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Explosionsschutz im Bergbau unter Tage - Schutzsysteme - Teil 2: Wassertrogsperren

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

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Foreword

This document (prEN 14591-2:2004) 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 for concentrated passive water trough barriers, distributed water trough barriers and quick-deploy water trough barriers as regards the propagation of explosions in roadways in underground coal mines when national regulations require the protection of the galleries by water barriers. The purpose of water trough barriers is to extinguish explosion flames in roadways in underground mines and in this way to limit propagation of explosions.

This standard does not apply to active water trough barriers.

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).

prEN 14591-3, *Explosion prevention and protection in underground mining – Protective systems – Part 3: Water troughs for explosion barriers.*

3 Terms and definitions

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

3.1
explosion barrier
device intended effectively to suppress coal-dust and firedamp explosions and to limit their physical impact.

3.2
water trough barrier
explosion barrier in which the extinguishing medium, namely water, is contained in water troughs

3.3
trough group
all troughs located within a roadway section of no more than 4 m in length in the distributed barrier (see Figure 1). A group can be composed of 1 to 3 rows of troughs

3.4
roadway cross-section
area bounded by the roadway floor and lagging or, where no lagging is installed, by the surrounding rock

3.5
volume of roadway section
product of mean roadway cross-section and relevant length. In the case of concentrated water trough barriers, the relevant length is the distance between the start and the end of the water trough barrier. In the case of distributed water trough barriers, the relevant length is the distance between two adjacent trough groups

3.6
passive water trough barrier
fixed or mobile water trough barrier in which the extinguishing medium, namely water, is dispersed solely by the blast pressure of the explosion

3.7
active water trough barrier
fixed or mobile water trough barrier in which the extinguishing medium, namely water, is dispersed independently of the blast pressure of the explosion

3.8
concentrated water trough barrier
water trough barrier which contains a minimum of 200 l of water per square metre of roadway cross-section and which has a length of at least 20 m. It contains a minimum of 5 l of water per cubic metre of roadway section between the start and the end of the water trough barrier

3.9
distributed water trough barrier
water trough barrier which contains a minimum of 1 l of water per cubic metre of roadway section in each trough group measured up to the adjacent trough group. The clear interval between adjacent trough groups does not exceed 30 m

3.10
quick-deploy water trough barrier
quick-deploy water trough barriers are used in the case of rescue action, when concentrated or distributed water trough barriers are not provided between areas where the rescue teams are working and the potential fire source. Quick-deploy water trough barriers contain at least 60 l of water per square metre of roadway cross-section

Dimensions in metres

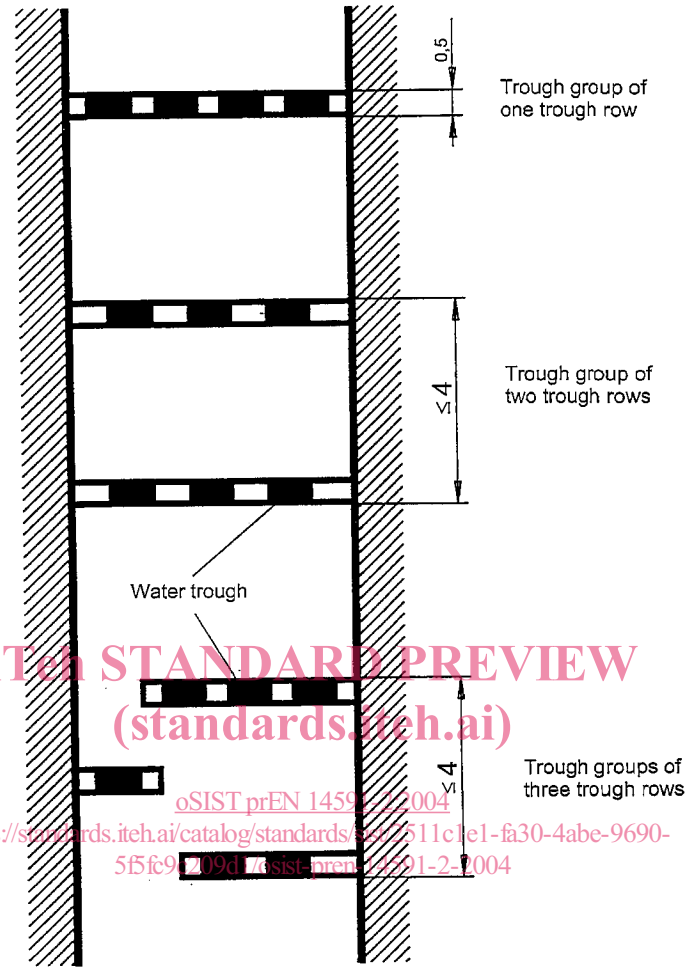

Figure 1 — Trough group, plan view

4 Construction of concentrated and distributed water trough barriers

4.1 General

The task of a passive water trough barrier is to fill all the roadway cross-section with water if it is exposed to the explosion blast pressure wave.

Water trough barriers comprise troughs which are filled with water (and, if applicable, a permissible additive) and arranged in trough groups. Trough groups are usually formed by special framework structures, shelves or by arranging the troughs on the floor or on appropriate fixtures. These water trough barriers are designated as fixed passive water trough barriers.

4.2 Water troughs

Water troughs for explosion barriers shall meet the requirements of prEN 14591-3.

4.3 Framework structures

Framework structures shall be capable of supporting the applied load. Each structure normally comprises two beams or one shelf arranged at right angles to the roadway axis and a number of cross-pieces set at right angles to the beams.

The framework structures, beams or shelves shall be attached to the supports or to the roadway fixtures by means of suitable mountings. Chains, steel ropes or suspension rods can also be used for this purpose.

The framework structures shall be designed in such a way that suspended troughs can be supported on all sides by the full width of their edges, or failing that at least by the full width of their long sides, or that the troughs can be installed where necessary using battens

4.4 Arrangement of troughs in the roadway cross-section

The number of water troughs in a trough group shall be sufficient to comply with 3.8 and 3.9.

The trough groups shall cover the greatest width of the roadway cross-section (floor width or roadway diameter) at the point of installation. The achieved coverage should be as follows:

- at least 35 % for roadway cross-sections of up to 10 m^2
- at least 50 % for roadway cross-sections of up to 15 m^2
- at least 65 % for roadway cross-sections of over 15 m^2.

This calculation is based on measurements taken between the edges of the outer troughs of the trough group at the sides of the roadway.

The horizontal distance between the roadway wall and the nearest trough, measured perpendicular to the roadway direction, should not exceed 1,2 m, while this same distance measured between two troughs should not exceed 1,5 m.

The vertical distance between the bottom of any trough and the boundary of the roadway cross-section should not exceed 2,6 m in a downward direction and 2,0 m in an upward direction.

In the event that the distance measured in an upward direction from a trough has to be greater than 2,0 m, an additional trough shall be installed above the trough in question.

Troughs should normally be installed with their long sides at right angles to the roadway direction (transverse arrangement). As a deviation from this, individual troughs can be arranged longitudinally, though the number should not exceed half of all the troughs in the group, where this is necessary in order to provide cover for the roadway width and to reduce the interspaces (longitudinal arrangement).

Troughs shall be arranged so that they are not obscured by the supports or by roadway fixtures. Troughs which are spaced less than 1,2 m apart in the direction of the roadway shall not obscure one another.

Troughs which are arranged above other troughs at a distance of < 0,5 m shall not obscure more than half the lid area of any trough located beneath them.

4.5 Arrangement of water trough barriers in mine workings

Water trough barriers are to be installed at roadway intersections and roadway junctions in such a way that the latter are cordoned off on all sides. Intersections and junctions also include points where roadways intersect with surface shafts, insets or staple shafts

The distance between the water trough barriers and the intersection or junction shall be kept as small as possible and shall not exceed 75 m in the case of concentrated water trough barriers and 30 m in the case of distributed water trough barriers.

The maximum distances of 75 m and 30 m between intersections and junctions do not apply when there are no distances greater than 200 m between adjacent concentrated water trough barriers designed to cordon off the intersection and junction areas.

The distance requirements do not apply either between closely-spaced intersections and junctions provided that in any circumstance which may arise the distance between a distributed water trough barrier and an adjacent distributed or concentrated water trough barrier designed to cordon off the intersection and junction areas does not exceed 120 m. In this zone, the erection of water trough barriers can be dispensed with. This means that points where roadways intersect with surface shafts, shaft insets or staple shafts are treated as intersections or junctions. The trough groups of these distributed water trough barriers shall contain a quantity of at least 200 l of water per square metre of roadway cross-section.

Concentrated water trough barriers installed in roadways shall be arranged in such a way that the distance between one water trough barrier and another does not exceed 400 m. Distributed water trough barriers installed in roadways shall be arranged in such a way that the distance between the trough groups does not exceed 30 m.

Within a roadway, the distance between a concentrated water trough barrier and the first trough group of a distributed water trough barrier shall not exceed 30 m.

By contrast, the distance between a concentrated water trough barrier and the first trough group of a distributed water trough barrier, when measured through a individual roadway intersection or junction, can be as much as 105 m (30 m + 75 m).

In gate-roads and in mechanized in-seam drivages, water trough barriers shall be erected as distributed barriers. Where no mining is being carried out in the gate-road zone, or when no mechanized heading operation is under way in this area, distributed water trough barriers can be replaced with concentrated barriers if this proves necessary for transport activities and such like.

When concentrated water trough barriers are used in roadway drivage operations, the distance from the heading face to the nearest water trough barrier in the roadway shall be as small as possible; this distance shall not exceed 320 m, though the first water trough barrier shall be erected at the very latest on reaching a drivage length of 200 m. When distributed barriers are used in roadway drivage operations, the distance from the heading face to the nearest trough group in the roadway shall be as small as possible. This distance shall not exceed 120 m, though the first trough group shall be erected at the very latest on reaching a drivage length of 120 m.

As a deviation from this, the drivage length in gate-roads can also be allowed to reach 200 m before installing the first water trough barrier, provided that the latter is designed as a concentrated barrier.

In gate-roads, the distance from the face-gate intersection to the nearest trough group shall be as small as operating conditions permit; under no circumstances shall this distance exceed 120 m.

Where the advance heading section of a non-interconnected gate-road is longer than 120 m, distributed water trough barriers are to be erected at this point in accordance with 3.9. In addition, the water content of all the trough groups shall be at least 200 l/m^2 of roadway cross-section.

Where the distance between the face/gate intersection and the roadway junction is less than 120 m during coal winning, a concentrated water trough barrier shall be installed in the gate-road at the roadway junction or intersection. This concentrated water trough barrier can be omitted when the structural explosion protection provided in the main seam road is in the form of distributed water trough barriers. The ability to provide structural explosion protection in such cases shall be taken into account during the roadway and coal face planning phase.