TENAXPANEL

METHODOLOGICAL GUIDELINES

FOR CALCULATIONS AND MOUNTING

OF WALL PANEL SUSPENDED STRUCTURES MANUFACTURED BY TENAX PANEL SIA

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1. INTRODUCTION

These Methodological Guidelines describe the required calculations to determine the impact of loads caused by suspended facades on Tenax wall panels and to establish the maximum acceptable weight of the suspended facades for the specific panel type considering the given loads. The calculations can be performed manually according to the Methodological Guidelines, or automatically according to the load calculation model for suspended facades developed by RTU in MS Excel format.

2. TYPICAL SOLUTIONS FOR SUSPENDED STRUCTURE MOUNTING

Suspended facades are usually secured to wall panels by means of steel profiles that are fixed onto the external or internal layer of the wall panel with screws or with rivets.

Depending on the support structure, wall panels can be installed horizontally or vertically. Irrespective of how the wall panels are mounted, the suspended facade mounting profiles can be fixed either in parallel to the longitudinal direction of wall panels (Fig. 1) or perpendicularly to the panels, i. e., transversely (Fig. 2).

The mounting direction of profiles relative to the direction of the panel has no significant effect on the maximum acceptable weight of the suspended facade. However, due to structural reasons, different minimum/maximum distances between profiles are recommended depending on whether they are mounted in parallel or transversely.

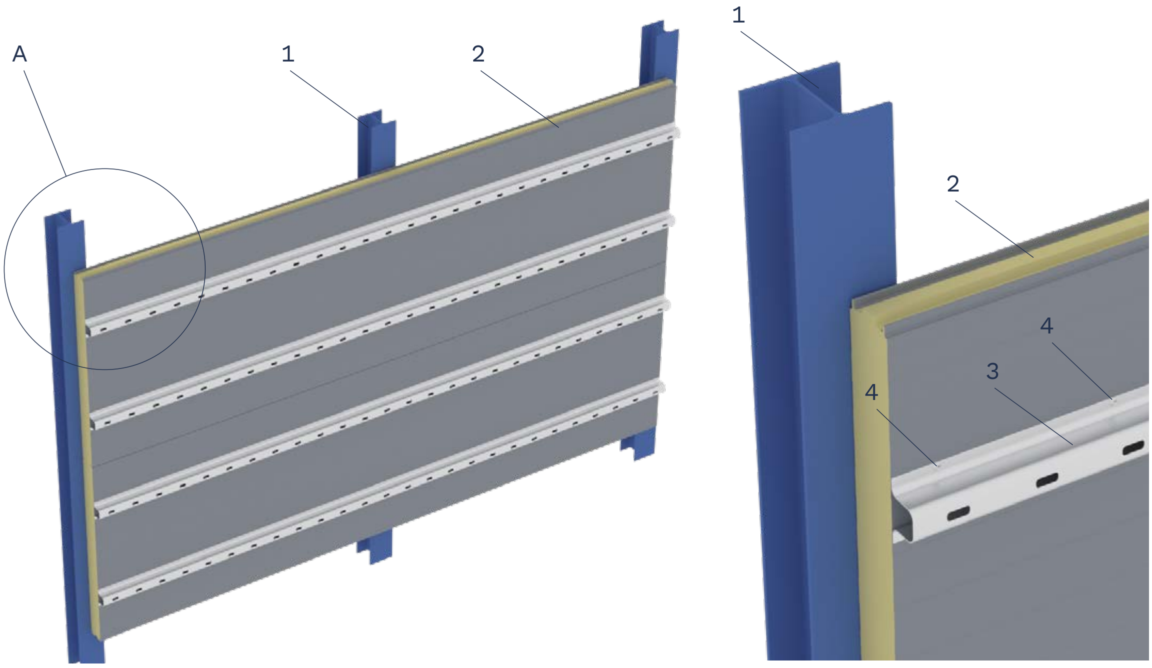

Figure 1. Longitudinal fixing of suspended facade mounting profiles:
1: support structure; 2: wall panel; 3: suspended facade mounting profile; 4: screw/rivet

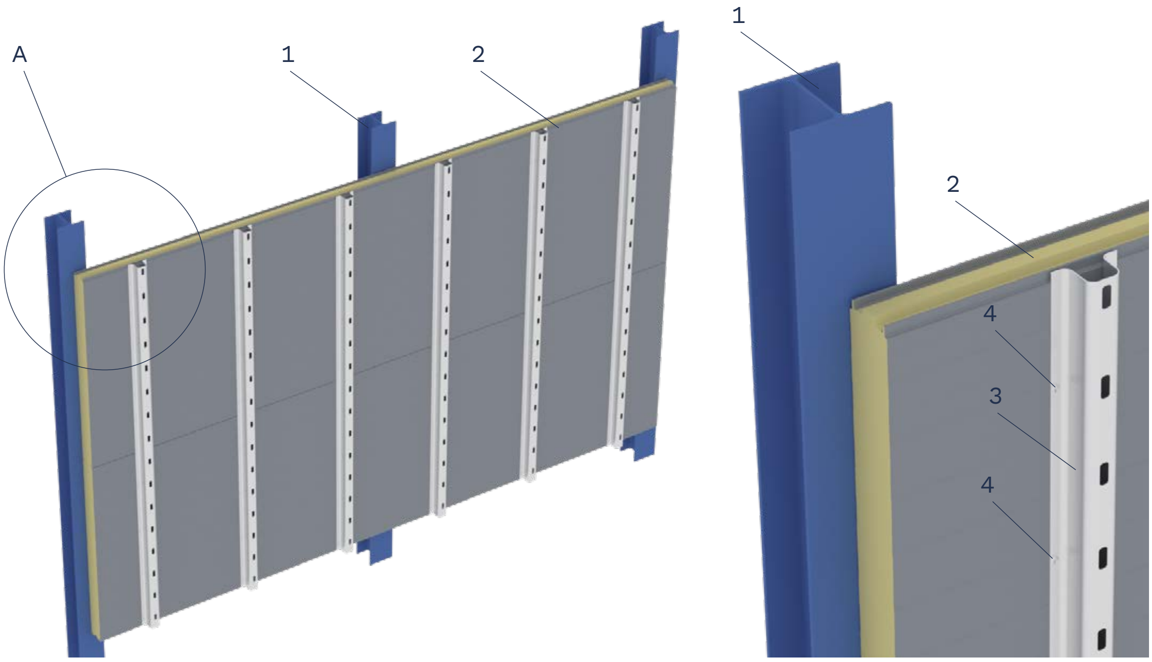

Figure 2. Transversal fixing of suspended facade mounting profiles:
1: support structure; 2: wall panel; 3: suspended facade mounting profile; 4: screw/rivet

Figures 1 and 2 do not show the elements of the suspended facade. It is assumed that in a typical case the cover elements of suspended facades (such as plates) are tightly secured to the mounting profiles to create a rigid assembly.

3. LOADS AND IMPACTS OF SUSPENDED FACADES ON WALL PANELS

3.1. LOAD TYPES AND THEIR CALCULATIONS

Suspended facades create various additional loads and impacts on wall panels. Mainly, additional loads on wall panels are created by the self weight of the suspended facade, as well as the wind pressure and the negative (suction) wind pressure. Considering the specific features of a given facade, during its design it should also be considered whether the suspended facade will accumulate snow, water, ice, dirt, etc. that could significantly increase its weight. Expansion/shrinkage of the suspended facade due to changes in temperature and humidity should also be considered, and whether this causes a significant additional load on wall panel fastening elements. In all cases when a suspended facade is designed, the wall panel fastening elements used to secure them to load-bearing structures should be tested to make sure that they will be able to withstand additional stress created by the suspended facade.

The self wight of the suspended facade exerted onto the wall panel creates a vertical transversal force P_q that is applied to mounting profiles on the plane of the panel sheating layer (Fig. 3; a, b). From the mounting profile, the transversal force P_q is transferred to fastenings (screws/rivets) that connect the mounting profiles to the sheating layer of the wall panel. In this case, the fastenings are loaded in shear stress conditions, and the load-bearing capacity of such screwed/riveted joints is determined by the resistance to the shear load of the fastenings fixed into the sheating layer.

The negative pressure of the wind w^- on the suspended facade creates tensile forces $P_{T,w}$ that are perpendicular to the panel plane (Fig. 3; a, b). The tensile forces $P_{T,w}$ are absorbed by the fastenings fixed into the sheating layer (screws or rivets). In this case, the fastenings are loaded in tensile stress conditions, and the load-bearing capacity of such joints is determined by the resistance to the tensile (pulling) load of the fastenings fixed into the sheating layer.

The pressure of the wind w^+ on the suspended facade creates compression forces $P_{C,w}$ that are perpendicular to the panel plane (Fig. 3; a, b). Via the mounting profiles, the compression forces $P_{C,w}$ are transferred to the sheating layer of wall panels. In this case, the area of the mounting profile that is in contact with the sheating layer of the wall panel and that creates compression onto the surface of the panel cover is decisive.

a) b)

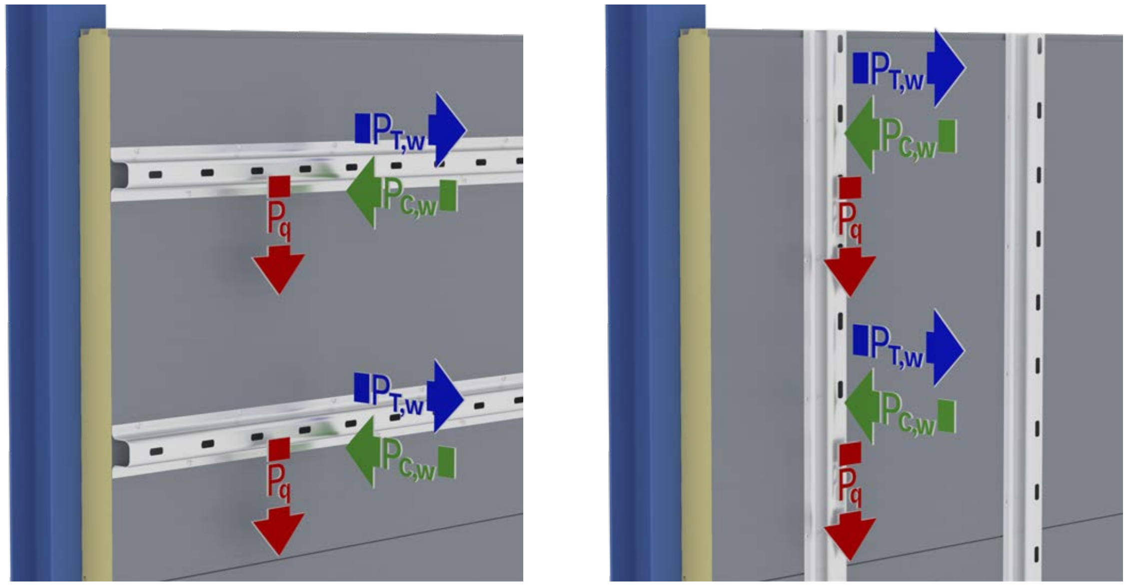

Figure 3. Loads created by the suspended facade: P_q: transversal force created by the self weight of a suspended facade; $P_{T,w}$: tensile load created by the wind load; $P_{C,w}$: compression force created by the wind load; a) mounting profiles fixed longitudinally to the panel; b) mounting profiles fixed transversally to the panel.

If the suspended facade is mounted onto the internal sheating layer (e.g. in the building), the wind loads $P_{T,w}$, $P_{C,w}$ are not created; however, it should be assessed whether the panel is subject to any other operational loads due to the suspended facade.

The strength test of the suspended facade system is carried out by comparing the external load with the system resistance to external loads. The strength test of the suspended facade should be performed independently for each type of load, as well as during periods of combined loads. The system resistance is determined by calculating the total resistance of fastenings (screws/rivets) to tensile and shear loads, as well as by calculating the compression resistance of the core layer of wall panels. Detachment between the sheating layer and intermediate layer of the wall panel that results from loads caused by suspended facades should not be allowed; therefore, additional tests should be made to determine if the total linear load on the mounting profile does not exceed maximum acceptable values that differ depending on the panel type, sheating layer, etc.

3.1.1. Tensile load calculation

As indicated in Section 3.1, the negative wind pressure (suction) w^- on the suspended facade causes a tensile load $P_{T,w}$ perpendicularly to the wall panel plane (Fig. 3; a, b). The resistance of the system to the tensile load perpendicularly to the panel plane F_T [kN/m²] is calculated as:

$$F_T = f_T \cdot n_A \qquad (1)$$

where f_T is the calculated resistance of one fastening element (screw/rivet) to the pulling force determined according to Table 1; n_A is the number of fastening elements per one m² of the wall panel. The selected fastening should be suitable for its intended use, and the load-bearing values Should not be lower than those given in Table 1.

The tested system strength for the tensile load should be performed according to the following:

$$\frac{W_d^-}{F_T} \leqslant 1 \qquad (2)$$

where W_d^- is the value of the negative wind pressure load calculated according to LVS EN 1991-1-4.

3.1.2. Compression load calculation

The compression load $P_{C,w}$ is created by positive wind pressure W_d^+ that is perpendicular to the wall panel plane (Fig. 3; a,b). The resistance of the system to the compression load perpendicularly to the wall panel plane F_P [kN/m^2] is calculated as:

$$F_P = f_{c,d} \cdot A_{pr} \tag{3}$$

where $f_{c,d}$ is the calculated compression strength [kN/m^2] of the core layer of the wall panel, and A_{pr} is the contact area of mounting profiles and sheating layer per one m^2 of the wall panel surface [m^2/m^2].

The system strength test for the compression load should be performed according to the following:

$$\frac{W_d^+}{F_P} \leqslant 1 \tag{4}$$

where W_d^+ is the value of the wind pressure load calculated according to LVS EN 1991-1-4.

3.1.3. Transversal force load calculation

The transversal force load P_q is created by the self weight of the suspended facade (Fig. 3, a, b). The resistance of the system to the transversal force load on the wall panel plane F_S [kN/m^2] is calculated as:

$$F_S = f_S \cdot n_A \tag{5}$$

where f_S is the calculated resistance of one fastening element (screw/rivet) to the shear force determined according to Table 1; and n_A is the number of fastening elements per one m^2 of the wall panel.

The system strength test for the transversal force load should be performed according to the following:

$$\frac{q_d}{F_S} \leqslant 1 \tag{6}$$

where q_d is the calculated value of the self weight load of suspended facade determined according to LVS EN 1991-1-1.

3.1.4. Combined Tensile and transversal force load calculation

System strength test at concurrent tensile and transversal force loads should be carried out according to EN 1993-1-3 as per the following:

$$\left(\frac{W_d^-}{F_T}\right) + \left(\frac{q_d}{F_S}\right) \leqslant 1 \tag{7}$$

3.1.5. Combined Compression and transversal force load calculation

System strength test at concurrent compression and transversal force loads should be carried out according to EN 1993-1-3 as per the following:

$$\left(\frac{W_d^+}{F_P}\right)+\left(\frac{q_d}{F_S}\right)\leqslant 1 \qquad (8)$$

3.1.6. Testing the maximum tensile loads on mounting profiles

The maximum acceptable linear tensile load on one meter of the mounting profile $F_{pr,T}$ [kN/m] is calculated as

$$F_{pr,T}=f_T\cdot n_l \qquad (9)$$

where n_l is the number of fastenings per one meter of a mounting profile.

To prevent other wall panel degradation processes (e.g. detachment), the $F_{pr,T}$ value should be limited by the maximum values $f_{pr,T}$ indicated in Table 2. Thus, it should be tested if the value $F_{pr,T}$ calculated according to formula (9) does not exceed the value $f_{pr,T}$ indicated in Table 1:

$$F_{pr,T}\leqslant f_{pr,T} \qquad (10)$$

If $F_{pr,T}>f_{pr,T}$, then the assumed maximum acceptable value is $f_{pr,T}$.

The strength test of the mounting profile at the linear tensile load should be performed as follows:

$$\frac{W_{d,pr}^-}{\min\left(F_{pr,T},f_{pr,T}\right)}\leqslant 1 \qquad (11)$$

where $W_{d,pr}^-$ is the calculated value of the linear tensile load [kN/m] per meter of a mounting profile.

3.1.7. Testing the maximum transversal force loads on mounting profiles

The maximum acceptable linear transversal force load per meter of mounting profiles $F_{pr,s}$ [kN/m] is calculated as

$$F_{pr,s} = f_s \cdot n_l \qquad (12)$$

To prevent other wall panel degradation processes (e.g. detachment), the $F_{pr,s}$ value should be limited by the maximum values $f_{pr,s}$ indicated in Table 2. Thus, it should be tested if the value $F_{pr,s}$ calculated according to formula (12) does not exceed the value $f_{pr,s}$ indicated in Table 2:

$$F_{pr,s} \leqslant f_{pr,s} \qquad (13)$$

If $F_{pr,s} > f_{pr,s}$, then the assumed maximum acceptable value is $f_{pr,s}$.

The strength test of the mounting profile at the linear transversal force load should be performed as follows:

$$\frac{q_{d,pr}}{\min(F_{pr,s}, f_{pr,s})} \leqslant 1 \qquad (14)$$

where $q_{d,pr}$ is the calculated value of the linear shear load [kN/m] per meter of a mounting profile.

Table 1. The calculated resistance of fastenings to tensile and transversal force load depending on the panel type

Panel type	Panel sheating layer	The calculated resistance of a screw to the pull-out force, f_T [kN]	The calculated resistance of a screw to the shear force, f_S [kN]
PIR150	0.5 mm MICRO profile	0.20	0.45
	0.5 mm MESA, RIB, V(n), V0 profiles	0.15	0.35
MW200	0.6 mm MICRO profile	0.25	0.40
	0.5 mm MESA, RIB, V(n), V0 profiles	0.15	0.35

Table 2. Maximum acceptable linear tensile and transversal force load per meter of a mounting profile depending on the panel type

Panel type	Panel sheating layer to which the mounting profile is fixed	Maximum acceptable tensile load, $f_{pr,T}$ [kN/m]	Maximum acceptable transversal force load, $f_{pr,s}$ [kN/m]
PIR150	0.5 mm MICRO profile	1.60	2.80
	0.5 mm MESA, RIB, V(n), V0 profiles	1.00	2.40
MW200	0.6 mm MICRO profile	1.70	2.80
	0.5 mm MESA, RIB, V(n), V0 profiles	1.00	2.40

For suspended facades it is recommended to use a 0.6+ mm MICRO profile panel.

Considering the concurrent impact of the self weight load of the suspended facade and the wind load, as well as the possible eccentricity of the load, **50 [kg/m^2]** or 0.49 [kN/m^2] should be the maximum acceptable suspended load level for MW panels, while for PIR panels the respective values should be **35 [kg/m^2]** or 0.34 [kN/m^2].

In the developed calculation model, experimentally determined maximum pull-out and shear resistance values of fastenings (screws) are used (see Table 1). The calculated maximum values are valid also for long-term and cyclic loads.

While if the suspended facade creates dynamic loads, it is necessary to use through fastenings (screws/rivets) that pass through the entire wall panel, incl. both sheating layers.

4. RECOMMENDATIONS FOR THE MINIMUM AND MAXIMUM DISTANCES BETWEEN FASTENINGS

To prevent other degradation processes due to the loads created by the suspended facade, e.g. detachment of the sheating layer sheating layer and the core layer of the wall panel, as well as due to structural considerations, the following maximum and minimum distances between the mounting screws l_s are established:

Table 3. Minimum and maximum acceptable distances between mounting screws l_s depending on the panel type

Panel type	Panel sheating layer to which the suspended facade is mounted	Minimum distance, l_s^{min} [mm]	Maximum distance, l_s^{max} [mm]
PIR150	0.5 mm MICRO profile	125	300
	0.5 mm MESA, RIB, V(n), V0 profiles	150	300
MW200	0.6 mm MICRO profile	150	300
	0.5 mm MESA, RIB, V(n), V0 profiles	150	300

It is also necessary to note that for PIR and MW panels the minimum distance between the cutted edge (from the end surface, and from the side surface) should be at least 150 mm.

If it is possible, the mounting screws should be positioned in the key joint of wall panels irrespective of whether the longitudinal or transversal mounting direction of profiles is chosen.

5. RECOMMENDATIONS FOR THE MINIMUM AND MAXIMUM DISTANCES BETWEEN PROFILES WHEN MOUNTED HORIZONTALLY AND VERTICALLY

The required distance between metal profiles l_{pr} that are mounted onto wall panels are determined according to the approach to calculation indicated in the Methodological Guidelines.

To prevent other degradation processes due to the loads created by the suspended facade, e.g. detachment of the sheating layer and the core layer of the wall panel, as well as due to structural considerations, the following maximum and minimum distances between the mounting profiles l_{pr} are established:

Table 4. Minimum and maximum acceptable distances between mounting profiles l_{pr} depending on the panel type and profile mounting method

Panel type	Profile mounting type	Minimum distance, l_{pr}^{min} [mm]	Maximum distance, l_{pr}^{max} [mm]
PIR150	In the longitudinal direction of the panel	300	½ width of the panel
MW200	In the transversal direction of the panel	300	1,200

6. RECOMMENDATIONS TO COMPENSATE FOR THERMAL EXPANSION

It is expected that mounting profiles (Fig. 2) fixed transversally onto the panel will have lesser impact due to thermal expansion in comparison to mounting profiles longitudinally onto the panel (Fig. 1), as in the transversal direction the panel usually is less resistant (this is the direction of profiling) than in the longitudinal direction, and a significant part of the thermal expansion in the transversal direction of the wall panels is absorbed by joint assemblies (e.g. key joint).

It is expected that profiles mounted in the longitudinal direction will sustain a relatively larger impact of the thermal expansion, as in the longitudinal direction the cover layer of panels does not have any bends.

More serious thermal expansion problems are expected if the structure of the suspended facade has considerably different thermal expansion characteristics than those of the steel mounting profiles and the steel sheating layer.

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Generally, to compensate for thermal expansion between the suspended facade and the wall panels, we strongly recommend oval openings in the mounting profile (see, e.g. Fig. 1 and 2). This solution will allow the suspended facade and mounting profiles to deform independently.

7. NOTES

In case of dynamic (moving) loads, screws or rivets that go through the wall panel should be used.

It is assumed that the suspended facade is evenly secured to the mounting profiles, not creating concentrated or eccentric load onto the mounting profiles. If the suspended facade is fixed on an individual mounting profile, the loading eccentricity should be taken into account during the design stage, i.e. that the self weight of the suspended facade also creates tensile and compression forces.

It is assumed that the connection of elements of the suspended facade and the mounting profiles form a rigid assembly.

It is assumed that additional mounted structures that are secured according to the recommendations in the Methodological Guidelines do not reduce the load resistance of the panel pressed by the wall.

When suspended facades are designed, it is necessary to test the load-bearing capacity of specific fastenings of wall panels at the load-bearing structures of buildings. It should be tested if the current fastenings (like through screws used to secure the panel to the load-bearing steel columns or beams) can hold additional weight from the suspended facade.

8. SAMPLE CALCULATION

Self weight of a suspended facade, incl. fastening elements $q = 45$ [kg/m^2] or $q = 0.44$ [kN/m^2], wind load pressure $w^+ = 1.77$ [kN/m^2], negative wind load pressure (suction) $w^- = -1.83$ [kN/m^2], panel type PIR150; the suspended facade is mounted to the external covering layer of the wall panel. Characteristic compression strength of the core layer of the panel $f_C = 100$ [kN/m^2]. The suspended facade is mounted to the wall panel with the mounting profiles (with Omega-type cross section) with the total shelf width of b_{pr} is 80 mm.

During the calculation, wind and self weight loads should be determined first:

The load created by wind pressure is calculated as:

$$w_d^+ = w^+ \cdot \gamma_w = 1{,}77 \cdot 1{,}5 = 2{,}66\ [kN/m^2]$$

where $\gamma_W = 1.5$ is the wind load safety ratio according to LVS EN 1991-1-1

The load created by the negative wind pressure (suction) is calculated as:

$$w_d^- = w^- \cdot \gamma_w = -1{,}83 \cdot 1{,}5 = -2{,}75\ [kN/m^2]$$

The load created by the self weight of the suspended facade is calculated as

$$q_d = q \cdot \gamma_q = 0{,}44 \cdot 1{,}35 = 0{,}59\ [kN/m^2]$$

The assumed distance between screws l_S is 150 [mm], and the assumed distance between mounting profiles l_{pr} is 300 [mm].

Depending on the assumed distance between screws and profiles, the number of screws per 1 m^2 is:

$$n_A = \left[\frac{1}{l_S}\right] \cdot \left[\frac{1}{l_{pr}}\right] = \left[\frac{1}{0{,}15}\right] \cdot \left[\frac{1}{0{,}30}\right] = 6 \cdot 3 = 18\,[\text{gab.}]$$

and the number of screws per 1 m of the mounting profile is:

$$n_l = \left[\frac{1}{l_S}\right] = \left[\frac{1}{0{,}15}\right] = 6\,[\text{gab.}]$$

Square brackets [] are used for rounding down to an integer.

Table 1 is used to determine the calculated resistance of one screw to pull-out force $f_T = 0.20$ [kN] and to calculate the resistance to shear force $f_S = 0.45$ [kN] (PIR150 panel, external sheating layer).

Table 2 is used to determine the maximum acceptable tensile and transversal force per one meter of a mounting profile, namely $f_{pr,T} = 1.60$ [kN] and $f_{pr,S} = 2.80$ [kN].

Further calculations are made according to Sections 3.1.1–3.1.7 of the Methodological Guidelines:

Tensile strength test

The resistance of the system to the tensile load perpendicularly to the panel plane, f_T [kN/m^2]:

$$F_T = f_T \cdot n_A = 0{,}20 \cdot 18 = 3{,}60\,[\text{kN/m}^2]$$

System strength test at tensile load:

$$\frac{W_d^-}{F_T} = \frac{2{,}75}{3{,}60} = 0{,}76 \leqslant 1 \text{ (test successful)}$$

Compression strength test

First, the mounting profile and the contact area of the sheating layer per 1 m^2 of the wall panel surface [m^2/m^2], A_{pr} is determined:

$$A_{pr} = b_{pr} \cdot \left(\frac{1}{l_{pr}}\right) = 0{,}08 \cdot \left(\frac{1}{0{,}30}\right) = 0{,}27\,[\text{m}^2/\text{m}^2]$$

The value of the inter-layer compression strength of the panel $f_{c,d}$ is calculated:

$$f_{c,d} = \frac{f_c}{\gamma_c} = \frac{100}{1{,}33} = 75{,}19\,[\text{kN/m}^2]$$

where $\gamma_c = 1.33$ according to LVS EN 14509

The resistance of the system to the compression load perpendicularly to the panel plane F_P [kN/m^2]:

$$F_P = f_{c,d} \cdot A_{pr} = 75{,}19 \cdot 0{,}27 = 20{,}30 \, [kN/m^2]$$

System strength test at compression load:

$$\frac{W_d^+}{F_P} = \frac{2{,}66}{20{,}30} = 0{,}13 \leqslant 1 \text{ (test successful)}$$

Transversal force strength test

The resistance of the system to the transversal force load in the wall panel plane, F_S [kN/m^2], is determined:

$$F_S = f_S \cdot n_A = 0{,}45 \cdot 18 = 8{,}10 \, [kN/m^2]$$

System strength test at transversal force load:

$$\frac{q_d}{F_S} = \frac{0{,}59}{8{,}10} = 0{,}07 \leqslant 1 \text{ (test successful)}$$

Combined tensile and transversal strength test

System strength test at concurrent tensile and transversal force loads:

$$\left(\frac{W_d^-}{F_T}\right) + \left(\frac{q_d}{F_S}\right) = \left(\frac{2{,}75}{3{,}60}\right) + \left(\frac{0{,}59}{8{,}10}\right) = 0{,}76 + 0{,}07 = 0{,}83 \leqslant 1 \text{ (test successful)}$$

Combined compression and transversal strength test

System strength test at concurrent compression and transversal force loads:

$$\left(\frac{W_d^+}{F_P}\right) + \left(\frac{q_d}{F_S}\right) = \left(\frac{2{,}66}{20{,}30}\right) + \left(\frac{0{,}59}{8{,}10}\right) = 0{,}13 + 0{,}07 = 0{,}20 \leqslant 1 \text{ (test successful)}$$

Testing the maximum tensile loads on mounting profiles

The maximum acceptable linear tensile load per meter of a mounting profile. $F_{pr,T}$ [kN/m], is determined:

$$F_{pr,T} = f_T \cdot n_l = 0{,}20 \cdot 6 = 1{,}20 \, [kN/m]$$

It should be checked if the calculated $F_{pr,T}$ value does not exceed the value indicated in Table 2 $f_{pr,T}$ = 1.60 [kN/m].

$$F_{pr,T} \leqslant f_{pr,T} \longrightarrow 1{,}20 \leqslant 1{,}60$$

The strength test of the mounting profile at the linear tensile force:

$$\frac{W_{d,pr}}{\min(F_{pr,T}, f_{pr,T})} = \frac{W_d \cdot l_{pr}}{\min(F_{pr,T}, f_{pr,T})} = \frac{2{,}75 \cdot 0{,}3}{\min(1{,}20,\ 1{,}60)} = \frac{0{,}83}{1{,}20} = 0{,}69 \leqslant 1 \text{ (test successful)}$$

Testing the maximum transversal force loads on mounting profiles

The maximum acceptable linear transversal force load per meter of a mounting profile, $F_{pr,s}$ [kN/m], is determined:

$$F_{pr,s} = f_s \cdot n_l = 0{,}45 \cdot 6 = 2{,}70 \text{ [kN/m]}$$

It should be tested if the calculated $F_{pr,s}$ value does not exceed the value indicated in Table 2 $f_{pr,s}$ = 2.80 [kN/m].

$$F_{pr,s} \leqslant f_{pr,s} \longrightarrow 2{,}70 \leqslant 2{,}80$$

The strength test of the mounting profile at the linear transversal force:

$$\frac{q_{d,pr}}{\min(F_{pr,s}, f_{pr,s})} = \frac{q_d \cdot l_{pr}}{\min(F_{pr,s}, f_{pr,s})} = \frac{0{,}59 \cdot 0{,}3}{\min(2{,}70,\ 2{,}80)} = \frac{0{,}18}{2{,}70} = 0{,}07 \leqslant 1 \text{ (test successful)}$$

Thus, it can be concluded that in the sample calculation all strength tests have been successful.

If any of the tests is unsuccessful, the calculation should be repeated, assuming a shorter distance between screws, changing the distance between mounting profiles, choosing a different panel type, changing the shape of the mounting profile, etc.

9. SAMPLE CALCULATION FOR SUSPENDED FACADE SYSTEMS TO BE MOUNTED ON SANDWICH PANELS

MW200 0.6 MICRO

Option A					Option B				
Area of wind load	Wind pressure parameter	Load parameter of a suspended facade	Distance between screws	Distance between profiles	Area of wind load	Wind pressure parameter	Load parameter of a suspended facade	Distance between screws	Distance between profiles
	w_c	q_c	l_s	l_p		w_c	q_c	l_s	l_p
Area	[kN/m²]	[kg/m²]	[m]	0.6	Area	[kN/m²]	[kg/m²]	[m]	0.6
A	-1	40	0.15	0.8	A	-1.25	40	0.15	0.6
B	-0.6		0.15	1.2	B	0.83		0.15	0.9
C	0.55		0.15	1.2	C	0.8		0.15	0.9

PIR150 0.5 MICRO

Option A					Option B				
Area of wind load	Wind pressure parameter	Load parameter of a suspended facade	Distance between screws	Distance between profiles	Area of wind load	Wind pressure parameter	Load parameter of a suspended facade	Distance between screws	Distance between profiles
	w_c	q_c	l_s	l_p		w_c	q_c	l_s	l_p
Area	[kN/m²]	[kg/m²]	[m]	0.6	Area	[kN/m²]	[kg/m²]	[m]	0.6
A	-1	30	0.15	0.7	A	-1.25	30	0.15	0.58
B	-0.6		0.15	1.1	B	0.83		0.15	0.8
C	0.55		0.15	1.1	C	0.8		0.15	0.8

Since the very beginning, TENAX Group has relied on a key principle: be a stable and trusted partner to its employees, customers and suppliers, ensuring compliance with the highest quality standards in all areas of our operation.

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