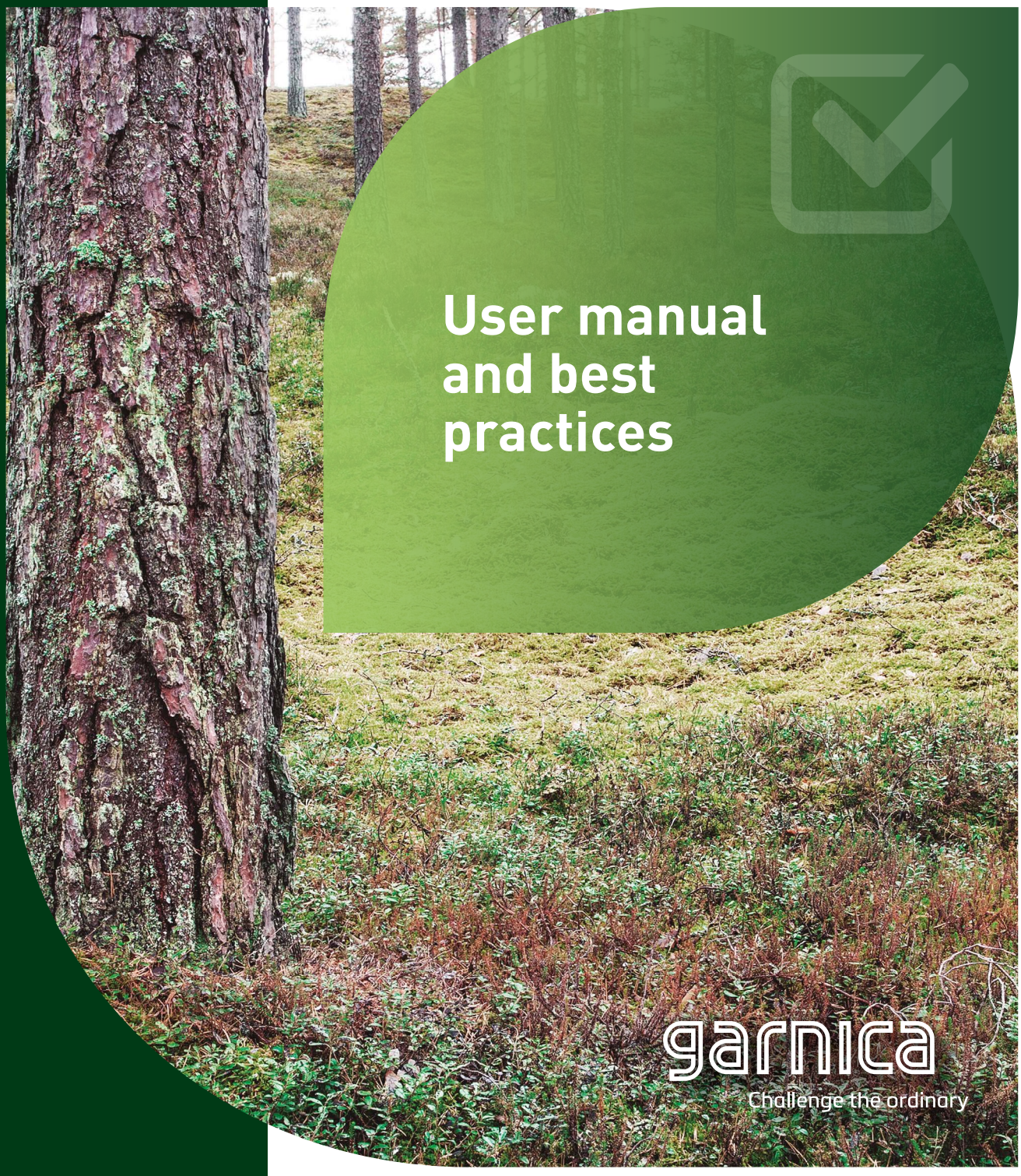
MADERAS
DE LLODIO

Made to last



User manual and best practices

garnica
Challenge the ordinary

MADERAS
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laudio

CONTENTS

AIMS

This document aims to provide general guidelines for the proper use of panels in order to:

- ☑ Preserve the characteristics of the material
- ☑ Increase the useful life of the panel
- ☑ Optimise the number of uses
- ☑ Improve the concrete finish
- ☑ Guarantee the end user is satisfied

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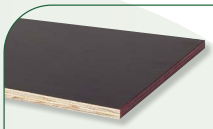
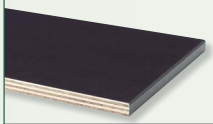
PRODUCT RANGE

	laudio form	**Plywood panel with a Radiata Pine-based core covered with 170 g/m² smooth phenolic film on both faces.**
	laudio form TOP	**Plywood panel with a Radiata Pine-based core covered with smooth phenolic film - 440 g/m² on the face and 170 g/m² on the back.**
	laudio form plus	**Plywood panel with Radiata Pine-based core reinforced with eucalyptus and covered with 170 g/m² smooth phenolic film on both faces.**
	laudio wire	**Plywood panel with a Radiata Pine-based core covered with 170 g/m² anti-slip phenolic film on both faces.**
	laudio wire Xtra	**Plywood panel with Radiata Pine-based core covered with phenolic anti-slip film - 240 g/m² on the face and 120 g/m² on the back.**
	laudio wire plus	**Plywood panel with Radiata Pine-based core reinforced with eucalyptus and covered with 170 g/m² anti-slip phenolic film on both faces.**
	laudio wire plus Xtra	**Plywood panel with Radiata Pine-based core reinforced with eucalyptus and covered with phenolic anti-slip film - 240 g/m² on the face and 120 g/m² on the back.**
	laudio pine	**Radiata Pine-based plywood panel. Quality faces: II, II/III, III and IV.**
	laudio pine TG	**Radiata Pine-based plywood panel with tongue and groove finish on two (TG2) or four (TG4) edges. Quality faces: II, II/III, III and IV.**
	laudio pine plus	**Plywood with a eucalyptus-reinforced Radiata Pine-based core and pine faces. Quality faces: II/III and III.**
	laudio deco	**Radiata Pine-based decorative plywood. Quality faces B/C (I/III).**
	laudio deco Groove	**Radiata Pine-based decorative plywood with grooved face on the longitudinal side (type U or W). Comes with a tongue and groove finish on the two longest edges (TG2). Quality faces B/C (I/III).**
	laudio LVL (L)	**Radiata Pine-based plywood panel with all sheets unidirectional.**
	laudio LVL (T)	**Radiata Pine-based plywood panel with unidirectional sheets and two or more transversal sheets.**

APPLICATIONS

	Horizontal formwork	Vertical formwork	Exposed formwork	Curved formwork	Formwork systems	Precast concrete	Stages	Vehicle floors	Industrial flooring	Packaging	Furniture	Decoration	Ceilings	Walls	Flooring	Scaffolding
laudio form	⊗			⊗		⊗										
laudio form TOP	⊗	⊗	⊗	⊗		⊗										
laudio form plus	⊗	⊗		⊗	⊗	⊗										
laudio wire							⊗	⊗	⊗							⊗
laudio wire Xtra							⊗	⊗	⊗							⊗
laudio wire plus							⊗	⊗	⊗							⊗
laudio wire plus Xtra							⊗	⊗	⊗							⊗
laudio pine								⊗		⊗	⊗	⊗	⊗	⊗	⊗	
laudio pine TG													⊗	⊗		
laudio pine plus								⊗		⊗		⊗	⊗	⊗	⊗	
laudio deco											⊗	⊗	⊗	⊗		
laudio deco Groove												⊗	⊗	⊗		
laudio LVL (L)											⊗	⊗	⊗	⊗		
laudio LVL (T)								⊗	⊗		⊗				⊗	

⊗ *Recommended product*

⊗ *Alternative product or product that meets the basic requirements*

PANEL STORAGE

STORING THE PRODUCT PRIOR TO INSTALLATION OR TRANSFER TO SITE

✔ Do not expose the material to extreme storage conditions as this may damage the panels:

- Avoid sudden changes in temperature and/or humidity.
- Avoid very hot or very dry storage areas.
- Protect the panels from exposure to direct sunlight and avoid direct contact with water.

✔ We recommend storing in a closed, dry room.

✔ If this is not possible and the material must be stored outside, it should be kept under a vapour-permeable, waterproof covering. All panels should be stored on raised supports to avoid contact with agents that might damage the panels (puddles, soil, mould, fungus, etc.).

✔ We recommend storing the material horizontally on flat surfaces and, if necessary, levelling it with suitable supports.

✔ The stacking of the panels must comply with minimum safety requirements. Panels must be stacked on battens placed a maximum of 600 mm apart in order to avoid panel deformation. If several packs are to be stacked, we recommend that the battens are aligned vertically to ensure suitable weight distribution.

✔ Avoid placing panels near machinery transit areas.

PANEL STORAGE

STORING THE PRODUCT ON CIVIL PROJECTS

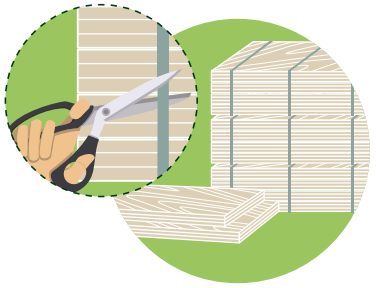
- ✔ If the material is not going to be used immediately after arriving on site and is to be stored, it must be stored in conditions that comply with those described above.

- ✔ We recommend the packaging is kept on for as long as possible before conditioning for use.

STORING THE PRODUCT AT THE PLACE OF USE / INSTALLATION

- ✔ We recommended the panel is conditioned before use by removing the protective packaging to acclimatise it to the working conditions.

- ✔ Once the packaging has been removed, care must be taken during transport as the panels may slip. The possibility of slipping is increased in the case of filmed panels.



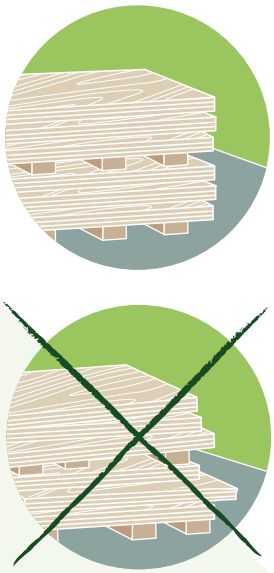
Conditions of use	Products
Scope of conditions of use outdoors 3.2. according to UNE-EN 335 "Durability of wood and wood-based products". **Classes of use:** Exterior. Above ground, exposed to the elements. Panels remain wet for long periods*. Water may accumulate.	laudio form laudio form plus
Scope of conditions of use outdoors 3.1. according to UNE-EN 335 "Durability of wood and wood-based products". **Classes of use:** Exterior. Above ground, exposed to the elements. The panels do not remain wet for long periods. Water does not accumulate.	laudio wire laudio wire plus
Scope of conditions of use indoor in a humid environment 2 according to UNE-EN 335 "Durability of wood and wood-based products". **Classes of use:** Panels are covered and are not exposed to the elements but may be subject to occasional but not persistent humidification. In this type of use, condensation may occur on the surface of the wood.	laudio pine laudio pine plus laudio deco laudio LVL

** Laudio Form and Laudio Form Plus panels are designed for temporary outdoor use.*

PANEL HANDLING

GENERAL RECOMMENDATIONS:

- ✔ Avoid the use of mechanical handling equipment, metal slings or other items that could mark and/or damage the panels.
- ✔ We recommend that lifting forks are protected to avoid marking the panel on the base of the pack.
- ✔ Panels must be lifted, moved and stacked correctly to avoid warping or other possible deformations.
- ✔ To avoid damage or scratching of the finished surfaces, the panels must not be moved over each other using rollers with sharp edges or chains.
- ✔ Once the packaging has been removed from **Laudio Form** and **Laudio Form Plus** products, the pack should not be moved as the panels are very slippery.



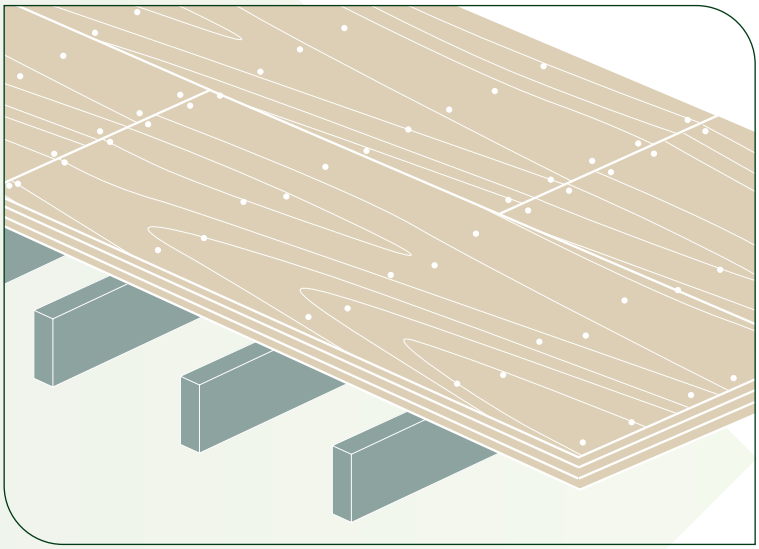
PANEL INSTALLATION

The following recommendations apply to **Laudio Form** and **Laudio Wire** filmed panels used in the construction of horizontal slabs.

We recommend that panels with straight edges are supported continuously on all four sides, with the shorter sides resting on battens and the longer sides on cross members or joint coverings.

The nails and screws must have a length that is at least twice the thickness of the panel and a diameter at least 0.16 times the thickness of the panel.

We recommend nails and screws are countersunk 2 to 3 mm below the panel surface. When used as a floor covering, it is preferable not to seal the countersink holes.

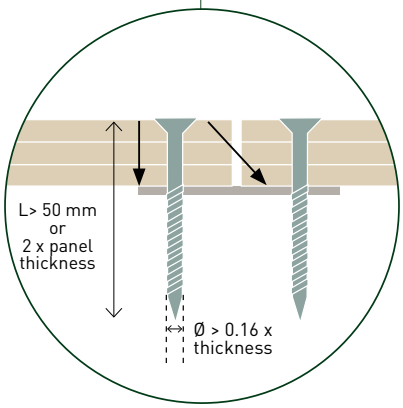


If the panel is fixed incorrectly, it can have a limited use and lead to problems, such as a reduced useful life as a result of repairs or the possibility of the panel being chipped.

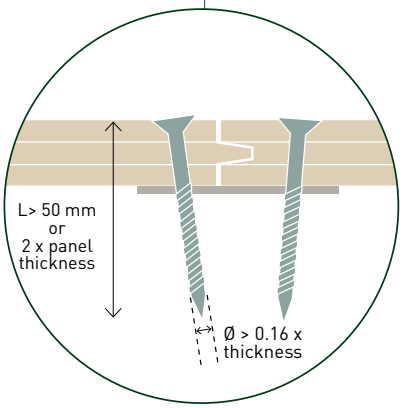
The maximum and minimum distance between the fixings and the edges are shown below:

Maximum distance between fixings (mm)		Minimum distance from the edge of the panel (mm)
Distance between fixings around the panel perimeter	Distance between fixings on battens, beams or uprights that serve as intermediate supports for panels	
150	300	8

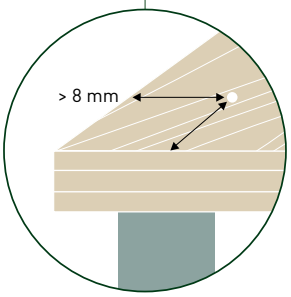
PANEL INSTALLATION



Fixing requirements
for flat ended panels



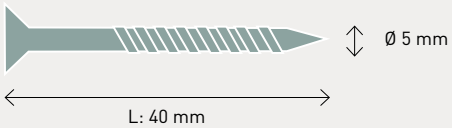
Fixing requirements for tongue
and groove panels



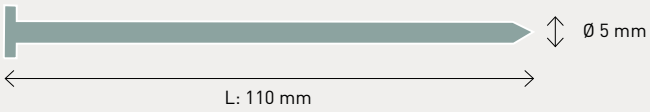
For an 18 mm panel the following requirements must be met:

- Length must be greater than 40 mm
- Diameter must be greater than 5 mm

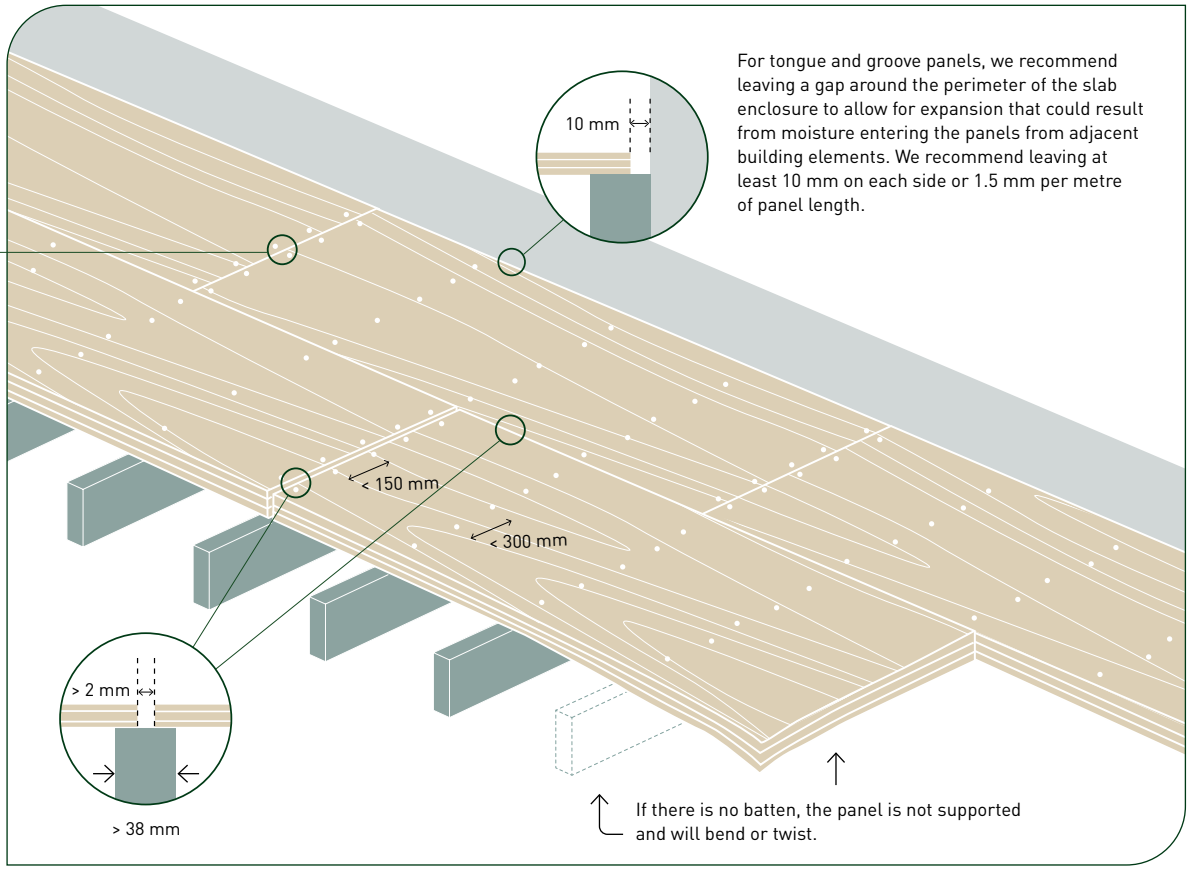
Wood screw:



Spikes and nails:



In the case of the **Laudio Form** panels, use steel spikes instead of wood screws so that it can be disassembled from below.



Incorrect shoring between panels.

For further information, please refer to **UNE-ENV 12872, "Wood-based panels. Guidance on the use of load-bearing boards in floors, walls and roofs"**.

CHARACTERISTICS

Laudio Form Family

Laudio Form panels are made of a Radiata Pine-based core and covered with a smooth fused phenolic film.

The **Laudio Form Plus** version has improved mechanical performance resulting from the combination of Radiata Pine wood and Eucalyptus Globulus.

Both versions of the panel are available with the edges sealed with damp-proof paint.

	Horizontal formwork	Vertical formwork	Exposed formwork	Curved formwork	Formwork systems	Precast concrete	Stages	Vehicle floors	Industrial flooring	Packaging	Furniture	Decoration	Ceilings	Walls	Flooring	Scaffolding
laudio form	⊗			⊗		⊗										
laudio form TOP	⊗	⊗	⊗	⊗		⊗										
laudio form plus	⊗	⊗		⊗	⊗	⊗										

⊗ *Recommended product*

⊗ *Alternative product or product that meets the basic requirements*

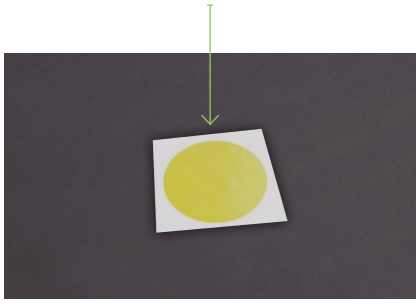
CHARACTERISTICS

One of the characteristics of the **Laudio Top Form** panel is the difference between the face and back covering (440 g/m² face and 170 g/m² back).

Sealing of edges: colour of damp-proof paint	
Form Plus Family	Anthracite grey RAL 7016
Form Family	Phenolic paper red 2 EDE 2999

Two red lines are added on the Top version

A sticker with a yellow circle is put on the back of the panel.

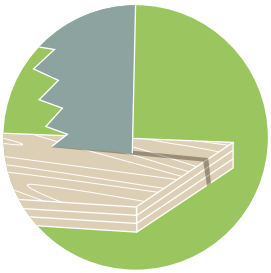


PREPARING THE PANELS

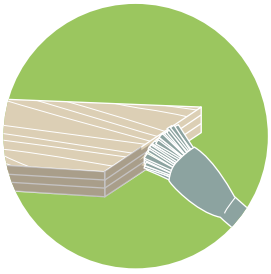
Irrespective of the type of coating, it is essential that the plywood panels are thoroughly treated with a release agent before first use. We recommend treating the panels twice before first use and once before each subsequent re-use.

The quality of the release agent may affect the quality or appearance of the concrete finish. It is important to follow the supplier's instructions.

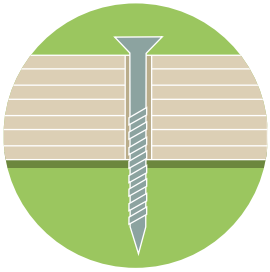
✔ The panels should be cut using a fine toothed saw to minimise breakage of the panel or coating.

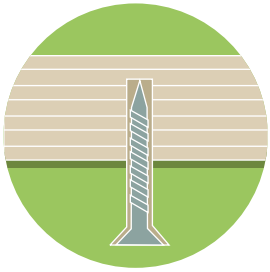


✔ After cutting, it is important that the edges of the panels are sealed to provide protection: this avoids excess moisture in the panel and minimises rippling.



✔ To ensure an improved concrete finish, it is recommended that they are fixed from below, i.e. the non-concreting side, whenever possible.





POURING CONCRETE

Pour the concrete and insert the vibrator in the rebar, making sure it is long enough to vibrate all the concrete that has still not set. Gaps between panels silicone joints, paste, weatherstripping or felt should be covered prior to pouring to contain the uncured concrete and avoid leaks.

If the vibrator touches the panel, part of the panel may stick to the concrete. The vibrator must therefore be protected with a rubber block or the rebar must be designed so that the vibrator cannot touch the panel.

Mark left on the face of the panel by the vibrator.

Mark left in the concrete by the vibrator.

To avoid breaking the panel, the formwork should be stripped as soon as possible so that there is as little adherence to the concrete as possible.

The concrete manufacturer should be consulted throughout the process.

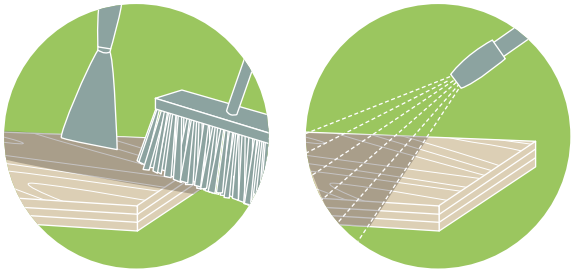
CHARACTERISTICS

Examples of uses of panels from the Laudio Form family.

DISASSEMBLY

Follow the concrete manufacturer's instructions for the formwork stripping process.

After the panel has been used, it must be cleaned and treated with a release agent immediately after stripping and before being stored for further use.



Formwork that is not cleaned immediately after use is likely to be damaged when the formwork is stripped after the next use.

Plastic or nylon tools are recommended during cleaning. Metal brushes and high-pressure cleaning should not be used.

The formwork should be stored horizontally with its face protected from the sun, e.g. leaning against a wall. Exposing the plywood face to the sun can cause rapid moisture loss in the first sheet and damage the phenolic film.

We recommend that any small marks are repaired using an appropriate putty and deep cracks or holes repaired with putty or epoxy filler.

Refer to the storage conditions set out in previous sections.

RIPPLING AND CRACKING

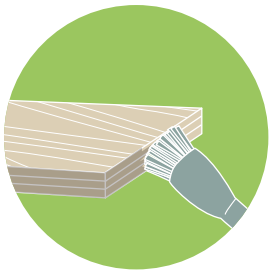
Certain weather conditions trigger natural phenomena in the wood, which can be seen on the surface of the panels.

- **Rippling** is a phenomenon where wood fibres swell, creating waves in the face of the wood. This may occur in conditions of high humidity.
- **Cracking** is caused by the wood shrinking, which causes the film to crack. This can be observed in conditions of high thermal contrast.

Rippling effect on the panel.

Rippling effect on concrete.

To minimise rippling, we recommend using the 440 gr/m² side of the **Laudio Top Form** panel and to properly seal the edges with two coats of paint. In cases where the concrete has already been poured and rippling is noticeable, we recommend wetting the panels with lots of water to balance the swelling on the face of the panel.



This can be effective as long as the temperature gradient does not alter sharply afterwards.

It should be noted that rippling is a natural phenomenon independent of installation and inherent to the wood: it is more pronounced when the panels are first used since the variation in humidity is most abrupt.

To achieve a better quality finish, we recommend the use of **Laudio Top Form**, which has a barrier that prevents cracking, lessens the effects of rippling and minimises the telegraphing of the wood.

OTHER CONSIDERATIONS

Laudio Form is not recommended for formwork for concrete with a white decorative finish since the characteristics of the wood may be reflected in the finish.

It should be noted that the quality of the panel surface may be affected by how many times it has been used.

At certain times of the year resin can leak from the knots in the sheets.
This resin can be cleaned with acetone before use.

Laudio Wire Family

Laudio Wire panels are made of a Radiata Pine-based core and covered with an anti-slip phenolic film on the face and a smooth film on the back.

The **Laudio Wire Plus** version has improved mechanical performance resulting from the combination of Radiata Pine wood and Eucalyptus Globulus.

Both versions of the panel are available with the edges sealed with damp-proof paint.

	Horizontal formwork	Vertical formwork	Exposed formwork	Curved formwork	Formwork systems	Precast concrete	Stages	Vehicle floors	Industrial flooring	Packaging	Furniture	Decoration	Ceilings	Walls	Flooring	Scaffolding
laudio wire							⊗	⊗	⊗							⊗
laudio wire Xtra							⊗	⊗	⊗							⊗
laudio wire plus							⊗	⊗	⊗							⊗
laudio wire plus Xtra							⊗	⊗	⊗							⊗

⊗ *Recommended product*

⊗ *Alternative product or product that meets the basic requirements*

It is important to take care when loading and unloading materials so as not to damage the surface. The process should be carried out progressively. Repeated movements of heavy vehicles, as well as sudden impacts (falling heavy objects, sharp objects etc.), could affect the durability of the panels if precautions are not taken.

Heavy loads should be evenly distributed over the surface (spanning several support points if possible), avoiding point loads in small areas of the panel.

Refer to the properties of the panel in the data sheet and the DOP (Declaration of Performance) to ensure that the bending load on the panel does not exceed the limit and the deflection is minimised.

Examples of uses of panels from the Laudio Wire family.

Laudio Pine Family

Laudio Pine panels are particularly versatile due to their composition based on European Radiata Pine from sustainable plantations.

The **Laudio Pine Plus** version has improved mechanical performance resulting from the combination of Radiata Pine wood and Eucalyptus Globulus.

	Horizontal formwork	Vertical formwork	Exposed formwork	Curved formwork	Formwork systems	Precast concrete	Stages	Vehicle floors	Industrial flooring	Packaging	Furniture	Decoration	Ceilings	Walls	Flooring	Scaffolding
laudio pine								⊗		⊗	⊗	⊗	⊗	⊗	⊗	
laudio pine TG													⊗	⊗		
laudio pine plus								⊗		⊗		⊗	⊗	⊗	⊗	

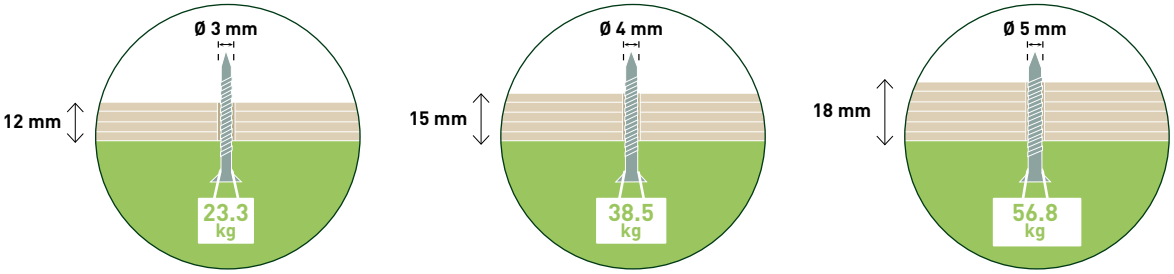
⊗ *Recommended product*

⊗ *Alternative product or product that meets the basic requirements*

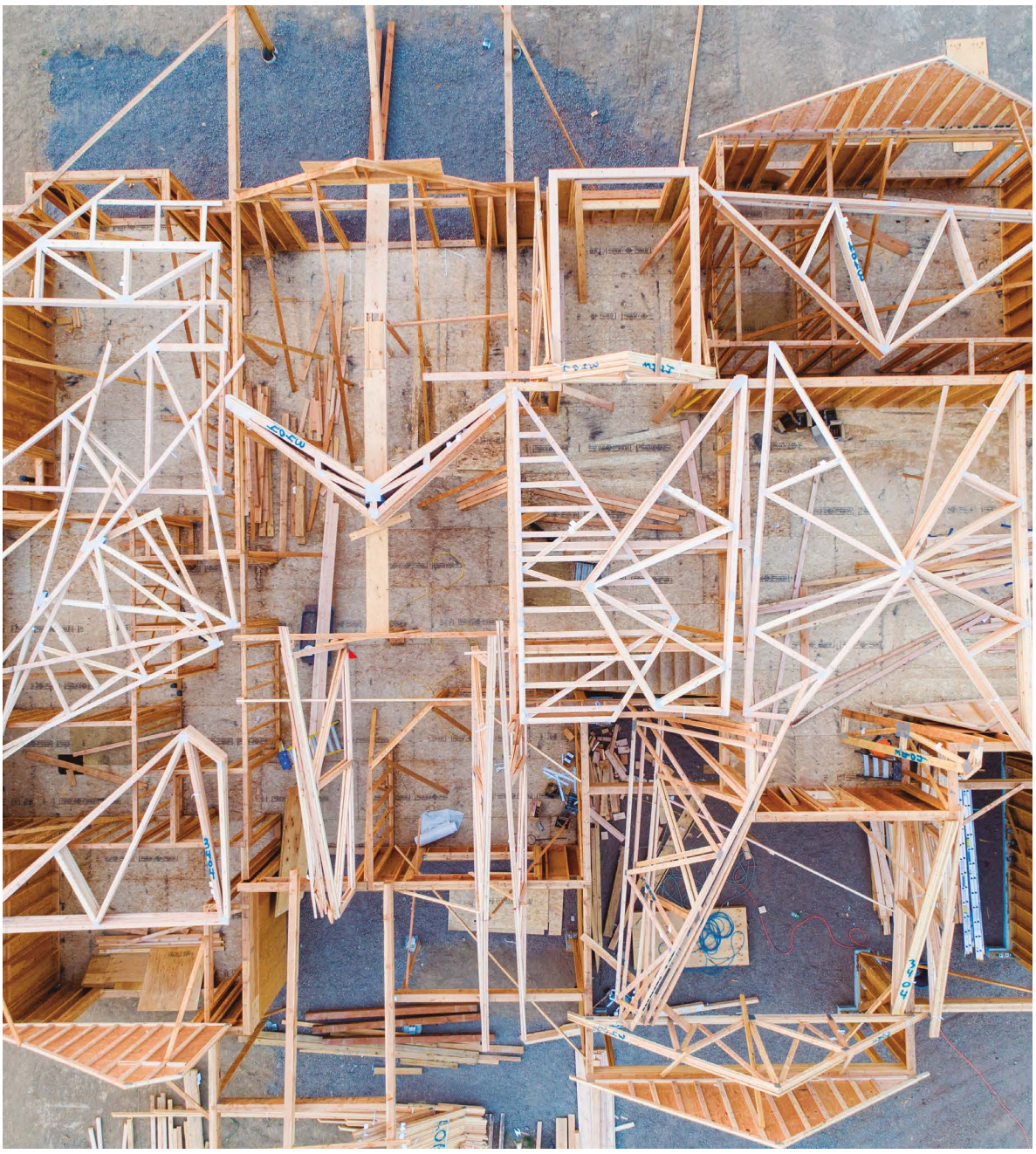
Laudio Pine and **Laudio Pine Plus** have been tested according to **EN 13446 "Wood-based panels. Connector withdrawal resistance"**. The results of this analysis are shown below:

	Thickness (mm)	Screw diameter								
		3 mm			4 mm			5 mm		
		f_{Face} (N/mm²)	f_{Edge} (N/mm²)	Load (kg)	f_{Face} (N/mm²)	f_{Edge} (N/mm²)	Load (kg)	f_{Face} (N/mm²)	f_{Edge} (N/mm²)	Load (kg)
laudio pine	**9**	34	27	24.0	28	12	34.9	27	26	52.4
	12	33	24	23.3	25	15	31.2	23	35	44.9
	15	33	23	23.2	31	13	38.5	22	38	43.3
	18	33	27	23.6	30	15	37.1	29	37	56.8
	21	32	30	22.8	30	19	38.3	32	31	63.7
laudio pine plus	**9**	40	31	28.4	27	17	34.3	30	26	59.7
	12	41	34	28.7	35	19	44.5	27	30	52.0
	15	47	32	32.9	37	17	47.0	40	34	78.9
	18	43	30	30.2	40	20	50.1	37	33	72.7
	21	44	33	30.8	42	22	52.8	39	58	76.9

A graphical representation of the load that can be supported by **Laudio Pine** plywood on a roof is shown below. A panel thickness has been selected for each of the three screw diameters analysed.



Examples of uses of panels from the Laudio Pine family.



REUSING PANELS AT THE END OF THEIR USEFUL LIFE

When a panel is no longer suitable for its intended use, it can be reused for other purposes, such as packaging.

Furthermore, the panels can be used as biomass wood.

As a final option, the product can be disposed of: we recommend it is shredded and subsequently incinerated in an authorised facility in accordance with the corresponding environmental legislation applicable in each particular country.

MADERAS
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User manual and best practices | MADERAS DE LLODIO | Version 1 | May 2021 | © Design: BRANDSMITH

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