EUROPEAN ASSESSMENT DOCUMENT

EAD 340025-00-0403

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Substructure kit for heated buildings

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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

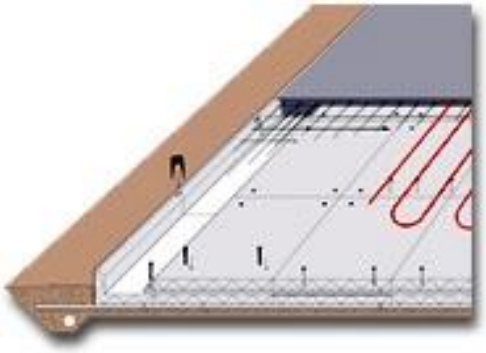
This EAD is applicable to substructure for heated buildings which are consisting of the following components:

- Prefabricated insulated edge elements consisting of insulation material with an external core of fibre reinforced cement-bounded render. The insulation is normally EPS according to EN 13163.
- Ground insulation made of EPS according to EN 13163.
- Reinforced concrete floor slab.
- Floor heating conduits (when applicable).

Concrete will be locally supplied. Dimensions and classes for the concrete will be specified in the design documentation for each individual work.

This EAD is also applicable to insulated edge elements as single products, provided that they are placed individually on the market for an intended use as a part of substructure kits for heated buildings within the scope of the EAD.

Principal sketch of the kit:



The product is not covered by a harmonised European standard (hEN).

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 Intended use(s)

This EAD covers the following intended uses and (assembled) systems:

Substructure kit for heated buildings, with or without integrated floor heating system.

The intended use for the kits is mainly residential buildings. The building kits may also be used for other applications when the performance requirements are about the same as for residential houses

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 substructure kits for heated buildings 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[1].

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 Edge element

Elements comprising a core of insulation material and an external skin.

[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 substructure kits for heated buildings is assessed in relation to the essential characteristics.

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
Basic Works Requirement 1: Mechanical resistance and stability			
1	Structural capacities	Clause 2.2.1	Description
2	Frost resistance	Clause 2.2.2	Description
Basic Works Requirement 2: Safety in case of fire			
3	Reaction to fire	Clause 2.2.3	Class
Basic Works Requirement 6: Energy economy and heat retention			
4	Thermal resistance	Clause 2.2.4	Description

Table 1a shows how the performance of the prefabricated insulated edge elements is assessed in relation to the essential characteristics.

Table 1a 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
Basic Works Requirement 1: Mechanical resistance and stability			
1	Bond strength	Clause 2.3.1	Level
2	Bond strength after ageing	Clause 2.3.2	Level
3	Frost resistance	Clause 2.3.3	Description
Basic Works Requirement 2: Safety in case of fire			
4	Reaction to fire	Clause 2.3.4	Class
Basic Works Requirement 3: Hygiene, health and the environment			
5	Water absorption	Clause 2.3.5	Level
Basic Works Requirement 6: Energy economy and heat retention			
6	Thermal resistance	Clause 2.3.6	Description

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the kit, Substructure kits for heated buildings

2.2.1 Structural capacities

The characteristics of structural materials and components related to mechanical resistance and stability should be specified in the ETA as simply as possible with regard to the needs of fulfilling national provisions.

The following option according to Guidance Paper L shall be used for the declaration of structural capacity:

- Method 3b: Reference to design documents produced and held by the manufacturer according to order for the works

This method is related to the situation where the design calculations are made case by case by the manufacturer according to order for the works.

Note:

Under this method the manufacturer is responsible for the structural design. Therefore, design calculation examples shall be presented by the manufacturer, demonstrating that the manufacturer is able to take the National Provisions applicable to the works into account in the design of the kit. The Approval Body shall check and validate the calculation (tools and results) used by the manufacturer to design the product, by judging and, if deemed appropriate, performing independent calculations for validation. The amount, extension and type of design calculation examples depend on the construction of the kit and are decided by the Technical Assessment Body.

Calculations of structural performance shall be based on EN 1992-1-1.
The following parts of EN 1992-1-1 are to be considered:
Clause 4.4.1, Table 4N.
Clause 5.1.2 (1) and (2).
Clause 6.1.
Clause 6.2.2.
Clause 9.8.2.
Clause 9.8.3.

The detailed structural analyses to verify the declared mechanical resistance and stability shall always be available to the approval body as part of the technical file for the ETA.

Supplementary calculations relevant for the resistance against seismic actions should be carried out according to the provisions in EN 1998-1.

Other information on capacities against seismic actions based on the various national determined parameters given in national annexes or other national regulations may be taken into account for the specific structural design for each individual works.

Assessment of the structural performance of the loadbearing structures shall consider deformations of the constructions.

The parameters used for calculation shall be declared, including special National Determined Parameters if such have been applied.

Verification of material and component durability shall be done as stated in the relevant technical specifications (hEN, ETA or EN) for each component.

For cases in which a structural component or kit is produced in accordance with the design details (drawings, material specifications, etc.) prepared by the designer of the works following the National Provisions, component hENs or ETAs shall provide, where relevant, that the information to accompany the CE marking with regard to the product properties can be given by making reference, in an unambiguous way, to the respective design documents of the works.

2.2.2 Damage due to frost

If the kit is intended to be used in areas with risk for damages due to frost, the risk shall be considered and clarified case-by-case according to ISO 13793.

The result of the assessment shall be included in the design documentation for each individual building.

2.2.3 Reaction to fire

The materials and components included in the kit shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

or

The materials and components included in the kit is considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire in accordance with the EC Decision 96/603/EC (as amended) without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

The materials and components included in the kit shall be classified according to EN 13501-1.

2.2.4 Thermal resistance

Thermal resistance (R-value) and the corresponding thermal transmittance (U value) of the substructure shall be calculated according to EN ISO 6946.

For insulation products, the declared thermal conductivity according to harmonized product standards or according to an ETA for a special insulation product shall be used for calculations. For other components the design thermal conductivity values for materials according to EN ISO 10456 can be used. Alternatively, the thermal resistance may be verified by testing according to EN ISO 8990.

The corresponding thermal transmittance shall be specified as the corrected thermal transmittance $U_c = U+\Delta U$ according to EN ISO 6946 Annex D, (D.1), where the correction term $\Delta U= \Delta U_g+\Delta U_f +\Delta U_r$ is calculated according to EN ISO 6946 Annex D (D.2).

Thermal resistance values for the substructure shall be declared as the total thermal resistance Rt in (m^2K/W), including the surface resistances.

2.3 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the kit, Prefabricated insulated edge elements

2.3.1 Bond strength

The bond strength test is performed on panels of the edge elements dried for at least 28 days. The temperature shall be between 10°C and 25°C and the relative humidity shall not be less than 50 %.
Five squares with appropriate sample size are cut through the render, according to Fig. 1,
using an angle grinder. Square metal plates of appropriate size are affixed to these areas with a suitable adhesive.
The Bond strength test (see Fig. 1) is performed at a tensioning speed of 10 ± 1 mm/minute.
The mean failure resistance is based on the results of five tests.
The individual and mean values are recorded and the results are expressed in N/mm2 (MPa).

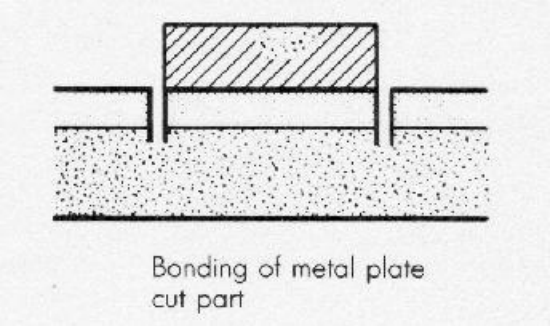


Figure 1 Bond strength test

2.3.2 Bond strength after ageing

Five squares with appropriate sample size are cut through the render, according to Fig. 1, using an angle grinder.

Heat - rain cycles:
The samples is subjected to a series of 80 cycles, comprising the following phases:
- heating to 70°C (rise for 1 hour) and maintaining at (70 ± 5)°C and 10 to 30% RH for 2 hours (total of 3 hours),
- spraying for 1 hour (water temperature (+ 15 ± 5)°C, amount of water 1 l/m² min),
- leave for 2 hours (drainage).

Heat-cold cycles:
After at least 48 hours of subsequent conditioning at temperatures between 10 and 25°C and a minimum relative humidity of 50 %, the samples are exposed to 5 heat/cold cycles of 24 hours comprising the following phases:
- exposure to (50 ± 5)°C (rise for 1 hour) and maximum 30% RH for 7 hours (total of 8 hours),
- exposure to (- 20 ± 5)°C (fall for 2 hours) for 14 hours (total of 16 hours).

The bond strength test is carried out according to clause 2.3.1 after the hygrothermal cycles and at least 7 days drying.

The individual and mean values are recorded and the results expressed in N/mm^2 (MPa).

2.3.3 Frost resistance

The freeze-thaw test shall be carried out as determined by the analysis of the water absorption test according to 2.3.5, i.e. shall be conducted except if the water absorption after 24 hours of edge element is less than 0,5 kg/m^2.
The test shall be carried out on three samples 500 mm x 500 mm of the edge element
These samples are prepared and then stored for at least 28 days at (23 ± 2)°C and (50 ± 5) % RH.
Cycles:
The samples are then subjected to a series of 30 cycles (one cycle lasts for 24 hours) comprising:
- Exposure to water for 8 hours at initial temperature of (23 ± 2)°C by immersion of the samples, render face downwards, in a water bath, by the method described in 2.3.5
- Freezing to (- 20 ± 2)°C (fall for 5 hours at the sample surface and for 2 hours in the conditioned air) for respectively 11 and 14 hours (total of 16 hours).

If the test is interrupted, because the samples are handled manually and there are stops during weekends or holidays, the samples shall always be maintained immersed in water between the cycles.
Remark:
The specified temperatures are measured at the surface of the samples. The regulation is obtained by conditioned air.

A bond strength test shall be performed in accordance with 2.3.1 on each sample submitted to freeze-thaw cycles.

The individual and mean values are recorded and the results expressed in N/mm^2 (MPa).

2.3.4 Reaction to fire

According to clause 2.2.2

2.3.5 Water absorption

This tests has 2 purposes, to determine:
- the water absorption
- whether the frost resistance test described in 2.3.3 is necessary.

Preparation of the samples:
Three samples are prepared by taking a piece of the edge element, at least 200 mm x 200 mm

The prepared samples are conditioned for at least 7 days at (23 ± 2)°C and (50± 5) % RH.
The edges of the samples, including the insulation product, are sealed against water, to ensure that during subsequent testing, only the face of the render is subject to water absorption.

The samples are then subject to a series of 3 cycles comprising the following phases:
- 24 h immersion in a water bath (tap water) at (23 ± 2)°C. The samples are immersed rendered face downwards, to a depth of 2 to 10 mm, the depth of immersion dependent upon surface roughness. To achieve complete wetting of rough surfaces, the samples shall be tilted as they are introduced into the water. The depth of immersion can be regulated in the water tank by means of a height-adjustable slat.
- 24 h drying at (50 ± 5)°C.

If interruptions are necessary, e.g. at week-ends or holidays, the samples are stored at (23 ± 2)°C and (50 ±)% RH after the drying at (50 ± 5)°C.
After the cycles, the samples are stored for at least 24 h at (23 ± 2)°C and (50 ± 5)% RH.

Test procedure:
To start the test the samples are again immersed in a water bath as described above.

The samples are weighed after 3 minutes immersion in the bath (reference mass) and then after 1 hour and 24 hours. Prior to the second and subsequent weighing, water adhering to the surface of the sample is removed with a damp sponge cloth.

Analysis of results:
Calculation is undertaken to determine the mean water absorption of the three samples per square metre after 1 and 24 hours.

The individual and mean values are recorded and the results expressed in kg/m^2.

2.3.6 Thermal resistance

According to clause 2.2.3

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: Decision 1999/94/EC(EU)]

The system(s) is (are): 2+

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 of the kit; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method*	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Design process product planning	I I, C			each design each new design
2	Control of raw materials and components conformity of the product (standard) optical damages dimensions especially verification of purchased components	I M	 size tolerances		each delivery where relevant
3	Handling of non-conforming products	I			
4	End control	I			each kit

* I = inspection by the person responsible for the process.
C = calculation by the person responsible for the process.
M = measurement by the person responsible for the process.
A = auditing (continuous surveillance, judgement, assessment).

Table 2a Control plan for the manufacturer of the prefabricated edge elements; 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)					
1	Control of raw materials and components - conformity of the product (standard) - optical damages - dimensions - especially verification of purchased components	I M	 size tolerances		each delivery where relevant
2	Handling of non-conforming products	I			
3	End control	I			each kit
4	Testing of samples	T**			if relevant

* I = inspection by the person responsible for the process.
C = calculation by the person responsible for the process.
M = measurement by the person responsible for the process.
A = auditing (continuous surveillance, judgement, assessment).

** Will be specified in the ETA and/or the manufacturers FPC plan.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the process of assessment and verification of constancy of performance for Prefabricated edge elements are laid down in Table 3.

The corner stones of the actions to be undertaken by the notified body in the process of assessment and verification of constancy of performance for Prefabricated edge elements are laid down in Table 3a.

Table 3 Control plan for the notified body for the kit; 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	Design process	I			
2	Control of raw materials and components	I			
3	Control of component production	I			
4	Handling of non-conforming products (incoming materials, own production)	I			
5	End control	I			
Continuous surveillance, assessment and evaluation of factory production control					
1	Implementation of FPC by the manufacturer	A			
2	Design process	A			
3	Control of raw materials and components	A			
4	Handling of non-conforming products (incoming materials, own production)	A			
5	End control	A			

* I = inspection.
A = auditing (continuous surveillance, judgement, assessment).

Table 3a Control plan for the notified body for the prefabricated edge elements; 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	Control of raw materials and components	I			
2	Control of component production	I			
3	Handling of non-conforming products (incoming materials, own production)	I			
4	End control	I			
Continuous surveillance, assessment and evaluation of factory production control					
1	Implementation of the FPC by the manufacturer	A			
2	Control of raw materials and components	A			
3	Handling of non-conforming products (incoming materials, own production)	A			
4	End control	A			

* I = inspection.
A = auditing (continuous surveillance, judgement, assessment).

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 1990	Eurocode - Basis of structural design
EN 1992-1-1	Eurocode 2: Design of concrete strucures - Part 1-1: General rules and rules for buildings
EN 1998-1	Eurocode 8 - Design of structures for earthquake resistance - Part 1: General rules, seismic actions and rules for buildings
ISO 13793	Thermal design of foundations to avoid frost heave
EN 13501-1	Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests
EN ISO 6946	Building components and building elements - Thermal resistance and thermal transmittance - Calculation method (ISO 6946)
EN ISO 8990	Thermal insulation – Determination of steady-state thermal transmission properties – Calibrated and guarded hot box (ISO 8990)
EN ISO 10456	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456)