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European Assessment Document for

Thermal insulation elements of fibre-reinforced polymer which form a thermal break between structural elements

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

The thermal insulation elements of fibre-reinforced polymer which form a thermal break between structural elements (in the following referred to as "the thermal insulation elements") are structural thermal break plates made from fibre-reinforced polymer.

The thermal insulation elements are bolted, through fixed or clamped between flanged connections of internal and external steelwork, or internal concrete and external steelwork.

See Figure 1.1.1 for a description of the product.

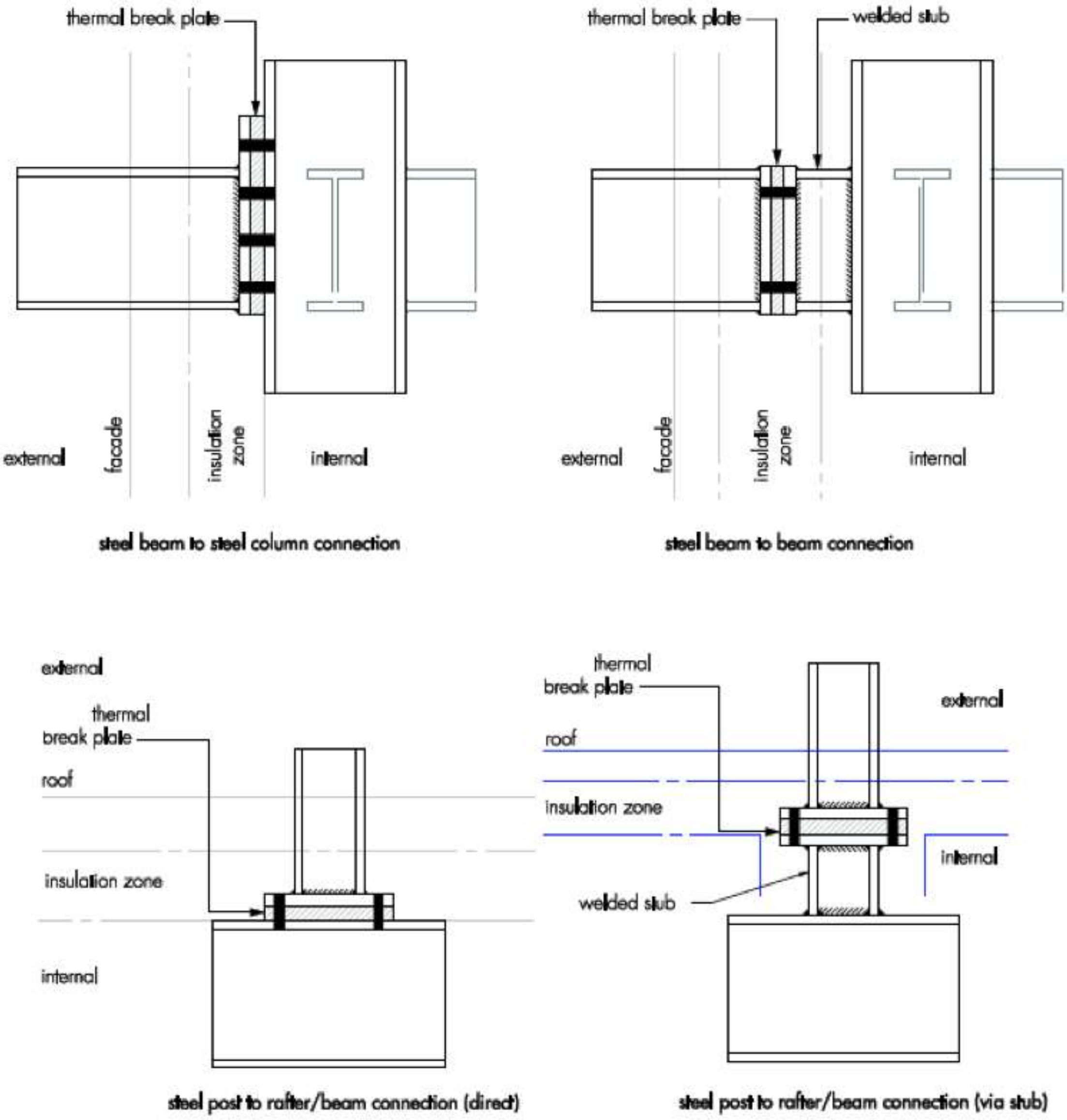


Figure 1.1.1 Examples of the thermal break

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)

The intended use of the thermal insulation elements is to reduce the thermal bridging between flanged connections of internal and external steelwork or internal concrete and external steelwork. The thermal insulation elements are intended to transmit only compressive forces arising from the structural action of the connection, whereas the thermal insulation element does not contribute to the overall load bearing capacity of the structure, which is established by the bolted, through fixed or clamped connections between the flanges. The compression strength and creep resistance is to ensure the thermal performance of the thermal insulation element during the estimated working life.

The element is subjected to static or quasi-static loads only and is not intended to resist shear or tensile force.

The element is not intended to be subjected to exposure from weathering/humidity.

Whilst the structure into which the thermal break material is incorporated can be both internal and external, the thermal break element itself shall always be protected from weathering as part of the thermal envelope (internal).

The products are used in the construction of new-build and refurbishment projects such balconies, façade system connections, brise-soleil and canopies, external access systems (staircases, balustrading, etc), roof plant room super-structure (columns), connections between new and existing construction, Building Maintenance Units (BMU).

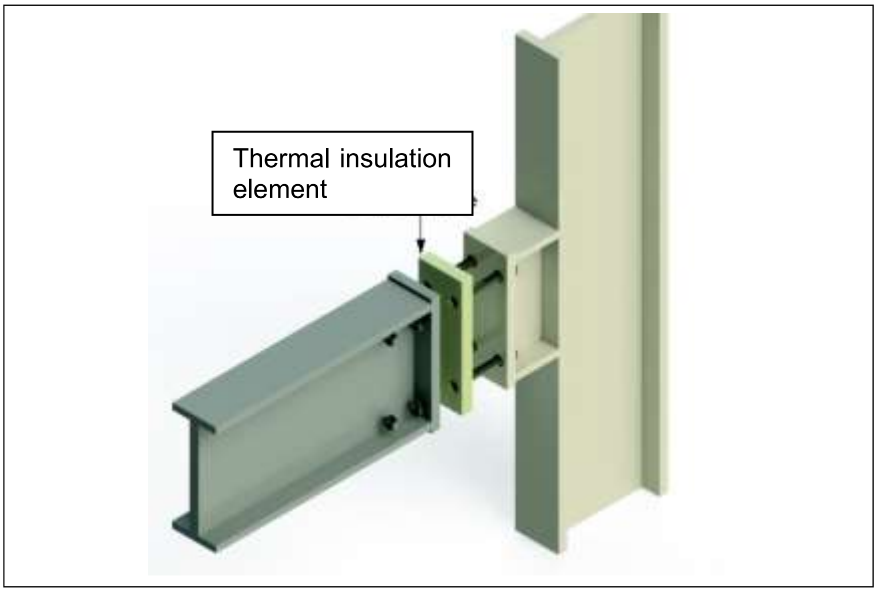


Figure 1.2.1.1 Example of intended use

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 thermal insulation elements of fibre-reinforced polymer which form a thermal break between structural elements 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 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

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

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the thermal insulation elements 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
Basic Works Requirement 2: Safety in case of fire			
3	Reaction to fire	2.2.1	Class
Basic Works Requirement 4: Safety in use			
1	Compressive strength and modulus of elasticity	2.2.2	Level f_{ck} [N/mm^2], E_k [N/mm^2]
2	Compressive creep	2.2.3	Level X [%]
Basic Works Requirement 6: Energy economy and heat retention			
4	Thermal conductivity	2.2.4	Level λ [W/mK]
Aspects of durability			
5	Flexural strength	2.2.5	Level σ_{fM} [MPa]
6	Water absorption	2.2.6	Leve W_{lt}, [%]

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 Reaction to fire

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

When the basis for the classification requires testing in accordance with EN 13823 (SBI test), the corner configuration described in EN 13823 is applied (short wall 495+/-5 mm long x 1500+/- 5 mm high; long wall 1000+/-5 mm long x 1500+/-5 mm high). The specimens shall be tested clamped between a frame manufactured from steel hollow sections 60x60x5 mm placed at the front and the Calcium Silicate boards butted up against the reverse face of the specimen with no air gap left between these boards and the testing specimen. The Calcium Silicate board shall be in accordance with EN 13238 (12±3) mm thick and (1000±5) mm long x (1500±5) mm high behind the long wall and (595±5) mm long x (1500±5) mm high behind the short wall.

The specimens shall be clamped between the steel frame and the calcium silicate board mechanically with steel elements with a distance of maximum 250 mm between these along the entire perimeter of both long and short wall specimens, so that no clamping elements protrude beyond the steel frame. A horizontal joint in the specimen at a height of (1200±5) mm from the bottom edge of the specimen shall be established by butting two elements together. See annex A for the test arrangement drawing.

The following product parameters shall be considered within the tests:

- Product variations of a product family (as defined by a certain combination of raw materials and a certain type of production process),
- Organic content – the variation with the highest organic content shall be tested,
- Density – to cover a range of different densities the highest as well as lowest one shall be tested,
- Thickness – to cover a range of different wall thickness the highest as well as lowest one shall be tested.

When the basis for the classification requires testing in accordance with EN ISO 11925-2, the tests shall be conducted with both surface exposure as well as edge exposure as prescribed by the test standard.

The class and corresponding field of application is stated in the ETA.

2.2.2 Compressive strength and modulus of elasticity

Based on their intended use, the thermal insulation elements shall resist compression forces arising from the pre-loading of the bolt assembly and the rotation of the flanged connecting element.

The compressive strength and modulus of elasticity shall be determined in accordance with EN ISO 604. Specimens shall be tested in the orientation which they are intended to be installed in the works. The specimens are prepared in sizes of 50 mm x 50 mm and shall be tested at an ambient temperature of 23±2°C, 50±3% relative humidity. The specimen shall be pre-loaded to 10N in accordance with clause 9.4 of EN ISO 604 to avoid a curved region at the start of the stress/strain curve. The test load shall be applied at a speed of 1 mm/minute to failure.

The 5 %-fractile with a confidence level of 75 % shall be indicated in the ETA for compressive strength, f_{ck} and modulus of elasticity, E_k, together with information about the orientation of the specimens.

2.2.3 Compressive creep

The products shall be assessed for loss of bolt preload or rotation of the supported element due to compressive creep. Products shall be tested in accordance with EN ISO 16534, with an applied stress equal to 0,15 to 0,35 x σ_m for 90 days, where σ_m is determined in accordance with clause 8.1.1 of EN ISO 29469. The applied stress level is used as default (other possibilities are permitted in addition as manufacturer may wish). At least three test specimens shall be made for each stress level with dimensions 50 mm x 50 mm x 25 mm and shall be conditioned for at least 24 hours at 23±2°C and 50±5% relative humidity. The relative creep deformation, X, in % shall be calculated in accordance with annex A of EN ISO 16534 and be given in the ETA.

2.2.4 Thermal conductivity

The value of the thermal conductivity of the structural thermal break material shall be tested in accordance with EN 12667 at a testing temperature of 10±2°C and relative humidity of (50 ± 10) % using the guarded hot plate in accordance with clause 5.2 of EN 12667.

This thermal conductivity shall be given in the ETA as the characteristic value, determined in accordance with clauses 5 of EN ISO 10456 as the mean value of the lambda value from at least 6 individual test results.

2.2.5 Flexural strength

Flexural strength shall be tested in accordance with EN ISO 14125 using method A (three-point deflection), and ambient test conditions of 23±2°C and 50±3% relative humidity and the specimens shall be conditioned as described below:

- Two-hour water boil – to check the laminate quality as hydrolysis of the glass reinforcement can occur in poor laminates, reducing the life expectancy of the product,
- Heat ageing - two sets of specimens aged for 50 days and 100 days at 80˚C.

The flexural strength, σ_{fM}, shall be stated in the ETA in MPa.

2.2.6 Water absorption

The water absorption shall be tested in accordance with EN ISO 16535, method 2A on four test specimens with dimensions 200 x 200 x 30 mm. The long-term water absorption by total immersion expressed in volume percent, W_{lt}, 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 98/214/EC, as amended by Decision 2001/596/EC.

The system to be applied is 2+.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the thermal insulation elements in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

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
Factory production control (FPC)					
Primary materials					
1	Incoming materials	According to relevant specification	To be specified in control plan	All incoming materials	Every delivery
Manufactured product					
2	Density	3.4.1	To be specified in control plan	1	Each batch or 1 per 24 h
3	Main dimensions	3.4.2	To be specified in control plan	1	Each batch or 1 per 24 h
4	Reaction to fire	2.2.1	To be specified in control plan	1	1 per 2 years direct testing
5	Compressive strength and modulus of elasticity	2.2.2	To be specified in control plan	1	2 per year
6	Thermal conductivity	2.2.4	To be specified in control plan	1	1 per 1 years
7	Flexural strength	2.2.5	To be specified in control plan	1	2 per year

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 thermal insulation elements are laid down in Table 3.3.1.

Table 3.3.1 Tasks of the notified body under AVCP system 2+

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				
The Notified Body will ascertain that the factory production control with the staff and equipment is suitable to ensure a continuous and orderly manufacturing.	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
Continuous surveillance, assessment and evaluation of factory production control				
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	1/year

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

3.4.1 Density

The apparent density of the product is determined in accordance with EN ISO 29470.

3.4.2 Dimensions

Dimensions of the products shall be measured in accordance with EN ISO 29465 (width and length), EN ISO 29466 (thickness), EN 824 (squareness) and EN ISO 29468 (flatness).

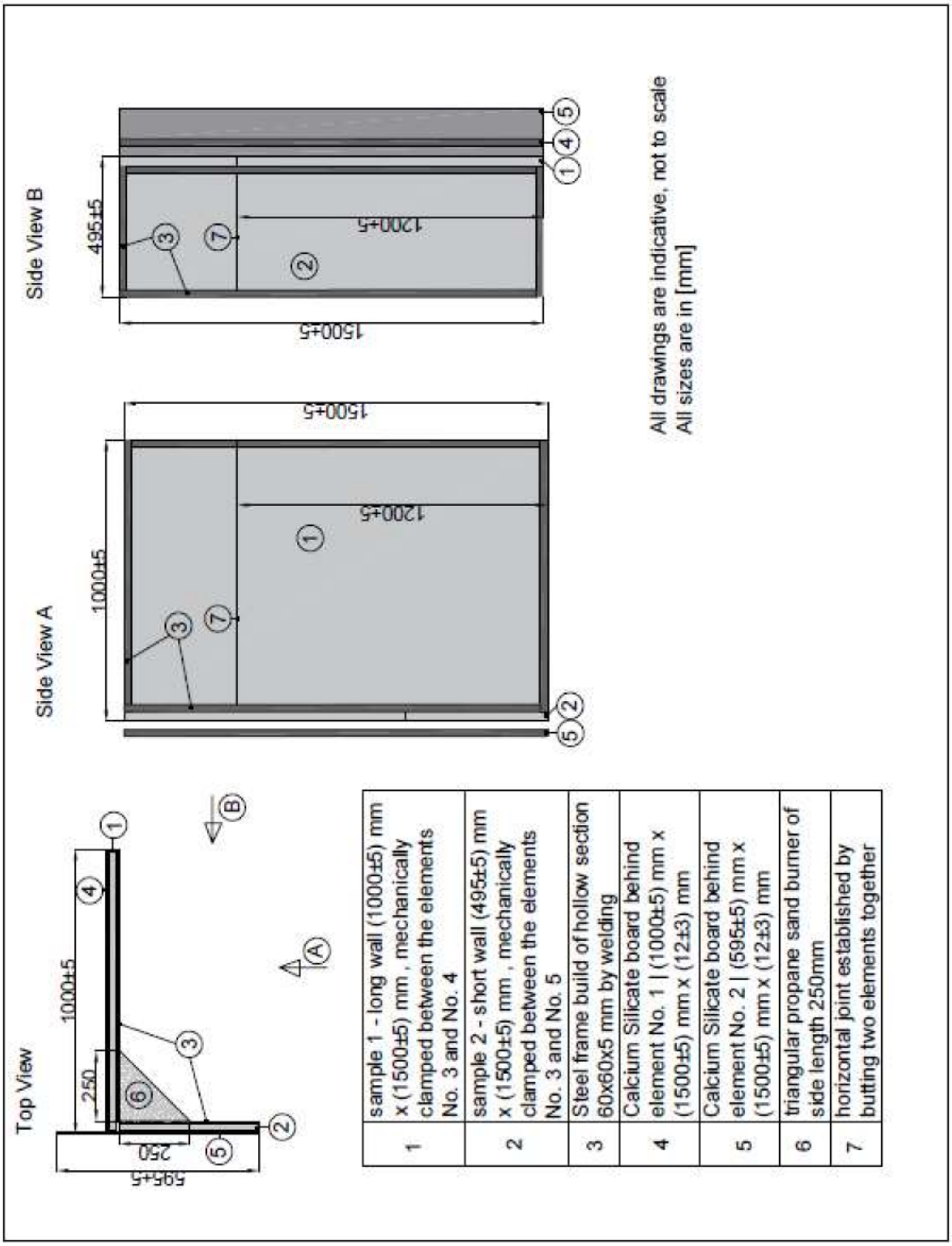
4 REFERENCE DOCUMENTS

EN ISO 29465:2022	Thermal insulating products for building applications — Determination of length and width
EN ISO 29466:2022	Thermal insulating products for building applications — Determination of thickness
EN 824:2013	Thermal insulating products for building applications — Determination of squareness
EN ISO 29468:2022	Thermal insulating products for building applications — Determination of flatness
EN 12667:2001	Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance
EN 13238:2010	Reaction to fire tests for building products – Conditioning procedures and general rules for selection of substrates
EN 13501-1:2018	Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests
EN ISO 604:2003	Plastics — Determination of compressive properties (ISO 604:2002)
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+Cor1:2009)
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 14125:1998+AC:2002+A1:2011	Fibre-reinforced plastic composites – Determination of flexural properties (ISO 14125:1998+Cor1:2001+Amd1:2011)
EN ISO 16534:2020	Thermal insulating products for building applications — Determination of compressive creep (ISO 16534:2020)
EN ISO 29469:2022	Thermal insulating products for building applications – Determination of compression behaviour
EN ISO 16535:2019	Thermal insulating products for building applications – Determination of long-term water absorption by immersion (ISO 16535:2019)
EN ISO 29470:2020	Thermal insulating products for building applications — Determination of apparent density (ISO 29470:2020)

ANNEX A MOUNTING AND FIXING DETAILS FOR THE SBI TEST

Figure A.1 Total view of the exposed surface of the long wing

Figure A.2 Close up view of the vertical outer edge of the long wing at a height of 500 mm



1	sample 1 - long wall (1000±5) mm x (1500±5) mm , mechanically clamped between the elements No. 3 and No. 4
2	sample 2 - short wall (495±5) mm x (1500±5) mm , mechanically clamped between the elements No. 3 and No. 5
3	Steel frame build of hollow section 60x60x5 mm by welding
4	Calcium Silicate board behind element No. 1 | (1000±5) mm x (1500±5) mm x (12±3) mm
5	Calcium Silicate board behind element No. 2 | (595±5) mm x (1500±5) mm x (12±3) mm
6	triangular propane sand burner of side length 250mm
7	horizontal joint established by butting two elements together

Figure A.3 Detailed description of the test specimen