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Extended application of results from fire resistance tests - Part 12: Loadbearing masonry walls

Erweiterter Anwendungsbereich der Ergebnisse aus Feuerwiderstandsprüfungen - Teil 12: Tragende Mauerwerkswände

Application étendue des résultats des essais de résistance au feu - Partie 12: Murs porteurs en maçonnerie

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13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements
91.060.10	Stene. Predelne stene. Fasade	Walls. Partitions. Facades

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Foreword

This document (EN 15080-12:2011) has been prepared by Technical Committee CEN/TC 127 “Fire safety in buildings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2011, and conflicting national standards shall be withdrawn at the latest by July 2011.

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1 Scope

This European Standard provides guidance, and where appropriate defines procedures, for variations of certain parameters and factors associated with the design of internal and external loadbearing walls that have been tested in accordance with EN 1365-1.

Data from historic standard fire resistance tests may be used as supporting information.

Manufactured stone masonry units according to EN 771-5 and natural stone units according to EN 771-6 are not covered.

This European Standard is not valid for reinforced masonry.

2 Normative references

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

EN 771-1, *Specification for masonry units — Part 1: Clay masonry units*

EN 771-3, *Specification for masonry units — Part 3: Aggregate concrete masonry units (Dense and light-weight aggregates)*

EN 772-1, *Methods of test for masonry units — Part 1: Determination of compressive strength*

EN 772-16, *Methods of test for masonry units – Part 16: Determination of dimensions*

EN 998-1:2010, *Specification for mortar for masonry — Part 1: Rendering and plastering mortar*

EN 1363-1, *Fire resistance tests — Part 1: General requirements*

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures*

EN 1365-1, *Fire resistance tests for loadbearing elements — Part 1: Walls*

EN 1996-1-1, Eurocode 6 — *Design of masonry structures — Part 1-1: General rules for reinforced and unreinforced masonry structures*

EN 1996-1-2:2005, Eurocode 6 — *Design of masonry structures — Part 1-2: General rules — Structural fire design*

EN 1996-2, Eurocode 6 — *Design of masonry structures — Part 2: Design considerations, selection of materials and execution of masonry*

EN 1996-3:2006, Eurocode 6 — *Design of masonry structures — Part 3: Simplified calculation methods for unreinforced masonry structures*

EN 13501-2, *Fire classification of construction products and buildings elements — Part 2 Classification using data from fire resistance tests, excluding ventilation services*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1996-1-2:2005 and the following apply.

3.1
unit grouping
is defined in EN 1996-1-1

3.2
unfilled perpend joint
vertical plain joint or joint with tongue and groove, not filled with mortar or adhesive

3.3
utilisation factor
relation between the applied load on the test specimen and the design resistance without partial safety factors

NOTE For design resistance see EN 1996-1-1 or EN 1996-3.

3.4
historical test data
test data generated by fire resistance tests that have been undertaken by a Notified Test Laboratory in accordance with European and/or former and in accordance with standards

NOTE 1 Previously existing test data is acceptable even though the test may not have been carried out using the plate thermometer as long as the necessary additional information, (see 4.3) is available. This data can only be used as described in this European Standard.

NOTE 2 The temperature-time curve used is based on the one specified in EN 1363-1, which is also defined in ISO 834.

3.5
moisture content of units
difference between the density of the units at the beginning of the fire test and the gross dry density of the units, related to the gross dry density of the units, in percent by mass

4 General principles

4.1 General

(1) The fire behaviour of load bearing masonry mainly depends on:

— the masonry unit material - clay, calcium silicate, autoclaved aerated concrete, dense/lightweight aggregate concrete;

— the type of unit - solid or hollow (type of holes, percentage and direction of holes), shell and web thickness;

— the unit dimensions;

— the unit gross density;

— the unit compressive strength;

— the type of mortar - general purpose, thin layer or lightweight mortar;

— the type of perpend joint – filled or unfilled perpend joint, especially for unplastered walls;

— the use of finishes;

— the geometrical slenderness of the wall as defined in EN 1996-1-1;

— the level of the applied load;

— eccentricities;

— fire exposure of separating/non separating elements.

(2) For the determination of values by consideration of test results, the interpretation of any existing fire test results has to be based on the requirements for the relevant test method from EN 1363-1, EN 1363-2 and EN 1365-1.

(3) For the evaluation of use of previously existing data, differences between the test methods, have to be considered.

NOTE Differences to be considered are for example material properties, specimen dimensions, utilisation factor based on maximum loading, eccentricities, etc.

(4) To establish the extended application, the rules given in Clause 5 shall be followed for each of the given parameters.

(5) Extrapolations exceeding the rules of this European Standard are possible, provided that tests give evidence to do so. Such extrapolations have to be specified in the report, see Clause 6.

4.2 Classifications

(1) All the given rules are always valid for the same classification.

(2) Extrapolation is possible for different wall thicknesses and geometries, different unit densities, compressive strengths, perforation patterns and sizes, different types of masonry mortar, different types of external covering, different load levels and eccentricities.

(3) An extrapolation for higher fire resistances or from REI tests to REI-M or R is not possible.

NOTE 1 In some cases, there are different extended application rules given for the classifications R, REI and REI-M.

NOTE 2 In addition, the rules given in this European Standard for REI tests also apply for RE and REW tests.

4.3 Necessary additional information

For the classification according to these extended application rules additional information on material properties and additional measurements during the test procedure according to EN 1363-1, EN 1365-1 and EN 1363-2 or historic standard fire test methods are necessary:

— measurement of the deflection of the test specimen at least in mid height, to allow for an extrapolation for height, see 5.5 (1);

— gross density, compressive strength and moisture content of the units;

— percentage of voids, web and shell thickness and combined thickness for perforated units;

— gross density and compressive strength of the mortar;

— thickness of unfilled perpend joints in unplastered or unrendered walls;

— thickness and type of plaster or render in rendered walls;

— measurement of applied load on the test specimens;

— determination of the utilisation factor.

NOTE The measurement of the temperature within the test specimen at least in mid-height across the wall thickness is advised to allow for a future calculation of fire resistances according to EN 1996-1-2. Thermocouples should be placed at least in depths of 10 mm, 30 mm and 50 mm from the exposed side and then every 50 mm.

5 Rules for extended application

5.1 Units

(1) Extrapolations are only possible within the same type of material – e.g. tests on clay unit masonry with units according to EN 771-1 can only be used for extrapolations for clay unit masonry. For lightweight aggregate concrete units according to EN 771-3 extrapolations are only possible within lightweight aggregate concrete units.

(2) The test results are valid for the tested type of unit. If solid units, i.e. group 1 units according to EN 1996-1-1 are tested, the results are only valid for group 1 units with the same or a smaller percentage of voids.

(3) For vertically perforated units (group 1, 2 and group 3 according to EN 1996-1-1), the test results can be applied for units with the same or a smaller percentage of voids. If the difference between the tested percentage of voids and the upper limit of the group in EN 1996-1-1 is less than 5 % of the overall surface of the unit, test results are valid for all percentages of voids within that group. The tested percentage of voids can be rounded up to the next multiple of 5 %.

(4) For vertically perforated units, the test results can be applied for units with the same or a higher thickness of webs and shells and for the same or higher values of the combined thickness. The value of the combined thickness can be rounded down to the next multiple of 10 mm/m.

(5) Test results for vertically perforated units can be applied for solid units.

(6) For the classification REI and R the test results are valid for the tested size of the unit and units larger in height, length and width.

(7) For units with a length between 200 mm and 1000 mm, test results for a unit length from that range are valid for the whole range of unit lengths between 200 mm and 1000 mm.

(8) For the classification REI-M, test results are valid for the tested length and width and units larger in length and width. It is not possible to extrapolate from tests on masonry walls with unit heights equal or smaller than 250 mm to units with greater heights.

(9) For tested wall thicknesses up to 140 mm, the test results are valid for masonry with units with the same or a higher declared value of the gross density of the units within the following ranges.

— unit density between 300 kg/m^3 and 999 kg/m^3: Tested density and densities up to 800 kg/m³ higher than the tested density up to a maximum gross dry density of 1600 kg/m³.

— unit density between 1000 kg/m^3 and 2200 kg/m^3: Tested density and densities up to 600 kg/m^3 higher than the tested density up to a maximum gross dry density of 2200 kg/m³.

NOTE 1 Extrapolations for lightweight aggregate concrete units are limited to net dry densities 20 % higher than tested.