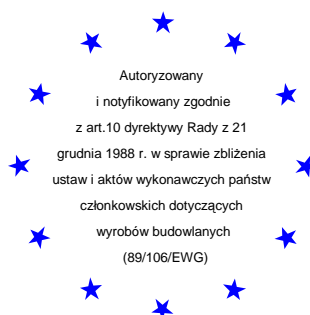


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Członek EOTA

European Technical Approval

ETA-07/0018

(English translation – the original version is in Polish language)

Nazwa handlowa

Trade name

THERMOMUR

THERMOMUR

Właściciel aprobaty

Holder of approval

Przedsiębiorstwo Produkcyjno-Usługowo-Handlowe THERMODOM Sp. z o.o.

**ul. Boczna 6
PL 44-240 Żory**

Rodzaj i przeznaczenie wyrobu

*Generic type and use
of construction product*

Zestaw nienośnych styropianowych szalunków traconych

*Non load-bearing permanent shuttering kit based on
elements of EPS*

Termin ważności

Valid

od

from

02. 05. 2012

do

to

02. 05. 2017

Zakład produkcyjny

Manufacturing plant

Przedsiębiorstwo Produkcyjno-Usługowo-Handlowe THERMODOM Sp. z o.o.

**ul. Boczna 6
PL 44-240 Żory**

Niniejsza Europejska

Aprobata Techniczna zawiera

*This European Technical
Approval contains*

43 strony, w tym 31 Załączników

43 pages including 31 Annexes

Niniejsza Europejska

Aprobata Techniczna zastępuje

*This European Technical
Approval replaces*

ETA-07/0018 ważną od 18.05.2007 do 18.05.2012

ETA-07/0018 with validity from 18.05.2007 to 18.05.2012



Europejska Organizacja ds. Aprobatach Technicznych

European Organisation for Technical Approvals

I LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by Instytut Techniki Budowlanej in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by the Council Directive 93/68/EEC² and Regulation (EC) no. 1882/2003 of the European Parliament and of the Council³;
 - ustawa z dnia 16 kwietnia 2004 r. o wyrobach budowlanych (law on construction products of 16 April 2004)⁴;
 - rozporządzenie Ministra Infrastruktury z dnia 14 października 2004 r. w sprawie europejskich aprobat technicznych oraz polskich jednostek organizacyjnych upoważnionych do ich wydawania (ordinance of Ministry of Infrastructure of 14 October 2004 on the European Technical Approvals and Polish bodies entitled to issue them)⁵;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC⁶;
 - Guideline for European Technical Approval of “*Non load-bearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete*” ETAG 009, edition June 2002.
2. Instytut Techniki Budowlanej is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.
3. This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1; or manufacturing plants other than those laid down in the context of this European Technical Approval.
4. This European Technical Approval may be withdrawn by Instytut Techniki Budowlanej, in particular pursuant to information by the Commission according to Article 5 (1) of Council Directive 89/106/EEC.
5. Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Instytut Techniki Budowlanej. In this case, partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.
6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities no. L 40, 11.2.1989, p. 12

² Official Journal of the European Communities no. L 220, 30.8.1993, p. 1

³ Official Journal of the European Union no. L 284, 31.10.2003, p.1

⁴ Official Journal of the Polish Republic no. 92/2004, pos. 881

⁵ Official Journal of the Polish Republic no. 237/2004, pos. 2375

⁶ Official Journal of the European Communities no. L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of product

The non load-bearing permanent shuttering kit THERMOMUR consists of the elements made of expanded polystyrene (EPS) applied as the formwork for plain or reinforced concrete walls cast in-situ. The THERMOMUR elements comprise of two walls of expanded polystyrene separated by steel or expanded polystyrene spacers. The spacers incorporated during production, connect the shuttering leaves and resist the pressure of the concrete during filling.

The kit consists of four groups of standard shuttering elements: THERMOMUR-250 of the overall thickness 250 mm, THERMOMUR-300 of the overall thickness 300 mm, THERMOMUR-400 of the overall thickness 400 mm and THERMOMUR-450 of the overall thickness 450 mm. The thickness of the inner shuttering leaf in all these elements is 50 mm and the distance of two walls (the thickness of the concrete core) is 150 mm. The thickness of the outer shuttering leaf depends on the type of element (see Annexes 1 to 16). The height of the shuttering elements is 250 mm and the length of the standard elements is 750 mm or 1200 mm. The upper and the lower surfaces of the shuttering leaves are tongue and groove to lock elements together.

Special elements as lintel element, tie beam element, hinge elements (for curved walls) and additional elements are also part of the kit (see Annexes 17 to 21).

1.2 Intended use

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

When using this type of construction below ground a waterproofing as well as the layer protecting the waterproofing from mechanical damage shall be used according to the national provisions and to the ETA-holder's installation instruction.

The walls made of the shuttering kit THERMOMUR may be used in building works designed according to EN 1992-1-1 or to the applicable national rules. For the concrete walls of a grid type EN 1992 (parts 1-1 and 1-6) do not provide a design method for in plane shear forces. For this reason, Annex B of ETAG 009 gives a proposal that can be used in absence of applicable national or harmonised methods.

The walls made of the shuttering kit THERMOMUR influence the flanking transmission of sound in building. This shall be considered in calculations of the sound insulation, according to EN 12354-1:2000.

The provisions made in this European Technical Approval are based on an assumed working life of the shuttering kit of at least 50 years, provided that the shuttering kit in end use conditions is subjected to an appropriate use and maintenance. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer or the Approval Body, but should only be regarded as means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

2.1.1 Shuttering elements

The kit consists of the following shuttering elements:

- a) standard elements (see Annexes 1 to 16):
 - THERMOMUR-250 with polystyrene spacers: TH-1, TH-2, TH-2L, TH-2P,
 - THERMOMUR-250 with steel spacers: TH-8, TH-9,
 - THERMOMUR-300 with polystyrene spacers: TH-14, TH-15L, TH-15P, TH-18L, TH-18P,
 - THERMOMUR-400 with polystyrene spacers: TH-20, TH-21L, TH-21P, TH-26L, TH-26P,
 - THERMOMUR-400 with steel spacers: TH-20/B, TH-21L/B, TH-21P/B, TH-26L/B, TH-26P/B,
 - THERMOMUR-450 with polystyrene spacers: TH-22, TH-23L, TH-23P, TH-25L, TH-25P,
 - THERMOMUR-450 with steel spacers: TH-22/B, TH-23L/B, TH-23P/B, TH-25L/B, TH-25P/B,
- b) tie beam element TH-3 (see Annex 17),
- c) lintel element TH-4 (see Annex 17),
- d) hinge elements: TH-11/12, TH-13 (see Annex 18),
- e) additional elements: TH-16, TH-17, TH-19, TH-24, TH-27 (see Annexes 19, 20 and 21).

The views and vertical sections of standard shuttering elements are shown in Annexes 22 to 25. The dimensions and tolerances of the shuttering elements not indicated in Annexes 1 to 25 are given in the technical documentation of this ETA⁷.

For the EPS shuttering elements and for the EPS leaves of the shuttering elements with steel spacers expanded polystyrene EPS-EN 13163-T1-L1-W2-S1-P4-BS200-CS(10)150-DS(N)2-DS(70,-)1-TR200-WL(T)3, density not less than 24 kg/m³, shall be used.

- 2.1.2 For the steel spacers the profiles made of galvanized steel sheet of the thickness not less than 0,5 mm, grade DX51D according to EN 10327, shall be used.

2.2 Methods of verification

2.2.1 General

The assessment of the fitness of the shuttering kit THERMOMUR for the intended use has been made in compliance with the Guideline for European Technical Approval of “*Non-loadbearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete*”, ETAG 009.

⁷ The technical documentation of this European Technical Approval is deposited at Instytut Techniki Budowlanej and, as far as relevant for the tasks of the approved body involved in the attestation of conformity procedure, may be handed over only to the approved body involved.

2.2.2 ER 1 Mechanical resistance and stability

2.2.2.1 Resulting structural pattern

In end use conditions the walls made of THERMOMUR shuttering elements are walls of a grid type – in case of walls made of elements with expanded polystyrene spacers, and continuous type – in case of walls made of elements with steel spacers, according to ETAG 009, clause 2.2.

2.2.2.2 Efficiency of filling

Considering the instructions of clause 4.2 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.

2.2.2.3 Possibility of steel reinforcement

The instructions in the installation guide of the ETA-holder enable installation of walls steel reinforcement according to EN 1992-1-1 or corresponding national rules.

2.2.3 ER 2 Safety in case of fire

2.2.3.1 Reaction to fire

THERMOMUR shuttering elements are the products of the reaction to fire class E according to EN 13501-1+A1.

2.2.3.2 Resistance to fire

Fire resistance classification of the load-bearing walls made of THERMOMUR-250, THERMOMUR-300, THERMOMUR-400, THREMOMUR-450 elements according to EN 13501-2+A1 is given in Table 1.

For the walls with other finishes: no performance determined.

Table 1

Outer finish	Inner finish	Type of spacers	Maximum load, kN/m	Resistance to fire class
Rendering: mineral base coat + glass fibre mesh + mineral finishing coat	Gypsum plasterboards 2 x 12,5 mm	Expanded polystyrene or steel	105	REI 60(i→o), REI 60(o→i)-ef
	Gypsum plaster 25 mm thick			REI 30(i→o)
	Gypsum plasterboard 1 x 12,5 mm	Expanded polystyrene	67	REI 30(i→o), REI 60(o→i)-ef
		Steel		REI 60(i→o), REI 60(o→i)-ef

Notes: The outer and inner finishes are not part of the kit covered by this ETA.

2.2.4 ER 3 Hygiene, health and the environment

2.2.4.1 Content and/or release of dangerous substances

According to the manufacturer's declaration the THERMOMUR shuttering elements made of expanded polysterene contain a substance included in Annex XIV of the Regulation (EC) No 1907/2006 (REACH). The chemical composition of the shuttering elements has been deposited in Instytut Techniki Budowlanej.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within their scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.2.4.2 Water vapour permeability

Results of the tests according to EN 12086 (test conditions A) indicate the water vapour diffusion resistance factor of expanded polystyrene $\mu = 51,4$.

The value of water vapour diffusion equivalent air layer thickness $s_d = 2$ m is assumed for the outer finish according to ETAG 004. The values for the water vapour diffusion resistance factor of concrete and other materials are tabulated in EN ISO 10456.

According to the calculations in accordance with EN ISO 13788, the annual moisture balance and the maximum amount of interstitial condensation will be on the safe side taking into account the inner and outer finishes given in Table 1.

2.2.5 ER 4 Safety in use

2.2.5.1 Bond strength between the shuttering leaves and the concrete core

The bond strength is at least equal to the resisting concrete pressure of the shuttering elements according to clause 2.2.5.2.

2.2.5.2 Resistance to concrete pressure

To resist the concrete pressure the bending tensile strength of the shuttering leaves shall be more than 200 kPa (see also designation code of EPS given in clause 2.1.1), the tensile strength of the polystyrene spacers shall be more than 200 kPa (see also designation code of EPS given in clause 2.1.1) and the strength to pull out of the steel spacers more than 1000 N.

Additionally the fitness for the intended use in relation to resistance to concrete pressure has been determined by testing of the complete shuttering made of THERMOMUR-250 elements with EPS spacers.

The requirements according to ETAG 009, chapter 6.4.2 are met.

2.2.5.3 Safety against personal injury by contact

Delivered on site the shuttering elements do not have sharp or cutting edges. The surface of the shuttering leaves is soft. There is no risk of abrasion or of cutting injuries.

2.2.6 ER 5 Protection against noise

2.2.6.1 Airborne sound insulation

Sound reduction indexes of external and internal walls made of THERMOMUR shuttering elements, determined according to EN-ISO 717-1:1996, are given in Table 2.

For the walls with other finishes: no performance determined.

Table 2

Type of the wall	Symbol of the element	Type of spacers	R _w (C, C _{tr}), dB
External walls			
– outer finish – rendering of the thickness 6 mm (mineral base coat + glass fibre mesh + mineral finishing coat) – inner finish – gypsum plasterboard of the thickness 12,5 mm bonded to the substrate using “dabs” of gypsum mortar			
THERMOMUR-250	TH-1	Expanded polystyrene	42 (-2, -4)
THERMOMUR-300	TH-14		
THERMOMUR-400	TH-20		
THERMOMUR-450	TH-22		
THERMOMUR-250	TH-8	Steel	44 (-4, -6)
THERMOMUR-400	TH-20/B		
THERMOMUR-450	TH-22/B		
Internal walls			
– outer and inner finishes made of gypsum plasterboard of the thickness 12,5 mm bonded to the substrate using “dabs” of gypsum mortar			
THERMOMUR-250	TH-8	Steel	45 (-1, -5)
Note: The outer and inner finishes are not part of the kit covered by this ETA.			

2.2.6.2 Sound absorption

No performance determined.

2.2.7 ER 6 Energy economy and heat retention

2.2.7.1 Thermal resistance

The values of thermal resistance R of the shuttering elements in end use conditions (with concrete filling but without inner and outer finishes) are given in Table 3.

Table 3

Type of shuttering element	R, m ² K/W
THERMOMUR-250 with expanded polystyrene spacers	3,1
THERMOMUR-250 with steel spacers	1,9
THERMOMUR-300 with expanded polystyrene spacers	4,5
THERMOMUR-400 with expanded polystyrene spacers	7,5
THERMOMUR-400 with steel spacers	7,1
THERMOMUR-450 with expanded polystyrene spacers	8,9
THERMOMUR-450 with steel spacers	8,5

2.2.7.2 Thermal inertia

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

2.2.8 Aspects of durability and serviceability

2.2.8.1 Resistance to deterioration

Physical agents

As given in the designation code of the EPS material used (clause 2.1.1) the dimensions of the shuttering elements and the leaves in case of elements with steel spacers do not differ more than 1% after exposing them for 48 h at 70°C (DS(70,-)1).

Chemical agents

The steel spacers, necessary only for the resistance to concrete pressure, are made of galvanized steel sheet.

Biological agents

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.

2.2.8.2 Resistance to normal use damage

Incorporation of ducts

The instructions in the installations guide of the ETA-holder enable installation of horizontally passing ducts on site.

Fixing of objects

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

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 98/279/EC of the European Commission amended by 2001/596/EC the system 2+ of attestation of conformity applies.

The system 2+ of attestation of conformity is defined as follows:

Declaration of conformity of the product by the manufacturer on the basis of:

a) Tasks of the manufacturer:

- (1) initial type-testing of the product,
- (2) factory production control,
- (3) testing of samples taken at the factory in accordance with a prescribed test plan,

b) Tasks of the notified body:

- (4) certification of factory production control on the basis of:
 - initial inspection of factory and of factory production control,
 - continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. 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 products are in conformity with this European Technical Approval.

The manufacturer shall only use raw materials stated in the technical documentation of this ETA.

The factory production control shall be in accordance with the control plan⁸ which is a part of the technical documentation of this ETA. The control plan has been agreed between the manufacturer and Instytut Techniki Budowlanej and is laid down in the context of the factory production control system operated by the manufacturer and deposited with Instytut Techniki Budowlanej.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

The records shall be presented to the notified body involved in continuous surveillance. On request they shall be presented to Instytut Techniki Budowlanej.

3.2.1.2 Other tasks of the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is notified for the task referred to in section 3.1 in the field of non-load bearing shuttering systems in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in section 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the notified body involved.

The manufacturer shall make a declaration of conformity, stating that the non-load bearing shuttering kit is in conformity with the provisions of the ETA-07/0018.

3.2.2 Tasks of the notified body

The notified body shall perform the:

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan.

The notified body shall retain the essential points of its actions referred to above and state the results obtained and conclusion drawn in written report.

The notified certification body involved by the manufacturer shall issue an EC certificate of the factory production control stating the conformity with the provisions of this ETA.

In cases where the provisions of the ETA and its control plan are no longer fulfilled the notified certification body shall withdraw the certificate of FPC and inform Instytut Techniki Budowlanej without delay.

⁸ The control plan has been deposited with Instytut Techniki Budowlanej and may be handed over only to the notified body involved in the procedure of attestation of conformity.

3.3 CE marking

The CE marking shall be affixed on the product itself, the attached label, or the accompanying commercial documents. The letters „CE” shall be followed by the identification number of the notified body and be accompanied by the following additional information:

- the name and address of the ETA-holder,
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of the factory production control,
- the number of the ETA,
- the number of the ETAG,
- the non-load bearing shuttering kit trade name,
- reaction to fire class according to EN 13501-1+A1,
- fire resistance class according to EN 13501-2+A1,
- the sound reduction index,
- the declared value of thermal conductivity of the expanded polystyrene $\lambda_D = 0,034 \text{ W(m}\cdot\text{K)}$.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The ETA is issued on the basis of agreed data/information, deposited with Instytut Techniki Budowlanej, 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 Instytut Techniki Budowlanej before the changes are introduced. Instytut Techniki Budowlanej 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 alterations to the ETA shall be necessary.

4.2 Installation

4.2.1 General

The manufacturer shall ensure that the requirements in accordance with sections 1, 2 and 4 are made known to those involved in design and execution of construction works. The installation guide is deposited with Instytut Techniki Budowlanej and shall be available at every construction site.

After installation of the shuttering elements (see clause 4.2.2) the site-mixed or ready mixed concrete is poured in and compacted.

In end use conditions concrete walls of a grid type – in case of walls made of elements with expanded polystyrene spacers and continuous type – in case of walls made of elements with steel spacers, of plain or reinforced concrete will be formed according to EN 1992-1-1 or according to corresponding national rules.

4.2.2 Installation of the shuttering elements

The shuttering elements are put together on site in layers without adhesive. To receive stable floor high formworks the vertical connecting elements (clamps) made of wire of the diameter $\Phi 3$ mm between two shuttering elements have to be used – 8 clamps per m^2 of the wall. The clamps and the method of using them are shown in Annex 26.

According to the installation guide of the ETA-holder in order to keep the walls aligned vertically the bracing are to be used (see Annex 27). The bracing supports are to be arranged at a maximum distance of 1,0 m, to be connected over the entire wall height with the shuttering elements and to be fastened to the floor. They shall be used on one side of the wall only (usually inside).

The necessary steel reinforcement according to static calculation shall be installed. Apart from the static calculation the minimum required steel reinforcement is as following:

- horizontally – 2 $\Phi 8$ mm in the first and last layer of shuttering elements of the storey,
- vertically – 2 $\Phi 12$ mm in wall corners and around openings.

The minimum necessary steel reinforcement and the rules of its installation are shown in Annex 28. Construction of 90° wall corner, construction of curved wall with the hinge elements and placement of horizontal reinforcement steel in T-walls are shown in Annexes 29 to 31.

4.2.3 Concreting

For the production of normal concrete EN 206-1 shall apply.

In case of walls made of elements with expanded polystyrene spacers the maximum aggregate size shall be 8 mm and the flow class of fresh concrete shall be F5. The concrete shall be compacted by rodding.

In case of walls made of elements with steel spacers the maximum aggregate size shall be 16 mm and the flow class of fresh concrete shall be higher than or equal to F3. The consistency of concrete on compacting by vibration shall be within the lower consistency range of F3 and on compacting by rodding within the upper consistency range of F3.

The concrete shall have rapid or middle strength development according to EN 206-1, Table 12. The concrete may fall freely up to a height of 3 m.

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

Pouring the concrete shall be performed in layers of approximately 1,0 m at a maximum vertical concreting rate of 3 m/h. The requirements of the installation guide of the ETA-holder shall be taken into account during concreting.

After concreting the walls may not deviate from the plumb line more than 5 mm per running meter of the wall height.

4.2.4 Finishing

Walls made of the shuttering kit THERMOMUR shall be protected by finishes. The choice of the finishes shall be examined and assessed by the designer case-by-case and depending on the particular use. Finishes are not part of the kit covered by this ETA. Preferably for external surfaces the rendering (base coat + glass fibre mesh + finishing coat) used should meet the requirements of ETAG 004 “*External Thermal Insulation Composite Systems with rendering*”.

5 Indications to the manufacturer

5.1 Packaging, transport and storage

Packaging of the shuttering elements has to be such that the products are protected against damage, soiling and intensive action of water during transport and storage, unless other measures are foreseen by the manufacturer for this purpose.

5.2 Use, maintenance, repair

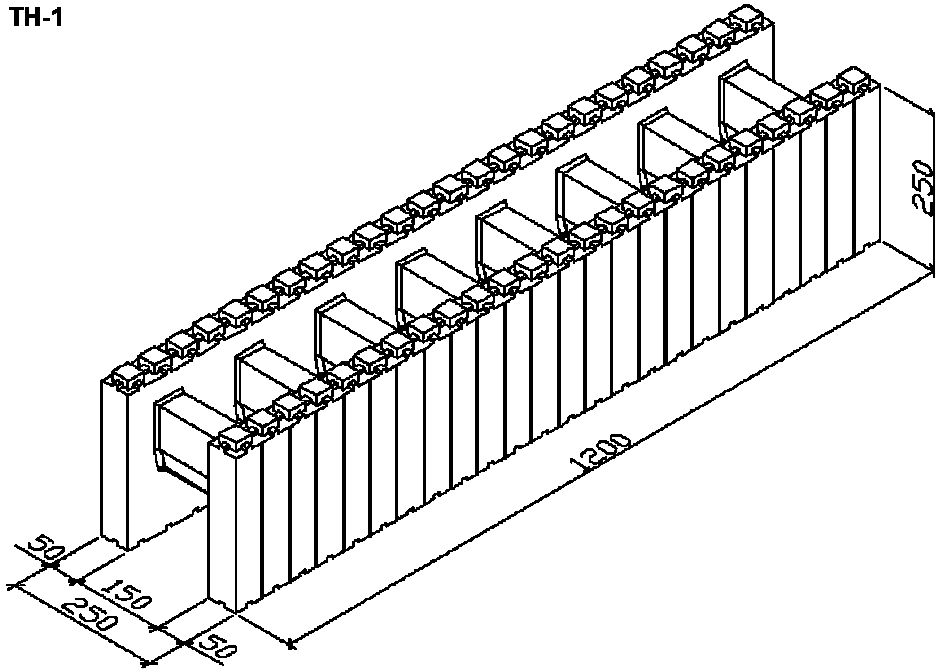
To the indication on use, maintenance and repair ETAG 009, clause 7.5 applies.

On behalf of Instytut Techniki Budowlanej

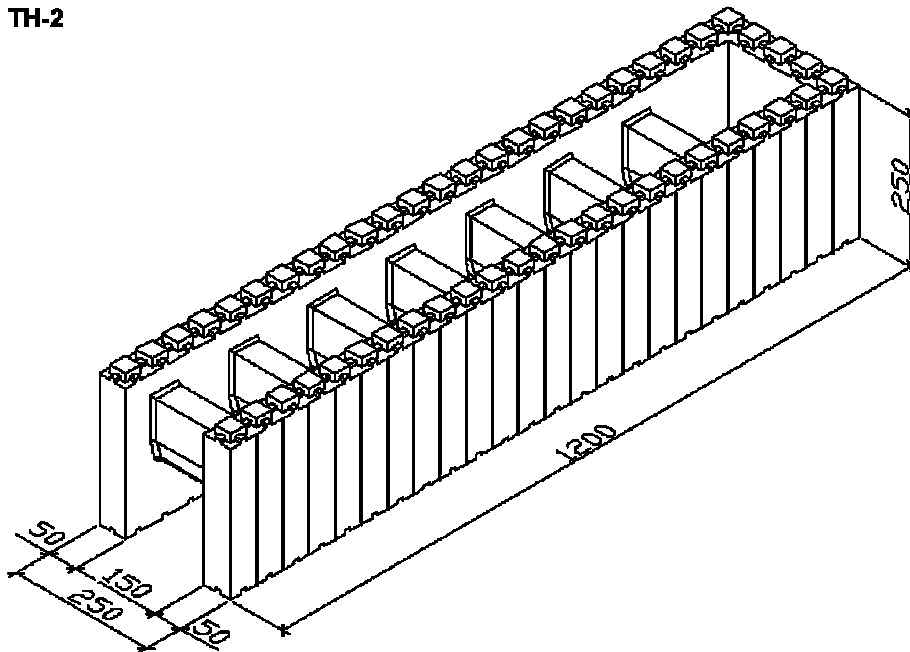


Marek Kaproń
Director of ITB

TH-1



TH-2

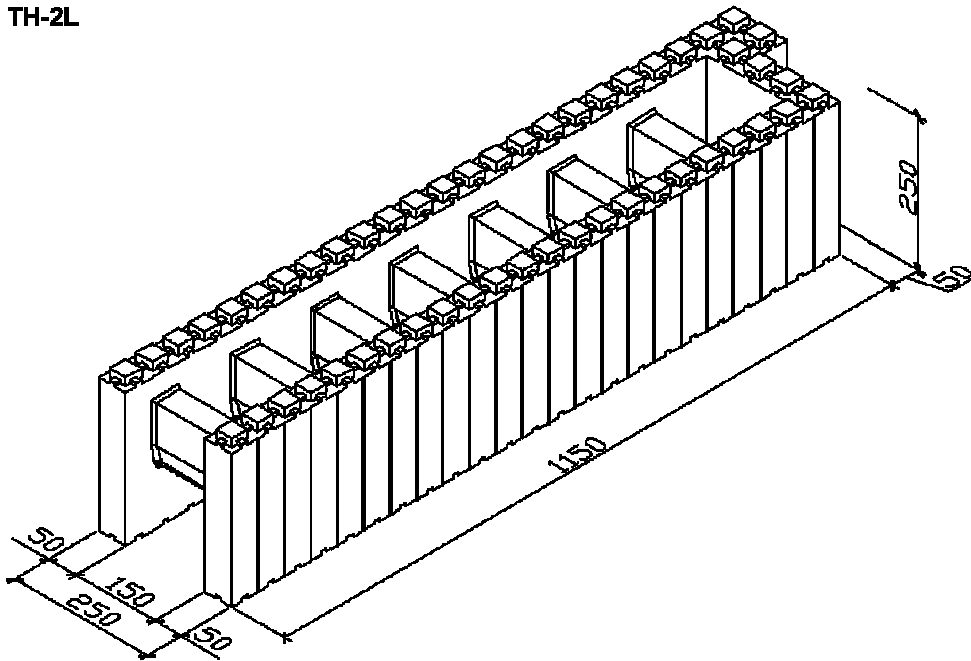


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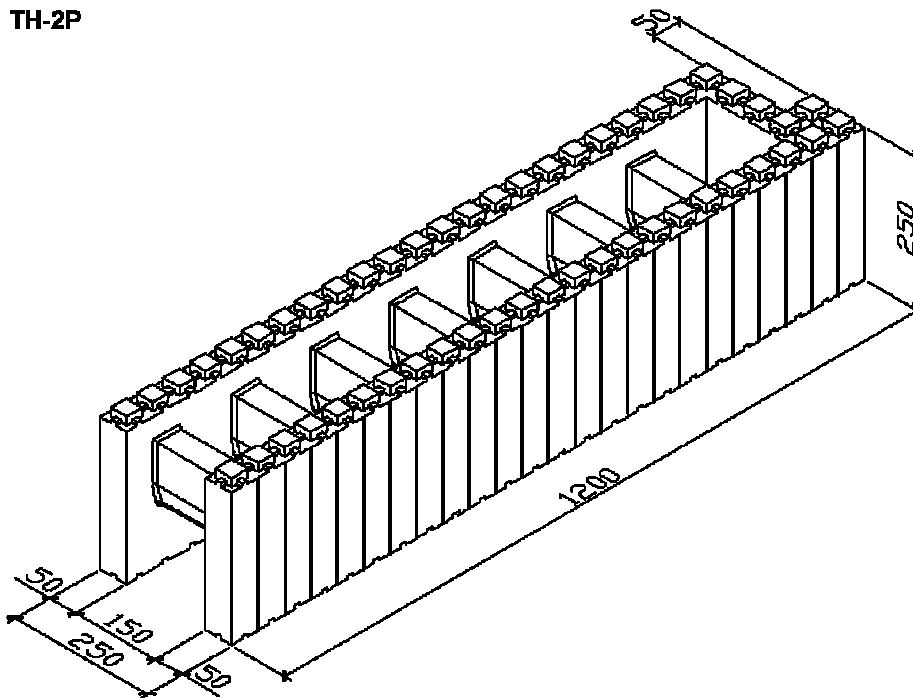
THERMOMUR-250 standard elements

Annex 1
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Technical Approval
ETA-07/0018

TH-2L



TH-2P

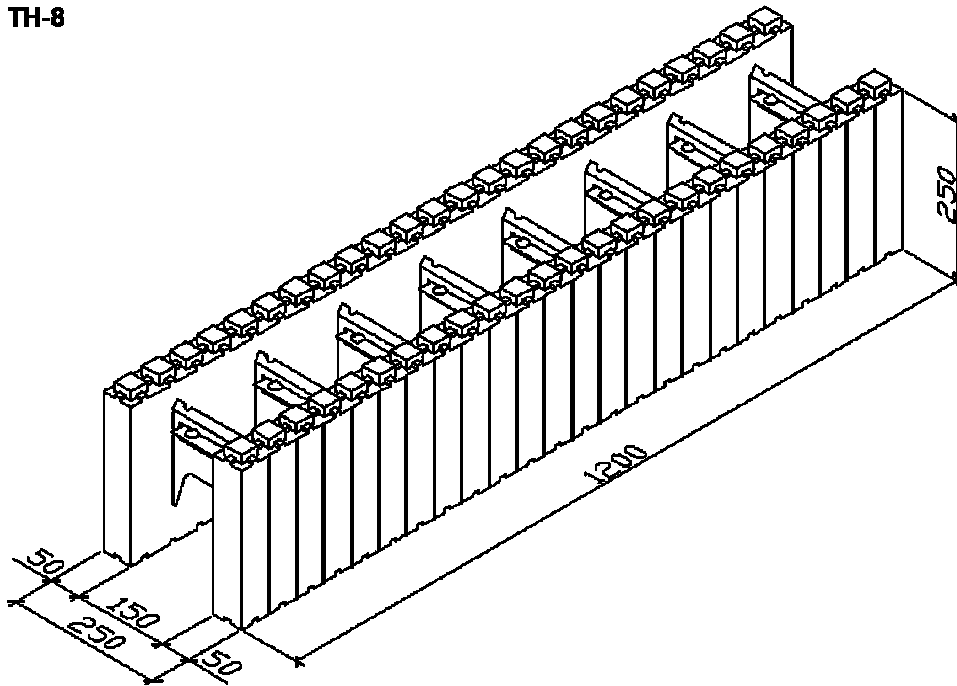


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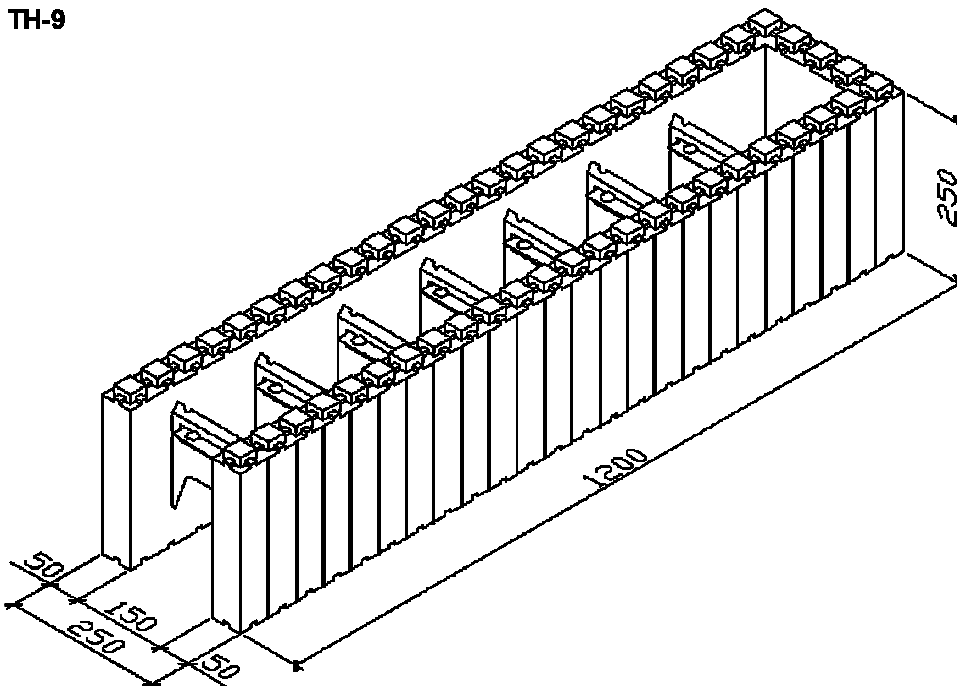
THERMOMUR-250 standard elements

Annex 2
of European
Technical Approval
ETA-07/0018

TH-8



TH-9

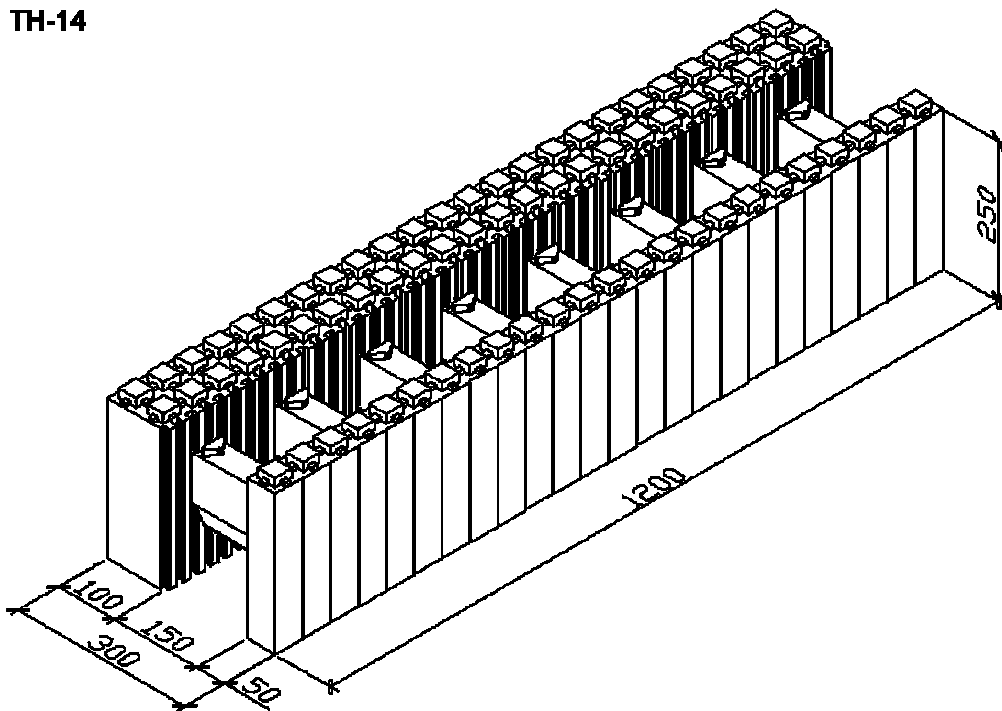


THERMOMUR

THERMOMUR-250 standard elements

Annex 3
of European
Technical Approval
ETA-07/0018

TH-14

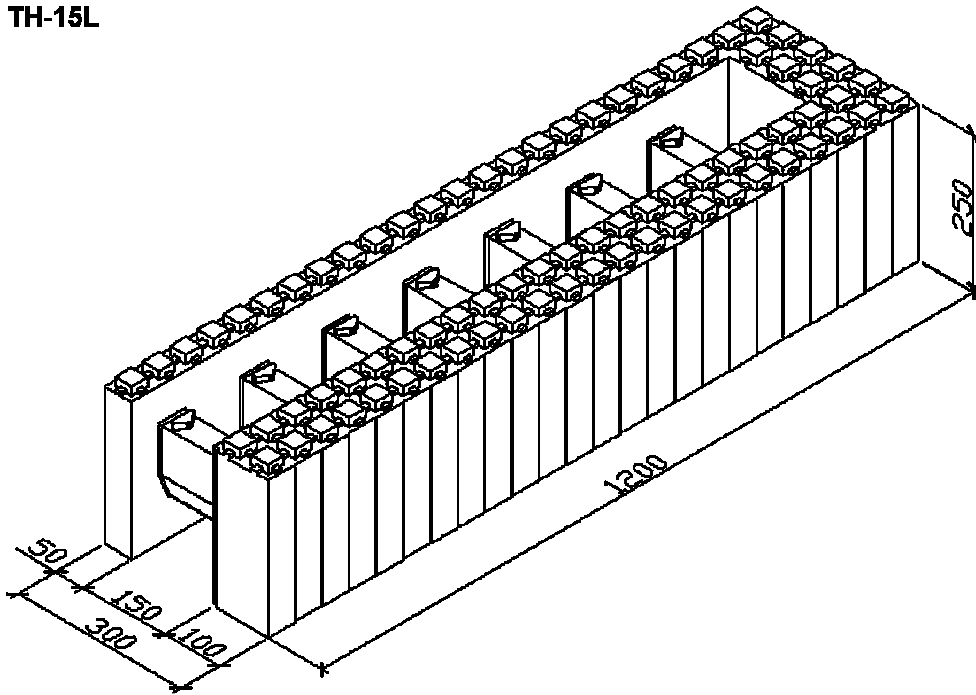


THERMOMUR

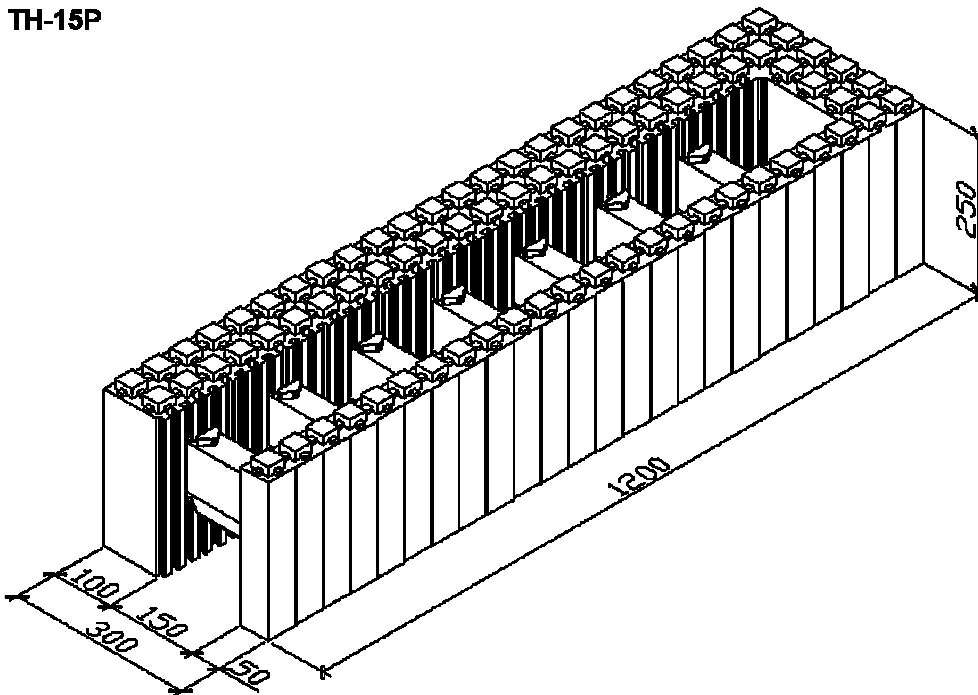
THERMOMUR-300 standard elements

Annex 4
of European
Technical Approval
ETA-07/0018

TH-15L



TH-15P

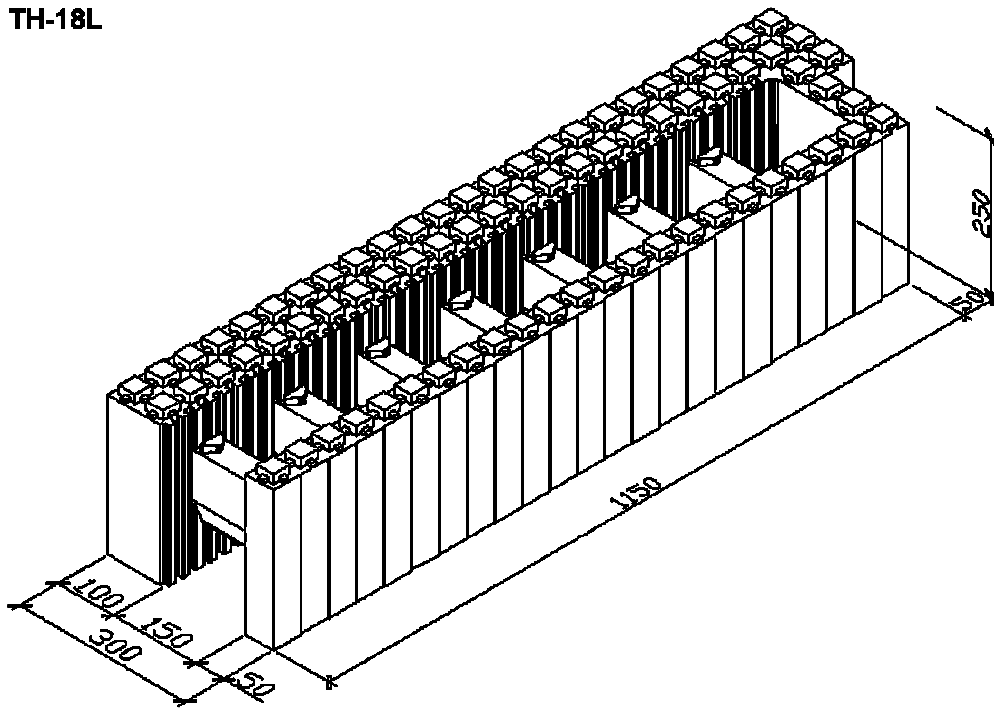


THERMOMUR

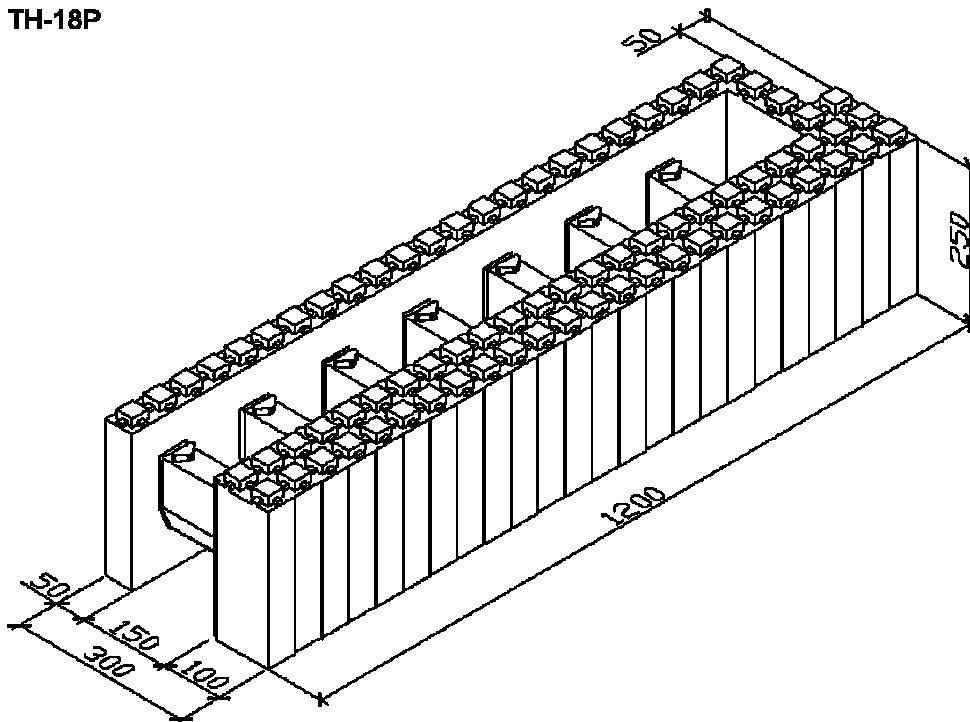
THERMOMUR-300 standard elements

Annex 5
of European
Technical Approval
ETA-07/0018

TH-18L



TH-18P

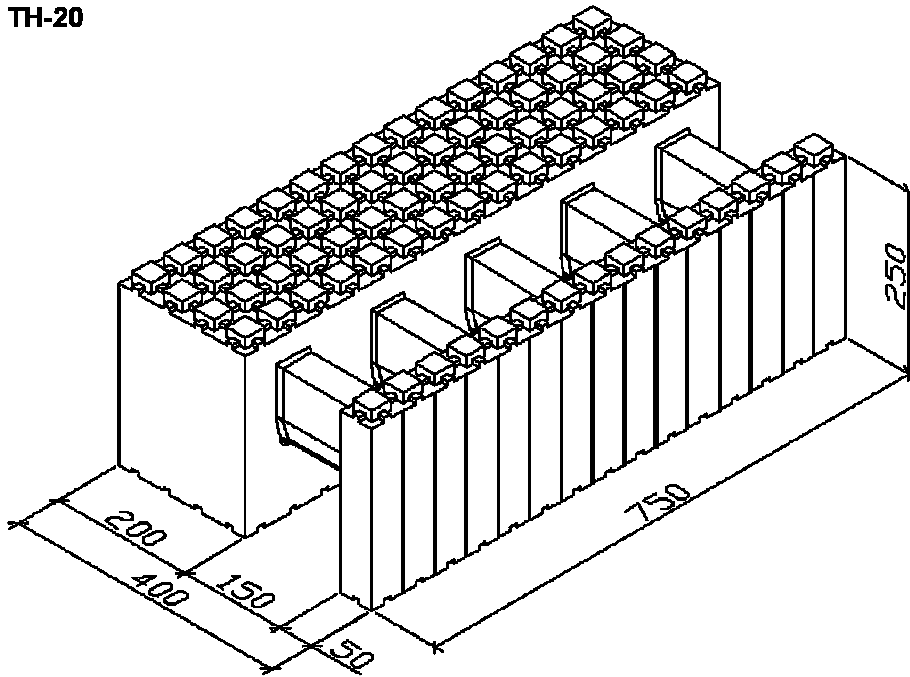


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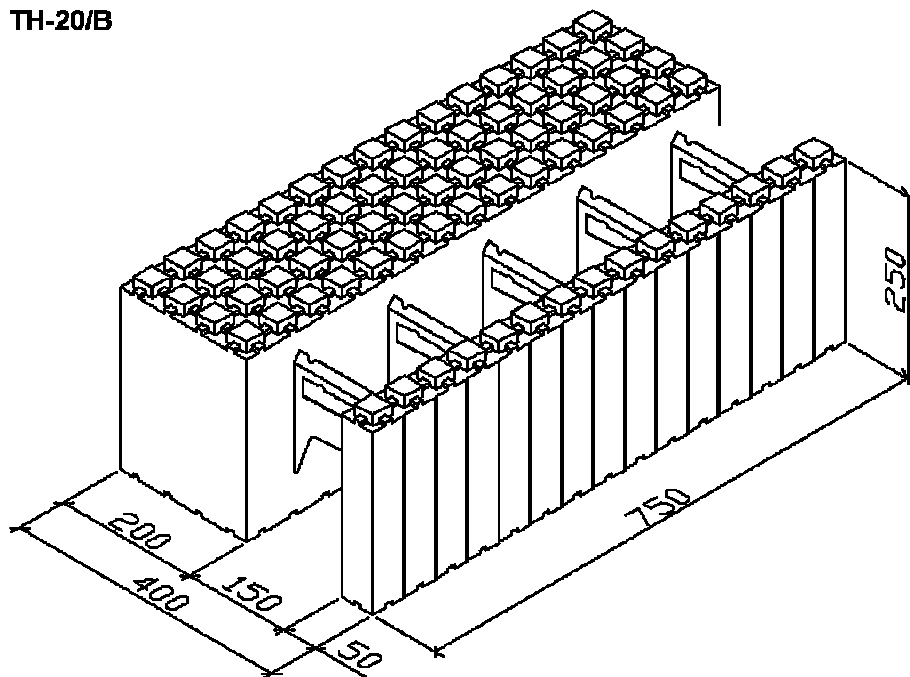
THERMOMUR-300 standard elements

Annex 6
of European
Technical Approval
ETA-07/0018

TH-20



TH-20/B

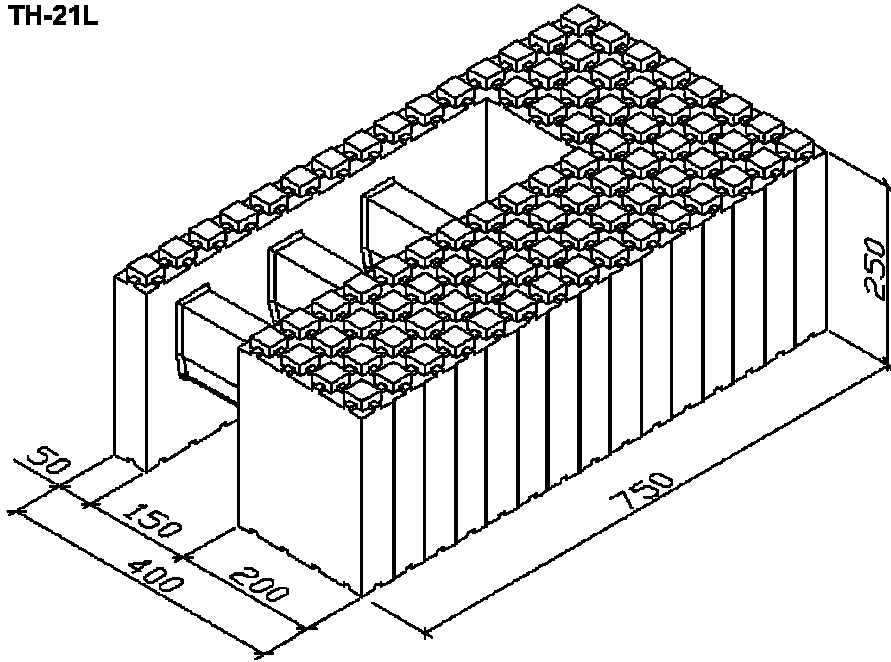


THERMOMUR

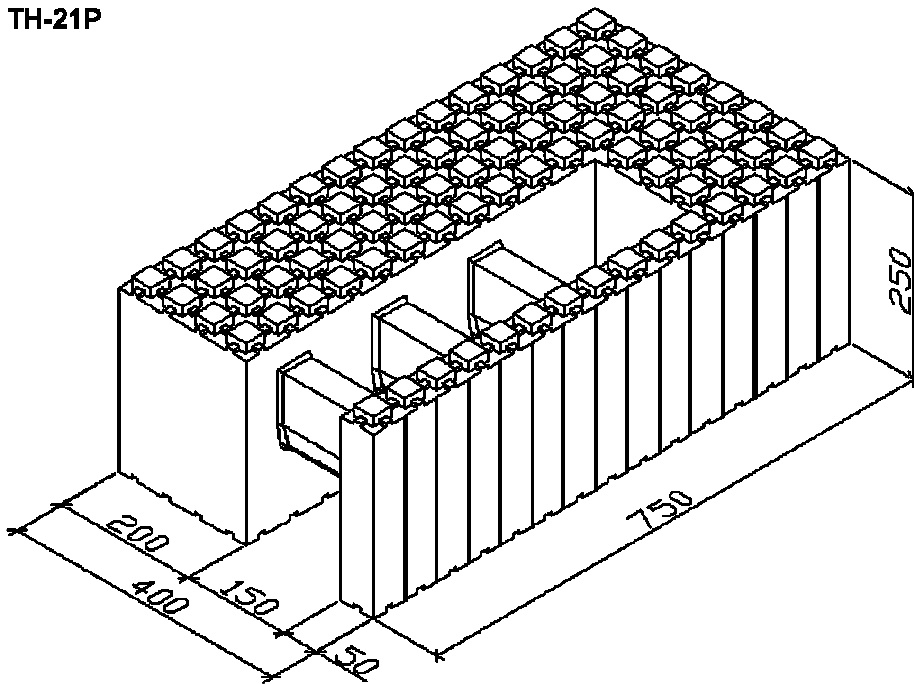
THERMOMUR-400 standard elements

Annex 7
of European
Technical Approval
ETA-07/0018

TH-21L



TH-21P

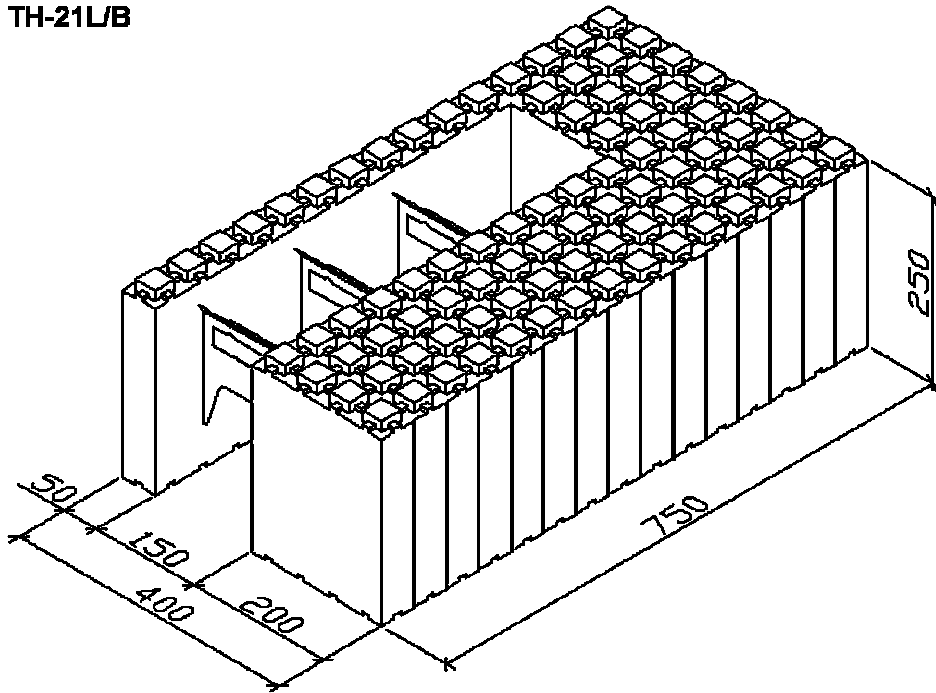


THERMOMUR

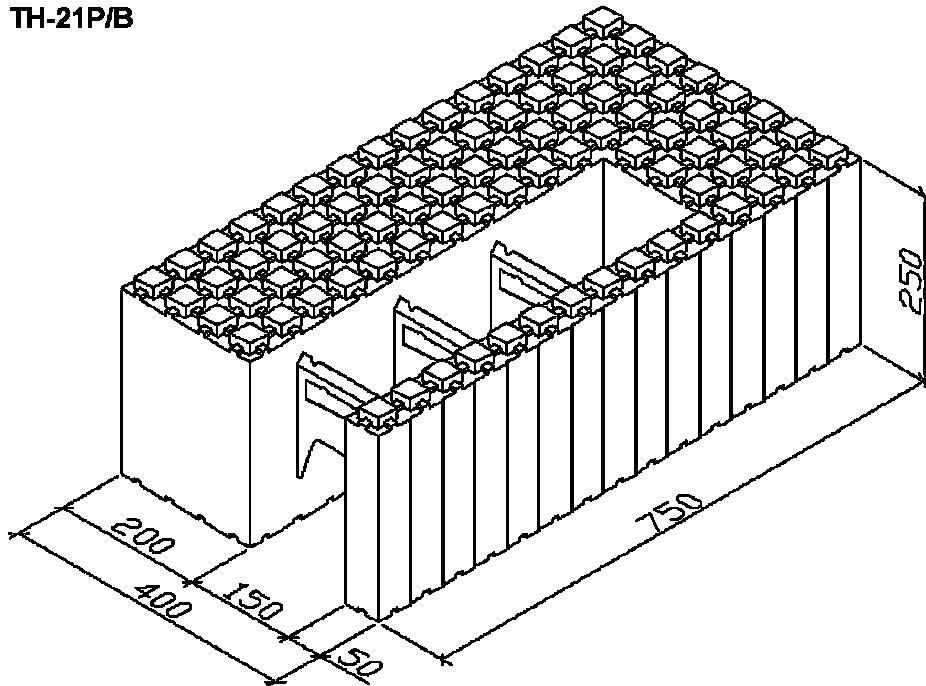
THERMOMUR-400 standard elements

Annex 8
of European
Technical Approval
ETA-07/0018

TH-21L/B



TH-21P/B

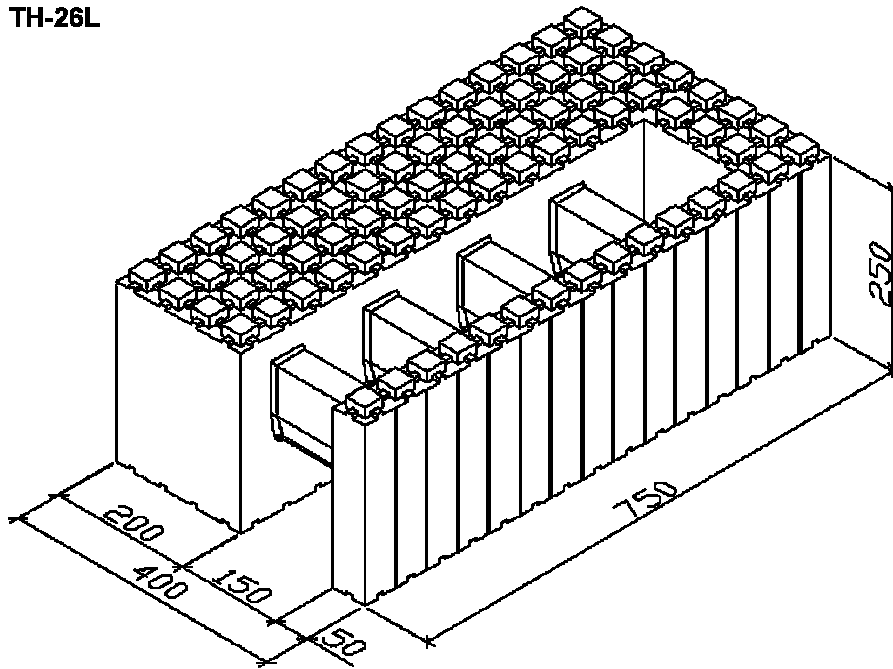


THERMOMUR

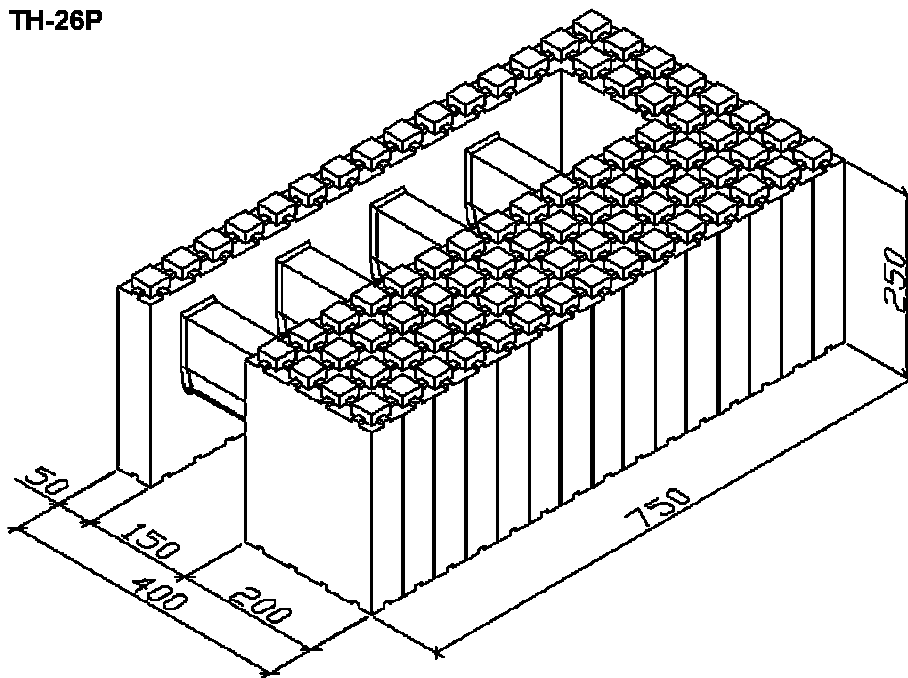
THERMOMUR-400 standard elements

Annex 9
of European
Technical Approval
ETA-07/0018

TH-26L



TH-26P

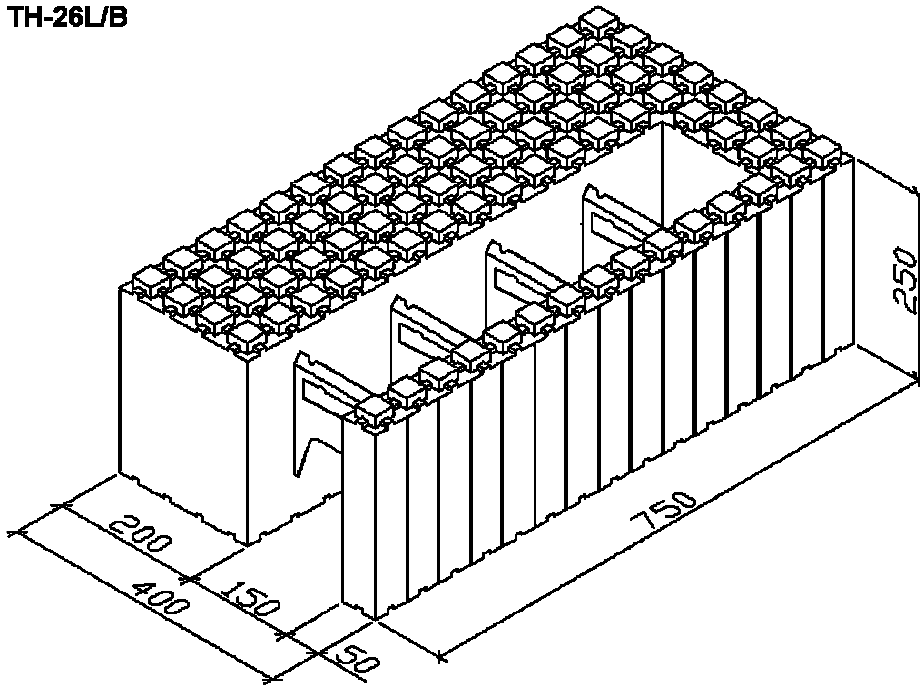


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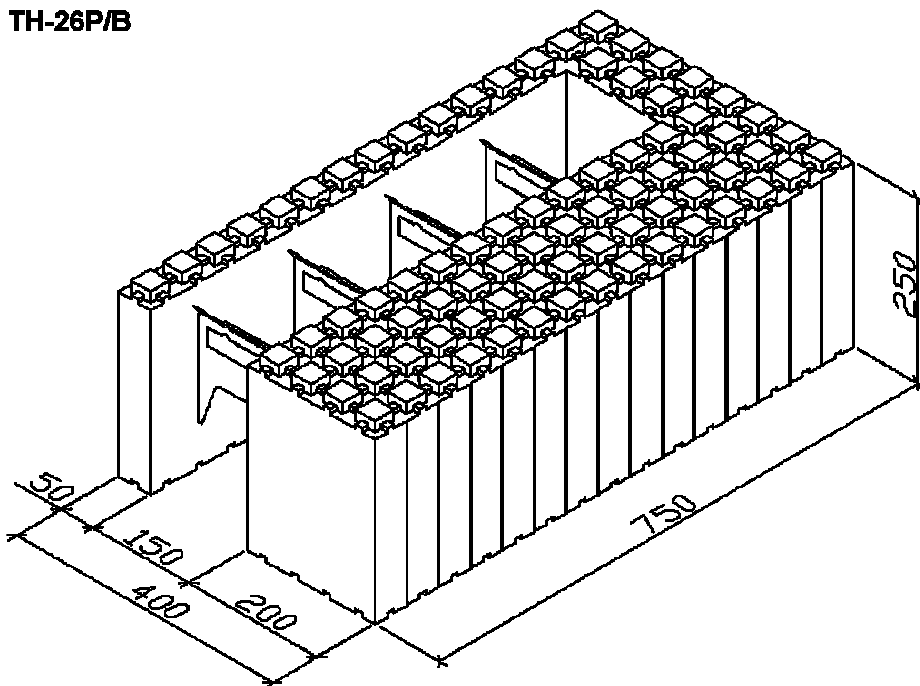
THERMOMUR-400 standard elements

Annex 10
of European
Technical Approval
ETA-07/0018

TH-26L/B



TH-26P/B

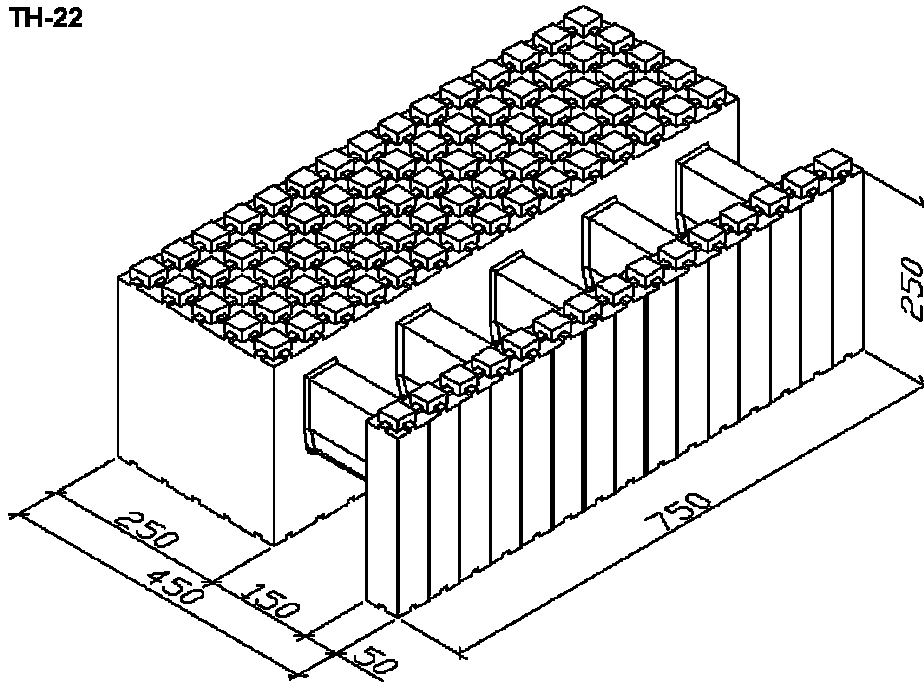


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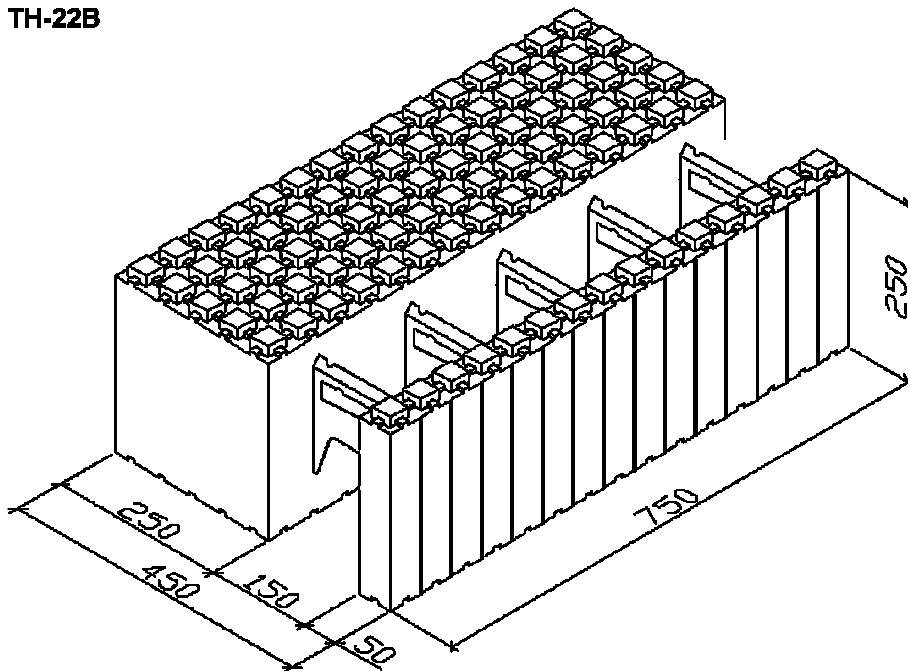
THERMOMUR-400 standard elements

Annex 11
of European
Technical Approval
ETA-07/0018

TH-22



TH-22B

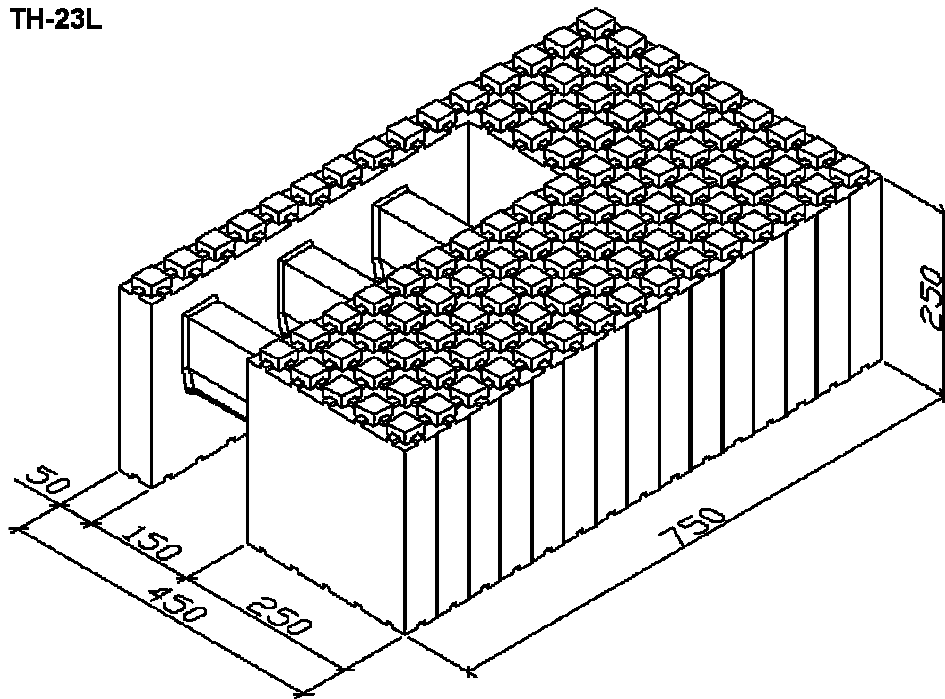


THERMOMUR

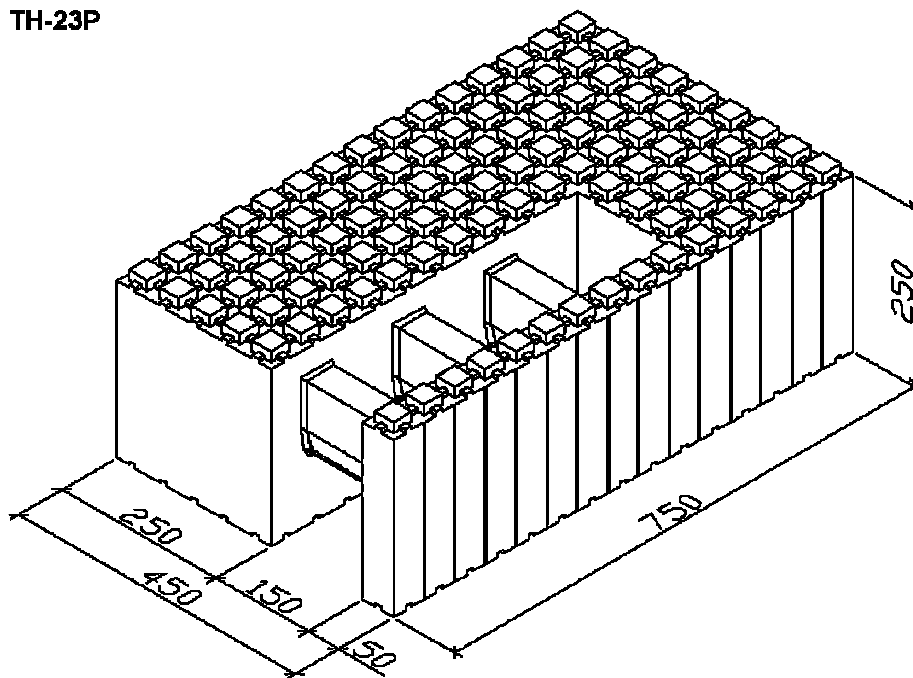
THERMOMUR-450 standard elements

Annex 12
of European
Technical Approval
ETA-07/0018

TH-23L



TH-23P

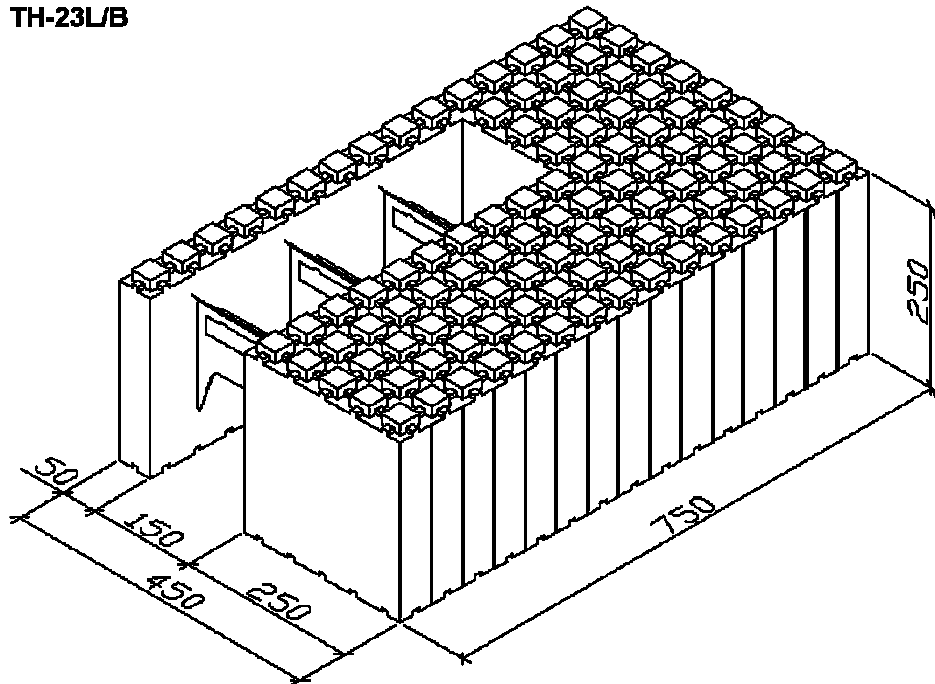


THERMOMUR

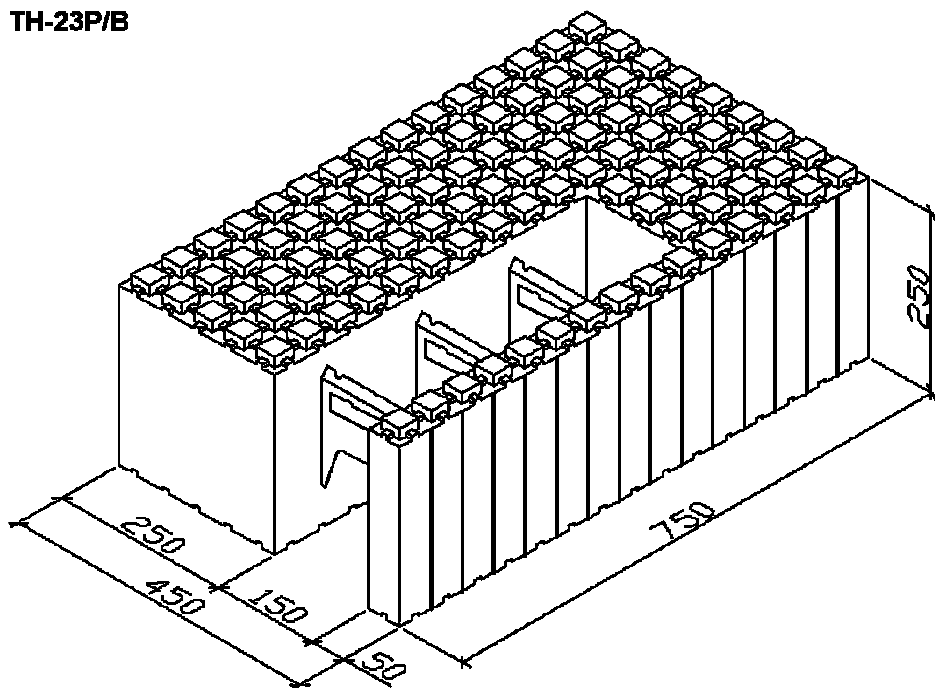
THERMOMUR-450 standard elements

Annex 13
of European
Technical Approval
ETA-07/0018

TH-23L/B



TH-23P/B

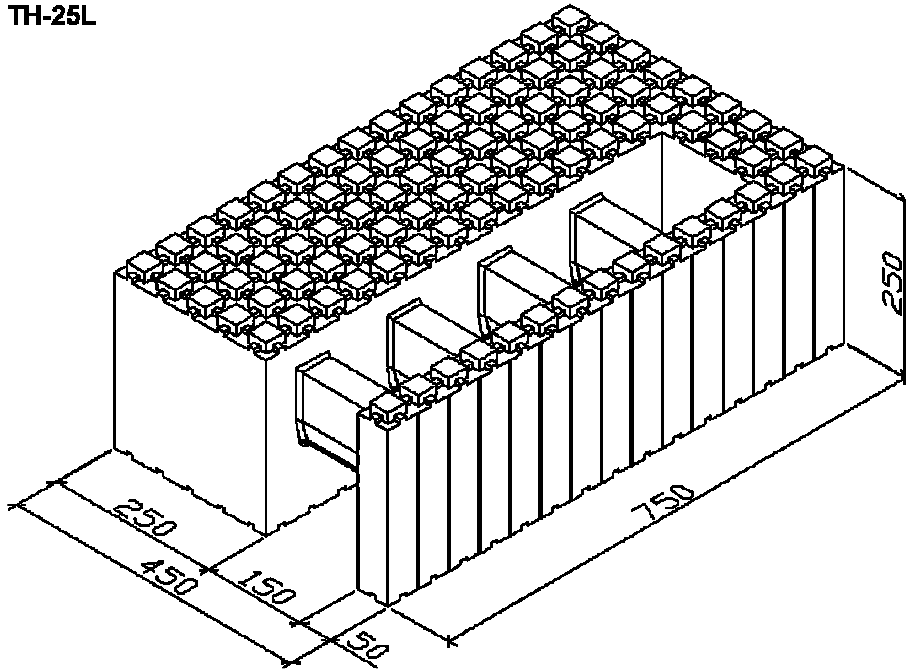


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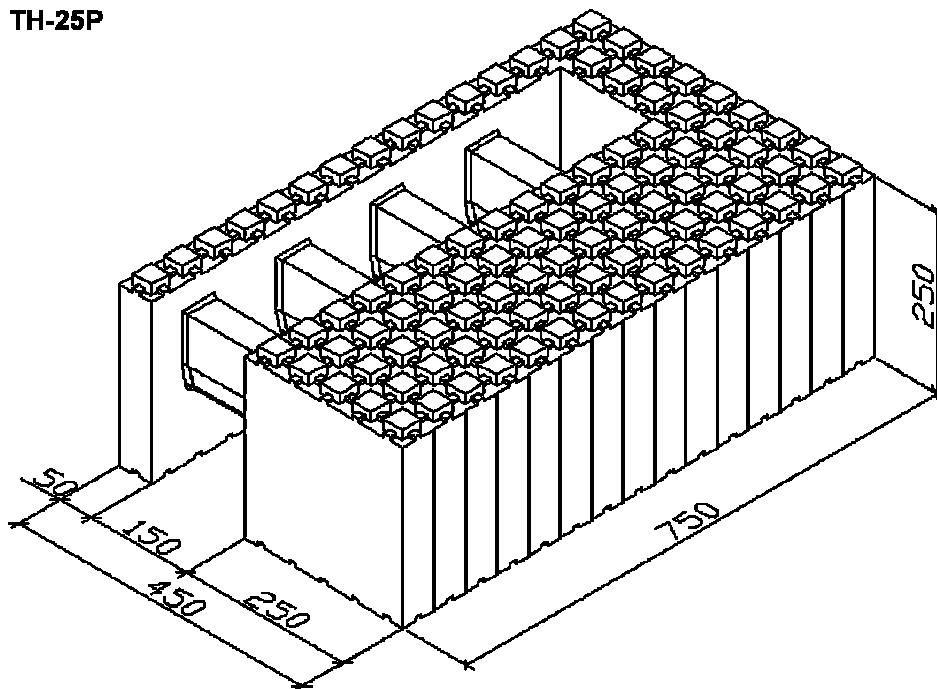
THERMOMUR-450 standard elements

Annex 14
of European
Technical Approval
ETA-07/0018

TH-25L



TH-25P

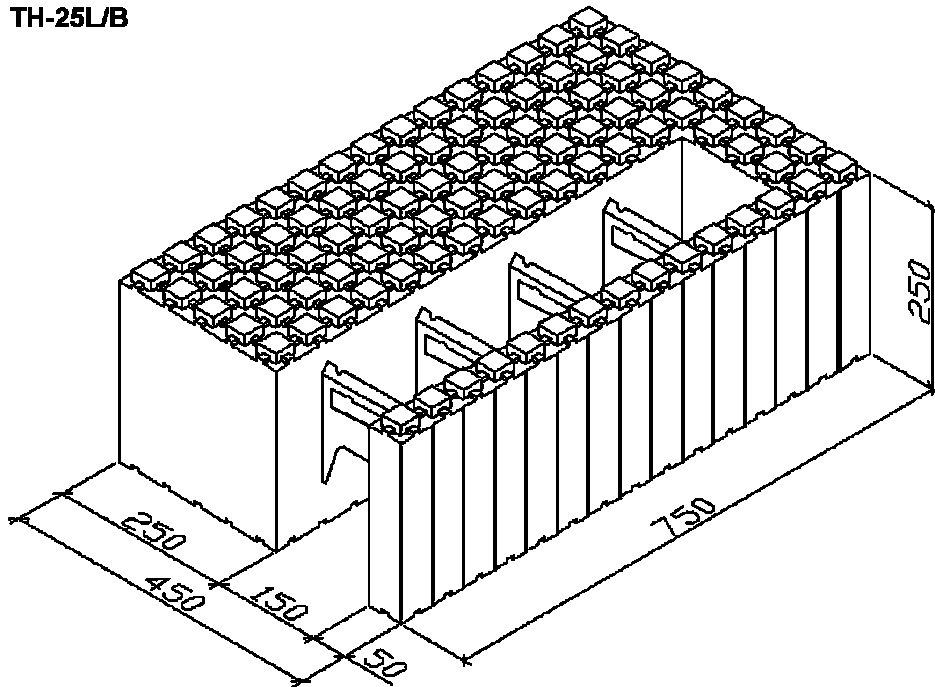


THERMOMUR

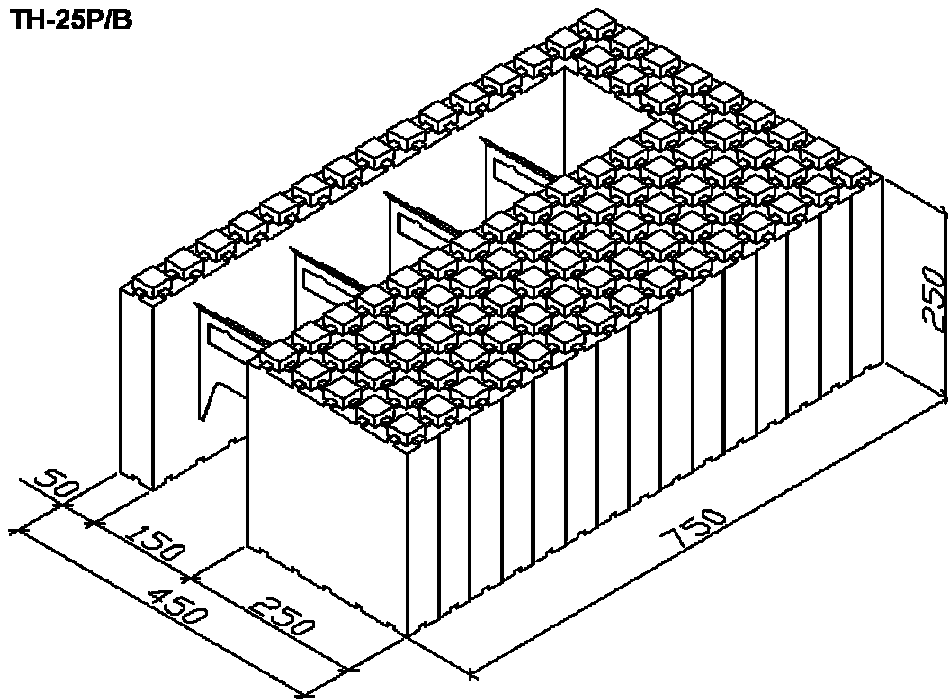
THERMOMUR-450 standard elements

Annex 15
of European
Technical Approval
ETA-07/0018

TH-25L/B



TH-25P/B

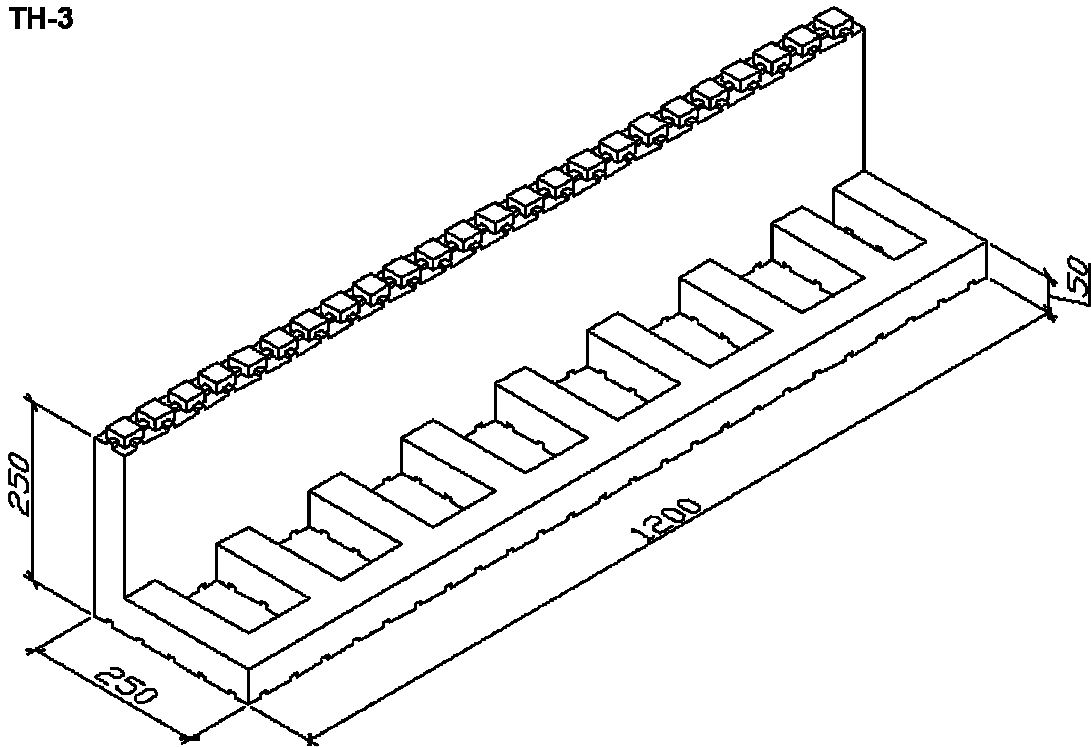


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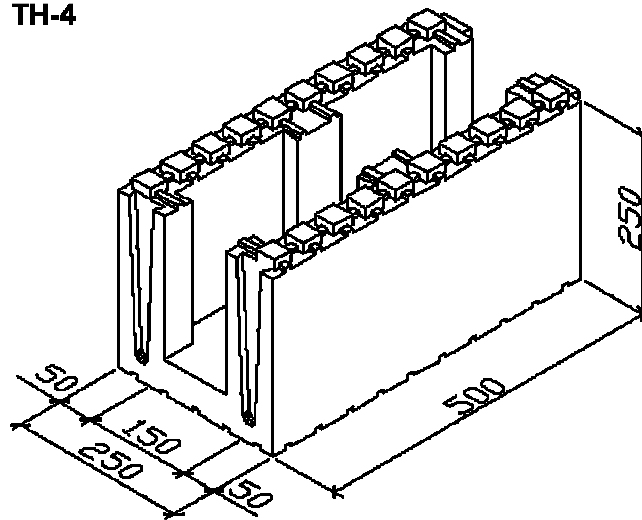
THERMOMUR-450 standard elements

Annex 16
of European
Technical Approval
ETA-07/0018

TH-3



TH-4

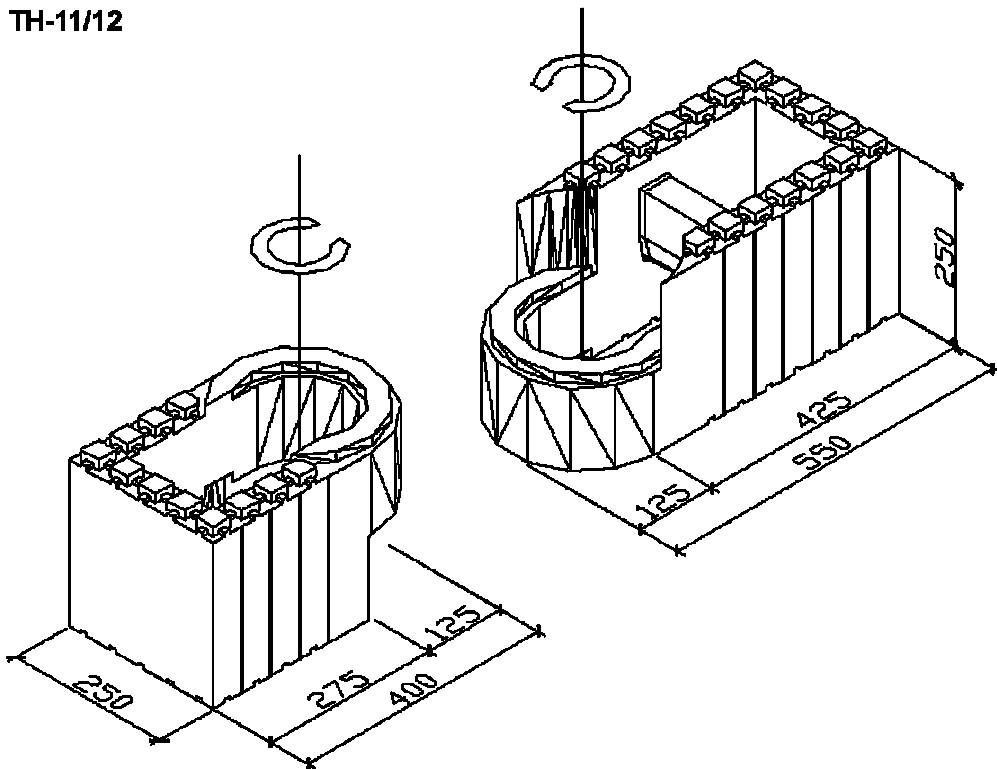


THERMOMUR

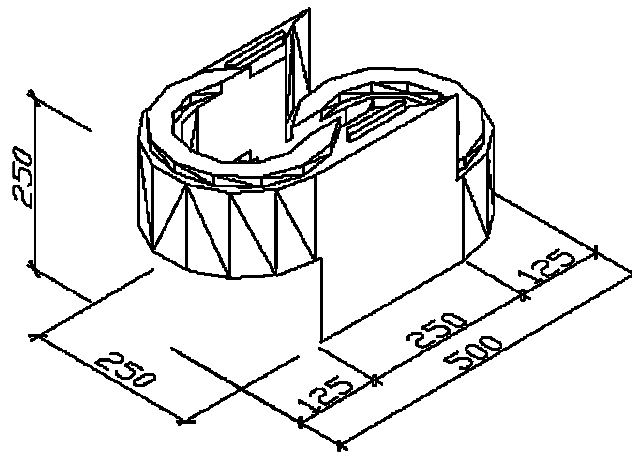
Tie beam TH-3 and lintel TH-4 elements

Annex 17
of European
Technical Approval
ETA-07/0018

TH-11/12



TH-13

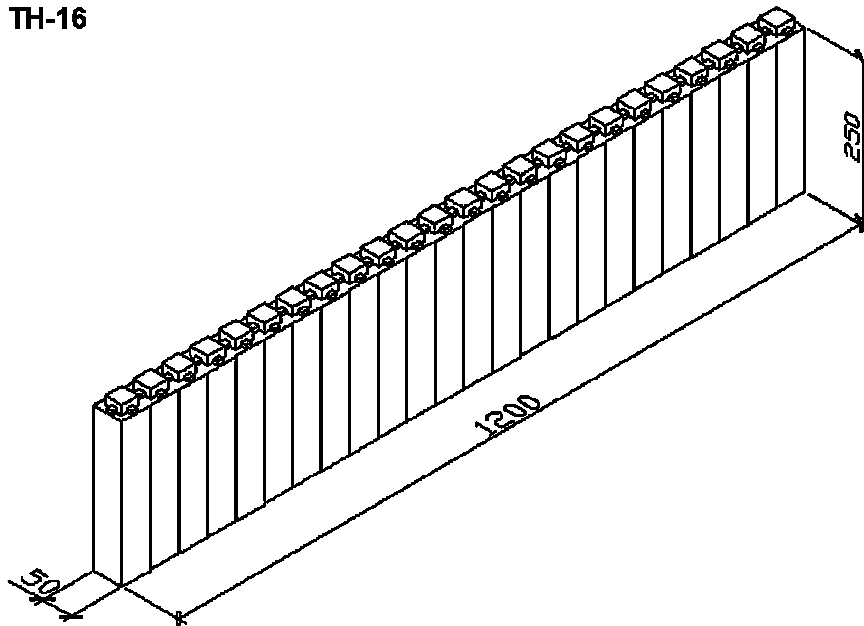


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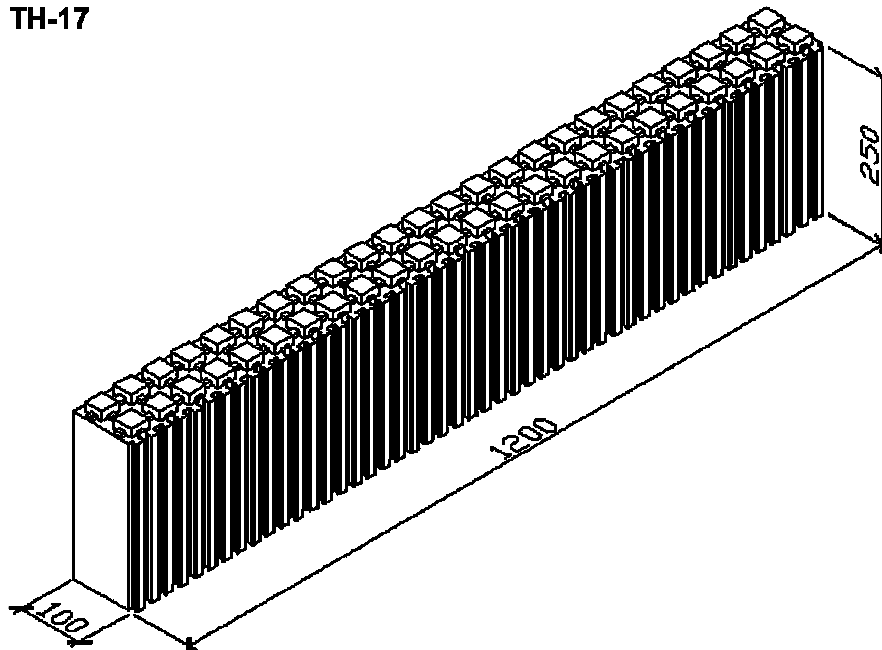
Hinge elements

Annex 18
of European
Technical Approval
ETA-07/0018

TH-16



TH-17

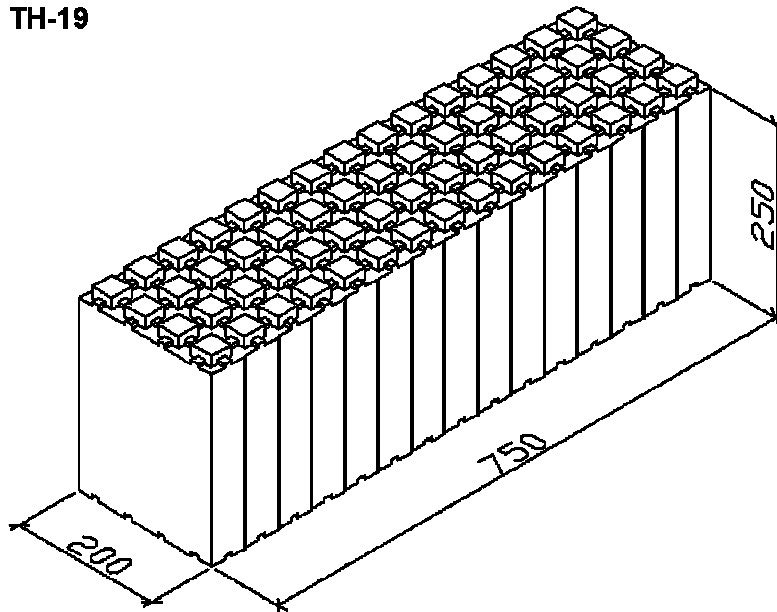


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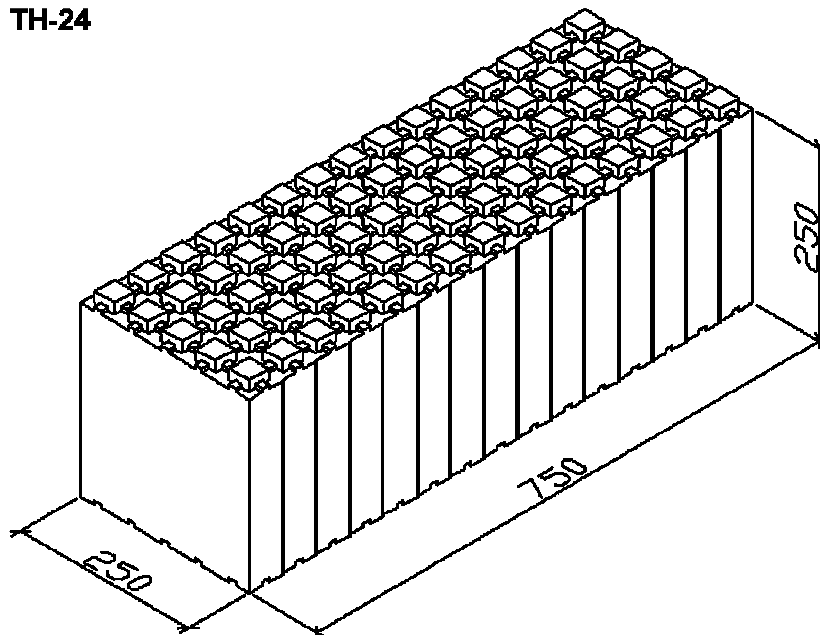
Additional elements

Annex 19
of European
Technical Approval
ETA-07/0018

TH-19



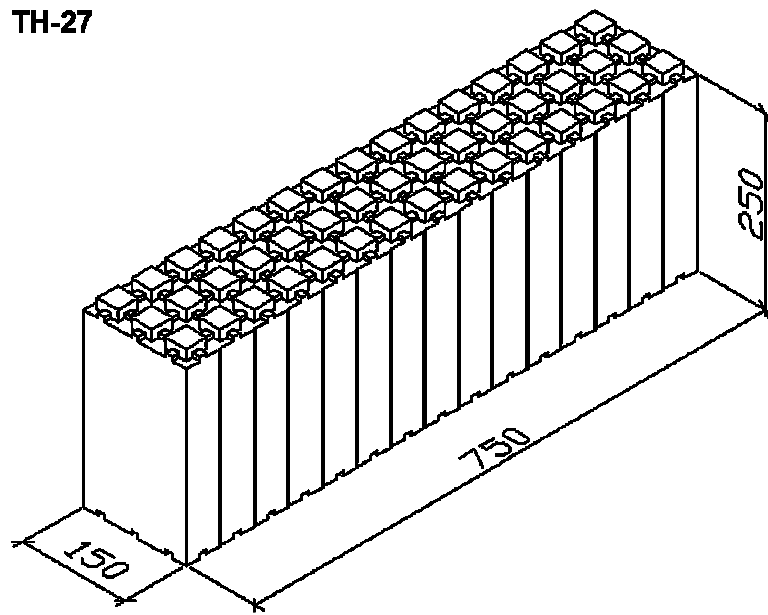
TH-24



THERMOMUR

Additional elements

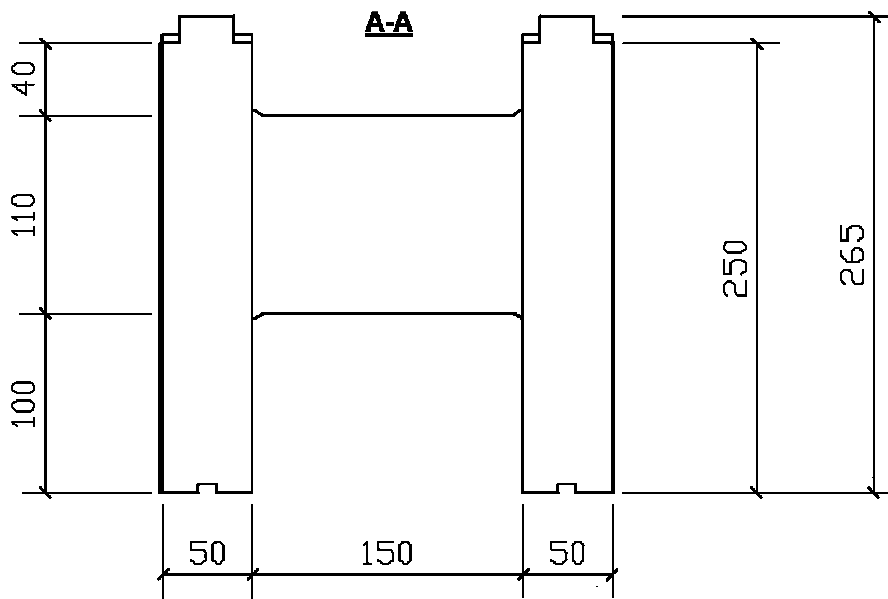
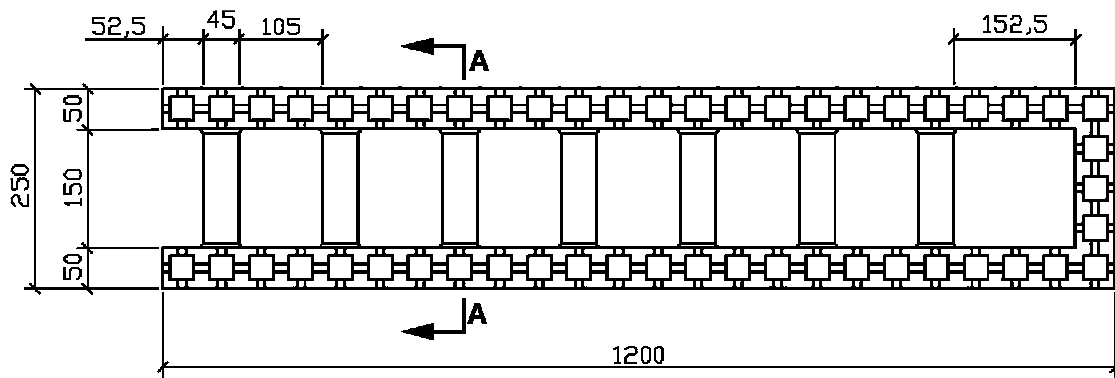
Annex 20
of European
Technical Approval
ETA-07/0018



THERMOMUR

Additional elements

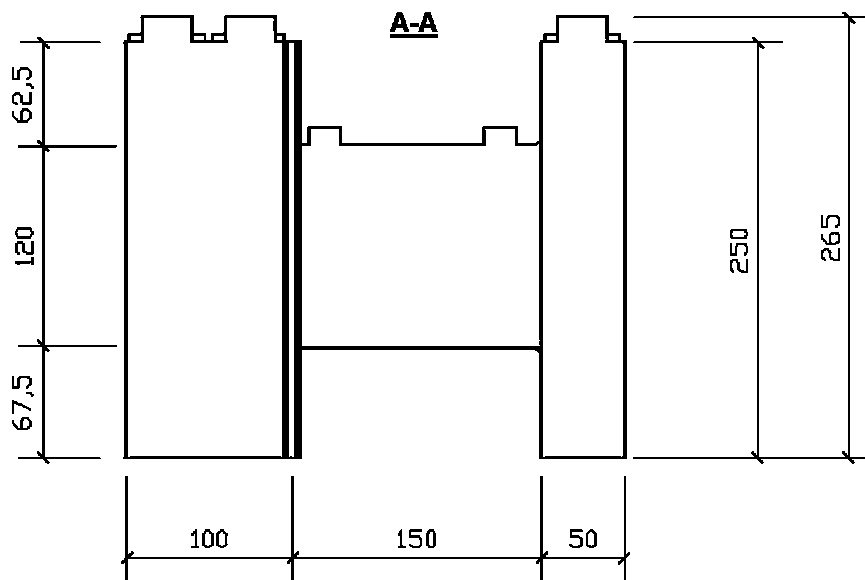
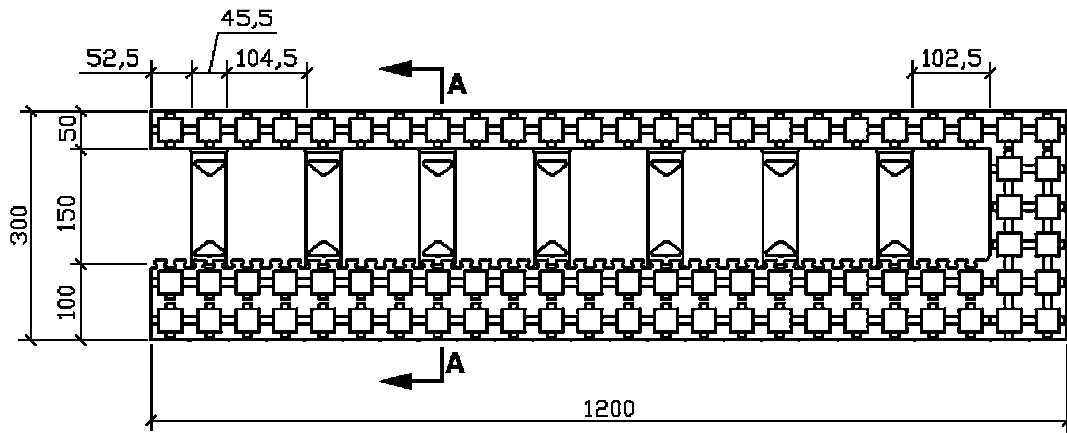
Annex 21
of European
Technical Approval
ETA-07/0018



THERMOMUR

THERMOMUR-250 standard element (view and vertical section)

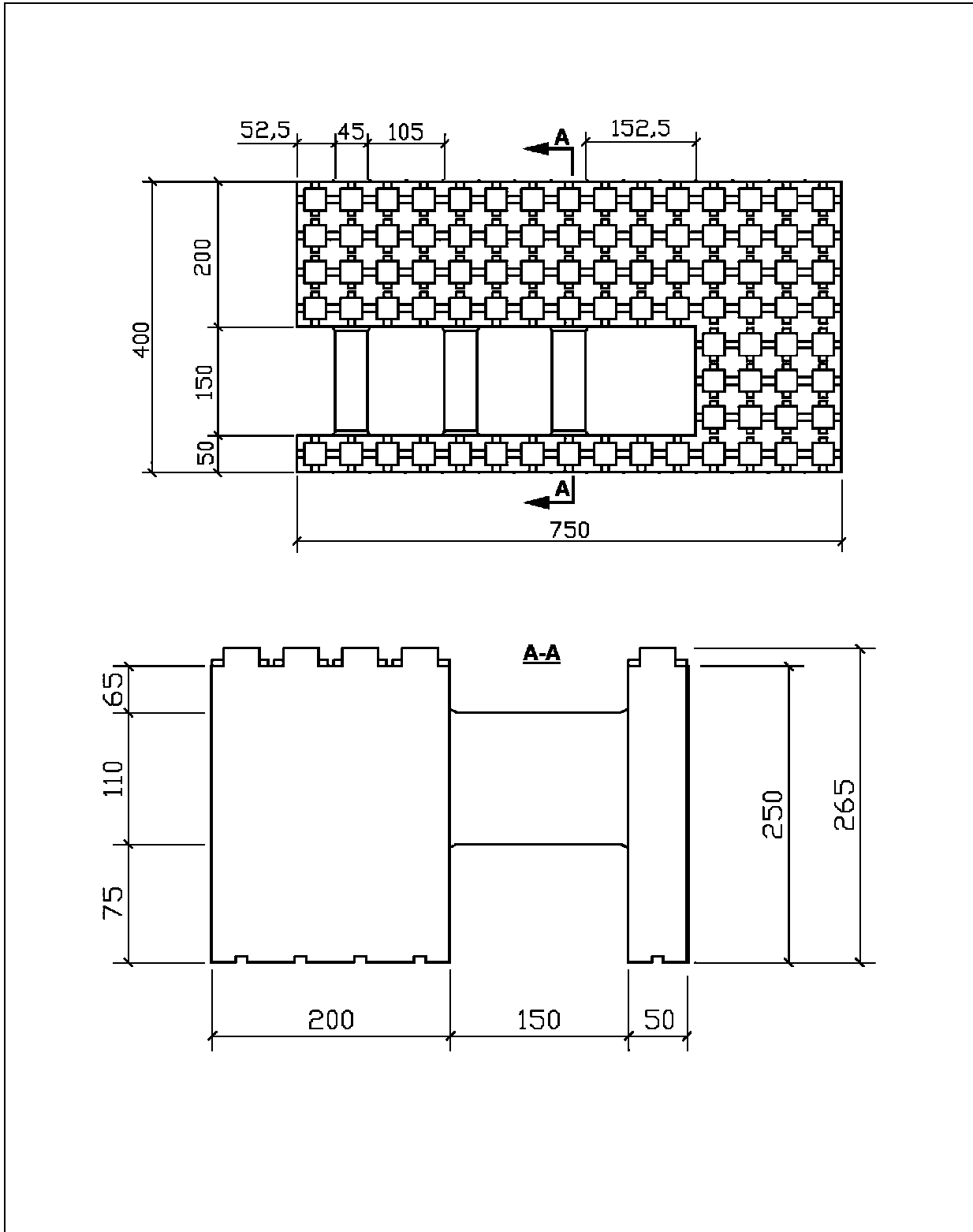
Annex 22
of European
Technical Approval
ETA-07/0018



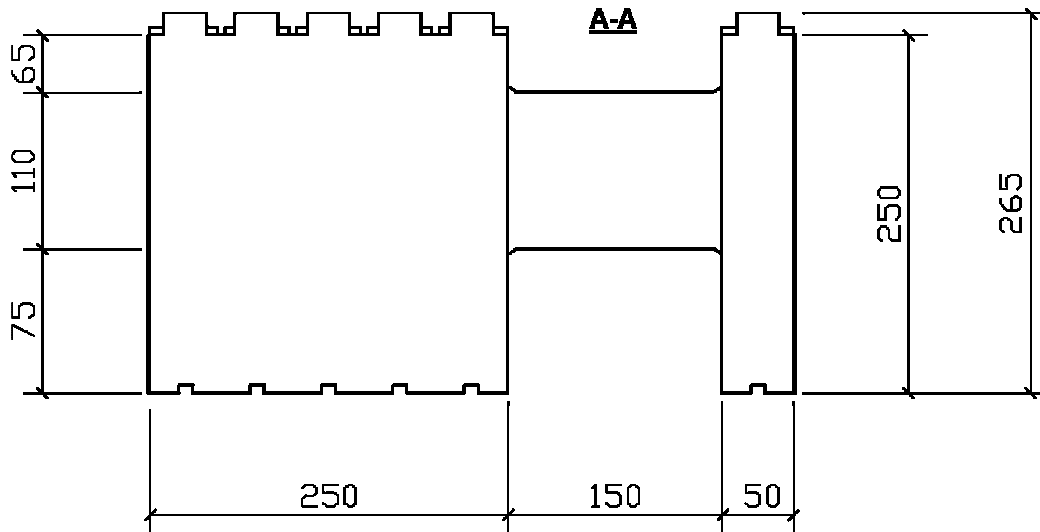
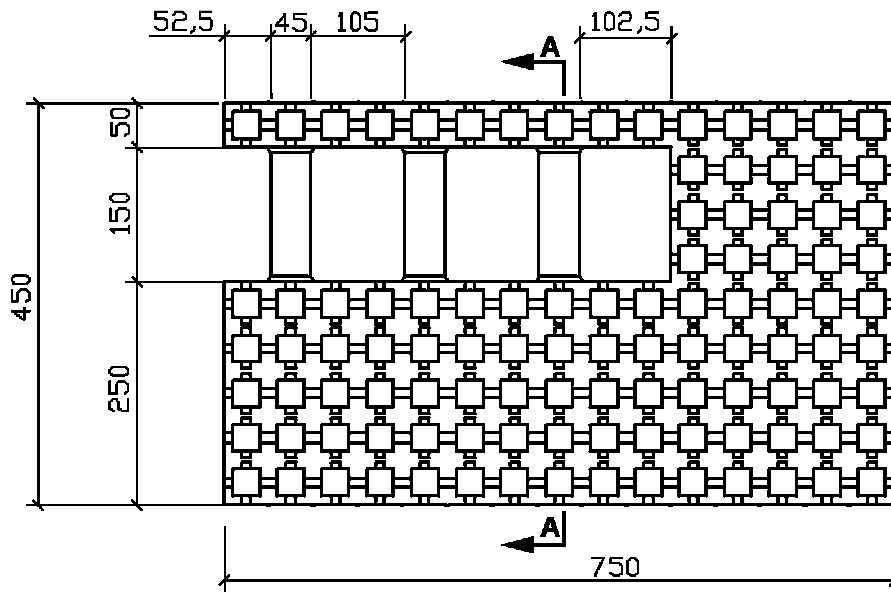
THERMOMUR

THERMOMUR-300 standard element (view and vertical section)

Annex 23
of European
Technical Approval
ETA-07/0018



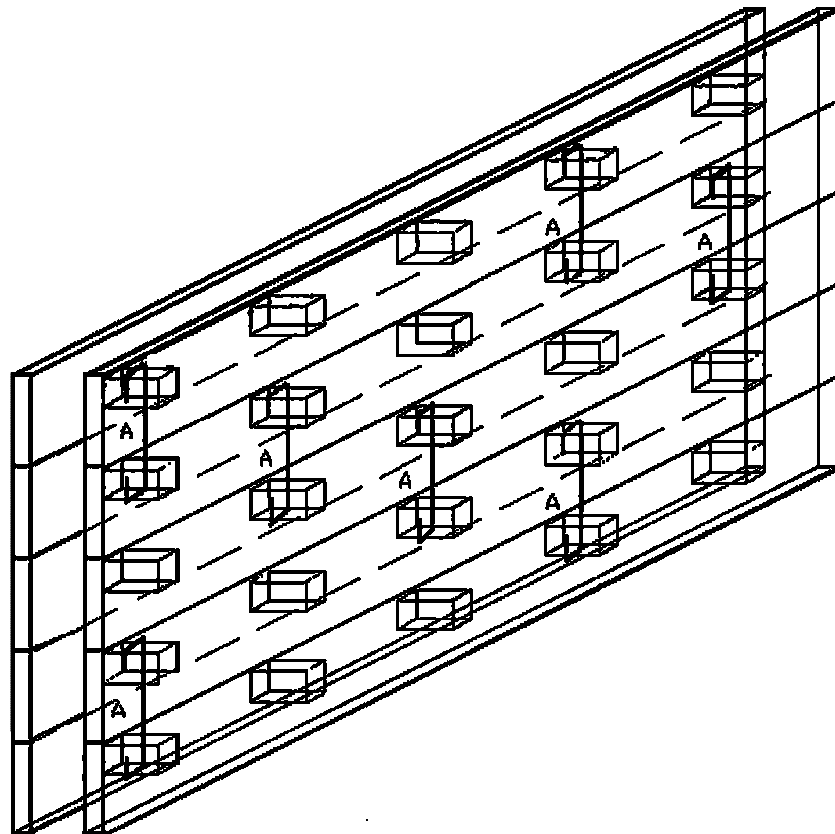
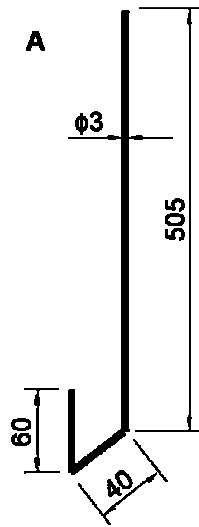
THERMOMUR	Annex 24
THERMOMUR-400 standard element (view and vertical section)	of European Technical Approval ETA-07/0018



THERMOMUR

THERMOMUR-450 standard element (view and vertical section)

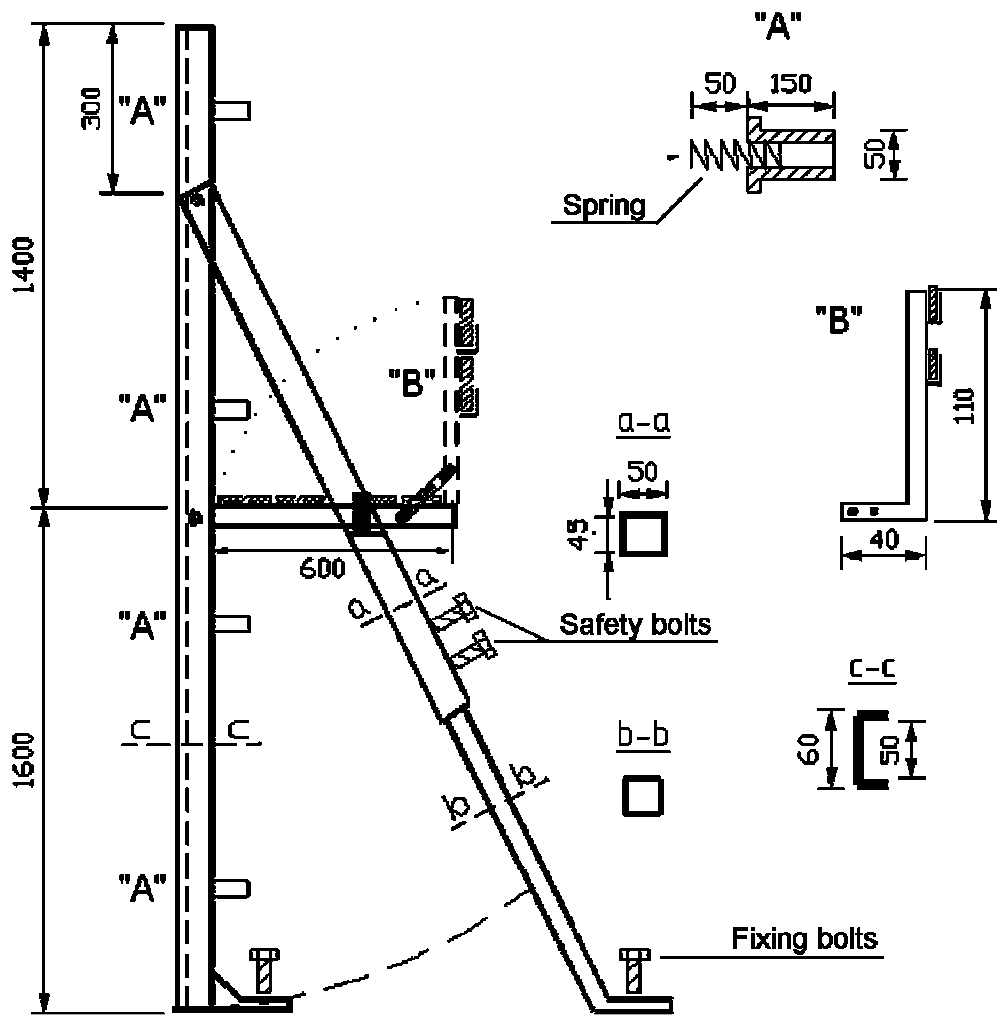
Annex 25
 of European
 Technical Approval
 ETA-07/0018



THERMOMUR

Clamps made of wire of the diameter $\Phi 3$ mm using between two shuttering elements (8 clamps per m^2 of the wall)

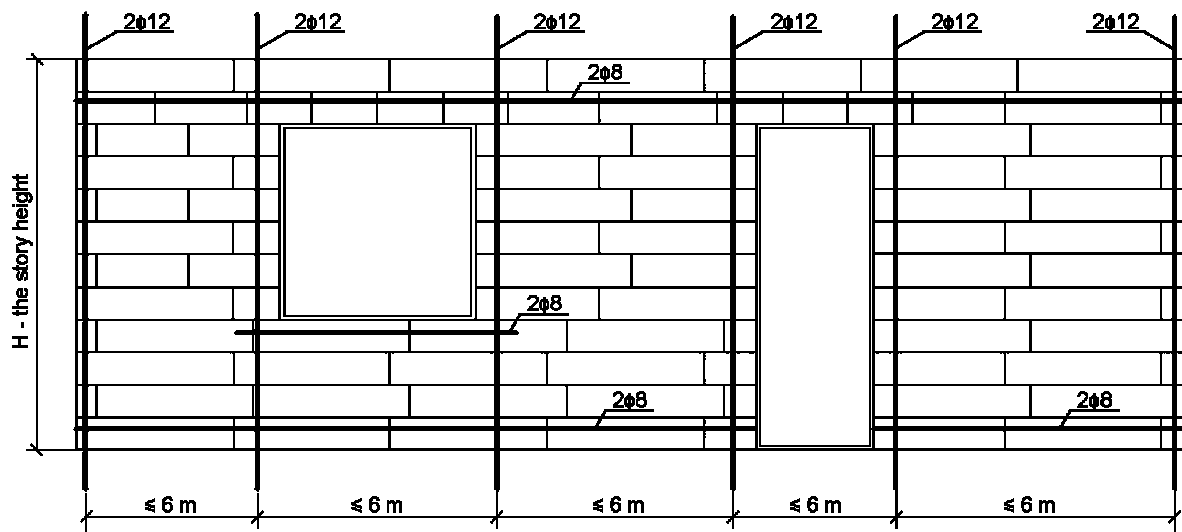
Annex 26
of European
Technical Approval
ETA-07/0018



THERMOMUR

Bracing supports arranged at a maximum distance of 1,0 m

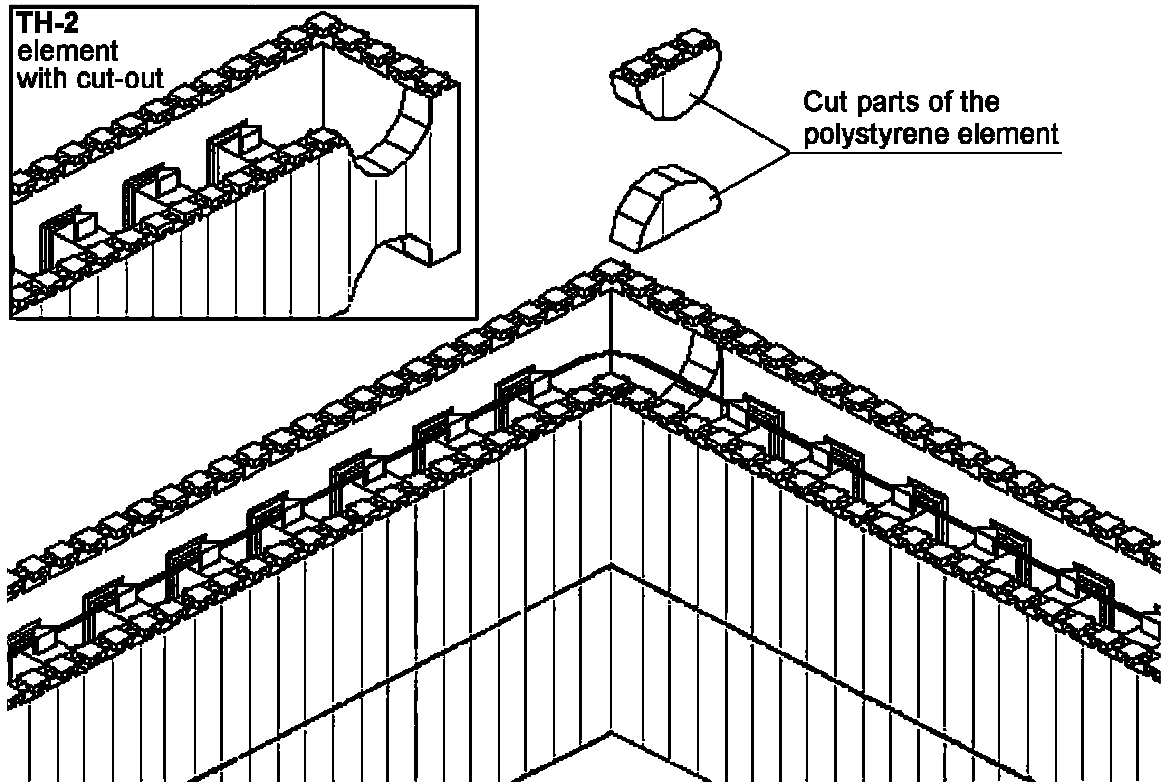
Annex 27
 of European
 Technical Approval
 ETA-07/0018



THERMOMUR

Minimum necessary steel reinforcement
(apart from the static calculation)

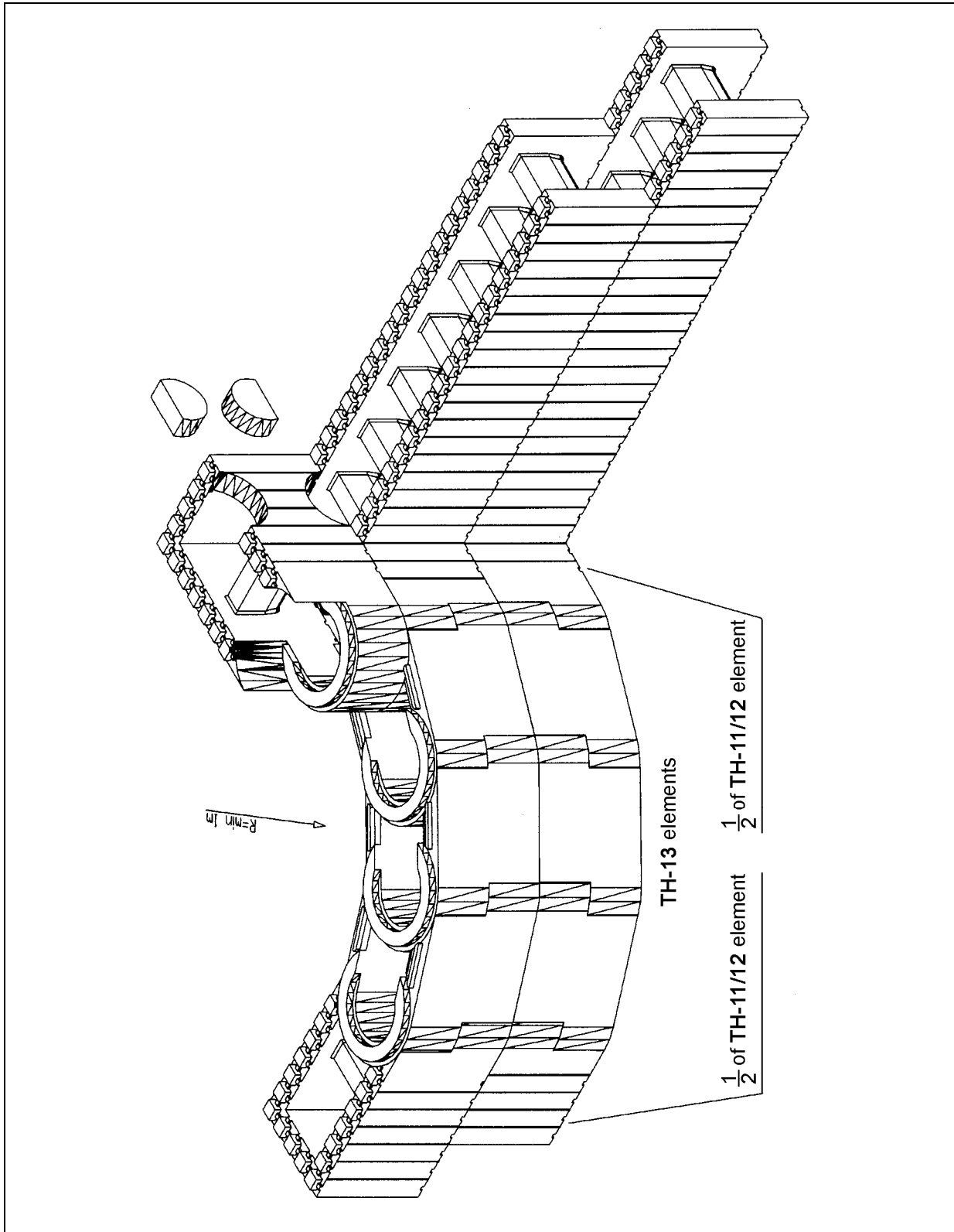
Annex 28
of European
Technical Approval
ETA-07/0018



THERMOMUR

Construction of 90° corner

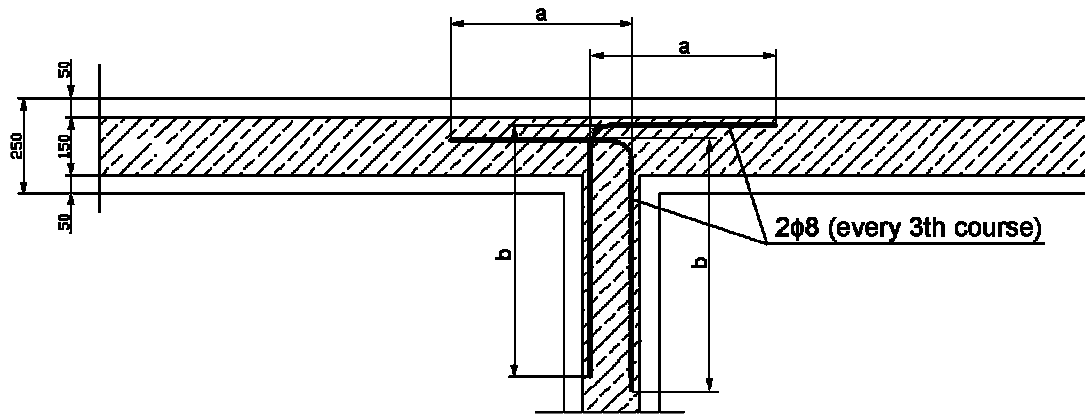
Annex 29
of European
Technical Approval
ETA-07/0018



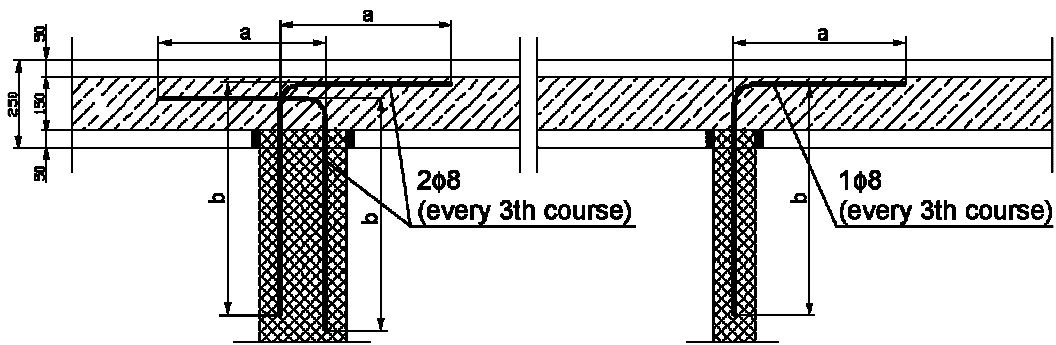
THERMOMUR

Construction of curved wall with TH-11/12 and TH-13 hinge elements

Annex 30
of European
Technical Approval
ETA-07/0018



THERMOMUR wall



traditionally built
load-bearing wall

traditionally built
non load-bearing wall

$a - 40 \times d_{\text{steel bar}}$

$b - 50 \times d_{\text{steel bar}}$

THERMOMUR

Placement of horizontal reinforcement steel in T-walls

Annex 31
of European
Technical Approval
ETA-07/0018