



European Technical Approval ETA-07/0105

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	ARGISOL
Zulassungsinhaber <i>Holder of approval</i>	BIOISOTHERM S.r.l. via Roma, n. 14 20045 BESANA IN BRIANZA (MILANO) ITALIEN
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Nicht lasttragender verlorener Schalungsbausatz "ARGISOL" aus EPS Schalungselementen <i>Non load bearing shuttering kit "ARGISOL" based on shuttering elements of EPS</i>
Geltungsdauer: <i>Validity:</i>	vom <i>from</i> bis <i>to</i> 23 April 2013 23 April 2018
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Diese Zulassung ersetzt
This Approval replaces

ETA-07/0105 mit Geltungsdauer vom 16.11.2010 bis 16.11.2015
ETA-07/0105 with validity from 16.11.2010 to 16.11.2015

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by *Deutsches Institut für Bautechnik* 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 Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998⁴, as amended by Article 2 of the law of 8 November 2011⁵;*
 - 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 "Nonload-bearing permanent shuttering systems based on hollow blocks or panels of insulating materials and sometimes concrete", ETAG 009.
- 2 *Deutsches Institut für Bautechnik* 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 indicated on page 1 of this European technical approval.
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- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities L 40, 11 February 1989, p. 12
² Official Journal of the European Communities L 220, 30 August 1993, p. 1
³ Official Journal of the European Union L 284, 31 October 2003, p. 25
⁴ *Bundesgesetzblatt Teil I 1998*, p. 812
⁵ *Bundesgesetzblatt Teil I 2011*, p. 2178
⁶ Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the product and intended use

1.1 Definition of the construction product

1.1.1 General

The shuttering system "ARGISOL" is a non load-bearing permanent shuttering kit based on standard shuttering elements, accessory parts and special shuttering elements (see Annexes 1 to 3) applicable as formwork for plain and reinforced concrete walls cast in-situ.

The shuttering elements consist of shuttering leaves of expanded polystyrene (EPS shuttering leaves) and spacers of steel (steel spacers).

The shuttering elements are generally used for external load-bearing walls as well as for internal load-bearing walls.

Finishes are not part of the shuttering system "ARGISOL".

1.1.2 Standard shuttering elements

The standard shuttering elements (see Annexes 1.1, 2.1, 2.9 and 3.1) consist of inner and outer shuttering leaves of expanded polystyrene (EPS shuttering leaves) and steel spacers. These components are assembled by foaming (factory-made) steel spacers into the inner and outer EPS shuttering leaves.

The EPS shuttering leaves are one-layered and the steel spacers provide thicknesses of the concrete core of 140 mm, 165 mm and 215 mm and thicknesses of the wall of 250 mm, 300 mm, 350 mm, 400 mm and 450 mm, as indicated in Table 1. The thickness of the inner EPS shuttering leaf range is either 48 mm or 62 mm and the thickness of the outer EPS shuttering leaf is in the range of 62 mm and 173 mm. The length of the standard shuttering elements is 1000 mm respectively 1200 mm and the height is 230 mm, 250 mm or 300 mm.

The spacers are made of galvanized steel (steel spacers).

The following types of standard shuttering elements are available:

Table 1: Wall thicknesses of the EPS standard shuttering elements

Type	according Annex	Thickness of the wall	Thickness of concrete core	EPS shuttering leaves				Longitudinal centre distance of steel spacers
				Thickness		Height	Length	
				inner	outer			
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25/14.0	1.1	250	140	48	62	250	1000	125
30/14.0		300	140	48	112	250	1000	125
35/14.0		350	140	48	162	250	1000	125
30/16.5	2.1 2.9	300	165	62	73	230	1200	150
						300		
35/16.5		350	165	62	123	230	1200	150
						300		
40/16.5		400	165	62	173	230	1200	150
						300		
35/21.5	3.1	350	215	62	73	300	1200	150
40/21.5		400	215	62	123	300	1200	150
45/21.5		450	215	62	173	300	1200	150

The top and the bottom of each EPS shuttering leaf incorporate an interlocking arrangement to form a tight joint (see Annexes 1.1, 2.1, 2.9 and 3.1).

The surfaces are generally smooth. There are also tapered vertical grooves on the inside and outside face of each EPS shuttering leaf. These element-high dovetail grooves on the inside face provide a mechanical interlock between EPS shuttering leaves and concrete core (see clause 2.2.5.1) and additionally form locks for end stops.

The vertical ends of the EPS shuttering leaves are tongue and groove joints and form a tight joint. Sealing foam is used to seal these vertical joints, where required, and to fill in gaps caused by inaccuracy of foundation level to between any of the formed joints.

The standard shuttering elements are dry laid in staggered vertical joints (masonry bond).

The formwork requires alignment and support during concrete placing (see Annex 6).

The system can be used to construct straight and angled walls (45°- and 90°-angles).

Steel reinforcement can be fixed directly to the steel spacer web. The maximum centre distance of steel spacers in longitudinal direction of the standard shuttering elements shall be 125 mm respectively 150 mm, see Table 1 and Annexes 1.1, 2.1, 2.9 and 3.1.

The standard shuttering elements are interlocked and build up horizontally and vertically into a tight and rigid formwork. The wall is formed by filling of the standard shuttering elements with concrete. The formwork is used in conjunction with concrete class C16/20 (according to EN 206-1) to built plain concrete walls or in conjunction with concrete of classes in the range from C20/25 to C50/60 (according to EN 206-1) to built reinforced concrete walls.

1.1.3 Accessory parts

1.1.3.1 Wedges for horizontal curved walls (Annex 1.5)

Wedges for horizontal curved walls are used for curved walls to fill the gaps between the joints of the inside face of the EPS shuttering leaves.

1.1.3.2 Single leaves, pieces for the equalization of differences in height, end stops (EPS or wood) and wood support edges (Annexes 1.6, 2.10 and 3.7)

The top and the bottom of these accessory parts incorporate an interlocking arrangement to form a tight joint as well as element-high dovetail grooves on the inside and outside face of each EPS shuttering leaf in the same manner as the EPS shuttering leaves of the standard shuttering elements described above, see clause 1.1.2. The vertical ends of these EPS shuttering leaves are tongue and groove joints and form a tight junction.

Single leaves and pieces for equalization are provided to fill gaps between connections of shuttering elements (e. g. roof connection). Single leaves are additionally used in the ceiling level as a vertical shuttering part and to avoid heat bridges in end use conditions. For this purpose the single leaves are fixed to resist the pressure of fresh concrete of the ceilings when the concrete core of the wall has sufficiently hardened. The dimensions of the single leaves are equivalent to the dimensions of the EPS shuttering leaves. The length and the height of pieces for the equalization of differences in height are varying dependent on the thickness of the concrete core.

End stops are used to lock walls at the end of the EPS shuttering leaves at wall openings. The dimensions of end stops are varying dependent on the thickness of the concrete core and of the material (expanded polystyrene or wood).

The length of the wood support edges is in all cases 5 cm, the height is 2,5 cm and the thickness is 48 cm

1.1.4 Special shuttering elements

Special shuttering elements are also part of the shuttering system. Special shuttering elements are designed in the same manner as the standard shuttering elements described above, see clause 1.1.2.

1.2 Intended use

The kit is intended to be used for the 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 non pressing water or pressing water is to be dealt with. The waterproofing shall be protected from mechanical damage by an impact 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 3: Product with no contact to and no impact on soil water, ground- and surface water.

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 conditions laid down in clauses 4.2, 5.1 and 5.2 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, but are to be regarded only as a means for choosing the right products 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 effects of weather.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

2.1.1 General

The shuttering kit "ARGISOL" consists of the following elements:

- standard shuttering elements,
- accessory parts and
- special shuttering elements,

see clauses 2.1.2, 2.1.3 and 2.1.4.

2.1.2 Standard shuttering elements

The standard shuttering elements (composed of EPS shuttering leaves and steel spacers) correspond to the information and drawings given in Annexes 1.1, 2.1, 2.9 and 3.1.

The EPS shuttering leaves are made of expanded polystyrene (EPS) EPS-EN 13163-T2-L2-W2-S2-P4-BS150-CS(10)100-DS(N)2-TR100-WL(T)5 according to EN 13163 composed of polystyrene particle foam with graphite (NEOPOR® DUE S made by BASF).

The density ρ of the expanded polystyrene is in the range between 25 kg/m³ and 30 kg/m³.

The declared value of thermal conductivity of the expanded polystyrene is 0,031 W/(m×K).

The nominal thickness of the spacers made of galvanized steel (steel spacers, see e.g. Annexes 1.1, 2.1, 2.9 and 3.1) is 0.50 mm and the minimum height in the middle of the steel spacers is 50 mm.

The tensile strength of the steel spacers shall be at least 360 MPa. The pull-out strength between steel spacers and the EPS shuttering leaves shall be at least 850 N.

The material characteristics, dimensions and tolerances of the standard shuttering elements not indicated in Annexes 1.1, 2.1, 2.9 and 3.1 are given in the technical documentation⁷ of the ETA.

⁷

The technical documentation of the ETA is deposited with *Deutsches Institut für Bautechnik* and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

2.1.3 Accessory parts

The accessory parts correspond to the information and drawings given in Annexes 1.5, 1.6, 2.10 and 3.7. The accessory parts are:

- wedges for horizontal curved walls,
- single leaves,
- pieces for the equalization of differences in height,
- end stops (EPS or wood) and
- wood support edges.

The accessory parts consist of EPS, it is the same material used for standard shuttering elements specified in clause 2.1.2.

2.1.4 Special shuttering elements

The special shuttering elements correspond to the information and drawings given in Annexes 1.2 to 1.5, Annexes 2.2 to 2.8 and Annexes 3.2 to 3.6. The special shuttering elements are:

- T elements,
- terminal window elements,
- lintel elements,
- corner elements 90°,
- curved corner elements,
- corner elements 45°,
- 90° opposite angular elements and
- elements with hinges for horizontal curved walls.

Special shuttering elements are designed in the same manner as the standard shuttering elements described above, see clause 1.1.2.

The special shuttering elements consist of EPS and steel spacers, it is the same material used for standard shuttering elements specified in clause 2.1.2.

2.2 Methods of verification

2.2.1 General

The assessment of the fitness of the shuttering system for the intended use has been made in compliance with ETAG 009, 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", edition June 2002.

The ETA is issued for the shuttering kit "ARGISOL" on the basis of agreed information, deposited with *Deutsches Institut für Bautechnik*, 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 *Deutsches Institut für Bautechnik* before the changes are introduced. *Deutsches Institut für Bautechnik* 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.

2.2.2 Essential Requirement 1: Mechanical resistance and stability

2.2.2.1 Resulting structural pattern

In end use conditions walls made with shuttering elements "ARGISOL" are walls of a continuous type 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 manufacturer an 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, clause 6.1.2 are met satisfactorily.

2.2.2.3 Possibility of steel reinforcement

The instructions in the installation guide of the manufacturer are appropriate to install steel reinforcement for walls according to EN 1992-1-1 or corresponding national rules.

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

2.2.3 Essential Requirement 2: Safety in case of fire

2.2.3.1 Reaction to fire

Shuttering elements "ARGISOL" made of expanded polystyrene (EPS) fulfil the requirement of Class E according to EN 13501-1⁸.

2.2.3.2 Resistance to fire

The walls will be exposed to fire on one site only.

According to ETAG 009, Annex C, Table 1, for a continuous type of load-bearing walls ("REI") or non load-bearing walls ("EI") and a minimum concrete strength of C16/20, the system meets the criteria "REI" and "EI" according to Table 2.

Table 2: Determination of "REI" of load-bearing walls and "EI" of non load-bearing walls

Thickness of concrete core [mm]	"REI"	"EI"
140	90	120
165	120	120
215	120	120

The preconditions for this classification are:

- The design of the building 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.
- A normal weight concrete as defined in EN 206-1 or EN 1992-1-1 shall be used. 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 strength of concrete shall be between C16/20 and C50/60 according to EN 206-1. In lack of availability of European standard EN 206-1, 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.

⁸ A European reference fire scenario for facades has not been laid down. In some Member States the classification of permanent shuttering systems according to EN 13501-1 might not be sufficient for the use in facades. An additional assessment of permanent shuttering systems according to national provisions (e.g. on the basis of a large scale test) might necessary to comply with Member States regulations, until the existing European classification system has been completed.

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

2.2.4 Essential Requirement 3: Hygiene, health and environment

2.2.4.1 Content and/or release of dangerous substances

The chemical composition of the shuttering system/kit must comply with the data deposited with *Deutsches Institut für Bautechnik*.⁹

Due to the chemical composition of the shuttering system "ARGISOL", the product does not contain dangerous substances according to Council Directive 67/548/EEC, Regulation (EC) No 1272/2008 and/or the "Indicative list on dangerous substances" of the EGDS (expert group on dangerous substances of the European Commission) with the exception of hexabromocyclododecane (HBCDD).

The content of HBCDD is < 1 % by weight.

Note: For dangerous substances falling under the scope of the CPD for which:

- no assessment and verification methods are given in this ETA,

or

- the "No performance determined" option is declared,

or

- the chosen verification and assessment method does not comply with the regulatory requirement of a particular Member State,

there might be the necessity for an additional assessment at national level.

2.2.4.2 Water vapour permeability

The tabulated design value of the water vapour resistance factor of expanded polystyrene (EPS), according to EN ISO 10456 is $\mu = 60$.

The values of the water vapour resistance factor of concrete depending on type and density are tabulated in EN ISO 10456.

Using these values the verification of the annual moisture balance or the maximum amount of interstitial condensation according to EN ISO 13788 will be on the safe side.

2.2.4.3 Water absorption

As given in the designation code "WL(T)5" of the EPS (see clause 2.1.2) the long term water absorption by total immersion W_{it} of the EPS shuttering leaves shall not exceed 5,0 %, according to EN 13163.

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

2.2.4.4 Watertightness

Because finishes are not part of the shuttering system "ARGISOL" the "No performance determined" option in ETAG 009, Table 3 is used.

⁹

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, 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 Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.2.5 Essential Requirement 4: Safety in use

2.2.5.1 Bond strength between EPS shuttering leaves and concrete core and resistance to impact load

Under end use conditions the EPS shuttering leaves are durable fixed by the steel spacers. The bond strength is at least equal to the resisting pressure of fresh concrete of the EPS shuttering leaves, see clause 2.2.5.2, 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), constructed with shuttering system "ARGISOL" 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 core insures an adequate resistance of the complete wall under normal used impact loads.

The requirements according to ETAG 009, clause 6.4.1 are met satisfactorily.

2.2.5.2 Resistance to pressure of fresh concrete

To resist the pressure of fresh concrete the bending tensile strength of the EPS shuttering leaves shall be more than 150 kPa, see designation code "BS150" of EPS in clause 2.1.2.

The tensile strength of the steel spacers shall be at least 360 MPa. The pull-out strength between steel spacers and the EPS shuttering leaves shall be at least 850 N.

The requirements according to ETAG 009, clause 6.4.2 are met satisfactorily.

2.2.5.3 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 EPS shuttering leaves there is no risk of abrasion or of cutting people.

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

2.2.6 Essential Requirement 5: Protection against noise

2.2.6.1 Airborne sound insulation

The "No performance determined" option in ETAG 009, Table 3 is used.

2.2.6.2 Sound absorption

The "No performance determined" option in ETAG 009, Table 3 is used.

2.2.7 Essential Requirement 6: Energy economy and heat retention

2.2.7.1 Thermal resistance

The declared value of thermal resistance $R_{D,element}$ of the shuttering elements in end use conditions (see Annex 7, with concrete core without rendering) is the sum of the declared value of thermal resistance of the EPS shuttering leaves $R_{D,EPS}$ and the concrete core $R_{D,concrete}$. The declared value of thermal resistance of the EPS shuttering leaves $R_{D,EPS}$ shall be calculated in accordance with EN ISO 6946 with a declared value of thermal conductivity of the EPS shuttering leaves of $\lambda = 0.031 \text{ W/(m}\cdot\text{K)}$ according to EN 13163, clause 4.2.1 and the declared value of thermal resistance of the concrete core $R_{D,concrete}$ shall be calculated in accordance with EN ISO 6946 with a value of thermal conductivity λ of the concrete core depending on the density ρ tabulated in EN ISO 10456 and considering the influence of the steel spacers by an reduction factor, see Table 3, according to the influence of the thickness of the EPS shuttering leaves.

Table 3: Reduction factor

Type	Thickness of EPS shuttering leaves		Reduction factor
	inner leaf	outer leaf	
	[mm]	[mm]	
25/14.0	48	62	0,80
30/14.0	48	112	0,80
35/14.0	48	162	0,90
30/16.5	62	73	0,80
35/16.5	62	123	0,80
40/16.5	62	173	0,90
35/21.5	62	73	0,80
40/21.5	62	123	0,80
45/21.5	62	173	0,90

The planner shall consider the metal parts of the system as thermal bridges, where relevant, for determination of the declared value of thermal resistance $R_{D,element}$.

2.2.7.2 Influence of moisture transfer on insulating capacity of the wall

Using the values of clause 2.2.4.2 the verification of the annual moisture balance or the maximum amount of interstitial condensation according to EN ISO 13788 will be on the safe side.

2.2.7.3 Heat capacity

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 agent

As given in the designation code "DS(N)2" of the EPS (see clause 2.1.2) the relative changes of the EPS shuttering leaves in length and width under constant normal laboratory conditions (23 °C, 50 % relative humidity) shall not exceed $\pm 0,2 \%$, according to EN 13163.

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

Chemical agent

The steel spacers are only necessary for the resistance to pressure of fresh concrete. When the concrete core has sufficiently hardened the bond between concrete core and EPS shuttering leaves is given by the vertical dovetail grooves on the inside face of each EPS shuttering leaf (see clause 2.2.5.1).

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, clause 6.7.1.2 are met satisfactorily.

Biological agent

The application of EPS as thermal insulation material for decades has shown that it is sufficiently protected 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.

The shuttering system "ARGISOL" does not contain any biocides.

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

2.2.8.2 Resistance to normal use damage

Normal use impacts

Concrete walls (without consideration of the finishes), constructed with shuttering system "ARGISOL" 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 core insures an adequate resistance of the complete wall under normal used impact loads.

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

Incorporation of ducts

The instructions in the installation guide of the manufacturer are appropriate to produce horizontal perforations through the walls, which are necessary for passing through ducts, see clause 4.2.4.

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

Fixing of objects

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

The requirements according to ETAG 009, clause 6.7.2.3 are met satisfactorily.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the Decision 98/279/EC of 5 December 1997¹⁰ amended by the Decision 2001/596/EC¹¹ of the European Commission system 2+ of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

- (a) Tasks for 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 control plan.
- (b) Tasks for the approved 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.

Note: Approved bodies are also referred to as "notified bodies".

¹⁰ Official Journal of the European Communities L 127 of 24 April 1998
¹¹ Official Journal of the European Communities L 209 of 8 January 2001

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European technical approval may be used unless there are changes to the product, in the production line or plant. In such cases the necessary initial type-testing shall be agreed between *Deutsches Institut für Bautechnik* and the manufacturer involved.

3.2.1.2 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 insure that the product is in conformity with this European technical approval.

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

The factory production control shall be in accordance with the modified control plan of 1 February 2013 which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with *Deutsches Institut für Bautechnik*.¹²

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

3.2.1.3 Other tasks of the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in clause 3.1 in the field of non load-bearing shuttering systems in order to undertake the actions laid down in clause 3.2.2. For this purpose, the control plan referred to in clauses 3.2.1.2 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks for the approved body

The approved body shall perform the

- initial inspection of factory and of factory production control and
 - continuous surveillance, assessment and approval of factory production control,
- in accordance with the provisions laid down in the control plan.

The frequency of the inspections by the approved bodies shall be performed in accordance with section II of control plan.

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

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical approval.

¹² The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See clause 3.2.2.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform *Deutsches Institut für Bautechnik* without delay.

3.3 CE marking

The CE marking shall always be affixed on packaging and on the accompanying commercial documents. The letters "CE" shall be followed by the identification number of the approved certification body and be accompanied by the following additional information:

- the name and the address of the manufacturer (legal entity responsible for the manufacturer)
- the last two digits of the year in which the CE marking was affixed
- the number of the EC certificate for the factory production control
- the number of the European technical approval ETA-07/0105
- the number of the guideline ETAG 009 of the European technical approval
- the designation code of the expanded polystyrene according to EN 13163 (see clause 2.1.2)
- Reaction to fire: Class according to EN 13501-1 (see clause 2.2.3.1)
- Resistance to fire: Class according to EN 13501-2 in dependence of minimum thickness of the concrete core (see clause 2.2.3.2)
- Water vapour permeability (see clause 2.2.4.2)
- Protection against noise (see clause 2.2.6)
- the declared value of thermal resistance $R_{D,element}$ of the shuttering elements with concrete core and without rendering (see clause 2.2.7.1)

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

4.1 Manufacturing

The shuttering elements are manufactured in accordance with the provisions of the European technical approval using the automated manufacturing process as identified during the inspection of the plant by *Deutsches Institut für Bautechnik* and the approved body and laid down in the technical documentation.

The European technical approval is issued for the product on the basis of agreed data/information, deposited with *Deutsches Institut für Bautechnik*, 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 *Deutsches Institut für Bautechnik* before the changes are introduced. *Deutsches Institut für Bautechnik* will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Installation

4.2.1 General

The manufacturer shall ensure that the requirements in accordance with clauses 1, 2, and 4 are made known to those involved in planning and execution. The installation guide is deposited with *Deutsches Institut für Bautechnik* 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 4.2.2) site mixed or ready mixed concrete is placed and compacted (see clause 4.2.3).

In end use conditions concrete walls of a continuous type¹³ of plain or reinforced concrete will be formed according to EN 1992-1-1 or according to corresponding national rules.

For structural design purposes the thickness of the wall and the weight per unit area without rendering are shown in Annex 7.

In end use conditions the EPS shuttering leaves are the main part of the thermal insulation of the walls.

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

4.2.2 Installation of the shuttering elements

The shuttering elements are put together on site in layers without mortar or adhesive. To receive stable floor high formworks the vertical joints between two elements of one layer have to be shifted of at least a quarter of the element length, better a half of the element length, to the vertical joints of the previous and next layer (see Annexes 4 and 5).

First of all two layers of the entire floor plan are to be interlocked according to the installation guide of the manufacturer.

Afterwards levelling to the subsoil is performed (foundation, bottom, ground floor and ceiling). Voids between the EPS shuttering leaves and the uneven subsoil are to be sealed with PU foam before concreting.

Subsequently, according to the installation guide of the manufacturer, the shuttering elements are to be interlocked to floor height, levelled and fastened to the push pull props (see Annex 6).

The push pull props shall be arranged with a maximum distance of 0.80 m to be connected over the entire wall height with the shuttering elements and to be fastened to the floor.

The necessary reinforcement according to static calculation shall also be installed according to the instructions in the installation guide provided by the manufacturer.

Rectangular corners are to be formed according to Annex 4. Typical wall junctions are to be formed according to Annex 5.

Further information is given in the installation guide.

4.2.3 Concreting

For the production of normal concrete EN 206-1 shall apply. The consistency of concrete shall be at least within the lower consistency range F3 when compacted by vibration and at least within the upper consistency range F3 when compacted by poking.

The maximum aggregate size shall be at least 8 mm and shall not exceed 16 mm.

Furthermore the concrete shall have rapid or medium strength development according to EN 206-1, Table 12.

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

Placing the concrete shall be performed in layers of maximum 0.75 m at a maximum concreting rate of 1 m/h. For curved and angled walls made with shuttering elements the concreting rate shall not exceed 1 m/h.

¹³

see ETAG 009, clause 2.2

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

Horizontal cold joints are to be arranged preferably at the height of the floor. If cold joints cannot be avoided within the height between the floors, vertical starter bars shall be installed. The starter bars shall meet the following requirements:

- Two adjacent starter bars shall not be situated in the same plane parallel to the surface of the wall.
- The distance between two starter bars in wall direction shall be at least 10 cm and not larger than 50 cm.
- The total section area of the starter bars shall not be less than 1/2000 of the section area of the concrete.
- Anchorage length of the starter bars on both sides of the cold joint shall be at least 20 cm.

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

If no cold joint is planned, placing of concrete in layers may only be interrupted until the concrete layer placed last has not yet set so that a good and even bond is still possible between the two concrete layers. When using internal vibrators the vibrating cylinder shall still penetrate into the already compacted lower concrete layer.

The concrete may fall freely only up to a height of 2 m, beyond that the concrete shall be cohered by discharge pipes or concreting tubes with a diameter of 100 mm at the most and shall be led shortly before the place of installation.

Cones from placing concrete are to 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 walls may not deviate from the plumb line more than 5 mm per running meter wall height.

The ceiling shall only be placed on walls made of shuttering elements when the concrete core has sufficiently hardened.

4.2.4 Ducts crossing and situated inside the wall

Horizontally passing ducts are to be installed according to the installation guide of the manufacturer and are to be taken into account when designing the wall.

Horizontal ducts situated inside the concrete cores and running parallel to the wall surfaces shall be avoided. If absolutely necessary, these are to 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 ducts is less than 2 m.

4.2.5 Reworking and finishes

Walls of the type "ARGISOL" are to 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 rendering systems used 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 load-bearing structure, because of the detrimental influence of weather and UV radiation on the surface of the EPS shuttering leaves.

4.2.6 Fixing of objects

Fixing of objects in the EPS shuttering leaves is not possible. The part of fixings which is relevant for the mechanical resistance shall be inside the concrete core. The influence of the fixing to the reduction of the declared value of thermal resistance $R_{D,element}$ shall be considered according to EN ISO 6946.

5 Indications to the manufacturer

5.1 Packaging, transport and storage

The shuttering elements have to be protected against damage, soiling and intensive action of water during transport and storage. If necessary the shuttering elements shall be covered.

5.2 Use, maintenance, repair

Regular checks should be carried out on renderings and finishes to ensure that any damage is detected and repaired as soon as possible.

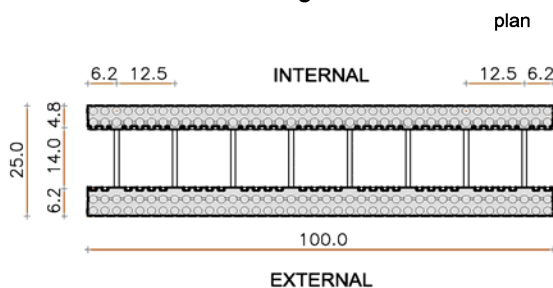
The recommendations on use, maintenance and repair in ETAG 009, clause 7.5 shall be considered.

The shuttering elements have to be protected against high temperature, overheating and intensive exposure to weather and UV radiation. If necessary, the shuttering elements have to be covered.

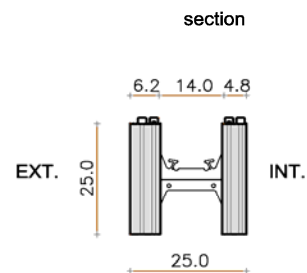
Georg Feistel
Head of Department

beglaubigt:
Schwab

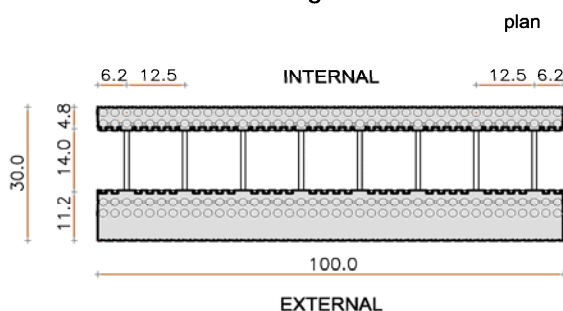
Standard shuttering element 25/14.0



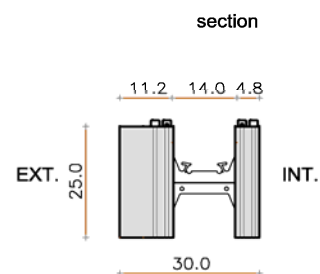
Dimension standard shuttering element 25/14.0 (100x25x25)



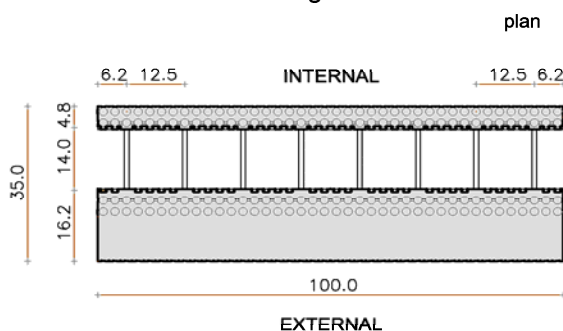
Standard shuttering element 30/14.0



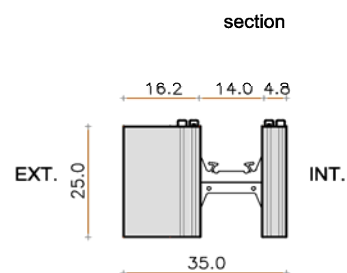
Dimension standard shuttering element 30/14.0 (100x30x25)



Standard shuttering element 35/14.0



Dimension standard shuttering element 25/14.0 (100x35x25)



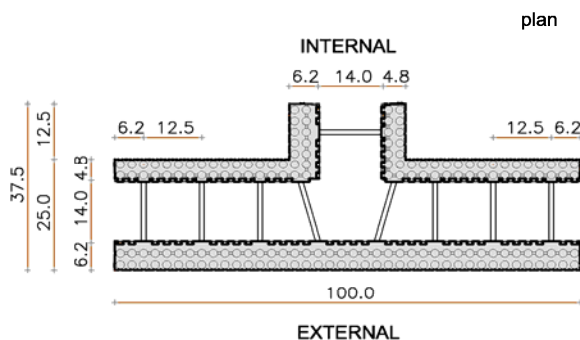
all dimensions in cm

ARGISOL

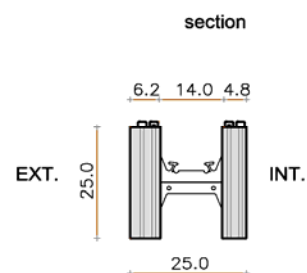
Standard shuttering elements – 14 cm

Annex 1.1

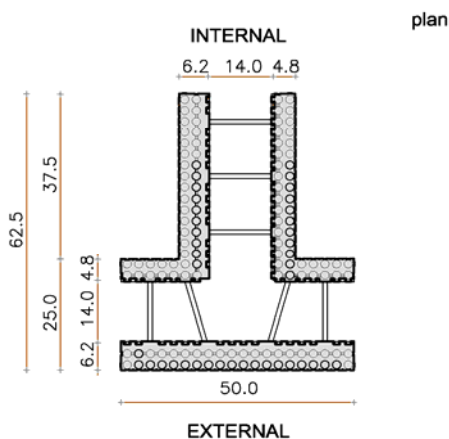
"T" element 25/14.0



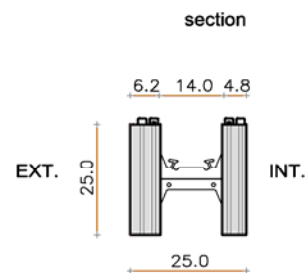
Dimension "T" element 25/14.0 (100-37.5x25x25)



"T" element 25/14.0



Dimension "T" element 25/14.0 (50-62.5x25x25)



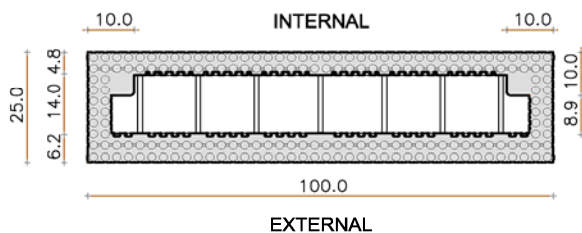
all dimensions in cm

ARGISOL

Special shuttering elements – 14 cm
T elements

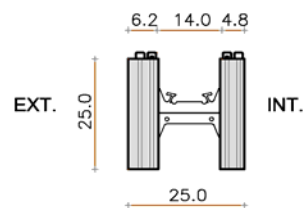
Annex 1.2

Terminal window element 25/14.0 plan

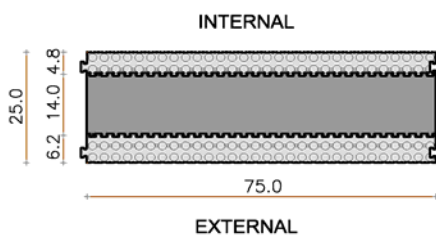


Dimension terminal window element 25/14.0 (100x25x25)

section

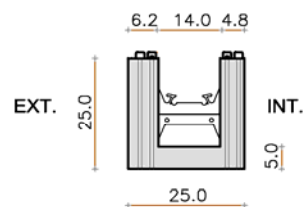


Lintel element 25/14.0 plan



Dimension lintel element 25/14.0 (75x25x25)

section



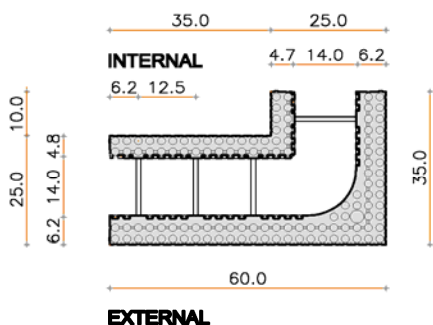
all dimensions in cm

ARGISOL

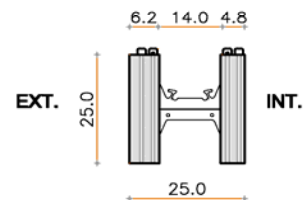
Special shuttering elements – 14 cm
Terminal window elements
Lintel elements

Annex 1.3

Corner shuttering element 25/14.0 plan

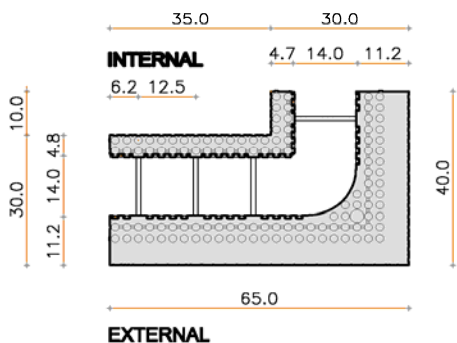


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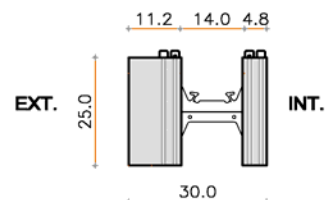


Dimension corner shuttering element 25/14.0 (60-35)x25x25

Corner shuttering element 30/14.0 plan

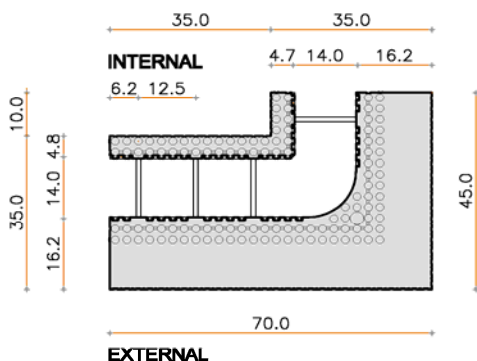


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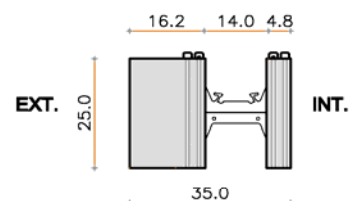


Dimension corner shuttering element 30/14.0 (65-40)x30x25

Corner shuttering element 35/14.0 plan



section



Dimension corner shuttering element 35/14.0 (70-45)x35x25

all dimensions in cm

Electronic copy of the ETA by DIBt: ETA-07/0105

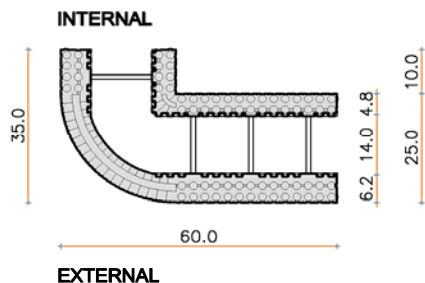
ARGISOL

Special shuttering elements – 14 cm
Corner elements

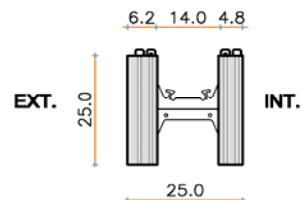
Annex 1.4

Curved corner element

plan



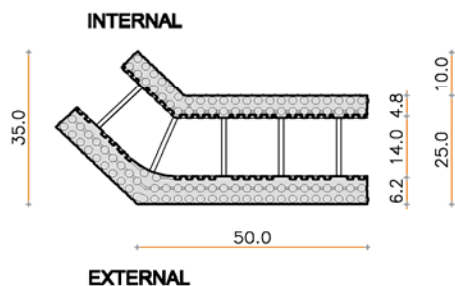
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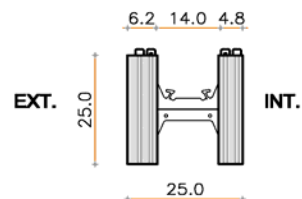
Dimension curved corner element 25/14.0 (60-35)x25x25

Corner element 45°

plan



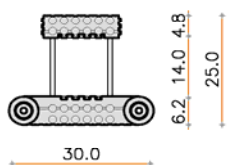
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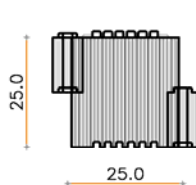
Dimension corner element 45° 25/14.0 (50-35)x25x25

Element with hinges for horizontal curved walls 30/14.0

plan INTERNAL



section

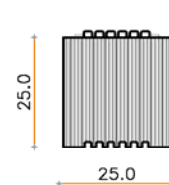


Wedges

plan



section



EXTERNAL

Dimension element with hinges for horizontal curved walls 25/14.0 (30x25x25)

all dimensions in cm

Electronic copy of the ETA by DIBt: ETA-07/0105

ARGISOL

Special shuttering elements – 14 cm
Curved corner elements / Corner elements 45°
Elements with hinges for horizontal curved walls / Wedges for horizontal curved walls

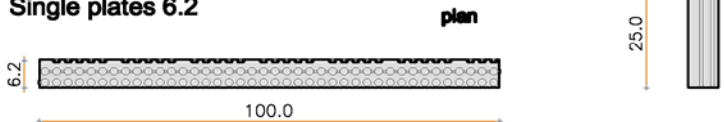
Annex 1.5

Pieces for the equalization of differences in height



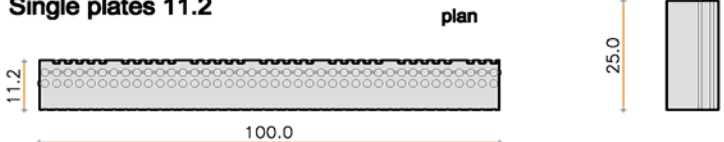
Dimension pieces for the equalization of differences in height 5.0 (50x5x5)

Single plates 6.2



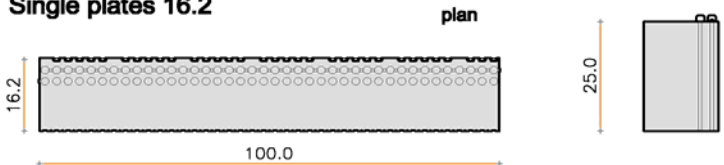
Dimension single plates 6.2 (100x6.2x25)

Single plates 11.2



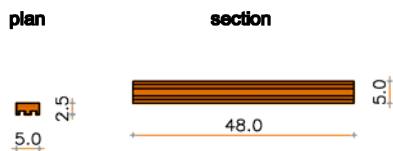
Dimension single plates 11.2 (100x11.2x25)

Single plates 16.2

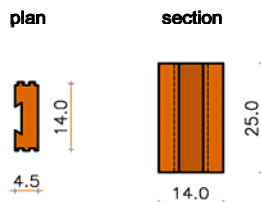


Dimension single plates 16.2 (100x16.2x25)

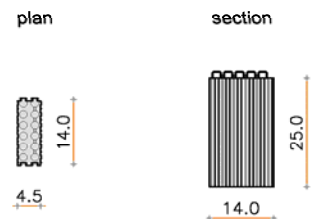
Wood support edge



End stops wood



End stops EPS



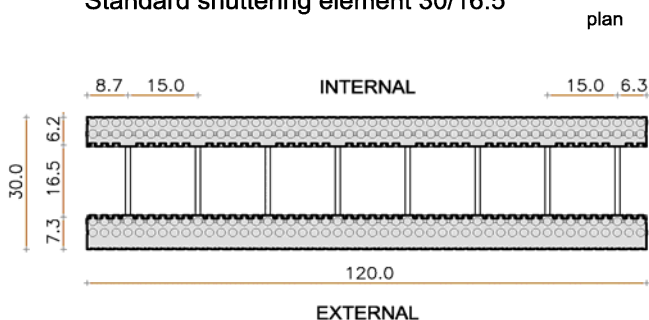
all dimensions in cm

ARGISOL

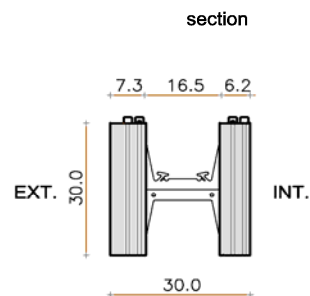
Accessory parts – 14 cm
Pieces for the equalization of differences in height / Single leaves
Wood support edges / End stops (wood or EPS)

Annex 1.6

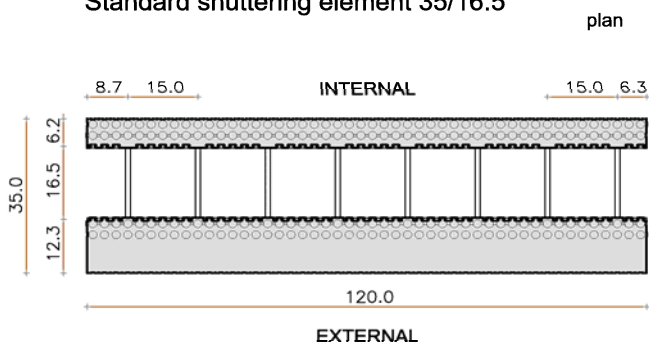
Standard shuttering element 30/16.5



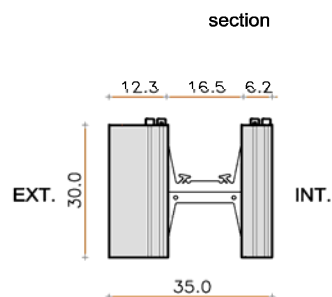
Dimension standard shuttering element 30/16.5 (120x30x30)



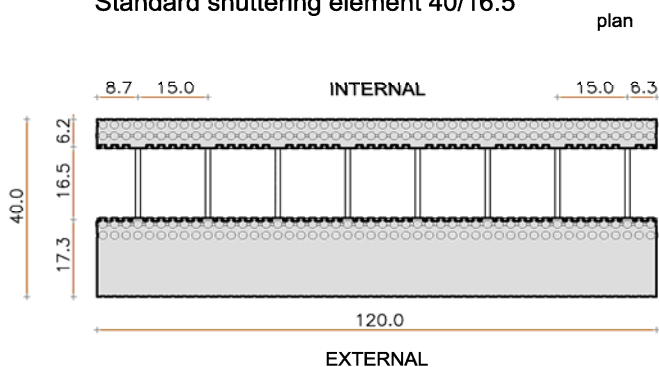
Standard shuttering element 35/16.5



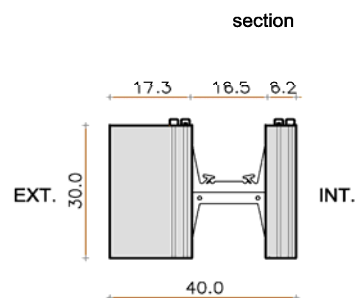
Dimension standard shuttering element 35/16.5 (120x35x30)



Standard shuttering element 40/16.5



Dimension standard shuttering element 40/16.5 (120x40x30)

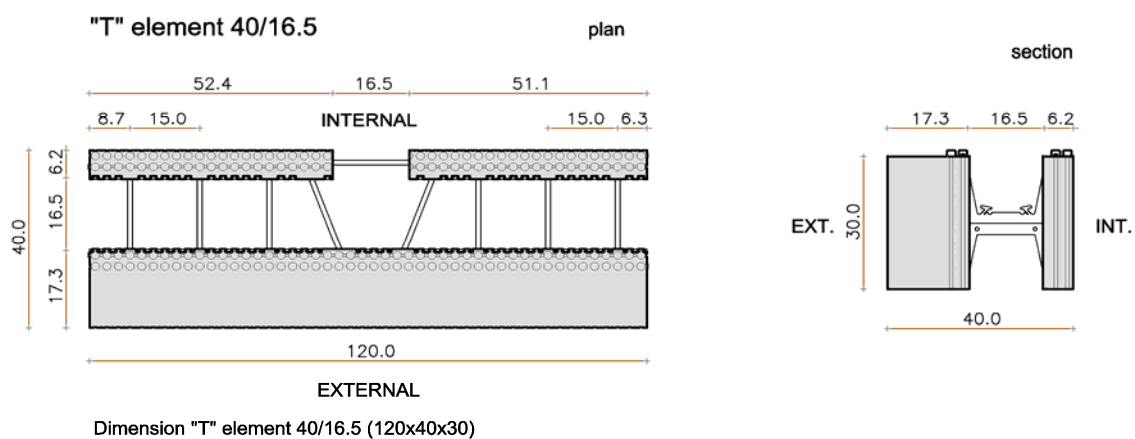
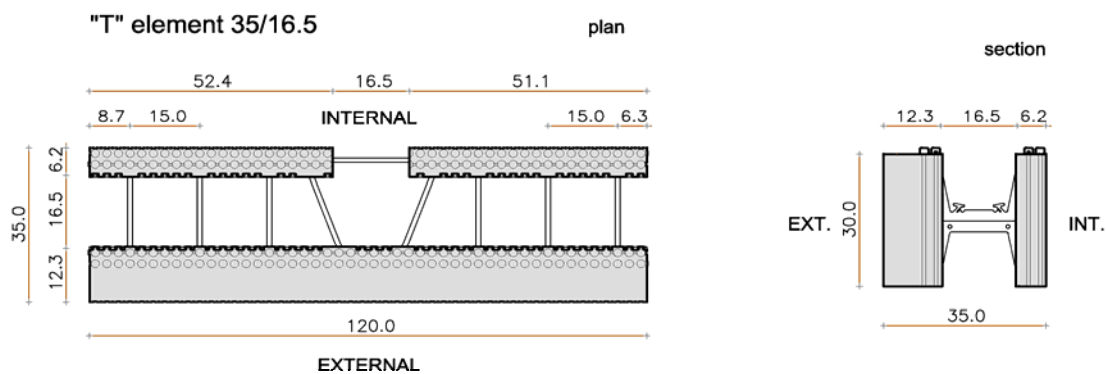
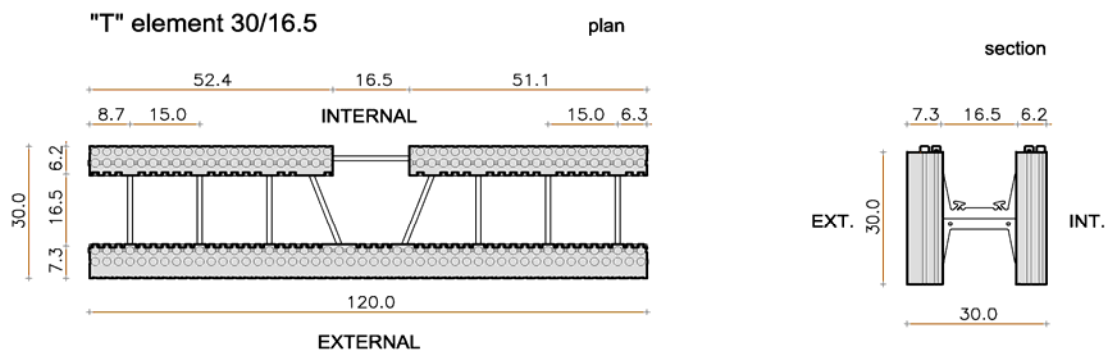


all dimensions in cm

ARGISOL

Standard shuttering elements – 16,5 cm, h = 30 cm

Annex 2.1



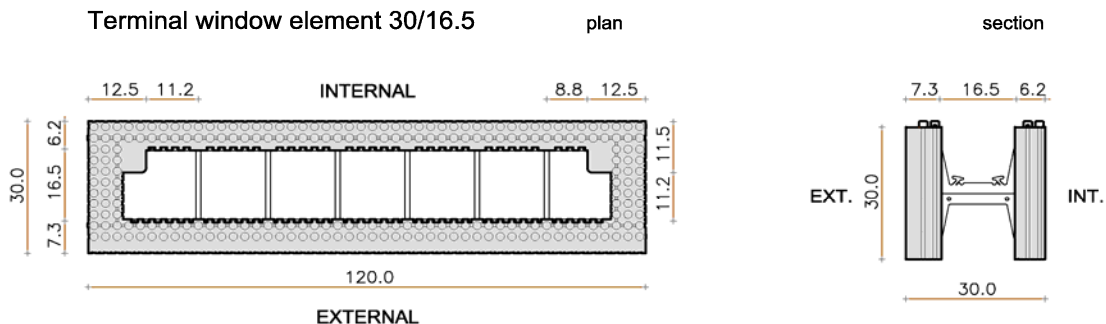
all dimensions in cm

ARGISOL

Special shuttering elements – 16,5 cm
T elements

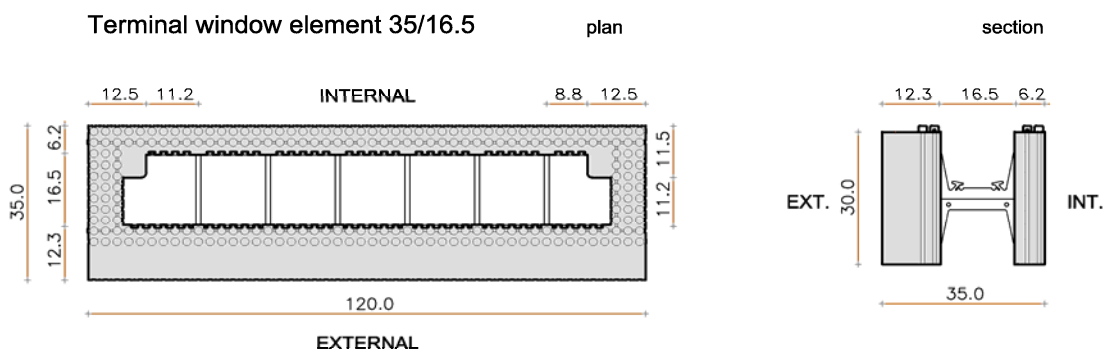
Annex 2.2

Terminal window element 30/16.5



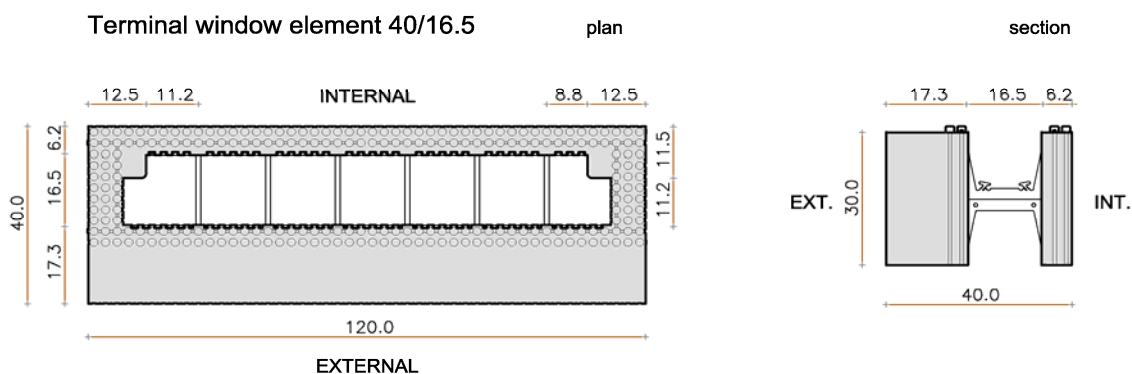
Dimension terminal window element 30/16.5 (120x30x30)

Terminal window element 35/16.5



Dimension terminal window element 35/16.5 (120x35x30)

Terminal window element 40/16.5



Dimension terminal window element 40/16.5 (120x40x30)

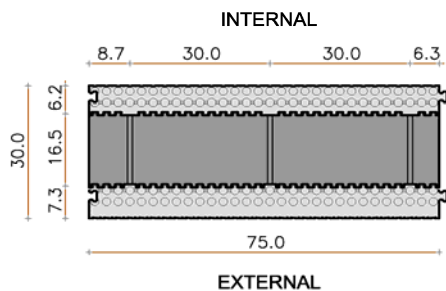
all dimensions in cm

ARGISOL

Special shuttering elements – 16,5 cm
Terminal window elements

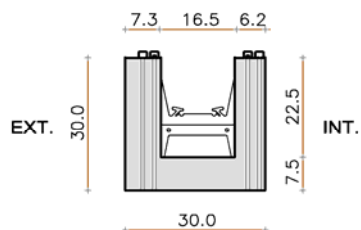
Annex 2.3

Lintel element 30/16.5 plan

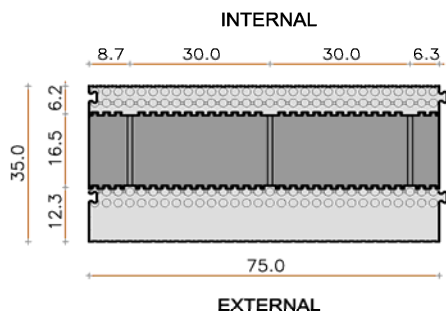


Dimension lintel element 30/16.5 (75x30x30)

section

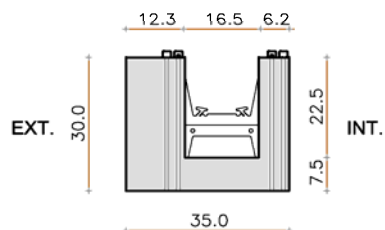


Lintel element 35/16.5 plan

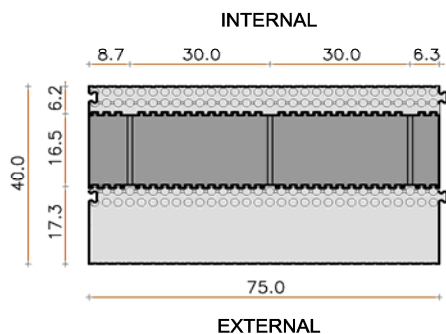


Dimension lintel element 35/16.5 (75x35x30)

section

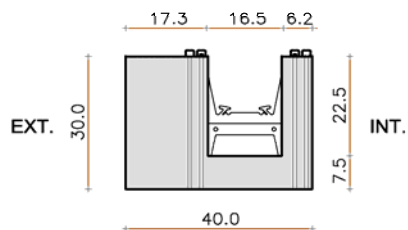


Lintel element 40/16.5 plan



Dimension lintel element 40/16.5 (75x40x30)

section



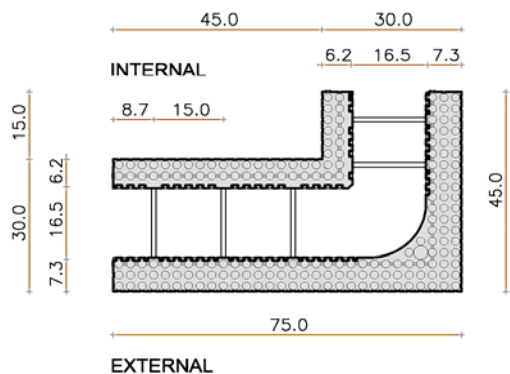
all dimensions in cm

ARGISOL

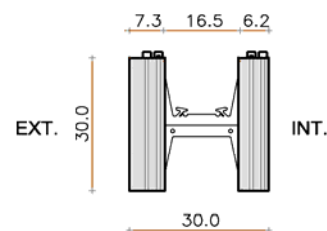
Special shuttering elements – 16,5 cm
Lintel elements

Annex 2.4

Corner shuttering element 30/16.5 plan

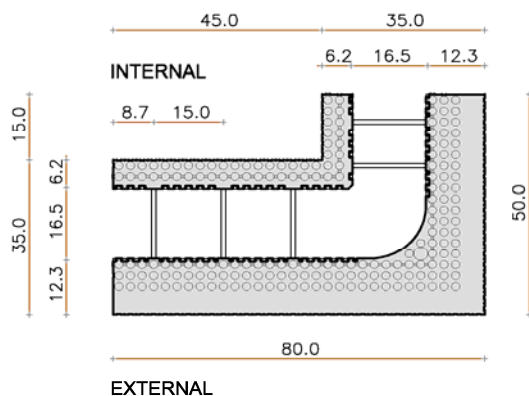


section

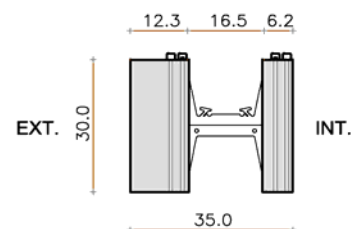


Dimension corner shuttering element 30/16.5 (45-75)x30x30

Corner shuttering element 35/16.5 plan

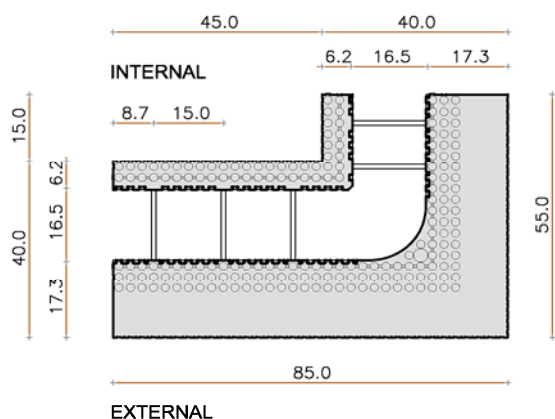


section

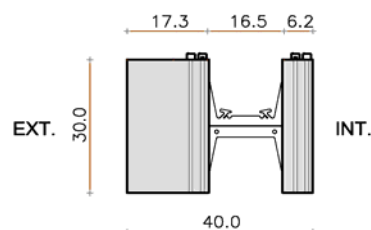


Dimension corner shuttering element 35/16.5 (50-80)x35x30

Corner shuttering element 40/16.5 plan



section



Dimension corner shuttering element 40/16.5 (55-85)x40x30

all dimensions in cm

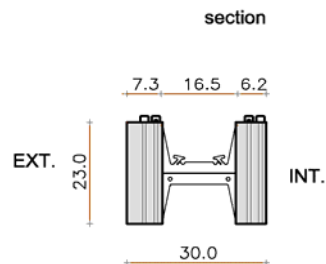
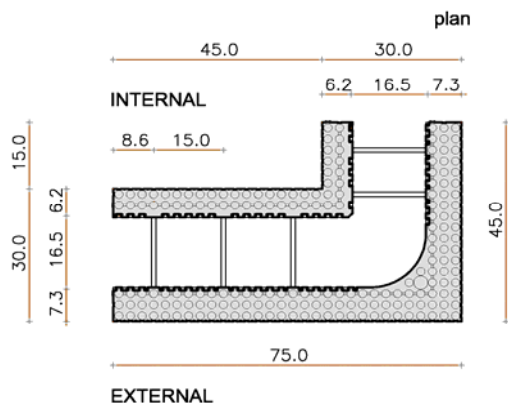
Electronic copy of the ETA by DIBt: ETA-07/0105

ARGISOL

Special shuttering elements – 16,5 cm
Corner elements, h = 30 cm

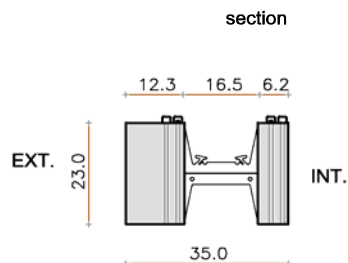
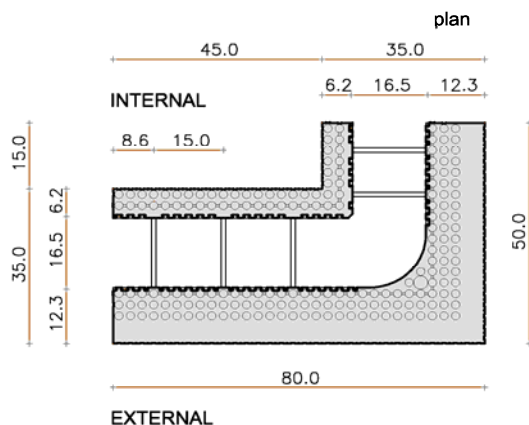
Annex 2.5

Corner shuttering element 30/16.5 - h. 23



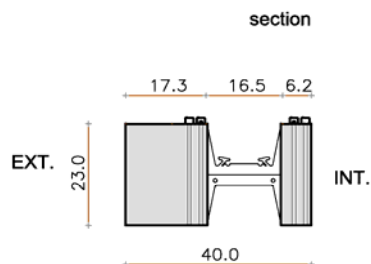
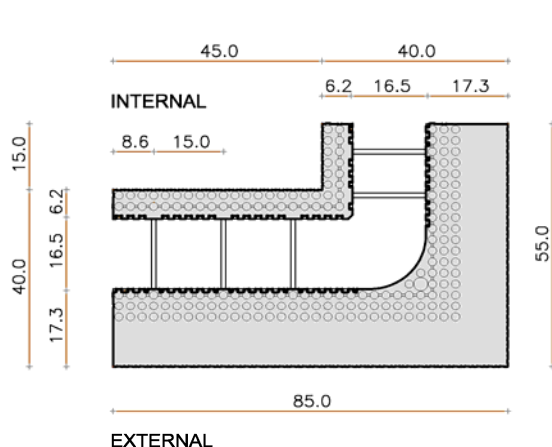
Dimension corner shuttering element 30/16.5 (45-75)x30x23

Corner shuttering element 35/16.5 - h. 23



Dimension corner shuttering element 35/16.5 (50-80)x35x23

Corner shuttering element 40/16.5 - h. 23



Dimension corner shuttering element 40/16.5 (55-85)x40x23

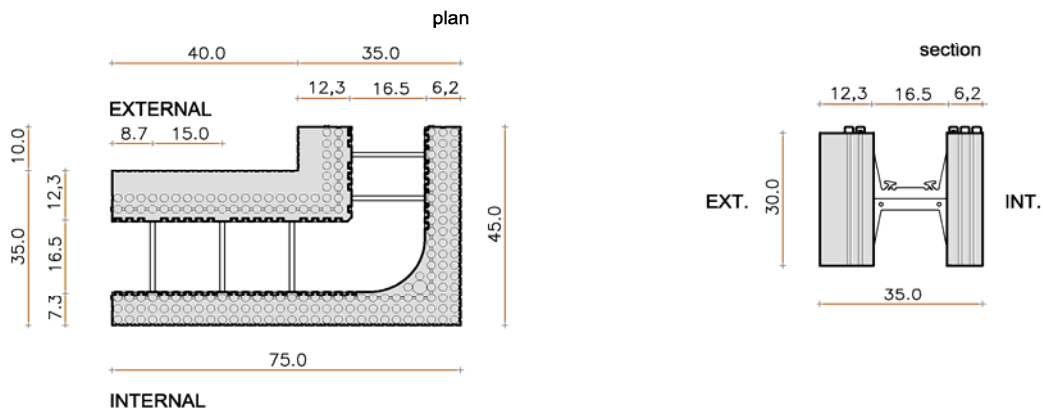
all dimensions in cm

ARGISOL

Special shuttering elements – 16,5 cm
Corner elements, h = 23 cm

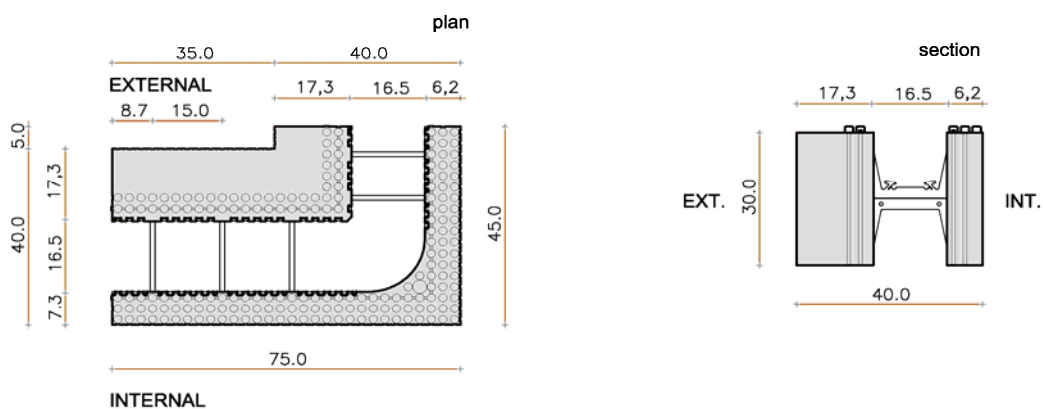
Annex 2.6

90° opposite angular shuttering element 35/16.5



Dimension 90° opposite angular shuttering element 35/16.5 (45-75)x35x30

90° opposite angular shuttering element 40/16.5



Dimension 90° opposite angular shuttering element 40/16.5 (45-75)x40x30

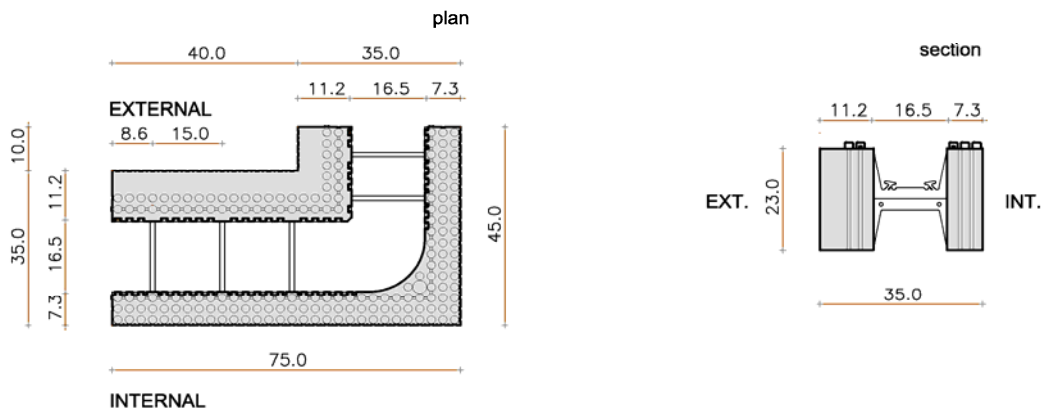
all dimensions in cm

ARGISOL

Special shuttering elements – 16,5 cm
90° opposite angular elements, h = 30 cm

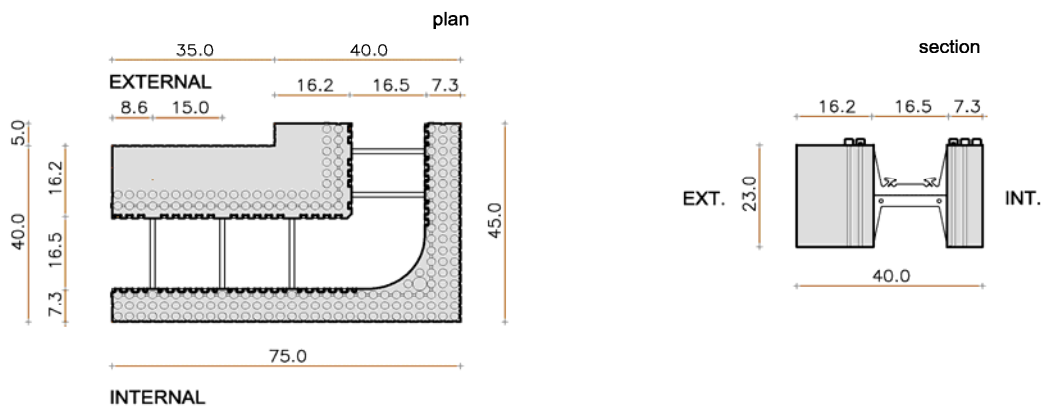
Annex 2.7

90° opposite angular shuttering element 35/16.5 - h. 23



Dimension 90° opposite angular shuttering element 35/16.5 (45-75)x35x23

90° opposite angular shuttering element 40/16.5 - h. 23



Dimension 90° opposite angular shuttering element 40/16.5 (45-75)x40x23

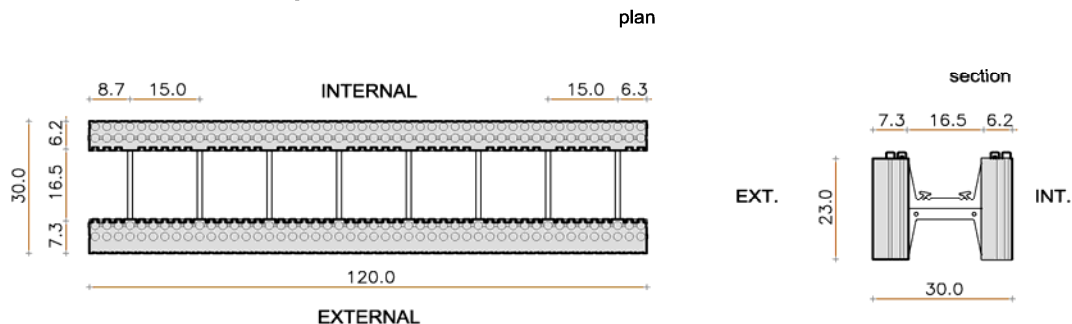
all dimensions in cm

ARGISOL

Special shuttering elements – 16,5 cm
90° opposite angular elements, h = 23 cm

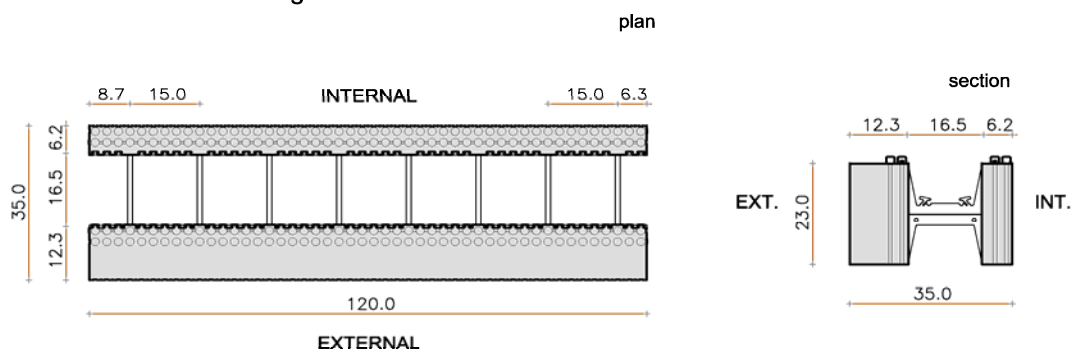
Annex 2.8

Standard shuttering element 30/16.5 - H=23



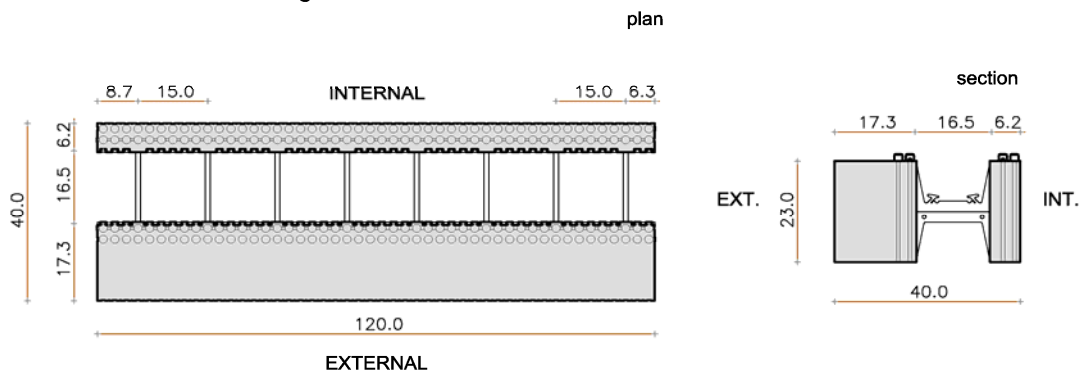
Dimension standard shuttering element 30/16.5 (120x30x23)

Standard shuttering element 35/16.5 - H=23



Dimension standard shuttering element 35/16.5 (120x35x23)

Standard shuttering element 40/16.5 - H=23



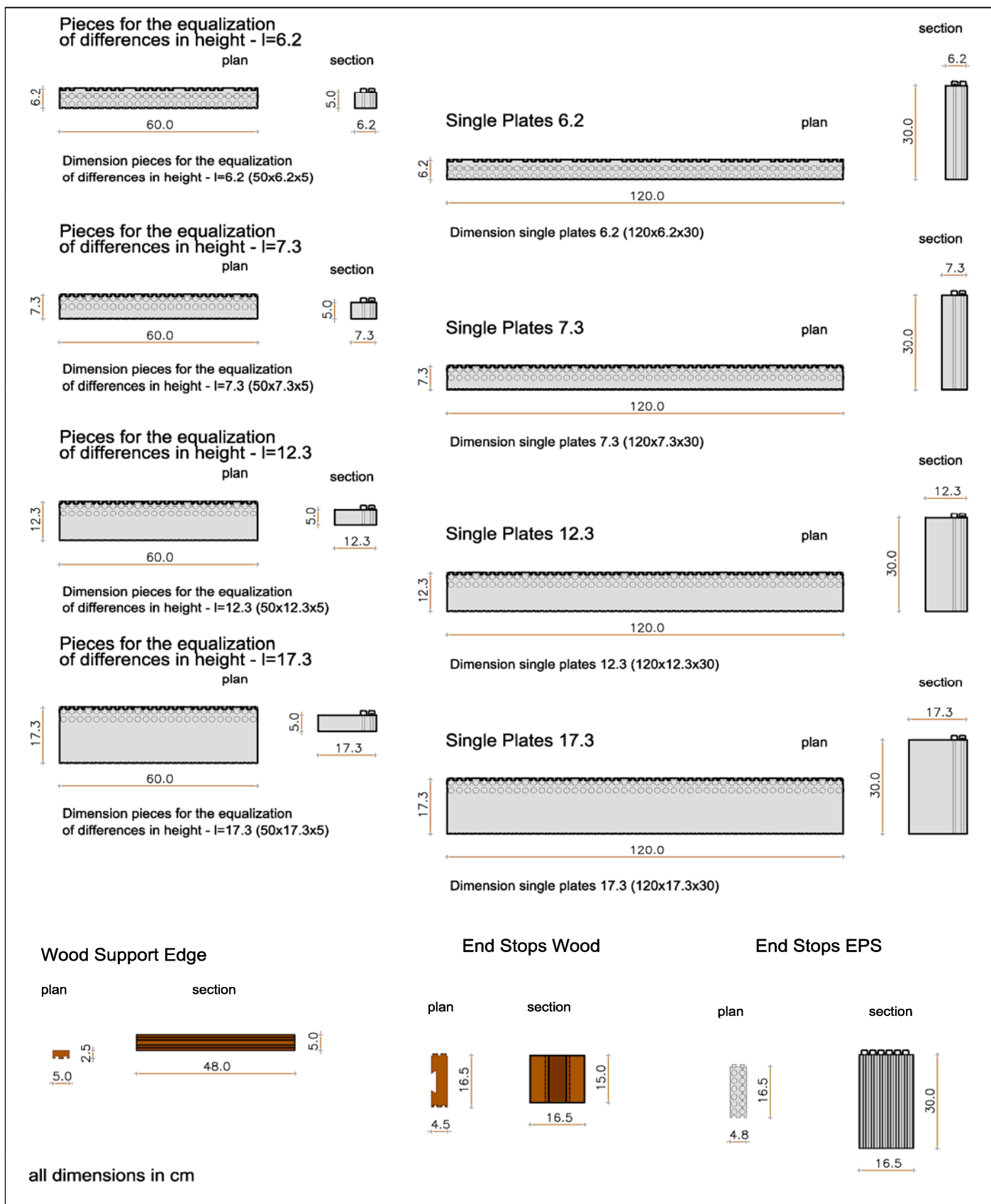
Dimension standard shuttering element 40/16.5 (120x40x23)

all dimensions in cm

ARGISOL

Standard shuttering elements – 16,5 cm, h = 23 cm

Annex 2.9



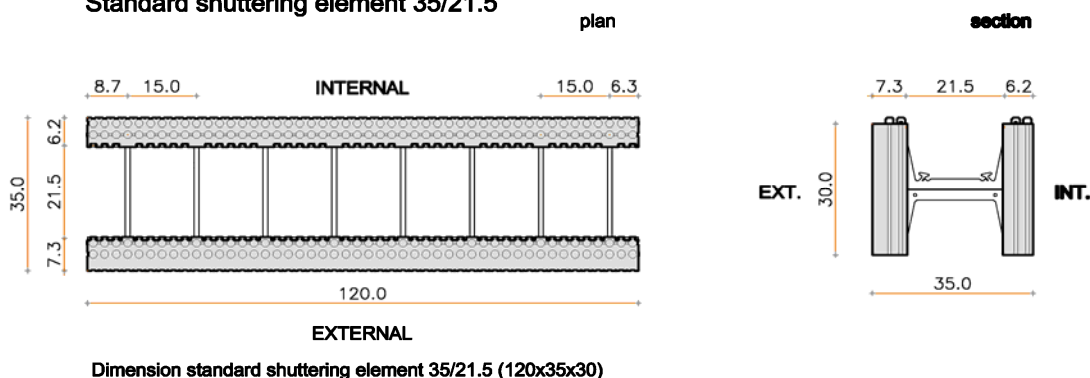
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ARGISOL

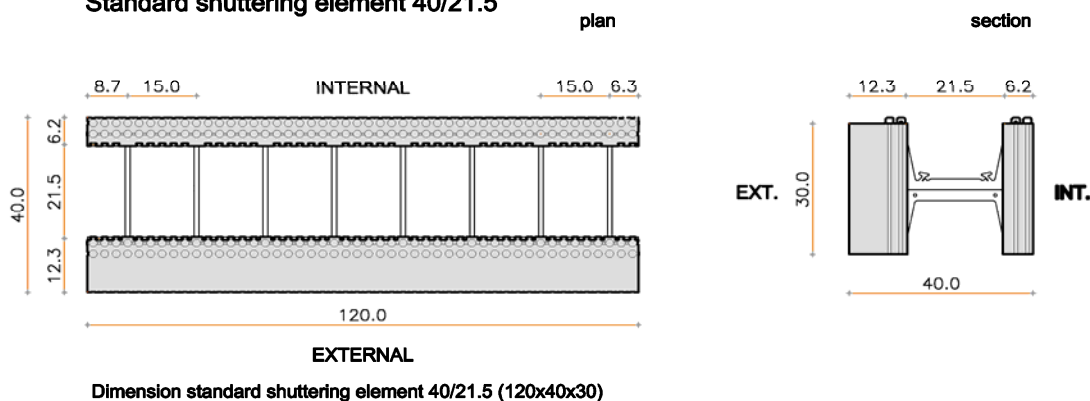
Accessory parts – 16,5 cm
Pieces for the equalization of differences in height / Single leaves
Wood support edges / End stops (wood or EPS)

Annex 2.10

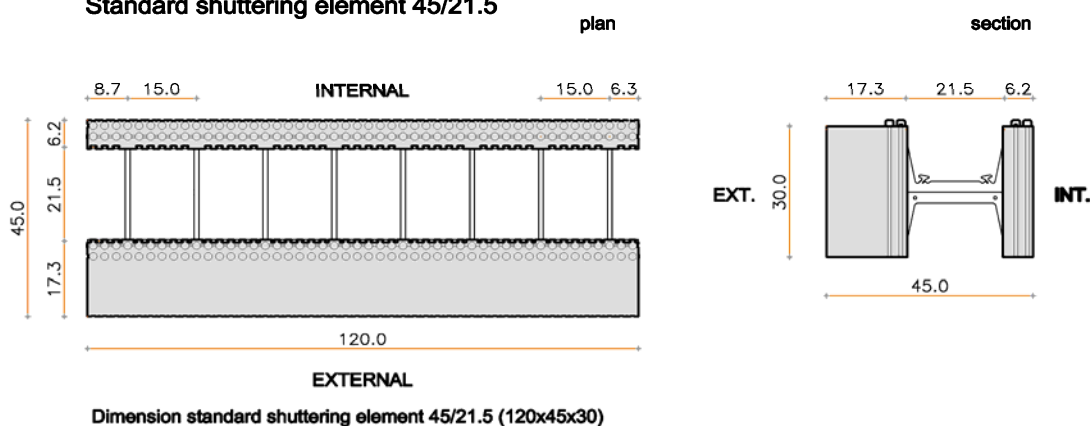
Standard shuttering element 35/21.5



Standard shuttering element 40/21.5



Standard shuttering element 45/21.5

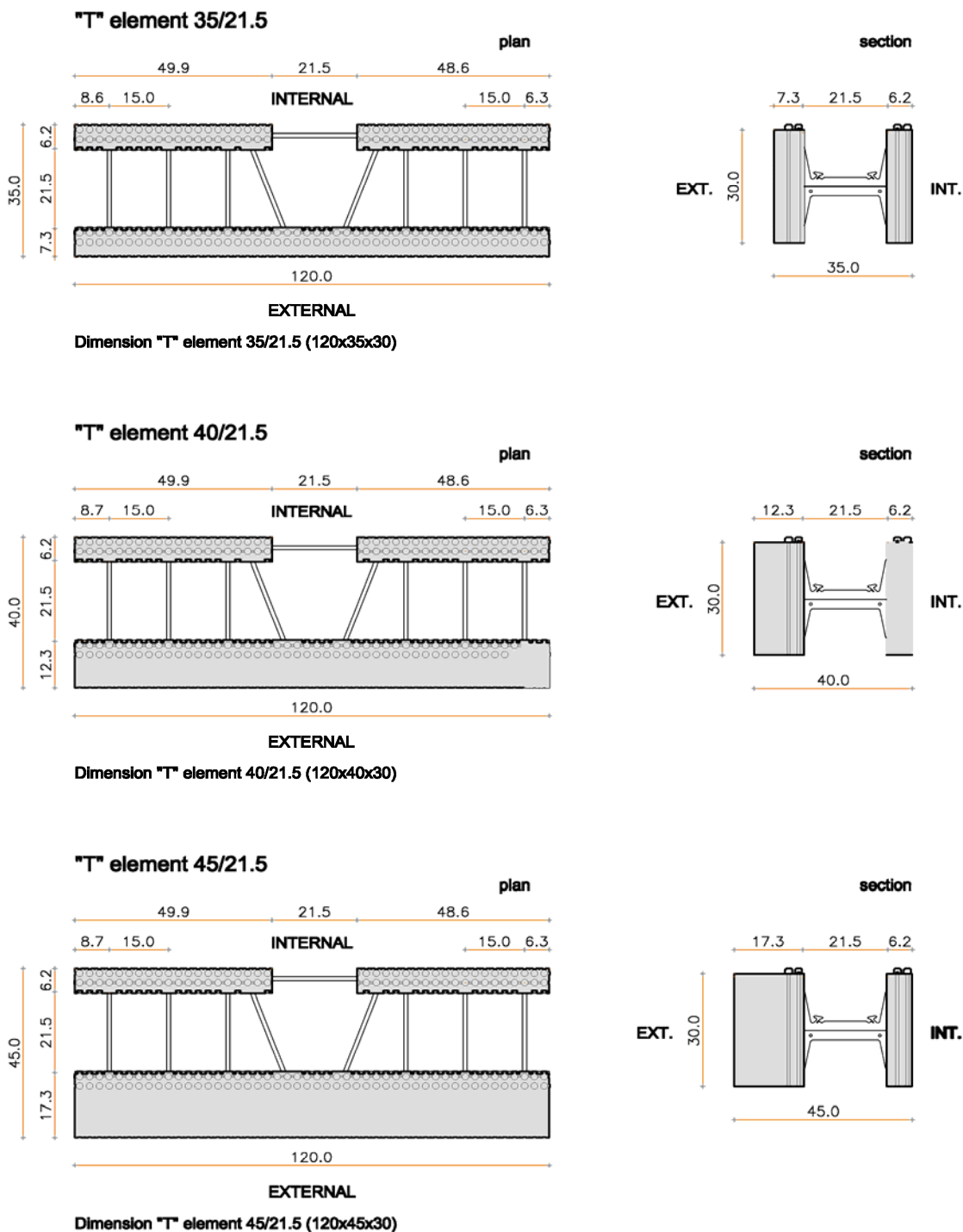


all dimensions in cm

ARGISOL

Standard shuttering elements – 21,5 cm

Annex 3.1



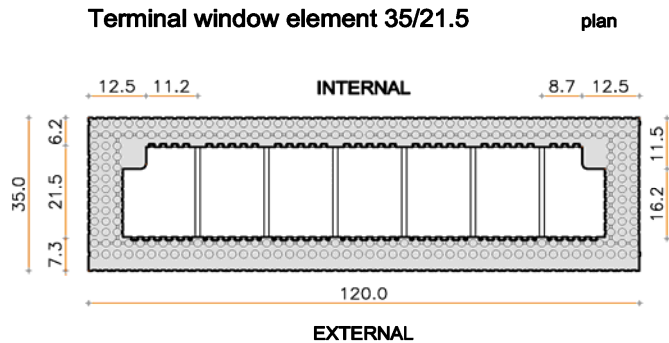
all dimensions in cm

ARGISOL

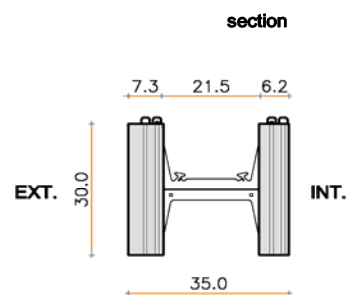
Special shuttering elements – 21,5 cm
T elements

Annex 3.2

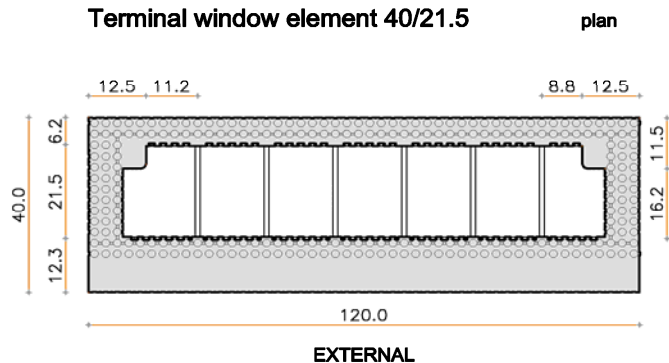
Terminal window element 35/21.5



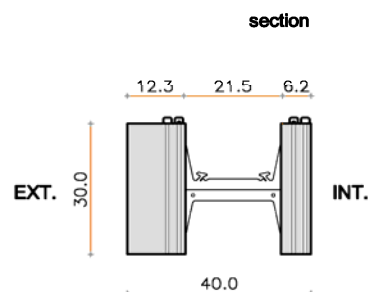
Dimension terminal window element 35/21.5 (120x35x30)



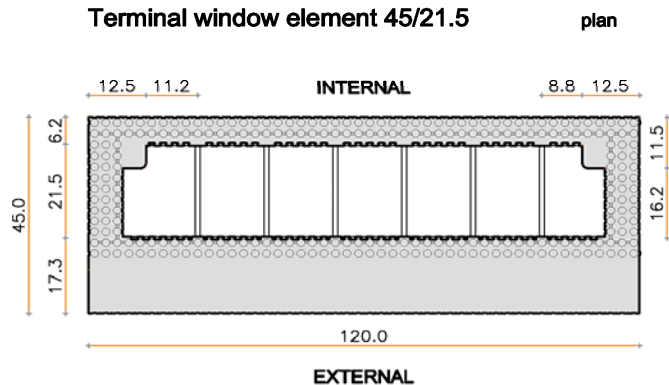
Terminal window element 40/21.5



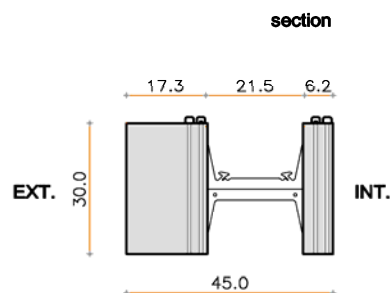
Dimension terminal window element 40/21.5 (120x40x30)



Terminal window element 45/21.5



Dimension terminal window element 45/21.5 (120x45x30)



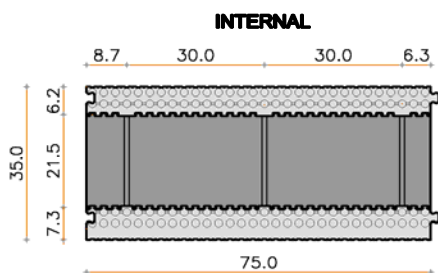
all dimensions in cm

ARGISOL

Special shuttering elements – 21,5 cm
Terminal window elements

Annex 3.3

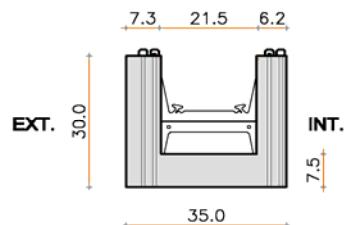
Lintel element 35/21.5 plan



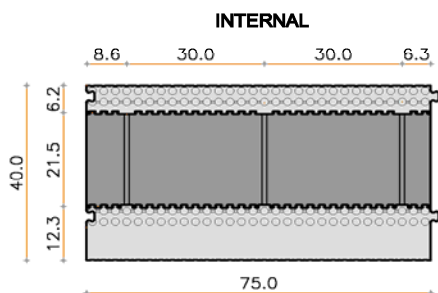
EXTERNAL

Dimension lintel element 35/21.5 (75x35x30)

section



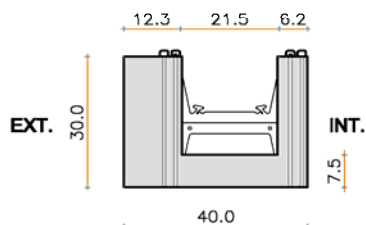
Lintel element 40/21.5 plan



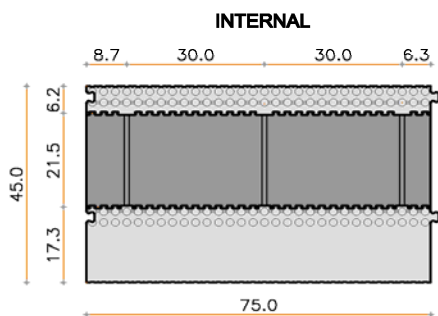
EXTERNAL

Dimension lintel element 40/21.5 (75x40x30)

section



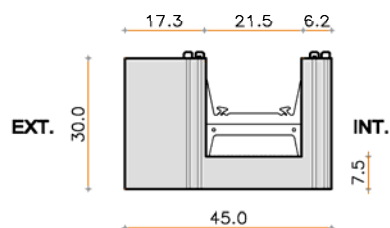
Lintel element 45/21.5 plan



EXTERNAL

Dimension lintel element 45/21.5 (75x45x30)

section



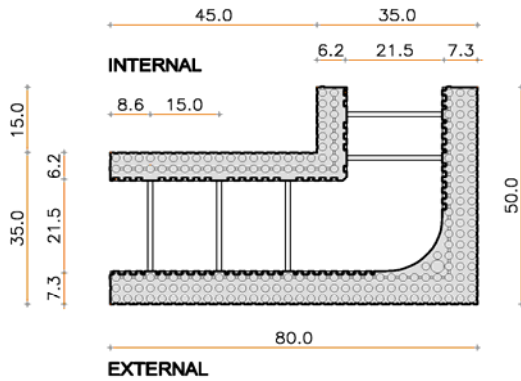
all dimensions in cm

ARGISOL

Special shuttering elements – 21,5 cm
Lintel elements

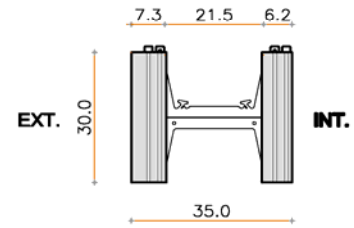
Annex 3.4

Corner shuttering element 35/21.5 plan

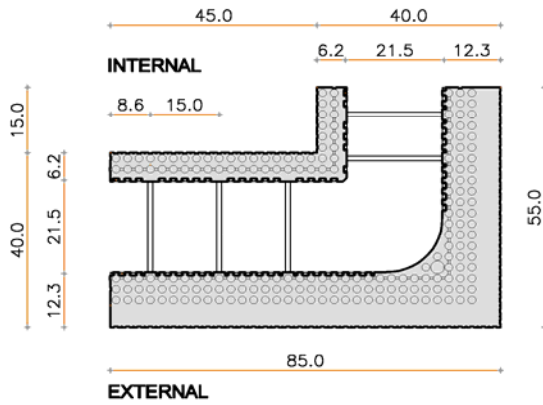


Dimension corner shuttering element 35/21.5 (50-80)x35x30

section

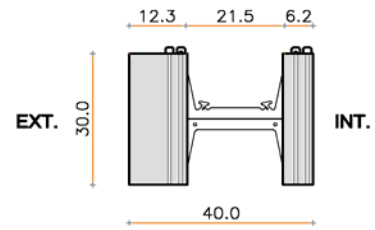


Corner shuttering element 40/21.5 plan

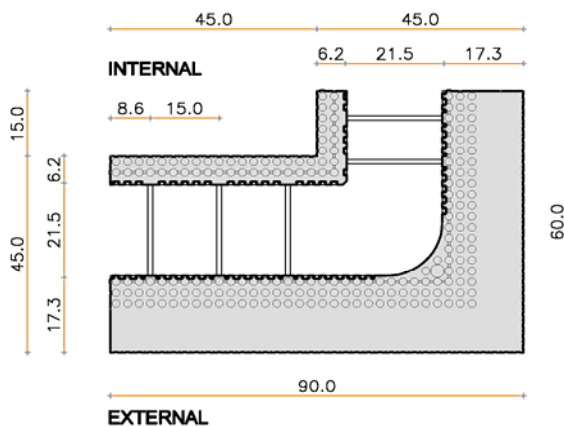


Dimension corner shuttering element 40/21.5 (55-85)x40x30

section

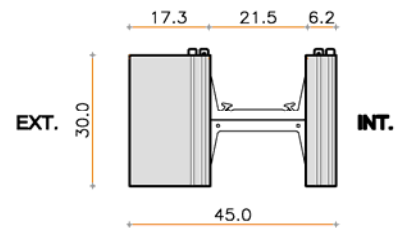


Corner shuttering element 45/21.5



Dimension corner shuttering element 40/21.5 (60-90)x45x30

section



all dimensions in cm

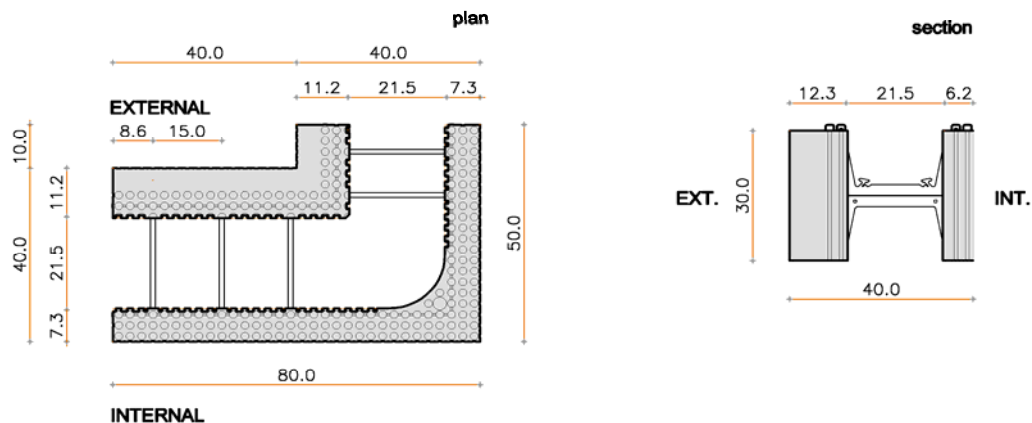
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ARGISOL

Special shuttering elements – 21,5 cm
Corner elements

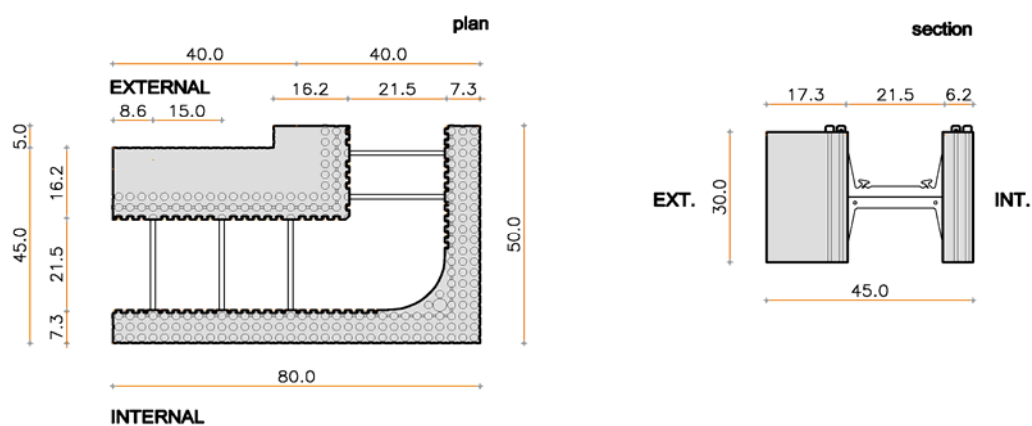
Annex 3.5

90° opposite angular shuttering element 40/21.5



Dimension 90° opposite angular shuttering element 40/21.5 (50-80)x40x30

90° opposite angular shuttering element 45/21.5



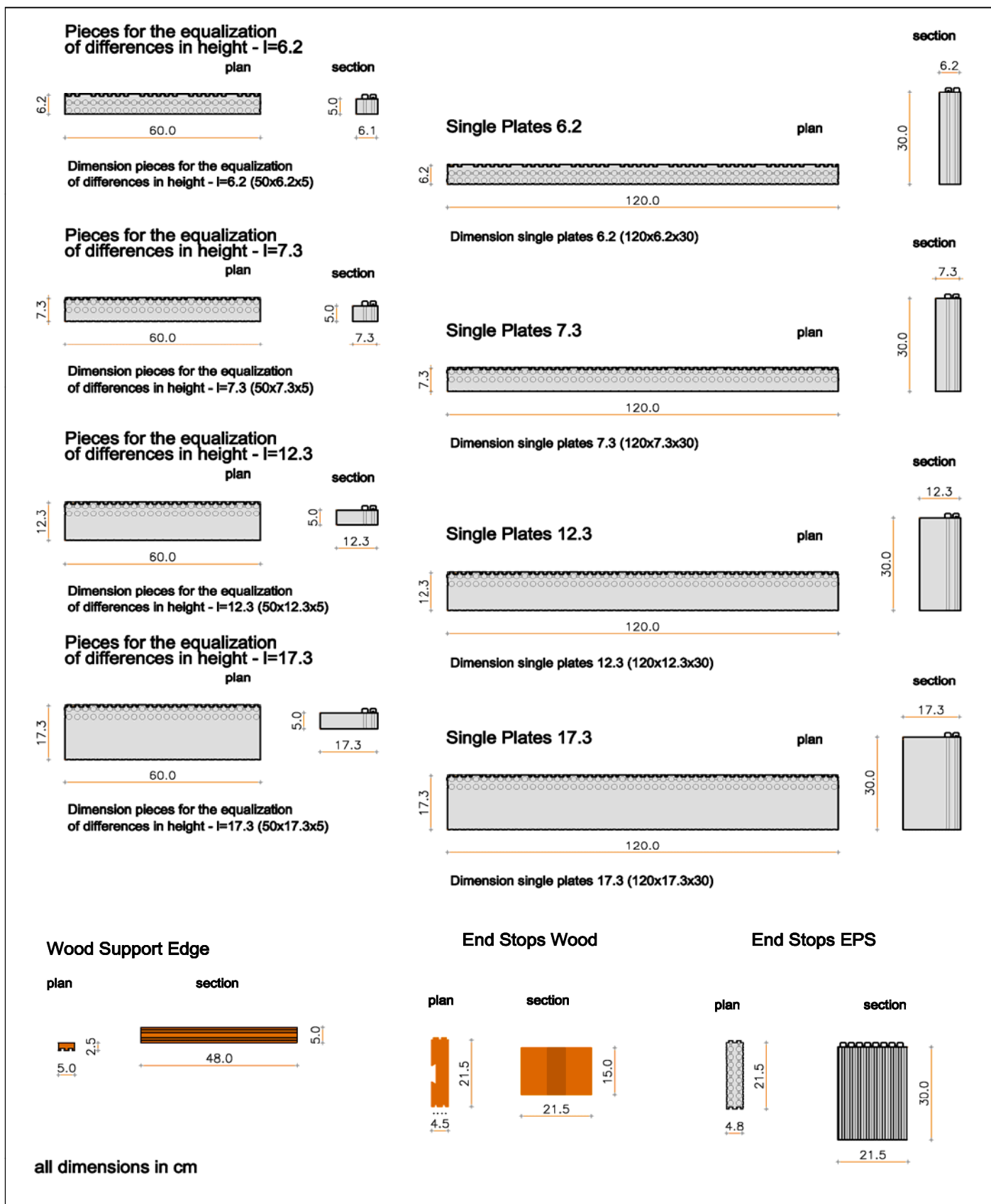
Dimension 90° opposite angular shuttering element 45/21.5 (50-80)x45x30

all dimensions in cm

ARGISOL

Special shuttering elements – 21,5 cm
90° opposite angular elements

Annex 3.6

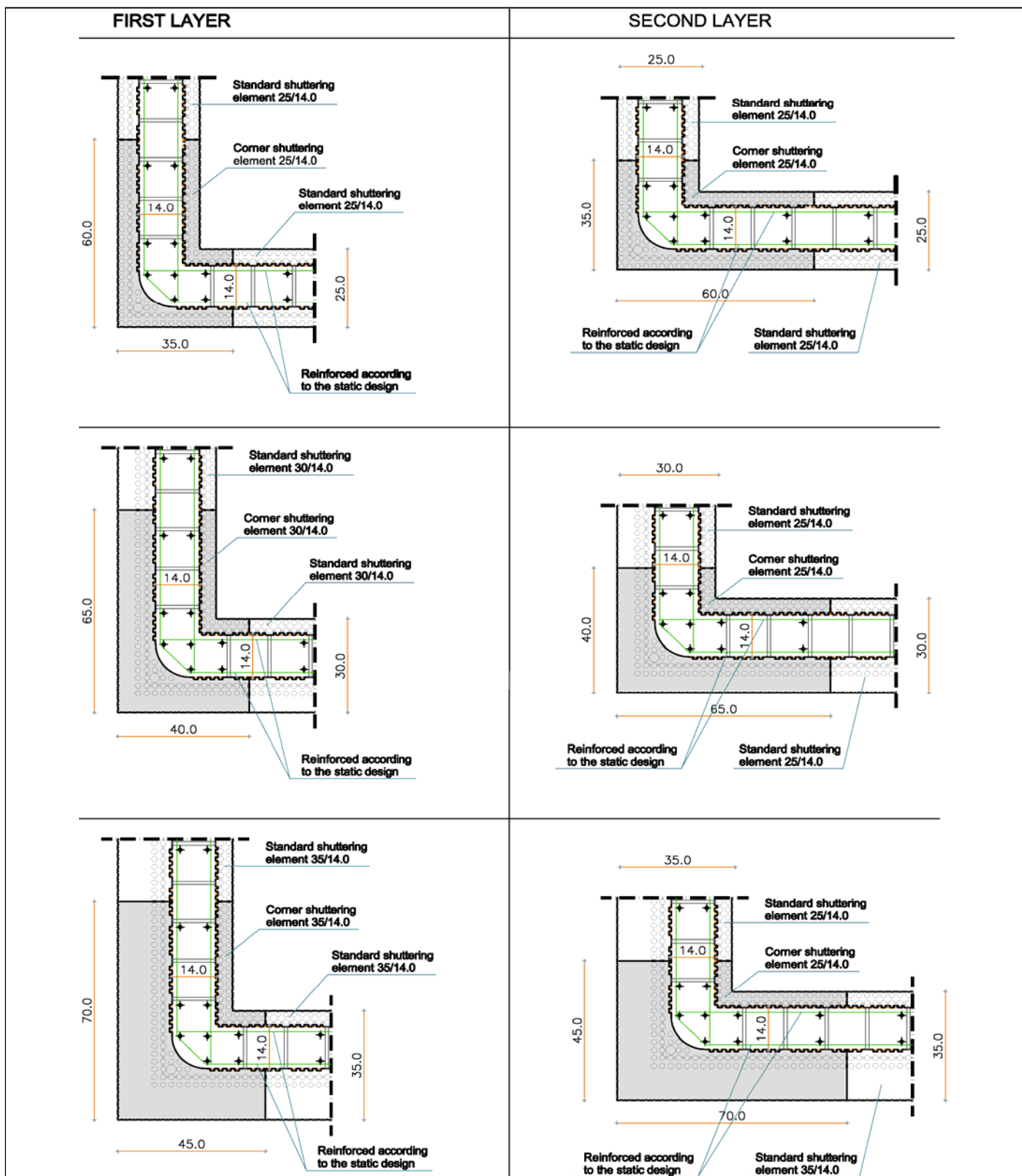


Electronic copy of the ETA by DIBt: ETA-07/0105

ARGISOL

Accessory parts – 21,5 cm
Pieces for the equalization of differences in height / Single leaves
Wood support edges / End stops (wood or EPS)

Annex 3.7

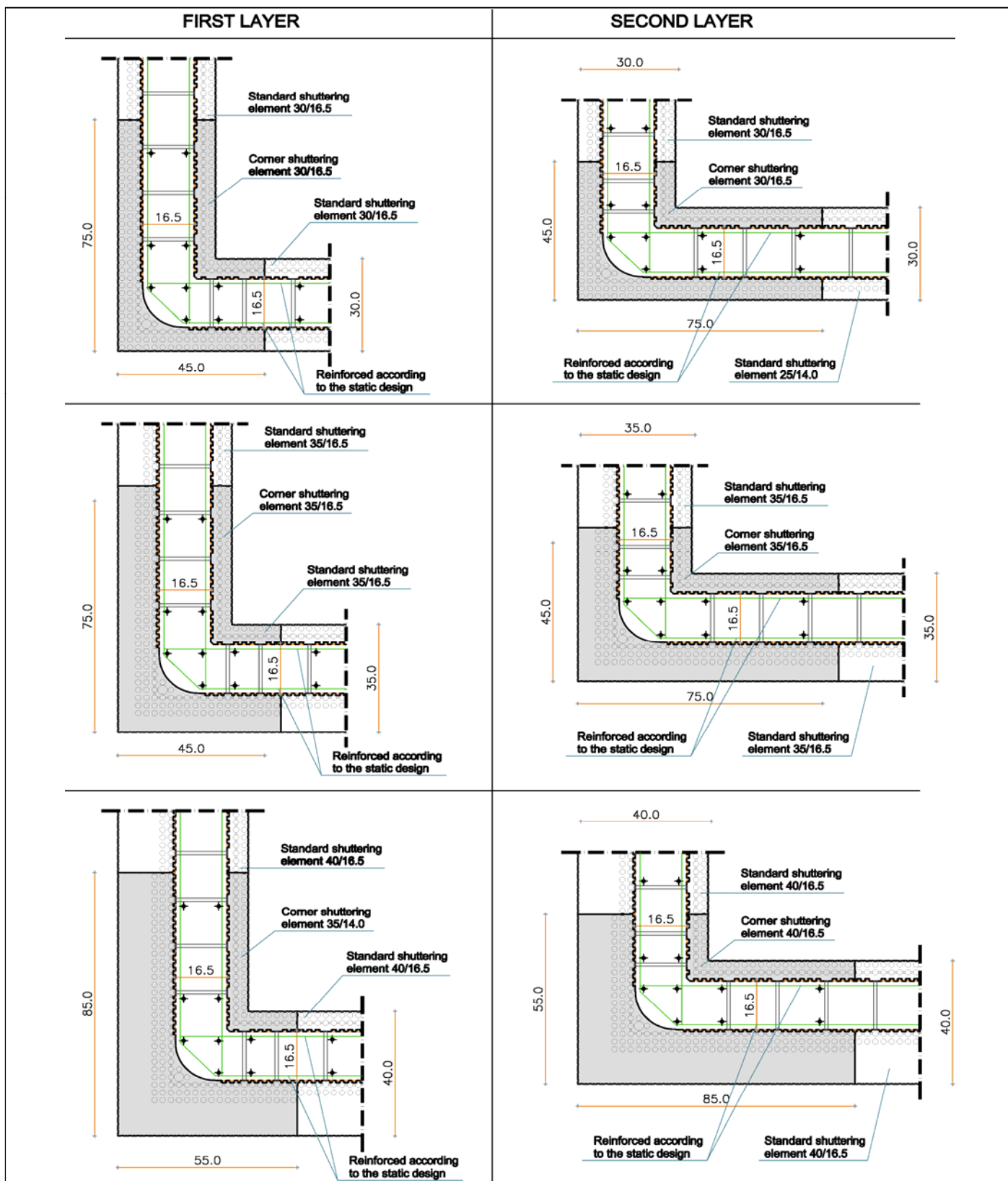


all dimensions in cm

ARGISOL

Bond of different layers – Rectangular wall corners
Concrete core of 14 cm and a thickness of the wall of 25 cm – 30 cm – 35 cm

Annex 4.1

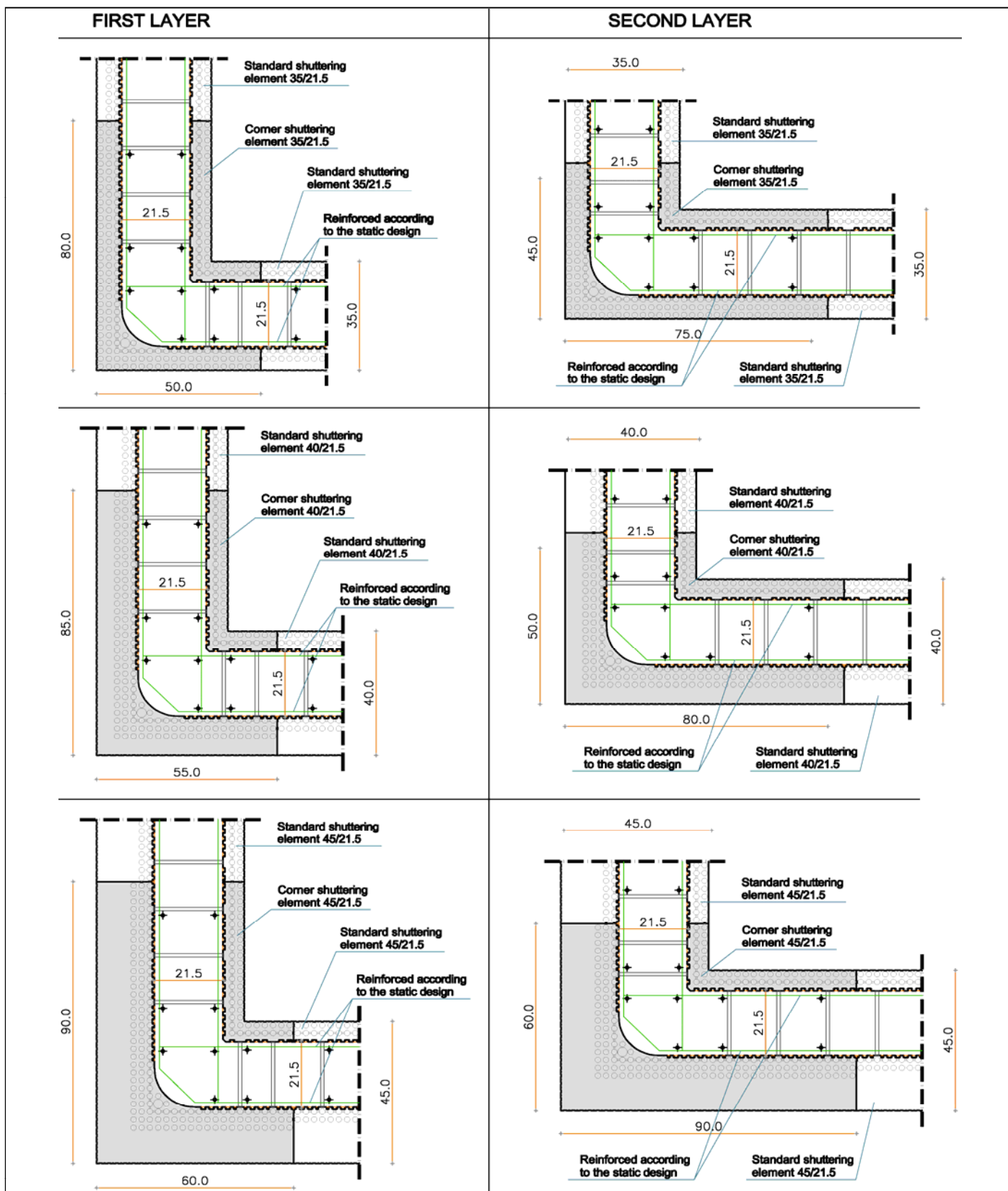


all dimensions in cm

ARGISOL

Bond of different layers – Rectangular wall corners
Concrete core of 16,5 cm and a thickness of the wall of 30 cm – 35 cm – 40 cm

Annex 4.2



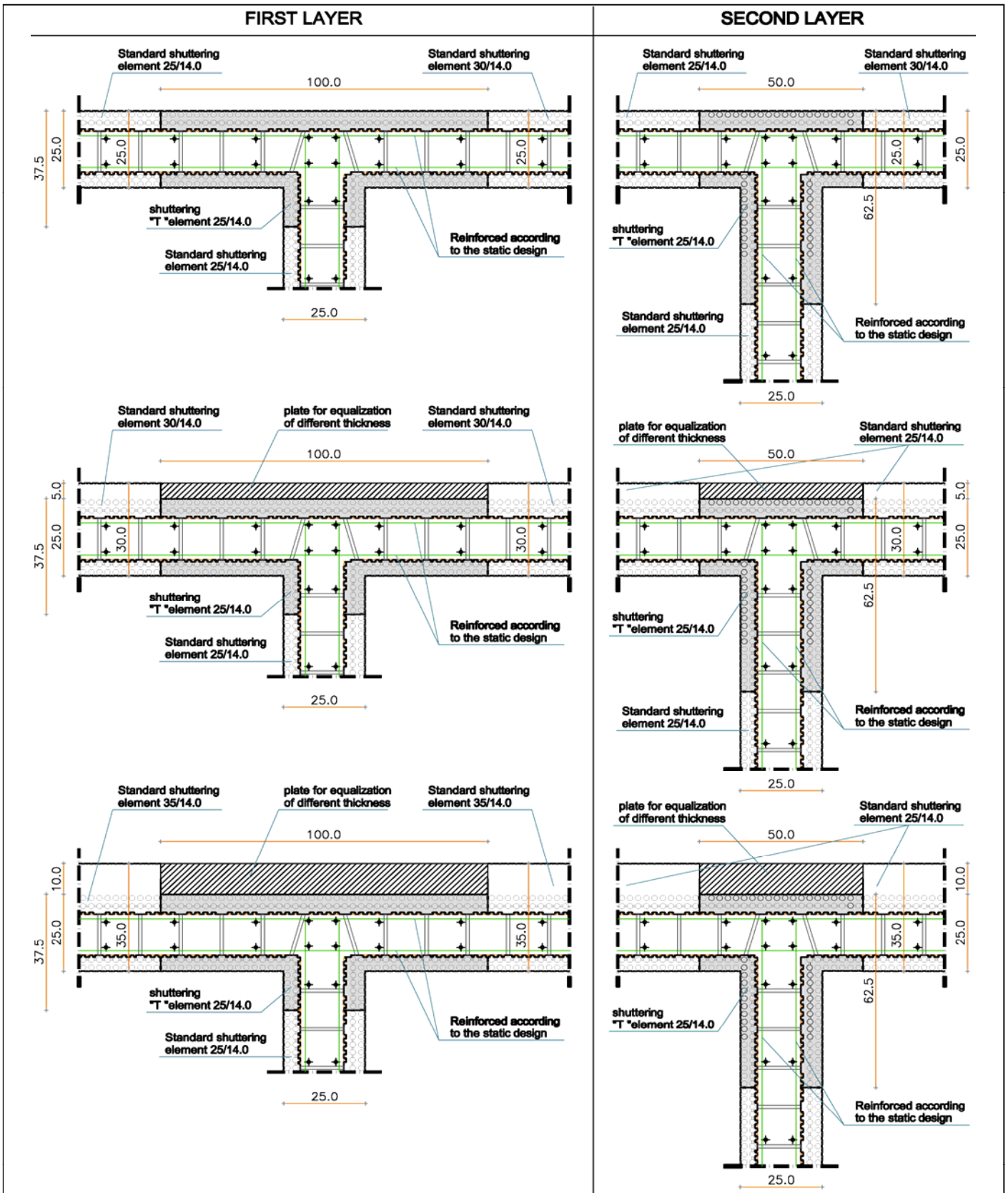
all dimensions in cm

ARGISOL

Bond of different layers – Rectangular wall corners
Concrete core of 21,5 cm and a thickness of the wall of 35 cm – 40 cm – 45 cm

Annex 4.3

English translation prepared by DIBt

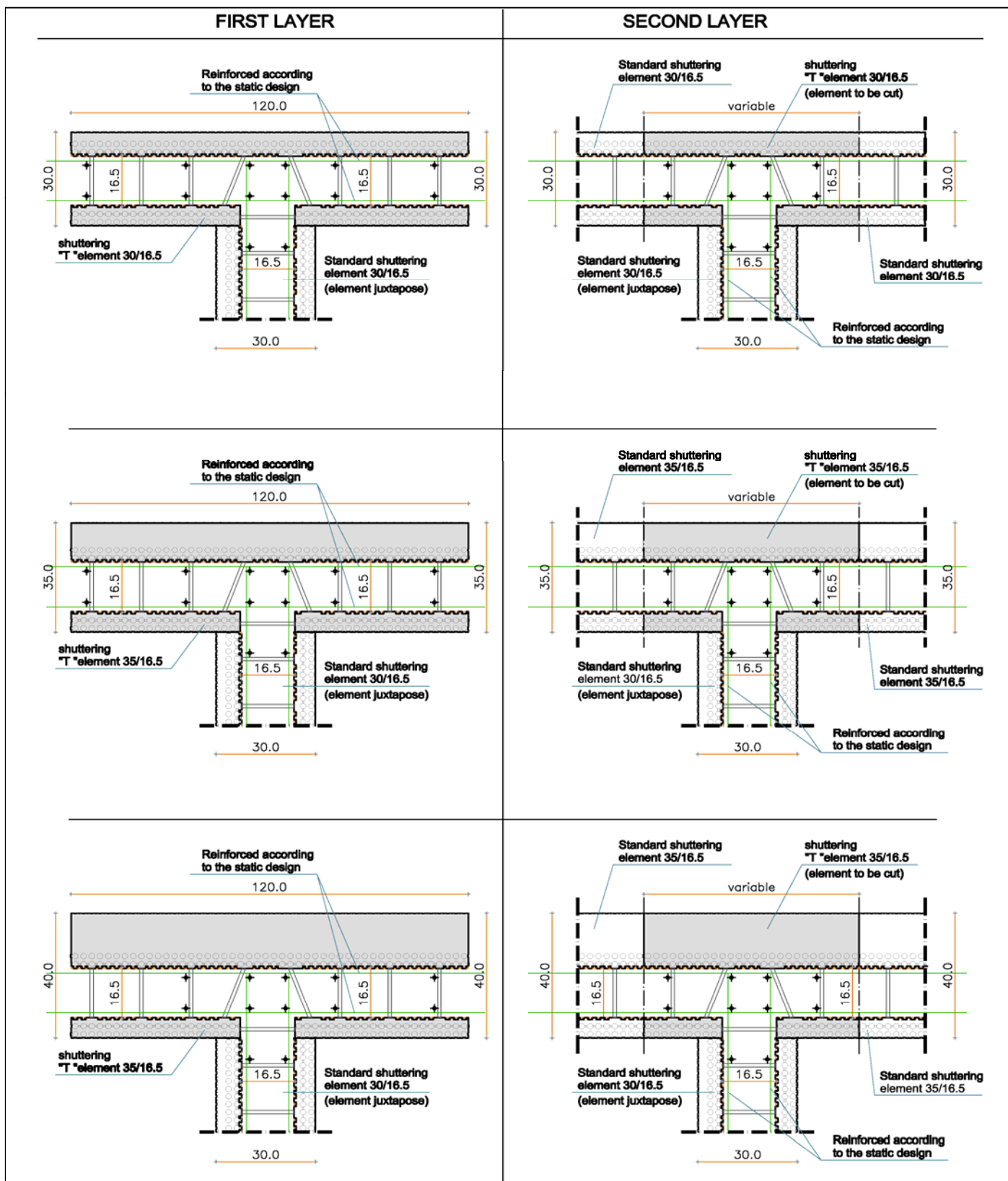


all dimensions in cm

ARGISOL

Bond of different layers – Wall junctions
Concrete core of 14 cm and a thickness of the wall of 25 cm – 30 cm – 35 cm

Annex 5.1



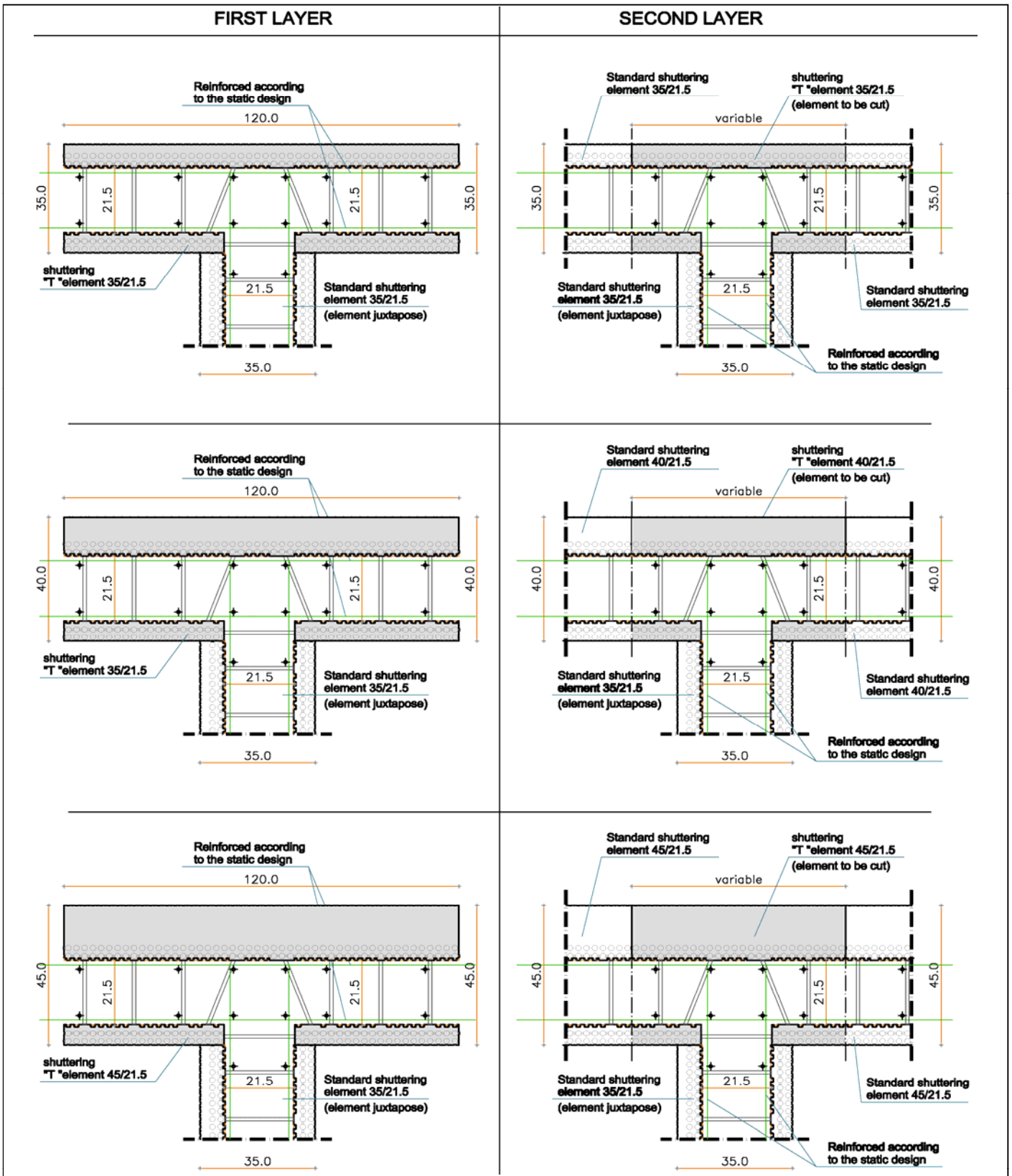
all dimensions in cm

ARGISOL

Bond of different layers – Wall junctions
Concrete core of 16,5 cm and a thickness of the wall of 30 cm – 35 cm – 40 cm

Annex 5.2

English translation prepared by DIBt



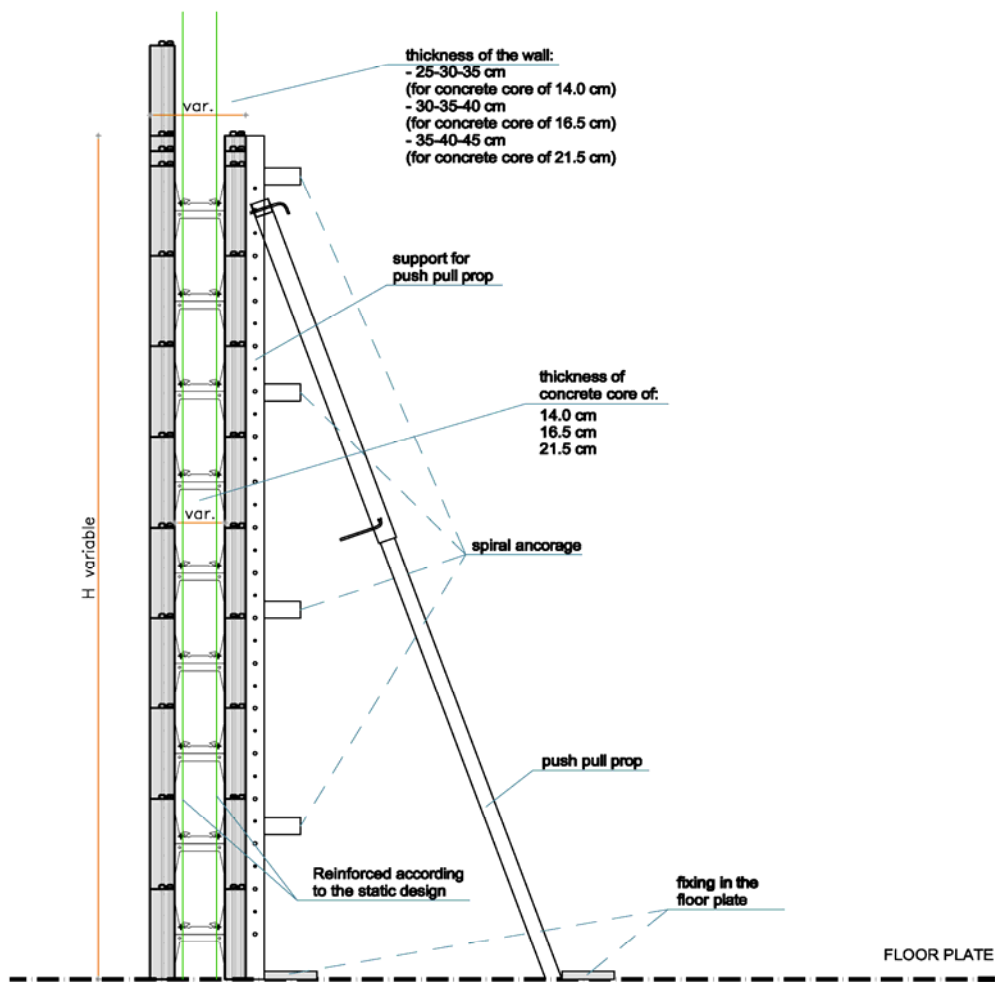
all dimensions in cm

ARGISOL

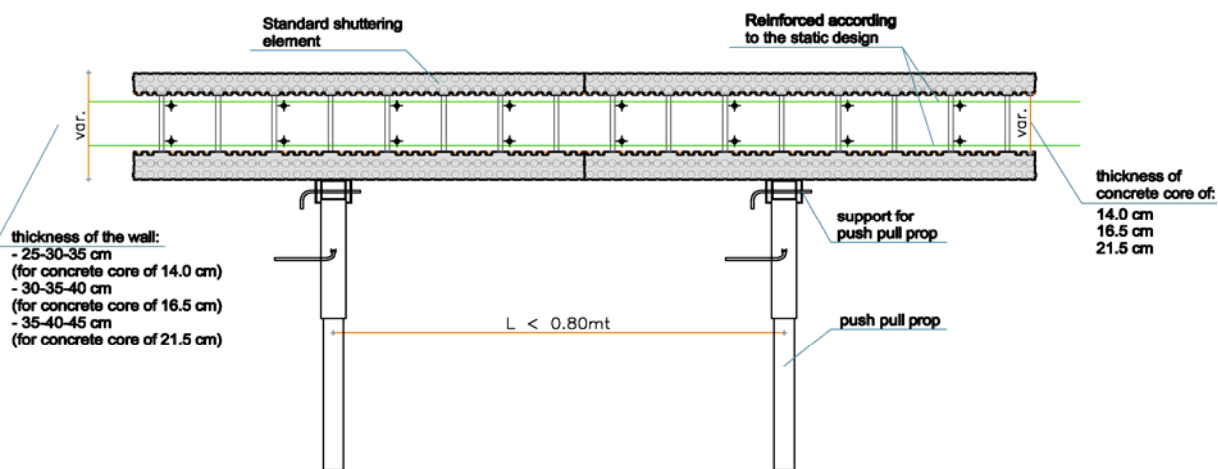
Bond of different layers – Wall junctions
Concrete core of 21,5 cm and a thickness of the wall of 35 cm – 40 cm – 45 cm

Annex 5.3

VERTICAL SECTION



PLAN



ARGISOL

Scaffolding when placing concrete

Annex 6

Values of wall elements for combinations of ARGISOL shuttering elements													
Type of the wall	Thickness of the wall	Thickness of EPS shuttering leaves		Thickness of concrete core	Nominal value of thermal resistance of shuttering element				concrete core $R_{D,concrete}$ * [(m ² xK)/W]	shuttering leaves $R_{D,eps}$ * [(m ² xK)/W]	Volume of concrete core [m ³ /m ²]	Weight of ARGISOL parts per m ² [kN/m ²]	Weight of concrete at 24 kN/m ³ per m ² [kN/m ²]
		inner [mm]	outer [mm]		$R_{D,element}$ * [(m ² xK)/W]	reduction factor (clause 2.2.7.1) [-]	including factor $R_{D,element,Factor}$ * [(m ² xK)/W]						
Wall/Concrete	[mm]	[mm]	[mm]	[kN/m ²]	[m ² xK/W]	[-]	[m ² xK/W]	[m ² xK/W]	[m ² xK/W]	[m ³ /m ²]	per m ²	per m ²	[kN/m ²]
25/14.0	250	48	62	140	3,604	0,800	2,884	3,548	0,056	0,140	0,052	3,36	
30/14.0	300	48	112	140	5,217	0,800	4,174	5,161	0,056	0,140	0,062	3,36	
35/14.0	350	48	162	140	6,830	0,900	6,147	6,774	0,056	0,140	0,072	3,36	
30/16.5	300	62	73	165	4,421	0,800	3,537	4,355	0,066	0,165	0,063	3,96	
35/16.5	350	62	123	165	6,034	0,800	4,827	5,968	0,066	0,165	0,074	3,96	
40/16.5	400	62	173	165	7,647	0,900	6,882	7,581	0,066	0,165	0,086	3,96	
35/21.5	300	62	73	165	4,421	0,800	3,537	4,355	0,066	0,215	0,063	5,16	
40/21.5	350	62	123	165	6,034	0,800	4,827	5,968	0,066	0,215	0,074	5,16	
45/21.5	400	62	173	165	7,647	0,900	6,882	7,581	0,066	0,215	0,086	5,16	
* The nominal value of thermal resistance of the shuttering elements, the shuttering leaves and the concrete core is calculated in accordance with clause 2.2.7.1 with following factors:													
Nominal value of thermal conductivity λ [W/mxK]													
					Type		Shuttering elements		Concrete core				
					λ [W/mxK]		0,031		2,5				

ARGISOL

Thicknesses of walls and concrete core
Nominal values of thermal resistance R_D
Geometry, volumes and weights

Annex 7

standards and guidelines	issue	title
EN 206-1	2000	Concrete - Part 1: Specification, performance, production and conformity
EN 1992-1-1	2004 + AC:2010	Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings
EN 13163	2008	Thermal insulation products for buildings - Factory made products of expanded polystyrene (EPS) - Specification
EN 13501-1	2007 + A1:2009	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN 13501-2	2007 + A1:2009	Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN ISO 6946	2007	Building components and building elements - Thermal resistance and thermal transmittance - Calculation method
EN ISO 10456	2007 + AC:2009	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values
EN ISO 13788	2001	Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods
ETAG 004	2011	Guideline for European technical approval of "External thermal insulation composite systems with rendering"
ETAG 009	2002-06	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"
ARGISOL		Annex 8
List of standards and guidelines		