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EAD **170051-00-0305**

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European Assessment Document for

Compressed solid earth blocks with or without lime or cement and wall kits made of these blocks and natural hydraulic lime mortar

This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

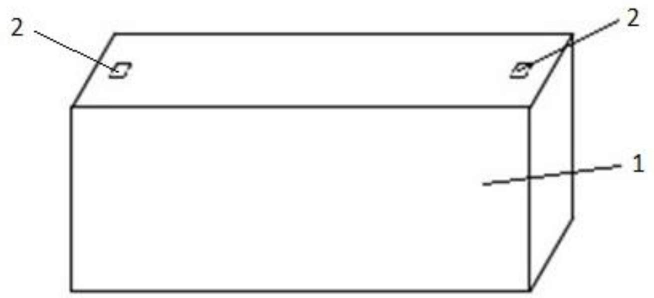
1.1 Description of the construction product

This EAD applies to the following two products:

1) compressed solid earth blocks with or without lime or cement, hereinafter named as “block(s)”,

2) wall kits made of these blocks and natural hydraulic lime mortars, hereinafter named as “wall kit(s)”.

The blocks have a rectangular parallelepiped shape, all their faces are flat, and the blocks do not have any holes, however they may have some cavities (grip holes) for handling purposes.



1. Block
2. Grip hole (optional)

Figure 1.1.1: Shape of the blocks.

The raw material used for the elaboration of the blocks is a mix of different types of earth (soil, clay, silt, etc.); they can also contain lime, cement or both as binder with a maximum of 15 % in weight.

Blocks containing lime or cement or both are named in this EAD as chemically stabilised blocks (see Clause 1.3.1.2), blocks without containing lime or cement are named as non-chemically stabilised blocks (see Clause 1.3.1.3).

Blocks belong to:

- Group 1S as defined in Table 5.1 of EN 1996-1-1, i.e., volume of all holes (percentage of the gross volume) not greater than 5%.

- Category I of masonry units (see Clause 1.3.1.10).

The specific heat capacity of the blocks is c_p = 1000 J/(kg·K).

The wall kits are composed of the above-mentioned blocks and natural hydraulic lime mortars in accordance with EN 998-2[1], hereinafter named as “lime mortar”.

Minimum data for describing the blocks are dimensions, composition (percentage in weight of lime or cement or both contents) and maximum organic content (percentage in weight). Blocks are considered as the same composition within a percentage tolerance of ± 2 % for each different material content.

Minimum data for describing the lime mortars are compressive strength, water absorption and maximum organic content (percentage in weight).

Wall kits are installed applying to the blocks a layer of lime mortar in horizontal and in vertical joints. The blocks are installed with the vertical joints in broken formation, discontinuously.

1 All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

The product products are not fully covered by the following harmonised technical specification: EN 771-1, EN 771-2, EN 771-3, EN 771-4, EN 771-5 and EN 771-6, because:

- The blocks covered by this EAD are made of a different material than the ones covered by the scope of these standards.

- This EAD also covers wall kits made of these blocks and these standards do not cover kits.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed in accordance with the manufacturer's instructions or (in absence of such instructions) in accordance with the usual practice of the building professionals.

Relevant manufacturer's stipulations, e.g., with regard to the intended end use conditions, having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA as long as the details of the assessment methods as laid down in this EAD are respected.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

Blocks and wall kits are intended to be used for masonry walls as given in the Table 1.2.1.1. The masonry walls may or may not be protected (see Clauses 1.3.1.4 and 1.3.1.5).

Blocks and wall kits are not intended to be used in retaining walls (see Clause 1.3.6).

Table 1.2.1.1 Type of blocks and their uses

Type of blocks	Type of masonry walls		
Chemically stabilised blocks	Loadbearing	Internal partition walls	Protected masonry wall
			Unprotected masonry wall
		External walls	Protected masonry wall
			Unprotected masonry wall
	Non-loadbearing	Internal partition walls	Protected masonry wall
			Unprotected masonry wall
		External walls	Protected masonry wall
			Unprotected masonry wall
Non-chemically stabilised blocks	Non-loadbearing	Internal partition walls	Protected masonry wall
			Unprotected masonry wall
		External walls	Protected masonry wall

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the blocks or wall kits for the intended use of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[2].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

1.3.1 Specific terms

1.3.1.1 Compressed earth block

Preformed unit made of compressed earth for use in masonry constructions, obtained from static or dynamic compression of humid earth, followed by immediate demoulding.

1.3.1.2 Chemically stabilised block

Compressed earth block containing lime, cement or both as binder.

1.3.1.3 Non-chemically stabilised block

Compressed earth block without containing lime or cement.

1.3.1.4 Protected masonry wall

Masonry wall which is protected against water penetration and is not in contact with soil and ground water.

It can either be masonry wall in external walls which is protected, (e.g., by a layer of suitable render or by a cladding), or it can be the inner leaf of a cavity wall, or it can be an internal wall. It may or may not be loadbearing.

1.3.1.5 Unprotected masonry wall

Masonry wall which may be exposed to rain, freeze/thaw or may be in contact with soil and ground water without a suitable protection.

It can either be masonry in external walls which is fully unprotected, or which is intended to be provided by a limited protection (e.g., by a thin layer of render). It may or may not be loadbearing.

1.3.1.6 Retaining wall

Wall structure that holds or retains soil behind it.

1.3.1.7 Loadbearing wall

Wall primarily designed to carry an imposed load in addition to its own weight.

2 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

1.3.1.8 Non-loadbearing wall

Wall not considered to resist forces such that it can be removed without prejudicing the remaining integrity of the structure.

1.3.1.9 Normalised compressive strength

See Clause 3.1.3.11 of EN 1996-1-1.

1.3.1.10 Category I of masonry units

Masonry units with a compressive strength (mean or characteristic value) with a probability of failure to reach it not exceeding 5 %.

1.3.2 Symbols

Symbol	Description	Unit
f_b	Normalised compressive strength.	N/mm^2
f_{cm}	Mean (arithmetic average) compressive strength.	N/mm^2
f_{ck}	Characteristic compressive strength.	N/mm^2
E	Modulus of elasticity.	N/mm^2
$F_{i,max}$	Individual maximum load for each tested specimen.	N
e_i	Individual strain for each tested specimen at one third of the maximum strength achieved.	---
A_i	Individual loaded cross-section area for each tested specimen.	mm^2
Ei	Individual modulus of elasticity for each tested specimen.	N/mm^2
$\Delta l_c/l$	Moisture movement coefficient.	mm/m
t_{so}	Immersion time for water absorption by capillarity test.	min
$c_{w,s}$	Water absorption coefficient.	g/(m^2·s^{0,5})
$\rho_{g,u}$	Gross density in standard conditioning (23 ºC and 50 % RH).	kg/m^3
$\rho_{n,u}$	Net density in standard conditioning (23 ºC and 50 % RH).	kg/m^3
$\lambda_{23,50}$	Thermal conductivity of blocks in standard conditioning (23 ºC and 50 % RH).	W/(m·K)
$\lambda_{23,RH}$	Thermal conductivity of blocks in other conditioning.	W/(m·K)
$\lambda_{mortar,dry}$	Thermal conductivity of mortars in dry conditioning.	W/(m·K)
$\lambda_{mortar,RH}$	Thermal conductivity of mortars in other conditioning.	W/(m·K)
c_p	Specific heat capacity.	J/(kg·K)
f_k	Characteristic compressive strength.	N/mm^2
f_{xk1}	Characteristic flexural strength in the plane of failure parallel to the bed joints.	N/mm^2
f_{xk2}	Characteristic flexural strength in the plane of failure perpendicular to the bed joints.	N/mm^2
f_{vk0}	Characteristic initial shear strength.	N/mm^2
F_{fire}	Load applied in the resistance to fire tests.	kN/m
R_w	Sound reduction index of the airborne sound insulation.	dB
C and C_{tr}	Spectrum adaptation terms of the airborne sound insulation.	dB
α_w	Weighted sound absorption coefficient.	---
$R_{23,50,mas}$	Thermal resistance of walls in standard conditioning (23 ºC and 50 % RH).	m^2·K/W
$R_{23,RH,mas}$	Thermal resistance of walls in other conditioning.	m^2·K/W
Q_{PCS}	Gross heat of combustion per square meter	MJ/m^2
$X_{u,5}$	General representation of the characteristic value	Depends on the characteristic
X_{mean}	General representation of the mean value (arithmetic average value)	Depends on the characteristic
k_n	Variable as a function of the number of test specimens	---
S	Standard deviation of series under consideration	Depends on the characteristic
W	Width of the blocks and wall kit.	mm
H	Height of the blocks.	mm
L	Length of the blocks.	mm
f_Ψ	Moisture conversion coefficient by volume.	m^3/m^3
q	Horizontal linear static load.	kN/m

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of blocks is assessed in relation to the essential characteristics.

Table 2.1.2 shows how the performance of wall kits is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the blocks and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Compressive strength	2.2.1.1	Level
2	Modulus of elasticity	2.2.1.2	Level
Basic Works Requirement 2: Safety in case of fire			
3	Reaction to fire	2.2.1.3	Class
Basic Works Requirement 3: Hygiene, health and the environment			
4	Water vapour permeability	2.2.1.4	Level
5	Water absorption by capillarity	2.2.1.5	Level
6	Behaviour after mid-term exposure to capillarity water	2.2.1.6	Description
7	Content, emission or release of dangerous substances	Clause 5.2.13 of EN 771-1	Description
Basic Works Requirement 4: Safety and accessibility in use			
8	Dimensional tolerances	2.2.1.7	Level
9	Plane parallelism of the bed faces	2.2.1.8	Level
10	Flatness of faces	2.2.1.9	Level
11	Density	2.2.1.10	Level
12	Impact resistance (hard body impact)	2.2.1.11	Level
Basic Works Requirement 6: Energy economy and heat retention			
13	Thermal conductivity at standard conditioning	2.2.1.12.1	Level
14	Thermal conductivity at other humidity	2.2.1.12.2	Level
Aspects of durability			
15	Active soluble salts content	2.2.1.13	Level and description
16	Behaviour after immersion	2.2.1.14	Description and level
17	Erosion	2.2.1.15	Level
18	Behaviour after freeze-thaw cycles	2.2.1.16	Description
19	Moisture movement	2.2.1.17	Level

Table 2.1.2 Essential characteristics of the wall kits and methods and criteria for assessing the performance of the kit in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Compressive strength	2.2.2.1	Level and description
2	Modulus of elasticity	2.2.2.2	Level and description
3	Flexural strength	2.2.2.3	Level and description
4	Initial shear strength	2.2.2.4	Level and description
Basic Works Requirement 2: Safety in case of fire			
5	Reaction to fire	2.2.2.5	Class
6	Resistance to fire	2.2.2.6	Class
Basic Works Requirement 3: Hygiene, health and the environment			
7	Content, emission or release of dangerous substances	2.2.2.7	Description
Basic Works Requirement 4: Safety and accessibility in use			
8	Impact resistance	2.2.2.8	Description
9	Resistance to internal eccentric loads	2.2.2.9	Level
10	Resistance to external eccentric loads	2.2.2.10	Level
11	Internal horizontal linear static load resistance	2.2.2.11	Level
Basic Works Requirement 5: Protection against noise			
12	Airborne sound insulation	2.2.2.12	Level and description
13	Sound absorption	2.2.2.13	Level
Basic Works Requirement 6: Energy economy and heat retention			
14	Thermal resistance	2.2.2.14	Level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics which the manufacturer intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

The blocks and wall kits components shall be described in the ETA in accordance with the minimum data as indicated in Clause 1.1.

2.2.1 Blocks

2.2.1.1 Compressive strength

Purpose of the assessment

This assessment is intended to provide the compressive strength of blocks.

Assessment method

The compressive strength shall be tested in accordance with EN 772-1, with the following adaptations:

- Specimens shall be whole blocks without cutting, except in case of large blocks where the dimensions or compressive load resistance of the blocks exceeds the capacity of the laboratory’s testing equipment. In this case, specimens shall be representative portions cut from the blocks as stated in Clause B.1.

- Surface preparation shall be done in accordance with EN 772-1, Clause 7.2. Whenever capping is used, it shall be done in accordance with EN 772-1, Clause 7.2.5.1.

Each different composition, dimensions or shape of blocks shall be tested.

Compressive strength shall be tested in standard conditioning ((23 ± 5) ºC and (50 ± 5) % RH) and, additionally in other test conditionings (can be dry or wet conditions, e.g., at (23 ± 5) ºC) and (75 ± 5) % RH) in accordance with the specific environmental conditions where the block is used according to the Manufacturer’s Product Installation Instructions (MPII).

At least six specimens shall be tested for each conditioning (standard and other conditionings).

For testing compressive strength in standard conditioning, conditioning shall be done in accordance with Clause 7.3.2(a) of EN 772-1, at (23 ± 5) ºC and (50 ± 5) % RH.

For testing compressive strength in other test conditions, conditioning shall be done in a climate chamber, at temperature and humidity defined in MPII, to constant mass. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass. After that, the test shall be performed within 24 h.

In order to obtain the normalised compressive strength (f_b), the mean compressive strength (f_{cm}) shall be multiplied by the shape factor given in EN 772-1, Table A.1 wherein the width and height shall be determined in accordance with EN 772-16.

In the case where tests have been carried out on specimens cut from whole blocks, the normalised compressive strength derived from the test results for cut specimens shall be the one that applies to the whole block from which they were cut obtained according to the paragraph above.

Expression of results

Characteristic compressive strength (f_{ck}) [N/mm^2] and mean compressive strength (f_{cm}) [N/mm^2] at standard conditioning and, where relevant (e.g., blocks intended to be used in specific environmental conditions), additionally at other conditionings shall be stated in the ETA. Besides, the smallest single value obtained in the testing shall be given. Characteristic value shall be calculated in accordance with Equation A.1.

Normalised compressive strength (f_b) [N/mm^2] at standard and, where relevant, additionally at other test conditions shall also be stated in the ETA.

When not using whole blocks, the following additional data shall be stated in the ETA:

- reference to Clause B.1 for the cutting scheme.
- dimensions of such cut specimens.

When testing at other conditionings, the temperature and humidity considered for the testing shall be additionally stated in the ETA.

2.2.1.2 Modulus of elasticity

Purpose of the assessment

This assessment is intended to provide the modulus of elasticity of blocks.

Assessment method

Modulus of elasticity shall be assessed by considering the same tests than for compressive strength of blocks (see Clause 2.2.1.1).

Each different composition, dimensions or shape of blocks shall be tested.

Strain of blocks shall be recorded during the load application up to (50 ± 2) % of the maximum load.

Modulus of elasticity of each specimen [N/mm^2] shall be calculated at a stress equal to one third of the maximum stress achieved, using the Equation 2.2.1.2.1:

$$E_i = \frac{F_{i,max}}{3 \cdot e_i \cdot A_i} \qquad (2.2.1.2.1)$$

Where:

- $F_{i,max}$ = individual maximum load for each tested specimen [N].

- e_i = individual strain for each tested specimen at one third of the maximum strength achieved [--].

- A_i = individual loaded cross-section area for each tested specimen [mm^2].

- Ei = individual modulus of elasticity for each tested specimen [N/mm^2].

Modulus of elasticity (E) [N/mm^2] shall be calculated as the mean (arithmetic average) value to the nearest 100 N/mm^2.

Expression of results

Modulus of elasticity (E) [N/mm^2] at standard conditioning and additionally at other test conditionings shall be stated in the ETA.

2.2.1.3 Reaction to fire

Purpose of the assessment

This assessment is intended to provide the reaction to fire of blocks.

Assessment method

The blocks shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The blocks shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1. Mounting and fixing provisions and extended applications of test results are given in Annex C:.

Expression of results

The reaction to fire class shall be stated in the ETA.

2.2.1.4 Water vapour permeability

Purpose of the assessment

This assessment is intended to provide the water vapour permeability of blocks.

Assessment method

Each different composition of blocks shall be tested.

The water vapour permeability shall be tested in accordance with EN ISO 12572.

The specimens shall be cut to correspond with the dimensions of test assembly in accordance with Annex A of EN ISO 12572. Whenever possible, the thickness of specimens shall be that of the whole block. In other cases, specifications of Clause 6.2.3 of EN ISO 12572 apply.

Tests at both test conditions A (23 ºC – 0-50 % RH) and C (23 ºC – 50-93 % RH), in accordance with Table 1 of EN ISO 12572 shall be performed.

Expression of results

Water vapour resistance factor (μ) at test conditions A and C shall be stated in the ETA.

2.2.1.5 Water absorption by capillarity

Purpose of the assessment

This assessment is intended to provide the water absorption by capillarity of blocks. This assessment is applicable to blocks exposed to weather (unprotected masonry wall used in external walls).

Assessment method

Each different composition of blocks shall be tested.

The water absorption by capillarity shall be tested in accordance with EN 772-11.

At least six specimens shall be tested.

Test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass. The face of the blocks intended to be used as the external side of the external wall shall be the lower face of the test specimen (totally immersed).

The immersion time (t_{so}) shall be (10,0 ± 0,2) min.

Coefficient of water absorption shall be calculated in accordance with the equation of Clause 8.2 of EN 772-11.

Expression of results

Mean (arithmetic average) water absorption coefficient due to capillary action ($c_{w,s}$) [g/(m²·s^0,5)] shall be stated in the ETA.

2.2.1.6 Behaviour after mid-term exposure to capillarity water

Purpose of the assessment

This assessment is intended to provide the behaviour after mid-term exposure to capillarity water of blocks.

Assessment method

Each different composition of blocks shall be tested.

At least three specimens shall be tested.

Test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass.

Test arrangement is the following: in a basin with a flat bottom, capillary-conductive bricks or other porous stones shall be arranged in such a manner as to create a continuous flat surface. The coefficient of water absorption by capillarity of the stones shall be at least $c_{w,s} = 250\ g/m^2 \cdot s^{0,5}$ [3]. Sponge cloths shall be placed on the stones. The basin shall be filled with water and, during the test, replenished in a way that maintains the water level within the range of 1 mm to 5 mm below the upper edge of the stones. Test shall start after 24 hours and when both the bricks and sponge cloths are fully water-saturated.

The specimens shall be placed with their lower surface on the sponge cloths. The aspect of the specimens shall be visually checked after 30 minutes, as well as after 3 hours and 24 hours.

After each interval, visual check shall be done to detect any damage such as: cracks, visually perceptible to the naked eye and caused by swelling, appear on the top and side surfaces of the specimens. Minor hairline cracks that run parallel to the lower surface shall not be considered damage. The swelling itself shall not be considered damage.

Expression of results

Description of damages observed after 30 min, 3 h and 24 h shall be stated in the ETA. When no damage is observed after an interval "No damage" shall be stated for that interval.

2.2.1.7 Dimensional tolerances

Purpose of the assessment

This assessment is intended to provide the dimensional tolerances of blocks.

Assessment method

Dimensional tolerances shall be tested in accordance with EN 772-16 for each block geometry.

At least six specimens shall be tested.

For length, width and height dimensions, test procedures a) or b) of Clause 7.1 of EN 772-16 shall be applied, depending on the dimensions of the block, as stated in the same Clause.

Expression of results

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[3] $c_{w,s} = 250\ g/m^2 \cdot s^{0,5} = 15\ kg/m^2 \cdot h^{0,5}$.

For length, width and height dimensional tolerances, category of tolerances of the mean value and range in accordance with Clauses 5.2.1.2.2 and 5.2.1.2.3 of EN 771-1 respectively for blocks used in protected masonry walls, and in accordance with Clauses 5.3.1.2.2 and 5.3.1.2.3 of EN 771-1 respectively for blocks used in unprotected masonry walls shall be stated in the ETA.

2.2.1.8 Plane parallelism of the bed faces

Purpose of the assessment

This assessment is intended to provide the plane parallelism of the bed faces of blocks.

Assessment method

Plane parallelism of the bed faces shall be tested in accordance with EN 772-16 for each block geometry.

At least three specimens shall be tested.

For plane parallelism of the bed faces, procedure f) of Clause 7.4 of EN 772-16 shall be applied.

Tolerance and range shall be in accordance with Clauses 5.2.1.2.2 and 5.2.1.2.3 of EN 771-1 respectively for blocks used in protected masonry walls, and in accordance with Clauses 5.3.1.2.2 and 5.3.1.2.3 of EN 771-1 respectively for blocks used in unprotected masonry walls.

Expression of results

Maximum deviation from plane parallelism of the bed faces [mm] shall be stated in the ETA.

2.2.1.9 Flatness of faces

Purpose of the assessment

This assessment is intended to provide the flatness of faces of blocks.

Assessment method

Flatness of faces shall be tested in accordance with EN 772-20 for each block geometry.

At least six specimens shall be tested, except in the case of the determination of flatness of bed faces where it shall be 3 specimens.

Expression of results

Maximum deviation from flatness of faces [mm] shall be stated in the ETA.

2.2.1.10 Density

Purpose of the assessment

This assessment is intended to provide the gross density and net density of blocks in standard conditioning (23 ºC and 50 % RH).

Assessment method

Each different composition, dimensions or shape of blocks shall be tested.

Density shall be tested in accordance with EN 772-13.

At least six specimens shall be tested. Test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass.

Procedure defined in Clauses 7.1[4], 7.2 and 7.3 of EN 772-13 shall be applied, except mass shall be determined after the conditioning of the specimens, without drying.

Tests shall be done either in whole block specimens or in portions of whole block specimens, test with whole block specimens shall be considered the reference method in case of dispute:

- When testing whole block specimens, determination of mass and net density shall be done in accordance with EN 772-13, Clause 7.1.1 and 7.2.1, method c) respectively, but without drying the specimens as stated in EN 772-13, Clause 7.1.1.

- When testing portions of whole block specimens, determination of mass and net density shall be done in accordance with EN 772-13, Clause 7.1.2 and 7.2.2 respectively, but without drying the specimens as stated in EN 772-13, Clause 7.1.1. Portions shall be cut in accordance with Clause B.2.

Expression of results

Gross ($\rho_{g,u}$) and net ($\rho_{n,u}$) densities in standard conditioning [kg/m^3] shall be stated in the ETA. Also, tolerances of densities in accordance with Clause 5.2.3.3 of EN 771-1 shall be given.

When not using whole blocks, refer to Annex B for the cutting scheme. The dimensions of such specimens shall be given along with the related densities.

2.2.1.11 Impact resistance (hard body impact)

Purpose of the assessment

This assessment is intended to provide the hard body impact resistance of blocks, when in accordance with their intended use are susceptible of receiving this type of impacts, i.e., when they are used in unprotected masonry wall in external walls or internal partitions.

Assessment method

Each different composition of blocks shall be tested.

The impact resistance (hard body impact) of the blocks shall be tested in accordance with Clause 2.2.6.2 of EAD 210005-00-0505 with the following adaptations:

- Instead of an internal partition, individual whole blocks shall be tested.

- Blocks shall be fixed to a substrate impending any movement of the blocks during the impacts.

- Impacts shall be applied at the centre of the unprotected surface in its final use.

- After impacts, damages damage on the surface such as falling of debris or cracks shall be observed. Impact marks such as no penetrating hairline cracks shall not be considered damages.

At least the worst-case (minimum compressive strength) shall be tested.

Expression of results

For each tested impact energy [J], description of the observed damages shall be stated in the ETA. When no damages are observed, “No damage” shall be stated in the ETA.

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4 Dimensions or shape and mass of blocks shall be determined per each block with different composition.

2.2.1.12 Thermal conductivity

Purpose of the assessment

This assessment is intended to provide the thermal conductivity of blocks in standard conditioning (see Clause 2.2.1.12.1) and in different conditioning at other humidity (see Clause 2.2.1.12.2).

2.2.1.12.1 Thermal conductivity in standard conditioning

Assessment method

Each different composition of blocks shall be tested.

Specimens of at least three different batches shall be tested. For each batch, at least three specimens shall be tested (minimum total: 9 specimens).

Prior to testing thermal conductivity, net density ($\rho_{n,u}$) shall be obtained in accordance with Clause 2.2.1.10.

Thermal conductivity ($\lambda_{23,50}$) shall be tested in accordance with EN 12664 method of the guarded hot plate.

Thermal conductivity ($\lambda_{23,50}$) and net density of blocks shall be obtained in standard conditioning. Test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass.

Thermal conductivity of specimens shall be obtained in the direction of the blocks heat flow according to the MPII. Specimens shall be in accordance with Clause 6.2 and Annex A of EN 12664. When needed, specimens shall be cut from whole blocks in order to fulfil the dimensional limitations of test specimens stated in Clause 6.2 and Annex A of EN 12664. Specimens shall be enclosed in a vapour-tight envelope during testing.

With all the obtained pair of values of net density and thermal conductivity, a related thermal conductivity/net density graphic line shall be established by linear regression (with a square of the correlation coefficient R^2 ≥ 0,80), see Figure 2.2.1.12.1.1. Define the density range as the range between the lowest and the largest net density values obtained from the tested specimens. The linear regression is applicable to the defined density range.

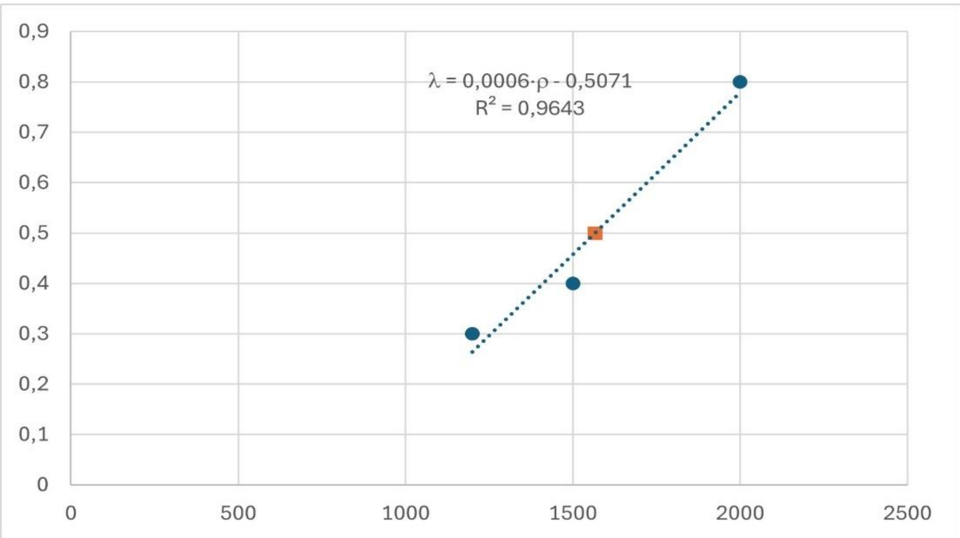


Figure 2.2.1.12.1.1: Example of line graphic obtained by linear regression including its equation and square of relation coefficient. Mean value represented as the orange square point.

Expression of results

The following data shall be stated in the ETA:

- The mean (arithmetic average) value of the thermal conductivity in standard conditioning ($\lambda_{23,50}$) [W/(m·K)].

- The linear regression equation or graphic line of thermal conductivity in standard conditioning ($\lambda_{23,50}$) [W/(m·K)] in function of net density ($\rho_{n,u}$) [kg/m^3], together with the applicable density range.

2.2.1.12.2 Thermal conductivity at other humidity

Thermal conductivity ($\lambda_{23,RH}$) may also be determined in different conditioning with other humidity (such as: (23 ± 5) ºC and (75 ± 5) % RH, or (23 ± 5) ºC and 100 % RH) depending on the climatic conditions where the blocks are intended to be used according to MPII.

Same assessment method as in Clause 2.2.1.12.1 shall be applied considering that the test specimens shall be conditioned for at least 48 h under corresponding temperature (°C) and relative humidity (%) before testing.

Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the change in mass between two determinations is not more than 0,2 % of the total mass.

Instead of net density in standard conditioning, net wet density at the corresponding temperature (°C) and relative humidity (%) conditionings shall be obtained in accordance with Clause 2.2.1.10 applying the corresponding conditionings instead of the one defined in Clause 2.2.1.10.

Expression of results

The following data shall be stated in the ETA:

- The mean (arithmetic average) value of the thermal conductivity in other conditioning ($\lambda_{23,RH}$) related to the tested temperature (ºC) and relative humidity (RH).

- The linear regression equation or graphic line of thermal conductivity in other conditioning at other humidity ($\lambda_{23,RH}$) [W/(m·K)] in function of net density at the corresponding relative humidity [kg/m^3], together with the applicable density range.

2.2.1.13 Active soluble salts content

Purpose of the assessment

This assessment is intended to provide the active soluble salts content of blocks. This assessment is applicable to blocks exposed to weather (unprotected masonry or protected masonry used in external walls), however, it may be also applied for blocks intended to be used in internal walls.

Assessment method

The active soluble salts content shall be tested in accordance with Clause 9.2 of EN 772-5.

Each different composition of blocks shall be tested.

The minimum number of specimens for the determination of the active soluble salts content shall be six and shall comprise whole blocks. The specimens shall be sampled in such a manner that they have not been exposed to water that would lead to leaching of soluble salts from the blocks.

From the bulk sample of blocks, a representative quantity of material of 50 g to 250 g, ground to pass a 150 µm test sieve (Clause 6.1 of EN 772-5), shall be prepared, using the crushing method described in 7.2 of EN 772-5.

Extraction procedure shall be done in accordance with Clause 8 of EN 772-5.

Expression of results

Content of water-soluble salts [%] in accordance with Clause 11 of EN 772-5 and active soluble salts content category in accordance with Clause 5.3.9, Table 1 of EN 771-1 shall be stated in the ETA.

2.2.1.14 Behaviour after immersion

Purpose of the assessment

This assessment is intended to provide the behaviour after immersion of blocks. This assessment is applicable to blocks exposed to weather (unprotected masonry wall or protected masonry wall used in external walls).

Assessment method

Each different composition of blocks shall be tested. Six whole blocks shall be tested following the next procedure.

Test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the drying process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass.

The specimens shall be placed in water in a tank at (23 ± 5) ºC for an immersion period of 10 minutes (three specimens) and 24 hours (the other three specimens). Only 10 cm of the specimens' height shall be immersed in the water. The specimens shall be placed supported on a supporting device, at least 5 cm in height, so that their lower faces shall be clear of the base of the tank where they are immersed. The face of the blocks intended to be used as the external side of the external wall shall be the lower face of the test specimen (totally immersed).

After the immersion periods, the blocks shall be taken from the tank and any water shall be removed from their faces using a damp cloth or sponge. Visual check shall be done to detect any damage such as: cracks, permanent swelling deformations on the faces or whether there is material loss due to blasting, i.e., detachment of fragments. Minor hairline cracks shall not be considered damages.

Furthermore, the material loss, at each immersion period, shall be determined by filtering the water with residues of blocks in the immersion tank. Dry the filtered material at (40 ± 5) ºC and then it shall be conditioned at (23 ± 5) ºC and (50 ± 5) % RH to constant mass. The material loss shall be calculated dividing the mass of the dried residue by the number of specimens in the tank at each immersion period (three), rounded to the nearest to 1 %.

Expression of results

The following data shall be stated in the ETA:

- Description of damages after 10 min and 24 h. When no damage is observed "No damage" shall be stated.
- the material loss [%] after each immersion period.

2.2.1.15 Erosion

Purpose of the assessment

This assessment is intended to provide the erosion of blocks. This assessment is applicable to blocks exposed to weather (unprotected masonry wall used in external walls).

Assessment method

Each different composition of blocks shall be tested. Five whole blocks shall be tested following the next procedure.

A continuous stream of water at (23 ± 5) ºC shall fall on the specimen for 10 min through a 5 mm inner diameter tube, connected to a constant level water tank. The specimen shall be situated 1 m below the tube, and the specimen shall be inclined 27º from the horizontal plane. After the test, with a vernier depth calliper, the depth of the cavities that appear shall be measured, with an accuracy of 0,1 mm. Depth of the cavities shall be measured between an unaffected surface point of the specimen and the deepest point of the cavities.

Mean depth of the cavities value shall be calculated as the arithmetic average of all tested specimens' results.

Expression of results

The mean depth of the cavities [mm] value shall be stated in the ETA.

2.2.1.16 Behaviour after freeze-thaw cycles

Purpose of the assessment

This assessment is intended to provide the behaviour of blocks after freeze-thaw cycles. This assessment is applicable for blocks exposed to weather (unprotected masonry wall or protected masonry wall used in external walls).

Assessment method

Each different composition of blocks shall be tested.

Five whole blocks shall be tested by ageing at freeze-thaw conditioning following the next cycle:

- The specimens shall be placed in water in a tank at (23 ± 5) ºC for 2 hours. Only 1 cm of the specimens' height shall be immersed in the water.
- The specimens shall be removed from the water and put in the freezing chamber.
- The temperature shall be regulated in the freezing chamber, so it drops linearly from (23 ± 5) ºC to (- 15 ± 5) ºC for 6 hours.
- This temperature shall be maintained for 34 hours.
- The temperature shall be regulated in the freezing chamber, so it increases linearly from (- 15 ± 5) ºC to (23 ± 5) ºC for 6 hours.

During the immersion phase, the specimens shall be placed on a supporting device, at least 5 cm in height, so that their lower faces shall be clear of the base of the tank where they are immersed. The face of the blocks intended to be used as the external side of the external wall shall be the lower face of the test specimen (totally immersed).

For blocks intended to be used in unprotected masonry walls in external walls, the cycle shall be repeated 15 times. For blocks intended to be used in protected masonry wall in external walls, the cycle shall be repeated 5 times.

After each cycle, visual check shall be done to detect any damage such as: cracks, permanent swelling deformations on the faces or whether there is material loss due to blasting, i.e., detachment of fragments. Minor hairline cracks shall not be considered damage.

Expression of results

The following data shall be stated in the ETA:

- Description of damages observed after each cycle. When no damage is observed at the end of the last cycle "No damage" shall be stated.
- The number of cycles tested.

2.2.1.17 Moisture movement

Purpose of the assessment

This assessment is intended to provide the moisture movement of blocks. This assessment is applicable to blocks exposed to weather (unprotected masonry wall or protected masonry wall used in external walls).

Assessment method

Each different composition of blocks shall be tested.

The moisture movement shall be tested in accordance with EN 772-14

At least six specimens shall be tested. Preparation of specimens and their conditioning shall be in accordance with Clause 6 of EN 772-14.

Unlike EN 772-14 Clause 7.3, conditioning of measurement of moisture expansion shall be done in a climatic chamber at (23 ± 5) ºC and 100 % RH, instead of immersed in water. After 96 h the specimens shall be removed from the climate chamber, they shall be stabilized for 10 min and then the distance as defined in Clause 7.3 of EN 772-14 shall be measured.

Movement coefficient ($\Delta l_c/l$) [mm/m] shall be calculated in accordance with EN 772-14 Clause 9.

Expression of results

Movement coefficient ($\Delta l_c/l$) [mm/m] shall be stated in the ETA.

2.2.2 Wall kits

General

The test specimens for the assessment of compressive strength, secant modulus of elasticity, flexural strength, initial shear strength, impact resistance from soft and hard body, resistance to eccentric loads, internal horizontal linear static load resistance, airborne sound insulation and sound absorption shall be made and conditioned as follows.

The test specimens shall be built in accordance with the MPII. Curing of walls shall last for at least 28 days before testing. Test specimens shall be conditioned for at least 24 h under (23 ± 2) °C and (50 ± 5) % relative humidity before testing.

2.2.2.1 Compressive strength

Purpose of the assessment

This assessment is intended to provide the compressive strength of wall kits.

Assessment method

Compressive strength shall be tested in accordance with EN 1052-1.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

Compressive strength of blocks used in the test specimens shall be defined in accordance with Clause 2.2.1.1.

Lime mortars used in the test specimens shall be defined in accordance with EN 1052-1, Clause 5.2.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

The characteristic compressive strength (f_k) shall be obtained in accordance with EN 1052-1, Clause 10.2(a), Equation (3).

Expression of results

Characteristic compressive strength (f_k) [N/mm^2] shall be stated in the ETA, along with the description of the wall configuration, compressive strength of blocks and the mortar characteristics and its mixing procedure in accordance with EN 1052-1, Clause 5.2.

2.2.2.2 Modulus of elasticity

Purpose of the assessment

This assessment is intended to provide the modulus of elasticity of wall kits.

Assessment method

After determining compressive strength of wall kits in accordance with Clause 2.2.2.1, the mean modulus of elasticity shall be calculated in accordance with Clause 10.3 of EN 1052-1.

Expression of results

Modulus of elasticity (E) in N/mm^2 shall be stated in the ETA, along with the description of the wall configuration and the lime mortar characteristics and its mixing procedure in accordance with EN 1052-1, Clause 5.2.

2.2.2.3 Flexural strength

Purpose of the assessment

This assessment is intended to provide the flexural strength of wall kits.

Assessment method

Flexural strength shall be tested in accordance with EN 1052-2. The characteristic flexural strength shall be assessed both in the planes of failure perpendicular and parallel to the bed joints.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

Compressive strength of blocks used in the test specimens shall be defined in accordance with Clause 2.2.1.1.

Lime mortars used in the test specimens shall be defined in accordance with EN 1052-2, Clause 5.2.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

Expression of results

Characteristic flexural strength in the planes of failure parallel and perpendicular to the bed joints (f_{xk1} and f_{xk2}, respectively) [N/mm^2] shall be stated in the ETA, along with the description of the wall configuration, compressive strength of blocks and the lime mortar characteristics and its mixing procedure in accordance with EN 1052-2, Clause 5.2.

2.2.2.4 Initial shear strength

Purpose of the assessment

This assessment is intended to provide the initial shear strength of wall kits.

Assessment method

Initial shear strength shall be tested in accordance with EN 1052-3.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

Compressive strength of blocks used in the test specimens shall be defined in accordance with Clause 2.2.1.1.

Lime mortars used in the test specimens shall be defined in accordance with EN 1052-2, Clause 5.2.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

The test shall be done in accordance with Clause 8.2.2 of EN 1052-3, procedure B (six specimens without prestressing). The characteristic initial shear strength of the masonry wall, f_{vk0}, shall be obtained in accordance with the Equation of EN 1052-3, Clause 10.2.2.

Expression of results

Characteristic initial shear strength (f_{vk0}) [in N/mm^2] shall be stated in the ETA, along with the description of the wall configuration, compressive strength of blocks and the lime mortar characteristics and its mixing procedure in accordance with EN 1052-3, Clause 5.2.

2.2.2.5 Reaction to fire

Purpose of the assessment

This assessment is intended to provide the reaction to fire of wall kits and their components (blocks and lime mortars).

Assessment method

Blocks shall be assessed in accordance with Clause 2.2.1.3.

Lime mortars shall be assessed in accordance with EN 998-2, Clause 5.4.8.

The wall kits shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The wall kits shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1. Mounting and fixing provisions and extended applications of test results are given in Annex C:.

Expression of results

The reaction to fire class of the wall kits and their components (blocks and lime mortars) shall be stated in the ETA.

2.2.2.6 Resistance to fire

Purpose of the assessment

This assessment is intended to provide the resistance to fire of wall kits.

Assessment method

The resistance to fire shall be tested in accordance with EN 1365-1 and EN 1364-1 for loadbearing and non-loadbearing walls use respectively, and the walls shall be classified in accordance with EN 13501-2.

In the case of testing in accordance with EN 1365-1 the figures of reference applicable to the loadbearing walls are:

- Figures 1 and 2 as examples of load transfer system at head.
- Figures 4 and 5 as examples of location of unexposed thermocouples positions and deflection measurement positions.

In the case of testing in accordance with EN 1364-1 the figures of reference applicable to the non-loadbearing walls are:

- Figures 2 and 3 as examples of location of unexposed thermocouples positions and deflection measurement positions.

The fields of direct application of test results of Clause 13 of EN 1365-1 for loadbearing walls and Clause 13 of EN 1364-1 for non-loadbearing walls apply.

Expression of results

The following data shall be stated in the ETA:

- The resistance to fire class
- The description of the tested wall configuration for each resistance to fire test results.
- Additionally, when loadbearing walls are tested, for the corresponding resistance to fire class:
    - The type of restraint applied to the horizontal edges, i.e., both ends fixed or one hinged edge.
    - The load applied (F_{fire}) in [kN/m] along with the eccentricity set and the method of loading, including the number and distribution of loading points.

2.2.2.7 Content, emission or release of dangerous substances

The assessment of the wall kits' content, emission or release of dangerous substances is carried out by means of the assessment of the content, emission or release of dangerous substances of the kit components (blocks and blocks and natural hydraulic lime mortars), which are representative of this essential characteristic for wall kits.

For blocks, content, emission or release of dangerous substances shall be assessed and stated in the ETA in accordance with Clause 5.2.13 of EN 771-1.

For natural hydraulic lime mortars, content, emission or release of dangerous substances shall be assessed and stated in the ETA in accordance with Clause 5.4.9 of EN 998-2.

2.2.2.8 Impact resistance

Purpose of the assessment

This assessment is intended to provide the resistance of assembled wall kits to hard and soft bodies impacts that may come from either the interior or the exterior of buildings.

Hard body impacts are relevant only when the wall kits are intended to be used as unprotected masonry walls because otherwise it will depend on the covering used for such protection (e.g., rendering, cladding, etc.).

Assessment method

Soft body impact resistance of the wall kits shall be tested in accordance with Clause 2 in Annex E of EAD 210005-00-0505.

For unprotected wall kits, hard body impact resistance of the wall kits shall be tested in accordance with Clause 3 in Annex E of EAD 210005-00-0505.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2 of this EAD.

Expression of results

The following information shall be stated in the ETA:

- Soft body impact resistances in [J] of each tested wall kit configuration, and the corresponding description of damages observed in accordance with the Clause 2.7 in Annex E of EAD 210005-00-0505. If no damages are observed “No damages” shall be stated.
- For unprotected wall kits, hard body impact resistances in [J] of each tested wall kit configuration, and the corresponding description of damages observed in accordance with the Clause 3.7 in Annex E of EAD 210005-00-0505. If no damages are observed “No damages” shall be stated.
- Use category as defined in Annex B of EAD 210005-00-0505.

2.2.2.9 Resistance to internal eccentric loads

Purpose of the assessment

This assessment is intended to provide the resistance to internal eccentric loads of wall kits, when walls are used as substrate to fix heavy or very heavy objects.

The assessment of resistance to internal eccentric loads is applicable to internal walls.

Assessment method

The resistance to internal eccentric loads of the kit shall be tested in accordance with Clause 2.2.7 of EAD 210005-00-0505.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

Expression of results

Resistance to internal eccentric loads of the wall shall be stated in the ETA in accordance with Clause 2.2.7 of EAD 210005-00-0505.

2.2.2.10 Resistance to external eccentric loads

Purpose of the assessment

This assessment is intended to provide the resistance to external eccentric loads of wall kits, when walls are used as substrate of exterior-finishing mechanically fixed.

The assessment of resistance to external eccentric loads is applicable to external walls when loads are applied to the external side of the walls.

Assessment method

The resistance to external eccentric loads of the kit shall be tested in accordance with Annex D.

When there are different wall configurations, (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength but greater width.

Expression of results

The mean value and the characteristic value (in accordance with Annex A) of the applied load [N] shall be stated in the ETA. Description of the fixing devices tested shall be stated in the ETA.

2.2.2.11 Internal horizontal linear static load resistance

Purpose of the assessment

This assessment is intended to provide the internal horizontal linear static load resistance of wall kits.

The assessment of resistance to internal eccentric loads is applicable to for internal walls or external walls when horizontal linear static loads are applied to the internal side of the walls.

Assessment method

The internal horizontal linear static load resistance of the kit shall be tested in accordance with Annex E.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block dimensions), at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks or lime mortars with greater compressive strength(s),
- blocks with the same compressive strength, length and height but greater width.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

Expression of results

The following information shall be stated in the ETA:

- Maximum load applied in [kN/m] at failure.
- Description of the failure observed in accordance with Clause E.2.

2.2.2.12 Airborne sound insulation

Purpose of the assessment

This assessment is intended to provide the airborne sound insulation of wall kits.

Assessment method

Airborne sound insulation shall be tested in accordance with EN ISO 10140-2. Test arrangement in accordance with EN ISO 10140-2, Clause 6.2 shall be applied.

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block width), at least the worst-case configuration (i.e., minimum density of the blocks, minimum density of the lime mortars and minimum width) shall be tested. Test results are also applicable to configurations with:

- blocks with the same density but greater width,
- blocks with the same width but greater density.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

Expression of results

The measured airborne sound insulation shall be expressed as a single number rating, R_w (C;C_{tr}) [dB], in accordance with EN ISO 717-1 and it shall be stated in the ETA, along with the description of the wall configuration.

2.2.2.13 Sound absorption

Purpose of the assessment

This assessment is intended to provide the sound absorption of unprotected wall kits, in internal uses.

Assessment method

Sound absorption shall be tested in accordance with EN ISO 354. Mounting Type A of EN ISO 354, Annex B applies.

Each different configuration of wall kits (i.e., different blocks or lime mortar compositions) shall be tested. Test results are also applicable to configurations with:

- blocks with the same composition.

The test specimens shall be conditioned in accordance with general part of Clause 2.2.2.

Expression of results

The measured sound absorption shall be expressed as the weighted sound absorption coefficient (α_w) [-] in accordance with EN ISO 11654 and stated in the ETA.

2.2.2.14 Thermal resistance

Purpose of the assessment

This assessment is intended to provide the thermal resistance of wall kits.

Assessment method

Thermal resistance shall be assessed following one of the three methods described below: by simplified calculation, reference method (see bullet (1) below), by numerical calculation method (see bullet (2) below) or by testing (see bullet (3) below).

Thermal resistance shall be obtained at least at standard conditioning ($R_{23,50,mas}$). In addition, thermal resistance may be obtained at different conditioning at other humidity ($R_{23,RH,mas}$).

When there are different wall configurations (i.e., different blocks or lime mortar compositions or different block width), at least the worst-case configuration (i.e., minimum density of the blocks, minimum density of the lime mortars and minimum width) shall be calculated/tested. Results are also applicable to configurations with:

- blocks with the same density but greater width,

- blocks with the same width but greater density.

(1) Assessment by simplified calculation (reference method).

Thermal resistance at standard conditioning ($R_{23,50,mas}$) shall be calculated in accordance with Clause 7.2.1 of EN 1745. Unlike Clause 7.2.1 of EN 1745, "$\lambda_{design,mortar}$" and "$\lambda_{design,unit}$" shall be replaced by "$\lambda_{mortar,dry}$" and "$\lambda_{23,50}$" of blocks (see Clause 2.2.1.12.1).

Thermal resistance at other conditioning ($R_{23,RH,mas}$) shall be calculated in accordance with Clause 7.2.1 of EN 1745. Unlike Clause 7.2.1 of EN 1745, "$\lambda_{design,mortar}$" and "$\lambda_{design,unit}$" shall be replaced by "$\lambda_{mortar,RH}$" and "$\lambda_{23,RH}$" of blocks (see Clause -).

Thermal conductivity of lime mortars ($\lambda_{mortar,dry}$) shall be taken from the MPII. When it is not defined, values from Table A.12 of EN 1745 shall be used. To calculate thermal conductivity of lime mortars with moisture content ($\lambda_{mortar,RH}$), use the moisture conversion coefficient by volume f_Ψ = 4 m³/m³ stated in such Table A.12 of EN 1745 and the conversion for thermal values for moisture according to Clause 7 of EN ISO 10456.

(2) Assessment by numerical calculation method.

Thermal resistance at standard conditioning ($R_{23,50,mas}$) shall be calculated in accordance with Clause 7.2.2 of EN 1745. Unlike Clause 7.2.2 of EN 1745, "λ_{design}-value" shall be replaced by "$\lambda_{mortar,dry}$" and "$\lambda_{23,50}$" of blocks (see Clause 2.2.1.12.1).

Thermal resistance at other conditioning ($R_{23,RH,mas}$) shall be calculated in accordance with Clause 7.2.2 of EN 1745. Unlike Clause 7.2.2 of EN 1745, "λ_{design}-value" shall be replaced by "$\lambda_{mortar,dry}$" and "$\lambda_{23,50}$" of blocks (see Clause 2).

Thermal conductivity of lime mortars ($\lambda_{mortar,dry}$) shall be taken from the MPII. When it is not defined, values from Table A.12 of EN 1745 shall be used. To calculate thermal conductivity of lime mortars with moisture content ($\lambda_{mortar,RH}$), use the moisture conversion coefficient by volume f_Ψ = 4 m³/m³ stated in such Table A.12 of EN 1745 and the conversion for thermal values for moisture according to Clause 7 of EN ISO 10456.

(3) Assessment by testing.

Thermal resistance shall be tested in accordance with EN 1934. .

Specimen dimensions shall be obtained from the Table 1 of EN 1934. Also, the metering cross-section of the specimen shall be large enough to cover a representative portion of the wall incorporating the occurring inhomogeneities in terms of thermal resistance (i.e., joints between blocks). At least, the specimen with the maximum percentage by square metre of joints between blocks shall be considered.

Unlike Clause 8.2 of EN 1934, conditioning of specimens shall be:

- For thermal resistance in standard conditioning: test specimens shall be conditioned to constant mass at (23 ± 5) ºC and (50 ± 5) % RH. Constant mass is reached, when during the conditioning process in two subsequent weightings with a 24 h interval, the loss in mass between two determinations is not more than 0,2 % of the total mass. For keeping the specimens' humidity, they shall be enclosed in a vapour-tight envelope until testing

- For thermal resistance in wet other conditioning: test specimens shall be conditioned for at least 48 h under (23 ± 5) °C and (RH) % relative humidity defined in the MPII (when no data in MPII, (75 ± 5) % RH shall be used) before testing. For keeping the specimens' humidity, they shall be enclosed in a vapour-tight envelope until testing.

Thermal resistances of specimens shall be obtained in accordance with Equation (2), Clause 8.4.3 of EN 1934.

Expression of results

The following data shall be stated in the ETA:

- Thermal resistance of walls in standard conditioning ($R_{23,50,mas}$) [$m^2 \cdot K/W$] together with the reference to the assessment used method and the percentage per square metre of joints of the tested specimen.

- Additionally, when thermal resistance of walls in different conditioning at other humidity ($R_{23,RH,mas}$) is obtained, the value per each (RH) assessed together with the reference to the assessment used method and the percentage per square metre of joints of the tested specimen.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Commission Decision 97/740/EC, as amended by Commission Decision 2001/596/EC.

The applicable AVCP system is 2+ for any use except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1, or 3, or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1 for blocks and Table 3.2.2 to 3.2.4 for wall kits.

The manufacturer (regarding the components he buys from the market with DoP) shall take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

Table 3.2.1 Control plan of blocks for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
Incoming materials					
1	Receipt materials (soil, silt, clay, lime, cement and additives)	Delivery ticket or label on the package	Conformity with the order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with the order	---	Each delivery
Finished product					
2	Compressive strength	2.2.1.1	As defined in the Control Plan	3	Each 4000 m^3 of blocks or monthly or as given in the Control Plan
3	Reaction to fire (*) (direct testing)	2.2.1.3	As defined in the Control Plan	1	Each 5 years
4	Organic content (also as an indirect test for reaction to fire)	3.4.4	As defined in the Control Plan	1	Each 3 months
5	Water vapour permeability	2.2.1.4	As defined in the Control Plan	1	Each year
6	Water absorption by capillarity	2.2.1.5	As defined in the Control Plan	1	Each 4000 m^3 of blocks or monthly or as given in the Control Plan
7	Dimensions	3.4.1	As defined in the Control Plan	3	Each week or batch
8	Configuration	3.4.2	As defined in the Control Plan	1	Each year
9	Dimensional tolerances	2.2.1.7	As defined in the Control Plan	3	Each week or batch
10	Plane parallelism of the bed faces	2.2.1.8	As defined in the Control Plan	3	Each week or batch
11	Flatness of faces	2.2.1.9	As defined in the Control Plan	3	Each week or batch
12	Density	2.2.1.10	As defined in the Control Plan	3	Each week or as given in the Control Plan
13	Thermal conductivity	2.2.1.12	As defined in the Control Plan	1	Each year
14	Behaviour after immersion	2.2.1.14	As defined in the Control Plan	1	Each year
15	Behaviour after freeze-thaw cycles	2.2.1.16	As defined in the Control Plan	1	Each year
16	Moisture movement	2.2.1.17	As defined in the Control Plan	1	Each year
17	Aspect: visual defects or cracks	3.4.3	As defined in the Control Plan	5	Each week or batch
(*) Only when the reaction to fire is performed.					

Table 3.2.2 Control plan of wall kits for the manufacturer; cornerstones

No	Subject/type of control		Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]						
1	Reaction to fire (*)	Direct testing	2.2.2.5	As defined in the Control Plan	1	Each 5 years
		Indirect testing (organic content of components)	See Table 3.2.1 & Table 3.2.3	See Table 3.2.1 & Table 3.2.3	See Table 3.2.1 & Table 3.2.3	See Table 3.2.1 & Table 3.2.3
Components **produced** by the manufacturer himself:						
1	Compressed earth blocks		See Table 3.2.1	See Table 3.2.1	See Table 3.2.1	See Table 3.2.1
2	Natural hydraulic lime mortars		See Table 3.2.3	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3
Components **not produced** by the manufacturer himself:						
3	Compressed earth blocks		See Table 3.2.4	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4
4	Natural hydraulic lime mortars		See Table 3.2.4	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4
(*) Only when the reaction to fire is performed.						

Table 3.2.3: Control plan when the <u>natural hydraulic lime mortars</u> is produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
Incoming materials					
1	Receipt materials	Delivery ticket or label on the package	Conformity with the order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with the order	---	Each delivery
Finished component					
2	In accordance with EN 998-2, Annex D	In accordance with EN 998-2, Annex D	As defined in the Control Plan	In accordance with EN 998-2, Annex D	In accordance with EN 998-2, Annex D
3	Organic content (also as an indirect test for wall kit reaction to fire)	3.4.4	As defined in the Control Plan	1	Each 3 months

Table 3.2.4: Control plan when the components are not produced by the manufacturer; cornerstones

No	Subject/type of control (ii)	Test or control method	Criteria, if any	Minimum number of specimens	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Components belonging to Case 1 (i)	(1)	Conformity with the order	Testing is not required	Each delivery
		(2)	In accordance with Control Plan	Testing is not required	Each delivery
2	Components belonging to Case 2 (i):	(1)	Conformity with the order	Testing is not required	Each delivery
	▪ Characteristics declared in the Declaration of Performance (DoP) for the specific use within the kit.	(2)	In accordance with Control Plan	Testing is not required	Each delivery
	▪ Characteristics not declared in DoP for the specific use within the kit.	(3)	In accordance with Control Plan	In accordance with Control Plan	In accordance with Control Plan
3	Components belonging to Case 3 (i):	(1)	Conformity with the order	Testing is not required	Each delivery
		(3)	In accordance with Control Plan	In accordance with Control Plan	In accordance with Control Plan

(1) Checking of delivery ticket or label or both on the package.
(2) Checking of technical data sheet and DoP or, when relevant: checking of supplier certificates or supplier tests or test or control in accordance with Tables 3.2.1 or 3.2.3 above.
(3) Checking of supplier certificates or supplier tests or test or control in accordance with Tables 3.2.1 or 3.2.3 above.

(i) Case 1: Component covered by a DoP for all characteristics needed for the specific use within the kit.
Case 2: If the component is a product covered by a DoP which, however, does not include all characteristics needed for the specific use within the kit or the characteristic is presented as NPD option for the component manufacturer.
Case 3: The component is not covered by a DoP.
(ii) Component characteristics are those defined in Tables 3.2.1 or 3.2.3 above.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for the blocks and wall kits are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the blocks and wall kits.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	In accordance with Control plan	In accordance with Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product or kits as indicated in Tables 3.2.1 to 3.2.4.	In accordance with Control plan	In accordance with Control plan	1/year

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire-retardants or a limiting of organic material).

In this case the cornerstones of the actions to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.2.

Table 3.3.2 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire-retardants or a limiting of organic material).	Verification of the complete FPC as described in the Control Plan agreed between the TAB and the manufacturer	As defined in the Control Plan agreed between the TAB and the manufacturer	As defined in the Control Plan agreed between the TAB and the manufacturer	When starting the production, after starting a new production line or after modifications of the production process
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire-retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the Control Plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	As defined in the Control Plan agreed between the TAB and the manufacturer	As defined in the Control Plan agreed between the TAB and the manufacturer	1/year

3.4 Special methods of control and testing used for the assessment and verification of constancy of performance

3.4.1 Dimensions

Dimensions shall be tested in accordance with EN 772-16 for each block geometry.

At least six specimens for length, width and height dimensions shall be tested.

For length, width and height dimensions, test procedures a) or b) of Clause 7.1 of EN 772-16 shall be applied, depending on the dimensions of the block, as stated in the same clause.

3.4.2 Configuration

Configuration shall be checked by means of:

— shape and features (by mean of a drawing or illustration, when relevant);

— volume of grip holes as a percentage of the gross volume (length × width × height) of the block. Volume of grip holes shall be not greater than 5% of the gross volume.

3.4.3 Aspect: visual defects or cracks

The aspect of blocks shall be checked by means of visual inspection and measurement of possible defects and cracks with a slide gauge.

Emphasis shall be placed on deep or extensive cracks, damage to edges and corners, presence of pebbles, inadequate compaction, widespread cracks throughout the entire surface, etc.

Minor defects or cracks which do not undermine the integrity, and the performance of the compressed earth blocks are acceptable. Specific criteria for accepting such visual defects or cracks shall be clearly outlined in the Control Plan.

3.4.4 Organic content

Organic content of blocks and lime mortars shall be tested in accordance with EN 13820 with the following deviations:

For blocks:

- Test specimens shall be prepared from the mixture of raw materials before moulding the blocks. Composition of the mixture shall be the same used for the blocks manufacturing.
- Five specimens with mass between 100 g and 200 g shall be tested.

For lime mortars:

- Test specimens shall be prepared from the mixture of raw materials used to produce the lime mortars. Composition of the mixture shall be the same used for the lime mortars manufacturing.
- Five specimens with mass between 100 g and 200 g shall be tested.

4 REFERENCE DOCUMENTS

EN 771-1:2011+A1:2015	Specification for masonry units - Part 1: Clay masonry units.
EN 771-2:2011+A1:2015	Specification for masonry units - Part 2: Calcium silicate masonry units.
EN 771-3:2011+A1:2015	Specification for masonry units - Part 3: Aggregate concrete masonry units.
EN 771-4:2011+A1:2015	Specification for masonry units - Part 4: Autoclaved aerated concrete masonry units.
EN 771-5:2011+A1:2015	Specification for masonry units - Part 5: Manufactured stone masonry units.
EN 771-6:2011+A1:2015	Specification for masonry units - Part 6: Natural stone masonry units.
EN 772-1:2011+A1:2015	Methods of test for masonry units - Part 1: Determination of compressive strength.
EN 772-5:2016 EN 772-5:2016/AC:2017	Methods of test for masonry units - Part 5: Determination of the active soluble salts content of clay masonry units.
EN 772-11:2011	Methods of test for masonry units - Part 11: Determination of water absorption of aggregate concrete, autoclaved aerated concrete, manufactured stone and natural stone masonry units due to capillary action and the initial rate of water absorption of clay masonry units.
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 772-14:2001	Methods of test for masonry units - Part 14: Determination of moisture movement of aggregate concrete and manufactured stone masonry units.
EN 772-16:2011	Methods of test for masonry units - Part 16: Determination of dimensions.
EN 772-20:2000 EN 772-20:2000/A1:2005	Methods of test for masonry units - Part 20: Determination of flatness of faces of masonry units.
EN 998-2:2016	Specification for mortar for masonry - Part 2: Masonry mortar.
EN 1052-1:1998	Methods of test for masonry – Part 1: Determination of compressive strength.
EN 1052-2:2016 EN 1052-2:2016/AC:2017	Methods of test for masonry - Part 2: Determination of flexural strength. (Consolidated version).
EN 1052-3:2002 EN 1052-3:2002/A1:2007	Methods of test for masonry - Part 3: Determination of initial shear strength.
EN 1363-1:2020	Fire resistance tests - Part 1: General Requirements.
EN 1364-1:2015	Fire resistance tests for non-loadbearing elements - Part 1: Walls.
EN 1365-1:2012 EN 1365-1:2012/AC:2013	Fire resistance tests for loadbearing elements - Part 1: Walls.
EN 1745:2020	Masonry and masonry products - Methods for determining thermal properties.
EN 1934:1998	Thermal performance of buildings - Determination of thermal resistance by hot box method using heat flow meter – Masonry.
EN 1990:2023	Eurocode - Basis of structural and geotechnical design.
EN 1996-1-1:2022	Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures.
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 13501-1:2018	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests.
EN 13501-2:2023	Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services.
EN 13820:2003	Thermal insulating materials for building applications. Determination of organic content.
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 ISO 354:2003	Acoustics - Measurement of sound absorption in a reverberation room (ISO 354:2003).

EN ISO 1716:2018	Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value) (ISO 1716:2018).
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 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 10456:2007 EN ISO 10456:2007/AC:2009	Building materials and products - Hygrothermal properties -Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007).
EN ISO 11654:1997	Acoustics. Sound absorbers for use in buildings. Rating of sound absorption. (ISO 11654:1997).
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).
EN ISO 12572:2016	Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method (ISO 12572:2016).
EAD 210005-00-0505	Internal partition kits for use as non-loadbearing walls.

ANNEX A: TEST RESULTS STATISTICAL DESCRIPTION

$X_{u,5} = X_{mean} - k_n \cdot S$ (A.1)

Where:

$X_{u,5}$ = the characteristic value giving 75 % confidence that 95 % of the test results will be greater than this value

X_{mean} = the mean value

k_n = the variable as a function of the number of test specimens for 5 % (p = 0,95) with 75 % confidence level when the population standard deviation is unknown (see Table A.1)

S = the standard deviation of series under consideration

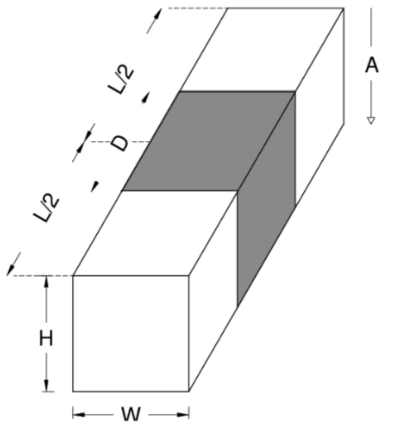
Table A.1 – The variable k_n as a function of the number of test specimens (see EN 1990 Eurocode: *Basis of structural design*, Table D1, Vx, unknown).

Number of specimens	3	4	5	6	7	8	10	20	30	∞
Variable k_n	3,37	2,63	2,33	2,18	2,10	2,00	1,92	1,76	1,73	1,64

ANNEX B: CUTTING SCHEMES

B.1 Cutting scheme for blocks compressive strength

The cutting scheme for producing specimens to obtain compressive strength is as shown in Figure B.1, where distance (D) shall be at least 250 mm.



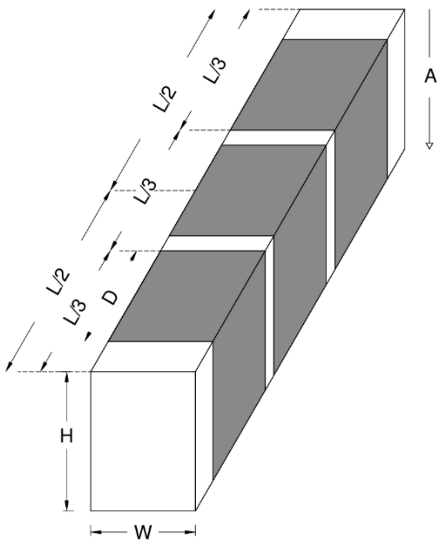
A: Load direction.
L: Length of block.
D: Length of the cut specimen (≥ 250 mm).
W: Width of block.
H: Height of block.

Figure B.1: Cutting scheme for blocks to obtain compressive strength.

B.2 Cutting scheme for blocks density

The cutting scheme for producing specimens to obtain density is as shown in Figure B.2, where distance (D) shall be the width of the block.

The mean (arithmetic average) value of the test results for the specimens cut from a block represents the mean value for that block.



A: Load direction.
L: Length of block.
D: Length of the cut specimen (D = W).
W: Width of block.
H: Height of block.

Figure B.2: Cutting scheme for blocks to obtain density.

ANNEX C: MOUNTING AND FIXING PROVISIONS AS WELL AS EXTENDED APPLICATIONS RULES FOR THE RELEVANT REACTION TO FIRE TESTS FOR BLOCKS AND WALL KITS

C.1 Single burning item test (EN 13823) for wall kits

C.1.1 Dimensions of the test rig

The test rig consists of a corner with a short and a long wing. The dimensions of the specimens shall be:

	Assembly dimensions (mm – nominally)	
	Length	**Height**
Short wing	500	1500
Long wing	1000 + W	1500
Where W = width of the blocks and wall kit.		

C.1.2 Test specimen

The blocks shall be installed together with the mortar and overlapped on alternate courses. Lime mortar applied in the specimen shall be recorded, i.e., quantity of mortar (g/m^2), type of shape of layers, thickness of layers, position in relation to the wall surface and if the mortar is applied in the vertical joints or not.

The assembly, including the joint detail and corner detail, shall be in accordance with end use conditions, as specified by the MPII.

At least the worst-case shall be tested, i.e., blocks and mortars with the worst reaction to fire class and the global greatest gross heat of combustion per square meter of wall (Q_{PCS}) in relation to the blocks and mortars definition.

Q_{PCS} [MJ/m^2] shall be calculated considering the gross heat of combustion of blocks and mortars (tested in accordance with EN ISO 1716), thickness and shape of mortar's layers, density of joints and thickness of the walls.

C.1.3 Mounting and fixing of the test assembly

The specimens shall be mounted and fixed in accordance with Clause 5.2.2, option a) of EN 13823, free standing at a distance of at least 80 mm from the backing board.

C.1.4 Extended applications of test results

The results of tests considering the parameters of the specimen are also valid for wall kits:

- with other blocks with the same or better reaction to fire class,
- with less global gross heat of combustion per wall square meter (Q_{PCS}),
- with different wall thickness but the same or less global gross heat of combustion per wall square meter (Q_{PCS}).
- for the tested thickness of the wall kit (if only one was tested) or the range between lowest and highest thickness tested and for any higher thickness than 160 mm, if 160 mm thick specimens were tested.

C.2 Single burning item test (EN 13823) for blocks

The same single burning item test for the wall kits is applicable to the blocks (see Clause C.1).

Alternatively, it is possible to perform the same test with a lime mortar with a reaction to fire class A1, in order to try to reach the classification for the blocks without any influence of the lime mortar.

C.3 Small ignition source test (EN ISO 11925-2) for blocks

C.3.1 Dimensions of the test specimen

The dimensions of the test specimens shall be as prescribed in Clause 5.2 of EN ISO 11925-2.

C.3.2 Test specimen

Each block with different composition and density considered in the assessment shall be tested.

C.3.3 Mounting and fixing of the test assembly

The flame is applied on the surface of the test specimen, in accordance with Clause 7.3.3 of EN ISO 11925-2.

C.3.4 Extended applications of test results

The results of tests are only valid for the blocks tested.

ANNEX D: RESISTANCE TO EXTERNAL ECCENTRICAL LOADS

D.1 Preparation of the test specimen

The test specimen is a wall that shall be built in accordance with the MPII. Curing of wall shall last for at least 28 days before testing. Test specimens shall be conditioned for at least 24 h under (23 ± 2) °C and (50 ± 5) % relative humidity before testing.

The test specimen shall be prepared in accordance with EN 1052-1, Clause 7.

D.2 Exterior-finishing fixing devices

Fixing devices intended to be used for applying the eccentric load on the test specimen shall be considered. These fixing devices are not part of the wall kit, therefore, one test for each fixing device type to be used with the wall kit according to the MPII shall be carried out.

Fixing devices may be mechanically fixed to the wall by only one fixing (punctual fixing) or by two or more points of fixings (brackets or profiles fixed by several screws).

In case of punctual fixing device, the following characteristics shall be considered:

- Generic type.
- Geometry (diameter and length).
- Material.

In case of fixing device with two or more points of fixings, the following characteristics shall be considered:

- Geometry of the bracket or profile: thickness (e), height (h), width (a) and wing length (w).
- Generic type of the screws between the bracket or profile and the wall
- Geometry of the screws.
- Number and position of screws.
- Screws and bracket/profile materials.

D.3 Test procedure

The tests shall be carried out under normal environmental laboratory conditions ((20 ± 10) ºC and (50 ± 20) % relative humidity).

A downward vertical force shall be exerted on the fixing device at a speed rate of (5,0 ± 0,5) mm/min until failure occurs.

The force-displacement shall be measured and reported in tabular or graphic form.

At least three specimens shall be tested.

D.4 Observation during the test

Failure is defined by anyone of the following events:

- The fixing device or the screws break.

- The fixing device reaches a maximum displacement of 15 mm.
- The wall breaks.

In the case of the failure occurs by means of the fixing device, the test may be repeated with other fixing devices or limit the performance of the kit to the ultimate failure load obtained.

D.5 Test report

The results are expressed in N.

At least, the test report shall detail the following in accordance with Annex A:

- Each individual force value for 1 mm displacement.
- The mean force value for 1 mm displacement.
- Each individual force value for 3 mm displacement.
- The mean force value for 3 mm displacement.
- The characteristic force values, for 1 mm and 3 mm displacements, giving 75 % confidence that 95 % of the test results will be higher than this value.
- The maximum force for which test specimen fails.
- The mode of failure description.

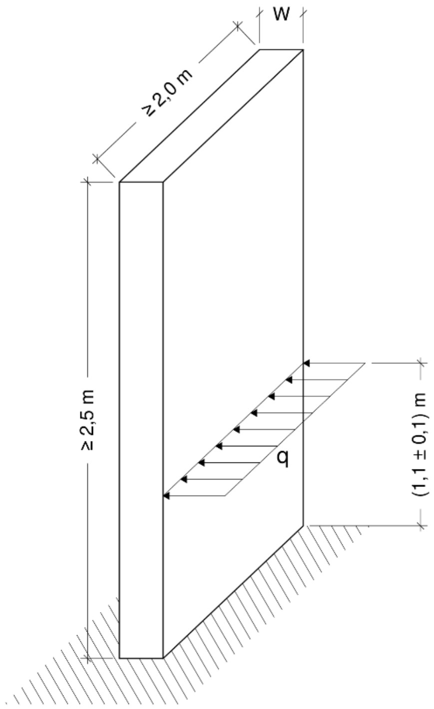
ANNEX E: INTERNAL HORIZONTAL LINEAR STATIC LOAD RESISTANCE

E.1 Preparation of the test specimen

One test specimen shall be tested for each configuration, or at least the worst-case configuration (i.e., minimum compressive strength of the blocks, minimum compressive strength of the lime mortars and minimum width).

The test specimen shall be built up according to the MPII. The ends (free edges) shall be free (see Figure E.1.1).

The total length of the specimen shall be at least 2 m. The height of the specimen shall be set by at least 2,5 m or according to MPII.



q = load to be applied.
W = width of the wall or width of the blocks.

Figure E.1.1: Test specimen configuration.

E.2 Procedure

The load “q” in [kN/m] shall be applied over the full length of the specimen at a height of (1,1 ± 0,1) m. The load shall be applied at speed rate (20 ± 1) mm/min.

Load-displacement graphic shall be recorded. Displacement shall be measured either by a displacement sensor positioned where the load is acting or by the recording of the loading actuator displacement.

Failure shall be observed. Failure is defined by any one of the following events:

- Test specimen breaks.
- A maximum displacement of 40 mm is reached without breaking.
- A maximum load of 4,0 kN/m is reached without breaking.

E.3 Test report

Test report shall include at least:

- Description of the test specimen including the dimensions of blocks, dimensions of joints between blocks and percentage by square metre of joints between blocks, dimensions of assembled wall.

- Maximum load “q” obtained at failure as defined in Clause E.2.

- The mode of failure description of the test specimen as defined in Clause E.2.