itecons

Rua Pedro Hispano, s/n
3030-289 Coimbra

Tel: (+351) 239 79 89 49
itecons@itecons.uc.pt
www.itecons.uc.pt

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European Technical Assessment

ETA 18/0984
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General Part

Technical Assessment Body issuing the ETA: Itecons - Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade	
Trade name of the construction product	ITS (Insulated Timber System)
Product family to which the construction product belongs	Product area code: 34 Prefabricated Buildings and Building Systems
Manufacturer	RUSTICASA-CONSTRUÇÕES, LDA.
Manufacturing plant(s)	Zona Industrial de Campos – Polo 1 – 4920-909 Vila Nova de Cerveira
This European Technical Assessment contains	33 pages including 20 pages of Annex A1 which forms integral part of this ETA
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	Guideline for European Technical approval (ETAG) No. 007 Timber building kits, edition November 2012, used as European Assessment Document (EAD)

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Specific parts

1. Technical description of the product

ITS (Insulated Timber System) composed by components "ISOLAM W180", "ISOLAM W90", "ISOLAM R230" and "CRIPTOLAM F210" is a predesigned timber frame building kit prepared in the factory for each individual building, and delivered as a package to be assembled on site. The kit includes the main building parts such as external and internal walls, floors and roof panels. Further components and materials are presented in Annex A1. The essential construction details, including their joints, are described in Annex A2. The number of storeys of the kit is one or two (ground floor + 1st floor).

The external walls are load-bearing and formed by ISOLAM W180 (8 x 3 m^2), a log panel composed essentially by 40 mm cryptomeria + 100 mm ICB insulation + 40 mm cryptomeria.

The internal walls are formed by ISOLAM W90 (8 x 3 m^2), a wall log panel composed essentially by 20 mm cryptomeria + 50 mm ICB insulation + 20 mm cryptomeria.

The connection between panels is made by self-locking hardware. The panel finish is in varnish at the inner side and in stain at the outer side.

This type of wood construction is known by Log-house.

The roof is composed by ISOLAM R230 (8 x 1,25 m^2). This panel is comprised by 145 mm of insulation (wood fibre (WF), rock wool (MW) or cork insulation (ICB)), finished in the inner side with 40 mm of cryptomeria. The panels outside may be comprised by a moisture-resistant chipboard with 18 mm or OSB board with 18 mm, coated with a sub-tile waterproof membrane. The edges are comprised by 160 x 25 mm^2 of cryptomeria. The panel joints are covered by an appropriate adhesive tape. A ventilation grille, already embedded in the lower end of each panel, crosses all roof perimeter.

When the building has a 1^{st} floor, the slab is formed by CRIPTOLAM F210 (0.5 x 8.0 m^2). These panels are built in cryptomeria glued laminated solid wood with 210 mm of thickness assembled side-by-side with nailed joint covers in the upper-face. The maximum free-span of these panels is 6,0 m and are directly supported on walls.

The kit is intended to be assembled on a rigid ground slab, for example a concrete slab.

Other accessories complete the “ITS” kit, such as:

- Columns on the exterior building corners. They are screwed to the walls and, beyond an aesthetic function, they support the cantilever beams by anchoring for hold the roof panels who compose the eaves in the gable wall;
- Anchorages to assemble the facade panels and interior wall partitions into the concrete slab;
- External joint-covers;
- Exterior roof-boards;
- Roof eaves wood boards;
- Windows and doors.

The kit is manufactured in accordance with the provisions of this European Technical Assessment and as laid down in the technical documentation deposited in Itecons.

2. Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

Timber building kit "ITS" – Insulated Timber System is intended, mainly, to be used as a residential building. It can be produced as ground floor buildings or can have one additional storey. The "ITS" kit is suitable for various climatic conditions.

The external envelope was evaluated as sufficient watertight under normal climatic conditions.

Concerning the vapour permeability and moisture resistance, the timber frame building kit is intended to be used for buildings with a humidity flow (diffusion) from inside towards outside.

Vapour permeability of the timber building kit was evaluated for specific climatic conditions. The kit should be re-assessed in case of application under different climatic conditions.

The use of the kit in areas where termite attack can occur is extremely inadvisable without additional chemical treatment. These kind of treatment is not part of this assessment.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the building kit of 50 years for the load-bearing structure and non-accessible components and materials, and 25 years for repairable or replaceable components and materials like claddings, roofing materials, exteriors trims, and integrated components like windows and doors provided. The kit, during its working life, should be subject to appropriate use and maintenance.

Package, transport, storage, erection and maintenance of the kits are laid down in the manufacturer's technical documentation.

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

The assessment of the fitness for use of this kit according to the basic requirements for construction works were carried out in compliance with ETAG 007 - Timber Frame Buildings Kits (Edition November 2012) used as EAD. The latest release of all referenced standards should always be taken into consideration.

Table 1: Performance of the product

BWR[1]	Essential characteristics	Method of assessment	Performance
BWR 1	Resistance of walls, floor and roof structures and their connections against vertical and horizontal loads	Method 1 and 2 according to ETAG 007	Clause 3.1
	Resistance against seismic actions	No performance determined	
BWR 2	Reaction to fire of materials and components	No performance determined	
	Resistance to fire	No performance determined	
	External fire performance of roof covering	No performance determined	
BWR 3	Vapour permeability and moisture resistance	Design values given in EN ISO 10456:2007 or European technical specifications (harmonized product standards, ETA's)	Clause 3.3.1

[1] BWR – Basic requirements for construction works.

BWR[1]	Essential characteristics	Method of assessment	Performance
	Water tightness: • External envelope • Internal surfaces	External envelope: EN 1027:2016 Internal: No performance determined	Clause 3.3.2
	Content and/or release of dangerous substances	EC directive 67/548/EC Dangerous substances Directive and Regulation (EC No 1272/2008)	Clause 3.3.3
	Formaldehyde content of the wood-based products	EN 14374, EN 13986 and EN 717-1	Clause 3.3.3
BWR 4	Slipperiness of floors	No performance determined	
	Impact resistance	No performance determined	
BWR 5	Airborne sound insulation of walls, floors and roof structures	Weighted sound reduction index R_w according to ISO 10140-1:2016, ISO 10140-2:2010, EN ISO 10140-4:2010 and ISO 717-1:2013	Clause 3.5.1
	Impact sound insulation of floors	Weighted normalised impact sound pressure level $L_{n,w}$ according to ISO 140-3:2010 AMD 1/2015, EN ISO 10140-4:2010 and ISO 717-2:2013	Clause 3.5.2
	Sound absorption	No performance determined	
BWR 6	Thermal resistance	Thermal resistance R_T according to ISO 6946:2007 and EN 10211:2007	Clause 3.6.1
	Air permeability	EN 1026:2016	Clause 3.6.2
	Thermal inertia	General assessment EN ISO 10456:2007.	Clause 3.6.3
BWR 7	Sustainable use of natural resources	No performance determined	

3.1 Mechanical resistance and stability (BWR 1)

The components of the kit are listed in Annex A1 and described regarding to their composition and structure.

3.1.1 Walls

The vertical resistance for the "ISOLAM W180" wall panel was determined by experimental procedures. The results are shown in the Table 2 and 3.

Table 2: "ISOLAM W180" characteristic compressive strength perpendicular to the grains

Data	Quality Class (NP 4544:2015)	
	CYS II	CYS I
Characteristic compressive strength perpendicular to the grains $f_{c,90,k}$ (MPa)	1.80	2.20
Design compressive strength perpendicular to the grains $f_{c,90,d}$ (MPa)	1.25	1.52
Minimum test value $f_{c,90}$ (MPa)	1.60	

Table 3: "ISOLAM W180" maximum admissible load for the vertical resistance

Data	Quality Class (NP 4544:2015)	
	CYS II	CYS I
Characteristic compressive strength perpendicular to the grains $f_{c,90,k}$ (MPa)	1.80	2.20
Design compressive strength to the grains $f_{c,90,d}$ (MPa)	1.25	1.52
Maximum admissible load (kN/m)	99.65	121.85

The results for the ridge beam support by ISOLAM W180 and ISOLAM W90 are presented in Table 4.

Table 4: W180 and W90 walls maximum admissible load for the ridge beam

Data	Quality class (NP 4544:2015)	
	CYS II	CYS I
Characteristic compressive strength perpendicular to the grains $f_{c,90,k}$ (MPa)	1.80	2.20
Design compressive strength to the grains $f_{c,90,d}$ (MPa)	1.25	1.52
Minimum test value $f_{c,90}$ (MPa)	1.60	
Maximum admissible load on W180 walls (kN)	15.95	19.50
Maximum admissible load on W90 walls (kN)	7.98	9.75

3.1.2 Suspended Floors and Roof Structures

The maximum admissible loads and deformation of the panels "CRIPTOLAM F210" and "ISOLAM R230" were determined by numerical simulation based on experimental data.

The results for "CRIPTOLAM F210" are shown in the Table 5 and 6.

Table 5: CRIPTOLAM F210 maximum admissible load for a final maximum deformation of L/300 [mm]

Span [m]	4.0	4.5	5.0	5.5	6.0
Maximum load values [kN/m^2] beyond: panel self-weight + Q = 2.0 kN/m^2	6.50	4.00	2.40	1.30	0.55
Instantaneous deformation | S.L.S. – P_{sd} = G+Q					
Deformation [mm]	7.90	9.14	10.53	12.33	13.98
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67
Final deformation | S.L.S. P_{sd} = 1.8G+1.24Q					
Deformation [mm]	13.25	14.91	16.62	18.24	19.99
Maximum deformation (L/300) [mm]	13.33	15.00	16.67	18.33	20.00

Table 6: CRIPTOLAM F210 maximum admissible load for a final maximum deformation of L/200 [mm]

Span [m]	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**
Maximum load values [kN/m²] beyond: panel self-weight + Q = 2.0 kN/m²	10.00	6.40	4.00	2.35	1.20
Instantaneous deformation | S.L.S. – P_{sd} = G+Q					
Deformation [mm]	11.09	12.48	13.86	15.24	16.64
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67
Final deformation | S.L.S. P_{sd} = 1.8G+1.24Q					
Deformation [mm]	13.25	14.91	16.62	18.24	19.99
Maximum deformation (L/200) [mm]	20.00	22.50	25.00	27.50	30.00

The results for "ISOLAM R230" are shown in the Table 7, 8, 9, 10 and 11.

Table 7: ISOLAM R230 Maximum admissible load for a final maximum deformation of L/300 [mm]

Span [m]	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
Maximum load values [kN/m²] beyond: panel self-weight + Q = 0.4 kN/m² + Q_{snow} = 1.1 kN/m²	6.50	5.50	3.75	2.50	1.60	0.95
Instantaneous deformation | S.L.S. – P_{sd} = G+Q						
Deformation [mm]	6.65	8.87	10.38	11.85	13.45	15.27
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67	18.06
Final deformation | S.L.S. P_{sd} = 1.8G+1.24Q						
Deformation [mm]	11.12	14.62	16.63	18.33	19.95	21.63
Maximum deformation (L/300) [mm]	13.33	15.00	16.67	18.33	20.00	21.67

Table 8: ISOLAM R230 Maximum load for a final maximum deformation of L/200 [mm]

Span [m]	**4.0**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
Maximum load values [kN/m²] beyond: panel self-weight + Q = 0.4 kN/m² + Q_{snow} = 1.1 kN/m²	7.00*	6.50*	5.50*	3.75	2.45	1.50
Instantaneous deformation | S.L.S. – P_{sd} = G+Q						
Deformation [mm]	7.02	10.05	13.51	15.16	16.59	17.95
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67	18.06
Final deformation | S.L.S. P_{sd} = 1.8G+0.94Q+1.16Q_{snow}						
Deformation [mm]	11.79	16.75	22.28	24.28	25.62	26.46
Maximum deformation (L/200) [mm]	20.00	22.50	25.00	27.50	30.00	32.50

*Limitation imposed by Ultimate Limit State

Table 9: ISOLAM R230 Maximum load – SLS-Deformation

Span [m]		4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
Maximum load values [kN/m^2] beyond: panel self-weight + Q = 0.4 kN/m^2 + Q_{snow} = 1.1 kN/m^2	L/300	6.50	5.50	3.75	2.50	1.60	0.95	0.50	0.10
	L/200	7.00*	6.50*	5.50*	3.75	2.45	1.50	0.80	0.25

*Limitation imposed by Ultimate Limit State

Table 10: Maximum load for ISOLAM R230 panels, with 1m cantilever beam, for a final maximum deformation of L/300 [mm]

Span [m]	4.0	4.5	5.0	5.5	6.0
Maximum load values [kN/m^2] beyond: panel self-weight + Q = 0.4 kN/m^2 + Q_{snow} = 1.1 kN/m^2	6.50	4.35	3.05	1.45	0.75
Instantaneous deformation | S.L.S. – Psd = G+Q – Maximum deformation in the cantilever beam (L/200=1000/200=5mm)					
Deformation [mm]	5.96	6.95	7.36	8.27	9.43
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67
Final deformation | S.L.S. – Psd = 1.8G+0.94Q+1.16Q_{snow} – Maximum deformation in the cantilever beam (L/150=1000/150=6.66mm)					
Deformation [mm]	10.07	10.70	11.54	12.33	13.30
Maximum deformation (L/300) [mm]	13.33	15.00	16.67	18.33	20.00

Table 11: Maximum load for ISOLAM R230, with 1.5m cantilever beam, for a final maximum deformation of L/300 [mm]

Span [m]	4.0	4.5	5.0	5.5	6.0
Maximum load [kN/m^2] beyond: panel self-weight + Q = 0.4 kN/m^2 + Q_{snow} = 1.1 kN/m^2	7.00	6.00	4.35	2.40	1.25
Instantaneous deformation | S.L.S. – P_{sd} = G+Q – Maximum deformation in the cantilever beam (L/200=1500/200=7.5mm)					
Deformation [mm]	5.87	8.87	8.92	9.39	10.22
Maximum deformation (L/360) [mm]	11.11	12.50	13.89	15.28	16.67
Final deformation | S.L.S. – P_{sd} = 1.8G+0.94Q+1.16Q_{snow} – Maximum deformation in the cantilever beam (L/150=1500/150=10mm)					
Deformation [mm]	10.05	14.07	14.57	14.62	15.06
Maximum deformation (L/300) [mm]	13.33	15.00	16.67	18.33	20.00

Resistance against seismic actions

If the kit is intended to be used in areas where seismic actions are predictable, the response of the structure should be study case-by-case, taking into account national regulations, if needed.

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire of materials or components

No performance determined.

3.2.2 Resistance to fire

No performance determined.

3.2.3 External fire performance of the roof covering

No performance determined.

3.3 Hygiene, health and environment (BWR 3)

3.3.1 Vapour permeability and moisture resistance

The values of vapour permeability are listed in Table A1.2. These values were obtained from EN ISO 10456:2007, material data sheet or European Technical Specifications.

3.3.2 Watertightness

3.3.2.1 External envelope

The watertightness of the facade was assessed according to EN 1027:2016. The test specimen was composed by ISOLAM W180 with dimensions of 1000 x 1180 mm^2.

The facade maintained the watertightness until a pressure of 1050 Pa.

3.3.2.2 Internal surfaces

Internal surfaces in wet areas are not part of the kit.

3.3.3 Content and/or release of dangerous substances

The kit complies with the provisions of the European Council Directive 67/548/EEC-Dangerous Substances Directive.

A declaration of conformity in this respect was made by the manufacturer.

For the products with formaldehyde, in particular, laminated veneer lumber, moisture-resistant multifunctional construction board and oriented strand board (OSB) panels, their emission classes are E1 in accordance with EN 14374, EN 13986 and EN 717-1, respectively.

3.4 Safety in use (BWR 4)

3.4.1 Slipperiness of floor finishes

No performance determined.

3.4.2 Impact resistance

No performance determined.

3.5 Protection against noise (BWR 5)

The acoustical performance of the components was carried out in accordance with EN ISO 10140-1:2016, EN ISO 10140-2:2016, 3 and EN ISO 10140-4:2010 and EN ISO 717-1:2013 and EN ISO 717-2:2013.

3.5.1 Airborne sound insulation of walls, floors and roof structures

The two wall solutions of the kit (ISOLAM W180 and ISOLAM W90) were tested. The specimens nominal dimensions were 3140 x 3140 mm^2 and mechanical connections according to the already described kit. The specimens perimeter was sealed with mineral wool and was also used a wood exterior frame (rim) for reinforcing the peripheral seal, in both cases. The test area, had the standardized value of 10 m^2 (3160 x 3160 mm^2).

The floor solution, CRIPTOLAM F210, was tested with an area of 3540 x 3540 mm^2. The specimen perimeter was supported on a test rim with 200 mm width and sealed with mineral wool. The test area had an approximate area of 10 m^2 (3160 x 3160 mm^2).

The weighted apparent sound reduction index of the components is shown in the Table 12.

Table 12: Weighted apparent sound reduction index

Component	Acoustical performance
ISOLAM W90	R_w = 26 dB
ISOLAM W180	R_w = 33 dB
CRIPTOLAM F210 with expanded clay aggregate (75mm) and wooden floor	R_w = 51 dB

3.5.2 Impact sound insulation

The floor solution of the kit, CRIPTOLAM F210, was tested. The specimen tested for the impact sound insulation was the same used in the determination of airborne sound insulation. The impact sound insulation for the CRIPTOLAM F210 panels is shown in the Table 13.

Table 13: Impact sound insulation for the CRIPTOLAM F210 panels

Component	Acoustical performance
CRIPTOLAM F210 with expanded clay aggregate (75mm) and wooden floor	Weighted apparent sound reduction index $L_{n,w}$ = 65 dB

3.5.3 Sound absorption

No performance determined.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal resistance

The thermal resistance, R_T, of the components was determined according to EN ISO 6946:2007 and EN ISO 10211:2007. The results are shown in Annex A1.

3.6.2 Air permeability

The air permeability of the facade was assessed for ISOLAM W180, according to EN 1026:2016. The test specimen was an exterior wall with dimensions of 1000 x 1180 mm^2.

The test results are shown in the table 14.

Table 14: Air permeability test results

Pressure P (Pa)	Air permeability as a function of total area VA ($m^3/h.m^2$)
50	0,12
100	0,30
150	0,43
200	0,50
250	0,61
300	0,62
450	0,83
600	0,89

3.6.3 Thermal inertia

Specific heat capacities and material densities are listed in Annex A1. These values were obtained from EN ISO 10456:2007, material data sheet and experimental determination (calorimetric test).

3.6.4 Durability, serviceability and identification

3.6.4.1 Durability

Cryptomeria natural durability is class 5 according with EN 350:2016.

The adequacy of the hazard classes/use classes according to EN 335:2013 (parts 1 to 3) for wood and wood-based products used in the kit is presented in the table 15.

Table 15: Hazard class/use class according to EN 335:2013 (parts 1 to 3)

Type of component	Hazard classes/Use classes
External components	2, 3
Internal components	1

The adequacy of the service classes according to EN 1995-1-1 for the fasteners used in the kit is given in Annex A1.

3.6.4.2 Serviceability

The resistant capacity of the CRIPTOLAM F210 panels, for the service limit state, was calculated using EC5 method. The results are shown in the table 16.

Table 16: Maximum admissible loads for CRIPTOLAM F210 panels beyond panel self-weight + Q = 200 kg/m^2 (P_{sd} = 1.8G+1.24Q)

	Limit [mm]	Span [m]				
		4.0	4.5	5.0	5.5	6.0
Maximum admissible loads [kg/m^2]	L/300	650	400	240	130	55
	L/200	1000	640	400	235	120

The resistant capacity of the ISOLAM R230 panels, for the serviceability limit state, has been calculated using EC5 method. The results are shown in the table 17.

Table 17: Maximum admissible loads for ISOLAM R230 panels beyond panel self-weight + Q = 40 kg/m^2 + Q_{snow} = 110 kg/m^2 (P_{sd} = 1.8G+0.94Q+1.16Q_{snow})

	Limit [mm]	Span [m]					
		4.0	4.5	5.0	5.5	6.0	6.5
Maximum admissible loads [kg/m^2]	L/300	650	550	375	250	160	95
	L/200	700*	650*	550*	375	245	150

*Limitation imposed by ultimate limit state

For the ISOLAM R230 panels with a free-span the results for the resistant capacity are shown in Table 18.

Table 18: Maximum admissible permanent loads for ISOLAM R230 panels with a free-span beyond panel self-weight + Q = 40 kg/m^2 + Q_{snow} = 110 kg/m^2 (P_{sd} = 1.8G+0.94Q+1.16Q_{snow})

	Free – span [m]	Limit [mm]	Span [m]				
			4.0	4.5	5.0	5.5	6.0
Maximum admissible permanent loads [kg/m^2]	1.0	L/300 for span and 1.0/150 for free-span	650	435	305	145	75
	1.5	L/300 for span and 1.5/150 for free-span	700	600	435	240	125

3.6.4.3 Floor stiffness

To reduce the floor vibrations, the final deformation for a permanent action *G* was limited to L/360.

3.6.4.3 Identification

The identification parameters and reference to product specifications for identifying the materials and components of the kit are given in the Annexes A1 and A2.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the Decision 1999/455/EC of the European Commission[2], the system of assessment and verification of constancy of performance (see Annex V to the regulation (EU) No 305/2011) is System 1.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Itecons Services.

Issued in Coimbra, Portugal on 13.08.2019

By

Technical Assessment Unit of

Itecons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade

(Andreia Gil, Technical Assessment Unit Coordinator)

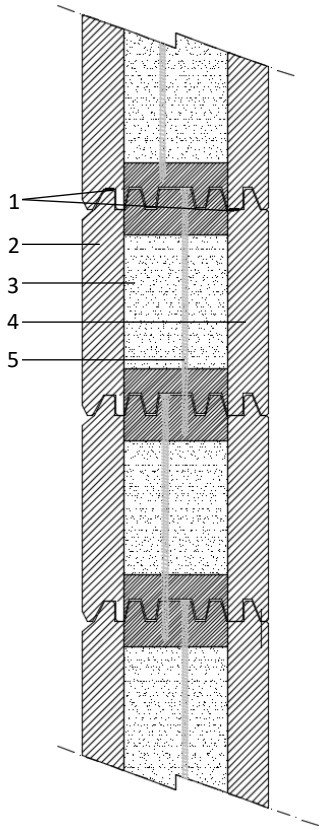
[2] Official Journal of the European Communities L 178/56-57 of 14.7.1999

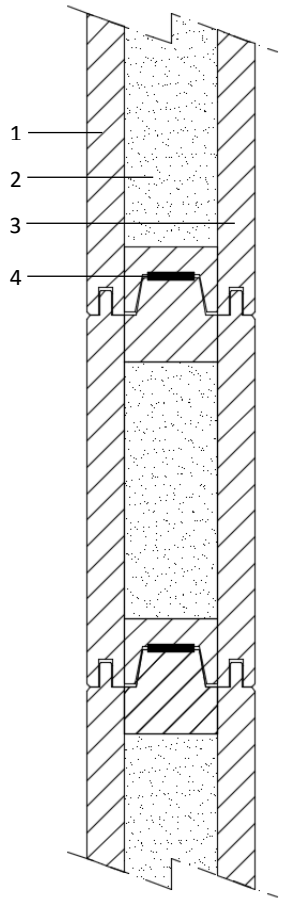
ANNEX A1

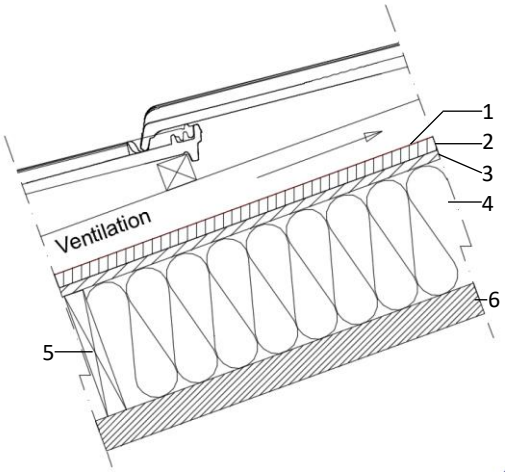
Index of building elements:

1. External wall – ISOLAM W180
2. Internal wall – ISOLAM W90
3. Roof Cross Section – ISOLAM R230
4. Floor cross section – CRIPTOLAM F210

Table A1.1: Materials/products specifications

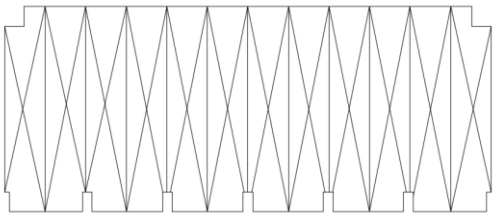
Building element 1 – External wall – ISOLAM W180	
Wall cross section:  	Element composition (from outside to inside): 1 – Self-expanding sealing tape 10x10 mm 2 – Cryptomeria 40 mm 3 – Expanded Insulated Cork Board 100 mm 4 – Cryptomeria 40 mm 5 – Screw 6x240mm cc 1.0 m Building physics characteristics: R_T = 3.03 $m^2ºC/W$ R_W = 33.00 dB M_T = 46.00 kg/m^2 $M_{si} = m_i$ = 11.48 kg/m^2

Building element 2 – Partition wall – ISOLAM W90	
Wall cross section:  	Element composition (from outside to inside): 1 – Cryptomeria 20 mm 2 – Expanded Insulated Cork Board 50 mm 3 – Cryptomeria 20 mm 4 – Self-expanding sealing tape 10x10 mm Building physics characteristics: R_W = 26.00 dB M_T = 23.00 kg/m^2 $M_{si} = m_i$ = 5.74 kg/m^2

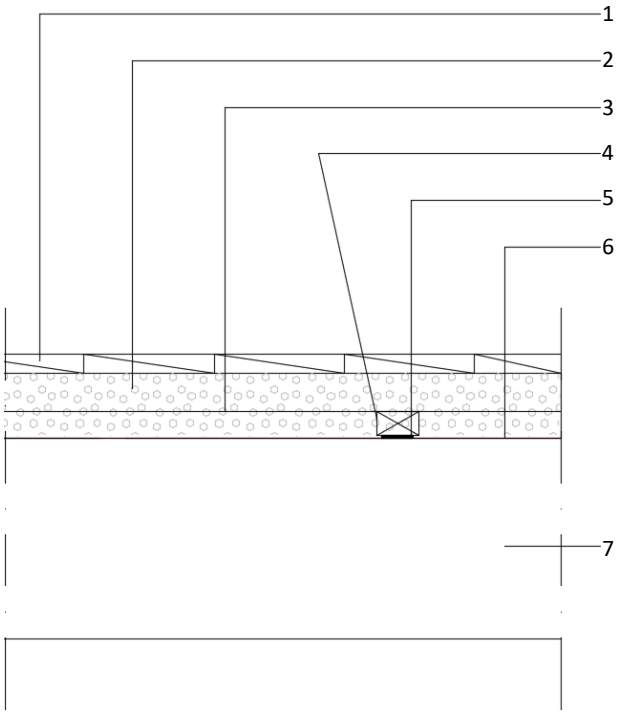
Building element 3 – Roof – ISOLAM R230	
Roof cross section:  	Element composition (from outside to inside): 1 – Roof membrane 2 – OSB 18 mm or Moisture-resistant multifunctional construction board 18 mm 3 – Cryptomeria 12 mm 4 – Wood Fibre or Mineral wool or Expanded Insulation Cork Board 145 mm 5 – Cryptomeria 25x160 mm^2 6 – Cryptomeria 40 mm Building physics characteristics: $R_{T\ ISOLAM\ R230\ composed\ by\ OSB\ and\ MW}$ = 4.54 $m^2ºC/W$ $R_{T\ ISOLAM\ R230\ composed\ by\ OSB\ and\ WF}$ = 4.43 $m^2ºC/W$ $R_{T\ ISOLAM\ R230\ composed\ by\ OSB\ and\ ICB}$ = 4.28 $m^2ºC/W$ $R_{T\ ISOLAM\ R230\ composed\ by\ moisture\text{-}resistant\ multifunctional\ construction\ board\ and\ MW}$ = 4.52 $m^2ºC/W$ $R_{T\ ISOLAM\ R230\ composed\ by\ moisture\text{-}resistant\ multifunctional\ construction\ board\ and\ WF}$ = 4.41 $m^2ºC/W$ $R_{T\ ISOLAM\ R230\ composed\ by\ moisture\text{-}resistant\ multifunctional\ construction\ board\ and\ ICB}$ = 4.25 $m^2ºC/W$ M_T = 46.00 kg/m^2 $M_{si} = m_i$ = 11.48 kg/m^2

Building element
4 – Floor – CRIPTOLAM F210

Floor transversal cross section (without coating layers):



Floor longitudinal cross section (with coating layers)



Element composition:

Floor transversal cross section (without coating layers):

Cryptomeria glued laminated solid wood with 210x500 mm^2 and 8000 mm of length

Floor longitudinal cross section (with coating layers):

1 – Wooden floor 20 mm
2 – Expanded clay granulate
3 – Wooden beam 45x45 cc 0.40 m
4 – Wooden ribbon 25x45 cc 0.70 m
5 – Resilient soundproofing profile
6 – Polyethylene sheet
7 – CRIPTOLAM F210

Building physics characteristics:

R_T = 3.29 m^2.ºC/W (ascending flow)
R_T = 3.29 m^2.ºC/W (downward flow)
R_W = 51.00 dB
$L_{n,w}$ = 65.00 dB
M_T = 100.00 kg/m^2
$M_{si} = m_i$ = 90.64 kg/m^2

Table A1.2 – Materials and products specifications

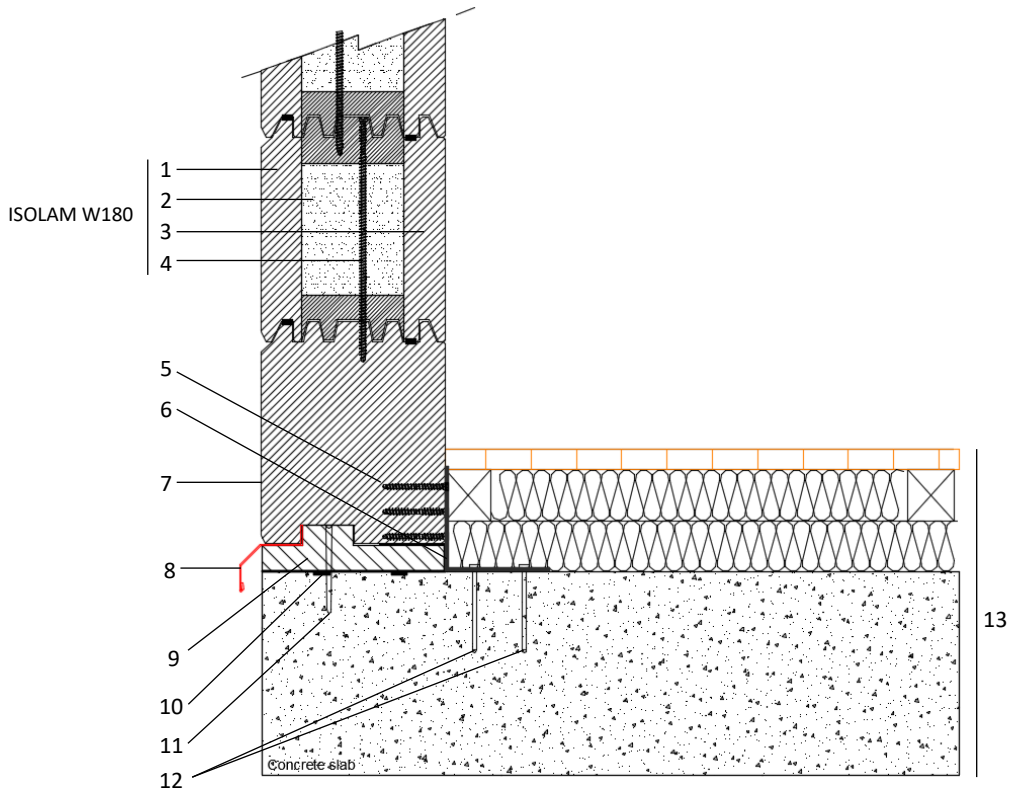
Product	Technical Specification	ρ (Kg/m³)	λ (W/mºC)	μ (-)	C (kJ/kgºC)	Reaction to fire EN 13501-1+A1
Solid timber	EN 12267:2001	287	0.0747	50	1.54	
Laminated timber	EN 14374:2004	480				D-s1,d0
Moisture-resistant multifunctional construction board	EN 13986: 2004		0.14	50		D-s2,d0
ICB Insulation	EN 13170:2012	120	0.040	20		E
Mineral wool	EN 13162:2009		0.034	1		A1
Fibre wood	EN 13171	60	0.036	1/2	2100	E
Linen insulating band, Isolina Oy	ISO 8301 DIN 52615 DIN 4108-5 EN ISO 12571 DIN 52620		0.038	1/2	1600	E
Monolithic thermoplastic polyurethane (PU) film, applied to polyester (PL) reinforcing layer	EN 13859 - 1/2:2010	210	0.2	150	1300	E
Microporous film and polypropylene (PP) protective layers	EN 13859 - 1/2:2010	210	0.2	150	1300	E
self-expanding sealing tape	ETA 07/0072		0.052	<100		B1
Resilient Soundproofing stripe	EN ISO 10848					
Expanded clay granulate	EN 13055-1 EN 14063-1	275	0.11			A1
Screws	ETA 11/0030					
Screws and plates	ETA 10/0189					
Angle Bracket	Metallic angle bracket – WBR 70, 90 and 100 (steel and zync according EN 1995:2008) rothoblaas					
Concealed Beam Hanger with and without holes	ETA 09/0361					
Varnish	IGUALAK IL-201 – OTADUY BARNICES					
Glue – Sistema MUF 1247/2526 – AkzoNobel, Wood and Finishes Adhesives	EN 301 EN 391 EN 392 DIN 68141 EN 14080					
PU Foam – Soudafoam Gun – Soudal – Produtos Químicos, Lda.	EN 1027 EN 1026 EN 12207	15/20	0.035	50/60		B3
Windows	EN 14351-1:2008	U_w = 2.0 W/m²K				
Doors	EN 14351-1:2008	U = 2.5 W/m²K				
Waterproof anti-termite barrier for foundations	EN 13967			Sd = 232 m		
Sealing wall barrier for irregular foundation	EN 13984		0.042	32		E
Oriented strand board - OSB 3	EN 13986	605	0.13			D-s2, d0
Anti-birds net for the air ventilation gap in the roof	Metallic or PVC anti-birds Flexible net of the air ventilation gap in the roof – Riwega SrL					

ANNEX A2

Index of details:

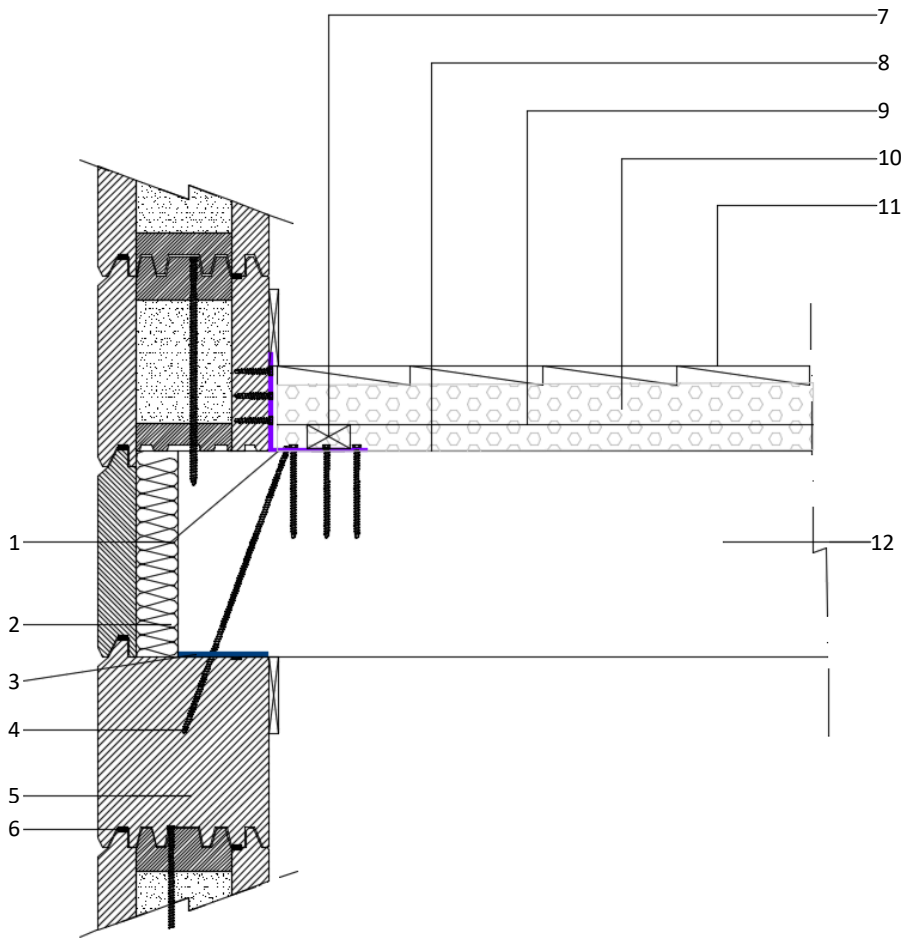
1. External wall – ground floor
2. External wall – intermediate floor
3. External wall – roof
4. Roof – ridge beam
5. Exterior wall – interior wall
6. Interior wall – interior wall
7. Exterior wall – window – transversal cross section
8. Exterior wall – window – longitudinal cross section
9. Sill
10. Exterior corner
11. Internal corner
12. External wall longitudinal joints
13. Corner ISOLAM W90

Detail 1: External wall – ground floor



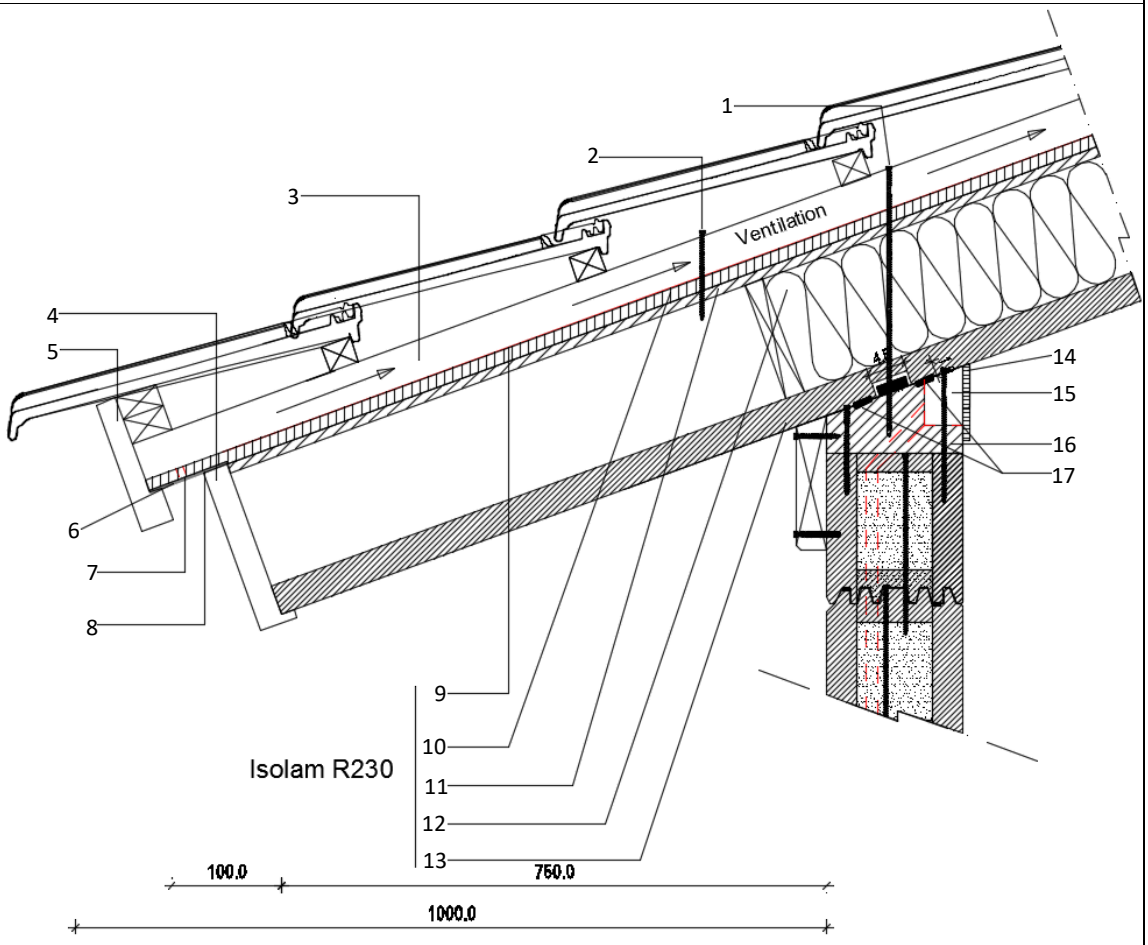
1 – Cryptomeria 40 mm
2 – Expanded Insulated Cork Board 100 mm
3 – Cryptomeria 40 mm
4 – Screw 6x240mm cc 1.0 m
5 – 3 Screws 8x80 mm
6 – Attachment bracket 100x100mm cc 1.0 m
7 – Massive base log
8 – Metallic drip edge
9 – Striker/sleeper CL4
10 – PE Membrane
11 – Anchor nail 6x80 mm cc 1.0 m
12 – 2 Mechanical Anchors 10x80 mm
13 – Ground floor layers (not included in the kit)

Detail 2: External wall – intermediate floor (CRIPTOLAM F210)



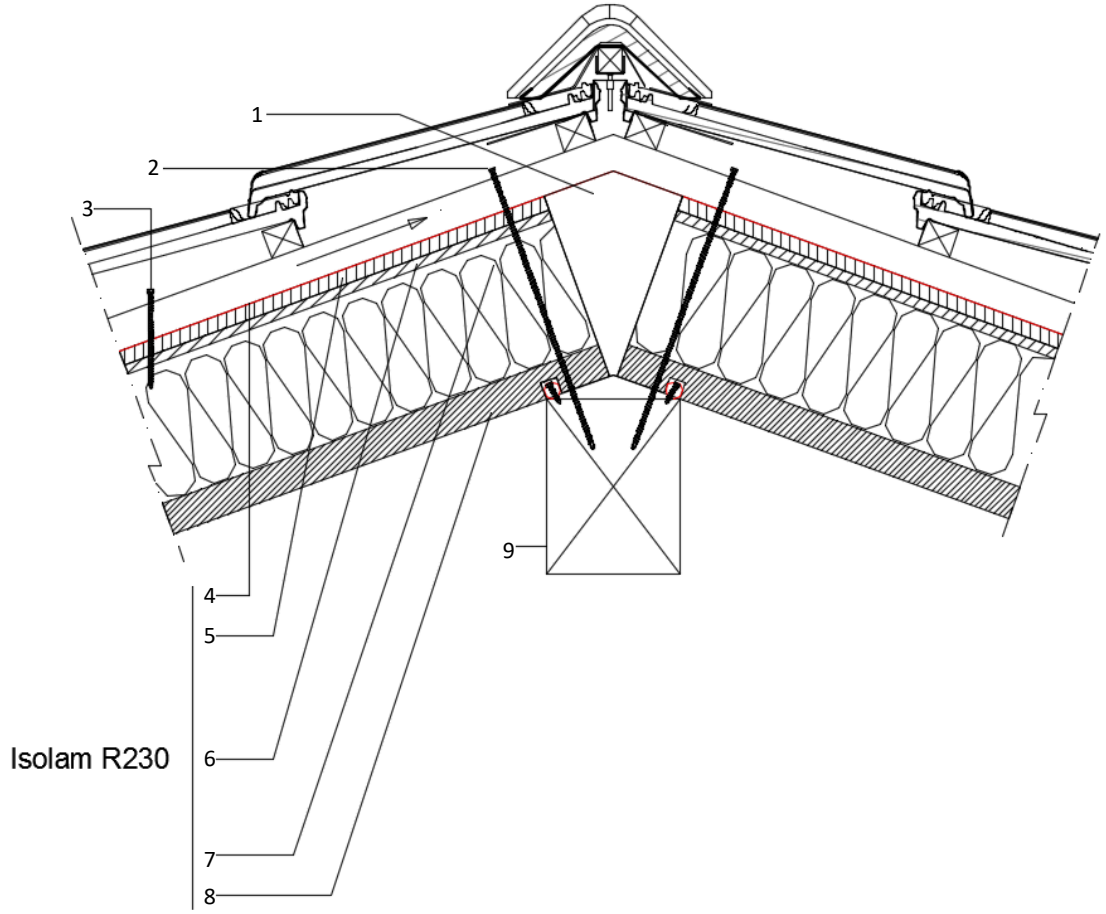
1 – Attachment bracket 100x100 mm cc 1.0m/3 screws 8x80 mm + 3 screws 8x40 mm
2 – Insulation PU foam
3 – Resilient soundproofing profile – load 7.35 kN/m
4 – Screw 10x360 mm cc 0.5 m
5 – Massive log
6 – Compriband 10x10 mm
7 – Wooden ribbon 25x45 cc 0.70 m with resilient soundproofing profile
8 – Polyethylene sheet
9 – Wooden beam 45x45 cc 0.40 m
10 – Expanded clay granulate
11 – Wooden floor 20 mm
12 – CRIPTOLAM F210

Detail 3: External wall – roof (ISOLAM R230)



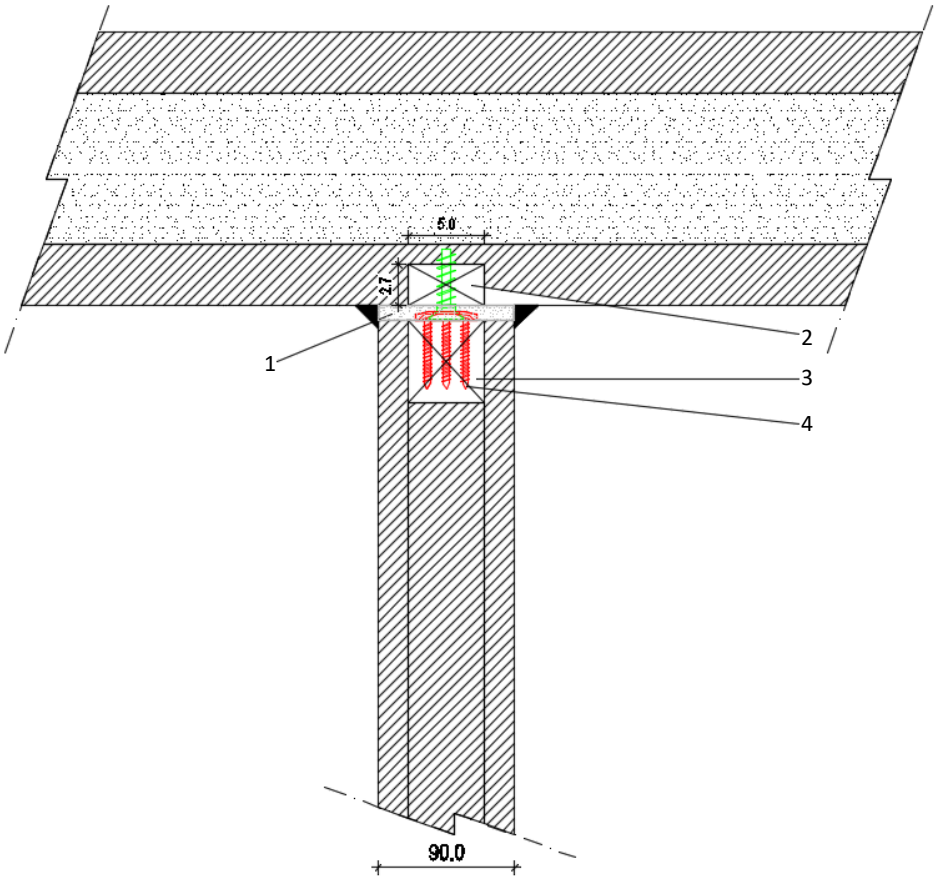
1 – Screw 10x360 cc 0.63 m
2 – Screw 6x100 cc 0.60 m
3 – Wooden beam 45x45 mm^2 cc 0.63 m
4 – Eaves wooden board 40x225 mm
5 – Eaves wooden board 40x160 mm
6 – Air open
7 – Ventilation grille
8 – Condensed water exit
9 – Roof membrane
10 – OSB 18 mm or moisture-resistant chipboard 18 mm
11 – Cryptomeria 12 mm
12 – Wood Fibre 145 mm
13 – Cryptomeria 40 mm
14 – Crown molding
15 – Recess-slot-nocth for electric pipelines
16 – Wooden Massive Striker
17 – Self-expanding sealing tape

Detail 4: Roof – Ridge Beam



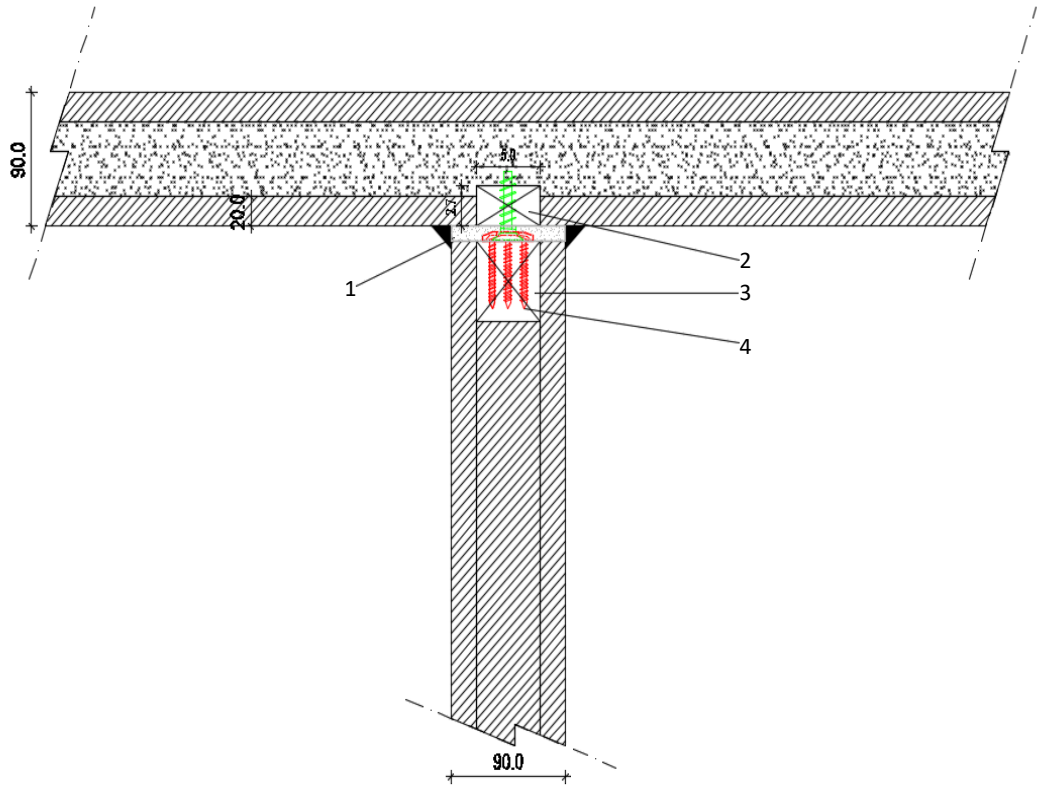
1 – Thermal insulation
2 – Screw 10x360 cc 0.63 m
3 – Screw 6x100 cc 0.60 m
4 – Roof membrane
5 – OSB 18 mm or moisture-resistant chipboard 18 mm
6 – Cryptomeria 12 mm
7 – Wood Fibre/Mineral Wool/Expanded cork agglomerate 145 mm
8 – Cryptomeria 40 mm
9 – Ridge beam

Detail 5: Exterior Wall – interior wall



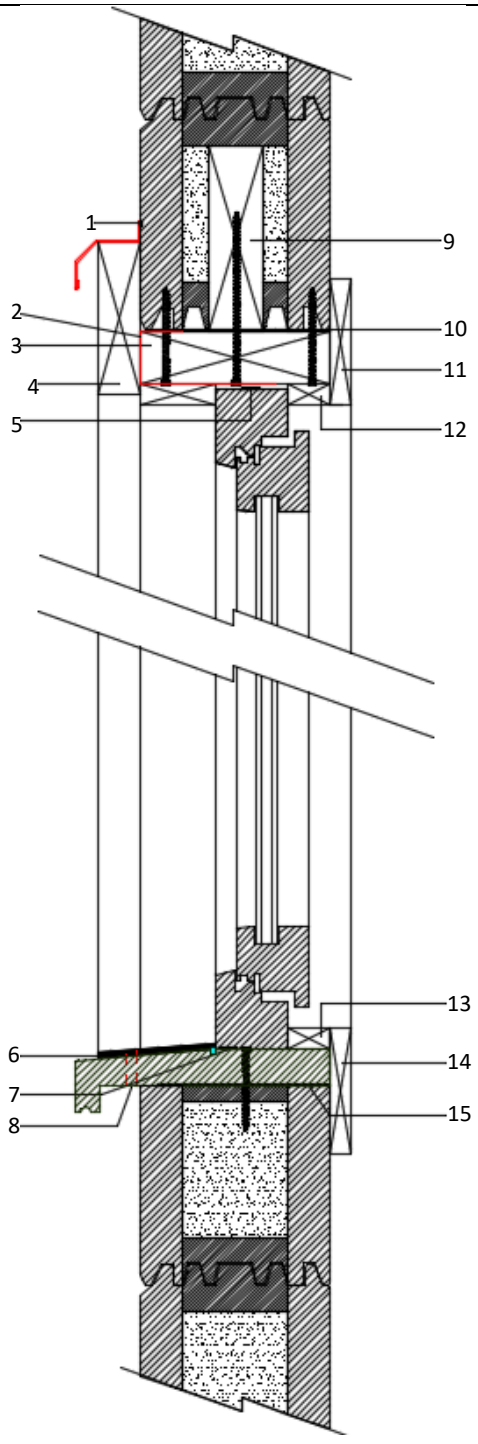
1 – PU acoustic foam
2 – LVL 50x27 mm
3 – LVL 50x50 mm
4 – Hardware

Detail 6: Interior Wall – interior wall



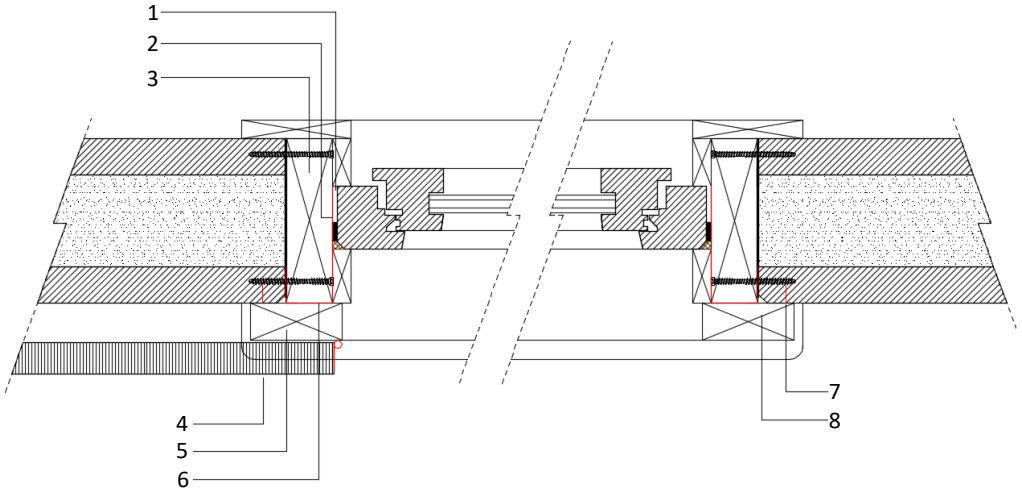
1 – PU acoustic foam
2 – LVL 50x27 mm
3 – LVL 50x50 mm
4 – Hardware

Detail 7: Exterior Wall – Window transversal



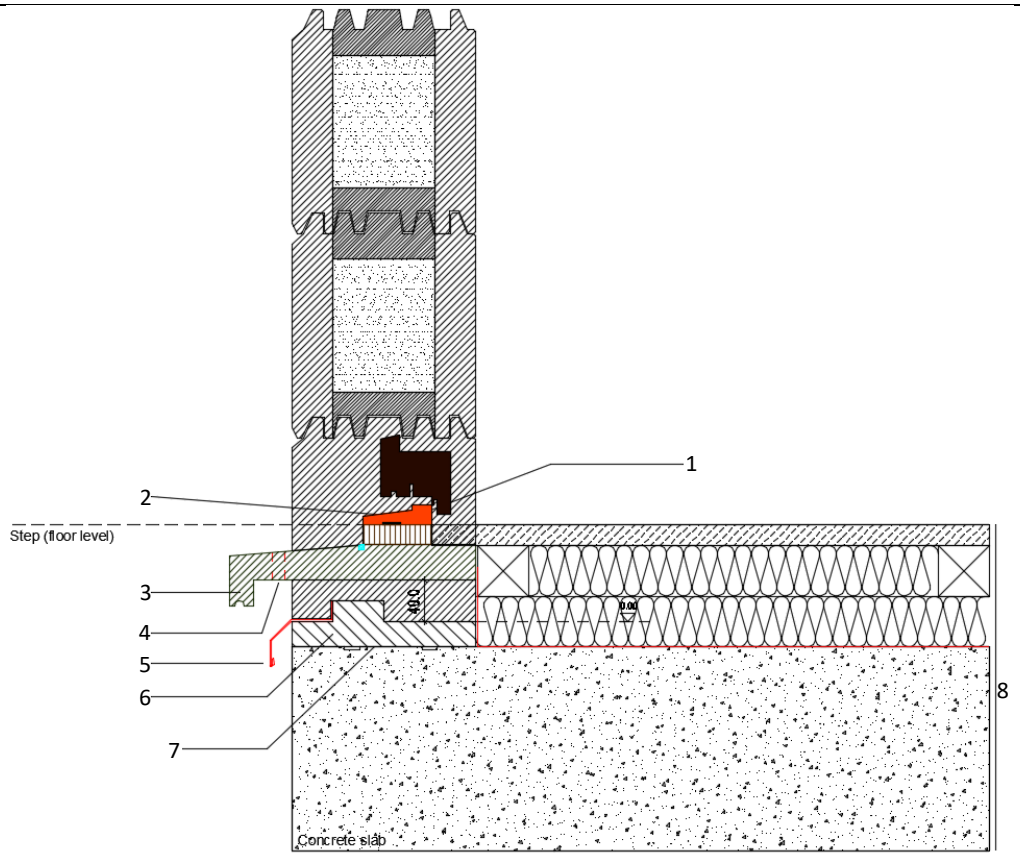
1 – Butyl Sealing gaskets 2 – Waterproof membrane 3 – Wooden lintel LVL 50 mm 4 – Trim (window frame) 40x160 mm 5 – Joint 6 – Joint 7 – Self-expanding sealing tape 8 – Drainage channel	9 – Embedded beam LVL 50 mm (for big spans) 10 – Seal joint 11 – Trim 20x100 mm 12 – Panelled 13 – Panelled 14 – Trim 20x100 mm 15 – Self-expanding sealing tape

Detail 8: Exterior Wall – Window – Longitudinal



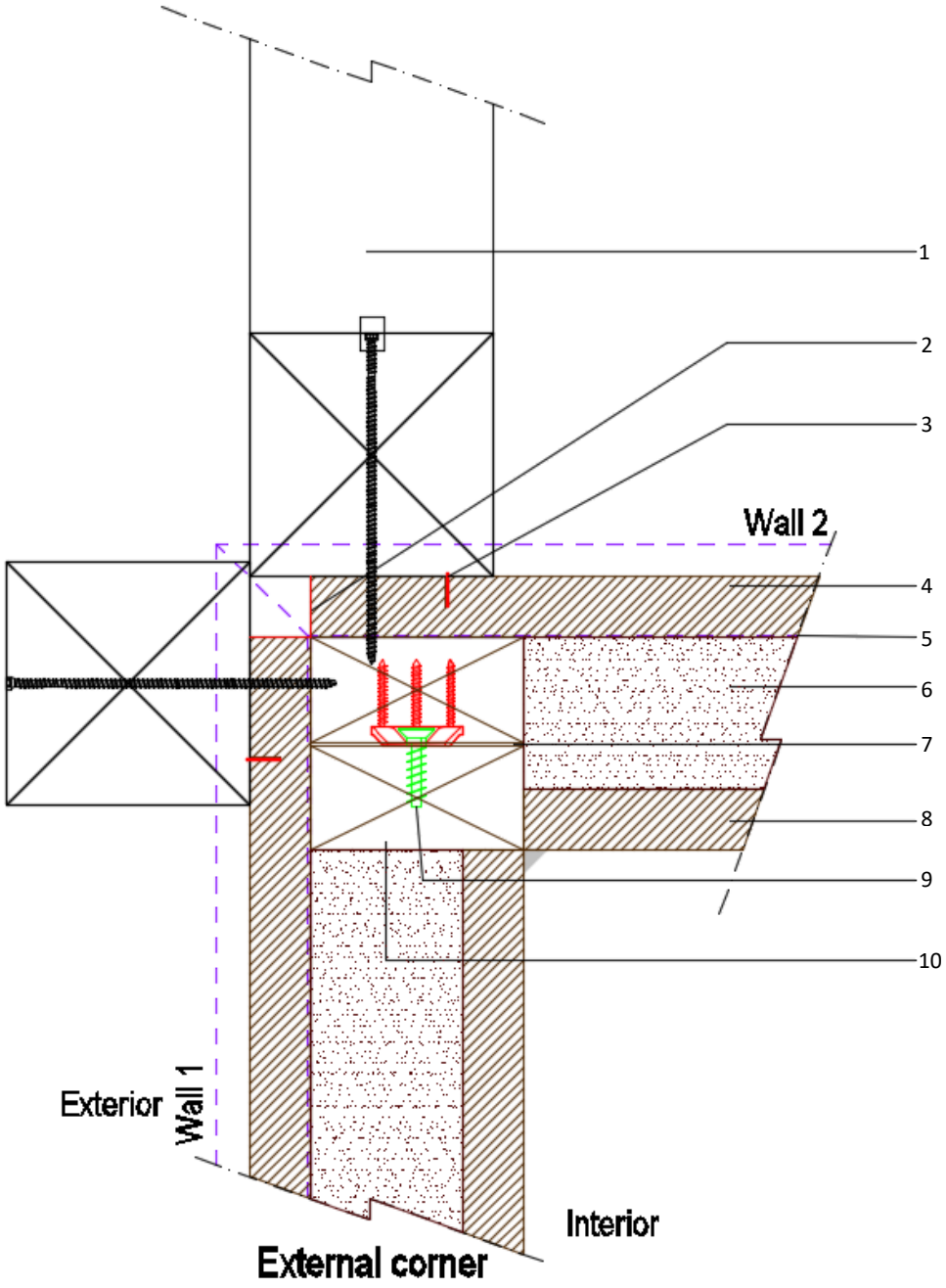
1 – Looseness 5 mm
2 – Joint
3 – Column LVL 50 mm
4 – Window Blinds
5 – Window pillar 40x100 mm
6 – Waterproof membrane
7 – Water barrier
8 – Drainage channel

Detail 9: Sill



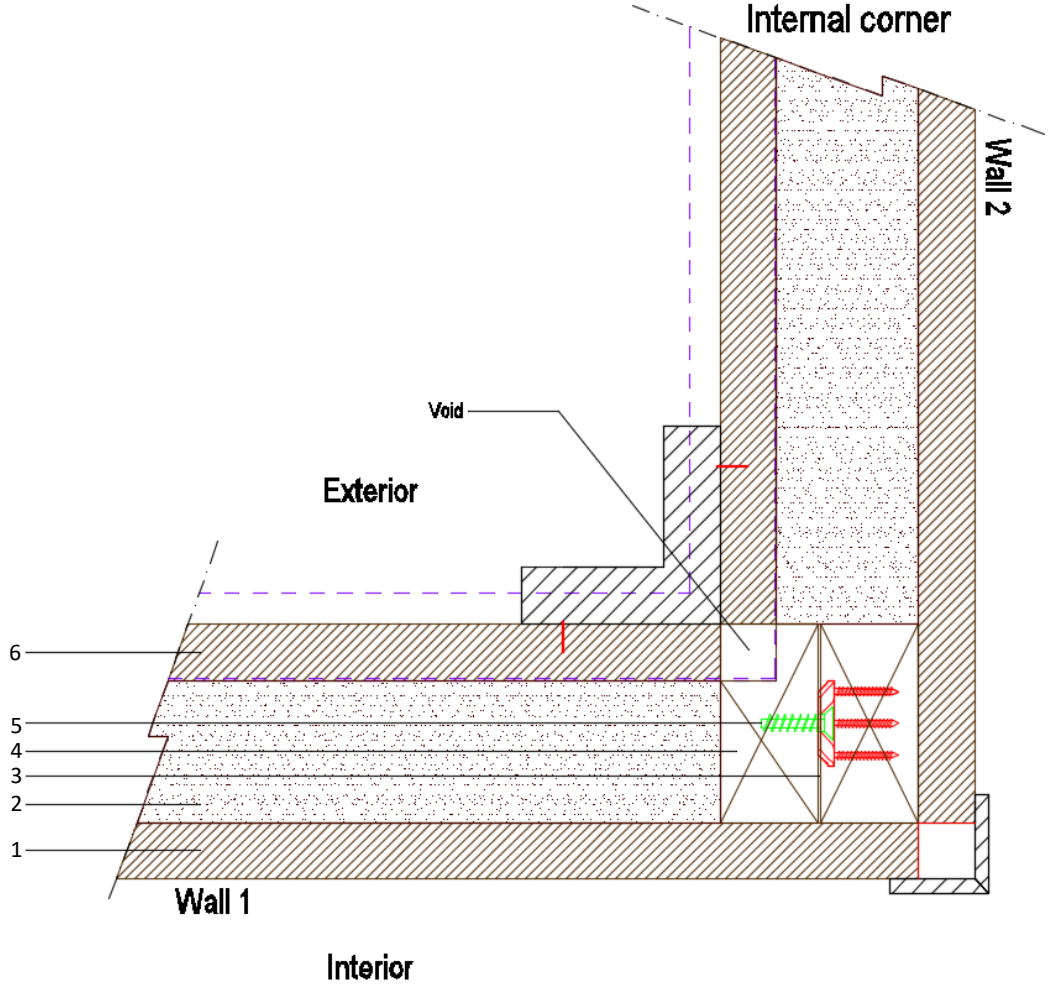
1 – Self-expanding sealing tape
2 – Window sill from persons with reduce mobility
3 – Wooden window sill
4 – Drainage channel
5 – Metallic drip edge
6 – Striker CL4
7 – Capillarity barrier termifilm
8 – Groud floor layers (not included in the kit)

Detail 10: Exterior corner



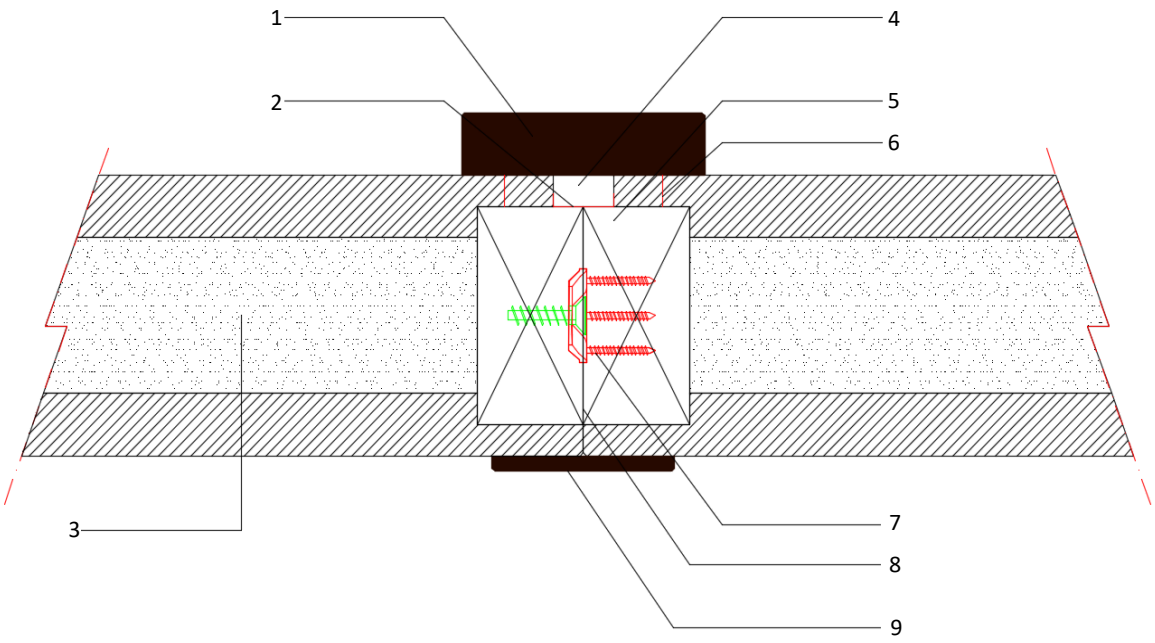
1 – Eaves support beam
2 – Adhesive Insulation tape
3 – Water barrier (aluminium profile)
4 – Cryptomeria 40 mm
5 – Metallic drip edge profile
6 – ICB 100 mm
7 – Linen insulating band
8 – Cryptomeria 40 mm
9 – Hardware Walco 60
10 – Column 140 mmx69 mm

Detail 11: Internal corner



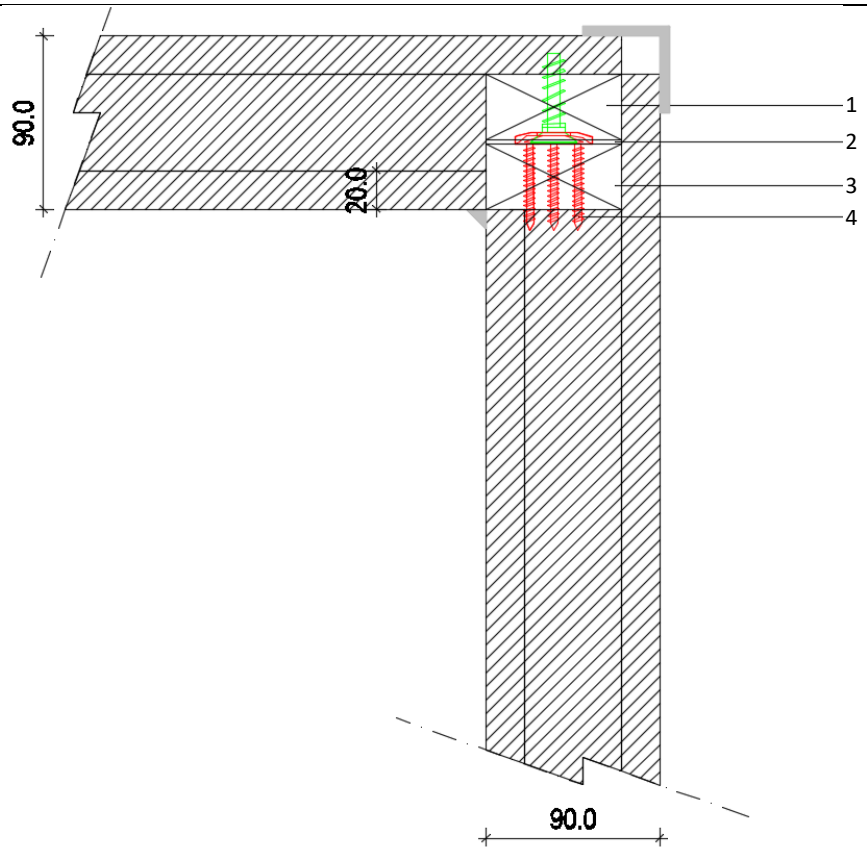
1 – Cryptomeria 40 mm
2 – ICB 100 mm
3 – Linen insulating band
4 – Column 140 mmx69 mm
5 – Hardware Walco 60
6 – Cryptomeria 40 mm

Detail 12: Longitudinal joints ISOLAM W180



1 – Joint cover 160x40 mm
2 – Adhesive insulation tape
3 – ISOLAM W180
4 – Drainage channel
5 – Column 140x70 mm
6 – Water barrier (Aluminum profile)
7 – Hardware Walco 60
8 – Linen insulating band
9 – Ledge profile

Detail 13: Corner ISOLAM W90



1 – Column LVL 70x34 mm
2 – Linen insulating band
3 – Column LVL 70x34 mm
4 – Hardware Rincon