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Interested committees:

Title: Draft BS EN 18190 Precast concrete products - Performance assessment and declaration.

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- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Precast concrete products - Performance assessment and declaration

Produit préfabriqué en béton - Évaluation des performances et déclaration

Betonfertigteile - Leistungsbeurteilung und -erklärung

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 229.

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.

This draft European Standard was established by CEN 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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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword	6
1 Scope.....	8
2 Normative references.....	11
3 Terms and definitions	14
4 Characteristics	18
4.1 Concrete	18
4.1.1 Characteristic compressive strength	18
4.1.2 Characteristic compressive strength lightweight concrete.....	19
4.1.3 Tensile splitting strength.....	19
4.1.4 Dry density lightweight concrete	19
4.1.5 Drying shrinkage.....	20
4.1.6 Maximum aggregate size	20
4.1.7 Water penetration depth of concrete	20
4.1.8 Water absorption.....	20
4.2 Reinforcing steel	20
4.2.1 Elongation at maximum load.....	20
4.2.2 Elongation after fracture.....	20
4.2.3 Stress ratio	20
4.2.4 Tensile yield strength.....	20
4.2.5 Ultimate tensile strength	20
4.3 Prestressing steel.....	21
4.3.1 Elongation at maximum load.....	21
4.3.2 Tensile 0,1 proof stress.....	21
4.3.3 Tensile 0,2 proof stress.....	21
4.3.4 Ultimate tensile strength	21
4.4 Mechanical strength – calculation aided by physical testing	21
4.5 Masts and poles: 5.4.3.Mechanical strength - testing.....	21
4.5.1 Junction boxes.....	21
4.5.2 Beams and blocks – concrete blocks, beams and blocks – lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks – EPS blocks, and beams and blocks – blocks - permanent lightweight formwork	21
4.5.3 Foundation piles – rigidity of joints	23
4.5.4 Shuttering blocks and woodchip shuttering blocks	23
4.5.5 Floor slats for livestock	23
4.6 Fire performance	25
4.6.1 Propensity to undergo continuous smouldering	25
4.6.2 Reaction to fire.....	25
4.6.3 Resistance to fire.....	26
4.7 Water performance.....	26
4.7.1 Water vapour permeability.....	26
4.7.2 Water permeability	26
4.8 Thermal performance	27
4.8.1 Thermal conductivity – testing	27
4.8.2 Thermal conductivity – tabulated values.....	27
4.9 Acoustic performance	27

4.9.1	Airborne sound insulation index - calculation	27
4.9.2	Airborne sound insulation index - testing	27
4.9.3	Impact sound insulation - calculation	27
4.9.4	Impact sound insulation - testing	27
4.9.5	Sound absorption coefficient building elements	27
4.10	Other performances	27
4.10.1	Mass of the element	27
4.10.2	Air tightness class - HVAC flue elements	27
4.10.3	Mechanical resistance of rungs	28
4.10.4	Moisture expansion	28
4.11	Release of dangerous substances	28
4.11.1	Release of dangerous substances to indoor air	28
4.11.2	Release of dangerous substances to soil and ground water	28
4.12	Environmental sustainability	30
4.12.1	Reference service life	30
4.12.2	Life cycle assessment environmental characteristics	30
4.12.3	Resource use environmental characteristics	30
4.12.4	Waste environmental characteristics	31
4.12.5	Output flows environmental characteristics	32
4.12.6	Biogenic carbon content environmental characteristics	32
4.13	Performances in attached documentation of the product	32
4.13.1	General	32
4.13.2	Off-the-shelf products	32
4.13.3	Custom-made products	33
4.13.4	Set of drawings	33
4.13.5	Calculations	33
5	Testing, assessment and sampling methods	34
5.1	Concrete	34
5.1.1	Characteristic compressive strength	34
5.1.2	Characteristic compressive strength lightweight concrete	36
5.1.3	Tensile splitting strength	36
5.1.4	Dry density lightweight concrete	36
5.1.5	Drying shrinkage	36
5.1.6	Maximum aggregate size	36
5.1.7	Water penetration depth of concrete	36
5.1.8	Water absorption	36
5.2	Reinforcing steel	37
5.2.1	Elongation at maximum load	37
5.2.2	Elongation after fracture	37
5.2.3	Stress ratio	37
5.2.4	Tensile yield strength	37
5.2.5	Ultimate tensile strength	37
5.3	Prestressing steel	37
5.3.1	Elongation at maximum load	37
5.3.2	Tensile 0,1 proof stress	37
5.3.3	Tensile 0,2 proof stress	37
5.3.4	Ultimate tensile strength	37
5.4	Mechanical strength - calculation aided by testing	38
5.4.1	Box culverts	38
5.4.2	Fence elements	38
5.4.3	Masts and poles	38
5.5	Mechanical strength - testing	38

5.5.1	Junction boxes.....	38
5.5.2	Beams and blocks – concrete blocks, beams and blocks – lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks – EPS blocks, and beams and blocks – blocks - permanent lightweight formwork	38
5.5.3	Foundation piles – rigidity of joints	39
5.5.4	Shuttering blocks and woodchip shuttering blocks	39
5.6	Reaction and resistance to fire	39
5.6.1	Propensity to undergo continuous smouldering	39
5.6.2	Reaction to fire.....	39
5.6.3	Resistance to fire.....	39
5.7	Water performance.....	39
5.7.1	Water vapour permeability.....	39
5.7.2	Water permeability	40
5.8	Thermal performance	40
5.8.1	Thermal conductivity – testing	40
5.8.2	Thermal conductivity – tabulated values.....	40
5.9	Acoustic performance	40
5.9.1	Airborne sound insulation index - calculation.....	40
5.9.2	Airborne sound insulation index – testing	40
5.9.3	Impact sound insulation - calculation	40
5.9.4	Impact sound insulation – testing.....	40
5.9.5	Sound absorption coefficient building elements.....	41
5.10	Other performances.....	41
5.10.1	Mass of the element.....	41
5.10.2	Air tightness class - HVAC flue elements	41
5.10.3	Mechanical resistance of rungs.....	41
5.10.4	Moisture expansion.....	41
5.11	Release of dangerous substances.....	41
5.11.1	Release of dangerous substances to indoor air	41
5.11.2	Release of dangerous substances to soil and ground water.....	42
5.12	Environmental sustainability	42
5.12.1	Reference service life	42
5.12.2	Life cycle assessment environmental characteristics	43
5.12.3	Resource use environmental characteristics	43
5.12.4	Waste environmental characteristics	43
5.12.5	Output flows environmental characteristics	43
5.12.6	Biogenic carbon environmental characteristics	43
5.13	Performances in attached documentation of the product.....	43
5.13.1	General.....	43
5.13.2	Off-the-shelf products	44
5.13.3	Custom-made products.....	44
6	Assessment and verification of constancy of performance – AVCP	44
6.1	General.....	44
6.2	Assessment of performance.....	45
6.2.1	General.....	45
6.2.2	Test samples, testing and assessment criteria.....	45
6.3	Verification of constancy of performance.....	82
6.3.1	Factory production control (FPC)	82
6.3.2	Initial inspection of factory and of FPC	100
6.3.3	Initial inspection of factory to validate environmental sustainability company specific data	101
6.3.4	Continuous surveillance of FPC	101

6.3.5 Environmental sustainability assessment validation	102
Annex A (normative) Verification by calculation aided by physical testing of box culverts	103
Annex B (normative) Loadbearing capacity testing of fence elements.....	108
Annex C (normative) Loadbearing capacity testing of masts and poles	114
Annex D (normative) Reaction to fire test for thin blocks.....	117
Annex E (normative) Measurement of dimensions.....	122
Annex F (normative) Test of water absorption.....	135
Annex G (normative) Test method for the verification of robustness and rigidity of pile joints	139
Annex H (normative) Loadbearing capacity testing of beams and blocks – concrete blocks, beams and blocks - lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks - EPS blocks, and beams and blocks - blocks - permanent lightweight formwork.....	144
Annex I (normative) Determination of the mechanical strength of shuttering blocks and woodchip shuttering blocks	154
Annex J (normative) Mechanical strength of junction boxes.....	162
Annex K (normative) Environmental impact indicators.....	166
Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No.305/2011	169
Bibliography	244

European foreword

This document (prEN 18190:2025) has been prepared by Technical Committee CEN/TC 229 “Precast concrete products”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will partially supersede:

EN 1168:2005+A3:2011, *Precast concrete products – Hollow core slabs*

EN 12839:2012, *Precast concrete products — Elements for fences*

EN 12737:2004+A1:2007, *Precast concrete products – Floor slats for livestock*

EN 12794:2005+A1:2007, *Precast concrete products – Foundation piles*

EN 12843:2004, *Precast concrete products – Masts and poles*

EN 13224:2011, *Precast concrete products – Ribbed floor elements*

EN 13225:2013, *Precast concrete products – Linear structural elements*

EN 13369:2023, *Common rules for precast concrete products*

EN 13693:2004+A1:2009, *Precast concrete products – Special roof elements*

EN 13747:2005+A2:2010, *Precast concrete products – Floor plates for floor systems*

EN 13978-1:2005, *Precast concrete products – Precast concrete garages – Part 1: Requirements for reinforced garages monolithic or consisting of single sections with room dimensions*

EN 14843:2007, *Precast concrete products – Stairs*

EN 14844:2006+A2:2011, *Precast concrete products – Box culverts*

EN 14991:2007, *Precast concrete products – Foundation elements*

EN 14992:2007+A1:2012, *Precast concrete products – Wall elements*

EN 15037-1:2008, *Precast concrete products – Beam-and-block floor systems – Part 1: Beams*

EN 15037-2:2009+A1:2011, *Precast concrete products – Beam-and-block floor systems – Part 2: Concrete blocks*

EN 15037-3:2009+A1:2011, *Precast concrete products – Beam-and-block floor systems – Part 3: Clay blocks*

EN 15037-4:2010+A1:2013, *Precast concrete products – Beam-and-block floor systems – Part 4: Expanded polystyrene blocks*

EN 15037-5:2013, *Precast concrete products – Beam-and-block floor systems – Part 5: Lightweight blocks for simple formwork*

EN 15050:2007+A1:2012, *Precast concrete products – Bridge elements*

EN 15258:2008, *Precast concrete products – Retaining wall elements*

EN 15435:2008, *Precast concrete products — Normal weight and lightweight concrete shuttering blocks — Product properties and performance*

EN 15498:2008, *Precast concrete products — Wood-chip concrete shuttering blocks — Product properties and performance*

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

prEN 18190:2025 includes the following significant technical changes with respect to the standards listed above:

- merging of the documents;
- removal of every clause not related to the assessment and verification of the constancy of performance in answer to the Standardisation Request;
- addition of the necessary clauses to answer new essential characteristics as listed in the Standardisation Request;
- replacement of the references to EN 206 with the corresponding technical content;
- removal of the references to Eurocode standards;
- updating of the Annex ZA considering the standardization request addressed to CEN by the European Commission.

This document also includes in its scope the following other precast concrete products:

- solid slabs;
- junction boxes;
- heating, ventilation and air conditioning (HVAC) flue elements.

1 Scope

This document covers the following products regardless of if manufactured in factories or in temporary plants on site under the same conditions:

a) Precast concrete products intended to be used as structural elements:

- linear structural elements, including columns, beams and frame elements, made of concrete or lightweight concrete, reinforced or prestressed, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products used as bridge elements and products of less than 4,5 m intended to be used as lintels in masonry wall;
- beams made of concrete or lightweight concrete, reinforced or prestressed, with or without clay shells, to be used in conjunction with blocks as beam-and-block system and intended to be used for floor and roofing systems, including the use in contact with indoor air and the use in contact with soil or ground water;
- foundation elements, including columns with integrated foundation elements, pocket foundation elements and sockets, made of reinforced concrete or lightweight concrete, including the use in contact with soil or ground water, to the exclusion of products using prestressing steel;
- foundation piles and segments of piles made of concrete or lightweight concrete, reinforced or prestressed, including the use in contact with soil or ground water;
- poles (also called masts), made of concrete or lightweight concrete, hollow or solid, reinforced or prestressed, in one piece or composed of elements and their inserts and connectors, including the use in contact with soil or ground water, to the exclusion of lighting columns for use in traffic circulation areas;
- bridge deck elements made of concrete, reinforced or prestressed, including the use in contact with soil or ground water, to the exclusion of abutments, barriers, bumpers, piers, guards and arches;
- floor plates made of concrete or lightweight concrete, reinforced or prestressed, intended to be used in floor systems in conjunction with cast-in-situ concrete, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products used as bridge elements, and products with stiffening ribs taking a major part of the mechanical resistance, considered either as ribbed floor elements or hollow-core slabs;
- solid slabs made of concrete or lightweight concrete, reinforced or prestressed, without voids or void formers intended to be used as self-supporting structural elements, such as floors, roofs, landings and balconies, which can be installed without a structural topping but to which a structural topping can be added, and with a cross section which is rectangular but may present slopes for drainage, grooves for handling and shear keys, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of balustrades without structural behaviour and slabs manufactured using hollow core slabs manufacturing process;
- hollow core slabs and solid slabs manufactured in the same way but without hollow cores, made of concrete or lightweight concrete, reinforced or prestressed, with a maximum depth of 500 mm for prestressed elements and 300 mm for reinforced elements, to be used in conjunction with cast-in-situ concrete or without it, including the use in contact with indoor air and the use in contact with soil or ground water;

- ribbed floor elements made of concrete or lightweight concrete, reinforced or prestressed, intended to be used for floors and roofs, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of floor plates for floor systems;
- floor slats for livestock made of concrete or lightweight concrete, reinforced or prestressed, intended to be used for the housing of livestock, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products used as load bearing elements other than stock and stockmen, and of prestressed single slat beams;
- hollow core, multilayer and composite loadbearing wall elements, made of concrete or lightweight concrete, reinforced or prestressed, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of retaining walls;
- cladding elements, made of concrete or lightweight concrete, reinforced or prestressed, intended to be used as non-loadbearing elements, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of non-reinforced cladding elements with a maximum size of 2,25 m², a maximum length of 1,5 m and a thickness smaller than 80 mm, which are considered non-structural;
- solid, hollow, multilayer and special roof elements, made of concrete or lightweight concrete, reinforced or prestressed, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of ribbed floor elements and floor slabs elements;
- stairs (monolithic) made of concrete or lightweight concrete, reinforced or prestressed, and kits of stairs constructed from individual steps, including the use in contact with indoor air and the use in contact with soil or ground water;
- retaining walls, made of concrete or lightweight concrete, reinforced or prestressed, including the use in contact with soil or ground water, to the exclusion of retaining walls intended to retain tanks or reservoirs of liquid and precast diaphragm walls (concrete sheet piling);
- rectangular cross-section box culverts, made of reinforced concrete or lightweight concrete, intended to be used as continuous elements for the creation of voids below ground, cable tunnels and subways, including the use in contact with soil or ground water, to the exclusion of box culverts having both internal cross-sectional dimensions less than or equal to 1 250 mm which are considered non-structural, of products using prestressing steel, and of non-monolithic products;
- rectangular prismatic junction boxes, made of concrete or lightweight concrete, including the use in contact with soil or ground water, to the exclusion of products using prestressing steel;
- garages as monolithic unit or as kits of single or double sections, made of reinforced concrete or lightweight concrete, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products used as supporting upper structures and products using prestressing steel.

b) Precast concrete products not intended to be used as structural elements:

- fence elements, made of concrete or lightweight concrete, reinforced or prestressed, including posts, panels, rails and base panels, intended to be used as light-structural or non-structural elements, including the use in contact with soil or ground water;
- hollow core shuttering blocks, made of concrete or lightweight concrete, to be used for form walls and partitions intended to be used as loadbearing and non-loadbearing elements, including

the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of masonry units;

- wood-chip hollow core shuttering blocks, to be used for form walls and partitions intended to be used as loadbearing and non-loadbearing elements in conjunction with concrete infill, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products intended to be used unfilled;
 - composite wall elements made of concrete or lightweight concrete, reinforced or prestressed, intended to be used as non-loadbearing element, including the use in contact with indoor air and the use in contact with soil or ground water;
 - cladding elements, made of concrete or lightweight concrete, non-reinforced, with a maximum size of 2,25 m², a maximum length of 1,5 m and a thickness smaller than 80 mm, intended to be used as non-loadbearing elements, including the use in contact with indoor air and the use in contact with soil or ground water;
 - rectangular cross-section box culverts, made of reinforced concrete or lightweight concrete, having both internal cross-sectional dimensions less than or equal to 1 250 mm (small box culverts), intended to be used as light structural or non-structural continuous elements, for the creation of voids below ground, cable tunnels and subways, including the use in contact with soil or ground water, to the exclusion of products using prestressing steel and non-monolithic products;
 - heating, ventilation and air conditioning (HVAC) flue elements, made of concrete or lightweight concrete, intended to be used to convey heating, ventilation, and air conditioning gases, including the use in contact with indoor air and the use in contact with soil or ground water, to the exclusion of products intended to be used to convey smoke from a furnace, boiler or combustion chamber, products intended to be used to convey, control or limit smoke and fire propagation, and products using prestressing steel.
- c) Blocks intended to be used as structural elements in conjunction with beams as beam-and-block system:
- precast concrete blocks made of concrete, including the use in contact with indoor air and the use in contact with soil or ground water;
 - precast concrete blocks made of lightweight concrete, including the use in contact with indoor air and the use in contact with soil or ground water;
 - blocks made of clay, with or without clay shells, to be used for floor and roofing systems, including the use in contact with indoor air and the use in contact with soil or ground water;
 - blocks fully made of EPS or combined with different materials, and permanent formworks made of EPS, including the use in contact with indoor air;
 - lightweight permanent formworks made of wood, plastic, cardboard, glass reinforced plastic, agglomerated stone, metal or a combination of them to be used as permanent formwork, including the use in contact with indoor air, to the exclusion of lightweight permanent formworks made of EPS.

This document does not cover:

- masonry and ancillary products;

- roof covering products for discontinuous laying;
- chimney components;
- products for wastewater treatment;
- paving units and kerbs;
- road equipment;
- prefabricated reinforced components of autoclaved aerated concrete or light-weight aggregate concrete with open structure;
- the design, production, handling, installation of the elements and the water tightness of joints between elements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CEN/TS 15117:2005, *Guidance on direct and extended application*

EN 772-1:2011+A1:2015, *Methods of test for masonry units - Part 1: Determination of compressive strength*

EN 772-13:2000, *Methods of test for masonry units – Part 13: Determination of net and gross dry density of masonry units (except for natural stone)*

EN 772-19:2000, *Methods of test for masonry units - Part 19: Determination of moisture expansion of large horizontally perforated clay masonry units*

EN ISO 29469:2022, *Thermal insulating products for building applications - Determination of compression behaviour (ISO 29469:2022)*

EN 933-1:2012, *Tests for geometrical properties of aggregates - Part 1: Determination of particle size distribution - Sieving method*

EN 1008:2002, *Mixing water for concrete - Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 1365-1:2012, *Fire resistance tests for loadbearing elements - Part 1: Walls*

EN 1365-2:2014, *Fire resistance tests for loadbearing elements - Part 2: Floors and roofs*

EN 1365-3:1999, *Fire resistance tests for loadbearing elements - Part 3: Beams*

EN 1365-4:1999, *Fire resistance tests for loadbearing elements - Part 4: Columns*

EN 1365-5:2004, *Fire resistance tests for loadbearing elements - Part 5: Balconies and walkways*

EN 1365-6:2004, *Fire resistance tests for loadbearing elements - Part 6: Stairs*

EN 1507:2006, *Ventilation for buildings - Sheet metal air ducts with rectangular section - Requirements for strength and leakage*

EN 1745:2020, *Masonry and masonry products — Methods for determining thermal properties*

EN 12350-7:2019¹, *Testing fresh concrete - Part 7: Air content - Pressure methods*

EN 12390-1:2021, *Testing hardened concrete - Part 1: Shape, dimensions and other requirements for specimens and moulds*

EN 12390-2:2019, *Testing hardened concrete - Part 2: Making and curing specimens for strength tests*

EN 12390-3:2019, *Testing hardened concrete - Part 3: Compressive strength of test specimens*

EN 12390-4:2025, *Testing hardened concrete - Part 4: Compressive strength - Specification for testing machines*

EN 12390-5:2019, *Testing hardened concrete - Part 5: Flexural strength of test specimens*

EN 12390-6:2023, *Testing hardened concrete - Part 6: Tensile splitting strength of test specimens*

EN 12390-7:2019², *Testing hardened concrete - Part 7: Density of hardened concrete*

EN 12390-8:2019, *Testing hardened concrete - Part 8: Depth of penetration of water under pressure*

EN 12390-16:2019, *Testing hardened concrete - Part 16: Determination of the shrinkage of concrete*

EN 12504-1:2019, *Testing concrete in structures - Part 1: Cored specimens - Taking, examining and testing in compression*

EN 12620:2002+A1:2008, *Aggregates for concrete*

EN 12664:2001, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance*

EN 12667:2001, *Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance*

EN 13055:2016, *Lightweight aggregates*

EN 13101:2002, *Steps for underground man entry chambers - Requirements, marking, testing and evaluation of conformity*

EN 13163:2012+A2:2016, *Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products - Specification*

EN 13238:2010, *Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates*

EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

¹ As impacted by EN 12350-7:2019/AC:2022.

² As impacted by EN 12390-7:2019/AC:2020.

EN 13501-2:2023, *Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance and/or smoke control tests, excluding ventilation services*

EN 13823:2020+A1:2022, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 15080-8:2009, *Extended application of results from fire resistance tests - Part 8: Beams*

EN 15804:2012+A2:2019³, *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*

EN 16516:2017+A1:2020, *Construction products: Assessment of release of dangerous substances - Determination of emissions into indoor air*

EN 16637-1:2023, *Construction products: Assessment of release of dangerous substances - Part 1: Guidance for the determination of leaching tests and additional testing steps*

EN 16637-2:2023, *Construction products: Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test*

EN 16733:2016, *Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering*

EN 16757:2022, *Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements*

EN ISO 354:2003, *Acoustics - Measurement of sound absorption in a reverberation room (ISO 354:2003)*

EN ISO 717-1:2020, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:2020)*

EN ISO 717-2:2020, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation (ISO 717-2:2020)*

EN ISO 1182:2020, *Reaction to fire tests for products - Non-combustibility test (ISO 1182:2020)*

EN ISO 1716:2018, *Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716:2018)*

EN ISO 10140-2:2021, *Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2021)*

EN ISO 10140-3:2021, *Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound insulation (ISO 10140-3:2021)*

EN ISO 10456:2007⁴, *Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)*

EN ISO 11925-2:2020, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)*

³ As impacted by EN 15804:2012+A2:2019/AC:2021.

⁴ As impacted by EN ISO 10456:2007/AC:2009.

EN ISO 12354-1:2017, *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 1: Airborne sound insulation between rooms (ISO 12354-1:2017)*

EN ISO 12354-2:2017, *Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 2: Impact sound insulation between rooms (ISO 12354-2:2017)*

EN ISO 12572:2016, *Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method (ISO 12572:2016)*

EN ISO 15630-2:2019, *Steel for the reinforcement and prestressing of concrete - Test methods - Part 2: Welded fabric and lattice girders (ISO 15630-2:2019)*

3 Terms and definitions

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

3.1

acceptance number

highest number of non-conforming products for which the consignment is accepted

3.2

actual dimension

dimension found by measurement (on the finished product)

3.3

ambient conditions

hygrothermal conditions in the factory which result in effects on the hardening process of the concrete

3.4

base panel

horizontal fence panel of reinforced concrete used between posts at ground level

3.5

beam

linear structural element usually horizontal, for carrying loads primarily by flexure, entirely or partially precast

3.6

cantilever retaining wall

wall whose stability is obtained by its flexural and shear resistance connected to act compositely with a foundation slab

3.7

composite wall

wall consisting of two precast reinforced layers, separated by a gap, which are joined together by means of a lattice girder system

Note 1 to entry: On site, the space between the layers is filled with concrete. Composite walls may also consist of a shell with lattice girders with the other side limited by an existing wall or another formwork during the erection.

3.8

concrete cover

distance between the surface of the reinforcement closest to the nearest concrete surface (including links and stirrups and surface reinforcement where relevant) and the nearest concrete surface

[SOURCE: EN 1992-1-1:2023, 4.4.1.1]

3.9

concrete family

group of concrete compositions for which a reliable relationship between relevant properties is established and documented

[SOURCE: EN 206:2013+A2:2021, 3.1.1.2]

3.10

corner splay

internal chamfering of the corners of a box culvert

3.11

cut block

EPS block formed by cutting from EPS block

3.12

deviation

difference between an actual measure and the corresponding nominal dimension

3.13

embedment length

length of the pole segment firmly fixed in the surrounding of earth or foundation

3.14

floor plate

reinforced or prestressed concrete plates generally used as permanent formwork for cast-in-situ concrete, which, when hardened and liaised with the upper face of the floor plate, forms a structurally composite slab

Note 1 to entry: Some floor plates can be used as formwork for cast-in-situ concrete, with no contribution to the strength of the finished floor.

3.15

foundation pile

long element to be driven in the ground to provide support to the foundation

3.16

hollow core

void produced by specific industrial manufacturing techniques, located with a regular pattern

3.17

lattice girder

two dimensional or three-dimensional metallic structure comprising an upper chord, one or more lower chords and continuous or discontinuous diagonals which are welded or mechanically connected to the chords

[SOURCE: EN 10080:2005, 3.18]

3.19

loadbearing wall

wall element which carries external loads or is important for the safety of people

3.20

moulded block

EPS block formed by moulding

3.21

nominal dimension

dimension specified in the drawings and calculations and targeted at manufacture

3.22

non-loadbearing wall

wall element which carries only its self-weight and is neither necessary for the building stability nor important for the safety of people

3.23

panel

horizontal fence element of reinforced or pre-stressed concrete, connected to the post

3.24

pile joint

device by which separate segments of a segmental foundation pile are structurally connected

3.25

post

vertical fence element of reinforced or pre-stressed concrete, intended to be buried or fastened at its base

Note 1 to entry: This element is designed to accommodate solid or open-work panels and/or rails, meshes or wires.

3.26

precast concrete product

product which is made of concrete and is manufactured in a place different from the final destination of use, and which is the result of an industrial process

3.27

principal dimensions

length, width, depth or thickness

3.28

product family

group of products produced by one manufacturer for which the assessment results for one or more characteristics from any one product within the range are valid for all other products within this range

3.29

R1 type block

block for floor system allowing a mechanical liaison between the beam and the structural topping

Note 1 to entry: Its only mechanical function is that of formwork during the construction of the floor system. Blocks which are supported only on beam ledgers provide no mechanical function to the final floor.

3.30**R2 type block**

block for floor system that extends over the beam header in the peak stress zone, contributing to the mechanical function of the final floor

Note 1 to entry: Blocks type R2 are generally used with self-bearing beams.

3.31**rail**

horizontal fence element of reinforced or pre-stressed concrete, connected to and supported by the post

Note 1 to entry: Rails for sports grounds are distinguished from other types of rails.

3.32**solid panel**

fence panel made of reinforced concrete without any opening

3.33**solid wall**

precast wall of any shape produced as one solid unit including reinforcement and fixtures

3.34**special roof element**

thin-walled structural element with variable transverse cross-section, such as folded plates, or shell elements, specifically intended for roofings with their typical loads

3.35**thermal conductivity**

thermal transmission through unit area of a uniform material of unit thickness when unit difference of temperature is established between its faces

Note 1 to entry: Thermal conductivity is expressed in W/(mK).

[SOURCE: ISO 2424:2024, 9.2.4]

3.36**thick block**

lightweight block for beam-and-block floor system constituted by one or several materials, which forms a filled product

3.37**thin block**

lightweight block for beam-and-block floor system formed as a vault made of one or several layers of material

3.38**tolerance**

range between the upper accepted maximum deviation and the lower accepted maximum deviation

3.39**topping**

in-situ concrete layer cast over the entire floor surface and acting monolithically by bond with or without connecting reinforcement

3.40**web**

solid material linking the faces or shells of a product

3.41**web recess**

formed notch in a web

4 Characteristics**4.1 Concrete****4.1.1 Characteristic compressive strength**

When assessed, the characteristic value of the compressive strength of concrete shall be determined in accordance with 5.1.1.

The performance shall be expressed as a class as indicated in Table 1. The characteristic compressive strength at 28 days of 150 mm diameter by 300 mm cylinders ($f_{ck,cyl}$) or the characteristic compressive strength at 28 days of 150 mm cubes ($f_{ck,cube}$), shall be used for classification.

Table 1 — Compressive strength classes for concrete

Compressive strength class	Minimum characteristic cylinder strength $f_{ck,cyl}$ MPa	Minimum characteristic cube strength $f_{ck,cube}$ MPa
C8/10	8	10
C12/15	12	15
C16/20	16	20
C20/25	20	25
C25/30	25	30
C30/37	30	37
C35/45	35	45
C40/50	40	50
C45/55	45	55
C50/60	50	60
C55/67	55	67
C60/75	60	75
C70/85	70	85
C80/95	80	95
C90/105	90	105
C100/115	100	115

4.1.2 Characteristic compressive strength lightweight concrete

When assessed, the characteristic value of the compressive strength of lightweight concrete shall be determined in accordance with 5.1.2.

The performance shall be expressed as a class as indicated in Table 2. The characteristic compressive strength at 28 days of 150 mm diameter by 300 mm cylinders ($f_{ck,cyl}$) or the characteristic compressive strength at 28 days of 150 mm cubes ($f_{ck,cube}$), shall be used for classification.

Table 2 — Compressive strength classes for lightweight concrete

Compressive strength class	Minimum characteristic cylinder strength $f_{ck,cyl}$ MPa	Minimum characteristic cube strength $f_{ck,cube}$ MPa
LC8/9	8	9
LC12/13	12	13
LC16/18	16	18
LC20/22	20	22
LC25/28	25	28
LC30/33	30	33
LC35/38	35	38
LC40/44	40	44
LC45/50	45	50
LC50/55	50	55
LC55/60	55	60
LC60/66	60	66
LC70/77	70	77
LC80/88	80	88

4.1.3 Tensile splitting strength

When assessed, the tensile splitting strength of concrete or lightweight concrete shall be determined in accordance with 5.1.3 and expressed in MPa rounded to the nearest 0,05.

4.1.4 Dry density lightweight concrete

When assessed, the dry density lightweight concrete shall be determined in accordance with 5.1.4 and expressed as a class in accordance with Table 3.

Table 3 — Dry density classes for lightweight concrete

Class	Minimum dry density (kg/m ³)	Maximum dry density (kg/m ³)
D1.0	800	1 000
D1.2	1001	1 200
D1.4	1201	1 400
D1.6	1401	1 600
D1.8	1601	1 800
D2.0	1 801	2 000

4.1.5 Drying shrinkage

When assessed, the drying shrinkage shall be determined in accordance with 5.1.5 and expressed in mm/m, rounded to the nearest 10.

4.1.6 Maximum aggregate size

When assessed, the maximum aggregate size shall be determined in accordance with 5.1.6 and expressed in mm rounded to the nearest integer.

4.1.7 Water penetration depth of concrete

When assessed, the water penetration depth of concrete shall be determined in accordance with 5.1.7 and expressed in mm rounded to the nearest integer.

4.1.8 Water absorption

When assessed, the water absorption shall be determined in accordance with 5.1.8 and expressed as a percentage rounded to the nearest 0,1 %.

4.2 Reinforcing steel**4.2.1 Elongation at maximum load**

The elongation at maximum load shall be assessed in accordance with 5.2.1 and expressed as a percentage, rounded to the nearest 0,1 %.

4.2.2 Elongation after fracture

The elongation after fracture shall be assessed in accordance with 5.2.2 and expressed as a percentage, rounded to the nearest 0,1 %.

4.2.3 Stress ratio

The stress ratio shall be assessed in accordance with 5.2.3 and expressed as a percentage, rounded to the nearest 0,01 %.

4.2.4 Tensile yield strength

The tensile yield strength shall be assessed in accordance with 5.2.4 and expressed in MPa, rounded to the nearest integer.

4.2.5 Ultimate tensile strength

The ultimate tensile strength shall be assessed in accordance with 5.2.5 and expressed in MPa, rounded to the nearest integer.

4.3 Prestressing steel

4.3.1 Elongation at maximum load

The elongation at maximum load shall be assessed in accordance with 5.3.1 and expressed as a percentage, rounded to the nearest 0,1 %.

4.3.2 Tensile 0,1 proof stress

The tensile 0,1 proof stress shall be assessed in accordance with 5.3.2 and expressed in MPa, rounded to the nearest integer.

4.3.3 Tensile 0,2 proof stress

The tensile 0,2 proof stress shall be assessed in accordance with 5.3.3 and expressed in MPa, rounded to the nearest integer.

4.3.4 Ultimate tensile strength

The ultimate tensile strength shall be assessed in accordance with 5.3.4 and expressed in MPa, rounded to the nearest integer.

4.4 Mechanical strength – calculation aided by physical testing

When the calculation of the mechanical strength characteristics is aided by testing, it shall be assessed whether the test result achieves a minimum 95 % ratio compared to the calculated performance. The result of this assessment shall be expressed as a Boolean: true when the minimum ratio is achieved and false when not.

The calculation shall be provided in the documentation attached to the declaration in accordance with 4.13.

For the following products, the test shall be made in accordance with:

- box culverts: 5.4.1 ;
- fence elements: 5.4.2.

4.5 Masts and poles: 5.4.3.Mechanical strength - testing

4.5.1 Junction boxes

4.5.1.1 Flexural strength

When assessed, the flexural strength shall be determined in accordance with 5.5.1.1 and expressed in daN rounded to the nearest 10.

4.5.1.2 Resistance to concentrated loads bottom

When assessed, the resistance to concentrated loads bottom shall be determined in accordance with 5.5.1.2 and expressed in daN rounded to the nearest 10.

4.5.2 Beams and blocks – concrete blocks, beams and blocks – lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks – EPS blocks, and beams and blocks – blocks - permanent lightweight formwork

4.5.2.1 Resistance to concentrated loads

When assessed, the resistance to concentrated loads of R1 type blocks shall be determined in accordance with 5.5.2.1 and expressed as a class in accordance with Table 4.

Table 4 — Resistance to concentrated loads classes — R1 blocks

Resistance to concentrated loads class	Minimum characteristic punching-bending strength (kN)
Very low non-resisting (R1-VLNR)	0,7
Low non-resisting (R1-LNR)	1,0
Non-resisting (R1-NR)	1,5
Semi-resisting (R1-SR)	2,0
Resisting (R1-RR)	2,5

4.5.2.2 Bending strength

When assessed, the resistance to concentrated loads of R2 type blocks shall be determined in accordance with 5.5.2.2 and expressed as a class in accordance with Table 5, where L is the block length in m (see Annex E).

Table 5 — Resistance to concentrated loads classes – R2 blocks

Resistance to concentrated loads class	Minimum bending strength load (kN)
Low non-resisting (R2-LNR)	1,0
Non-resisting (R2-NR)	1,5
Semi-resisting (R2-SR)	Minimum of 2,0 or $12 \times L$

4.5.2.3 Longitudinal compression strength

When assessed, the characteristic longitudinal compression strength of resisting and semi-resisting blocks shall be determined in accordance with 5.5.2.3 and expressed as a class in accordance with Table 6.

Table 6 — Longitudinal compression strength classes

Longitudinal compression strength class	Minimum characteristic longitudinal compression strength (MPa)
R0	0
R2-RRC	16
R1-RRC	20

4.5.2.4 Transverse strength

When assessed, the transverse strength of resisting and semi-resisting blocks shall be determined in accordance with 5.5.2.4 and shall meet a threshold value of 3,5 kN.

4.5.2.5 Gross dry density beams and blocks - clay blocks

When assessed, the gross dry density of beams and blocks - clay blocks shall be determined in accordance with 5.5.2.5 and expressed as a class in accordance with Table 7.

Table 7 — Gross dry density classes for beams and blocks - clay blocks

Class	Minimum mean gross dry density (kg/m ³)	Maximum mean gross dry density (kg/m ³)
0,5	401	500

0,6	501	600
0,7	601	700
0,8	701	800
0,9	801	900
1,0	901	1 000
1,1	1 001	1 100
1,2	1 101	1 200
1,3	1 201	1 300
1,4	1 301	1 400
1,5	1 401	1 500

4.5.2.6 compressive strength - beams and blocks - clay blocks

When assessed, the compressive strength of beams and blocks - clay blocks shall be determined in accordance with 5.5.2.6 and expressed in MPa rounded to the nearest 0,1.

4.5.2.7 compressive strength - beams and blocks - EPS blocks

When assessed, the compressive strength of beams and blocks - EPS blocks shall be determined in accordance with 5.5.2.7 and expressed in kPa rounded to the nearest 1.

4.5.3 Foundation piles – rigidity of joints

When assessed, the rigidity of foundation piles joints shall be determined in accordance with 5.5.3 and expressed as a class in accordance with Table 8.

Table 8 — Foundation piles – Rigidity of joints classes

Class	Testing verification	Impact blows (n)	Impact blow stress level (N/mm ²)
A	impact and bending	1 000	28
B	impact and bending	1 000	22
C	impact and bending	1 000	17
D	Impact	500	17

4.5.4 Shuttering blocks and woodchip shuttering blocks

4.5.4.1 Flexural strength of shells

When assessed, the flexural strength of the shells $f_{t,m}$ shall be determined on the thinnest shell in accordance with 5.5.4.1 and expressed in MPa rounded to the nearest 0,1.

4.5.4.2 Tensile strength of webs

When assessed, the mean tensile strength of the webs $f_{t,n}$ shall be determined on the smallest section of the webs in accordance with 5.5.4.2 and expressed in MPa rounded to the nearest 0,01.

4.5.5 Floor slats for livestock

When assessed, the mechanical strength of floor slats for livestock shall be expressed as a class in accordance with Table 9 based on the following loads:

- a vertical characteristic linear load q_k ,
- a vertical characteristic point load $F_{k,v}$,
- a horizontal characteristic point load $F_{k,h}$.

Table 9 — Mechanical strength class - floor slats for livestock class

Mechanical strength class	linear load q_k (kN/m)	vertical point load $F_{k,v}$ (kN)	distance a (m)	horizontal point load $F_{k,h}$ (kN)
A1	2,5	1,2	0,5	0,5
A2	5,0	4,2	0,8	2,5
A3	5,0	4,2	0,8	2,5
B1	0,8	0,8	0,3	0,1
B2	1,5	1,0	0,5	0,5
B3	2,5	1,3	0,5	1,0

The given loading values include possible dynamic effects.

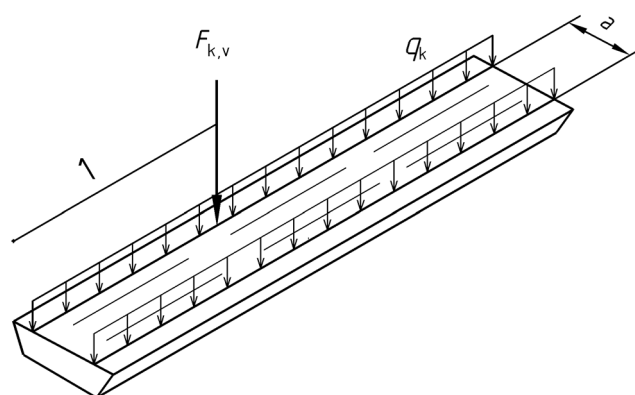
On top of the self-weight, the following load cases, corresponding to livestock and workers, shall be considered separately:

- a) A combination of a vertical characteristic linear load q_k and a vertical characteristic point load $F_{k,v}$, located at the most unfavourable position on the axis of a beam (see Figure 1). Further linear load(s) q_k , placed at distance a (see Table 9) shall be added if this increases the action-effect.

The vertical point load shall act at a location that is relevant for the action-effect under consideration. Locations within a distance h from the inner edge of a support, where h is the height of the floor slat shall be disregarded.

In the case of floor slats with $a/2 < b_1 < a$ where $b_1 = b_o - b - s$ and b_o represents the overall slat width, b the beam width and s the gap width, a linear load $((2b_1/a) - 1) \times q_k$ shall be added at distance b_1 .

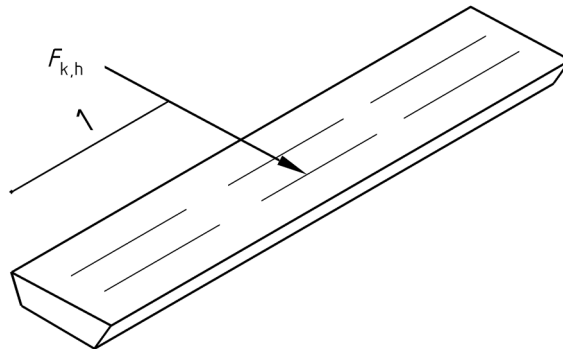
The combination of a linear load q_k and a vertical point load $F_{k,v}$ shall be replaced by a point load $2F_{k,v}$, located at the least favourable position on the axis of a beam, whenever this increases the action-effect.

**Key**

- 1 variable (most unfavourable position)

Figure 1 — Floor slats for livestock: vertical loads

- b) A horizontal characteristic point load $F_{k,h}$, acting at the least favourable location for the action-effect under consideration (see Figure 2). The torsional effects caused by the horizontal point load shall be disregarded.



Key

- 1 variable (most unfavourable position)

Figure 2 — Floor slats for livestock: horizontal load

The calculation shall be part of the documentation provided with the declaration in accordance with 4.12.

4.6 Fire performance

4.6.1 Propensity to undergo continuous smouldering

When assessed, the propensity to undergo continuous smouldering shall be determined and described in accordance with 5.6.1.

4.6.2 Reaction to fire

4.6.2.1 General

The reaction to fire indicates the degree of contribution of the material/product to the behaviour of the concrete and lightweight concrete solid slabs, HVAC flue elements, junction boxes, beams and blocks - beams, box culverts, cladding elements, fence elements, floor plates for floor systems, floor slats for livestock, foundation elements, garage boxes, hollow core slabs, linear structural elements, loadbearing wall elements - solid, hollow core, multilayer and composite, non-load bearing wall elements - composite panels and partitions, masts and poles, retaining wall elements, ribbed floor elements, solid, hollow, multilayer and special roof elements, stairs, concrete deck elements for bridges, and beams and blocks - concrete blocks, beams and blocks - lightweight concrete blocks, beams and blocks - clay blocks, beams and blocks - EPS blocks, and beams and blocks - blocks - permanent lightweight formwork, in the event of fire. When tested in accordance with the test method given in clause 5.6.2, relevant for the claimed class, the test result is expressed as a class according to the classification published in the Official Journal of the European Union on this specific matter.

NOTE The applicable document at the time this standard was drafted is Commission Delegated Regulation (EU) 2016/364 of 1 July 2015 (see OJEU L, 2016-03-15).

The conditions for which the declared classification is valid may be included in the attached documentation.

4.6.2.2 Classification without further testing (WFT)

Whether products covered by this standard fulfil the conditions, under which they have demonstrated of having a stable reaction to fire performance in a given reaction to fire class, based on testing to the

appropriate EN test methods, the established assigned class applies to these products without the need of carrying out further reaction to fire tests.

NOTE The rules to apply this classification are published as Commission Decisions or Commission Delegated Regulations.

4.6.2.3 Classification without testing (WT)

When products covered by this standard are made from one or more of the materials that have been considered, under established conditions, as belonging to the category “No contribution to fire” because of their low level of combustibility, the reaction to fire class A applies to these products without the need of carrying out reaction to fire tests.

NOTE The applicable document at the time this standard was drafted is Commission Decision 96/603/EEC, *Materials to be considered as reaction to fire Class A* without the need for testing as amended by Commission Decision 2000/605/EC of 26 September 2000 (see OJEU L, 2000-10-12).

4.6.3 Resistance to fire

The resistance to fire is the capability of the product to provide, in the event of fire and for a given time, one or more of the following behaviours:

- Load-bearing capacity (R);
- Integrity (E);
- Insulation (I).

When assessed in accordance with the test method indicated in 5.6.3, the result is expressed as class in minutes according to the classification published in the Official Journal of the European Union on this specific matter, completed by the established suffixes.

NOTE The applicable document at the time this standard was drafted is Commission Delegated Regulation (EU) 2024/1681 of 6 March 2024 (see OJEU L, 2024-06-13).

4.7 Water performance

4.7.1 Water vapour permeability

4.7.1.1 Water vapour permeability – equivalent air layer thickness

When assessed, the equivalent air thickness of water vapour permeability shall be determined in accordance with 5.7.1.1 and expressed as equivalent air layer thickness in m rounded to the unit.

4.7.1.2 Water vapour permeability – resistance factor - testing

When assessed, the water vapour permeability resistance factor shall be determined in accordance with 5.7.1.2 and expressed as μ factor rounded to the unit.

4.7.1.3 Water vapour permeability – resistance factor - tabulated values

When estimated through a tabulated value, the water vapour permeability shall be determined in accordance with 5.7.1.3 and expressed as μ factor.

4.7.2 Water permeability

When assessed, the water permeability shall be determined in accordance with 5.7.2 and expressed as a percentage rounded to the nearest 0,1 %.

4.8 Thermal performance

4.8.1 Thermal conductivity – testing

When assessed, the thermal conductivity λ shall be determined in accordance with 5.8.1 and declared as a characteristic value in W/(m.K).

4.8.2 Thermal conductivity – tabulated values

When estimated through a tabulated value, the thermal conductivity shall be determined in accordance with 5.8.2.

4.9 Acoustic performance

4.9.1 Airborne sound insulation index - calculation

When calculated, the airborne sound insulation index shall be estimated in accordance with 5.9.1. It shall be expressed in one-third octave bands 100 Hz to 3 150 Hz and as a single number quantity with spectrum adaptation terms in accordance with EN ISO 717-1:2020 in dB rounded to the first decimal.

4.9.2 Airborne sound insulation index – testing

When assessed, the airborne sound insulation index shall be measured in accordance with 5.9.2. It shall be expressed in one-third octave bands 100 Hz to 3 150 Hz and as a single number quantity with spectrum adaptation terms in accordance with EN ISO 717-1:2020 in dB rounded to the first decimal.

4.9.3 Impact sound insulation - calculation

When calculated, the impact noise transmission index shall be estimated by calculation in accordance with 5.9.3. It shall be expressed in the third octave bands 100 Hz to 3 150 Hz and as a single number quantity with spectrum adaptation terms in accordance with EN ISO 717-2:2020 in dB rounded to the first decimal.

4.9.4 Impact sound insulation – testing

When assessed, the impact noise transmission index shall be measured in accordance with 5.9.4. It shall be expressed in the third octave bands 100 Hz to 3 150 Hz and as a single number quantity with spectrum adaptation terms in accordance with EN ISO 717-2:2020 in dB rounded to the first decimal.

4.9.5 Sound absorption coefficient building elements

When assessed, the sound absorption coefficient of HVAC flue element sound absorbing covering materials shall be determined in accordance with 5.9.5 and expressed as a 10 % fractile with a 90 % confidence interval of the weighted sound absorption coefficient rounded to the nearest 0,01.

4.10 Other performances

4.10.1 Mass of the element

When assessed, the mass shall be determined in accordance with the test method given in clause 5.10.1 and expressed in kg rounded to the nearest integer for products up to 50 kg and to the nearest 10 for the other products.

4.10.2 Air tightness class - HVAC flue elements

When assessed, the air tightness class of HVAC flue elements shall be determined in accordance with 5.10.2.

4.10.3 Mechanical resistance of rungs

When assessed, the mechanical resistance of rungs for junction boxes shall be determined in accordance with 5.10.3 and expressed in N rounded to the nearest 10.

4.10.4 Moisture expansion

Applies to beams and blocks - clay blocks

When assessed, the moisture expansion shall be determined in accordance with 5.10.4 and expressed in mm/m rounded to the nearest 0,1.

4.11 Release of dangerous substances

4.11.1 Release of dangerous substances to indoor air

The release of the substances listed in Table 11 indicates the air concentration of the substance in the reference room for walls or floor, ceiling. When required and assessed in accordance with the test method given in 5.11.1, the test result is expressed as a value and rounded as indicated in Table 11.

Table 11 — Release of dangerous substances to indoor air

Substance	Unit	Rounding
Acetaldehyde	µg/m ³	nearest integer
Benzene	µg/m ³	nearest 10
dibutyl phthalate	µg/m ³	nearest 10
ethylhexyl phthalate	µg/m ³	nearest 10
Formaldehyde	µg/m ³	nearest 10
Toluene	µg/m ³	nearest 10
Trichlorethylene	µg/m ³	nearest 10

4.11.2 Release of dangerous substances to soil and ground water

The release of the substances listed in Table 12 indicates the concentration of the substance in the eluates. When required and assessed in accordance with the test method given in 5.11.2, the test result is expressed as a value in rounded as indicated in Table 12.

Table 12 — Release of dangerous substances to soil and ground water

Substance	Unit	Rounding
Antimony	mg/m ²	nearest integer
Arsenic	mg/m ²	nearest integer
Asbestos	mg/m ²	nearest integer
Barium	mg/m ²	nearest integer
Benzene	mg/m ²	nearest integer
Bromine	mg/m ²	nearest integer
Cadmium	mg/m ²	nearest integer
Chlorine	mg/m ²	nearest integer

Substance	Unit	Rounding
Chromium	mg/m ²	nearest integer
Cobalt	mg/m ²	nearest integer
Copper	mg/m ²	nearest integer
Ethylbenzene	mg/m ²	nearest 100
Fluoride	mg/m ²	nearest 10
Lead	mg/m ²	nearest integer
Mercury	mg/m ²	nearest integer
mineral oil	mg/m ²	nearest integer
Molybdenum	mg/m ²	nearest integer
Nickel	mg/m ²	nearest integer
pcbs (sum)	mg/m ²	nearest 100
Phenol	mg/m ²	nearest 100
polycyclic aromatic hydrocarbons (pah): anthracene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): benzo(a)anthracene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): benzo(a)pyrene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): benzo(ghi)perylene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): benzo(k)fluoranthene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): chrysene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): indeno(1,2,3cd)pyrene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): fluoranthene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): naphthalene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): phenanthrene	mg/m ²	nearest integer
polycyclic aromatic hydrocarbons (pah): sum	mg/m ²	nearest integer
Selenium	mg/m ²	nearest 10
Sulphate	mg/m ²	nearest integer
Tin	mg/m ²	nearest integer
Toluene	mg/m ²	nearest 100
Vanadium	mg/m ²	nearest integer
Xylenes	mg/m ²	nearest 100
Zinc	mg/m ²	nearest integer

4.12 Environmental sustainability

4.12.1 Reference service life

The reference service life is the service life to be expected under a set of reference in-use conditions consistent with the characteristics of the product. When required and assessed in accordance with the method given in clause 5.12.1, the results are expressed as a value in years.

4.12.2 Life cycle assessment environmental characteristics

Characteristics in Table 13 are related to the life cycle assessment of the product. When required and assessed in accordance with the method given in clause 5.12.2, the results are expressed as a value in the units included in Table 13 for modules A1 to A3 and for each module and European harmonised scenario described in clause 5.12.2.

Table 13 — Life cycle assessment environmental characteristics

Characteristic	Unit	Dimensions
climate change – total	kg CO ₂ eq.	M
climate change – fossil	kg CO ₂ eq.	M
climate change – biogenic	kg CO ₂ eq.	M
climate change - land use and land use change	kg CO ₂ eq.	M
ozone depletion	kg CFC 11 eq.	M
Acidification	mol H ⁺ eq.	N
eutrophication aquatic freshwater	kg PO ₄ eq.	M
eutrophication aquatic marine	kg N eq.	M
eutrophication terrestrial	mol N eq.	N
photochemical ozone formation	kg NMVOC eq.	M
depletion of abiotic resources - minerals and metals	kg Sb eq.	M
depletion of abiotic resources - fossil fuels	MJ, net calorific value	ML ² T ⁻²
water use	m ³ world eq. deprived	L3
particulate matter emissions	Disease incidence	-
ionising radiation, human health	kBq U235 eq.	S-1
ecotoxicity (freshwater)	CTUe	M-1
human toxicity, cancer effects	CTUh	M-1
human toxicity, non- cancer effects	CTUh	M-1
land use related impacts / soil quality	unitless	-

4.12.3 Resource use environmental characteristics

Characteristics in Table 14 are related to the resource use over the life cycle of the product. When required and assessed in accordance with the method given in 5.12.3, the results are expressed as a value in the units included in Table 14 for modules A1 to A3 and for each module and European harmonised scenario described in 5.12.3.

Table 14 — Resource use environmental characteristics

Characteristic	unit	dimensions
use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	ML ² T ⁻²
use of renewable primary energy resources used as raw materials	MJ	ML ² T ⁻²
total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	ML ² T ⁻²
use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	ML ² T ⁻²
use of non-renewable primary energy resources used as raw materials	MJ	ML ² T ⁻²
total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	ML ² T ⁻²
use of secondary material	kg	M
use of renewable secondary fuels	MJ	ML ² T ⁻²
use of non-renewable secondary fuels	MJ	ML ² T ⁻²
net use of fresh water	m ³	L ³

4.12.4 Waste environmental characteristics

Characteristics in Table 15 are related to the waste produced over the life cycle of the product. When required and assessed in accordance with the method given in 5.12.4, the results are expressed as a value in the units included in Table 15 for modules A1 to A3 and for each module and European harmonised scenario described in 5.12.4.

Table 15 — Waste environmental characteristics

Characteristic	unit	dimensions
hazardous waste disposed	kg	M
non-hazardous waste disposed	kg	M
radioactive waste disposed	kg	M

4.12.5 Output flows environmental characteristics

Characteristics in Table 16 are related to the output flows over the life cycle of the product. When required and assessed in accordance with the method given in 5.12.5, the results are expressed as a value in the units included in Table 16 for modules A1 to A3 and for each module and European harmonised scenario described in 5.12.5.

Table 16 — Output flows environmental characteristics

Characteristic	unit	Dimensions
components for re-use	kg	M
materials for recycling	kg	M
materials for energy recovery	kg	M
exported energy	MJ	ML2T-2

4.12.6 Biogenic carbon content environmental characteristics

Characteristics in Table 17 are related to the waste produced over the life cycle of the product. When required and assessed in accordance with the method given in 5.12.6, the results are expressed as a value in the units included in Table 17 for modules A1 to A3 and for each module and European harmonised scenario described in 5.12.6.

Table 17 — Biogenic carbon environmental characteristics

Characteristic	unit	Dimensions
biogenic carbon content in product	kg C	M
biogenic carbon content in accompanying packaging	kg C	M

4.13 Performances in attached documentation of the product

4.13.1 General

In case the structural behaviour, including fatigue resistance, earthquake resistance, fire resistance and durability, is expressed in a way not directly related to essential characteristics, the following applies.

4.13.2 Off-the-shelf products

In this case, information about the loads and exposure scenarios of product is not known so the relevant information comprises:

- A detailed set of drawings including nominal dimensions, tolerances and materials used allowing the determination of the behaviour when the loads and exposure scenarios are defined.

- When relevant, usual load and exposure scenarios and calculations or tabulated values relevant to them, including durability assessment, even if they do not reflect the applicable loads and exposures in which the product is used.
- When relevant, reference to the calculation methods, exposure scenarios and any relevant additional information.

The performance shall be assessed in accordance with 5.13.2.

4.13.3 Custom-made products

In this case, information about the loads and exposure scenarios of the product is available so the relevant information comprises:

- A detailed set of drawings including nominal dimensions, tolerances and materials used allowing the calculation of the behaviour for the established loads and exposure scenarios.
- When relevant, the applicable load and exposure scenarios and calculations or tabulated values relevant to them, including durability assessment.
- When relevant, reference to the calculation methods, description of the exposure scenarios and any relevant additional information.

The performance shall be assessed in accordance with 5.13.3.

4.13.4 Set of drawings

The drawings shall consider and include when relevant:

- The detailing as regards fixings, plans, drawings and tolerances;
- The joints details and fixings/fastening in thin-walled elements of HVAC flues;
- The connections to other elements of junction boxes and foundation elements;
- The loadbearing compression joints of loadbearing wall elements;
- the opening and joints, and detailing as regards connectors of masts and poles;
- The stem-base description of cantilever retaining walls;
- The shape, components, supports, connections, and complementary elements of special roof elements;
- The stress-strain curve of the reinforcing steel;
- The client inputs in the case of custom-made products.

4.13.5 Calculations

The calculations shall consider and include when relevant:

- The traffic and fatigue situations;
- The performance under seismic conditions;
- The beam and block compatibility for beam-and-block floor systems;

- The cast-in-situ concrete topping of floor elements;
- The transient situations and shear and negative moments of floor elements;
- The formwork pressure for the concreting of composite walls on site;
- The beam-like behaviour, hyperstatic plate-systems behaviour, isostatic plate-system behaviour, and resistance verifications of special roof elements;
- The thermal insulation adhesion of shuttering blocks;
- The R, EI and REI resistance to fire classes when calculated or tabulated values are used;
- The client inputs in the case of custom-made products.

5 Testing, assessment and sampling methods

5.1 Concrete

5.1.1 Characteristic compressive strength

The characteristic compressive strength shall be determined on representative moulded specimens in accordance with EN 12390-3:2019.

The standard cylinder strength is obtained with a cylinder of 150 mm diameter and 300 mm height. The standard cube strength is obtained with a cube of 150 mm side length.

Cubes with a nominal size of at least 100 mm and not more than 150 mm and cylinders or cores with equal nominal length and diameter from 100 mm up to 150 mm can be assumed to give a strength value equivalent to the standard cube strength value obtained under the same ambient conditions.

Cylinders and cores with a nominal diameter of at least 100 mm and not larger than 150 mm and with a nominal length to diameter ratio equal to 2 can be assumed to give a strength value equivalent to the standard cylinder strength value obtained under the same ambient conditions.

For other shapes and sizes of specimens, conversion factors with the standard cylinder or cube strength shall be established by initial testing.

Cores with a nominal diameter less than 50 mm and/or a nominal length less than 0,7 times the diameter or cubes with a nominal size less than 50 mm shall not be used.

NOTE In order to obtain the (cylinder) strength f° for drilled cores with $d \geq 50$ mm diameter with length h not less than $0,7d$, a proper shape correlation for the measured strength f' can be calculated as a function of the size ratio h/d from the Formula hereafter:

$$f^\circ = f' \cdot (0,215 \cdot \ln(h/d) + 0,85),$$

where $0,7 \leq h/d \leq 2,0$

EN 13791:2019 provides information on shape correlation factors.

Conversion factors for the relationship between indirect structural strength and direct structural strength shall be established by initial testing. Depending on the shape and/or size of the specimens to be considered this conversion factor can include a shape and/or size conversion factor.

For stabilized production processes where the composition of the concrete and curing methods are not changed, the compressive indirect structural strength may be determined by test specimens, made from

fresh concrete, cured and stored in factory conditions as close to the precast concrete product as possible, provided an initial test has determined the correlation with the direct structural strength.

Density may be used as a characteristic for the establishment of the correlation.

For initial production, the characteristic compressive strength f_{ck} in MPa corresponding to the class as defined in Table 1 is determined based on the mean value f_{cm} of non-overlapping or overlapping groups of three consecutive results, expressed in MPa, as satisfying Formula (1) where f_{ck} is either $f_{ck,cyl}$ or $f_{ck,cub}$:

$$f_{ck} \leq (f_{cm} - 4) \quad (1)$$

For continuous production (equal or superior to 15 samples) the characteristic compressive strength f_{ck} in MPa corresponding to the class as defined in Table 1 is determined based on the mean value f_{cm} of non-overlapping or overlapping groups of three consecutive results, expressed in MPa, as satisfying Formula (2) where f_{ck} is either $f_{ck,cyl}$ or $f_{ck,cub}$ and σ is the estimated standard deviation of the population:

$$f_{ck} \leq f_{cm} - 1,48\sigma \quad (2)$$

The determination method used for initial production may be kept during the continuous production.

Where this method is applied to a concrete family, the mean of all non-transposed test results (f_{cm}) for a single family member shall be compared with the criterion given in Table 18. Any concrete failing this criterion shall be removed from the family and checked individually.

The reintegration of the removed concretes is accepted only after revision of the established relationships between the removed composition and the reference concrete.

Table 18 — Confirmation criterion for family members

Number n of test results for compressive strength for a single family member	Mean of n results (f_{cm}) for a single family member MPa
2	$\geq f_{ck} - 1,0$
3	$\geq f_{ck} + 1,0$
4	$\geq f_{ck} + 2,0$
5	$\geq f_{ck} + 2,5$
6	$\geq f_{ck} + 3,0$
7 to 9	$\geq f_{ck} + 3,5$
10 to 12	$\geq f_{ck} + 4,0$
13, 14	$\geq f_{ck} + 4,5$
≥ 15	$\geq f_{ck} + 1,48 \sigma$

At the end of initial production, the standard deviation (σ) of the population shall be estimated from at least 35 consecutive test results taken over a period exceeding three months. When continuous production begins, this value of standard deviation shall be used over the first assessment period. At the end of the first and subsequent assessment periods, the standard deviation based on the corresponding n test results s_n is checked to determine whether it has changed significantly compared to σ , using the limits given in Table 19 or determined by Formula (3) in case of more than 35 test results. If it has not changed significantly, the current estimate of the standard deviation applies to the following assessment period. When there is a significant change in standard deviation, a new standard deviation is calculated from the most recent 35 consecutive results and applied to the following assessment period.

Table 19 — Values for verification of standard deviation

Number of test results	Limits for s_n
15 to 19	$0,63 \sigma \leq s_n \leq 1,37 \sigma$
20 to 24	$0,68 \sigma \leq s_n \leq 1,31 \sigma$
25 to 29	$0,72 \sigma \leq s_n \leq 1,28 \sigma$
30 to 34	$0,74 \sigma \leq s_n \leq 1,26 \sigma$
35	$0,76 \sigma \leq s_n \leq 1,24 \sigma$

$$\sqrt{\frac{\chi_{0,025;n-1}^2}{(n-1)}}\sigma \leq s_n \leq \sqrt{\frac{\chi_{0,975;n-1}^2}{(n-1)}}\sigma \quad (3)$$

where $\chi_{\alpha;\nu}^2$ is the α -fractile of a chi-square distribution with $\nu = n - 1$ degrees of freedom.

5.1.2 Characteristic compressive strength lightweight concrete

The characteristic compressive strength lightweight concrete shall be determined in accordance with 5.1.1.

The provisions of 5.1.1 for concrete families apply also to lightweight concrete families.

5.1.3 Tensile splitting strength

When tested, the tensile splitting strength of concrete or lightweight concrete shall be determined in accordance with EN 12390-6:2023.

5.1.4 Dry density lightweight concrete

When tested, the dry density of lightweight concrete shall be determined as a mean value of measurements made in accordance with EN 12390-7:2019 under “oven-dried conditions”.

5.1.5 Drying shrinkage

When tested, the drying shrinkage in end use conditions shall be determined as a mean value of measurements made in accordance with EN 12390-16:2019.

5.1.6 Maximum aggregate size

When tested, the maximum aggregate size D shall be determined in accordance with EN 12620:2002+A1:2008, Table 2, for normal weight aggregates, or EN 13055:2016, 5.3.3, for lightweight aggregates, based on testing in accordance with EN 933-1:2012.

5.1.7 Water penetration depth of concrete

When tested, the water penetration depth of concrete shall be determined in accordance with EN 12390-8:2019.

5.1.8 Water absorption

When tested, the water absorption shall be determined in accordance with Annex F.

5.2 Reinforcing steel

5.2.1 Elongation at maximum load

The elongation at maximum load shall be determined in accordance with EN ISO 15630-1:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.2.2 Elongation after fracture

The elongation after fracture shall be determined in accordance with EN ISO 15630-1:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.2.3 Stress ratio

The stress ratio shall be determined in accordance with EN ISO 15630-1:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.2.4 Tensile yield strength

The tensile yield strength shall be determined in accordance with EN ISO 15630-1:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.2.5 Ultimate tensile strength

The ultimate tensile strength shall be determined in accordance with EN ISO 15630-1:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.3 Prestressing steel

5.3.1 Elongation at maximum load

The elongation at maximum load shall be determined in accordance with EN ISO 15630-3:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.3.2 Tensile 0,1 proof stress

The tensile 0,1 proof stress shall be determined in accordance with EN ISO 15630-3:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.3.3 Tensile 0,2 proof stress

The tensile 0,2 proof stress shall be determined in accordance with EN ISO 15630-3:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.3.4 Ultimate tensile strength

The ultimate tensile strength shall be determined in accordance with EN ISO 15630-3:2019. Alternative determination methods may be accepted. In this case, a correlation with the reference method shall be provided when possible.

5.4 Mechanical strength - calculation aided by testing

5.4.1 Box culverts

The test shall be made in accordance with Annex A.

5.4.2 Fence elements

The test shall be made in accordance with Annex B.

5.4.3 Masts and poles

The test shall be made in accordance with Annex C.

5.5 Mechanical strength – testing

5.5.1 Junction boxes

5.5.1.1 Flexural strength

When tested, the flexural strength shall be determined in accordance with J.1.

5.5.1.2 Resistance to concentrated loads bottom

When tested, the resistance to concentrated loads bottom shall be determined in accordance with J.2.

5.5.2 Beams and blocks – concrete blocks, beams and blocks – lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks – EPS blocks, and beams and blocks – blocks - permanent lightweight formwork

5.5.2.1 Resistance to concentrated loads

When tested, the resistance to concentrated loads of R1 type blocks shall be determined through a punching-bending strength test in accordance with H.1.

5.5.2.2 Bending strength

When tested, the resistance to concentrated loads of R2 type blocks shall be determined through a bending strength test in accordance with H.2.

5.5.2.3 Longitudinal compression strength

When tested, the characteristic longitudinal compression strength of resisting and semi-resisting blocks shall be determined in accordance with H.3.

5.5.2.4 Transverse strength

When tested, the transverse strength of resisting and semi-resisting blocks shall be determined in accordance with H.4.

5.5.2.5 Gross dry density beams and blocks - clay blocks

When tested, the gross dry density of beams and blocks - clay blocks shall be determined in accordance with EN 772-13:2000.

5.5.2.6 compressive strength - beams and blocks - clay blocks

When tested, the compressive strength of beams and blocks - clay blocks shall be determined in accordance with EN 772-1:2011+A1:2015.

5.5.2.7 compressive strength - beams and blocks - EPS blocks

When tested, the compressive strength of beams and blocks - EPS blocks shall be determined in accordance with EN ISO 29469:2022.

5.5.3 Foundation piles – rigidity of joints

When tested, the rigidity of foundation piles joints shall be determined in accordance with Annex G.

5.5.4 Shuttering blocks and woodchip shuttering blocks

5.5.4.1 Flexural strength of shells

When tested, the flexural strength of the shells $f_{t,m}$ shall be determined on the thinnest shell in accordance with I.1.

5.5.4.2 Tensile strength of webs

The tensile strength of the webs $f_{t,n}$ shall be determined on the smallest section of the webs in accordance with I.2.

5.6 Reaction and resistance to fire

5.6.1 Propensity to undergo continuous smouldering

When tested, the propensity to undergo continuous smouldering shall be determined and described in accordance with EN 16733:2016. The specimens shall be cut out from products in accordance with EN 16733:2016, 6.2. For the conditioning of the specimens, EN 13238:2010 shall apply. The direct and extended application of the results shall be established based on CEN/TS 15117:2005.

5.6.2 Reaction to fire

The reaction to fire class shall be determined in accordance with EN 13501-1:2018. The following testing standards shall apply with the indicated dated version: EN 13823:2020+A1:2022, EN ISO 1182:2020, EN ISO 1716:2018, EN ISO 11925-2:2020.

When relevant, the maximum content of homogeneously distributed organic material shall be assessed.

In the case of beams and blocks - EPS blocks, and beams and blocks - blocks - permanent lightweight formwork, the single item burning test described in EN 13823:2020+A1:2022 shall be adapted in accordance with Annex D for thin blocks.

5.6.3 Resistance to fire

The resistance to fire classification shall be assessed in accordance with EN 13501-2:2023.

The following testing standards shall apply with the indicated dated version: EN 1365-1:2012, EN 1365-2:2014, EN 1365-3:1999, EN 1365-4:1999, EN 1365-5:2004, EN 1365-6:2004. For beams, EN 15080-8:2009 shall apply for the EXAP rules.

5.7 Water performance

5.7.1 Water vapour permeability

5.7.1.1 Water vapour permeability – equivalent air layer thickness

When tested, the equivalent air thickness of water vapour permeability shall be determined in accordance with EN ISO 12572:2016 in dry (A) and/or, if relevant for the intended use, wet (C) conditions.

5.7.1.2 Water vapour permeability – resistance factor - testing

When tested, the water vapour permeability resistance factor shall be determined in accordance with EN ISO 12572:2016 in dry (A) and/or, if relevant for the intended use, wet (C) conditions.

5.7.1.3 Water vapour permeability – resistance factor - tabulated values

When estimated through a tabulated value, the water vapour permeability shall be determined as μ factor from EN ISO 10456:2007.

5.7.2 Water permeability

When tested, the water permeability of concrete HVAC flues shall be determined through a water absorption test in accordance with Annex F.

5.8 Thermal performance

5.8.1 Thermal conductivity – testing

When tested, the thermal conductivity $\lambda_{10,dry}$ shall be determined in accordance with EN 12664:2001.

For samples of thermal resistance higher than 0,5 m².K/W, EN 12667:2001 shall apply.

For beams and blocks - EPS blocks, the λ_D value shall be determined in accordance with EN 13163:2012+A2:2016.

5.8.2 Thermal conductivity – tabulated values

When estimated through a tabulated value, the thermal conductivity shall be expressed as λ value in W/(m.K) from EN ISO 10456:2007, Table 3.

For beams and blocks - concrete blocks, beams and blocks – lightweight concrete blocks, and beams and blocks - clay blocks, the $\lambda_{10,dry}$ value shall be taken from EN 1745:2020, Annex A.

5.9 Acoustic performance

5.9.1 Airborne sound insulation index - calculation

When calculated, the airborne sound insulation index shall be estimated following EN ISO 12354-1:2017.

In the case of floor plates for floor systems, the influence of the joint between floor plates for floor systems may be neglected in the calculation.

5.9.2 Airborne sound insulation index – testing

When tested, the airborne sound insulation index shall be measured in accordance with EN ISO 10140-2:2021.

5.9.3 Impact sound insulation - calculation

When calculated, the impact noise transmission index shall be estimated by calculation following EN ISO 12354-2:2017.

In the case of floor plates for floor systems, the influence of the joint between floor plates for floor systems may be neglected in the calculation.

5.9.4 Impact sound insulation – testing

When tested, the impact noise transmission index shall be measured in accordance with EN ISO 10140-3:2021.

5.9.5 Sound absorption coefficient building elements

When tested, the sound absorption coefficient of HVAC flue element sound absorbing covering materials shall be determined in accordance with EN ISO 354:2003.

5.10 Other performances

5.10.1 Mass of the element

Shuttering blocks, woodchip shuttering blocks, beams and blocks - concrete blocks, beams and blocks - lightweight concrete blocks, beams and blocks - clay blocks, beams and blocks - EPS blocks and beams and blocks - blocks - permanent lightweight formwork shall be weighed with an accuracy of 0,1 %. The value shall be expressed as a median value in kg rounded to the nearest 0,1.

For other products, the mass shall be determined by weighing with an accuracy of ± 3 % or estimated by calculation and expressed in kg rounded to the nearest 10. In case of mass production, the value shall be given as a median value.

The estimated mass shall be calculated from:

- the nominal dimensions of the finished product;
- the mean value of concrete density representative for the finished product considered, and measured from the test specimen used for compressive strength according to EN 12390-3:2019;
- the amount of reinforcement of the finished product.

5.10.2 Air tightness class - HVAC flue elements

When tested, the air tightness class shall be determined in accordance with EN 1507:2006.

5.10.3 Mechanical resistance of rungs

When tested, the mechanical resistance of rungs for junction boxes shall be determined in accordance with EN 13101:2002, Annex D.

5.10.4 Moisture expansion

When tested, the moisture expansion of beams and blocks - clay blocks shall be determined in accordance with EN 772-19:2000.

5.11 Release of dangerous substances

5.11.1 Release of dangerous substances to indoor air

Release of dangerous substances to indoor air shall be tested according to EN 16516:2017+A1:2020 using the following testing specimens and sampling methodology:

- The sample shall be constituted by:
 - 6 products for large products,
 - The minimum number of shuttering blocks or woodchip shuttering blocks to make 6 times 1 m² of wall,
 - The minimum number of beams and blocks - concrete blocks, beams and blocks - lightweight concrete blocks, beams and blocks - clay blocks, beams and blocks - EPS blocks, beams and blocks - blocks - permanent lightweight formwork to make 6 times 1 m² of ceiling.

- The faces which are not supposed to be in contact with indoor air shall be sealed.
- The products shall be at least 28 days old and kept in the factory normal storage conditions.
- The loading factors L shall be the following:
 - 1,0 m²/m³ for HVAC flue elements, cladding elements, hollow core, multilayer and composite loadbearing wall elements - solid, hollow core, multilayer and composite, non-load bearing wall elements - composite panels and partitions, garage boxes, hollow core shuttering blocks, wood-chip hollow core shuttering blocks, ,
 - 0,4 m²/m³ for solid slabs, beams and blocks – concrete blocks, beams and blocks - lightweight concrete blocks, beams and blocks – clay blocks, beams and blocks - EPS blocks, beams and blocks - blocks - permanent lightweight formwork, floor plates for floor systems, hollow core slabs, ribbed floor elements, solid, hollow, multilayer and special roof elements, stairs,
 - 0,05 m²/m³ for beams and blocks – beams, linear structural elements, floor slats for livestock.

The result derived from the assessment will correspond to the median of the results observed in the tested samples. The resulting value should be rounded to the nearest integer to determine its classification.

The performance shall be expressed in dimensions ML-3 and in unit mg/m³

5.11.2 Release of dangerous substances to soil and ground water

Release of dangerous substances to soil and ground water shall be tested according to EN 16637-2:2023 using testing specimens according to EN 16637-1:2023 and the following sampling methodology:

- Large products: 6 representative moulded specimens in accordance with EN 12390-1:2021 and EN 12390-2:2019, or representative cores in accordance with EN 12504-1:2019, or sawn specimens, with at least 7 500 mm² of exposed side for cores and sawn specimens,
- Shuttering blocks, woodchip shuttering blocks, beams and blocks – concrete blocks, beams and blocks - lightweight concrete blocks, and beams and blocks – clay blocks: 6 specimens sawn from different products, with at least 7 500 mm² of exposed side,
- The faces which are not supposed to be in contact with soil and ground water (non-moulded faces and sawn faces) shall be sealed.
- The specimens shall be at least 28 days old and kept in the factory normal product storage conditions.

The result derived from the assessment will correspond to the median of the results observed in the tested samples. The resulting value should be rounded to the nearest integer.

The performance shall be expressed in dimensions ML-2 and in unit mg/m²

5.12 Environmental sustainability

5.12.1 Reference service life

The reference service life shall be defined according to Annex K of this document.

The result derived from the assessment will correspond to minimum value determined (in case of more than one) rounded to the nearest integer.

The performance shall be expressed in dimensions T and in unit year.

5.12.2 Life cycle assessment environmental characteristics

Life cycle assessment environmental characteristics shall be assessed according to EN 15804:2012+A2:2019, EN 16757:2022 and Annex K of this document.

The results derived from the assessment will correspond to the results for each module and each European harmonized scenario, as described in EN 16757:2022 and Annex K.

The performance shall be expressed in the dimensions and units included in Table 13.

5.12.3 Resource use environmental characteristics

Resource use environmental characteristics shall be assessed according to EN 15804:2012+A2:2019, EN 16757:2022 and Annex K of this document.

The results derived from the assessment will correspond to the results for each module and each European harmonized scenario, as described in EN 16757:2022 and Annex K.

The performance shall be expressed in the dimensions and units included in Table 14.

5.12.4 Waste environmental characteristics

Waste environmental characteristics shall be assessed according to EN 15804:2012+A2:2019, EN 16757:2022 and Annex K of this document.

The results derived from the assessment will correspond to the results for each module and each European harmonized scenario, as described in EN 16757:2022 and Annex K.

The performance shall be expressed in the dimensions and units included in Table 15.

5.12.5 Output flows environmental characteristics

Output flows environmental characteristics shall be assessed according to EN 15804:2012+A2:2019, EN 16757:2022 and Annex K of this document.

The results derived from the assessment will correspond to the results for each module and each European harmonized scenario, as described in EN 16757:2022 and Annex K.

The performance shall be expressed in the dimensions and units included in Table 16.

5.12.6 Biogenic carbon environmental characteristics

Biogenic carbon environmental characteristics shall be assessed according to EN 15804:2012+A2:2019, EN 16757:2022 and Annex K of this document.

In case the product is not made of materials containing biogenic carbon the value declared for the characteristic biogenic carbon content in product shall be 0. The same approach shall be used for the characteristic biogenic carbon content in accompanying packaging.

The results derived from the assessment will correspond to the results for each module and each European harmonized scenario, as described in EN 16757:2022 and Annex K.

The performance shall be expressed in the dimensions and units included in Table 17.

5.13 Performances in attached documentation of the product

5.13.1 General

In case the structural behaviour, including fatigue resistance, earthquake resistance, fire resistance and durability is assessed in a way not directly related to the essential characteristics of the product, appropriate methods and procedures for the determination of the geometrical data and materials used shall be established.

5.13.2 Off-the-shelf products

The assessment shall take into consideration usual load and exposure scenarios and calculations or tabulated values related to them, including durability assessment. The results may not reflect the real conditions in which the product is installed so they may require further verifications. In particular, the following elements shall be assessed when calculations or tabulated values are provided:

- Appropriateness of the calculation method and tabulated values applied to perform the calculation considering a usual load and exposure scenario;
- Validation of the input data for the calculation or tabulated values including the materials and constituents and their characteristics;
- Validation of the processing of data in relation to the calculation tool or tabulated value including the appropriateness of software used, if any;
- Validation of the results of the assessment.

5.13.3 Custom-made products

The assessment shall take into consideration the established load and exposure scenarios and calculations or tabulated values related to them, including durability assessment. In particular, the following elements shall be assessed in relation to the established conditions:

- Appropriateness of the calculation method and tabulated values applied to perform the calculation considering the applicable load and exposure scenario;
- Validation of the input data for the calculation or tabulated values including the materials and constituents and their characteristics;
- Validation of the processing of data in relation to the calculation tool or tabulated value, including the appropriateness of software used, if any;
- Validation of the results of the assessment.

When the result of the calculations or the applicable tabulated values are provided together with the loads and exposure scenarios only the following conditions apply:

- Appropriateness of the calculation method and tabulated values applied to perform the calculation considering the applicable load and exposure scenario;
- Validation of the input data as regards the materials and constituents and their characteristics;
- Verification that the final product, manufacturing process and other established conditions are fulfilled.

6 Assessment and verification of constancy of performance – AVCP

6.1 General

The technical details necessary for the implementation of the systems of assessment and verification of constancy of performance (AVCP) comprise provisions with regards to:

- the assessment of the performance of the products, which may be carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product; and

- the applicable factory production control (FPC).

6.2 Assessment of performance

6.2.1 General

When the intention is to declare any performance related to characteristics included in Annex ZA of this document this shall be carried out on the basis of testing (including sampling), calculation, tabulated values or modelling of the product, in accordance with Clause 'Characteristics'.

Assessment previously performed in accordance with the provisions of this document may be considered, provided that this assessment was performed to the same or a more rigorous assessment method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

For the purposes of assessment, the products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for that same characteristic for all products within that same family.

NOTE Products can be grouped in different families for different characteristics.

In addition, the assessment of the performance shall be:

- carried out for all characteristics included in this document for which it is intended to declare the performance and for the attached documentation of the product:
 - on first application of this document; or
 - at the beginning of the production of a new or modified product, unless a member of the same product family; or
 - at the beginning of a new or modified method of production, where the modification may affect the stated properties;
 - in case the list of characterization factors for the environmental assessment of products is revised.
- repeated for the characteristic(s) in question and for the attached documentation, whenever a change occurs in the product design, in the raw material(s) or in the supplier of the components, and/or in the method of production (subject to the definition of a family), which may affect significantly the performance of one or more of the characteristics or the attached documentation.

Where components are used whose performance in relation to their characteristics and attached documentation has already been determined on the basis of assessment methods of other harmonized technical specifications and those components bear CE marking in accordance with those harmonized technical specifications, these performances and attached documentation do not need to be re-assessed, if the intended use and the assessment methods of this document correspond to those used in relation to the components. The specifications of these components shall be documented.

6.2.2 Test samples, testing and assessment criteria

The samples to be tested/assessed shall be in accordance with Tables 20 to 56. Otherwise indicated, the number of specimens corresponds to 1 sample.

Table 20 — Number of specimens to be tested and assessment criteria: solid slabs

Characteristic	Clause	Minimum No. of specimens	Assessment methods and criteria
Characteristic compressive strength	4.1.1	2	5.1.1
Characteristic compressive strength lightweight concrete	4.1.2	2	5.1.2
Dry density lightweight concrete	4.1.4	2	5.1.4
Drying shrinkage	4.1.5	2	5.1.5
Maximum aggregate size	4.1.6	1	5.1.6
Water penetration depth	4.1.7	1	5.1.7
Elongation at maximum load - reinforcing steel	4.2.1	Supplier documentation	5.2.1
Elongation after fracture – reinforcing steel	4.2.2	Supplier documentation	5.2.2
Stress ratio - reinforcing steel	4.2.3	Supplier documentation	5.2.3
Tensile yield strength - reinforcing steel	4.2.4	Supplier documentation	5.2.4
Ultimate tensile strength - reinforcing steel	4.2.5	Supplier documentation	5.2.5
Elongation at maximum load - prestressing steel	4.3.1	Supplier documentation	5.3.1
Tensile 0,1 proof stress - prestressing steel	4.3.2	Supplier documentation	5.3.2
Tensile 0,2 proof stress - prestressing steel	4.3.3	Supplier documentation	5.3.3
Ultimate tensile strength - prestressing steel	4.3.4	Supplier documentation	5.3.4
Resistance to fire EI - testing	4.6.3	1 for each resistance to fire class	5.6.3
Resistance to fire R - testing	4.6.3	1 for each resistance to fire class	5.6.3
Resistance to fire REI - testing	4.6.3	1 for each resistance to fire class	5.6.3
Airborne sound insulation index - calculation	4.9.1	-	5.9.1
Airborne sound insulation index - testing	4.9.2	1	5.9.2
Impact noise transmission - calculation	4.9.3	-	5.9.3
Impact noise transmission - testing	4.9.4	1	5.9.4
Mass of the element	4.10.1	1	5.10.1

Table 21 — Number of specimens to be tested and assessment criteria: HVAC flue elements

Characteristic	Clause	Minimum No. of specimens	Assessment methods and criteria
Characteristic compressive strength	4.1.1	2	5.1.1
Characteristic compressive strength lightweight concrete	4.1.2	2	5.1.2
Dry density lightweight concrete	4.1.4	2	5.1.3
Drying shrinkage	4.1.5	2	5.1.5
Maximum aggregate size	4.1.6	1	5.1.6
Water penetration depth	4.1.7	1	5.1.7
Water absorption of concrete	4.1.8	2	5.1.8
Elongation at maximum load - reinforcing steel	4.2.1	Supplier documentation	5.2.1
Elongation after fracture - reinforcing steel	4.2.2	Supplier documentation	5.2.2
Stress ratio - reinforcing steel	4.2.3	Supplier documentation	5.2.3
Tensile yield strength - reinforcing steel	4.2.4	Supplier documentation	5.2.4
Ultimate tensile strength - reinforcing steel	4.2.5	Supplier documentation	5.2.5
Continuous smouldering	4.6.1	2	5.6.1
Water permeability	4.7.2	3	5.7.2
Water vapour permeability – equivalent air layer thickness	4.7.1.1	3	5.7.1.1
Water vapour permeability – resistance factor - testing	4.7.1.2	3	5.7.1.2
Water vapour permeability – resistance factor – tabulated values	4.7.1.3	-	5.7.1.3
Airborne sound insulation index - calculation	4.9.1	-	5.9.1
Airborne sound insulation index - testing	4.9.2	1	5.9.2
Impact noise transmission - calculation	4.9.3	-	5.9.3
Impact noise transmission - testing	4.9.4	1	5.9.4
sound absorption coefficient building elements	4.9.5	1	5.9.5
Mass of the element	4.10.1	1	5.10.1
air tightness class - HVAC flue elements	4.10.2	1	5.10.2

Table 22 — Number of specimens to be tested and assessment criteria: junction boxes

Characteristic	Clause	Minimum No. of specimens	Assessment methods and criteria
Characteristic compressive strength	4.1.1	2	5.1.1
Characteristic compressive strength lightweight concrete	4.1.2	2	5.1.2
Dry density lightweight concrete	4.1.4	2	5.1.3
Drying shrinkage	4.1.5	2	5.1.5
Maximum aggregate size	4.1.6	1	5.1.6
Water penetration depth	4.1.7	1	5.1.7
mechanical strength - testing - flexural strength	4.5.1.1	1	5.5.1.1
mechanical strength - testing - resistance to concentrated loads bottom	4.5.1.2	1	5.5.1.2
Elongation at maximum load - reinforcing steel	4.2.1	Supplier documentation	5.2.1
Elongation after fracture - reinforcing steel	4.2.2	Supplier documentation	5.2.2
Stress ratio - reinforcing steel	4.2.3	Supplier documentation	5.2.3
Tensile yield strength - reinforcing steel	4.2.4	Supplier documentation	5.2.4
Ultimate tensile strength - reinforcing steel	4.2.5	Supplier documentation	5.2.5
Mass of the element	4.10.1	1	5.10.1
Mechanical resistance of rungs	4.10.3	1	5.10.3