

EUROPEAN ASSESSMENT DOCUMENT

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INSULATING BUILDING ELEMENT FOR MASONRY WALLS

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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) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The elements consist of a structure made of lightweight concrete with high compressive strength and insulation made of expanded polystyrene.

The element has a rectangular geometry and is delivered in height, length and width corresponding to the dimensions of the masonry bricks in the walls they are to be used in.

Construction principle of the element

Components, see figure 1.1

- Light weight concrete
- Expanded Polystyrene

Principles for geometry

The width of the insulating building elements are identical with the width of the masonry wall whereas the length of the element shall be at least the length of the masonry block. The height of the element is at least 70 mm.

Loadbearing structure:

- Lightweight concrete or concrete

Insulation creating the rectangular dimension:

- expanded polystyrene

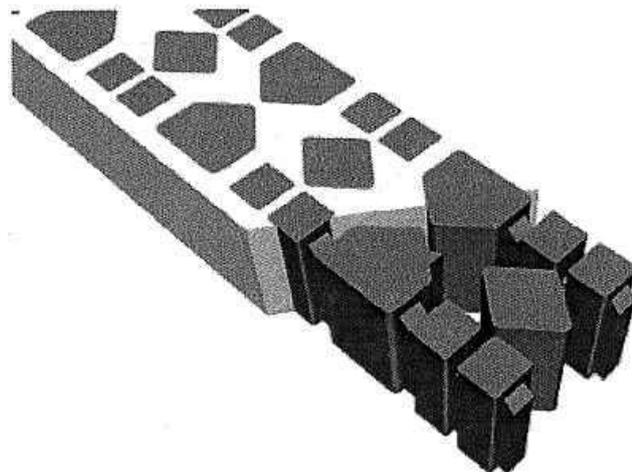


Fig. 1.1: Construction principle of an insulating building element (schematic)

The product is not covered by a harmonised European standard (hEN). The product is not covered by EN 771-3, since it is not a brick made from aggregate concrete masonry units, but a composite of lightweight concrete and expanded polystyrene. Only the geometry of the element is as described in the standard.

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 according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations 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.

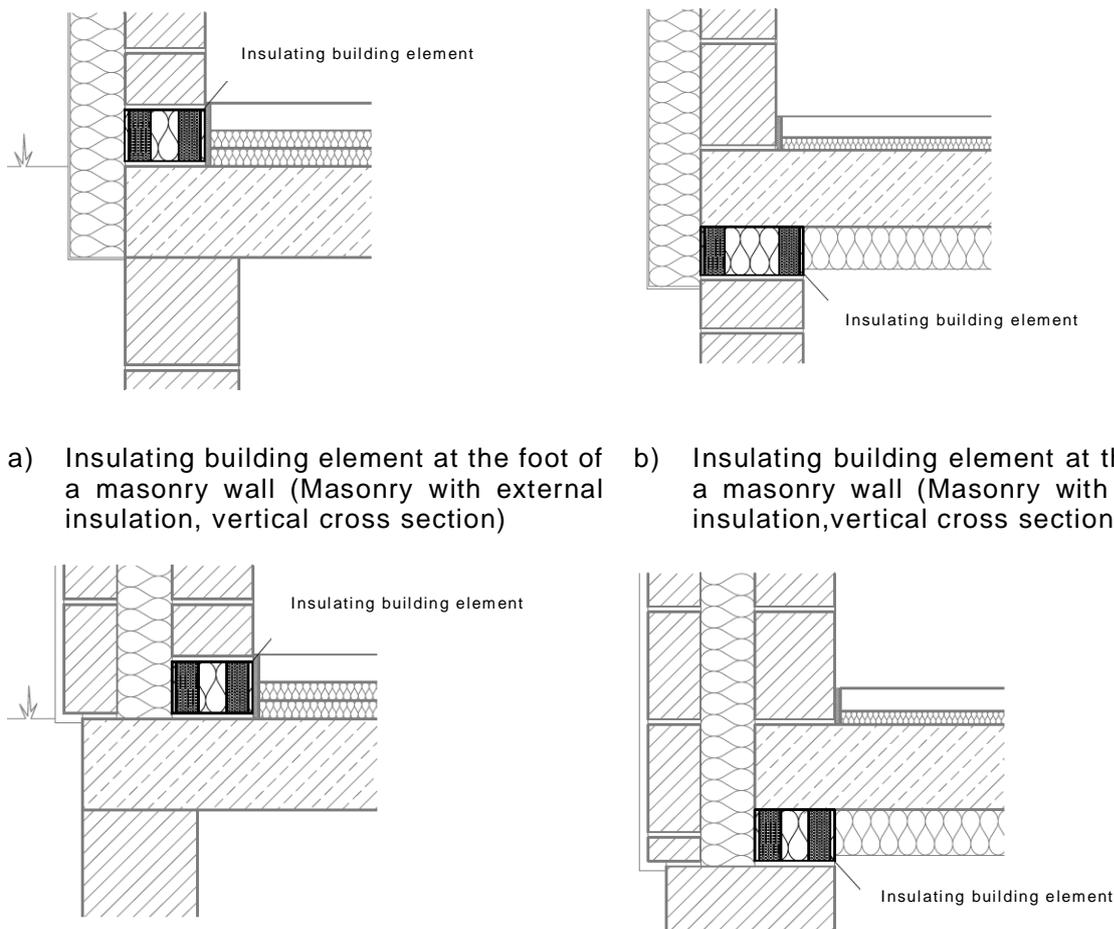
1.2 Information on the intended use(s) of the construction product

1.2.1 General

The insulating building element is a building component with a loadbearing and insulating capacity for the use in masonry walls.

The insulating building elements is intended to reduce the thermal bridge at the base of masonry walls, situated over not-heated underground level.

The insulating is always protected from corrosion, weathering and attack, since it is always installed behind the weather screen, (see Fig. 1.2)



a) Insulating building element at the foot of a masonry wall (Masonry with external insulation, vertical cross section)

b) Insulating building element at the top of a masonry wall (Masonry with external insulation, vertical cross section)

c) Insulating building elements at the foot of a masonry wall (double skin masonry; vertical cross section)

d) Insulating building elements at the top of a masonry wall (double skin masonry; vertical cross section)

Fig. 1.2: Applications of insulating building elements (schematic)

1.2.2 Intended use(s)

The insulating building elements are placed on the concrete slab as the first layer or at the top of a wall as the last layer under the slab (see Fig. 1.1). By its insulating capacity it reduces the thermal bridge at this point.

The insulating building elements are intended to be used in masonry wall structures made from the following:

- Sand lime masonry with normal or thin bed mortar
- Brick masonry with structural surface of at least 50% with normal or thin bed mortar

Assessment of the masonry wall or the used mortar is not part of this EAD.

1.2.3 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 building insulating element for the intended use of 50 years when installed in the works (provided that the building insulating element is subject to appropriate installation (see 1.1)) 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 works¹.

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 (if necessary in addition to the definitions in CPR, Art 2)

1.3.1 Abbreviations

EPS	=	expanded polystyrene
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1.3.2 Notations

$f_{k,N}$	N/mm ²	Characteristic resistance to vertical load
$f_{k,V}$	N/mm ²	Resistance to shear
$\lambda_{concrete}$	W/mK	thermal conductivity of the light weight concrete
λ_{EPS}	W/mK	thermal conductivity of the EPS
$\lambda_{eq,vertical}$	W/mK	thermal conductivity in vertical direction
$\lambda_{eq,horizontal}$	W/mK	thermal conductivity in horizontal direction
R_w	dB	sound insulation value
F	N	Force/Load
A	mm ²	Area
B	mm	Width
L	mm	Length

¹ 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.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of the insulating building element for masonry walls are assessed in relation to the essential characteristics.

Note. All undated references to standards or to EAD's in this chapter are to be understood as references to the dated versions listed in clause 4

Table 1 Essential characteristics of the product 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 (level, class, description)
Basic Works Requirement 1: Mechanical resistance and stability			
1	Characteristic compression strength of the insulating building element	2.2.1.1	Level
2	Characteristic compression strength of the insulating building element and of the structural material (light weight concrete)	2.2.1.2	Level
3	Density of the structural material (light weight concrete)	2.2.1.3	Level
4	Dimensions and weight of the insulating building element	2.2.1.4	Level
5	Loadbearing capacity of masonry walls with the insulating building element integrated at the base	2.2.1.5	Level
6	Shear strength	2.2.1.6	Level
Basic Works Requirement 2: Safety in case of fire			
7	Reaction to fire	Clause 2.2.2	Class
Basic Works Requirement 3: Hygiene, health and the environment			
8	Water absorption	Clause 2.2.3	Level
Basic Works Requirement 5: Protection against noise			
9	Sound insulation	Clause 2.2.4	Level
Basic Works Requirement 6: Energy economy and heat retention			
10	Thermal resistance	Clause 2.2.5	Level
Durability			
11	Durability of insulating building element	2.2.1.7	Description

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.

2.2.1 Mechanical strength and stability

2.2.1.1 Characteristic compression strength of the insulating building element

The compression strength of the insulating building element is tested in accordance with EN 12390-3

The test is made on 6 samples cut from 3 elements according annex B to F of this EAD to a length of 200 mm. The samples are stored at 20°C at 65% RH for 28 days.

The compression strength is determined as the average value of the tested samples and is stated in the ETA

2.2.1.2 Characteristic compression strength of the of the structural material (light weight concrete)

The compression resistance of the light weight concrete is tested in accordance with EN 12390-3.

The test is made on 6 cubes cut from the structure of 3 elements according to annex C of this EAD. The samples are stored at 20°C at 65% RH for 28 days.

The minimum and average value of the compression strength of the light weight concrete is stated in the ETA.

2.2.1.3 Density of the structural material (light weight concrete)

The density of the light weight concrete is tested in accordance with EN 12390-7.

The test is made on 6 cubes are cut from the structure of 3 elements according to annex C of this EAD. The samples are stored at 20°C at 65% RH for 28 days.

The dry density and the density under storage 20°C at 65% RH for 28 days of the light weight concrete with tolerances is given in the ETA.

2.2.1.4 Dimensions and weight of the insulating building element

The density of the insulating building element is determined in accordance with EN 772-4

The dimensions of the insulating building element are determined in accordance with EN 772-16. The measuring positions shall correspond to figure 1 d) in EN 772-16. For the height the measurement is taken on the EPS part.

The weight is determined on the element stored at 20°C at 65% RH for 28 days.

The average value and the tolerances of the dimensions and weight of the insulating building element are stated in the ETA.

2.2.1.5 Characteristic resistance to vertical load $f_{k,N}$

The characteristic resistance to vertical $f_{k,N}$ (see 1.3.2) for the resistance of a masonry wall with integrated insulating building element is determined by tests of walls according to figure 2.1 and pillars according to figures 2.2 and 2.3 according to EN 1052-1

The values $f_{k,N}$ are determined by the tests according 2.2.1.5 and the $f_{k,N}$ -values are determined in accordance with EN 1052-1 section 10.2.

In case the construction principle of the insulating building element is adapted to different widths, the tests on masonry walls with integrated insulating building element are to be made on masonry walls conform to the smallest and to the largest widths.

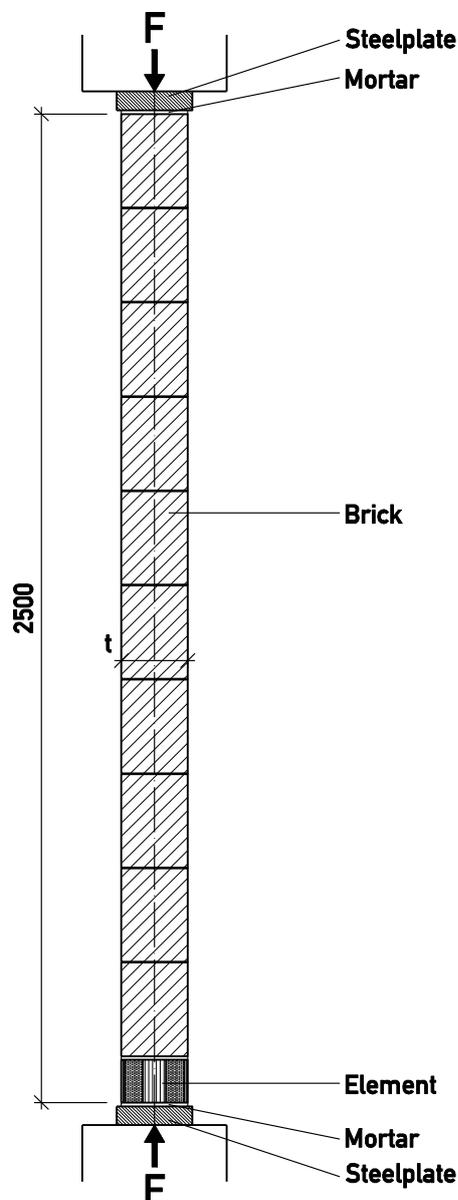
The loadbearing capacity of the insulating building element is to determine by testing (see annex A – Test program). The tests have to cover all strength classes and sizes (width) of elements.

The loadbearing capacity of the wall with integrated insulating building element is to determine by testing according to annex A – Test program.

The loadbearing capacity of the pillar with integrated insulating building element is to determine by testing according to annex A – Test program.

The $f_{k,N}$ -values are stated in the ETA.

Note. This characteristic is based on the principles in Eurocode 6 for assessing the characteristic resistance of a masonry wall to vertical load. The purpose of the tests is to ensure that the inclusion of the insulating building element has no adverse effect on the masonry walls in accordance with Eurocode 6.



Dimensions: mm

Fig. 2.1: Test setup to determine the load bearing capacity (centric load) of the wall

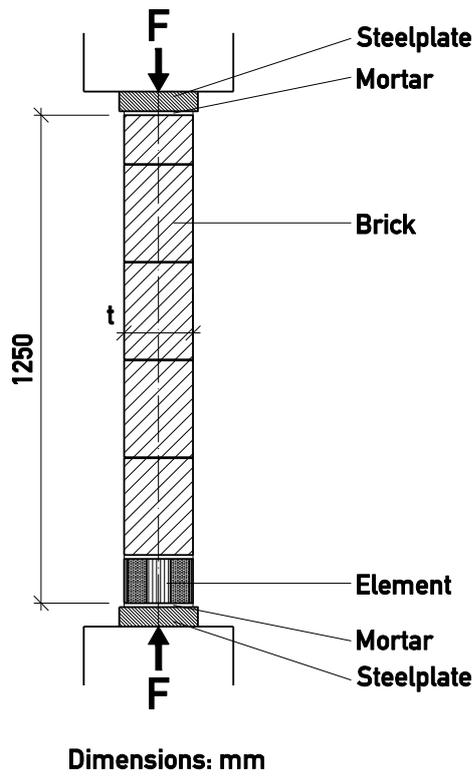


Fig. 2.2: Test setup to determine the load bearing capacity (centric load) of the wall

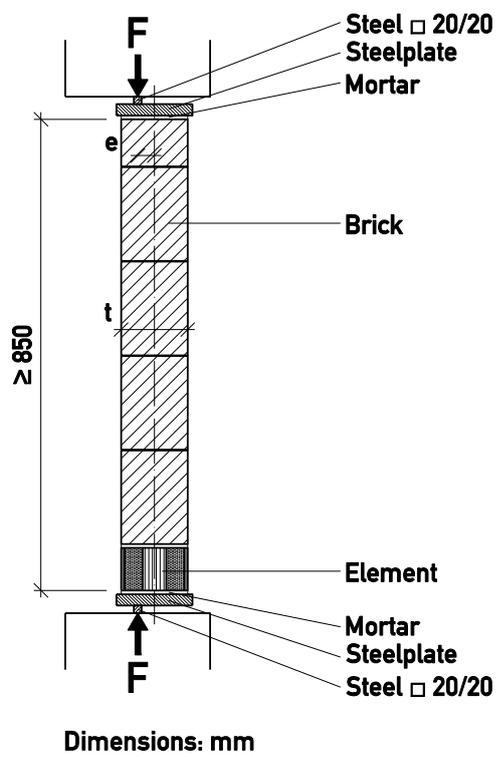


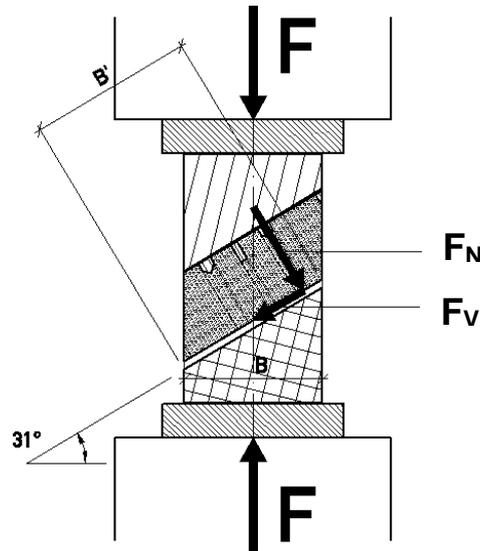
Fig. 2.3: Test setup to determine the load bearing capacity (excentric load) of the wall

2.2.1.6 Shear strength

The resistance to shear is tested on a setup according Fig.2.4. In the compression test according 12390-3 the shear resistance $f_{k,V}$ is determined and limited according EN1996-1

The test is made on 3 test-setups according to annex D of this EAD. The test setups are stored at 20°C at 65% RH for 28 days.

The average value of the shear strength of the setup is determined and the values $f_{k,V}$ are given in the ETA



Shear-Resistance $f_{k,V} = F \cdot \sin\alpha / A$; $A = L \times B$

Fig. 2.4 Test setup for shear-resistance

2.2.1.7 Durability of insulating building element

The specification of the insulating building element is taken from the value of the base material, EPS, and determined in accordance with EN 13163.

The durability of the lightweight concrete of the loadbearing structure is determined in accordance with EN 206 and EN 13055 for exposure class X0.

The specification of the insulating building element and lightweight concrete covered by the assessment is given in the ETA.

2.2.2 Reaction to fire

The insulating building elements shall be tested and classified in accordance with EC Delegated Regulation 2016/364/EU and EN 13501-1. The class is given in the ETA.

2.2.3 Water absorption

The water absorption of the insulating building element is tested in accordance with EN 772-11. The samples are oriented as the in-use position.

The water absorption is stated in the ETA

2.2.4 Sound insulation

The airborne sound insulations (sound insulation value R) shall be determined according to ISO 10140-2

The test sample is prepared in accordance with ISO 10140-2. A wall section with dimensions 1900 mm x 1095 mm is made from bricks. The top row of bricks is substituted with the insulating building element in width corresponding to the bricks used in the wall.

The wall can be made or without a render

The result is expressed as a single number rating in accordance with EN ISO 717-1 and given in the ETA together with the information on the specification of the test wall, i.e. dimensions of bricks, density of bricks, specification of mortar used, thickness and volume of possible render used.

2.2.5 Thermal resistance

The thermal conductivity λ of the components (Light weight concrete or concrete: $\lambda_{\text{concrete}}$) as well as the insulating building element (λ_{EPS}) is taken from the value of the base material, EPS, and determined according to EN 12667 or EN 12 664.

The insulation capacity shall be determined by the vertical ($\lambda_{\text{vertical}}$) and horizontal ($\lambda_{\text{horizontal}}$) thermal conductivity of the insulating building element. These values shall be derived by numerical calculations, and the values are stated in the ETA.

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: 97/740/EC as amended by 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 2.

Table 2 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method <i>(refer to 2.2 or 3.4)</i>	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Check of incoming materials				
1.1	Light weight concrete				
	Monitoring of the source materials of the Light weight concrete according to EN 206	EN 206	As defined in the control plan	As defined in the control plan	Every batch
1.2	Monitoring of the EPS: Check of the marking and the delivery notes	As defined in the control plan	As defined in the control plan	As defined in the control plan	Every batch
2	Test of the insulating building materials	As defined in the control plan	As defined in the control plan	As defined in the control plan	annual
3	Initial testing: Thermal resistance of the light weight concrete	EN 12667	As defined in the control plan	As defined in the control plan	annual
4	Initial testing: Thermal resistance of the EPS	EN 12664	As defined in the control plan	As defined in the control plan	annual
5	Initial testing: Water absorption	EN 772-11	As defined in the control plan		annual

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 insulating building element are laid down in Table 3.

In this case of AVCP system 2+ applies the cornerstones of the tasks to be undertaken by the notified body are laid down in Table 3

Table 3 Control plan for the notified body under AVCP system 2+; corner stones

Subject/type of control (<i>product, raw/constituent material, component - indicating characteristic concerned</i>)	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				
Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer regarding the constancy of performance of the brackets defined in the control plan (except reaction to fire).	As defined in control plan	As defined in control plan	As defined in control plan	According to the control plan
Continuous surveillance, assessment and evaluation of factory production control				
Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance of the brackets defined in the control plan (except reaction to fire).	As defined in control plan	As defined in control plan	As defined in control plan	According to the control plan

Regarding reaction to fire the involvement of the notified body is required only under the conditions defined in 99/90/EC amended by 2001/596/EC – in case of reaction to fire class A1, A2, B, C of the product for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an additional of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in table 4.

Table 4 Control plan for the notified body under AVCP system 1; corner stones

Subject/type of control (<i>product, raw/constituent material, component - indicating characteristic concerned</i>)	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				
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 and taking into account a limiting of organic material and/or the addition of fire retardants.	As defined in control plan	As defined in control plan	As defined in control plan	According to the control plan
Continuous surveillance, assessment and evaluation of factory production control				
Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire and taking into account a limiting of organic material and/or the addition of fire retardants.	As defined in control plan	As defined in control plan	As defined in control plan	According to the control plan

4 REFERENCE DOCUMENTS

EN 1996-1-1:2013 Eurocode 6: Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures

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

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 ISO 10140-1:2016 Acoustics - Laboratory measurement of sound insulation of building elements:

EN ISO 10140-2:2010 Laboratory measurement of sound insulation of building elements – Part 2: Measurement of airborne sound insulation

EN 13163:2016 Thermal insulation products for buildings-Factory made expanded polystyrene (EPS) products - Specification

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 with medium ad low thermal resistance

EN ISO 12571:2013 Hygrothermal performance of building materials and products – Determination of hygroscopic sorption properties

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

EN 771-1:2015 Specification for masonry units – Part 1: Clay masonry units

EN 771-2:2015 Specification for masonry units – Part 2: Calcium silicate masonry units

EN 206:2017: Concrete - Specification, performance, production and conformity

EN 772-4:1998 Methods of test for masonry units – Part 4: Determination of real and bulk density and of total and open porosity for natural stone masonry units

EN 772-16:2011 Methods of tests for masonry units – part 16 determination of dimensions

EN 12390-3:2012 Testing hardened concrete – part 3: Compressive strength of test specimens

EN 1052-1:1999 Test methods for masonry – Part 1: Determination of compression strength

EN 998-2:2016 Specification for mortar for masonry – Part 2 Masonry mortar

EN 13055:2016 Lightweight aggregates

ANNEX A – TEST PROGRAM

No.	Test series	Type of test	Width of Element	Number of tests	Strength class
1	E1	compression	B1	3	all
n	En	compression	Bn	3	all

Table A1: Required tests on elements

No.	Test series	Type	Element	Number of tests	Strength class ²⁾
1	W1	Wall ¹⁾	With	3	²⁾
n	W2	Wall ¹⁾	Without	3	²⁾
¹⁾ dimensions of the walls L x H x W = 1.25 m x 2.5 m x b (smallest size) with and without elements					
²⁾ strength class of the bricks the element is to be used					

Table A2: Required compression tests on masonry walls

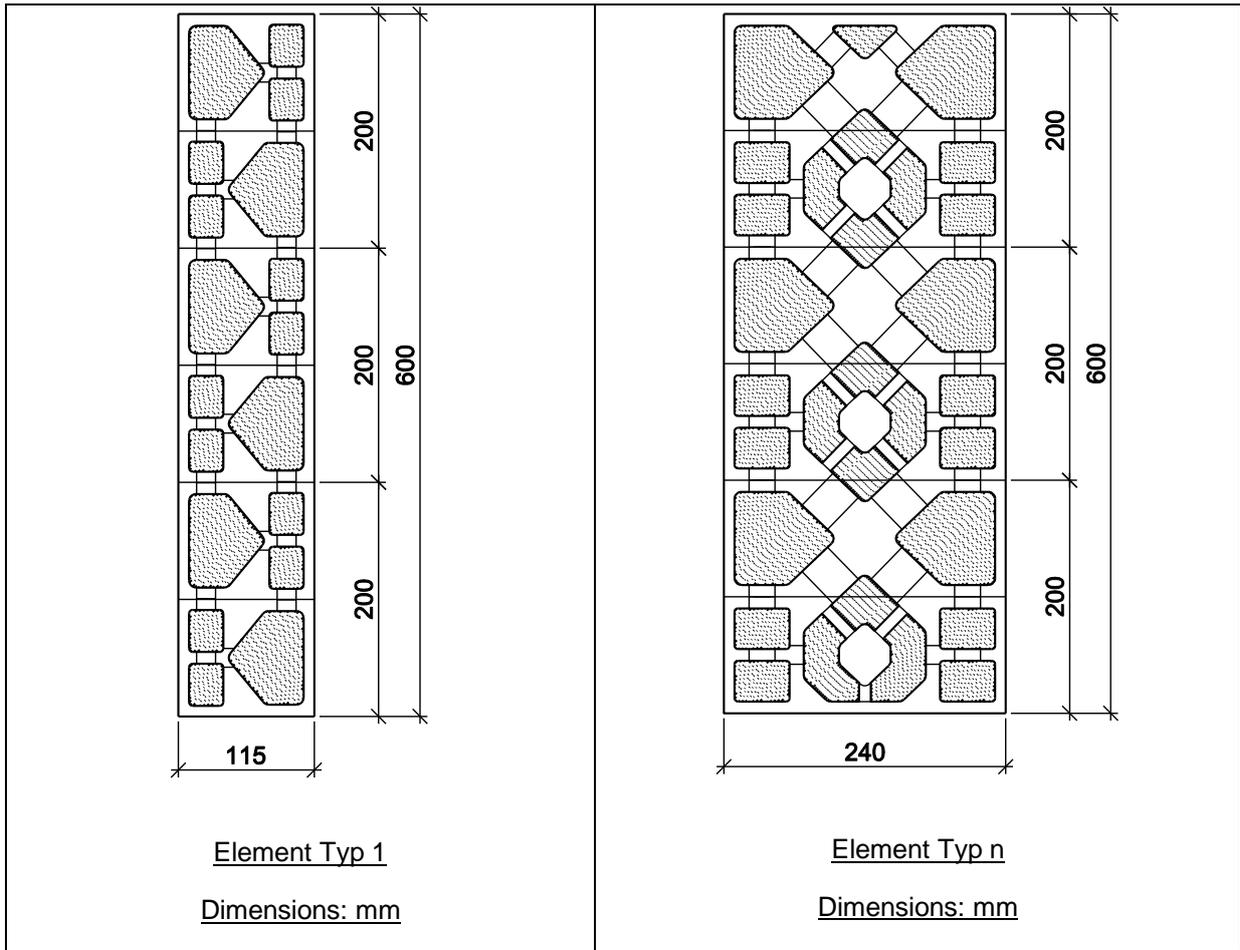
No.	Test series	Width	Element	Loading	Mortar	Number of tests	Strength class ²⁾
1	P1	B1	With	centric	Normal	3	²⁾
2	P2	B2	Without	centric	Normal	3	²⁾
3	P3	B2	With	centric	thin	3	²⁾
4	P4	B1	Without	centric	thin	3	²⁾
5	P5	B1	With	excentric	Normal	3	²⁾
6	P6	B1	Without	excentric	Normal	3	²⁾
7	P7	B1	Without	centric	Normal	3	≥20 ³⁾
¹⁾ dimensions of the pillars L x H x W = 1.25 m x 2.5 m x B1 and B2 (B1 =smallest size; B2=largest size) with and without elements							
²⁾ strength class of the bricks the element is to be used							
³⁾ strength class of the bricks to determine limiting strength of the pillar by integrating the element							

Table A3: Required compression tests on pillars

ANNEX B – TEST SAMPLES ON THE ELEMENT

No.	Test series	Type of test	sample cut of Element	Number of tests	Strength class
1	B1	compression	B1	3	all
n	Bn	compression	Bn	3	all

Table B1: Required tests on samples cut of elements

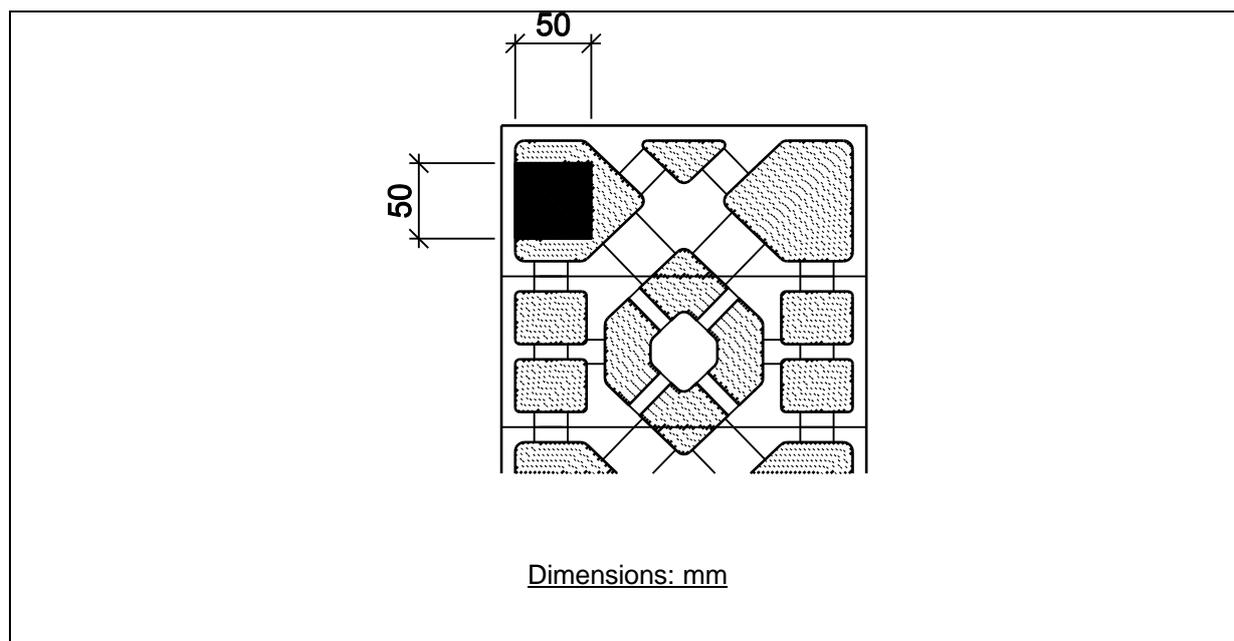


The samples are cut from the elements and comprise the geometrical unit the element is made of

ANNEX C – TEST ON CUBES CUT FROM THE ELEMENT

No.	Test series	Type of test	sample cut of Element	Number of tests	Strength class
1	C1	compression	B1	3	all
n	Cn	compression	Bn	3	all

Table C1: Required tests on samples cut of elements

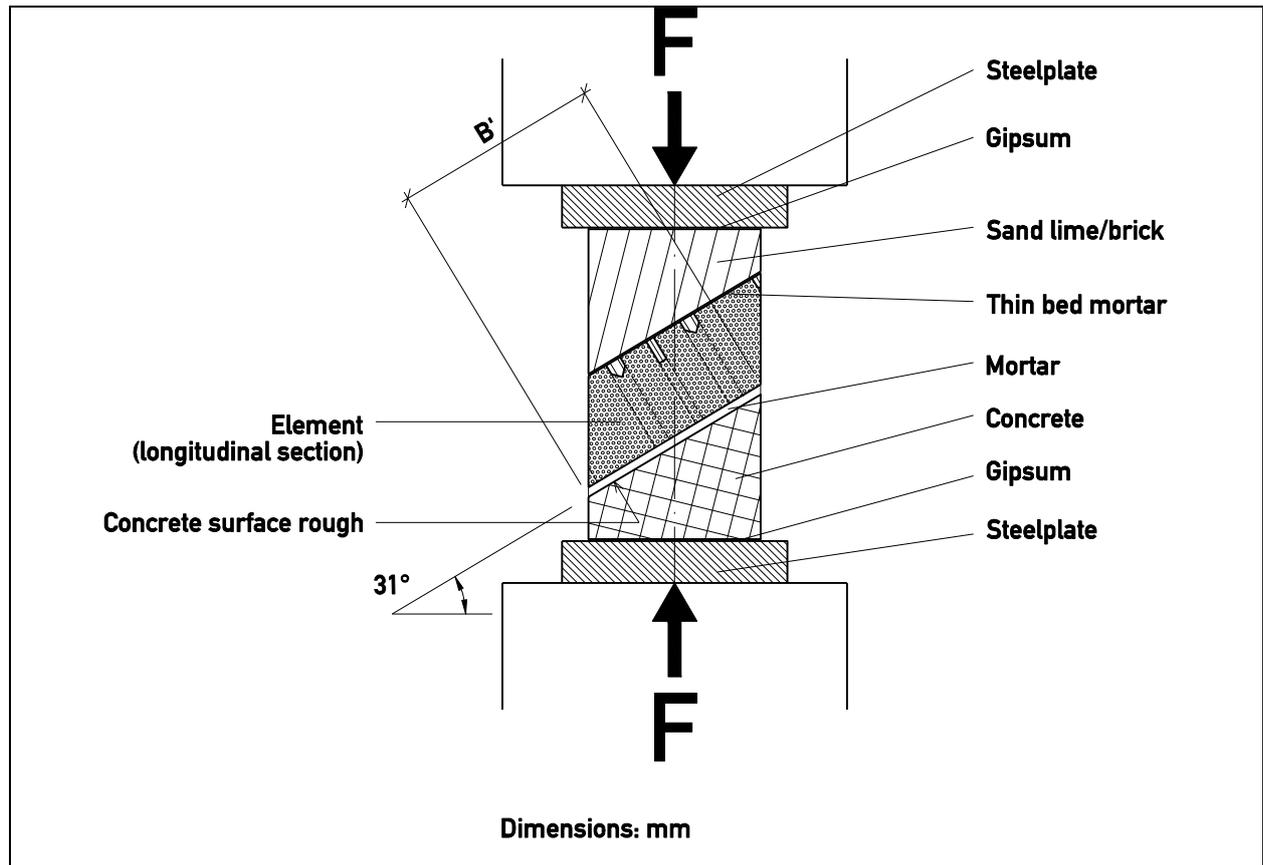


The cubes are cut from the elements

ANNEX D – SHEAR-TEST ON SETUP WITH ELEMENT

No.	Test series	Type of test	sample cut of Element	Number of tests	Strength class
1	S1	compression	B1	3	all

Table D1: Required tests on setup with element



Compression test

The compression test is made in accordance with EN 12390-3

Recording of test data

- The failure mechanism
- The ultimate Load under rupture

Determination of shear resistance

Shear-Resistance $f_{k,v} = F \cdot \sin \alpha / A$; $A = B \cdot L$

Additional Tests of components of setup

- Test of Mortar according EN 998-2 [xx]
- Test of masonry units according EN 771-2

