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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
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Foreword

This document (prEN 14591-3:2004) has been prepared by Technical Committee CEN/TC 305 "Potentially explosive atmospheres - Explosion prevention and protection", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

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

1 Scope

This Standard specifies the requirements and test methods for water troughs which are used in water trough barriers for underground coal mines

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 13463-1, *Non-electrical equipment for potentially explosive atmospheres - Part 1: Basic method and requirements.*

ISO 554, *Standard atmospheres for conditioning and/or testing – Specifications.*

3 Terms and definitions

For the purposes of this European Standard, the following terms ad definitions apply:

3.1
water trough
container to hold the extinguishing medium, namely water, together with matching cover

3.2
blast pressure
pressure exerted by a current of air on a free-standing static plate positioned at right angles to the direction of flow

3.3
water trough barrier
special explosion barrier in which the extinguishing medium, namely water, is contained in water troughs (see prEN 14591-2:2004)

4 Construction requirements

4.1 General

Water troughs shall be designed in such a way that in the event of an explosion the extinguishing medium they contain, namely water, is released in such a way that an effective quenching action is produced.

Water troughs shall be designed in such a way that an adequate dispersion of water is ensured during defined explosion tests with given blast pressures.

Water troughs shall be designed or arranged in such a way that it is possible anytime, without removing the covers, to check whether the level of water in the containers is below the minimum level.

Water troughs shall be of sufficient strength and shall be capable of retaining their shape.

Water troughs shall remain functional for as long as possible under the effect of high temperatures.

Water troughs shall be made of plastic.

Water troughs shall be composed of a material which does not burn spontaneously when subjected to a defined level of inflammation.

Water troughs shall be designed so that the rate of evaporation of the extinguishing medium, namely water, is as low as possible.

4.2 Dimensions, specifications

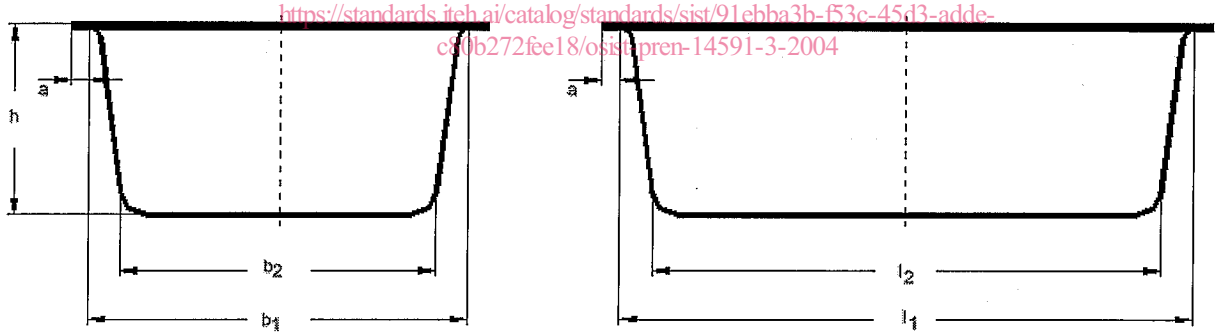

Figure 1 — Water trough type A (side elevations)

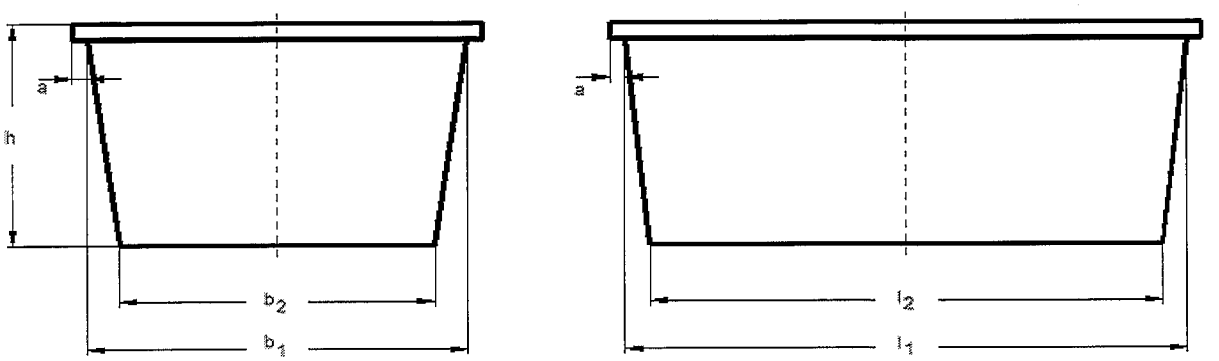

Figure 2 — Water trough type B (side elevations)

Table 1 — Container maximum dimensions and water content for 40 litre water troughs

Water trough type	Container dimensions – max. mm						Capacity l
	a	b_1	b_2	h	l_1	l_2	
Type A	59	465	270	285	750	525	40 ± 2
Type B	22	300,5	231,5	330	625,5	556,5	40 ± 2

Table 2 — Container dimensions and water content for 90 litre water troughs

Water trough type	Container dimensions mm						Capacity l
	a	b_1	b_2	h	l_1	l_2	
Type A	25 ± 2	500 ± 2,5	>415	275 ± 5	760 ± 5	>675	90 ± 4,5
Type B	20 ± 2	500 ± 2,5	>415	320 ± 5	760 ± 5	>675	90 ± 4,5

The covers shall be designed to give a flush fit with the outer rim of the containers.

5 Testing

5.1 General

The test pieces for the tests described below comprise one or several water troughs which shall come from the same production run. The number of test pieces required is determined by the respective testing station. When issuing contracts for testing, each testing station shall be provided not only with descriptions and drawings of the equipment (e.g. containers, covers, floats and lid holders), but also with precise data on the composition of the material used. For examples of possible tests procedures, see annex A.

5.2 Construction tests

5.2.1 Shape, capacity, dimensions

The specifications laid down in 4.2 shall be used as a basis for testing the shape, dimensions and capacity of the water troughs.

5.2.2 Strength, shape retention

When a uniform static load is applied to a stack of water troughs, composed of five containers fitted one inside the other, by a force of 500 N (direction of force at right angles to the container bottoms), the containers shall not suffer damage or permanent deformation. During subsequent unstacking, the containers shall not be wedged together and shall not be damaged.

The requirements laid down in 5.3 shall also be met.

5.2.3 Water level indicator

The minimum water level indicator shall be checked for correct operation and accuracy. The maximum margin of indicator error shall be ± 5 %.

5.3 Testing of electrical properties

5.3.1 Test method

The surface resistance shall be tested in accordance with EN 13463-1.

The test voltage shall be 100 V. The measured value shall be read 60 s after the test voltage has been applied. The measurement shall be carried out in standard atmosphere 23/50-2 according to ISO 554.

5.3.2 Assessment

Containers and matching covers, together with all attachments, shall be fitted together in a conductive manner. Conduction shall take place both externally and internally. The water trough being tested meets the requirements when the surface resistance R_{oA} is less than 10^9 Ω.

6 Additional fittings

Water troughs may be provided with additional fittings, such as level indicators and filling and draining devices. These additional fittings shall not conflict with the construction requirements laid down in clause 4.

7 Marking

Water troughs (containers and covers) should be marked according to the ATEX Directive.

Annex A
(informative)

Examples of some possible test procedures

A.1 Testing of heat reaction properties

A.1.1 Test procedure

Water-filled water troughs shall to be exposed to the effects of a water and air temperature of (45 ± 2) °C for a period of 48 h.

A.1.2 Test arrangement

Water troughs shall be tested using both "standing" and "suspended" arrangements (see Figure A.1). The standing water trough shall be mounted on two supports measuring 45 mm in width by 45 mm in height and spaced (300 ± 15) mm apart. 40 l water troughs shall have their long sides at right angles to the supports and 90 l water troughs shall have their long sides parallel to the supports.

The suspended water trough is to be supported between two hangers by its long edges in such a way that it rests on its full edge width (dimensions a and b_1 according to 4.2).

The temperature outside the water trough (air temperature) shall be established at two points at least and the temperature inside the water trough (water temperature) shall be established at one point at least. The measurement points for the air temperature shall be located centrally at the same level as the cover and container bottom.

Dimensions in millimetres

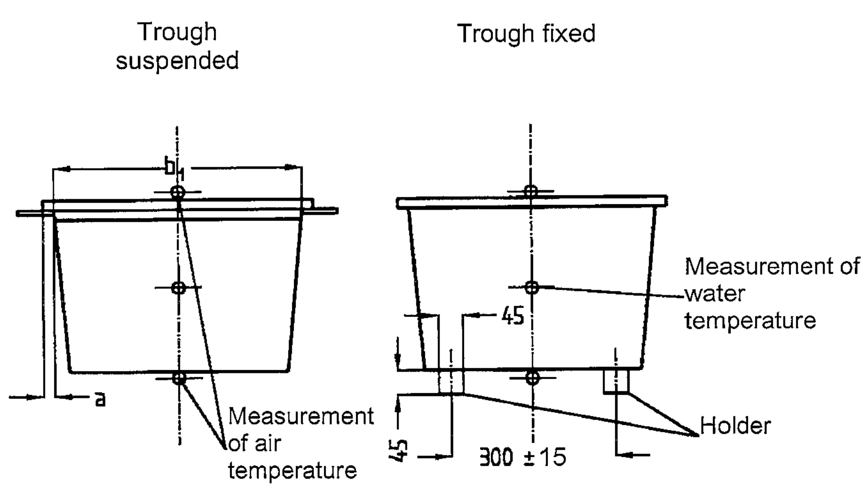

Figure A.1 — Test arrangement for determining heat reaction properties

A.1.3 Procedure

The water troughs shall be filled to the brim with water at a temperature of (45 ± 2) °C. The air temperature is to be set to (45 ± 2) °C within a period of 2 h and the humidity to at least 80% relative humidity.

After the test, the quantity of water remaining in the water trough shall be determined.

A.1.4 Assessment

Water troughs meet the requirements if, after a period of 48 h, the 40 l water trough contains at least 35 l of water and the 90 l water trough at least 80 l of water. During this test, there shall be no material damage which has resulted in leakage. During the test, the suspended water troughs shall not slip through the trough hangers.

A.2 Testing of explosion properties

A.2.1 Testing of water dispersion

A.2.1.1 Test procedure

In order to determine the quality of dispersion of the extinguishing agent under the effect of blast pressure of about 5 kPa, the absorption of infrared light is measured using testing equipment.

A.2.1.2 Test arrangement

The test is to be carried out in a tubular tunnel 25 m in length which is closed at one end and is circular in cross-section. The tubular tunnel shall be 1,8 m in height and 1,4 m in width (see Figure A.2). A homogeneous mixture comprising approximately 10 m^3 of CH_4 and air, in a concentration of between 6% CH_4 and 11% CH_4, is to be ignited at the closed end of the tunnel. This generates the blast pressures of between 1,5 kPa and 20 kPa which are required for the test.

The blast pressure which is generated is to be measured by a force sensing device. This comprises a 10 cm^2 circular static plate 1,5 mm in thickness. The force sensing device is to be positioned in the centre of the open end of the tunnel (see Figure A.2).

Two rows of six and four iodine-quartz lamps, each of identical output, are to be mounted one row above the other outside the tunnel and opposite the tunnel entrance as an infrared radiation source. All the lamps are to be aligned so that they illuminate the entrance to the tunnel. A photoconductive cell is to be positioned at each outer side wall, at mid-height level, at the entrance to the tunnel, in order to measure the infrared radiation from the iodine-quartz lamps and/or the infrared absorption. The radiation spectrum of the infrared radiation source shall match that of the photoconductive cell.

A carrier frame constructed from square steel tubing (40 mm x 40 mm x 2 mm) and capable of holding one water trough is to be rigidly fixed to the sides of the roadway at the entrance to the tunnel. The frame comprises two supports positioned at right angles to the roadway axis and two cross-members which lie at right angles to the supports

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