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## European Technical Assessment

**ETA-14/0283**  
of 31.07.2014

English version prepared by ZAG

### I GENERAL PART

Komercialno ime  
*Trade name*

**Energy Plus System**

Imetnik tehnične ocene  
*Holder of Technical Assessment*

**ENERGY PLUS SYSTEM GmbH**  
**Katharina-Pieslinger-Weg 33**  
**AT-4030 Linz**  
**Austria**

Družina proizvoda

*Product family*

34: Sistem izgubljenega opaža **Energy Plus System**" iz EPS elementov in jeklenih spojinikov za gradnjo zunanjih in notranjih nosilnih in predelnih sten

34: *Non - load bearing permanent shuttering kit "Energy Plus System" based on shuttering elements of EPS with steel spacers*

Proizvodni obrat  
*Manufacturing plant*

**Obrat 1, Obrat 2**  
*Plant 1, Plant 2*

Ta Evropska tehnična ocena vsebuje  
*This European Technical Assessment contains*

23 strani vključno z 11 prilogami, ki so sestavni del te tehnične ocene.

*23 pages including 11 annexes which form an integral part of the document.*

Ta Evropska tehnična ocena je izdana na podlagi Uredbe (EU) št. 305/2011 na osnovi

*This European Technical Assessment is issued in accordance to Regulation (EU) No 305/2011, on the basis of*

Smernice za evropska tehnična soglasja ETAG 009, izdaja junij 2002, ki se uporablja kot EAD

*Guideline for European Technical Approval ETAG 009, edition June 2002, used as EAD*

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## II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

### 1 Technical description of the product

#### 1.1 Definition of product

The "ENERGY PLUS SYSTEM" is a non-load-bearing permanent shuttering system based on EPS-leaves connected with steel spacers and accessory parts applicable as formwork for plain, reinforced concrete walls and concreting.

The shuttering elements are generally used for external load-bearing walls as well as for internal load-bearing walls. The thickness of the inner shuttering leaves is always 50 mm and the thickness of the outer shuttering leaves is 50, 100, 200 and 300 mm. The elements with inner and outer shuttering leaves of 50 mm thickness could be applied as internal walls.

The thickness of the concrete core is 150 and 200 mm. Concrete (EN 206-1:2000/A2:2005) for concreting the concrete core is not part of the shuttering system "ENERGY PLUS SYSTEM".

Finishes are not part of the shuttering system "ENERGY PLUS SYSTEM".

#### 1.1.1 The shuttering elements

The shuttering elements consist of inner and outer shuttering leaves and steel spacers which connect both leaves. These elements are fit together on site (to block) and create formwork. The shuttering EPS leaves are made from expanded polystyrene (EPS) and are moulded. They are available in thicknesses of 50, 100, 200 and 300 mm. The length of the normal shuttering leaves is 900 mm and the height is 265 mm. The density of the EPS for the leaves with thickness of 50 mm is 32 kg/m<sup>3</sup> and a density of the leaves with thickness more than 50 mm is 27.5 kg/m<sup>3</sup>.

*Table 1: Wall thickness and thickness of the shuttering elements (leaves)*

Block type	Overall thickness of the wall (mm)	Thickness of EPS leaves (mm)		Thickness of concrete core $t_c$ (mm)
		Inner $t_i$	Outer $t_o$	
e+ 250 Block (15)	250	50	50	150
e+ 300 Block (15)	300	50	100	150
e+ 400 Block (15)	400	50	200	150
e+ 500 Block (15)	500	50	300	150
e+ 300 Block (20)	300	50	50	200
e+ 350 Block (20)	350	50	100	200
e+ 450 Block (20)	450	50	200	200
e+ 550 Block (20)	550	50	300	200

### **1.1.2 Steel-spacers (connectors)**

The spacers are made of steel. A form of spacers is shown in Annexes 3 and 4.

### **1.1.3 Accessory elements**

Accessory elements are also part of the kit. They are made as special elements with density of 27.5 kg/m<sup>3</sup> according to EN 13163:2012.

#### **1.1.3.1 End leaves**

End leaves are used to ensure a proper sealing of the end of the shuttering elements. End leaves are inserted into the gap between the inner and outer shuttering leaves at the end of the shuttering elements at openings (windows, doors,...). Before concreting the end leaves shuttering elements shall not be supported.

#### **1.1.3.2 Lintel bottom leaves**

Lintel bottom leaves are put in the gaps between the shuttering leaves above the window, door or other openings. Before concreting the lintel bottom leaves shall be supported. The supports may only be removed after the concrete has hardened sufficiently.

## **2 Specification of the intended use(s) in accordance with the applicable EAD**

### **2.1 Intended use**

The shuttering kit is intended to be used for construction of internal walls as well as external walls above or below ground which are load-bearing (structural) or non-load-bearing (non-structural), including those which are subjected to fire regulations.

When using this type of construction below ground a waterproofing according to applicable national rules shall be provided depending on whether ground water not exerting pressure or ground water exerting pressure is to be dealt with. The waterproofing shall be protected from mechanical damage by a smash-resistant protective layer.

According to EOTA TR 034 the following use categories apply:

- Category IA 2: Product with no direct contact to (e. g. covered products) but possible impact on indoor air.
- Category S/W 2: Product with no direct contact to but possible impact on soil, ground and surface water.

The provisions made in this European technical assessment are based on an assumed working life of the shuttering kit of 50 years, provided that the conditions laid down in sections 3.1 and 3.2 for the packaging, transport, storage, installation, use, maintenance and repair are met.

The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer or the assessment body. They are to be regarded only as a means for the specifiers to choose the appropriate criteria for shuttering kits in relation to the expected economically reasonable working life of the works.

For the intended use it is essential to protect this type of construction against the effects of adverse weather conditions.

### **2.2 General assumptions**

#### **2.2.1 Manufacturing**

The shuttering elements are manufactured in accordance with the provisions of the European technical assessment using the automated manufacturing process as identified during the inspection of the plant by Slovenian National Building and Civil Engineering Institute (ZAG) and the approved body and laid down in the technical documentation.

The European technical assessment is issued for the product on the basis of agreed data/information, deposited with the Slovenian National Building and Civil Engineering Institute (ZAG), which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to the Slovenian National Building and Civil Engineering Institute (ZAG) before the changes are introduced. The Slovenian National Building and Civil Engineering Institute (ZAG) will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alternations to the ETA, shall be necessary.

## **2.2.2 Installation**

### **2.2.2.1 General**

The manufacturer shall ensure that the requirements in accordance with sections 1, 2, and 3 are made known to those involved in planning and execution. The installation guide is deposited with Slovenian National Building and Civil Engineering Institute (ZAG) and shall be present at every construction site. If the manufacturer's instructions contain provisions which differ from those stated here, the specifications of the ETA shall apply.

After installation of the shuttering elements (see clause 2.2.2.2) only the ready mixed concrete according EN 206-1 is brought in and compacted (see clause 2.2.2.3). In end use conditions concrete walls of a continuous type<sup>1</sup> of plain or reinforced concrete will be formed according to EN 1992-1-1 or according to corresponding national regulations. In end use conditions the EPS-shuttering leaves are the main part of the thermal insulation of the walls.

### **2.2.2.2 Installation of the shuttering elements**

The shuttering elements are put together on site in layers without mortar or adhesive. It is important to ensure that the wire spacers are aligned one above the other (except in the row 2, see annexes 8 and 9). The wire spacers are either assembled on site.

The first layer of shuttering elements in the contact with base (plate) is shown in annex 7. Detailed instructions is shown to the installation guide of the ETA holder.

Afterwards levelling to the subsoil is performed (foundation, bottom plate, and slabs). Voids between the shuttering leaves and the uneven subsoil shall be sealed with PU foam before concreting.

Subsequently, according to the installation guide of the ETA holder, the walls shall be interlocked to floor height, levelled and fastened by special spacer, see Annex 4.

The supporting system for stabilization and concreting shall be arranged at a distance of 1.00 m to maximum 1.25 m, to be connected over the entire wall height with the shuttering elements and to be fastened to the floor (basement).

The necessary reinforcement according to the structural analysis shall also be installed in an appropriate way.

Corner joint shall be formed according to Annex 8 and the "T" joint shall be formed according to Annex 9.

The values of thermal resistance respectively thermal conductivity shall be laid down according to the relevant national technical regulation.

Further information is given in the installation manual.

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<sup>1</sup> see ETAG 009 chapter 2.2

### **2.2.2.3 Concreting**

For the production of normal concrete with a minimum compressive strength class C20/25 EN 206-1 shall apply. The consistency of concrete on compacting by shaking shall be within the lower consistency range F3 and on compacting by poking within the upper consistency range F3. The maximum aggregate size shall not exceed 16 mm. The concrete shall have rapid or middle strength development according to EN 206-1, Table 12.

Placing the concrete shall be performed only by persons who were instructed in the functions and in the proper handling of the shuttering system.

Placing the concrete shall be performed in layers of 1.00 m at a maximum vertical concreting rate of 1 m/h.

With regard to the admissible tolerances the requirements and provisions applicable in the Member States where the building shall be executed as well as the manufacturer's information shall be taken into account.

If equivalent national rules are not available the following instructions shall be considered:

Horizontal day joints shall be arranged preferably at the height of the floor. If day joints can not be avoided within the height between the floors, vertical composite reinforcement bars shall be installed. The composite reinforcement shall comply the following requirements:

- Two adjacent composite reinforcement bars shall not be situated in the same plane parallel to the surface of the wall.
- The distance between two composite reinforcement bars in the direction of the wall shall be at least 15 cm and not larger than 50 cm.
- The total section area of the composite reinforcement bars shall not be less than 1/2000 of the section area of the concrete.
- Anchorage length of the composite reinforcement bars on both sides of the day joint shall at least be 20 cm.

Before the further placing of concrete, cement laitance and detached / loose concrete shall be removed and the day joints shall be sufficiently pre-wetted. At the time of concreting the surface of the older concrete shall be slightly moist, so that the cement paste of the newly brought in concrete can bond well with the older concrete.

If no day joint is planned, placing of the concrete in layers may only be interrupted until the concrete layer brought in last is not solidified yet, so that a good and even bond is still possible between the two concrete layers. When using suitable internal vibrators care shall be taken that the vibrating cylinder can still penetrate the already compacted lower concrete layer.

The concrete may fall freely only up to a maximum height of 2.0 m, beyond that the concrete shall be placed by discharge pipes or concreting tubes with the outer diameter of 100 mm (80 mm for concrete wall thickness of 150 mm) at the most and shall be led directly to the place of installation.

Cones from pouring shall be avoided by short distances of the places of fill in.

Planning shall allow for sufficient spaces in the reinforcement for discharge pipes or concreting tubes.

After concreting, the inclination of walls shall be according to standard EN 13670:2009.

The floor slab may only be placed on walls made of shuttering elements if a sufficient strength of the infill concrete has been reached.

### **2.2.2.4 Ducts crossing and situated inside the wall**

Horizontally passing ducts shall be installed according to the installation guide of the ETA holder and shall be taken into account when designing the wall.

Horizontal ducts situated inside the wall cores shall be avoided. If absolutely necessary, these shall be taken into account when designing the wall.

Also, vertical ducts in the concrete core shall be considered, if their diameter exceeds 1/6 of the thickness of the concrete core and the distance of the pipes is less than 2.0 m.

### **2.2.2.5 Reworking and finishes**

Walls of the type "ENERGY PLUS SYSTEM" shall be protected by finishes (e. g. rendering, plasters, cladding, panelling, coatings). Finishes are not part of the kit and therefore not considered in this ETA. Preferably, for external surfaces the used rendering systems should meet the requirement of ETAG 004. The cladding respectively panelling or their substructures shall be anchored in the concrete core. The execution of the rendering shall be performed according to applicable national rules.

The protection by finishes should be implemented preferably within one month after erecting the structural structure, because of the detrimental influence of weather and UV-radiation on the surface of the EPS-leaves.

### **2.2.2.6 Fixing of objects**

Fixing of objects in the shuttering leaves is not possible. The part of fixings which is relevant for the mechanical resistance shall be in the concrete. The influence of the fixing to the reduction of the thermal resistance has to be considered according to EN ISO 6946.

## **3 Performance of the product and references to the methods used for its assessment**

### **3.1 Performance of the product**

#### **3.1.1 Shuttering elements**

The shuttering elements (leaves) are used according to drawings given in the Annexes 7 to 9. The characteristic dimensions of the standard shuttering elements are given in the tables of Annex 1.

The shuttering system consists of the:

- Standard and corner shuttering elements (Annexes 1 and 2),
- Steel spacers (see 2.1.2 and Annexes 3 and 4)

For the shuttering leaves, expanded polystyrene (made of NEOPOR ® 2400 by BASF) EPS-EN 13163-T(1)-L(2)-W(2)-S(2)-P(5)-BS200-DS(N)5-DS(70,-)1-TR100 according to EN 13163:2012 is used.

The bending strength of the EPS leaves shall be more than 200 kPa (BS200) measured according to EN 12089:1997. The relative changes in length, width and thickness under specified temperature and humidity conditions (measured according EN 1604:2013) shall not exceed more than 1 % after exposing them for 48 h at 70 °C (DS(70,-)1, according to EN 13163:2012).

The density of the EPS for the leaves with thickness of 50 mm is 32 kg/m<sup>3</sup> and a density of the leaves with thickness more than 50 mm is 27.5 kg/m<sup>3</sup>. The declared value of thermal conductivity is  $\lambda = 0.031$  W/mK measured according to EN 12667:2001 and EN 12939:2000. The material characteristics, dimensions and tolerances of the shuttering elements not indicated in Annex 1 are given in the technical documentation<sup>2</sup> of the ETA.

#### **3.1.2 Steel spacers**

The nominal diameter of the spacers made of steel wire see Annex 3 and 4 shall be at least 4 mm.

The tensile strength of the wire spacers shall be at least 400 MPa. The characteristic (5%-fractile) pull-out strength between spacers and the EPS shuttering leaves shall be at least 355 N.

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<sup>2</sup> The technical documentation of this European Technical Assessment is deposited at the Slovenian National Building and Civil Engineering Institute (ZAG) and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over the approved bodies.

### **3.1.3 Accessory parts**

#### **3.1.3.1 End leaves**

End leaves are made of EPS (density 27.5 kg/m<sup>3</sup>) with a thickness of 50 mm and a height of 265 mm. The width is 150 mm and 200 mm, depending of the thickness of the concrete core.

#### **3.1.3.2 Lintel bottom leaves**

Lintel bottom leaves are made of EPS (density 27.5 kg/m<sup>3</sup>) with a height of 85 mm and a length of 900 mm. The width is between 150 mm and 200 mm, depending of the thickness of the concrete core.

### **3.2 Methods of verification**

#### **3.2.1 General**

The assessment of the fitness of the shuttering system for the intended use has been made in compliance with ETAG 009 (used as EAD), Guideline for European technical approval of "Non load bearing permanent shuttering kits/systems based on shuttering elements or blocks of insulating materials and sometimes concrete", edition June 2002.

The ETA is issued for the shuttering kit "ENERGY PLUS SYSTEM" on the basis of agreed information, deposited with Slovenian National Building and Civil Engineering Institute (ZAG), which identifies the shuttering kit that has been assessed and evaluated. Changes to the production process, the kit or the components which could result in this deposited information being incorrect, shall be notified to ZAG before the changes are introduced. ZAG will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA, and, if so, whether further assessment and/or alterations to the ETA shall be necessary.

#### **3.2.2 Mechanical resistance and stability (BWR 1)**

##### **3.2.2.1 Resulting structural pattern**

In end use conditions walls made with shuttering elements "ENERGY PLUS SYSTEM" are walls of a continuous type according to ETAG 009, chapter 2.2.

##### **3.2.2.2 Efficiency of filling**

Considering the instructions of chapter 3.2 and the installation guide of the ETA holder, the efficient filling without bursting of the shuttering and without voids or any uncovered reinforcement in the concrete core is possible.

The requirements according to ETAG 009, chapter 6.1.2 are met satisfactorily.

##### **3.2.2.3 Possibility of steel reinforcement**

The instructions in the installation guide of the ETA holder are appropriate to install steel reinforcement for walls according to EN 1992-1-1:2004/AC:2008 or corresponding national rules.

The requirements according to ETAG 009, chapter 6.1.3 are met satisfactorily.

#### **3.2.3 Safety in case of fire (BWR 2)**

##### **3.2.3.1 Reaction to fire of the shuttering elements from polystyrene**

Shuttering elements "ENERGY PLUS SYSTEM" made of expanded polystyrene (EPS) fulfill the requirement of class E according to EN 13501-1:2007+A1:2009.

### 3.2.3.2 Resistance to fire

The fire resistance can be determined according to annex C of the ETAG 009, therefore there are no tests conducted in order to determine the fire resistance of the walls erected using the shuttering elements.

The walls have to be exposed to the fire on only one side.

According to annex C, Table 1 of the ETAG 009, first column for the continuous type system, walls made of shuttering elements with a concrete core thickness of 150 mm or more, meets the criteria of **REI 120** for load bearing walls respectively **EI 120** for non-load bearing walls (see dimensions of concrete core in annex to draft of ETA).

The aforementioned classification of the shuttering elements is only valid, when the following assumption shall be fulfilled according to annex C of the ETAG 009.

- The strength of concrete shall be between the range of C16/20 and C50/60 according to standard EN 206-1. In lack of availability of European standard EN 206, alternatively a concrete according to national rules, valid in the place of use, with a compressive strength which fits in the interval given above, is also considered as appropriate.
- A normal weight concrete as defined in EN 206-1 or EN 1992-1-1. As far as European standards EN 206-1 or EN 1992-1-1 are not in force, an equivalent concrete according to national rules, valid in the place of use, is acceptable.
- The design has to take into consideration the secondary effects of fire. Especially constraints, introduced by thermal strain, should be sufficiently low and appropriate building joints should be foreseen. The rules, valid in place of use, govern. Structural requirements on work in normal conditions, valid in the place of use, may require larger dimensions. Concrete cover for the reinforcement has to be observed according to the rules valid in the place of use.

**Note:** The classifications of the walls constructed with the shuttering system "ENERGY PLUS SYSTEM" regarding to fire resistance are valid only for walls without openings (for windows or doors for examples).

### 3.2.4 Hygiene, health and the environment (BWR 3)

#### 3.2.4.1 Content and/or release of dangerous substances

The chemical composition of the shuttering system/kit must be in accordance with the deposited version by ZAG<sup>3</sup>. Content (w/w) of HBCDD in EPS is  $\leq 1.5\%$ .

**Note:** The shuttering elements made of expanded polystyrene contain a substance included in Annex XIV of the Regulation (EC) No 1907/2006 (REACH).

#### 3.2.4.2 Water vapour permeability

The tabulated value of the water vapour diffusion resistance coefficient of expanded polystyrene (EPS), according to EN ISO 10456:2007/AC:2009 is  $\mu = 60$ .

Using this value to verify the annual moisture balance or the maximum amount of interstitial condensation according to EN ISO 13788:2012 will be on the safe side.

The design values for the water vapour diffusion resistance factor of concrete depending on density and type are tabulated in EN ISO 10456 (Table 3).

#### 3.2.4.3 Water absorption

The requirements according to ETAG 009, chapter 6.3.3 are met satisfactorily.

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<sup>3</sup> In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU CPR, these requirements need also to be complied with, when and where they apply."



#### 3.2.4.4 Water tightness

The "No characteristic assessed" option is used.

### 3.2.5 Safety in use (BWR 4)

#### 3.2.5.1 Bond strength and resistance to impact load

Under end use conditions the EPS shuttering leaves are durable fixed by wire spacers. The bond strength is at least equal to the resistance of the EPS shuttering leaves against the pressure of fresh concrete, furthermore the vertical element-high dovetail grooves on the inside face of each EPS shuttering leaf provide a mechanical interlock between EPS shuttering leaves and concrete core.

Concrete walls (without consideration of the finishes), erected with shuttering system "ENERGY PLUS SYSTEM" and designed according EN 1992-1-1 respectively in lack of availability of EN 1992-1-1 according national design rules, lead to the assumption that concrete infill insures an adequate resistance of the complete wall under normal used impact loads. Resistance to impact load of shuttering elements in end use conditions according ETAG 009, chapter 5.4.1.4 is not assessed, because finishes are not part of "ENERGY PLUS SYSTEM".

#### 3.2.5.2 Resistance to filling pressure

To resist the filling pressure the bending strength of the EPS-shuttering leaves shall be more than 200 kPa (BS200).

The tensile strength of the wire spacers shall be at least 400 MPa and the characteristic (5%-fractile) pull-out strength between spacers and EPS-shuttering leaves shall be at least 355 N. The requirements according to ETAG 009, chapter 6.4.2 are met satisfactorily.

#### 3.2.5.3 Safety against personal injury by contact

Delivered on site, the shuttering elements do not have sharp or cutting edges.

Because of the soft surface of the shuttering leaves there is no risk of abrasion or of cutting people.

The requirements according to ETAG 009, chapter 6.4.3 are met satisfactorily.

### 3.2.6 Protection against noise (BWR 5)

#### 3.2.6.1 Airborne sound isolation

The "No characteristic assessed" option is used.

#### 3.2.6.2 Sound absorption

The "No characteristic assessed" option is used.

### 3.2.7 Energy economy and heat retention (BWR 6)

#### 3.2.7.1 Thermal resistance

Assuming a minimal declared value of thermal conductivity of  $\lambda = 0.031$  W/mK, see clause 2.1.1, for the expanded polystyrene and for concrete infill of  $\lambda = 2.3$  W/mK (according to EN ISO 10456) the values of declared thermal resistance of the shuttering elements have been determined by numerical calculations. Table 2 gives some declared values of thermal resistance  $R_D$ . In the calculation of the total thermal transmittance the thickness of the inner EPS leave 50 mm is used and 26 steel wire spacers per 1 m<sup>2</sup> of the wall have been taken into account.

Table 2: Thermal resistance  $R_D(m^2K/W)$  of the wall at different thicknesses of outer EPS leaves

Thickness of concrete core (mm)	Thickness of outer EPS leave (mm)			
	50	100	200	300
150	2.749	4.364	7.569	10.788
200	2.770	4.384	7.591	10.813

### 3.2.7.2 Influence of moisture transfer on insulating capacity of wall

The requirements according to ETAG 009, chapter 6.6.2 are met satisfactorily.

### 3.2.7.3 Thermal inertia

The values of heat capacity of concrete and expanded polystyrene are tabulated in EN ISO 10456.

### 3.2.8 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was investigated for this product.

### 3.2.9 Aspects of durability and serviceability

#### 3.2.9.1 Resistance to deterioration

##### Physical agent

The relative changes of the EPS-leaves (see chapter 3.1.1) in length, width and thickness under specified temperature and humidity conditions shall not exceed more than 1 % after exposing them for 48 h at 70 °C (DS(70, -)1, according to EN 13163).

The requirements according to ETAG 009, chapter 6.7.1.1 are met satisfactorily.

##### Chemical agent

Expanded polystyrene is chemically inert and would only be at risk from petrol or diesel or similar solvents. "ENERGY PLUS SYSTEM" does not contain any visible steel components. The finishes of the wall are not part of the ETA. Determination of the cleaning agent of the surface is not possible.

The requirements according to ETAG 009, chapter 6.7.1.2 are met satisfactorily.

##### Biological agent

The application of EPS as thermal insulating material for decades has shown that it sufficiently protects against fungi, bacteria, algae and insects.

EPS does not provide a food value and in general it does not contain voids suitable for habitation by vermin and not included biocide.

The requirements according to ETAG 009, chapter 6.7.1.3 are met satisfactorily.

#### 3.2.9.2 Resistance to normal use damage

##### Normal use impacts

Concrete walls (without consideration of the finishes), erected with shuttering system "ENERGY PLUS SYSTEM" and designed according EN 1992-1-1 respectively in lack of availability of EN 1992-1-1 according national design rules, lead to the assumption that concrete infill insures an adequate resistance of the complete wall under normal used impact loads.

The requirements according to ETAG 009, chapter 6.7.2.1 are met satisfactorily.

#### Incorporation of ducts

The instructions in the installation guide of the ETA holder are appropriate to produce horizontal perforations through the walls, which are necessary for passing through ducts, see also clause 2.2.2.4.

The requirements according to ETAG 009, chapter 6.7.2.2 are met satisfactorily.

#### Fixings of objects

Fixing of objects in the shuttering leaves is not possible. The part of fixings which is relevant for the mechanical resistance shall be in the concrete.

## **4 Assessment and verification of constancy of performance (AVCP)**

According to the Decision 98/279/EC of December 1997<sup>4</sup> amended by the decision 2001/598/EC<sup>5</sup> of the European Commission the system of assessment and verification of constancy of performance (see Annex V to regulation (EU) No 305/2011) **2+** applies.

## **5 Technical details necessary for the implementation of the AVCP system**

### **5.1 Tasks of the manufacturer**

The manufacturer shall exercise permanent internal control of production of concerned product. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European Technical Assessment.

The manufacturer may only use raw materials stated in the technical documentation of this European Technical Assessment.

The factory production control shall be in accordance with the Control plan which is a part of the technical documentation of this European Technical Assessment. The Control plan<sup>6</sup> is laid down in the context of the factory production control system operated by the manufacturer and deposited at Slovenian National Building and Civil Engineering Institute (ZAG Ljubljana). The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

The manufacturer shall, on the basis of a contract, involve a body, which is notified for the tasks referred to in a section 4 in the field of shuttering kits in order to undertake the actions laid down in section 5.2. For this purpose the Control plan referred to in sections 5.1 and 5.2 shall be handed over by the manufacturer to the involved notified body.

The manufacturer shall make a Declaration of performance according to Regulation (EU) No. 305/2011.

### **5.2 Tasks for the notified bodies**

The notified body shall retain the essential points of its actions defined in Annex V of Regulation (EU) No. 305/2011 for system 2+ and state results obtained and conclusions drawn in a written report.

The notified certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control on basis of:

- initial inspection of the manufacturing plant and of factory production control;

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<sup>4</sup> Official Journal of the European Communities L /127 of 24 April 1998

<sup>5</sup> Official Journal of the European Communities L /209 of 8 January 2001

<sup>6</sup> The Control plan is a confidential part of the technical documentation of this European Technical Assessment, but not published together with the ETA, and handed over only to the notified body or bodies involved in the procedure of attestation of conformity.

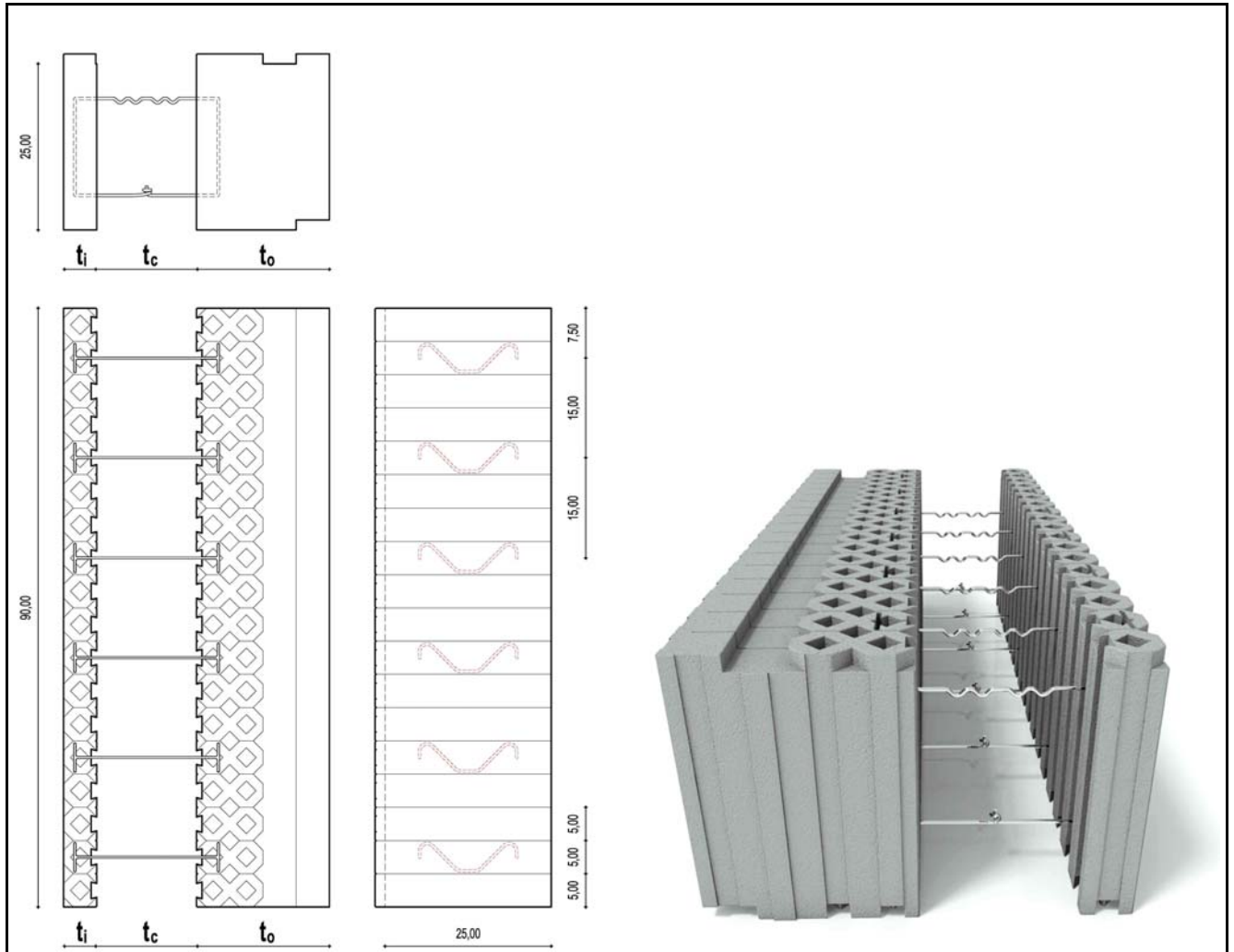
- continuous surveillance, assessment and evaluation of factory production control once a year.

In cases where the provisions of the European Technical Assessment and its Control plan are no longer fulfilled the notified body shall withdraw the certificate of constancy of the factory production control and inform the Slovenian National Building and Civil Engineering Institute (ZAG Ljubljana) without delay.

Issued in Ljubljana on 31.07.2014

Franc Capuder, M.Sc. (Civ.Eng.)

Head of the Service For Technical Assessments and Approvals:



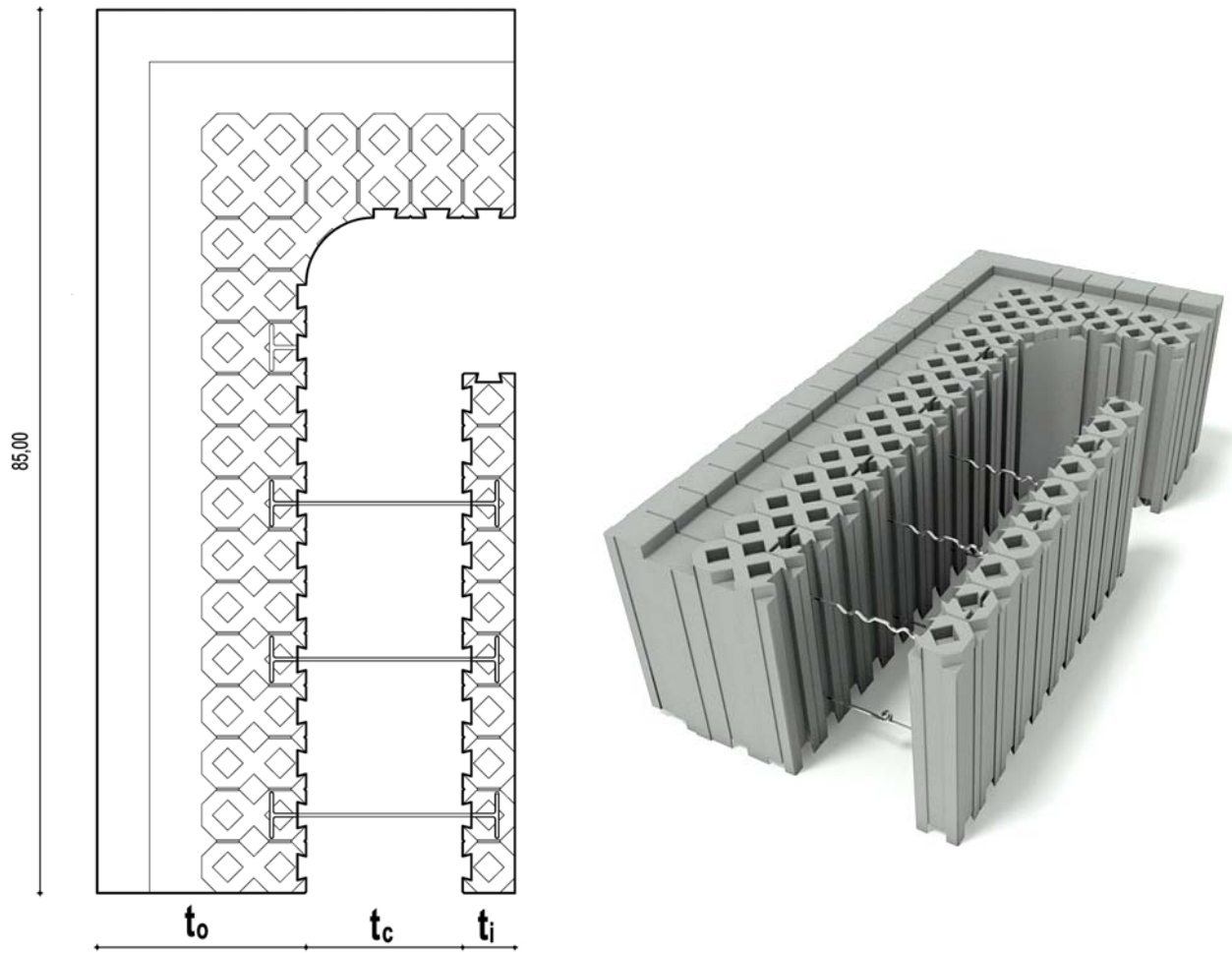
Block type	Overall thickness of the wall (mm)	Thickness of EPS leaves (mm)/ element type		Thickness of concrete core $t_c$ (mm)
		Inner $t_i$	Outer $t_o$	
e+ 250 Block (15)	250	50 (e+50)	50 (e+50)	150
e+ 300 Block (15)	300	50 (e+50)	100 (e+100)	150
e+ 400 Block (15)	400	50 (e+50)	200 (e+200)	150
e+ 500 Block (15)	500	50 (e+50)	300 (e+300)	150
e+ 300 Block (20)	300	50 (e+50)	50 (e+50)	200
e+ 350 Block (20)	350	50 (e+50)	100 (e+100)	200
e+ 450 Block (20)	450	50 (e+50)	200 (e+200)	200
e+ 550 Block (20)	550	50 (e+50)	300 (e+300)	200

**ENERGY PLUS SYSTEM**

Types of standard blocks

**Annex 1**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**



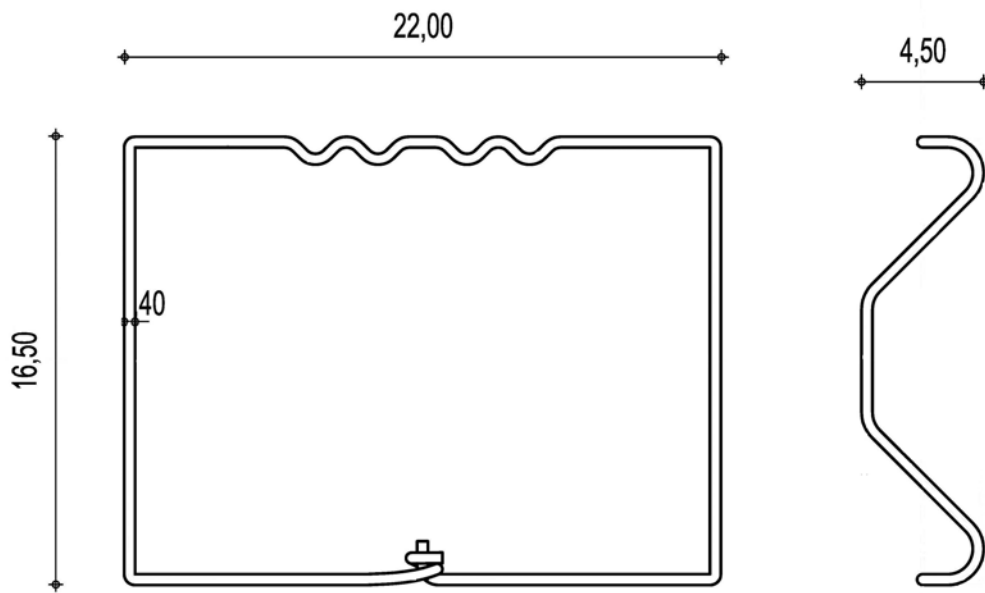
Corner Block type (left, right)	Overall thickness of the wall (mm)	Thickness of EPS leaves (mm)/ element type		Thickness of concrete core $t_c$ (mm)
		Inner $t_i$	Outer $t_o$	
e+ 400 corner Block (15)	400	50 (e+50)	200 (e+200 corner, left, right)	150
e+ 500 corner Block (15)	500	50 (e+50)	300 (e+300 corner, left, right)	150
e+ 450 corner Block (15)	450	50 (e+50)	200 (e+200 corner, left, right)	200
e+ 550 corner Block (15)	550	50 (e+50)	300 (e+300 corner, left, right)	200

**ENERGY PLUS SYSTEM**

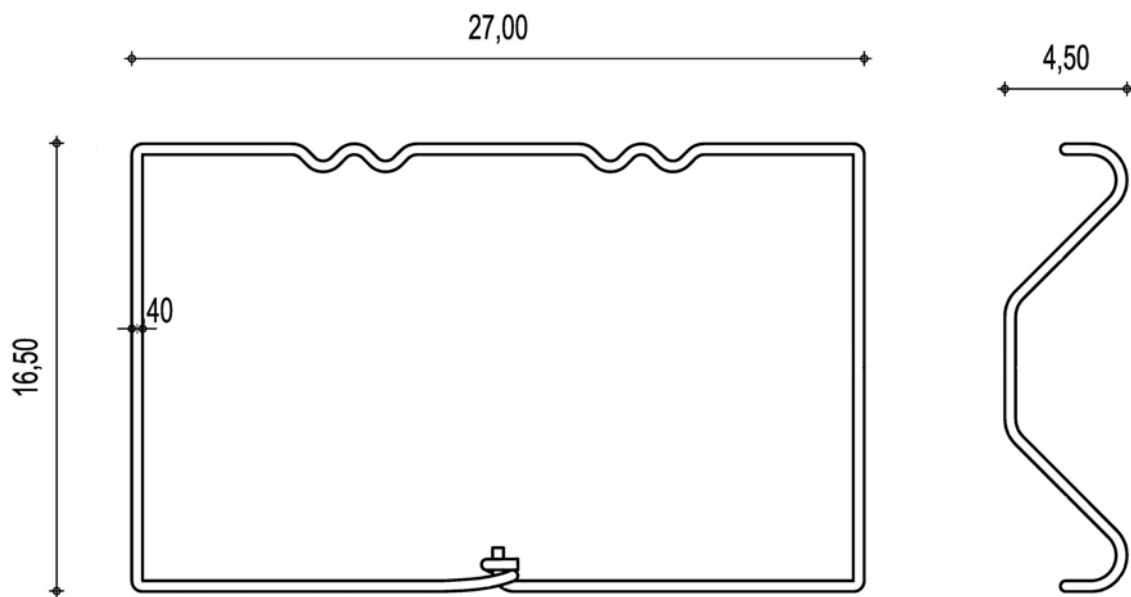
Types of corner blocks

**Annex 2**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**

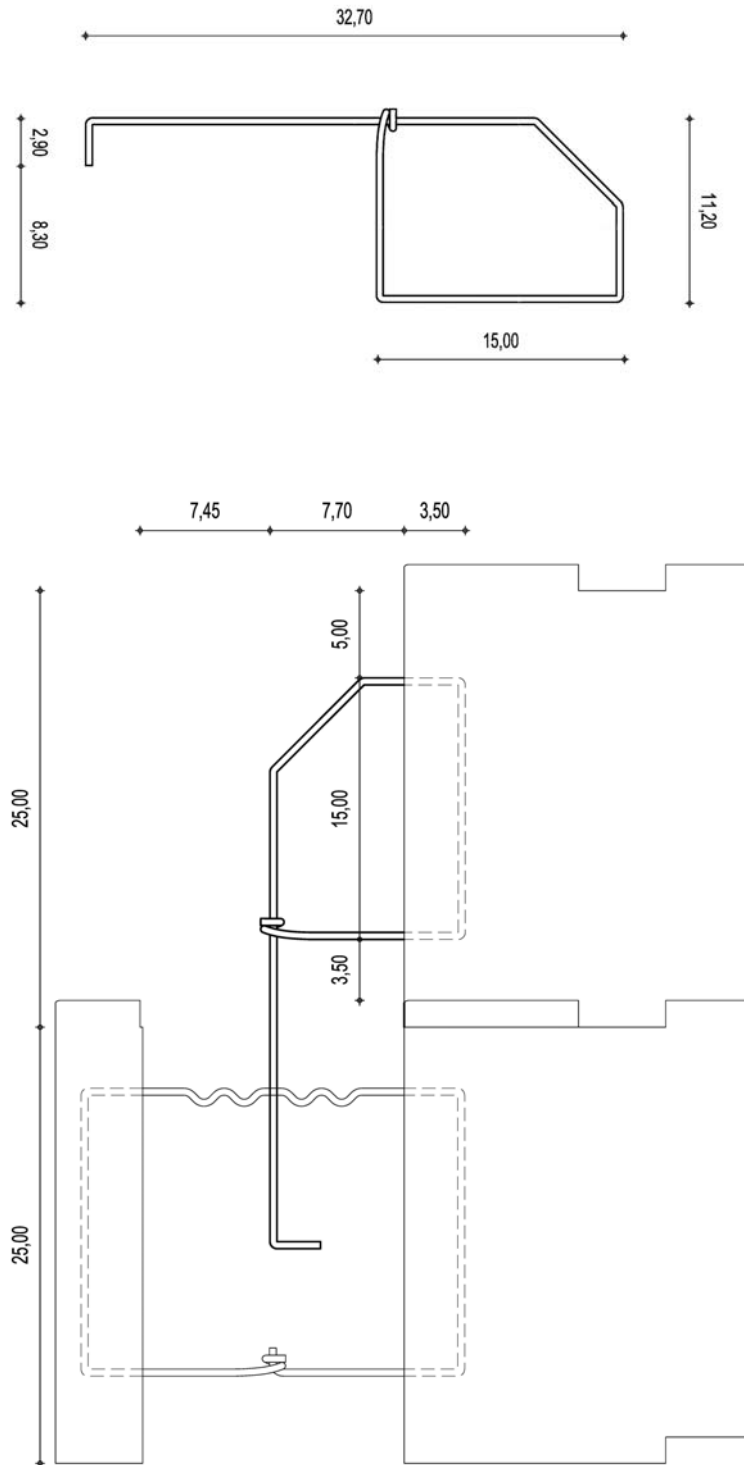


Wire spacer for concrete core 150 mm



Wire spacer for concrete core 200 mm

<b>ENERGY PLUS SYSTEM</b>	<b>Annex 3</b>
Typical wire spacer	of the <b>ETA - 14/0283</b> for the <b>ENERGY PLUS SYSTEM</b>



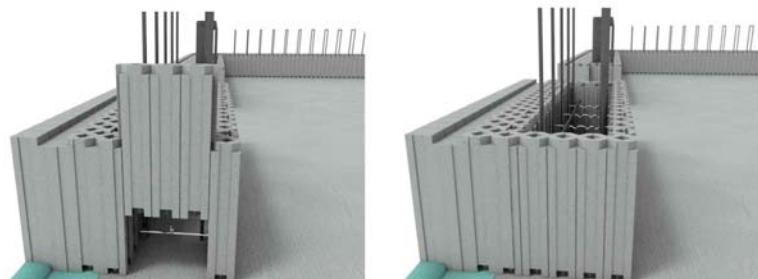
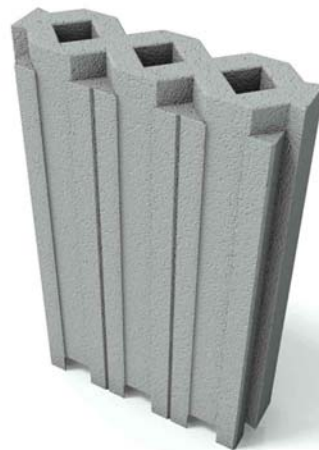
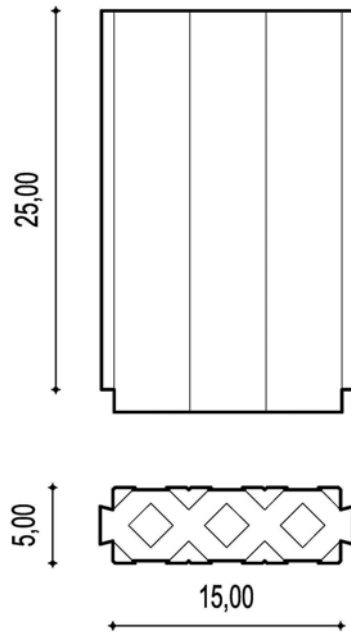
**ENERGY PLUS SYSTEM**

Floor edge spacer (connector ceiling)

**Annex 4**

of the - **14/0283**  
for the **ENERGY PLUS SYSTEM**



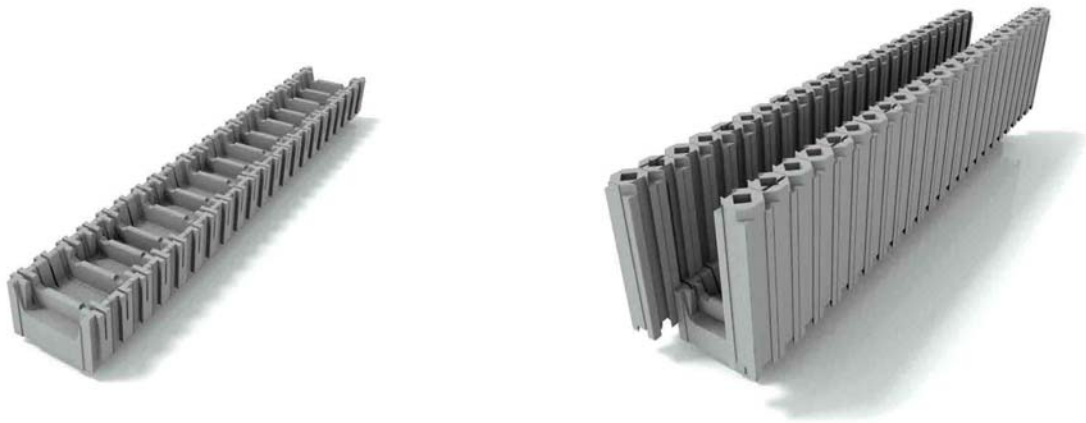
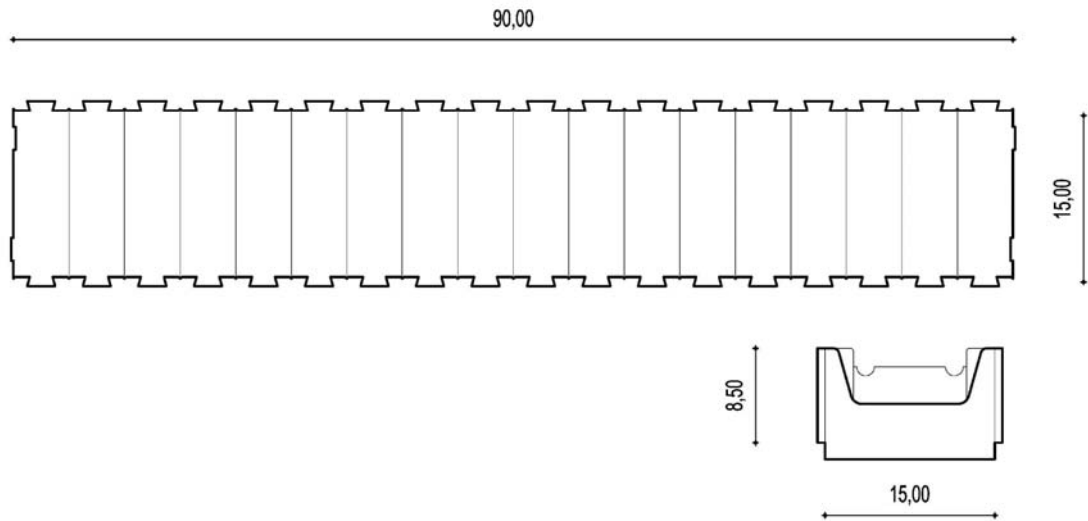


**ENERGY PLUS SYSTEM**

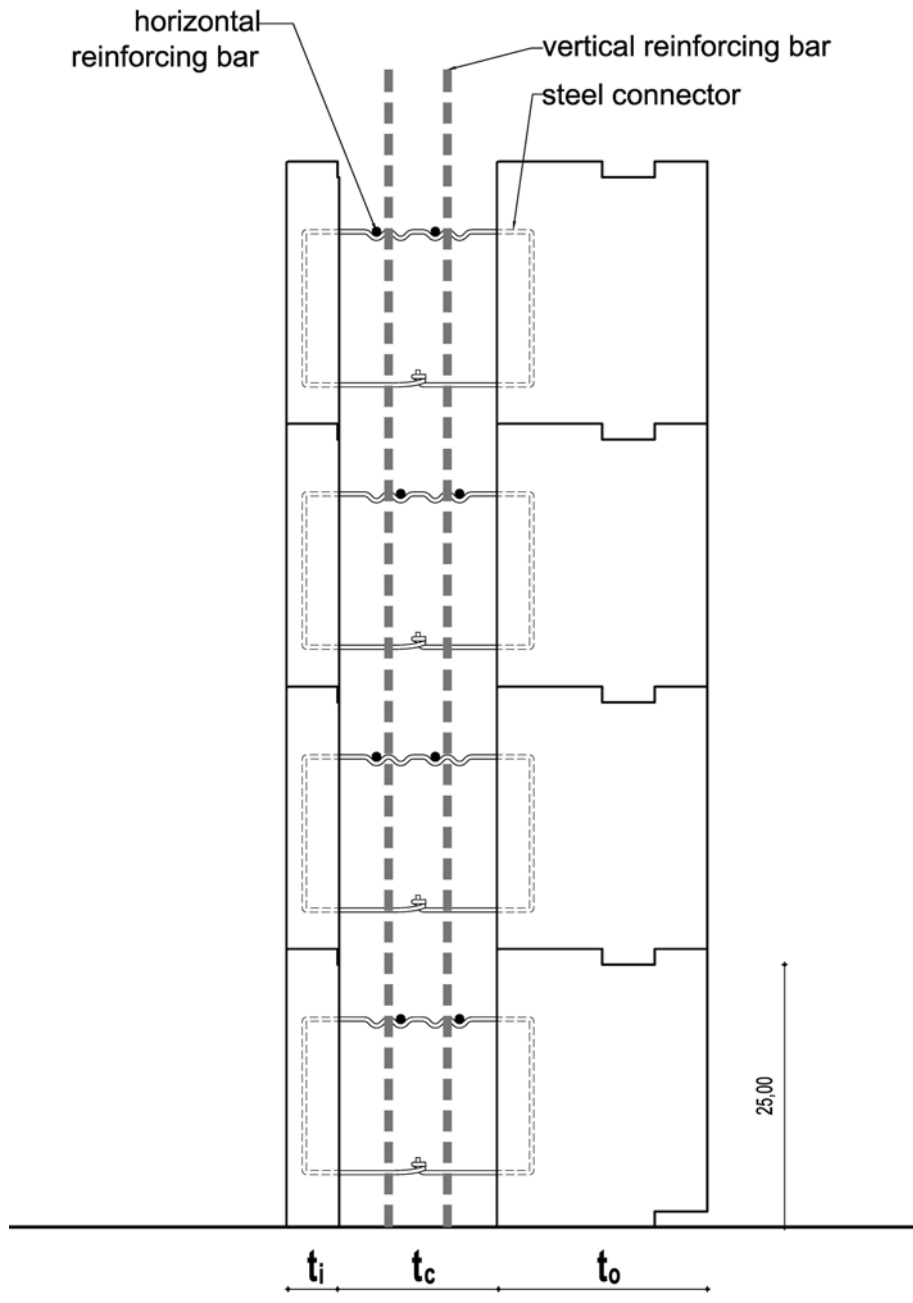
End leave element

**Annex 5**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**

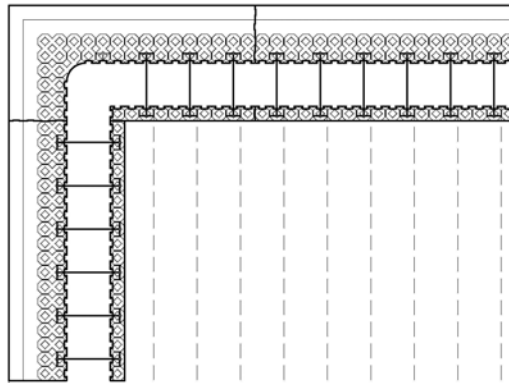


<b>ENERGY PLUS SYSTEM</b>	<b>Annex 6</b>
Lintel element (concrete core = 150 mm)	of the <b>ETA - 14/0283</b> for the <b>ENERGY PLUS SYSTEM</b>

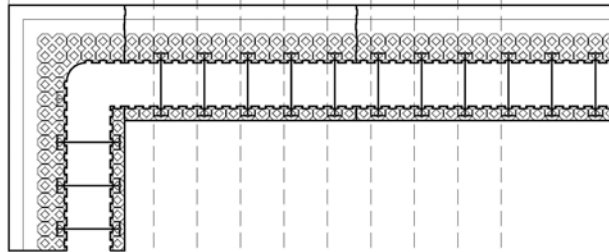


<b>ENERGY PLUS SYSTEM</b>	<b>Annex 7</b>
Vertical cross section	of the <b>ETA - 14/0283</b> for the <b>ENERGY PLUS SYSTEM</b>

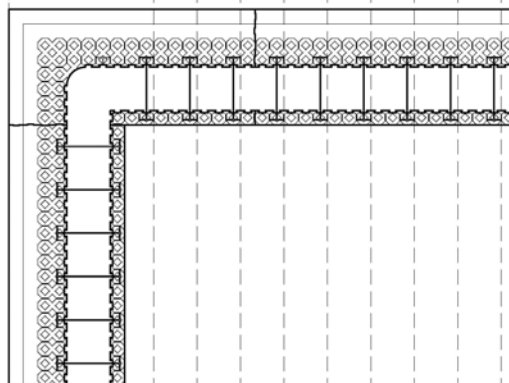
1. row



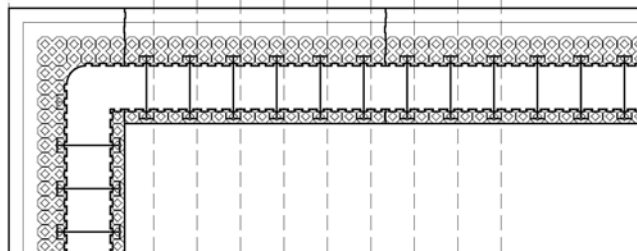
2. row



3., 5., 7., 9. row



4., 6., 8., 10. row



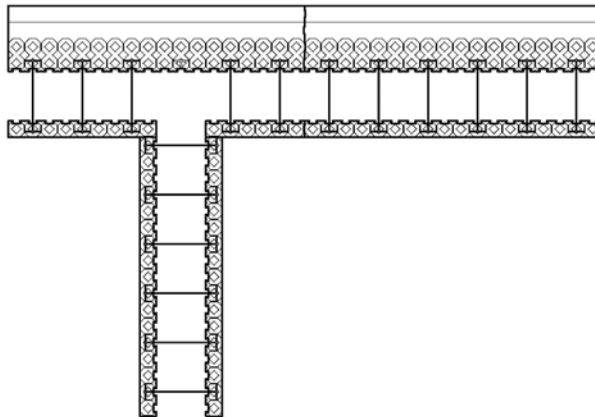
**ENERGY PLUS SYSTEM**

Corner

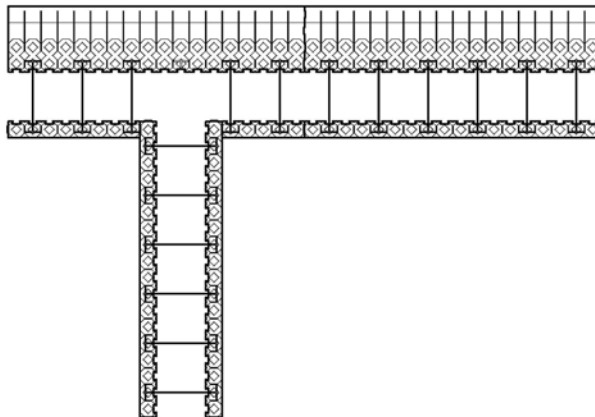
**Annex 8**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**

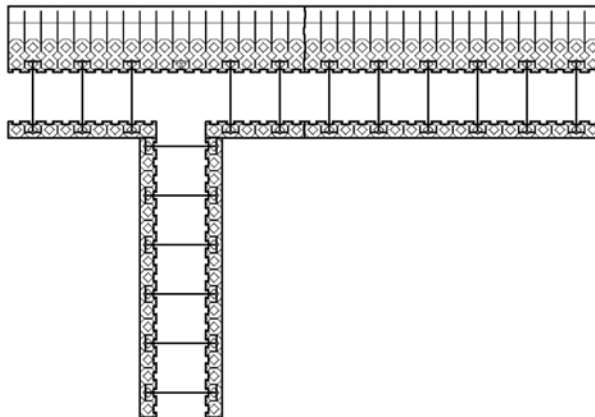
1. row



2., 4., ...row



3., 5., ... row

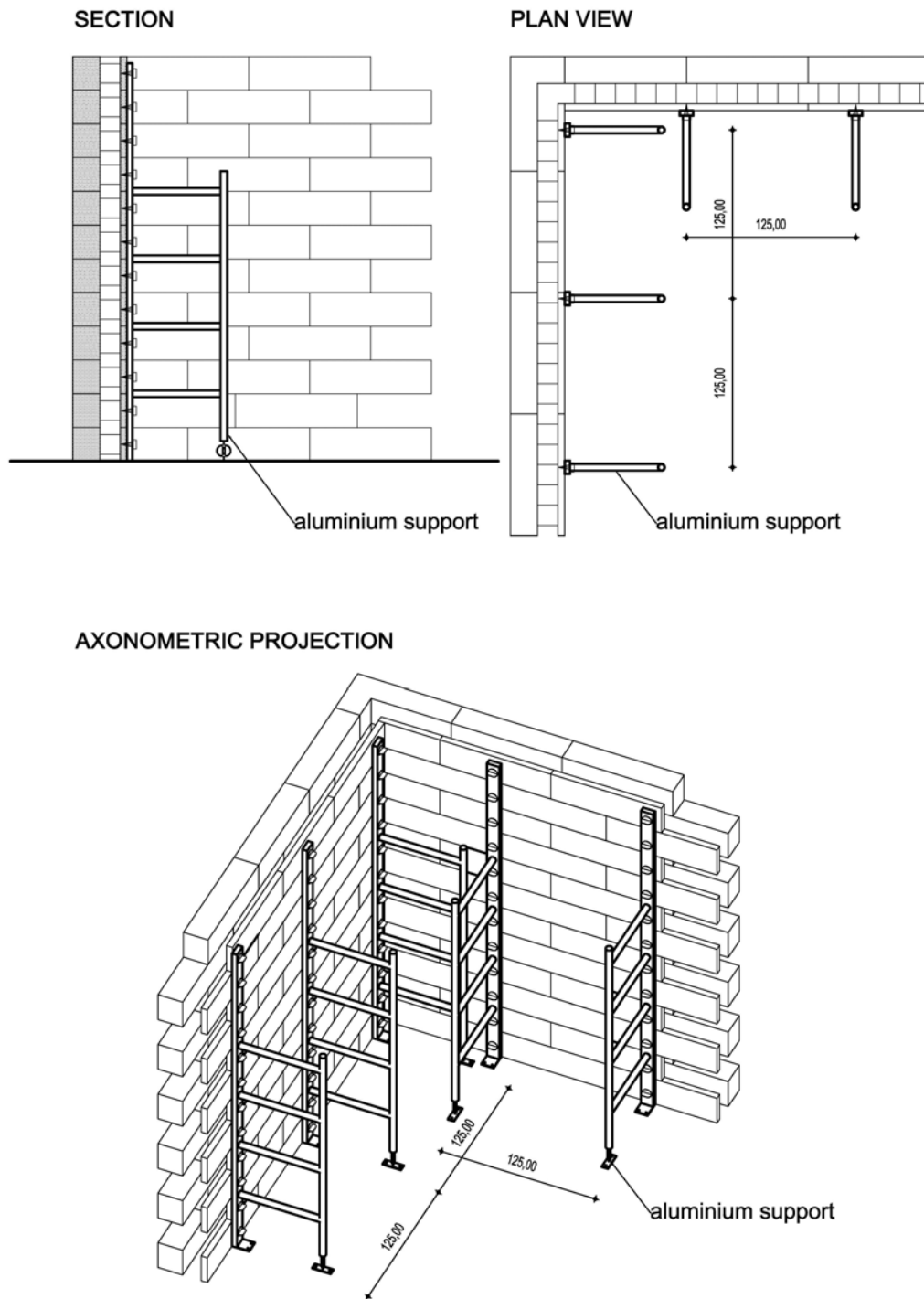


**ENERGY PLUS SYSTEM**

T joint

**Annex 9**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**

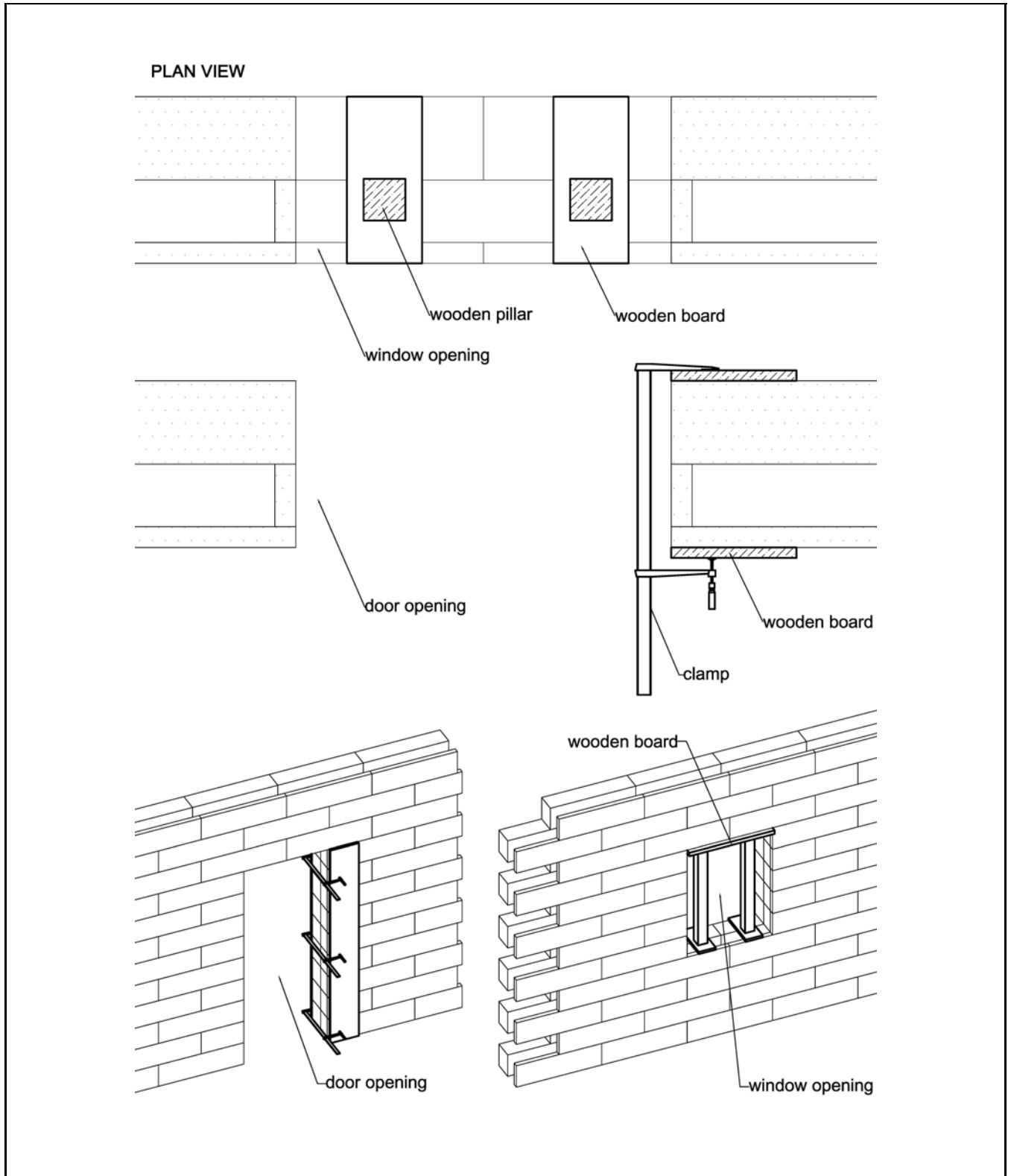


**ENERGY PLUS SYSTEM**

The supporting system for stabilization and concreting

**Annex 10**

of the **ETA - 14/0283**  
for the **ENERGY PLUS SYSTEM**



<b>ENERGY PLUS SYSTEM</b>	<b>Annex 11</b>
The supporting system of lintel above window and door openings	of the <b>ETA - 14/0283</b> for the <b>ENERGY PLUS SYSTEM</b>