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Eurokod 1 – Laster på bärverk –
Del 1-7: Allmänna laster – Olyckslast

Eurocode 1 – Actions on structures –
Part 1-7: General actions – Accidental actions

Europastandarden EN 1991-1-7:2006/A1:2014 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 1991-1-7:2006/A1:2014.

The European StandarEN 1991-1-7:2006/A1:2014 has the status of a Swedish Standard. This document contains the official English version of EN 1991-1-7:2006/A1:2014.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

Standarden är framtagen av kommittén för Eurokoder, SIS/TK 203.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1991-1-7:2006/A1

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ICS 91.010.30

English Version

Eurocode 1 - Actions on structures - Part 1-7: General actions - Accidental actions

Eurocode 1 - Actions sur les structures - Partie 1-7 : Actions générales - Actions accidentelles

Eurocode 1 - Einwirkungen auf Tragwerke - Teil 1-7: Allgemeine Einwirkungen - Außergewöhnliche Einwirkungen

This amendment A1 modifies the European Standard EN 1991-1-7:2006; it was approved by CEN on 6 February 2014.

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

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 1991-1-7:2006/A1:2014) has been prepared by Technical Committee CEN/TC 250 “Structural Eurocodes”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 1991-1-7:2006 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2015, and conflicting national standards shall be withdrawn at the latest by June 2015.

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

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1 Modification to 5.3, Principles for design

In Paragraph (1), replace the existing Note by the following one:

"

NOTE The National Annex may give the procedures to be used for the types of internal explosions. Guidance on dealing with the following specific types of explosion is given in Annex D:

– gas and vapour/air explosions in rooms and closed sewage basins;

– dust explosions in rooms, vessels and bunkers;

– gas and vapour/air explosions in road and rail tunnels;

– dust, gas and vapour/air explosions in energy ducts.

The values presented in Annex D of this part may be considered as nominal values given that the explosion occurs.

When calculating the structural response, dynamic and nonlinear behaviour may be taken into account. A load duration of 0,2 s may be adopted and damage is acceptable provided it does not lead to disproportional collapse.

The load-time function may be assumed triangular. A sensitivity study on the load-time function should be performed to identify the peak load time within the 0,2 s duration.".

2 Modification to Annex D (informative), Internal explosions

Replace the existing Annex D with the following one:

"

Annex D
(informative)

Internal explosions

D.1 Natural gas explosions

(1) For buildings which might have piped natural gas installed, or where gas canisters can be present, the structure may be designed to withstand the effects of an internal natural gas explosion using a nominal equivalent static pressure given by Formulae (D.1) and (D.2):

$$p_d = 3 + p_{stat} \quad \text{(D.1)}$$

or

$$p_d = 3 + p_{stat} / 2 + 0{,}04 / (A_v / V)^2 \quad \text{(D.2)}$$

whichever is the greater;

where

p_d is the nominal equivalent static pressure to design the structure in [kN/m^2];

p_{stat} is the uniformly distributed static pressure at which venting components will fail in [kN/m^2];

A_v is the area of venting components in [m^2];

V is the volume of rectangular enclosure in [m^3].

Formulae (D.1) and (D.2) are valid for a single room up to 1 000 m^3 total volume.

NOTE 1 The pressure due to deflagration acts effectively simultaneously on all of the bounding surfaces of the room.

NOTE 2 Multi-room explosions may give much higher pressures. The pressures are difficult to calculate as they are not simply limited by the strength of the vent panels; therefore, for this type of explosion, the strategy based on limiting the extend of localized failure (see Figure 3.1) should be adopted.

(2) Where building components with different p_{stat} values contribute to the venting area, the largest value of p_{stat} should be used. No value of p_d greater than 50 kN/m^2 need be taken into account.

(3) The ratio of the area of venting components and the volume should comply with Formula (D.3):

$$0{,}05 \text{ m}^{-1} \leq A_v / V \leq 0{,}15 \text{ m}^{-1} \quad \text{(D.3)}$$

NOTE Natural gas is a gaseous fossil fuel consisting primarily of methane but including significant quantities of ethane, butane, propane, carbon dioxide, nitrogen, helium and hydrogen sulfide. Before natural gas can be used as a fuel, it undergoes extensive processing to remove almost all materials other than methane.

D.2 Dust explosions in rooms, vessels and bunkers

(1) The design value p_d for the maximum pressure developed in vented cubic and elongated rooms, vessels and bunkers for dust explosions within a single room may be determined from the empirical Formula (D.4):

$$A_v = [4{,}485 \times 10^{-8}\, p_{max}\, K_{st}\, p_d^{-0{,}569} + 0{,}027(p_{stat} - 10)p_d^{-0{,}5}]V^{0{,}753} \quad \text{(D.4)}$$

where

A_v is the venting area [m^2];

V is the volume of room, vessel, bunker [m^3];

K_{St} is the deflagration index of a dust cloud [kN/m^2] (see Clause (2));

p_{max} is the maximum pressure of an explosion of the dust [kN/m^2] (see Clause (2));

p_{stat} is the static activation pressure of the vent areas [kN/m^2];

p_d is the design value of the pressure in the vented vessel [kN/m^2].

(2) Values for p_{max} and K_{St} may be experimentally determined by standard methods for each type of dust.

NOTE 1 The value of K_{St} depends on factors such as the chemical composition, particle size and moisture content. Indicative values for p_{max} and K_{St} are given in Table D.1.

NOTE 2 For standard methods, see for instance EN 14034–1:2004 and EN 14034–2:2006.

(3) Formula (D.4) is valid with the following restrictions:

- $0{,}1\ m^3 \leq V \leq 10\ 000\ m^3$;
- $L_3 / D_E \leq 2$, where L_3 is the largest dimension and $D_E = 2(L_1 \times L_2/ \pi)^{0,5}$, where L_1 and L_2 are the other two dimensions of the room;
- $10\ kN/m^2 \leq p_{stat} \leq 100\ kN/m^2$, rupture disks and panels with low mass which respond almost without intertia;
- $10\ kN/m^2 \leq p_d \leq 200\ kN/m^2$;
- $500\ kN/m^2 \leq p_{max} \leq 1\ 000\ kN/m^2$ for $1\ 000\ kN/m^2(m/s) \leq K_{St} \leq 30\ 000\ kN/m^2$;

  $500\ kN/m^2 \leq p_{max} \leq 1\ 200\ kN/m^2$ for $30\ 000\ kN/m^2(m/s) \leq K_{St} \leq 80\ 000\ kN/m^2$.

(4) For elongated rooms with $L_3/D_E \geq 2$ the following increase for the venting area should be considered:

$$\Delta A_v = A_v\ (- 4{,}305 \log p_d + 9{,}368) \log L_3/D_E \quad \text{(D.5)}$$

where

ΔA_v is the increase for venting area in [m^2].

NOTE In dust explosions, pressures reach their maximum value within a time span in the order of 20 ms to 50 ms. The decline to normal values strongly depends on the venting device and the geometry of the enclosure.