TECHNICAL DOCUMENT

HOW TO INSTALL STRUCTURAL PARTICLEBOARD PANELS | P4 - P6

SONAE ARAUCO
Taking wood further

CONTENTS

INTRODUCTION

Structural Tafipan is a wood particleboard panel that is in compliance with European Standard EN 312. It has excellent mechanical properties and is specifically designed for use in construction.

Structural Tafipan panels have CE marking according to European standard EN 13986.

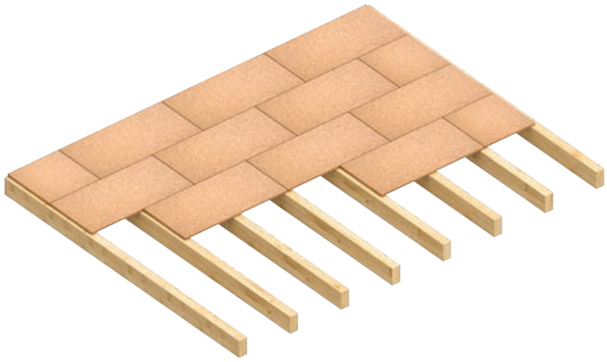


FIG. 1: Roof closing

MAIN USES

- Floor slabs
- Flooring
- Roofs

FIG. 2: Modulation for floor slab

ADVANTAGES

- Significant savings on time and labour costs.
- Dry construction, without drying times or introducing humidity.
- Ease and speed of installation.
- Excellent mechanical properties.
- Maximum use of the material and minimum waste.

FIG. 3: Flooring support

TYPES OF PANELS

TAFIPAN P4

• P4 panels for load-bearing use in dry environments.

• Certified by an independent monitoring body (Production monitoring certificate no. 1328.CPD.0073).

• Main uses: all kinds of closures or finishes, whether on flooring, ceilings or walls.

When the panels are used under conditions equivalent to service class 1, the characteristic values for the mechanical and density properties shown in Tables 1 and 2 are applicable. These values must be changed according to standard ENV 1995-1-1 as a function of the load duration (k_{mod}, k_{def}).

TAFIPAN P6

• P6 panels for heavier loads for load-bearing use in dry environments.

• Certified by an independent monitoring body (Production monitoring certificate no. 1328.CPD.0001).

• Main uses: suitable for all kinds of closures or finishes and recommended for more demanding load-bearing situations.

When the panels are used under conditions equivalent to service class 1, including one-off situations leading to service class 2 situations (such as situations inside unheated buildings located in damp areas), the characteristic values of the mechanical and density properties applicable are shown in Tables 1 and 2, and should be changed according to standard ENV 1995-1-1 as a function of the load duration (k_{mod}, k_{def}).

TABLE 1
MINIMUM CHARACTERISTIC VALUES FOR STRUCTURAL PARTICLEBOARD PANELS FOR USE IN DRY ENVIRONMENTS

THICKNESS (mm)	CHARACTERISTIC VALUES FOR DENSITY (Kg/m³) AND FOR STRENGTH (N/mm²)											
t_{nom}	Density ρ		Bending f_m		Tension f_t		Compression f_c		Shear f_v		Panel shear f_r	
	P4	P6	P4	P6	P4	P6	P4	P6	P4	P6	P4	P6
> 20 - 25	550	550	11.4	13.4	6.9	8.5	9.6	12.8	5.5	6.8	1.4	1.7
> 25 - 32	550	550	9.8	12.6	6.1	8.3	9	12.2	4.8	6.5	1.2	1.7
> 32 - 40	500	500	8	11.8	5	7.8	7.6	11.9	4.4	6	1.1	1.7

The properties not included in this table are in accordance with the requirements of standards EN 312-4 (P4) and EN 312-6 (P6).

TABLE 2
AVERAGE STIFFNESS VALUES FOR STRUCTURAL PARTICLEBOARD PANELS FOR USE IN DRY ENVIRONMENTS

THICKNESS (mm)	AVERAGE STIFFNESS VALUES (N/mm²)					
t_{nom}	Bending E_m		Tension and Compression E_t E_c		Shear G_v	
	P4	P6	P4	P6	P4	P6
> 20 - 25	2 700	3 500	1 600	2 100	770	1 050
> 25 - 32	2 400	3 300	1 400	1 900	680	950
> 32 - 40	2 100	3 100	1 200	1 800	600	900

LOAD AND SPAN VALUES

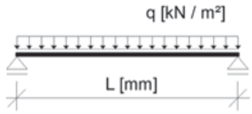
In order to check the maximum permissible load and span values according to the criteria of the Ultimate Limit States (rupture) and Serviceability (deformation), the characteristic values are used. These are determined according to European standards and the criteria of Eurocode 0 (EN 1990) and Eurocode 5 (EN 1995-1-1). The values in the tables refer to a situation of a simply supported panel, being considered a permanent action relative to the actual weight of the boards and a variable action (overload) of medium duration or permanent. Specific projects must be prepared for other situations, bearing in mind the applicable actions and taking the provisions of the Eurocodes and the national safety regulations and measures into account.

TAFIPAN P4

PERMISSIBLE LOADS ACCORDING TO THE SPAN AND THE THICKNESS OF THE TAFIPAN P4 PANELS

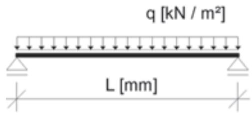
Deflection limit of L/300
Perpendicular supports on the longitudinal axis of the panel

TABLE 3A - MEDIUM DURATION LOADS, UNIFORMLY DISTRIBUTED



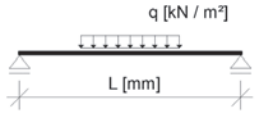
PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm						
	400	500	600	700	800	900	1000
	Maximum load capacity (kN/m²)) for 1 m wide panel						
22	7.53	3.23	1.72	1.02	0.58	0.35	0.21
25	10.12	4.77	2.55	1.52	0.87	0.53	0.33
30	15.10	7.54	4.20	2.50	1.55	0.97	0.60

TABLE 3B - PERMANENT LOAD, UNIFORMLY DISTRIBUTED



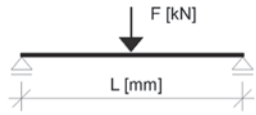
PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm						
	400	500	600	700	800	900	1000
	Maximum load capacity (kN/m²)) for 1 m wide panel						
22	6.36	3.20	1.70	1.01	0.57	0.34	0.21
25	8.54	4.73	2.51	1.50	0.85	0.52	0.33
30	12.75	7.54	4.20	2.50	1.55	0.97	0.60

TABLE 3C - LINEAR LOAD AT MIDSPAN



PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm						
	400	500	600	700	800	900	1000
	Maximum load capacity (kN/m²)) for 1 m wide panel						
22	4.64	1.97	1.04	0.61	0.32	0.20	0.12
25	6.31	2.93	1.60	0.91	0.50	0.28	0.15
30	9.28	4.57	2.48	1.42	0.82	0.46	0.23

TAB. 3D - POINT LOAD (AREA OF 100 X 100 mm) AT MIDSPAN



PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm						
	400	500	600	700	800	900	1000
	Maximum load capacity (kN/m²)) for 1 m wide panel						
22	2.09	1.29	0.87	0.61	0.45	0.34	0.25
25	3.14	1.96	1.33	0.95	0.71	0.53	0.41
30	5.19	3.08	2.00	1.46	1.11	0.85	0.67

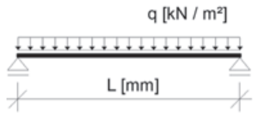
Note: Linear interpolation is allowed.

TAFIPAN P6

PERMISSIBLE LOADS ACCORDING TO THE SPAN AND THE THICKNESS OF THE TAFIPAN P6 PANELS

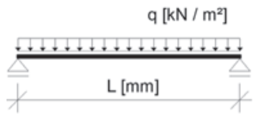
Deflection limit of L/300
Perpendicular supports on the longitudinal axis of the panel

TABLE 4A - MEDIUM DURATION LOADS, UNIFORMLY DISTRIBUTED



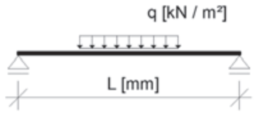
PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm								
	400	500	600	700	800	900	1000	1100	1250
	Maximum load capacity (kN/m²)) for 1 m wide panel								
25	17.90	6.53	3.71	2.22	1.42	0.77	0.50	0.32	0.20
30	24.28	10.44	5.93	3.62	2.32	1.41	0.95	0.82	0.52
35	30.70	15.51	8.80	5.39	3.47	2.32	1.58	1.08	0.60
38	34.57	19.06	10.81	6.63	4.28	3.00	2.05	1.52	1.03
40	37.17	21.65	12.28	7.54	4.87	3.50	2.40	1.95	1.32

TAB. 4B - PERMANENT LOAD, UNIFORMLY DISTRIBUTED



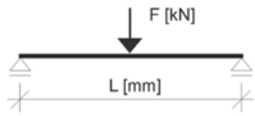
PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm								
	400	500	600	700	800	900	1000	1100	1250
	Maximum load capacity (kN/m²)) for 1 m wide panel								
25	10.38	4.78	3.30	2.18	1.40	0.76	0.49	0.31	0.19
30	14.08	7.66	5.27	3.51	2.29	1.38	0.93	0.78	0.51
35	17.80	11.37	7.83	5.39	3.47	2.32	1.58	1.08	0.60
38	20.05	13.98	9.62	6.60	4.25	2.97	2.03	1.50	1.01
40	21.55	15.87	10.93	7.49	4.81	3.47	2.35	1.93	1.29

TABLE 4C -LINEAR LOAD AT MIDSPAN



PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm								
	400	500	600	700	800	900	1000	1100	1250
	Maximum load capacity (kN/m²)) for 1 m wide panel								
25	11.12	4.08	2.27	1.31	0.86	0.45	0.29	0.18	0.11
30	15.21	6.43	3.62	2.14	1.36	0.79	0.50	0.41	0.26
35	19.03	9.54	5.35	3.21	2.02	1.29	0.83	0.52	0.22
38	21.46	11.82	6.62	3.94	2.48	1.66	1.11	0.89	0.59
40	23.01	13.30	7.41	4.45	2.81	1.94	1.22	1.04	0.69

TABLE 4D - POINT LOAD (AREA OF 100 X 100 mm) AT MIDSPAN



PANEL THICKNESS (mm)	SPAN (DISTANCE BETWEEN SUPPORTS) - mm								
	400	500	600	700	800	900	1000	1100	1250
	Maximum load capacity (kN/m²)) for 1 m wide panel								
25	4.40	2.76	1.87	1.34	0.99	0.75	0.58	0.41	0.30
30	7.19	4.53	3.10	2.24	1.66	1.43	1.15	0.79	0.61
35	10.83	6.88	4.72	3.43	2.61	2.28	1.97	1.53	1.20
38	13.40	8.54	5.85	4.28	3.15	2.68	2.31	1.64	1.17
40	15.31	9.75	6.70	4.88	3.74	3.38	3.02	2.29	1.80

Note: Linear interpolation is allowed.

PUNCHING SHEAR RISK

If the concentrated loads act on a small support area (for example the feet of metal shelves), there is a risk of perforation of the particleboard at the load point (punching shear).

Table 5 shows the maximum Concentrated Loads according to the support area, assuming maximum spans for each board thickness.

If the project involves small supports and loads higher than those shown in Table 5, pad footings must be placed under the load point, using this table as a guide to their sizes.

TABLE 5 - MAXIMUM CONCENTRATED LOADS FOR PUNCHING SHEAR (kN)

SIZE OF SUPPORT (mm)	THICKNESS OF BOARD (mm)					
	22	25	30	35	38	40
25x25 / Ø 7	2.8	3.0	3.2	3.4	3.5	3.6
50x50 / Ø 14	3.8	4.0	4.2	4.5	4.7	4.9
100x100 / Ø 28	7.5	8.0	8.6	9.1	9.5	9.8

PROJECT PROCEDURE

The following procedure applies to the design of the particleboards for floor slabs/flooring. The project for the wooden or metal beams to support the floor slab or flooring is not covered in this brochure. The beams must be designed to meet the specific load/deflection criteria.

1. LOADS AND PERFORMANCE

• Determine the maximum Concentrated Load (CL) and Uniformly Distributed Load (UDL) to be applied to the floor slab/particleboard flooring.

• Define if the UDL is temporary or permanent.

• Decide the deflection limits to be used – normally Span/300 for general traffic areas and Span/200 for restricted areas or industrial floors.

2. PRELIMINARY PROJECT

See the appropriate Load Tables for the type of particleboard to be used and determine the thickness/span options for the projected CL and UDL. There may be three thickness/span solutions for CL and three thickness/span solutions for UDL.

3. PROJECT ADJUSTMENT

If more than one thickness/span solution is possible, check the total cost of the floor and select the most economical board thickness and beam spacing. If the solution indicates very close spacing, review the CL design. Will the CL be applied generally to the floor or will it represent a specifically localised load? Will it be more economical to create a special support for a specific load? Does the entire floor need to be designed to support this load?

4. CHECK THE PUNCHING SHEAR RISK

See Table 5 and determine if the CL is below the maximum safe value for punching shear. Otherwise, specify areas requiring larger supports or suitable pad footings.

Next, it will be presented examples of product application in projects in the residential, office and industrial sectors.

RESIDENTIAL USE

Project a floor of a house with a permanent maximum uniformly distributed load (UDL) of 5 kN/m² and point concentrated load (CL) of 3.1 kN using Tafipan P4.

STEP 1

Determining loads and performance:

- UDL = 5 kN/m²;
- CL = 3.1 kN;
- Deflection Performance = Span/300.

STEP 2

Table 3B shows UDL = 5 kN/m², with the possible solutions being:

- Tafipan P4 22 mm with a span of 400 mm;
- Tafipan P4 25 mm with a span of 490 mm (interspersed);
- Tafipan P4 30 mm with a span of 580 mm (interspersed).

Table 3D shows CL = 3,1kN, with the possible solutions being:

- Tafipan P4 25 mm with a span of 400 mm;
- Tafipan P4 30 mm with a span of 500 mm.

The CL requirements are clearly stricter and therefore the solutions based on the UDL are discarded.

STEP 3

Project adjustment.

Check the costs of the possible solutions. Without going into detailed costs, tight spacings between beams will probably be costlier. Therefore, Tafipan P4 30 mm with beam spacing of 500 mm could be the most economical.

STEP 4

Check the punching shear risk.

The CL is 3.1 kN. See Table 5 for the maximum loads for resisting punching shear failure. A concentrated load of 3.1 kN is safe for Tafipan P4 30 mm. It is also safe for the 25 mm if the load point is at least 50 x 50 or Ø 14 mm.

USE IN OFFICES

An office is to be built in an existing building. The floor is P6 25 mm particleboard on beams spaced at 450 mm. The inspection showed that all wood was solid, but the loads for the office floor are assessed at UDL = 5 kN/m^2 and CL = 4.5 kN.

STEP 1

Determining loads and performance:

• UDL = 5 kN/m^2;

• CL = 4.5 kN;

• Deflection Performance = Span/300.

STEP 2

Preliminary check of the capacity of the existing project.

• Table 4B shows that Tafipan P6 25 mm can support a UDL up to 7.58 kN/m^2.

• Table 4D shows that Tafipan P6 25 mm can support a CL up to 3.58 kN/m^2.

Thus, the floor can support the necessary UDL, but not the CL.

STEP 3

Consider an extra layer of Tafipan P4 22 mm flooring. The load capacity of the particleboard 22 mm flooring on beams with spacing of 450 mm is (from Table 3D) CL = 1.69 kN.

For a layer of P6 25 mm and a layer of P4 22 m, adding the individual capacities gives CL = 3.58 + 1.69 = 5.27 kN, which is satisfactory.

STEP 4

Check the punching shear risk.

Table 5 gives a maximum punching shear load of 2.8 + 3.0 = 5.8 kN.

Therefore, no minimum requirements are necessary for the support areas (although these supports must never be smaller than 25 x 25 mm or Ø 7 mm).

STEP 5

Check the suitability of the existing beam system. This example focused on the particleboard flooring, but the beam system must also be checked using the new project loads.

USE IN WAREHOUSES

There is a proposal for the use of single axle trolleys on an existing Tafipan P6 35 mm panel floor supported on beams spaced at 700 mm. The trolleys will carry loads of up to 500 kg. Can the floor support these loads?

STEP 1

Loads and performance:

• UDL = no change;

• Deflection Performance = Span/300;

• CL = 500 kg + 50 kg for the trolley = 550 kg, i.e. 5.5 kN system load. Each wheel turn will apply 2.75 kN on the floor.

STEP 2

Checking the capacities of the existing floor.

From Table 4D, Tafipan P6 35 mm with beam spacing of 600 mm can support up to 3.43 kN of mobile load.

Therefore, the floor can support the trolley load.

STEP 3

Check the punching shear risk in Table 5. The maximum CL is 3.4 kN.

The situation is satisfactory, provided the trolley wheels have a rolling area of more than the equivalent of 25 x 25 mm.

STEP 4

Checking dynamic loads.

The aim of this example was to illustrate the trolley loads. In practice, the dynamic loads involved in stopping and changing direction must also be checked, especially if the trolley is motorised.

INSTRUCTIONS FOR USE

ONSITE INSTALLATION

The boards must be installed on at least three supports. The sides parallel to the supports (generally the shorter sides) must be supported all along their length. The support area for the boards on the beams or crossbeams must be at least 25 mm wide.

SPECIAL PROVISIONS

Leave an expansion joint of 1 mm per linear metre between boards, in both directions.

For a layout with continuous edges: Maximum area 30 m^2, with the extent of the area covered not exceeding 7 metres. Leave a perimeter joint of at least 10 mm on the floor.

FIXINGS

It is preferable to secure the boards with screws every 200 mm on the sides and every 300 mm on the intermediate joints. The length of the screws must be at least 2.5 times the thickness of the boards.

If nails are being used, they must be nailed in every 150 mm on the sides and every 300 mm on the intermediate joints. The length of the nails must be at least 3.5 times the thickness of the boards. The nails must be complemented with screws on the four corners of the boards and in the middle of each side.

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