ÉMI NON-PROFIT LIMITED LIABILITY COMPANY FOR QUALITY CONTROL AND INNOVATION IN BUILDING
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ÉPÍTÉSÜGYI MINŐSÉGELLENŐRZŐ INNOVÁCIÓS NONPROFIT KFT.

ÉMI NON-PROFIT LIMITED LIABILITY COMPANY FOR QUALITY CONTROL AND INNOVATION IN BUILDING
ÉMI SOCIÉTÉ À BUT NON LUCRATIF POUR LE CONTRÔLE DE QUALITÉ ET L'INNOVATION DU BÂTIMENT, RESPONSABILITÉ LIMITÉE
ÉMI NON-PROFIT GESELLSCHAFT FÜR QUALITÄTSKONTROLLE UND INNOVATION IM BAUWESEN MIT BESCHRÄNKTER HAFTUNG

A-32/2013

ÉME
NATIONAL TECHNICAL APPROVAL

Trade name of the product:	**Masonry construction with permanent formwork type IsoShell**
Intended uses of the product:	**Heat isolated wall element of residential and public buildings, as well as industrial facilities**
Applicant: as the holder of ÉME	**IsoShell Zrt. 1112 Budapest, Horzsakő utca 1**
Manufacturer of the product:	**IsoShell Zrt. 1112 Budapest, Horzsakő utca 1**
Professional code (SZRJ) of ÉMI Non-profit Llc.:	**Construction systems of miscellaneous material (SzRJ: 3.1.4.)**
ÉME valid from:	**28. June 2013**
ÉME valid until *:	**28. June 2018**

Géza Matuz

Deputy General Manager
Production and Sales Director

The National Technical Approval consists of 12 pages and one numbered stamped Annex.

* Expiry of ÉME validity is subject to conditions. The validity of ÉME is to be checked in homepage (www.emi.hu) of ÉMI Non-profit Llc.

Project number: **A1-1129K-00196-2013**

DO-7999K-02218-2013

I. LEGAL REGULATION AND GENERAL TERMS AND CONDITIONS

1. The present ÉME has been issued by ÉMI Non-profit Ltd. for Quality Control and Innovation in Building based on
   - the BM-GKM-KvVM (Ministry of Interior- Ministry of Economy and Transport- Ministry for Environment and Water) joint Decree No. 3/2003 (I. 25.) on detailed rules of the technical requirements, certification of conformity as well as marketing and uses of the construction products,
   - the assignation specified in IKIM (Ministry of Industry, Trade and Tourism) announcement No. 16/1998. (IKK.8.),
   - and evaluation of test results detailed in Suitability Test Protocol with same reference and date as of ÉME.
2. The holder of ÉME is the natural or legal entity, for which (whom) the ÉME was issued by ÉMI Non-profit Llc.
3. ÉMI Non-profit Llc., as approval body, is entitled to verify in the framework of follow-up testing if the contents of ÉME still exist in respect of the product, the production plant as well as the relating technical specifications and legislative environment, and to define the terms and conditions for maintaining and extending the validity of ÉME.
4. The holder of ÉME is not allowed to assign ÉME to other party. The ÉME is valid exclusively for products manufactured in the indicated production plants.
5. Pursuant to BM-GKM-KvVM joint Decree No. 3/2003 (I. 25.) ÉMI Non-Profit Llc. shall withdraw the ÉME in one year after the publication of the standard if a new naturalized harmonized European standard has been issued for the product within the duration of validity of ÉME, unless the product differs significantly from the standards. If a European Technical Approval (ETA) has been issued for the product within the validity period of ÉME, then the validity of ÉME cannot be renewed.
6. The holder of ÉME shall notify if the features, the intended application area or the production circumstances change and shall apply for ÉME amendment.
7. ÉMI Non-profit Llc. may withdraw the ÉME for the product if the follow-up inspection cannot be performed, the result of the inspection is inadequate, the modification procedure related to liability to give notice cannot be performed out of the fault of ÉMI Non-profit Llc., or the product turned out not to be suitable for the intended purpose.
8. ÉMI Non-profit Llc. shall issue the ÉME in Hungarian, and on subsequent request and for an additional fee in English, German or French or maybe in other languages. The basis of legal validity is the Hungarian issue of the ÉME.
9. ÉME may only be copied in its entirety or published by means of other data medium. Extracts are only allowed on the prior written approval of ÉMI Non-profit Llc. In case of notifying extracts this fact shall be indicated. Text and drawings of advertising materials may not be contrary to the content of the National Technical Approval and may not give rise to misunderstanding.
10. The ÉME, as a technical specification, will not replace other permits, certificates (e.g. environment protection and property protection, building authorities' permits) necessary for distribution, utilization, installation and use of the product as well the documents of the certification of conformity, the factory production control certification, the first type test protocol, supplier's certification of conformity).
11. The certification of conformity issued on the basis of ÉME shall not entitle either the manufacturer or the distributor to use CE conformity marking on the product or on the packaging.

II. SPECIAL TERMS AND CONDITIONS FOR THE NATIONAL TECHNICAL APPROVAL

1. DATA

1.1. Manufacturing location(s) of the product

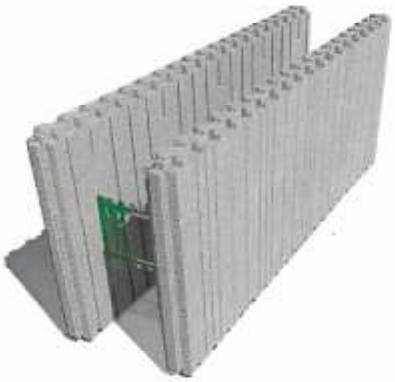
Knauf Pack Kft.

8000 Székesfehérvár, Bakony u. 6.

1.2. Description of the product

The expanded polystyrene side walls of IsoShell moulding elements (EPS – EN 13163 – T2 – L2 – W2 – S2 – P4 – BS250 – CS(10)80 – DS(N)2 – DS(70,-)1 – TR100 – W_{lp}0,5) are connected with spacers made of hard plastic. Allocation of the elements is supported by the cams placed on their upper part and which exactly fit into recesses on the lower part of the elements.

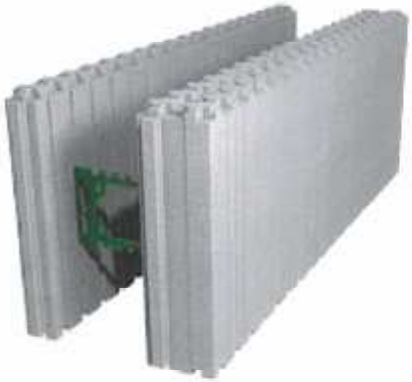
	IsoShell *SMART* element types	Nominal sizes of elements thickness/ height/ length (mm)	thickness			total thickness /mm/
			outer shell	concrete core	inner shell	
ISS 25	**ISS 25** wall element	250/350/950	50	150	50	250
ISS 30	**ISS 30** wall element	300/350/950	100	150	50	300
ISS 35	**ISS 35** wall element	350/350/950	150	150	50	350
ISS 40	**ISS 40** wall element	400/350/950	200	150	50	400
ISS 25 L	**ISS 25** bridging element	250/350/950	50	150	50	250
ISS 30 L	**ISS 30** bridging element	300/350/950	100	150	50	300
ISS 35 L	**ISS 35** bridging element	350/350/950	150	150	50	350
ISS 40 L	**ISS 40** bridging element	400/350/950	200	150	50	400
ISS 25 RB	**ISS 25** ring beam element	250/300/950	50	150	50	250
ISS 30 RB	**ISS 30** ring beam element	300/300/950	100	150	50	300
ISS 35 RB	**ISS 35** ring beam element	350/300/950	150	150	50	350
ISS 40 RB	**ISS 40** ring beam element	400/300/950	200	150	50	400
ISS+ 15EP	**ISS end piece 15** lock element	150/350/50	×	×	×	150
ISS+ 15P	**ISS level 15** breast element	150/50/500	×	×	×	150
ISS+ R	**ISS raiser** raising element	50/50/500	×	×	×	×



ISS-25 (basic element)

ISS-25L (bridging element)

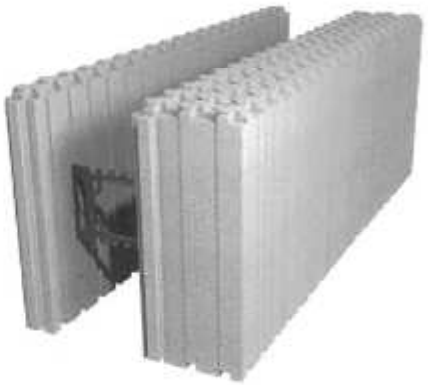
ISS-25RB (ring beam element)



ISS-30 (basic element)

ISS-30RB (ring beam element)

ISS-30L (bridging element)



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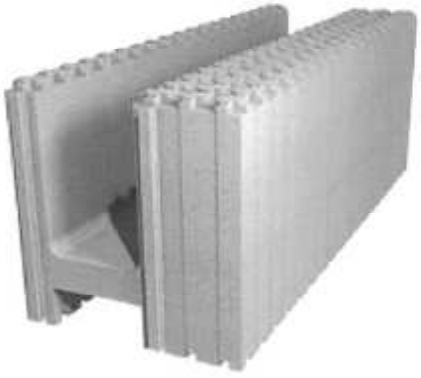

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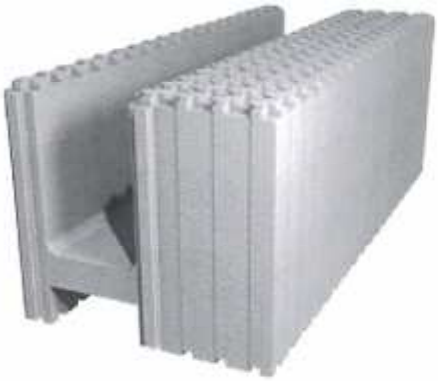
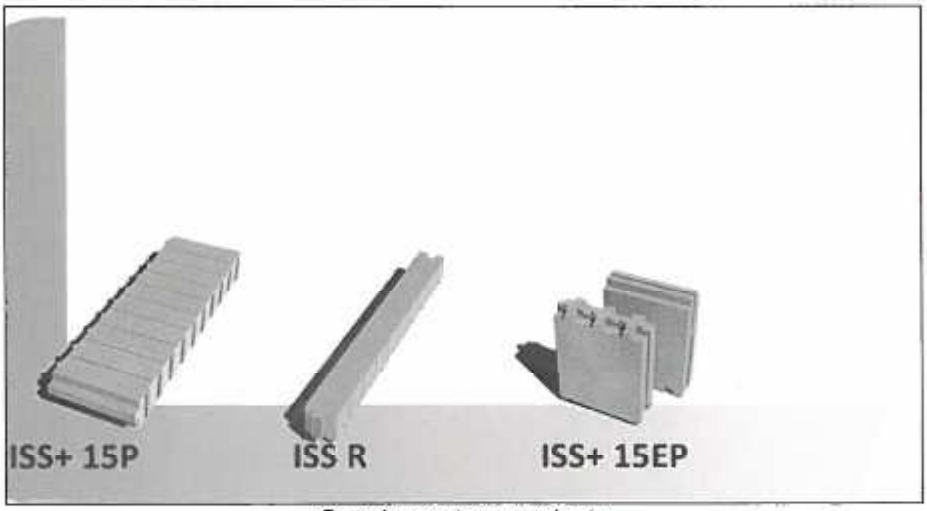
ISS-35RB (ring beam element)

ISS-40 (basic element)



ISS-40L (bridging element)

ISS-40RB (ring beam element)



Supplementary products

1.3. Description of the intended use the product

When making the wall structures type IsoShell the joints of the formwork elements assembled with polystyrene cellular hard plastic spacers are provided with statically sized reinforcement and are filled in intermittently (in maximum every second row) with concrete (minimum C16/20). The masonry is raised on traditional basic structure provided with prefabricated water proofing. In case of special demand on heat

insulation the erection of the facade wall structure starts with special EPS element. Following the consolidation of the concrete neither the plastic spacers nor the polystyrene side walls have static role.

The wall structure is used as exterior and interior bearing wall. The exterior wall structure is provided from outside with thin mortar reinforced with glass fabric, and from inside with 15 mm thick fire protection gypsum plasterboard mechanically fixed to the armoured concrete core. The interior wall structure is provided on both sides with 15 cm thick fire protection gypsum plasterboard mechanically fixed to armoured concrete core.

2. CHARACTERISTICS AND TEST/EVALUATION METHODS

2.1. Technical characteristics of the product, its approved values and inspection/judgment methods

2.1.1. Mechanical resistance and stability

The bearing capacity of wall structures type IsoShell must be checked individually based on the EUROCODE standard series as concrete or armoured concrete structure.

Structural model
Concerning the structural concrete filling the structural model of the wall made of IsoShell formwork elements is a continuous-type wall on the basis of chapter 2.2 of ETAG 009.

Efficiency of filling
Based on our observations made during filling the test structure the requirements of chapter 6.1.2 of ETAG 009 are met, neither breakage of the formwork nor steel reinforcement without holes and concrete cover occurred.

Possibility of steel-armoured reinforcement
Geometry of holes and arrangement of bridging elements make the correct allocation of steel reinforcement and appropriate concrete covering possible according to the requirements of point 6.1.3 of ETAG 009.

2.1.2. Safety in case of fire

Product characteristics	Product characteristics value	Test or calculation method
The formwork elements type IsoShell are **exterior bearing wall structures** made by filling with minimum C16/20 concrete, from outside provided with thin mortar reinforced with glass fibre, from inside provided with 15 mm thick fire protection gypsum plasterboard mechanically fixed to the concrete core, as well as **interior bearing wall structures** provided on both sides with 15 cm thick fire protection gypsum plasterboard mechanically fixed to armoured concrete core		
Resistance to fire (minute)	REI 120	MSZ EN 13501-2:2007+A1:2010, ETAG 009
Reaction to fire class (-)	B	MSZ EN 13501-1:2007+A1:2010, part OTSZ 5. issued with Decree No. 28/2011 (IX.6.) BM
IsoShell formwork element		
Reaction to fire class (-)	E	MSZ EN 11925-2 MSZ EN 13501-1:2007+A1:2010

2.1.3. Hygiene, health and environmental protection

Water vapour permeability

Product characteristics	Product characteristics value	Test or calculation method
EPS vapour diffusion resistance factor, μ	36	MSZ EN 12086

Water absorption

Product characteristics	Product characteristics value	Test or calculation method
Surface water absorption with short-term partial immersion $\frac{m_{24} - m_{ii}}{A}$	0,042 kg/m^2	MSZ EN 1609:1999

Dangerous substances

The manufacturer shall make a declaration on the dangerous substances used in the products (i.e. pentane), which must be considered as hazardous materials on the basis of the "General Check List ER 3 " and which are listed in the "Indicative list of hazardous materials ".

2.1.4. Safety in use

Product characteristics	Product characteristics value	Test or calculation method
Concrete pressure resistance, in case of concreting in every second row	adequate	with expert's assessment on the basis of ETAG 009 6.4.2.
Safety against personal injury	adequate	with expert's assessment on the basis of ETAG 009 6.4.3.

2.1.5. Protection against noise

Product characteristics	Product characteristics value	Test or calculation method
Weighted airborne sound damping number R_w, (dB) IsoShell wall structures with 15 cm thick concreting	R_w (C; Ctr) = 48 (-2; -5) dB-	MSZ EN ISO 10140-2:2011

2.1.6. Energy savings and thermal protection

Product characteristics	Product characteristics value	Test or calculation method
heat transmission resistance of wall structures without covering, calculated with $\lambda_{ps,\ d}$=0,032 W/mK and λ_{vb}=2,30 W/mK value		
R_{fal}- ISS 25	3,32 m^2K/W	confirmation as per MSZ EN ISO 6946:2008 standard
R_{fal}- ISS 30	4,89 m^2K/W	
R_{fal}- ISS 35	6,45 m^2K/W	
R_{fal}- ISS 40	8,01 m^2K/W	
heat transmission factor of polystyrene heat insulation of the formwork elements, λ_{ps}	0,031 W/mK	MSZ EN 12667:2001
heat transmission factor of backfill armoured concrete, λ_{vb}	2,30 W/mK	MSZ EN 12524:2001

2.1.7. Durability

Product characteristics	Product characteristics value	Test or calculation method
Durability against physical impacts	adequate	ETAG 009 6.7.1.1
Durability against chemical impacts	adequate	ETAG 009 6.7.1.2
Durability against biological impacts	adequate	ETAG 009 6.7.1.3
Resistance to damages in case of normal use	adequate	ETAG 009 6.7.2.1 ETAG 009 6.7.2.2 ETAG 009 6.7.2.3

2.1.8. Other features

Product characteristics	Product characteristics value	Test or calculation method
Shape-size accuracy (for cellular elements)	Difference in heights ± 2.0 mm Difference in heights and width ± 3 mm or ± 0.6% (the lower value is valid)	with simple measurements
	Deviation from right angle 0.5 mm/20 cm	
	Chip max. 2 cm2/damage 2 pcs / element	
construction accuracy in I. quality class (for wall structure without mortar and covering)	Deviation from plane (on the wall) 1 mm/m	with simple measurements

3. ATTESTATION OF CONFORMITY

3.1. Attestation of conformity

According to Council Directive No. **98/279/EC**,

according to Annex III. of the Council Directive No. 89/106/EEC and

to Annex 4 of the BM-GKM-KvVM (Ministry of Interior- Ministry of Economy and Transport - Ministry for Environment and Water) joint Decree No. 3/2003 (I. 25.):

(2+) system.

3.2. Tasks of the manufacturer

3.2.1 Factory production control (FPC)

The manufacturer shall develop, document and operate an FPC system that ensures that the marketed products meet continuously the present ÉME requirements in a verifiable way.

The manufacturer whose quality management system complies with the EN ISO 9001 standards and if this system is complemented with the requirements stipulated in the present ÉME and specified for factory production control, can be considered to have met the requirements of the factory production control system.

Regarding the product the manufacturer shall develop, operate and control a factory production control system, which ensures the continuous conformity of the products.

The factory production control system shall include:

- the tasks and their in-charges required in the procedure of attestation of conformity, including contact to the designated certifying organization and the reporting obligations,
- the regulations regarding the revision of the qualifications and training of personnel, production and testing equipment, raw materials, supplied products, manufacturing process, handling of emerging non-compliances and complaints and factory production control system by the manufacturer are involved in Annex B MSZ EN 13163:2009 standard and in the chart below, in scope of the factory production control, according to the inspection plan of the production control:

Tested product characteristics:	Test method	Minimum Test frequency
Formwork element		
Geometric dimensions	with simple measurements	once a day

- evaluation of the results of tests made in the framework of factory production control by comparing with the results of the first type test.

3.2.2 Initial type test

During the *initial type test* the following product characteristics must be tested according to chapter 2.1.2:

- Polystyrene fire protection class;
- Wall structure fire protection class;
- Fire resistance va lue of wall structure;
- Water vapour reduction permeability of the wall;
- Shock resistance of wall structures;
- Resistance again concrete pressure;
- Airborne sound damping of wall structures;
- Heat transmission resistance of wall structures;
- Material features of polystyrene as per EN 13163
- Shape-size accuracy of elements

The manufacturer can compile the first-type test documentation by using the results of the suitability tests made for issuing the present ÉME if point 2 as described above is met.

3.2.3. Specifying the product characteristics accompanying the product

The values of the following product characteristics must be given on the product packaging or accompanying documents:

- Polystyrene fire protection class;
- Wall structure fire protection class;
- Fire resistance value of wall structure;
- Airborne sound damping of wall structures;
- Heat transmission resistance of wall structures;
- Shape-size accuracy of elements
- Polystyrene material features (bulk density, compressive strength, heat transmission factor)
- Dangerous substances (i.e. quantity of pentane, isopentane, hexabromocyclododecane)

3.2.4. Issuing the Supplier's Declaration of Conformity

The statement to be issued by the manufacturer must contain the following:

- The name, identification number (trademark symbol) and address of the supplier (manufacturer, distributor or vendor) of the construction product.
- The intended purpose of the construction product (field of application) and the data necessary to identify the production date and product type.
- The name and identification number of the designated organization whose certification served for base for issuing the certificate of conformity.
- The identifier of this ÉME which the construction product is in conformity with as verified by testing.
- The validity of the declaration of conformity.
- The name (legibly) and position of the representative of the supplier, manufacturer or distributor authorized to sign the declaration of conformity.
- The identification number of the declaration of conformity, the date of issuing and the authorized signature of the issuer.
- Additional information:

– Technical Application Guide for the product (with the designation "delivered/available at the manufacturer's website", etc.)

The formal requirements of the declaration of conformity:

A set form is not required for the declaration. In general, it is an independent certificate that should be attached to the consignment or delivery note during delivery. Its size and form may be aligned to the design of other business papers of the manufacturer or the installation, operation and user's guide attached to the product.

3.3. Tasks of the designated certification body

3.3.1. The initial inspection of production control

3.3.1.1. Preliminary review of the documentation describing the factory production control system

As part of this, the completion of a review of documents prepared by the manufacturer and describing the operation of production control, the manufacturing process and the procedure of the related inspections and tests is done.
It is assessed based on the review whether the product quality control is appropriate and consistent with the requirements specified in 3.2.1.

3.3.1.2. The initial inspection of production control at the site

In the initial test it is checked and validated whether the plant activities are carried out in conformity with the production control documentation, and whether the manufacturer's own checks and tests are suitable for assessing the conformity of the products. The basic inspection covers whether the manufacturer has the tools necessary to produce products compliant to the requirements, and whether the personal and material conditions to carry out the production control, are available.

3.3.2. Issuing the certificate of factory production control

The designated certification organization certifies the conformity of the products by issuing a FACTORY PRODUCTION CONTROL CERTIFICATE based on the evaluation of the first type test conducted and submitted by the manufacturer, and the basic production control inspection.

3.3.3. Maintaining the validity of the certificate of factory production control

The designated certification body keeps the FACTORY PRODUCTION CONTROL CERTIFICATE in effect based on continuous monitoring of the factory production control.

The continuous monitoring of factory production control is to be performed once a year, its contents are equivalent to that described in the initial inspection, except that the document review covers only the documents modified since the initial inspection.

4. SUITABILITY REQUIREMENTS, RECOMMENDATIONS

Suitability requirements

4.1. Production

The incoming basic materials, the production process as well as the finished product must be checked continuously by the manufacturer. Only conditioned, dimensionally accurate elements are allowed to be delivered.

4.2. Building-in

4.2.1. The buildings to be erected by using wall structures type IsoShell must be realized on the basis of definite project plan.

4.2.2. The finished buildings and the features their structural elements must meet the technical parameters stipulated in point 2 and the quality requirements.

4.2.3. The reinforced concrete as well as the armoured concrete structures made by using formwork elements each case can be built in only under control of the structural designer. Dimensioning of the masonry must be performed taking the minimum horizontal cross-sectional area into consideration. The formwork elements of the walls need negative buoyancy and security against displacement

4.2.4. The plans must involve the standard name, composition and concrete technological description of the concrete to be applied.

4.2.5. Based on their fire protection parameters (**REI 120; B**), *from fire protection aspect* the wall structures type ISOSHELL to be made as indicated in chart of the point 2.1.2 are applicable as

- exterior and interior bearing walls in not more than five-storey buildings of fire class II, in not more than five-storey buildings of fire class III, in not more than two-storey buildings of fire class IV and in one-storey buildings of fire class V, as well as in one-storey halls of fire classes III-IV,
- non-bearing staircase wall in in not more than two-storey buildings of fire class IV,
- boundary wall structure of middle corridors, closed side corridors in not more than five-storey buildings of fire class III, in not more than two-storey buildings of fire class IV and in one-storey building of fire class V, as well as in one-storey halls of fire classes IV-V,
- infill (exterior space separating) wall in not more than five-storey buildings of fire classes II-III, in not more than two-storey buildings of fire class IV and in one-storey buildings of fire class V as well as in one-storey halls of fire classes III-V,
- division wall in not more than five-storey buildings of fire classes II-III, in not more than two-storey buildings of fire class IV and in one-storey buildings of fire class V as well as in one-storey halls of fire classes III-V.

The IsoShell wall structures are applicable **as perimeter wall with openings in one-storey buildings or in two-storey buildings where the two storeys form one destination unit or one open-plan space**. In case of an application other than this one the façade fire-spread limit test of the structure must be carried out according to MSZ 14800-6 and the structural regulations stipulated in point (5), art. 332 OTSZ (National Fire Safety Codes) issued together with the Decree No. 28/2011. (IX.06.) BM (Ministry of the Interior) must be taken into account.

Wall coverings are applicable on indoor surfaces of the wall structures according to the fire class requirements stipulated for wall claddings in the charts of the Annex No. 16 of OTSZ (National Fire Safety Codes) issued together with the Decree No. 28/2011. (IX.06.) BM (Ministry of the Interior).

The case surfaces of the openings on the interior wall structures must also be provided with 15 mm thick fire protective gypsum plasterboard covering as applied on the sides of the wall structure.

The wall structures type IsoShell are not applicable as division walls of flats, as fireproof wall and fire-wall.
In case of erecting residential buildings as semidetached houses or terraced houses the flats must be separated with (division) walls of fire class A1-A2, which are equivalent to fireproof walls, with fireproof wall on fire compartment boundaries as well as with fire-wall.

4.2.6. The tested wall structure is applicable only on places where the weighted airborne damping requirement is not greater than R_w = 48 dB as well as $R_w + C$ = 46 dB. If in addition to the special function there is a local requirement available, it can be taken into account by reducing the laboratory values. The size of the difference depends on the quality of building-in, on the arrangement of by-passes but in general we can calculate on 2 dB.
No direct acoustic requirement refers to the façade structures; it means always the design value according to the just characteristic noise load and internal function. The weighted laboratory airborne sound damping of the façade structure of the tested system is $R_w + C_{tr}$ =43 dB.
Based on the specified values it can be stated that the wall structure is in general appropriately sound attenuated for meeting the requirements of the internal noise limit

values and further acoustic designing and dimensioning could be necessary only in case of especially noisy outdoor environment.

4.2.7. The energetic dimensioning of new buildings to be erected by means of the system mentioned above according to the Decree No. 7/2006. (V. 24) TNM must be done in each case except for cases listed in point (2) art. 1. of the Decree.

During the planning of the buildings it is to check if the conservation, thermal comfort and vapour technical requirements are met. In certain cases, i.e. in case of warm-vaporous spaces, the erection of the interior side vapour-tight layer could be necessary.

4.2.8. Masonries exposed to increased mechanical load (i.e. industrial, agricultural, sport facilities, etc.) must be protected by applying double-layer glass-fibre mesh. Walls covered with one-layer gypsum plasterboards are not allowed in high-traffic buildings serving for mass stays.

4.2.9. The polystyrene foam element may not be permanently exposed to a temperature above 60 °C.

4.2.10. If the tank for the production of domestic hot water is installed on the wall in the building, the building drawings have to involve also the detail drawings for fixing the tank.

4.2.11. The polystyrene wall structure may not be uncovered, it must be protected during the construction work as well as it must be provided with external and internal claddings according to the documentation within the shortest time possible. Formwork elements exclusively with undamaged surface and edge can be installed in the masonry.

4.2.12. The construction company shall inform the building owner (operator) in writing on the operating and maintenance rules concerning the structures of the building.

4.2.13. As per the joint Decree No. 3/2003. (I.25.) BM-GKM-KvVM the installation and marketing of the products in Hungary are subject to the confirmation of their suitability.

Recommendations to packing, transport and storage

Packing, storage, loading and transport must ensure that the product taken off the production line fully maintains its production parameters and performance.

5. FOLLOW-UP INSPECTION AND OTHER CONDITIONS

5.1. Follow-up inspections to be done while the ÉME is in effect

Deadline of the next assignment concerning the performance of the follow-up inspection to be sent to ÉMI Non-profit Llc. is the 30. November 2015. . In case of failure to comply with the obligation to do a follow-up inspection the ÉME becomes void, and ÉMI Non-profit Llc deletes it from the database of valid National Technical Approvals.

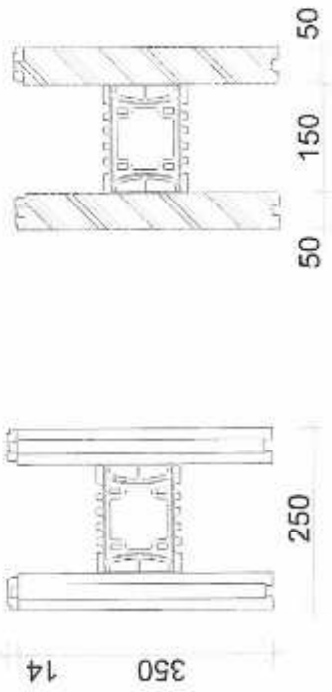
6. ATTACHEMENTS

Annex No. 1.: Typical drawings of IsoShell elements (15 pages)

Péter Tóth
Project Leader

Zoltán Budavári
Technical Evaluation Office
Manager

Annex 1.
Drawings of the elements (15 page)



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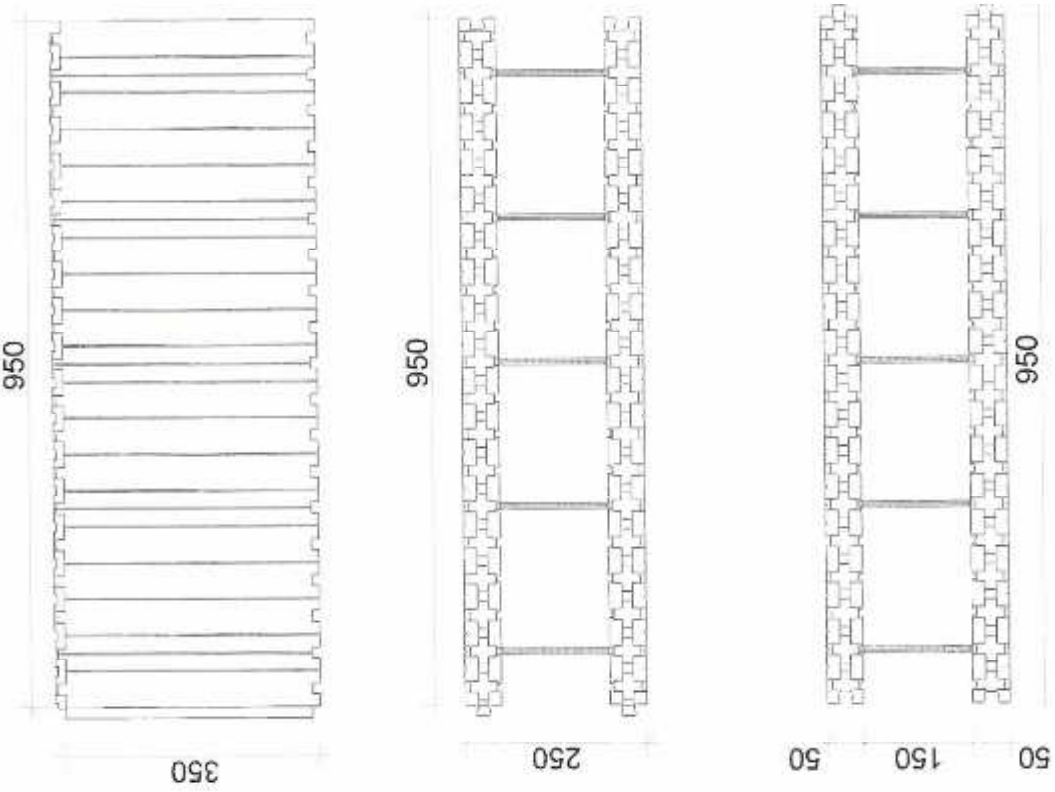
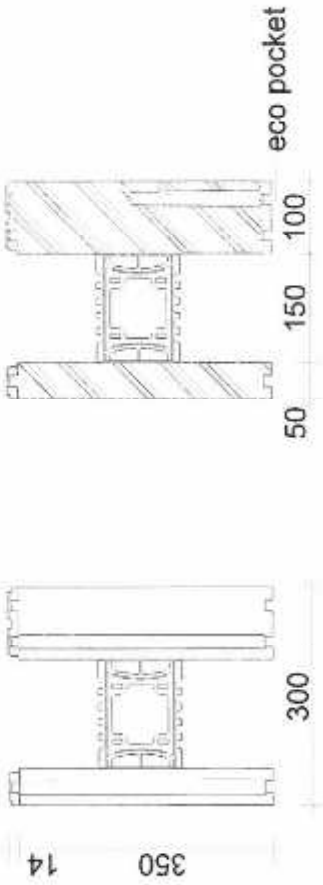
nominal dimensions /height/width/lenght/ 35/25/95 cm
weight: 1,45 kg



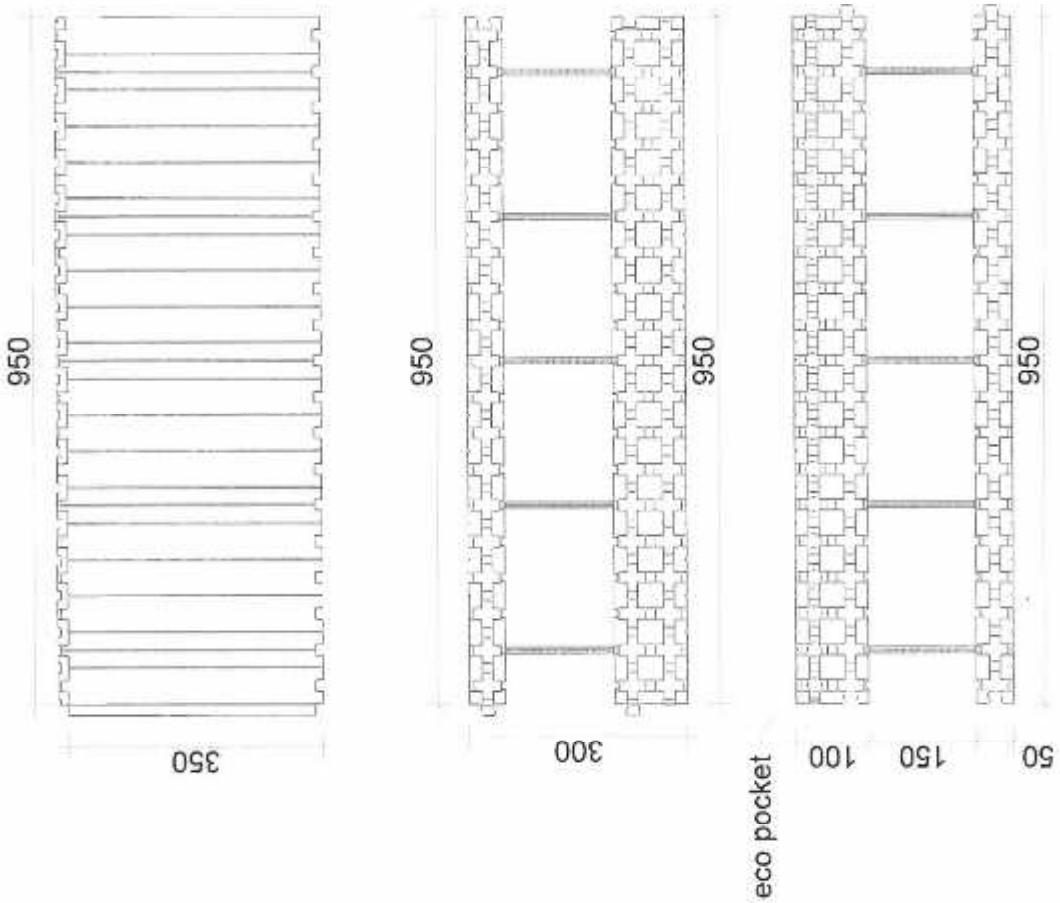
Dimensions are given in mm.

IsoShell wall element ISS 25

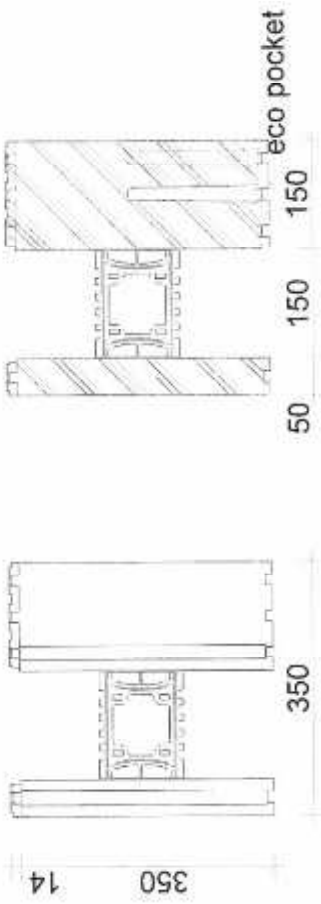
IsoShell wall element ISS 30



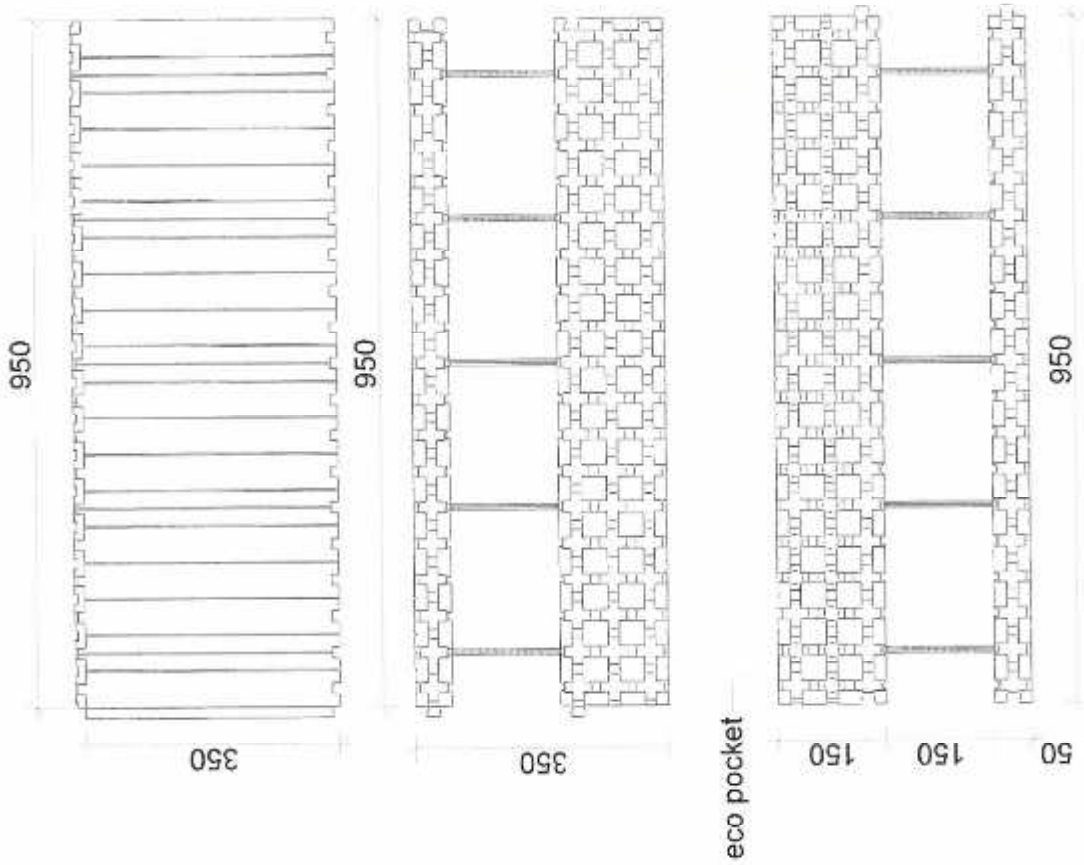
Technical details:
dimension /outer leaf/core/inner leaf/ 10/15/5 cm
nominal dimensions /height/width/lenght/ 35/30/95 cm
weight: 1,83 kg



Dimensions are given in mm.



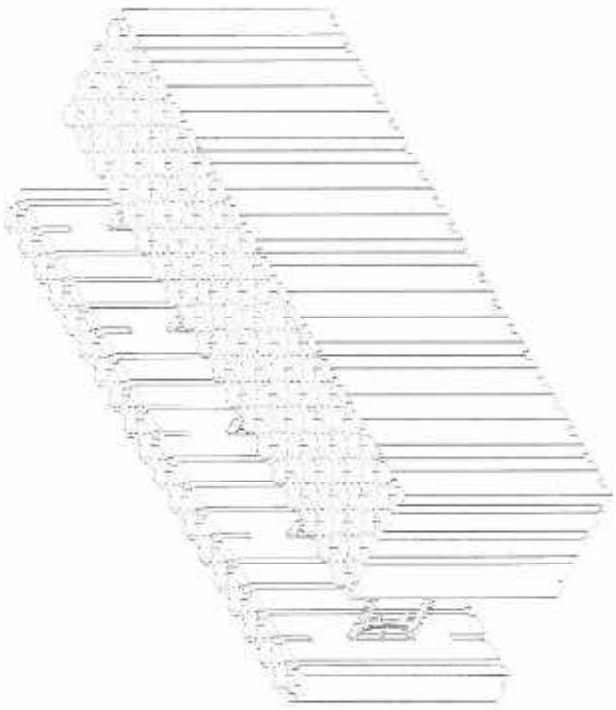
Technical details:
dimension /outer leaf/core/inner leaf/ 15/15/5 cm
nominal dimensions /height/width/lenght/ 35/35/95 cm
weight: 2,22 kg

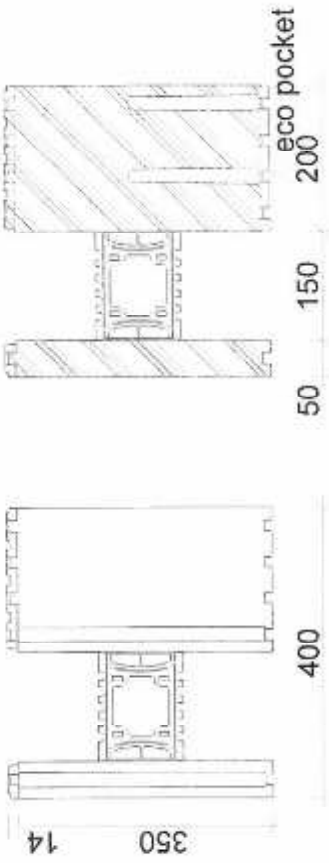


Dimensions are given in mm.

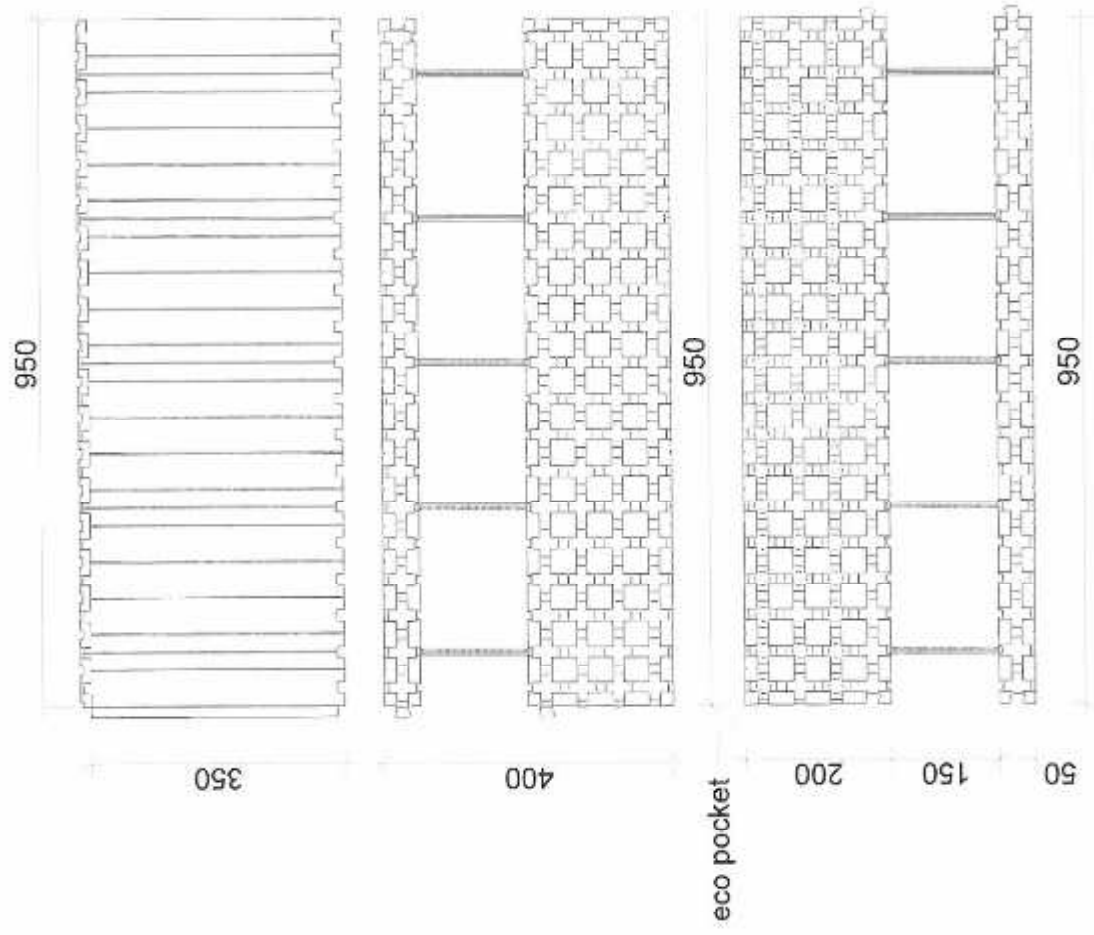
IsoShell wall element ISS 35

IsoShell wall element ISS 40



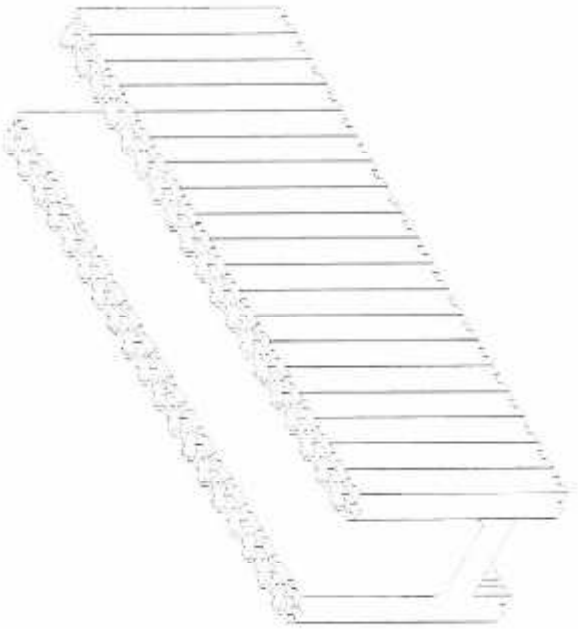


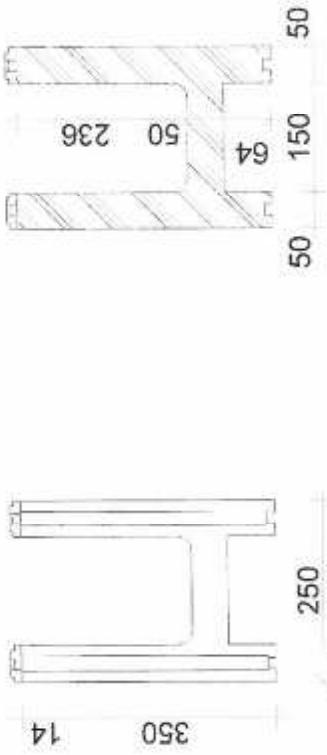
Technical details:
dimension /outer leaf/core/inner leaf/ 20/15/5 cm
nominal dimensions /height/width/lenght/ 35/40/95 cm
weight: 2,61 kg



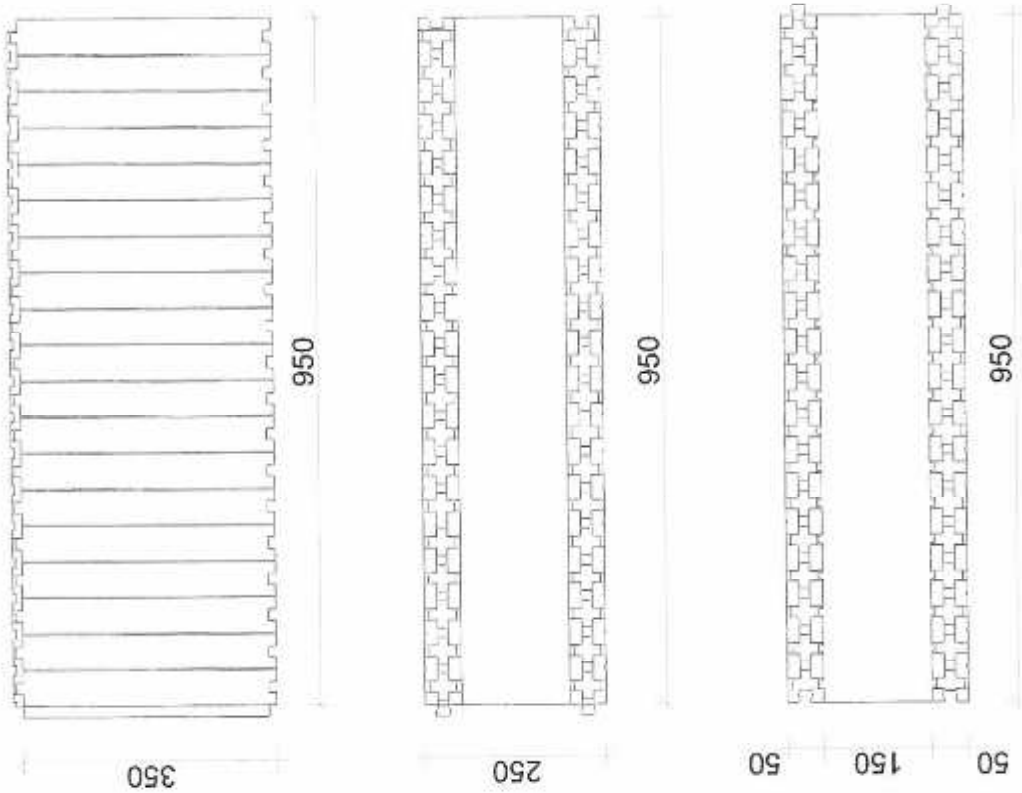
Dimensions are given in mm.

IsoShell lintel element ISS 25L

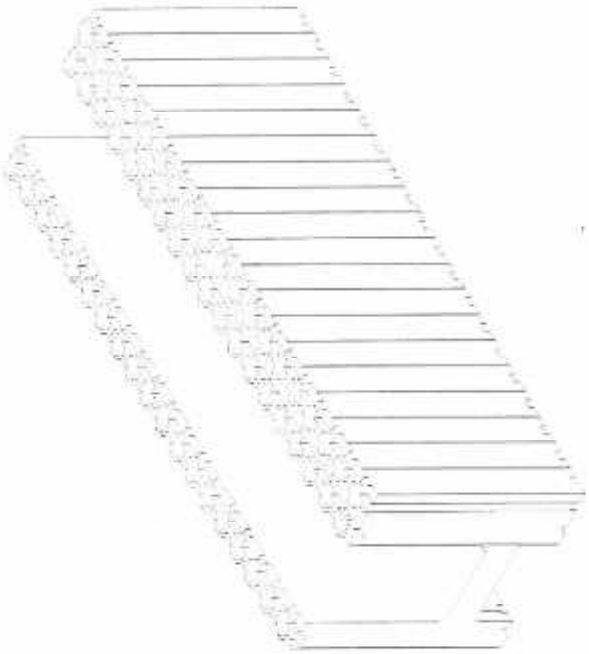


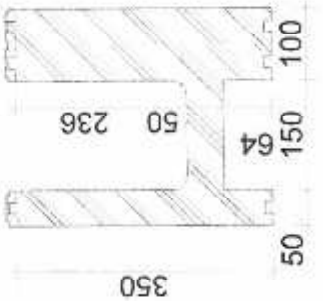


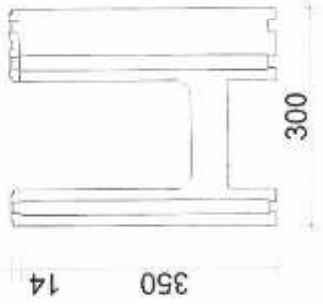
Technical details:
dimension /outer leaf/core/inner leaf/ 5/15/5 cm
nominal dimensions /height/width/lenght/ 35/25/95 cm
weight: 1,01 kg



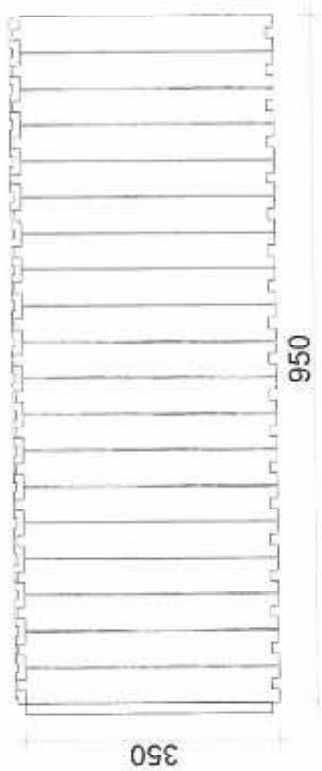
Dimensions are given in mm.

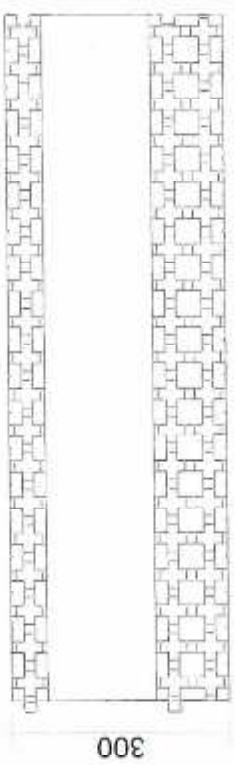


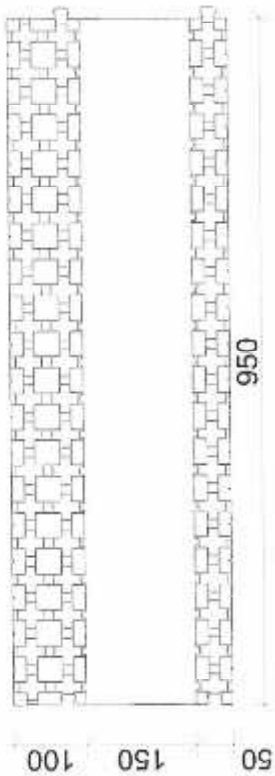




Technical details:
dimension /outer leaf/core/inner leaf/ 10/15/5 cm
nominal dimensions /height/width/lenght/ 35/30/95 cm
weight: 1,42 kg

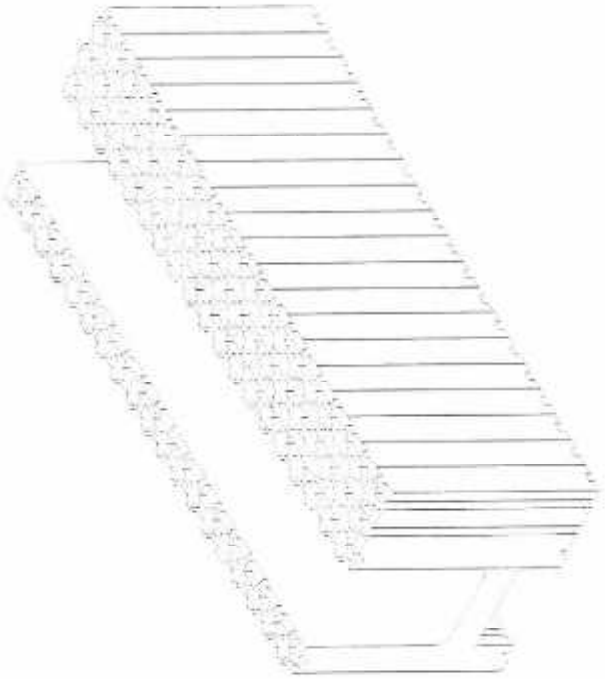


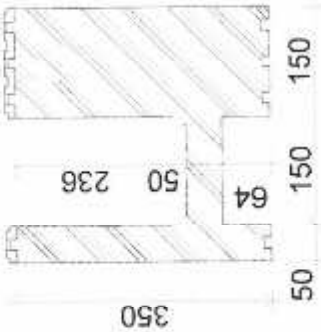


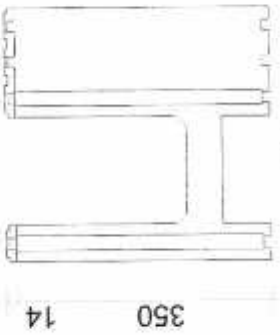


Dimensions are given in mm.

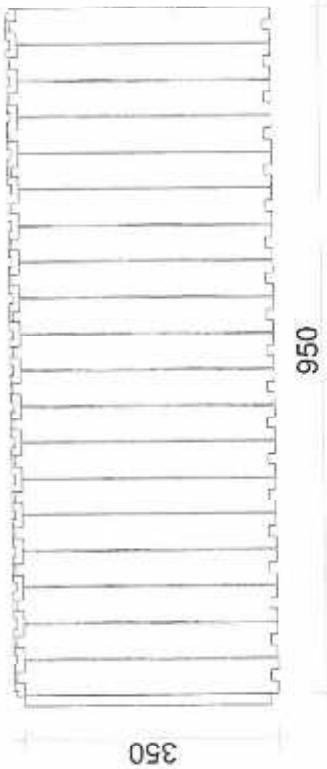
IsoShell lintel element ISS 30L

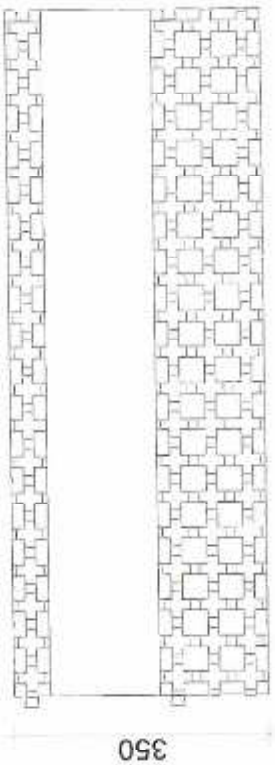


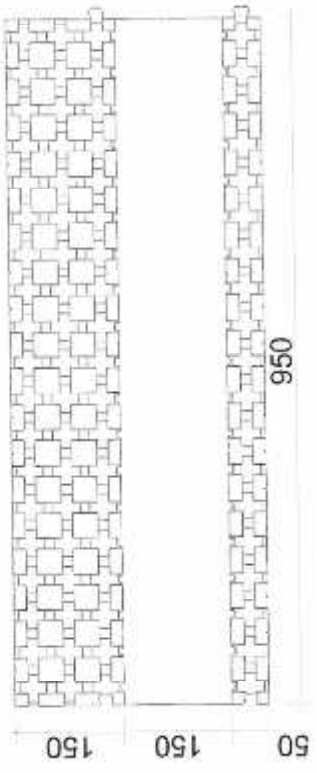




Technical details:
dimension /outer leaf/core/inner leaf/ 15/15/5 cm
nominal dimensions /height/width/lenght/ 35/35/95 cm
weight: 1,84 kg

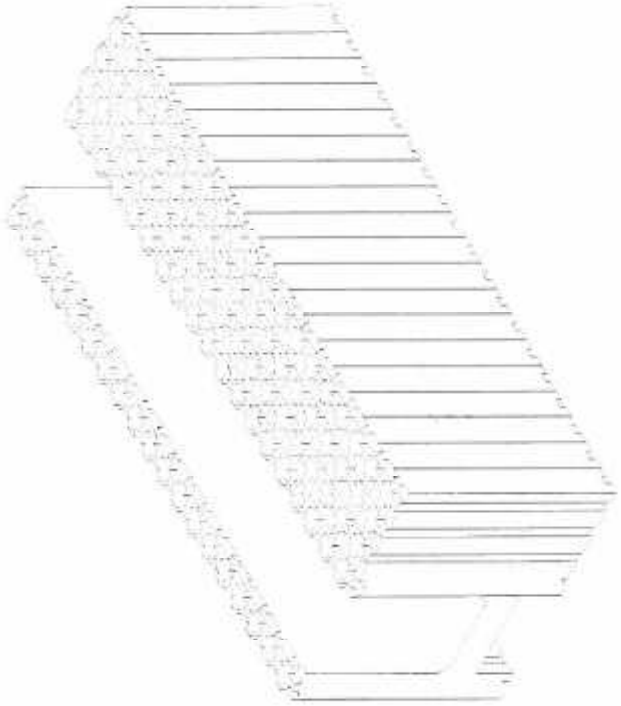


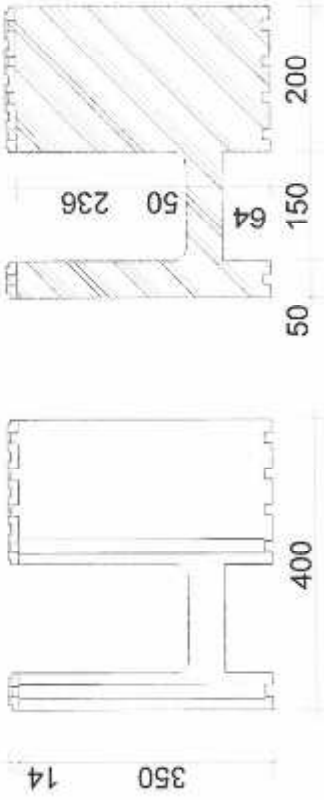




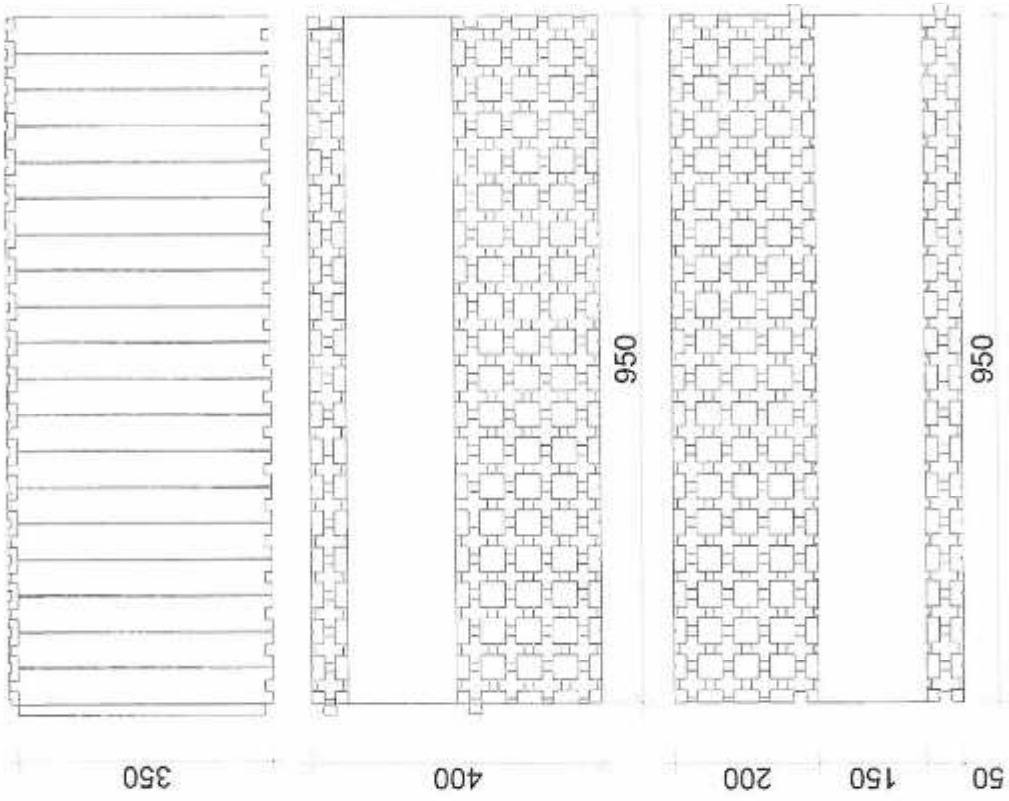
Dimensions are given in mm.

IsoShell lintel element ISS 35L



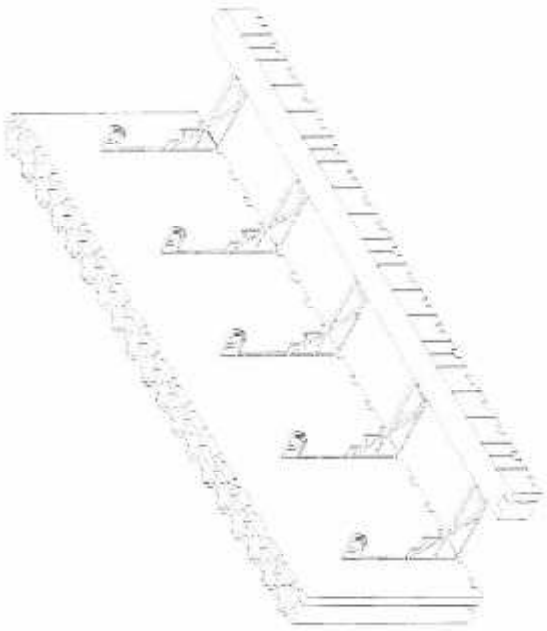


Technical details:
dimension /outer leaf/core/inner leaf/ 20/15/5 cm
nominal dimensions /height/width/lenght/ 35/40/95 cm
weight: 2,26 kg

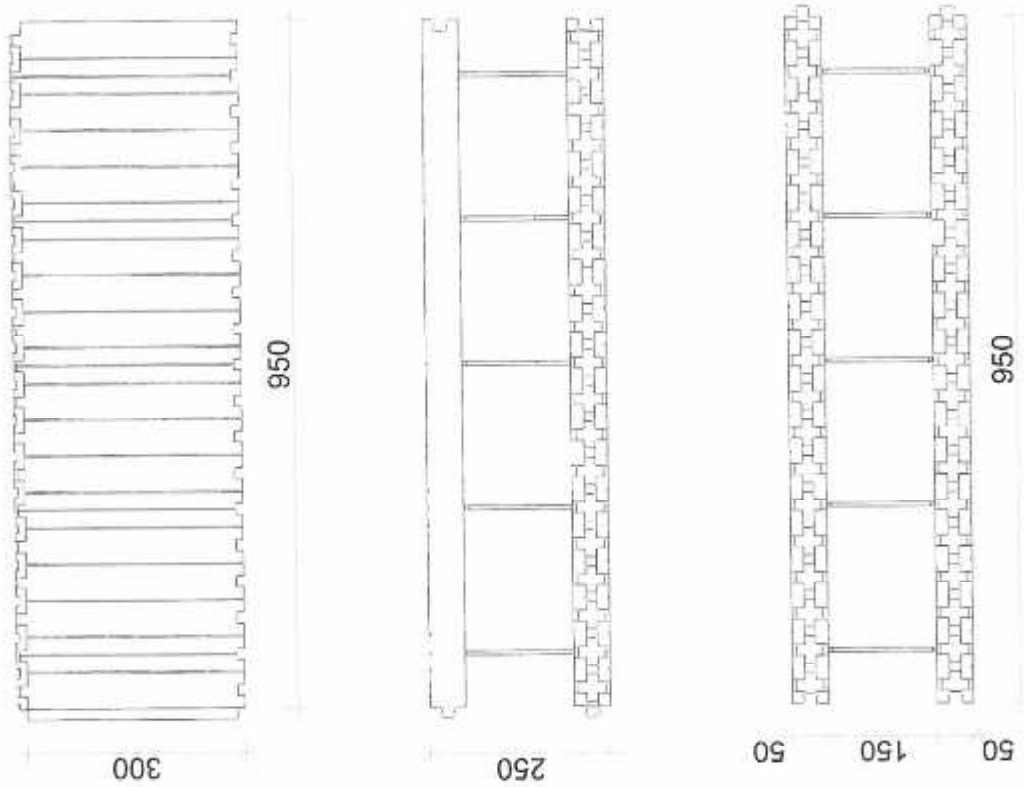


Dimensions are given in mm.

IsoShell lintel element ISS 40L

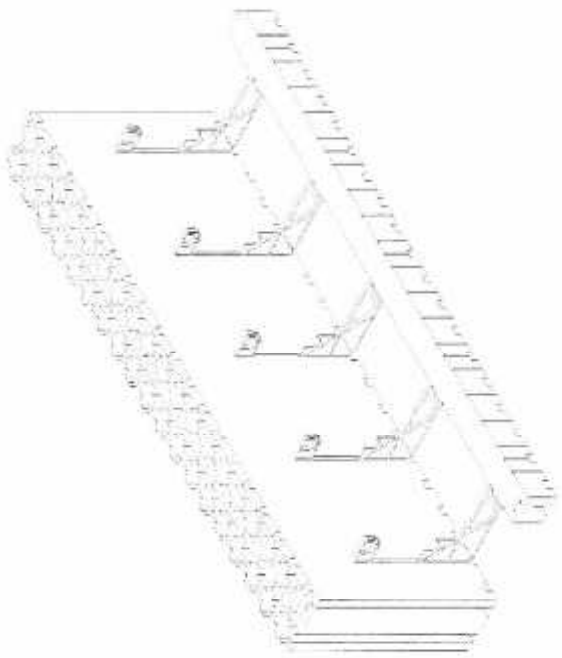


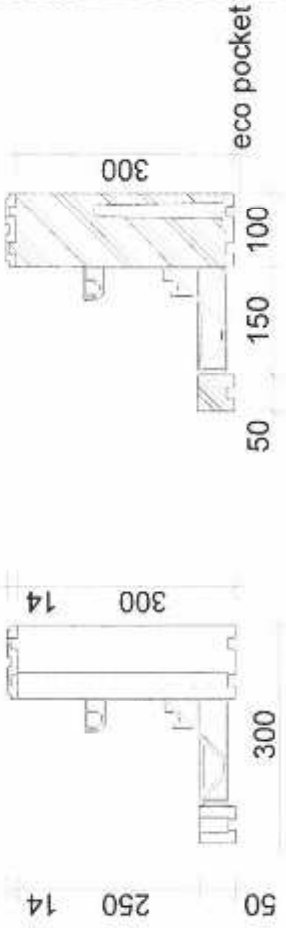
Technical details:
dimension /outer leaf/core/inner leaf/ 5/15/5 cm
nominal dimensions /height/width/lenght/ 30/25/95 cm
weight: 0,87 kg



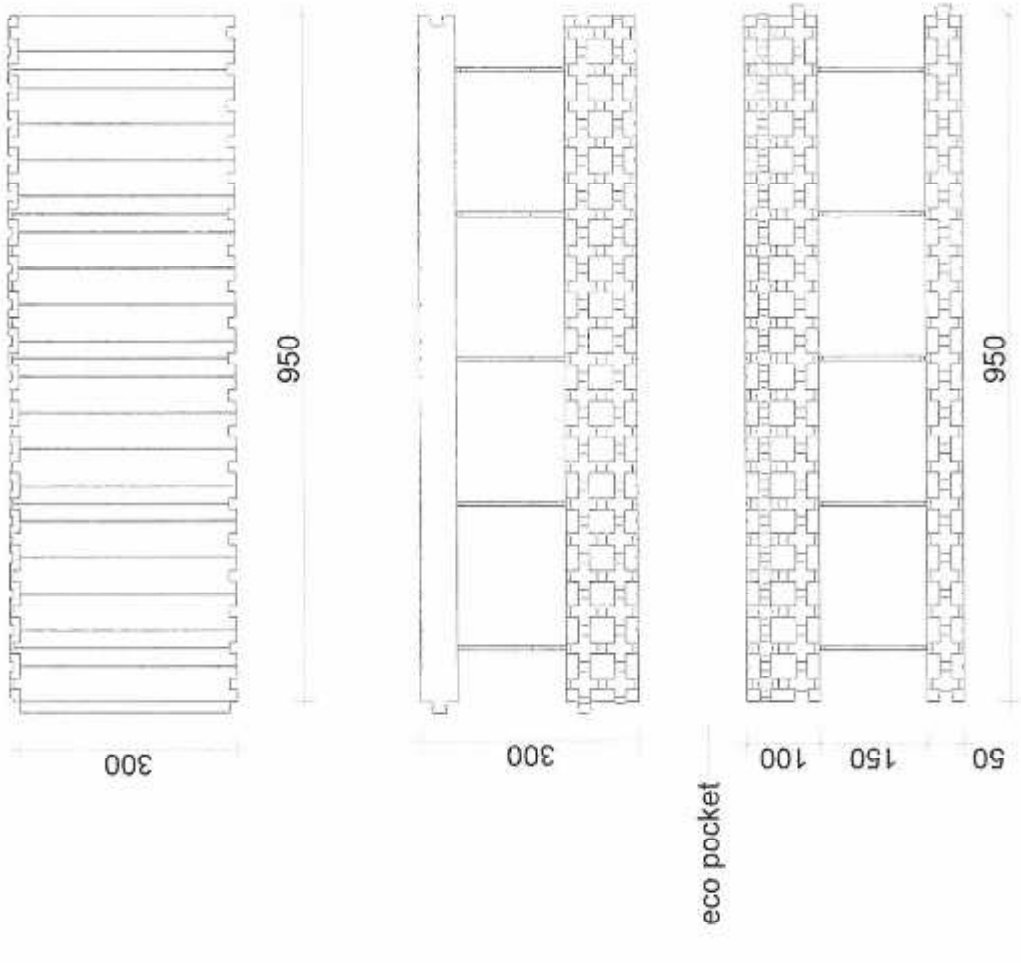
Dimensions are given in mm.

IsoShell ring beam element ISS 25RB





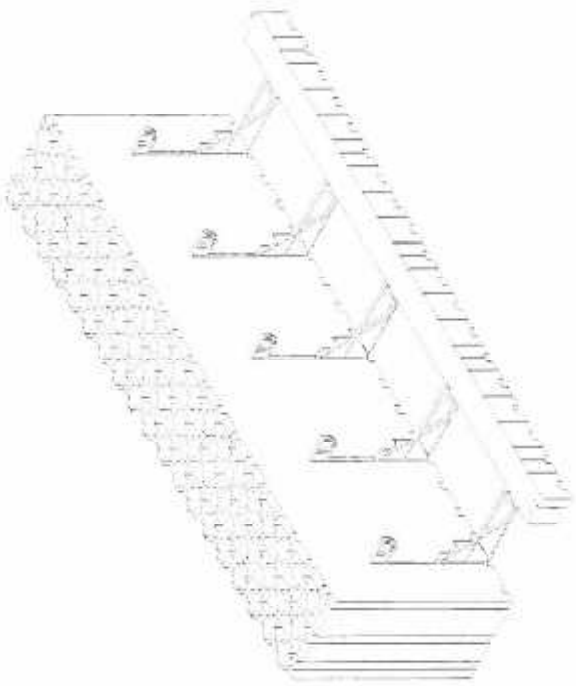
Technical details:
dimension /outer leaf/core/inner leaf/ 10/15/5 cm
nominal dimensions /height/width/lenght/ 30/30/95 cm
weight: 1,20 kg

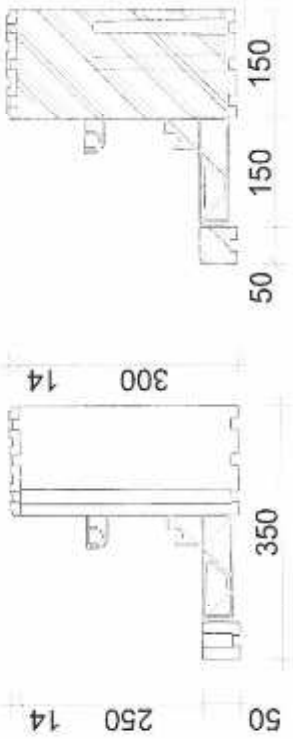


Dimensions are given in mm.

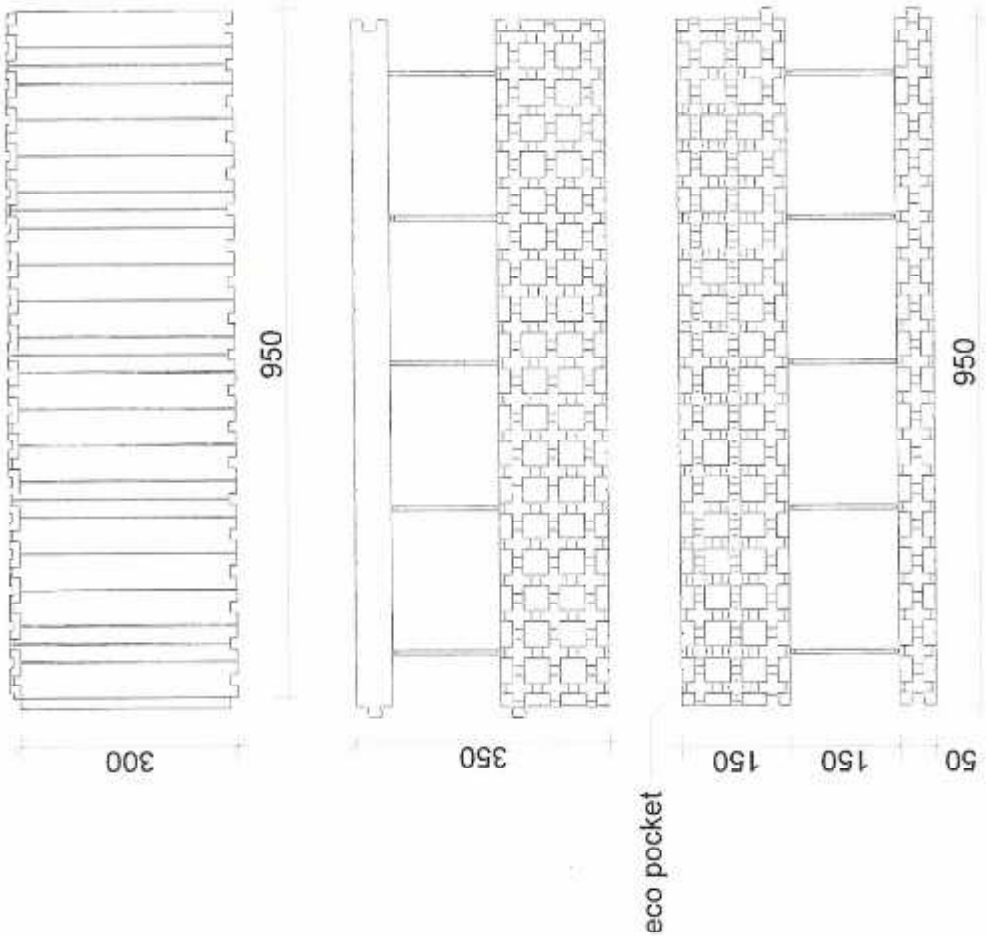
IsoShell ring beam element ISS 30RB

IsoShell ring beam element ISS 35RB

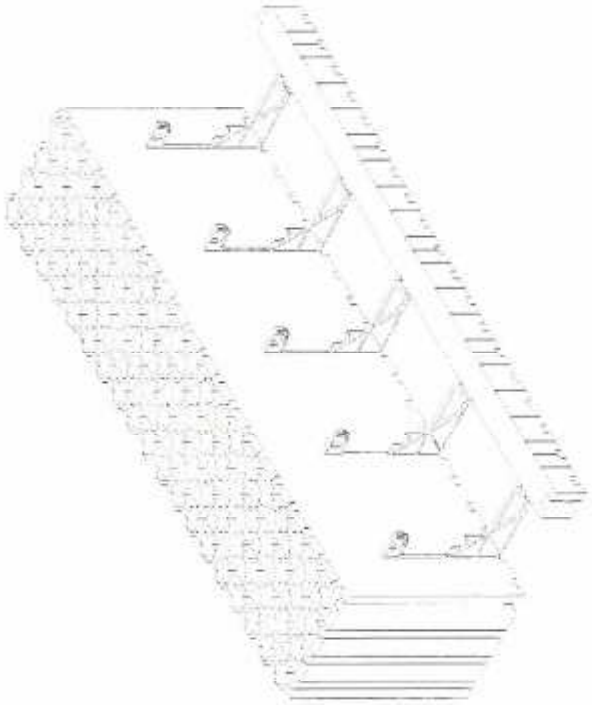


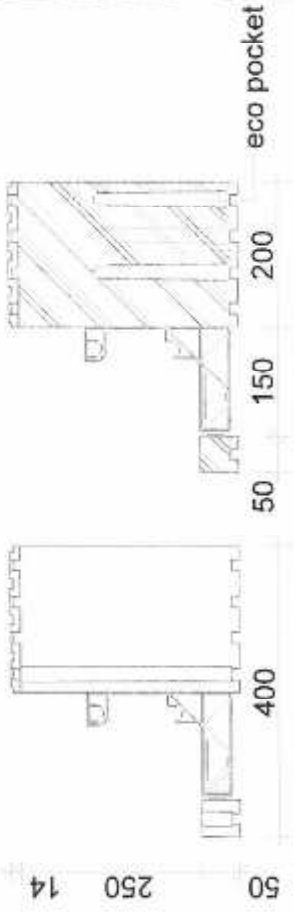


Technical details:
dimension /outer leaf/core/inner leaf/ 15/15/5 cm
nominal dimensions /height/width/lenght/ 30/35/95 cm
weight: 1,53 kg

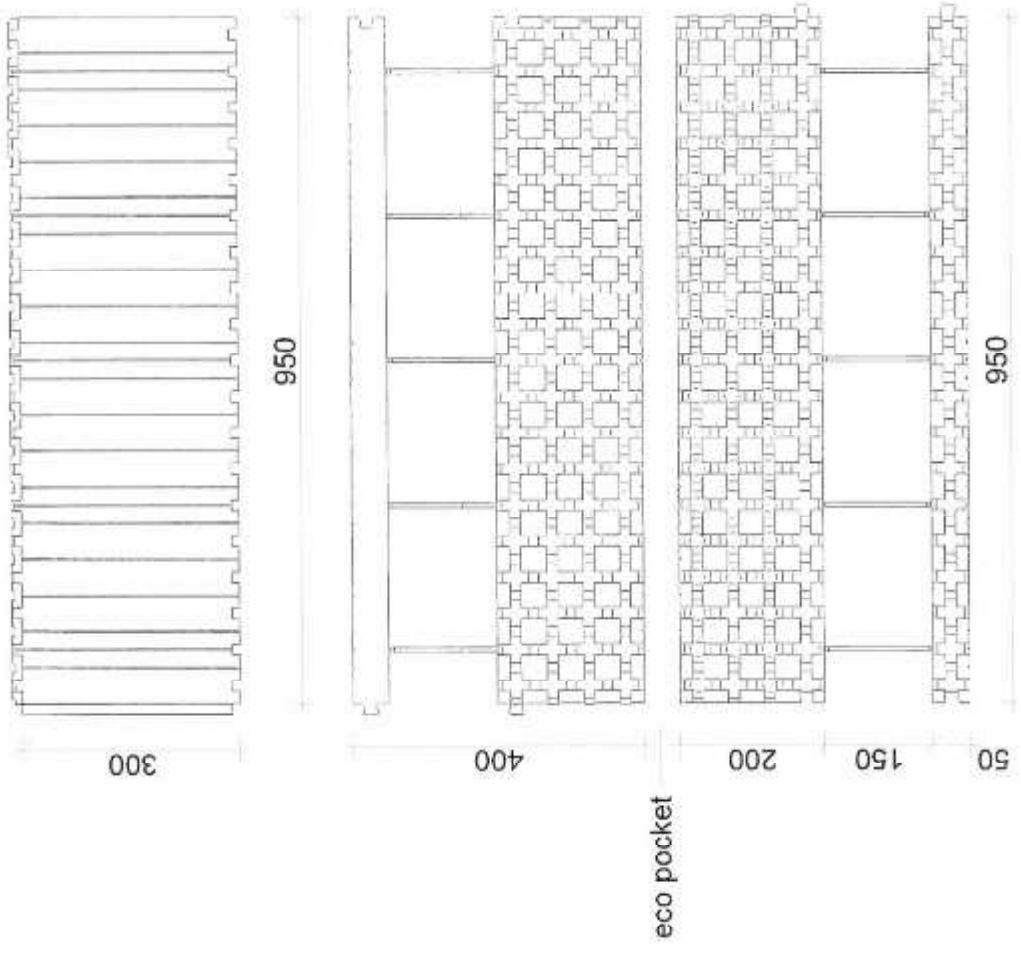


Dimensions are given in mm.





Technical details:
dimension /outer leaf/core/inner leaf/ 20/15/5 cm
nominal dimensions /height/width/lenght/ 30/40/95 cm
weight: 1.87 kg



Dimensions are given in mm.

IsoShell ring beam element ISS 40RB

IsoShell lock element ISS+ 15EP and ISS+ 20EP

Dimensions are given in mm.

Technical details:

ISS+ 15EP
nominal dimensions /height/width/lenght/ 35/15/5 cm
weight: 0.06 kg

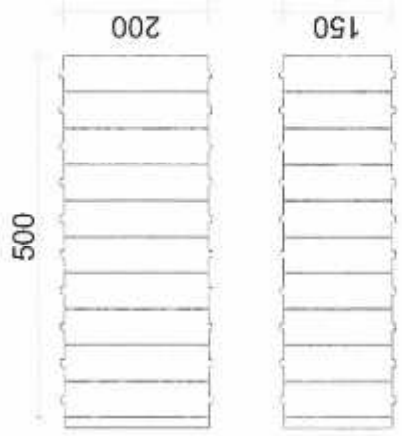
ISS+ 20EP
nominal dimensions /height/width/lenght/ 35/20/5 cm
weight: 0.08 kg

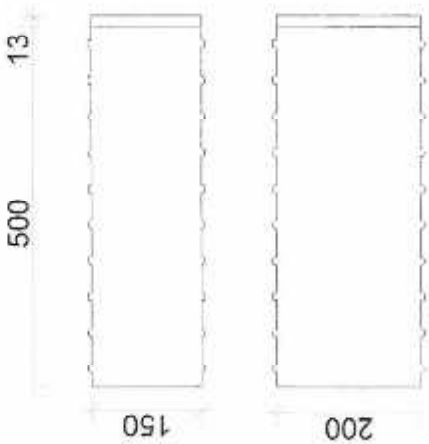
IsoShell parapet element ISS+ 15P and ISS+ 20P

Technical details:

ISS+ 15P
nominal dimensions /height/width/lenght/ 5/15/50 cm
weight: 0,10 kg

ISS+ 20P
nominal dimensions /height/width/lenght/ 5/20/50 cm
weight: 0,13 kg





Dimensions are given in mm.

Technical details:

nominal dimensions /height/width/lenght/ 5/5/50 cm
weight: 0,03 kg

Dimensions are given in mm.

IsoShell raise element ISS+ R