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European Technical Assessment

ETA 17/1012 of 31/01/2018

English version prepared by ITeCons

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	Painéis estruturais LSF
Product family to which the construction product belongs	Building Kits, Units and Prefabricated elements Product area code: 34
Manufacturer	Servisteel - Soluções Técnicas e Engenharia, Lda. Rua da Galega, Montemuro 2665-410 St.º Estevão das Galés, Mafra Portugal http://www.servisteel.pt/
Manufacturing plant(s)	Rua da Galega, Montemuro 2665-410 Mafra Portugal
This European Technical Assessment contains	14 pages
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	ETAG 025 used as European Assessment Document (EAD), edition May 2006, *Metal frame building kits*

Specific parts

1. Technical description of the product

The construction product *Painéis estruturais LSF* is a prefabricated light steel framing building kit which can, for example, be used for external and internal walls, suspended floors and inclined roofs.

The product consists of a metal frame structure, formed by a grid with three different types of profiles called beam profiles, support profiles and stud profiles; accessory metal brackets; self-drilling screws and fixation brackets, as shown in Figures A1 and A2 in Annex A. All profiles are cold-formed using a type C140 profile (see Annex A, Figure A3). The connection between the kit and support structure is made by anchoring.

Servisteel produces two types of metal frame building kits depending on the beam profile type: the simple structural panel, in which the beam profile has a single C140 profile and the support profile has a simple female fitting (see Annex A, Figure A4); the double structural metal frame, has two beam C140 profiles and the support profile has double female fitting located in the beam profiles' housing point (see Annex A, Figure A5). Figure A6 shows the configuration of the beam profile when using double metal frame.

The product is made out of stud profiles and locking stud profiles. These are placed in the middle of the beam profiles, and have a sheet steel thickness inferior to the remaining profiles.

To connect the profiles, some accessories are necessary. For example, self-drilling screws are used for simple connection between panels; metal brackets and bracket fixations are used to reinforce connections and are normally applied every three beam profiles. All components of the kit are specified in Table 1.

Table 1: Components of the metal frame building kit.

Component	Application	Material	Dimensions (mm)	Standard
Beam profiles	Structure	Galvanized steel sheet (DX51D+Z200 MA C)	140 x L x 1.5	EN 10346
Support profiles	Structure	Galvanized steel sheet (DX51D+Z200 MA C)	140 x L x 1.5	EN 10346
Stud profiles	Structure	Galvanized steel sheet (DX51D+Z200 MA C)	140 x L x 1.0	EN 10346
Metal brackets	Reinforcing connections	Galvanized steel sheet (DX51D+Z200 MA C)	120 x 80 x 3	EN 10346
Self-drilling screws	Simple connection between panels	Steel	Ø6.3 X 25	DIN 7504N(M)/ ISO 15482
Brackets fixation	Reinforcing connections	Steel 10.9	Ø12 x 30	EN 14399-1

L - variable dimensions, according to the Tables in Annex B
Ø – diameter registered in the technical sheet of the product

The kit *Painéis estruturais LSF* does not include products like the external envelope as thermal insulation, cladding, roof covering, internal lining, internal partitions, windows and doors, stairs, surface coverings, etc.

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

Servisteel has developed three products that individually or jointly are applied in various types of constructions. Servisteel provides solutions for lightweight roofs, lightweight floors and structural walls. The *Painéis estruturais LSF* are used for new construction and urban rehabilitation.
The provisions made in this European Technical Assessment are based on an assumed work life of the *Painéis estruturais LSF* of: 50 years for the load-bearing structure and for non-accessible materials and components; and 25 years for repairable materials and components, provided that the kit is subject to appropriate use and maintenance, as specified by the manufacturer in the maintenance instructions, included in every kit. The indications given on the work life cannot be interpreted as a guarantee given by the manufacturer or the Technical Assessment Body, but are to be regarded only as a means for choosing the appropriate product in relation to the expected, economically reasonable work life of the kit.

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

The identification of the tests and the assessment for the intended use for this metal frame building kit were carried out according to the Essential Requirements and in compliance with the ETAG 025, "Guideline for European Technical Approval of Metal Frame Building Kits" – edition May 2006 (hereinafter referred to as "ETAG 025, used as EAD").

3.1 Mechanical resistance and stability (BW1)

The metal frame building kit has to be capable of supporting the specified loadings with adequate safety against structural collapse, inadmissible deformations and, where applicable, disproportionate collapse. The relevant actions typically considered are the self-weight and imposed loads: wind loads, snow loads and, where appropriate, seismic loads.

The structural components, the structure itself and the connections were verified in conformity with the basis of design as given in the EN 1990 standard.

The verification of the different components was undertaken by structural calculations for ultimate limit states and serviceability limit states, according to the relevant sections of the EN 1993 standard. The results of the verification of the steel structural components cannot exceed the ultimate limit state.

For the *Painéis estruturais LSF* and respective load conditions in ultimate limit state, the verification included:

1. Bending moment, according to the requirements present in section 6.1.4.1 of the EN 1993-1-3 standard;
2. Shear resistance, according to section 6.1.5 of the EN 1993-1-3 standard;
3. Lateral-torsional buckling, according to section 6.2.4 of the EN 1993-1-3 standard;
4. Torsion resistance, according to section 6.1.6 of the EN 1993-1-3 standard.

Some parameters were dismissed for verification, since they are not relevant for the system application.

To define the system, the maximum design value of a uniformly distributed load over the panel ($\boldsymbol{P_{max}}$) was determined for different distances between beam profiles ($\boldsymbol{EVP}$), as well as the maximum distance between the connections to the structure ($\boldsymbol{AF}$), according to the above mentioned point 1. Then, the remaining verifications were performed (2, 3 and 4). In this way, $\boldsymbol{P_{max}}$ will define the maximum admissible uniformly distributed load over the panel, which states that the design value of action effects s is equal to the limiting design value of the corresponding resistance.

For all previous calculations, it was necessary to determine the effective area of cross-section, according with the procedure presented in section 5.5.3.2 (3) of EN 1993-1-3. Tables B1, B2, B5 and B6 in Annex B present the maximum admissible load as a function of $\boldsymbol{L_{max}}$.

The serviceability limit states were calculated according to the vertical dislocations, as mentioned in section A1.4.3 of EN 1990. The maximum design value of a uniformly distributed load on the panel at a serviceability limit state ($\boldsymbol{Q_{max}}$) was determined for various limits of admissible deflection. Hence, $\boldsymbol{Q_{max}}$ will define the maximum admissible uniformly distributed load over the panel, which verifies that the design value of action effects specified in the serviceability criterion is equal to the limiting design value. The dynamic effects – vibrations analysis, according to section A1.4.4 of EN 1990, was dismissed since the displacements are lower than 28 mm. The results from the calculations mentioned above, are presented in Tables B3 and B7 in Annex B.

The connections between the metal frame and the support structure are made using “L” shaped metal brackets. For these connections, a calculation of the maximum shear force ($\boldsymbol{V_{max}}$) for ultimate limit state was performed.

Tables B4 and B8 present the maximum design shear force ($\boldsymbol{V_{max}}$) and the minimum diameter of the anchor connection between the panel and the support structure ($\emptyset_{min}$), according to EN 1993-1-3 and EN 1993-1-8.

3.2 Safety in case of fire (BW2)

3.2.1 Reaction to fire

The individual kit components are considered to satisfy the requirements for performance Class A1 of the characteristic reaction to fire, in accordance with the provisions of the Commission Decision 96/603/EC (as amended), without the need for testing on the basis of its listing in that Decision.

3.2.2 Resistance to fire

No performance determined (NPD).

3.2.3 External fire performance of the roof covering

Not relevant.

3.2.4 Fire compartmentation

Not relevant.

3.3 Hygiene, health and environment (BW3)

3.3.1 Vapour permeability and moisture resistance

Not relevant.

3.3.2 Watertightness

Not relevant.

3.3.3 Release of dangerous substances

A written declaration was submitted by the ETA holder stating that metal frame building kit components do not contain dangerous substances.

In addition to the specific clauses relating to dangerous substances contained in this ETA, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Regulation (EU) n. º 305/2011, these requirements also need to be complied with, when and where they apply.

3.4 Safety in use (BW4)

3.4.1 Slipperiness of floor finishes

Not relevant.

3.4.2 Resistance to eccentric and impact loads

Not relevant.

3.4.3 Falling due to changes in level or sudden drops

Not relevant.

3.5 Protection against noise (BWR 5)

3.5.1 Airborne sound insulation

Not relevant.

3.5.2 Impact sound reduction

Not relevant.

3.5.3 Sound absorption

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

3.6.1 Thermal resistance

Not relevant.

3.6.2 Air permeability

Not relevant.

3.6.3 Thermal inertia

Not relevant.

3.7 Aspects of durability, serviceability and identification

3.7.1 Aspects of durability

No performance determined (NPD).

3.7.2 Aspects of serviceability

Deflections related to the structural design of the loadbearing elements shall be determined for each individual project in accordance with their dimensions and their properties, and shall be limited in accordance with the requirements of the Member States.

3.7.3 Identification

This ETA is issued for the kit *Painéis Estruturais LSF* on the basis of agreed data/information, deposited with ITeCons - Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade which identifies the kit components that have been assessed. The basic description of the kit components is given in chapter 1, Table 1, and annex A.

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

According to the 2003/728/EC decision of the European Commission, the attestation of conformity of AVCP systems is given in Table 2.

Table 2: System of attestation of conformity applicable to metal frame building kits.

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Metal frame building kits	In building works	Any	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 - Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade.

Issued in Coimbra, Portugal on 31.01.2018

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)

Annex A

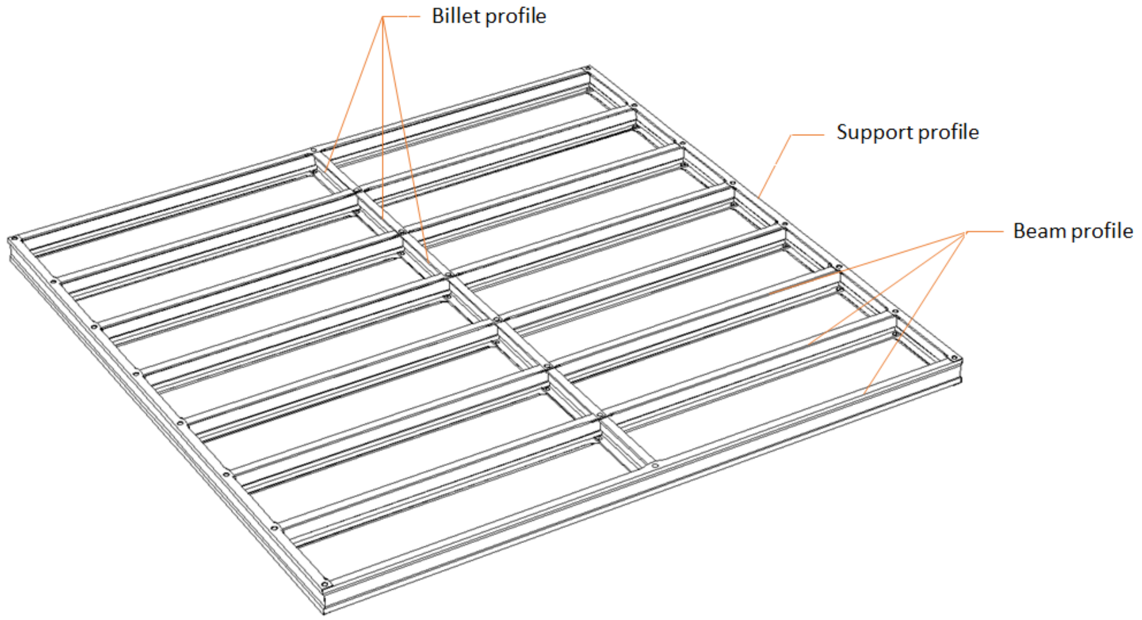

Figure A1: Simple structural panel.

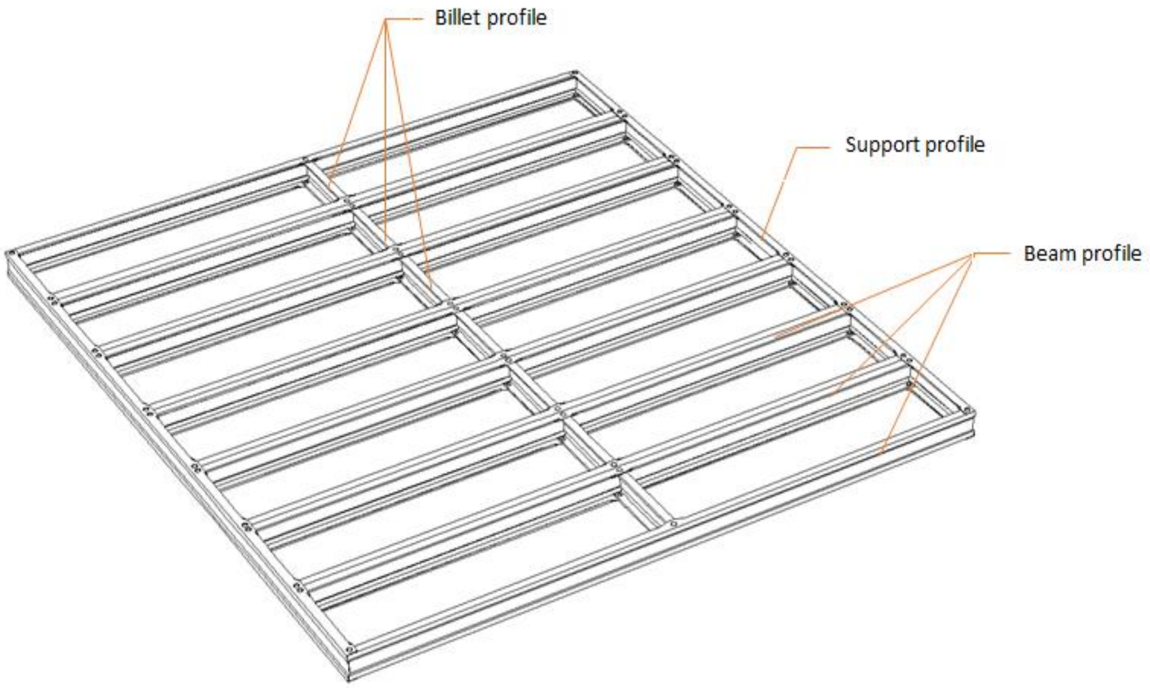

Figure A2: Double structural panel.

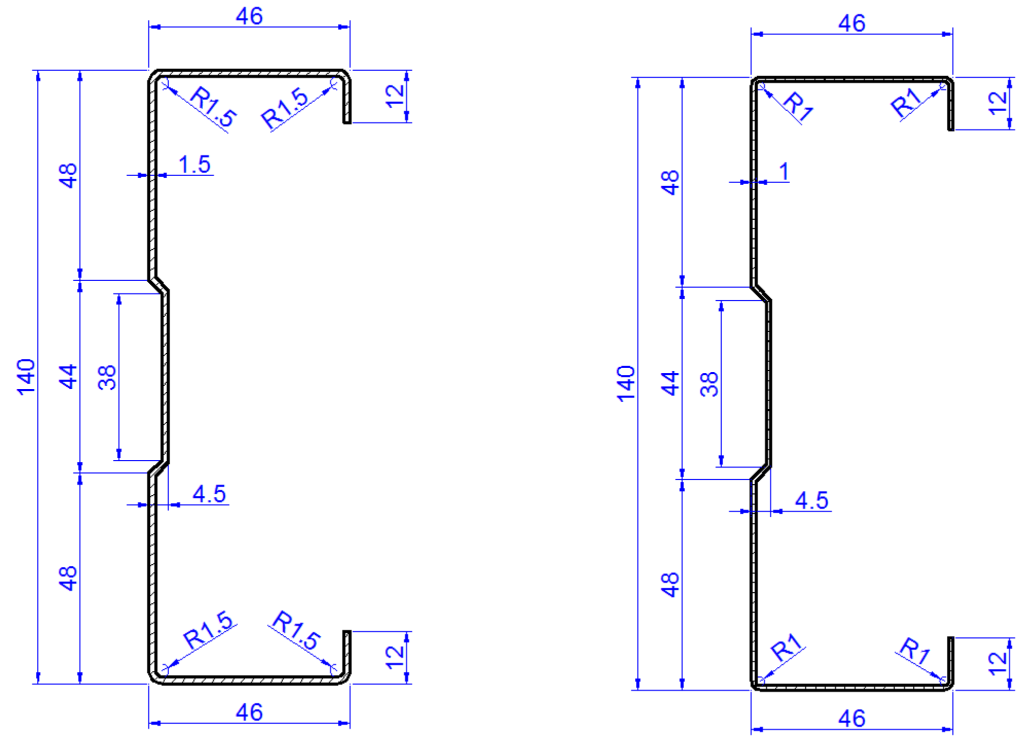

Figure A3: C140 section profile, beam and support profile (left) and stud profile (right) (dimensions in mm).

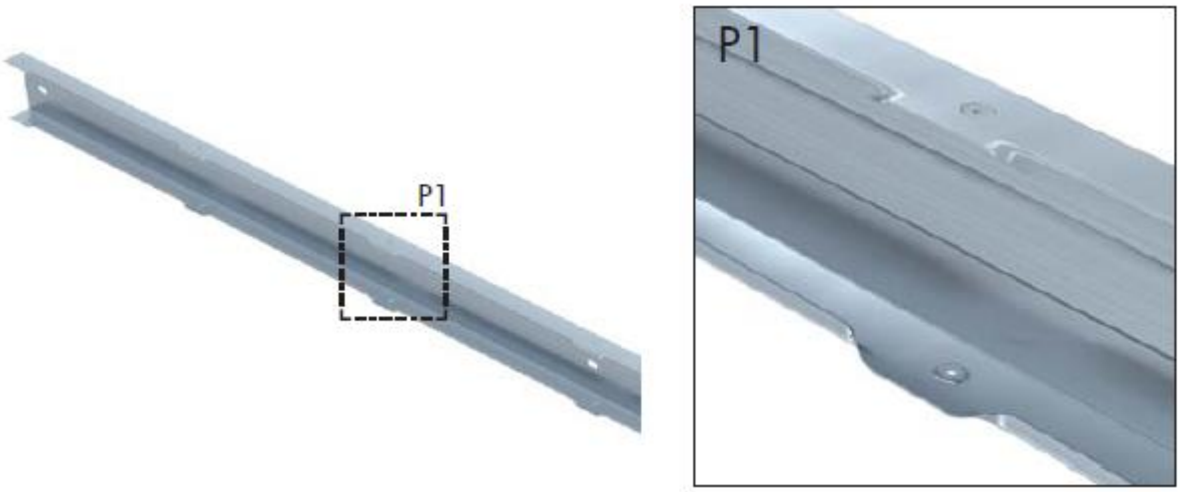

Figure A4: Support profile (simple structural panel).

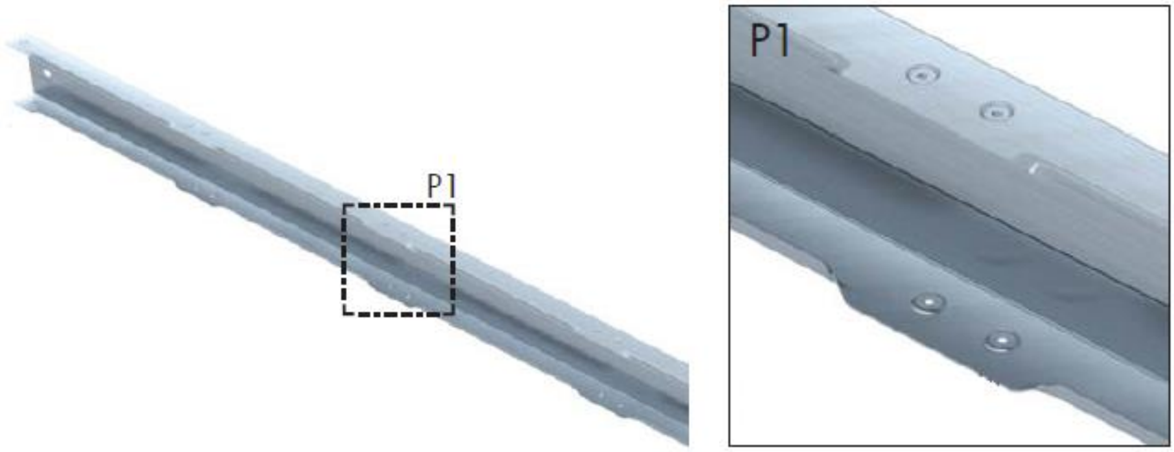

Figure A5: Support profile (double structural panel).

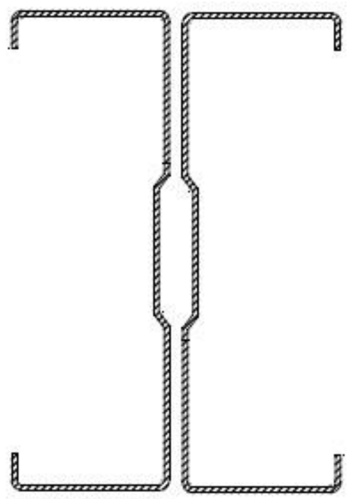

Figure A6: Configuration of the C140 section beam profile (double structural panel).

Annex B

Nomenclature

L_{max} **-** Maximum length of the panel in the direction of the beam profile (m).

EVP **-** Distance between beam profiles of panel (m).

H **-** Height of the structural panel. This dimension is variable, dependent on the predicted use (m).

P_{max} – Maximum design value of a uniformly distributed load over the panel for ultimate limit state (kN/m^2). This value must be greater than, or equal to, the load acting over the panel for the worst combination of actions for ultimate limit state, taking into account self-weighs, imposed loads, wind loads and snow loads with their respective safety and combination factors, dependent on the predicted use.

Q_{max} **–** Maximum design value of a uniformly distributed load over the panel for serviceability limit state (kN/m^2). This value must be greater than, or equal to, the load acting over the panel for the worst combination of actions for serviceability limit state, taking into account self-weighs, imposed loads, wind loads and snow loads with their respective safety and combination factors, dependent on the predicted use.

AF **–** Maximum distance between the connections and the structure (m).

V_{max} **–** Maximum design shear force in each connection of the panel to the support structure (kN). This value must be greater than, or equal to, the shear force obtained in the connections to structure for the worst combination of actions for ultimate limit state, taking into account self-weighs, imposed loads, wind loads and snow loads with their respective safety and combination factors, dependent on the predicted use.

$\emptyset_{min}$ **–** Minimum diameter of the anchor connection between the panel and the support structure (mm).

Simple structural panel

Table B1: Maximum design value of a uniformly distributed load for inclined roofs – ultimate limit state.

L_{max} $[m]$	EVP = 1.175 m			
	Downward		Upward	
	P_{max}	AF	P_{max}	AF
3.00	2.87	1	2.04	1
3.25	2.45	1	1.61	1
3.50	2.11	1	1.31	1
3.75	1.84	1	1.07	1
4.00	1.62	1	0.87	1

Table B2: Maximum design value of a uniformly distributed load for floors and walls – ultimate limit state.

L_{max} $[m]$	EVP $[m]$							
	0.45		0.5		0.6		0.625	
	P_{max}	AF	P_{max}	AF	P_{max}	AF	P_{max}	AF
3.00	7.50	3	6.75	3	5.62	3	5.40	3
3.25	6.39	3	5.75	3	4.79	3	4.60	3
3.50	5.51	3	4.96	3	4.13	3	3.97	3
3.75	4.80	3	4.32	3	3.60	3	3.45	3
4.00	4.22	3	3.80	3	3.16	3	3.04	3

Table B3: Maximum design value of a uniformly distributed load for floors, walls and inclined roofs – serviceability limit state.

Maximum deflection	L_{max} $[m]$	Floor and wall EVP $[m]$				Inclined roof EVP $[m]$
		0.45	0.5	0.6	0.625	1.175
		Q_{max}	Q_{max}	Q_{max}	Q_{max}	Q_{max}
$\frac{L_{max}}{200}$	**3.00**	5.51	4.96	4.13	3.97	2.11
	3.25	4.34	3.90	3.25	3.12	1.66
	3.50	3.47	3.12	2.60	2.50	1.33
	3.75	2.82	2.54	2.12	2.03	1.08
	4.00	2.33	2.09	1.74	1.67	0.89
$\frac{L_{max}}{250}$	**3.00**	4.41	3.97	3.31	3.18	1.69
	3.25	3.47	3.12	2.60	2.50	1.33
	3.50	2.78	2.00	2.08	2.00	1.06
	3.75	2.26	2.03	1.69	1.63	0.86
	4.00	1.86	1.67	1.40	1.34	0.71
$\frac{L_{max}}{300}$	**3.00**	3.68	3.31	2.76	2.65	1.41
	3.25	2.89	2.60	2.17	2.08	1.11
	3.50	2.31	2.08	1.74	1.67	0.89
	3.75	1.88	1.69	1.41	1.35	0.72
	4.00	1.55	1.40	1.16	1.12	0.59
$\frac{L_{max}}{350}$	**3.00**	3.15	2.84	2.36	2.27	1.21
	3.25	2.48	2.23	1.86	1.78	0.95
	3.50	1.98	1.79	1.49	1.43	0.76
	3.75	1.61	1.45	1.21	1.16	0.62
	4.00	1.33	1.20	1.00	0.96	0.51
$\frac{L_{max}}{400}$	**3.00**	2.76	2.48	2.07	1.98	1.06
	3.25	2.17	1.95	1.63	1.56	0.83
	3.50	1.74	1.56	1.30	1.25	0.66
	3.75	1.41	1.27	1.06	1.02	0.54
	4.00	1.16	1.05	0.87	0.84	0.45

Table B4: Maximum design shear force and minimum diameter of the anchor connection between the panel and the support structure in floor and wall, ultimate limit state: connection to structure.

L_{max} $[m]$	$EVP\ [m]$			
	Floor and wall		**Inclined roof**	
	0.45 / 0.5 / 0.6 / 0.625		**1.175**	
	V_{max}	$\emptyset_{min}$	V_{max}	$\emptyset_{min}$
3.00	15.18	12	5.06	12
3.25	14.01	12	4.67	12
3.50	13.01	12	4.34	12
3.75	12.14	12	4.05	12
4.00	11.39	12	3.80	12

Double structural panel

Table B5: Maximum design value of a uniformly distributed load for inclined roofs – ultimate limit state.

L_{max} $[m]$	EVP = 1.175 m			
	Downward		**Upward**	
	P_{max}	AF	P_{max}	AF
3.00	5.74	1	5.05	1
3.25	4.89	1	4.21	1
3.50	4.22	1	3.54	1
3.75	3.68	1	2.98	1
4.00	3.23	1	2.55	1

Table B6: Maximum design value of a uniformly distributed load for floors and walls – ultimate limit state.

L_{max} $[m]$	$EVP\ [m]$							
	0.45		**0.5**		**0.6**		**0.625**	
	P_{max}	AF	P_{max}	AF	P_{max}	AF	P_{max}	AF
3.00	14.99	3	13.49	3	11.25	2	10.80	2
3.25	12.78	3	11.50	3	9.58	2	9.20	2
3.50	11.02	3	9.91	3	8.26	2	7.93	2
3.75	9.60	3	8.64	3	7.20	3	6.91	3
4.00	8.43	3	7.59	3	6.33	3	6.07	3

Table B7: Maximum design value of a uniformly distributed load for floors, walls and inclined roofs – serviceability limit state.

Maximum deflection	L_{max} $[m]$	Floor and wall $EVP\ [m]$				Inclined roof $EVP\ [m]$
		0.45	**0.5**	**0.6**	**0.625**	**1.175**
		Q_{max}	Q_{max}	Q_{max}	Q_{max}	Q_{max}
$\frac{L_{max}}{200}$	**3.00**	11.03	9.92	8.27	7.94	4.22
	3.25	8.67	7.81	6.50	6.24	3.32
	3.50	6.94	6.25	5.21	5.00	2.66
	3.75	5.65	5.08	4.23	4.06	2.16
	4.00	4.65	4.19	3.49	3.35	1.78
$\frac{L_{max}}{250}$	**3.00**	8.82	7.94	6.62	6.35	3.38
	3.25	6.94	6.24	5.20	5.00	2.66
	3.50	5.56	5.00	4.17	4.00	2.13
	3.75	4.52	4.06	3.39	3.25	1.73
	4.00	3.72	3.35	2.79	2.68	1.43
$\frac{L_{max}}{300}$	**3.00**	7.35	6.62	5.51	5.29	2.82
	3.25	5.78	5.20	4.34	4.16	2.21
	3.50	4.63	4.17	3.47	3.33	1.77
	3.75	3.76	3.39	2.82	2.71	1.44
	4.00	3.10	2.79	2.33	2.23	1.19
$\frac{L_{max}}{350}$	**3.00**	6.30	5.67	4.73	4.54	2.41
	3.25	4.96	4.46	3.72	3.57	1.90
	3.50	3.97	3.57	2.98	2.86	1.52
	3.75	3.23	2.90	2.42	2.32	1.24
	4.00	2.66	2.39	1.99	1.91	1.02
$\frac{L_{max}}{400}$	**3.00**	5.51	4.96	4.13	3.97	2.11
	3.25	4.34	3.90	3.25	3.12	1.66
	3.50	3.47	3.12	2.60	2.50	1.33
	3.75	2.82	2.54	2.12	2.03	1.08
	4.00	2.33	2.09	1.74	1.67	0.89

Table B8: Maximum design shear force and minimum diameter of the anchor connection between the panel and the support structure in floor and wall, ultimate limit state: connection to structure.

L_{max} $[m]$	$EVP\ [m]$					
	Floor and wall				Inclined roof	
	0.45 / 0.5		**0.6 / 0.625**		**1.175**	
	V_{max}	$\emptyset_{min}$	V_{max}	$\emptyset_{min}$	V_{max}	$\emptyset_{min}$
3.00	30.36	16	20.24	12	10.12	12
3.25	28.03	16	18.68	12	9.34	12
3.50	26.02	16	17.35	12	8.67	12
3.75	24.29	12	24.29	12	8.10	12
4.00	22.77	12	22.77	12	7.59	12