test equipment	Table A.7	Every visit
Handling, storage, packaging and marking	Table A.7	Every visit
Control of non-conforming product	Table A.7	Every visit
Control of customers complaint procedure	visual	Every visit
Quality records	visual	Every visit

[a] The third party decides the extend of random investigation required at every visit. This can be based on a recognised inspection plan to ensure the whole product range is covered in a reasonable period

The third party Inspection will be undertaken without previous announcement, at least twice a year at regular intervals.

For manufacturers certified to EN ISO 9001, and addressing the requirements of thisstandard, the inspection can be reduced to at least once a year provided that the independent certification body is satisfied that the results of the internal quality controls are in compliance with the requirements of this standard.

When the third party test results do not confirm those recorded in the manufacturer's production control documentation the third party conducts further investigation and/or testing to identify the reason for this discrepancy.

D.2 Report by the third party

After the completion of the Inspection visit a report stating the main results is drawn up by the third party inspector. The manufacturer signs this report and retains a copy. If the manufacturer does not agree with this report, he signs the report and states his reservations therein.

The report contains at least the following items:

— the name of the manufacturer;

— the name and location of the factory;

— date, location and the signature of the manufacturer;

— the quality inspector's signature;

— description and manufacturer's reference numbers of products tested;

— a statement regarding the conformity of the products.

It further contains statements regarding:

— the validity of the certificate covering the quality system (for factories certified to EN ISO 9001);

— the results of the inspection in terms of staff, equipment, manufacturer's production control and documentation as well as handling complaints concerning non-conforming products (for factories not certified to EN ISO 9001).

Within 4 weeks of the inspection, the official report will be sent to the manufacturer by the third party.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European standard has been prepared under the mandate M 118 "Wastewater engineering Products" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European standard shown in this Annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the drainage channels covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE-marking.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (CREATE, accessed through *http://europa.eu.int).*

This Annex has the same scope as clause 1 of this standard. It establishes the conditions for the CE marking of drainage channels intended for the uses indicated in the relevant clauses applicable (see Table ZA.1).

Table ZA.1 — Relevant clauses for product Type M and Type I

Product: Drainage channel Type M and Type I as covered under the scope of this standard. **Intended use:** Collection and conveyance of surface water from areas subject to pedestrian and/or vehicular traffic.			
Essential Characteristics	**Requirement clauses in this and other European Standard(s)**	**Levels and/or classes**	**Notes**
Water-tightness — jointing of drainage channels	7.5.1	None	no leakage
Load bearing capacity, deflection under load — maximum load — Permanent set	 7.15 7.16	 None None	Results shall be expressed according to clause 4. Shall be in accordance with Table 11.
Durability	6	None	For weathering resistance of precast concrete units the results shall be expressed according to Table 1.

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see Clause ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for attestation of conformity of drainage channels

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of drainage channels indicated in Table ZA.1 as given in Annex III of the mandate for "Waste water engineering products", is shown in Table ZA.2 for the indicated intended use(s) and relevant level(s) or class(es):

Table ZA.2 — System of attestation of conformity

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system[a]
Drainage channel Type M and Type I	Collection and conveyance of surface water from areas subject to pedestrian and/or vehicular traffic	none	3
[a] System 3: See Directive 89/106/EEC (CPD) Annex III.2.(ii), Second possibility.			

The attestation of conformity of the drainage channels in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this or other European standard indicated therein.

Table ZA.3 — Assignment of evaluation of conformity tasks for drainage channels under system 3

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks for the manufacturer	Factory production control (F.P.C)	Parameters related to all characteristics of Table ZA.1	10.3 and 9.6
Tasks for the notified body	Initial type testing	all characteristics of Table ZA.1.	10.2

ZA.2.2 Declaration of conformity

When compliance with the conditions of this Annex is achieved, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity (EC Declaration of conformity), which authorises the affixing of the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

— description of the product (type, identification, use,...), and a copy of the information accompanying the CE marking;

— provisions to which the product conforms (e.g. Annex ZA of this EN);

— particular conditions applicable to the use of the product, (e.g. provisions for use under certain conditions, etc);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The above mentioned declaration shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

For both the channel body and the gratings or covers the manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix (see Figures ZA. 1, ZA.2 and ZA.3) shall be in accordance with Directive 93/68/EC.

The following information shall appear on the product:

— CE-Symbol

— name or identifying mark and registered address of the producer;

The following information shall appear on the commercial documents:

— CE-Symbol

— name or identifying mark and registered address of the producer;

— the last two digits of the year in which the marking is affixed;

— reference to this European Standard;

— description of the product: generic name, material, dimensions, intended use and place of installation (see clause 5),

— characteristics covered from EN 1433:

— load bearing capacity (classification according to clause 4);

— watertightness

— durability in compliance with clause 6 (according to the material);

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements.

Figure ZA.1 gives an example of the information to be given on the product.

CE **Company XYZ**	*CE conformity marking, consisting of the* *“CE”-symbol given in Directive 93/68/EEC.* *Name of Manufacturer*

Figure ZA.1 — Example CE marking information for marking on the product

Figure ZA.2 gives an example of the information to be given on the accompanying documents for products Type M.

CE	*CE conformity marking, consisting of the* *“CE”-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, PO Box 21, B-1050	*Name or identifying mark and registered address of the producer*
01	*the last two digits of the year in which the marking is affixed*;
EN 1433	*No. of European standard*
Drainage channel **Type M** for the collection and conveyance of surface water from Carriageways of roads (including pedestrian streets), hard shoulders and parking areas, for all types of road vehicles. **Strength class: D 400 in accordance with manufacturer's installation instructions** **Material: Concrete** **Grating: Cast iron** **Dimensions: L = 1000 mm; b = 300 mm; h = 200 mm** **Weathering resistance: N**	*Description of product* *information on regulated characteristics*

Figure ZA.2 — Example CE marking information for marking on the accompanying documents for products Type M

Figure ZA.3 gives an example of the information to be given on the accompanying documents for products Type I.

CE	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.*
AnyCo Ltd, PO Box 21, B-1050	*Name or identifying mark and registered address of the producer*
01	*the last two digits of the year in which the marking is affixed*;
EN 1433	*No. of European standard*
Drainage channel **Type I** for the collection and conveyance of surface water from Carriageways of roads (including pedestrian streets), hard shoulders and parking areas, for all types of road vehicles. **Strength class: D 400** **Material: Concrete** **Grating: Cast iron** **Dimensions: L = 1000 mm; b = 300 mm; h = 200 mm** **Weathering resistance: W**	*Description of product* *information on regulated characteristics*

Figure ZA.3 — Example CE marking information for marking on the accompanying documents for products Type I

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Bibliography

EN 124 *Gully tops and manhole tops for vehicular and pedestrian areas — Design requirements, testing, marking, quality control.*

EN ISO 9001*, Quality management systems - Requirements (ISO 9001:2000).*