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European Assessment Document for

# Dry masonry construction system with vertical elements



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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) 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

This EAD covers kits for dry masonry construction systems with vertical elements (from now on DMCS) for supporting and non-supporting wall structures. The kit is composed of:

- Masonry units of category I according to EN 771-3<sup>1</sup>, clause 3.1.19, made of porous aggregate concrete according to EN 771-3
- Connecting vertical elements made of:
  - 1) Rubber reinforced with steel rod.
  - 2) Timber.
  - 3) Reinforced concrete (RC).
  - 4) Steel profiles.

Mutual connection of masonry units is established only in vertical direction by the connecting elements. All four types of connecting elements can be used for inner connection between masonry units. All four types, except the rubber type, of connecting elements can be used for connection between masonry units on the face of the masonry units.

Schemes of the kit and connecting elements are in Figure 1.1.1 and 1.1.2.

The product is not fully covered by the harmonised technical specification EN 771-3 because this harmonized standard only covers the masonry units alone, it does not cover the product defined in this EAD, which is the dry masonry wall, as a whole, made of this masonry units and the vertical connectors between them.

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.

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<sup>1</sup> All undated references to standards or to EADs in this EAD are to be understood as references to the dated versions listed in chapter 4.

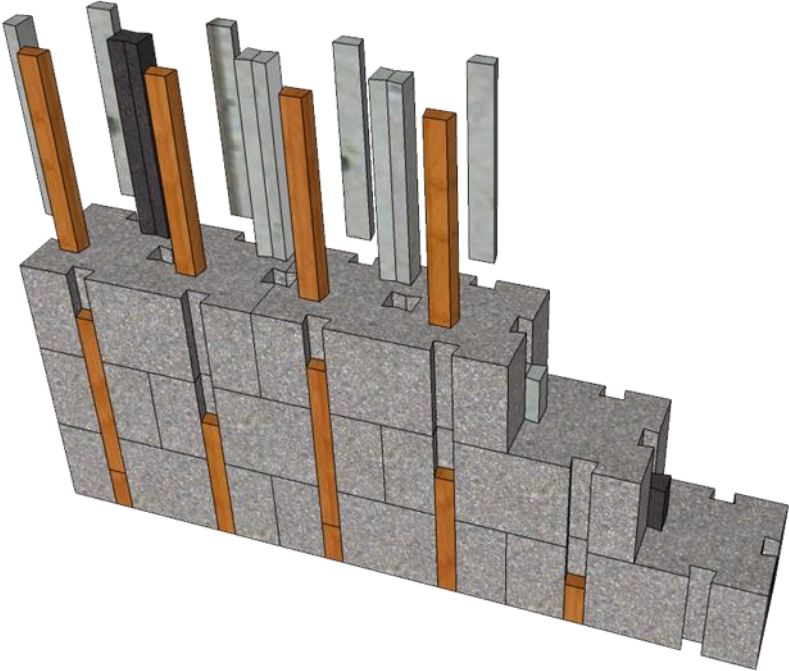


Figure 1.1.1 – General scheme of DMCS.

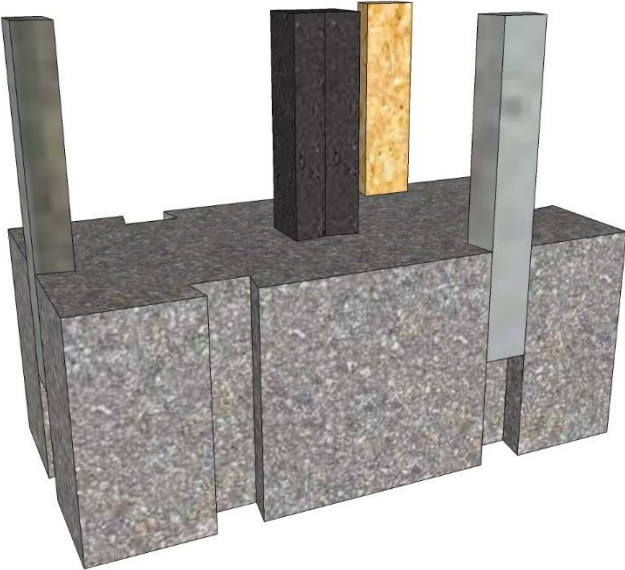


Figure 1.1.2 – Scheme of the masonry unit with vertical elements.

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

### **1.2.1 Intended use(s)**

DMCS is intended for use in supporting wall structures and in non-supporting wall structures in buildings for residential, administrative, social use, etc. Build-up is not limited with actual weather. In place with higher moisture, it is recommended to substitute wooden vertical elements with RC ones.

### **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 product for the intended use of 50 years when installed in the works (provided that the product 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 works<sup>2</sup>.

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.

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<sup>2</sup> 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 2.1.1 shows how the performance of DMCS is assessed in relation to the essential characteristics.

**Table 2.1.1 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
<b>Basic Works Requirement 1: Mechanical resistance and stability</b>			
1	Compressive strength	2.2.1	level
2	Flexural strength	2.2.2	level
3	Initial shear strength	2.2.3	level
<b>Basic Works Requirement 2: Safety in case of fire</b>			
4	Resistance to fire	2.2.4	class
5	Reaction to fire	2.2.5	class
<b>Basic Works Requirement 5: Protection against noise</b>			
6	Airborne sound insulation	2.2.6	level
<b>Basic Works Requirement 6: Energy economy and heat retention</b>			
7	Thermal conductivity	2.2.7	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.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant essential characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

### **2.2.1 Compressive strength**

Determination of compressive strength for DMCS shall be performed according to procedure described in EN 1052-1; clauses about mortar properties do not apply.

Geometry of test specimens shall be in accordance with EN 1052-1, clause 7.1, including cells for measurement of vertical deformation. Test specimen shall be described in detail in test report, including layout of vertical elements (see Annex A).

Results of mean compressive strength in MPa (as per EN 1052-1, clause 10) and characteristic compressive strength in MPa (as per EN 1052-1, clause 10) shall be stated in the ETA.

### **2.2.2 Flexural strength**

Determination of flexural strength for DMCS shall be performed according to procedure described in EN 1052-2; clauses about mortar properties do not apply.

Geometry of test specimens shall be in accordance with EN 1052-2, clause 7.1. Test specimen shall be described in detail in test report, including layout of vertical elements. For layout of vertical elements, Annex A is applicable. In accordance with EN 1052-2, clause 8.1, any of the two positions (vertical or horizontal) can be used.

Results of mean flexural strength in MPa (as per EN 1052-2, clause 10) and characteristic flexural strength in MPa (as per EN 1052-2, clause 10) shall be stated in the ETA.

### **2.2.3 Initial shear strength**

Determination of initial shear strength for DMCS shall be performed according to procedure described in EN 1052-3; clauses about mortar properties do not apply.

Geometry of test specimens shall be in accordance with EN 1052-3, clause 7.1. Test specimen shall be described in detail in test report, including layout of vertical elements. For layout of vertical elements, Annex A is applicable.

Results of mean shear strength in MPa (as per EN 1052-3, clause 10) and characteristic shear strength in MPa (as per EN 1052-3, clause 10) shall be stated in the ETA.



#### **2.2.4 Resistance to fire**

Resistance to fire classification procedure is described in EN 13501-2. For DMCS, resistance to fire classification using data from resistance to fire test shall be performed according to EN 13501-2, clause 7.3.2.

#### **2.2.5 Reaction to fire**

The DMCS shall be tested, using the method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The DMCS shall be classified according to the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

#### **2.2.6 Airborne sound insulation**

The airborne sound insulation shall be performed according to EN ISO 717-1.

Sound reduction index, as it is described in EN ISO 10140-2, clause 3.1, shall be obtained using laboratory measurement according to EN ISO 10140-2 (clause 6.2 shall be followed).

Expression of the results: value of weighted sound reduction index  $R_w$  in [dB] and the spectrum adaptation terms ( $C$ ;  $C_{tr}$ ) in [dB] shall be stated in the ETA in accordance with EN ISO 717-1, clause 5.

#### **2.2.7 Thermal conductivity**

Thermal conductivity of DMCS shall be determined according to EN 1745, clause 7. Influence of vertical elements shall be neglected. Clauses about mortar properties do not apply.

Expression of the results: value of thermal conductivity  $\lambda_{design,mas}$  in [ $W \cdot m^{-1} \cdot K^{-1}$ ] shall be 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 Commission Decision 97/740/EC.

The system is 2+ for category I masonry units according to EN 771-3, clause 3.1.19.

### 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.

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 for the manufacturer; cornerstones**

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b>					
1	Masonry units	EN 771-3, clause 5.2.1	EN 771-3, clause 5.2	EN 771-3, clause A.2	Each batch
2	Material type of connecting elements	Checking of supplier certificates or supplier tests	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan
3	Geometry (form and dimensions) of the connecting elements	Measuring and visual check	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan
4	Mechanical characteristics of the connecting elements	According to clause 3.4.1	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan
5	When relevant, organic content of components	Ash content / loss on ignition according to clause <b>Error! Reference source not found..</b>	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan	As defined in manufacturer's Control Plan

### 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 DMCS 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
<b>Initial inspection of the manufacturing plant and of factory production control</b>					
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 product.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
<b>Continuous surveillance, assessment and evaluation of factory production control</b>					
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 as indicated in Table 3.2.1	According to Control plan	According to Control plan	Once per year

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

#### **3.4.1 Mechanical characteristics of the connecting elements**

Mechanical characteristics of connecting elements depend on the material of the connecting elements.

- 1) For connecting elements made of rubber reinforced with steel rod, according to ISO 132, clauses 8 and 9.
- 2) For connecting elements made of timber, according to EN 384, clauses 5, 6 and 7.
- 3) For connecting elements made of reinforced concrete, according to EN 206, clauses 4, 5, 6 and 8.
- 4) For connecting elements made of steel profile, according EN 10025-2, clauses 7 and 8.

#### **3.4.2 Ash content or Loss on ignition**

For products which are inorganic, i.e., products containing a low percentage of organic compound, the test method shall be based on EN 13820.

For products which are organic, the test method shall be based on EN ISO 3451-1.

#### 4 REFERENCE DOCUMENTS

EN 206:2013 +A2:2021	Concrete – Specification, performance, production and conformity.
EN 384:2016 +A2:2022	Structural timber – Determination of characteristic values of mechanical properties and density.
EN 771-3:2011 +A1:2015	Specification for masonry units - Part 3: Aggregate concrete masonry units (Dense and light-weight aggregates).
EN 1052-1:1998	Methods of test for masonry - Part 1: Determination of compressive strength.
EN 1052-2:2016 +AC:2017	Methods of test for masonry - Part 2: Determination of flexural strength.
EN 1052-3:2002 +A1:2007	Methods of test for masonry - Part 3: Determination of initial shear strength.
EN 1745:2020	Masonry and masonry products - Methods for determining thermal properties.
EN 10025-2:2019	Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels.
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests.
EN 13501-2:2016	Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services.
EN ISO 717-1:2013	Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation.
EN ISO 10140-2:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation.
ISO 132:2017	Rubber, vulcanized or thermoplastic — Determination of flex cracking and crack growth (De Mattia).

## ANNEX A: LAYOUT OF VERTICAL ELEMENTS

Layout of vertical elements shall follow these recommendations (see Figure A.1):

- a) Slot 1 to be occupied by vertical elements made of reinforced concrete
- b) Slot 2 to be occupied by vertical elements made of timber
- c) Slot 3 to be occupied by vertical elements made of rubber

This recommendation of layout does not include fourth type of vertical element – steel profile – because it is used less often than the other types.

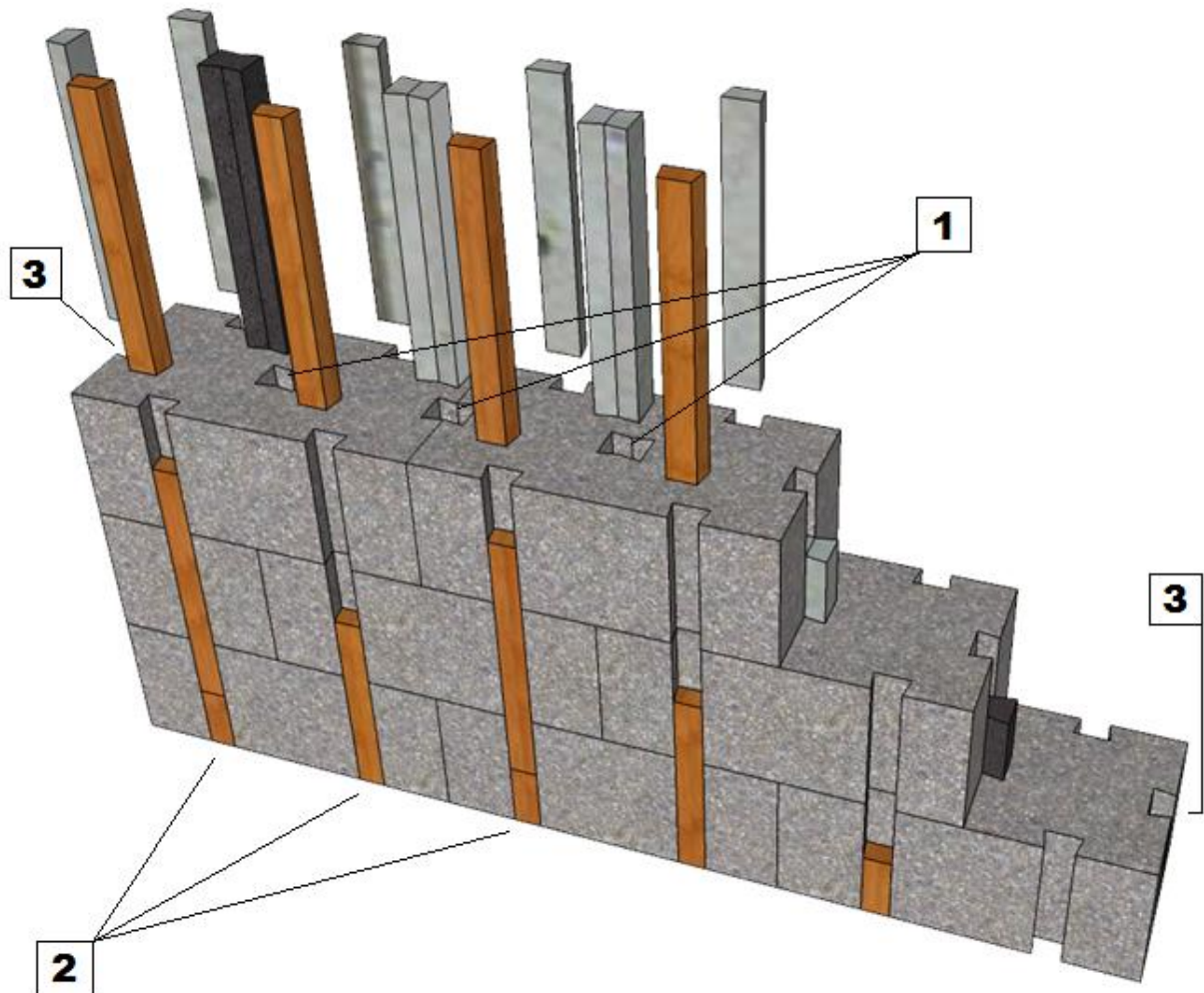


Figure A.1 – Recommendations for layout of the vertical elements in test specimens

*Slot 1: inner connection between masonry units*

*Slot 2: connection between masonry units on the face of masonry units.*

*Slot 3: side slot*