TABIHAUS® BUILDING SYSTEM

WORKING METHODOLOGY TABIHAUS® PANELS

Quick guide to project procedures

OWNER:

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Object

The content of this document aims to describe the TABIHAUS® Efficient Building System for the knowledge of the project management and the installer, and thus to better understand its operation and applications in the sector. In addition, the procedure and work methodology used by the TABIHAUS® technical department during the process of distribution, installation and optimisation of TABIHAUS® panels will be explained in as much detail as possible, as well as the criteria and rules that must be complied with for this system.

Description of the building system

The TABIHAUS® Efficient Building System is a complete building envelope solution for the different parts of the building.

The system is executed using non-load-bearing panels, which means that it must always be supported by the support recommended by the project management for each project. These supports can be made of metal framing, hot-laminated profiles, steel frame or timber framing.

In the case of continuous walls, in brick or concrete walls, etc., a metal substructure must be installed on the wall in order to screw the panels to it. It is also possible to install them directly on the masonry wall, for which the wall must be perfectly plumb.

The panels are manufactured in standard nominal sizes of 2600 mm x 1200 mm and 3000 mm x 1200 mm. The thickness of the XPS is customised to the requirement of the project management, from 14 mm upwards, in increments of 1 mm. Therefore, the panel of lesser thickness will be 8 mm of salt board, and 14 mm of XPS).

ANDARAGÓN S.L.U., through the TABIHAUS® Efficient Building System, cannot be held responsible for the calculation study of the different supports or trusses, which will be designed under the mandate of the project management, taking into account their structural integrity, load and suction of wind forces, stability, and calculation of inertia.

It is an essential requirement for correct installation that the base support is correctly levelled. The panels can also correct slight levelling faults in the original structure, but not too much.

The TABIHAUS® efficient construction system is made up of sandwich panels, which consist of one or two sheets of Epsom Salt double reinforced with fibreglass and 100% recycled XPS insulation. In addition, it allows multiple finishes, paints, mortars, lime cements, vertical garden, ventilated façade, ceramic or stone cladding, etc.

Intended uses of TABIHAUS® Efficient Building System

The TABIHAUS® Efficient Building System is used as exterior cladding in enclosures, partition walls and interior cladding, flat or pitched roofs, inverted roofs, slabs and floors. Also, in other uses such as steps, ramps, and its installation as technical cladding in lift shafts.

Anchorages to the support must be chosen according to the support and the stresses to which they will be subjected. They must also be protected against corrosion depending on the environment in which they are to be used. For this purpose, they should be protected with TABIHAUS® bonding compound.

Also, when using the TABIHAUS® Efficient Building System in unique buildings (e.g. high-rise buildings), other possible effects such as, for example, the shortening of the columns themselves, or the horizontal deformations of the structure due to wind and seismic forces must be considered.

TABIHAUS® Efficient Building System Components

The TABIHAUS® Efficient Building System is made up of the following components:

SYSTEM COMPONENTS

- TABIHAUS® prefabricated panel
- TABIHAUS® polymer
- Screws
- 2 and 6 mm spacer shims
- TABIHAUS® bonding-compound

ACCESORIES

- Fibreglass mesh for paint finishes
- Fibreglass mesh for mortar finishings
- Window frame profile
- Edge trim with mesh
- Drip edge profile with mesh
- Self-adhesive bituminous waterproofing tape
- Ventilated façade profiles
- Ceramic fixing staples
- Mortars required for each system
- Roof battens
- Roof tiles

TABIHAUS® prefabricated panel measuring 2600 mm x 1200 mm or 3000 mm x 1200 mm. It is composed of one or two Epsom salt boards reinforced with double glass fibre mesh, liquid waterproofing, recycled EPS particles and other additives. And bonded, a 100% recycled and recyclable XPS.

They are supplied with a thickness of 8 mm salt board, obtaining a value of EI 120 (8 mm board) and the thickness of the XPS is supplied to measure, millimetre by millimetre, from 14 mm to 120 mm. The thickness supplied will be given according to the thermal transmittances in the thermal envelope, and the values in terms of bending, as required by the project management.

Treatment of joints between panels

The excellent thermal stability of TABIHAUS® panels can be seen in their linear thermal expansion coefficient of 0.047 %, obtained in the laboratory at test temperatures > 65 ºC.

With this value, and with a safety coefficient (multiplied by three), two types of expansion joints can be created for panels installed outdoors:

A) 6 mm joints

The panels shall be spaced at installation with **6 mm spacer shims every 14 metres** in either vertical or horizontal direction, resulting in a 6 mm thick joint. Also at the start of the façade or wall with respect to the ground level, and at the junction with the roof or upper edge.

The resulting gaps are then filled with TABIHAUS® polymer (creating an expansion joint).

B) 2 mm joints

The panels will be separated in their installation by 2 mm spacer shims in the corners, and in the corners, filled with TABIHAUS® polymer.

In the rest of the exterior areas, thermal envelope, the panels will be installed head-to-head.

In the case of interior installation, slabs, floors or partition walls, the panels will be installed head-to-head.

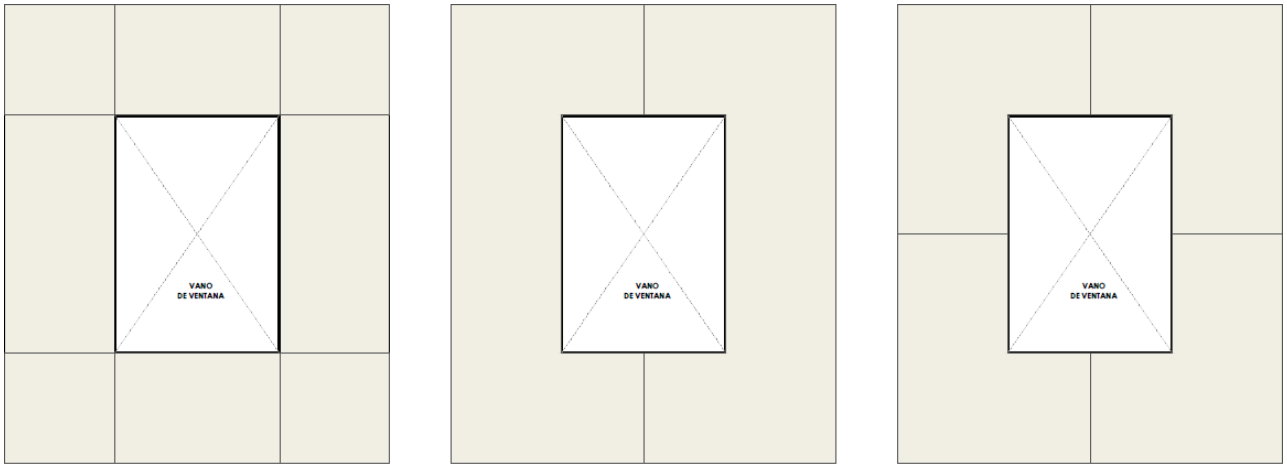
Façade design criteria

The design of the façade, opaque panels and openings must be modulated, taking into account the size of the panels.

Likewise, for the purposes of pre-dimensioning in the project, a 2 mm joint must be considered for the start of the façade, for its meeting with the roof, and in the corners of the façade (the panel can be cut on site for a correct modularisation and installation for these purposes) and the distance between openings or between opening and corner must be greater than or equal to 15 cm.

Recommended orientation for panels installed to create window openings in façades:

- The end of a gap or opening can **never** coincide with the edge of a panel.
- The panel must be cut according to the project requirements to form the required span. The isotropic properties of the panel allow it to adapt to any situation.
- It is necessary to install profiles or **reinforcement framework around the perimeter** of the span.
- Failure to follow the installation instructions may result in cracks.



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The design options discussed previously are reflected in the image above.

When used as a cladding for a masonry wall that is not perfectly plumb, a galvanised steel profile must be installed beforehand, to which the panels will be glued, sealed and screwed.

There are two possibilities for the layout of these profiles, depending on the dimensions of the panels and the needs of the project:

- **Transversely** arranged profiles: the profiles will be such as to allow screwing at **three points** across the width of the panel, being the following: **dimension 0 mm; dimension 600 mm and dimension 1200 mm**.

The maximum spacing required for the panel support profiles will therefore be 600 mm.

- Profiles arranged in **longitudinal** direction:

  PANEL OPTION 2600 mm x 1200 mm: this profile will be such as to allow screwing at **five points** along the length of the panel, as follows: **dimension 0 mm; dimension 650 mm; dimension 1300 mm; dimension 1950 mm and dimension 2600 mm**.

  PANEL OPTION 3000 mm x 1200 mm: these profiles will be such that they can be screwed at **seven points** along the length of the panel, as follows: **dimension 0 mm; dimension 500 mm; dimension 1000 mm; dimension 1500 mm, dimension 2000 mm, dimension 2500 mm and dimension 3000 mm**.

The maximum spacing required for the panel support profiles will therefore be 650 mm.

In any case, and regardless of the modularisation of these profiles, **additional perimeter profiles must be installed around the openings**, so that the panels do not overhang in these areas.

In lightweight frame construction systems, the usual layout is smaller, but **the distances mentioned above must be checked** so that they **do not exceed 600 mm and 650 mm**, so that the panels are never overhung during installation

Roof design criteria

The roof design must be modulated, taking into account the size of the panels.

Likewise, for the purpose of pre-dimensioning in the project, a **6 mm joint must be considered every 14 metres of roof length**, which will be filled with TABIHAUS® polymer as an expansion joint.

An expansion joint of 6 mm is provided at the joints between slopes, i.e. at the hip, valley and ridge areas (the panel can be cut on site for correct modularisation and installation for this purpose).

The panels can be placed both horizontally and vertically, and allow a combination of both positions, as they are isotropic.

Support on framework

If the supporting surface is a framework, structure or substructure of profiles, the layout of the same will be such that the panels of the TABIHAUS® system can be glued and screwed, according to the following indications:

Where walkable roofs are required, the panel must be made of **double-sided** Epsom salt board.

The layout of these profiles may have different possibilities depending on the dimensions of the panels and the needs of the project. See the drawings of permitted supports.

In the case of non-walkable roofs on profiles, the use of a panel with a single-sided salt board is permitted, but with the following considerations:

A) The minimum panel used must comply with the **thickness of 8 mm + 30 mm**.
B) The profiles must have a **flat support area** for the panel of **at least 9 cm wide.**
C) It may be installed with the Epsom salt panel facing outwards, or inwards, thus creating an inverted roof slab.

Support on continuous structure

If there is a continuous support, reinforced concrete slab, lost slab, wooden boards, etc., TABIHAUS® panels with a salt board on one side will be used, with the XPS resting on this support. In this case we are talking about the use of TABIHAUS® as an industrialised roof.

This allows the TABIHAUS® to correct small imperfections that may exist in the support, such as gaps between panels, roughness of the mortar or concrete, etc.

Before receiving the panels, a bead of TABIHAUS® polymer must be applied to the entire support surface for chemical fixation. At least 5 beads must be applied parallel to the length of the panel, paying special attention to the perimeter of the panels.

Design criteria for slabs/floors

The design of slabs or floors should be modulated, taking into account the size of the panels. Due to the minimal coefficient of linear thermal expansion of the TABIHAUS® panels, they will be laid **head-to-head on the floors and slabs inside the dwellings**, therefore, it will not be necessary to separate the joints between panels.

In slabs outside the building, the aforementioned guidelines are established, with expansion joints of 6 mm every 14 linear metres. The panels can be placed both horizontally and vertically, and allow a combination of both positions, as they are isotropic.

It also allows support by means of 'Plots', with a distribution of at least 4 units / m^2. This situation offers the possibility of laying raised floors.

It can be used as a floor, installed on lost screed, **continuous wood surfaces**, mortar or concrete, **a panel with an Epsom salt board** will be installed on one side, where the XPS will be in contact with the surface. It acts as a thermal and acoustic insulator, and as a moisture barrier by capillarity.

In **lightweight frame** construction systems, panels with Epsom salt board will be installed **on both sides**, and the spacings as discussed and described in the document on permissible supports will be checked.

In construction systems using hot-rolled profiles, **the installation of a lighter secondary structure is permitted** in order to obtain the aforementioned separations. Before receiving the panels, a bead of TABIHAUS® polymer must be applied to this profile, both on the framing profiles and for their gluing to the continuous surface, for their chemical fixing. Subsequently, they will be screwed for mechanical fixing.

Design criteria for wall cladding and interior partitions

The design of interior partitioning, opaque panels and perforations must be modulated, considering the size of the panels (the most common in this case is 2600 mm x 1200 mm).

In this system, **panels are supplied with salt board on one side**, 2600 x 1200 x 8 mm of salt board and 14 mm of XPS, **tongue and groove 22 mm**. These panel thicknesses and conditions are those **recommended** for the situations mentioned; however, if the project management considers, other XPS thicknesses can be supplied and worked with, according to need, being able to adapt configurations between 14 mm and 120 mm of XPS thickness provided by the panel. In this case, the offset between the panel and the XPS would be the thickness of the resulting panel, to facilitate the installation of the panels, especially in corners and corners.

The panels can be placed both horizontally and vertically, and allow the combination of both positions, as they are isotropic.

They will be installed on a metal structure usual in plasterboard systems (PYL profiles), allowing for different thicknesses of uprights, 48 mm, 70, 90, etc. The layout of the profiles will be such that **the distance of the vertical uprights is 400 mm**, which provides a 4-line fixing in the 2600 mm length of the panel.

The panels will **always** be installed with the **XPS in contact with the profiles**. A bead of TABIHAUS® polymer must first be applied to the metal structure for chemical bonding and sealing of the wall. Once the installation has been completed, **TABIHAUS® bonding compound** must be applied to cover the screw heads and the **joint between panels**.

Subsequently, it must be taped, applied and sanded to achieve perfect planimetry.

Assembly of the panels

After positioning the profiles or the continuous support and checking their correct positioning, the panels are installed following the **work sequence** described below:

Panel no. 1:

- Cutting to size of the panels if required.
- Application of a continuous bead of TABIHAUS® polymer on the support profiles, or on the continuous support surface.
- Screwing or mechanical fastening of the panels as required.
- Application of a continuous bead around the perimeter of the panel to seal the joint with the panel to be installed later. It will be applied following the line that joins the panel with the XPS.

Panel no. 2:

- Cutting to size of the panels if required.
- Application of a continuous bead of TABIHAUS® polymer on the support profiles, or on the continuous support surface.
- Screwing or mechanical fastening of the panels as required.
- Application of a continuous bead around the perimeter of the panel to seal the joint with the panel to be installed later. It will be applied following the line that joins the panel with the XPS.

And so on with the panels following the design of the project.

On the other hand, a number of project considerations will be necessary, which will be outlined below:

Start of façade and encounter with roof:

- The grey TABIHAUS® 6 mm shim will be placed before the next panel is positioned.
- Position the panel as described above.
- **Seal and fill the 6 mm joint** with TABIHAUS® polymer, paying particular attention to sealing the edge of the panel and creating the expansion joint.
- Remove excess TABIHAUS® polymer if necessary.

Every 14 metres in length:

- The grey TABIHAUS® 6 mm shim will be placed before the next panel is positioned.
- **Seal and fill the 6 mm joint** with TABIHAUS® polymer, paying particular attention to sealing the edge of the panel and creating the expansion joint.
- Remove excess TABIHAUS® polymer if necessary.

Corners and nooks:

- The yellow TABIHAUS® 2 mm shim will be placed before the next panel is positioned.
- Lay the **tongue and groove panel or according to the required cut** as described above.
- **Seal and fill the 2 mm joint** with TABIHAUS® polymer, paying particular attention to sealing the edge of the panel and creating the expansion joint.
- Remove excess TABIHAUS® polymer if necessary.

Resolution of corner encounters

TABIHAUS® panels are isotropic, so they can be installed vertically or horizontally, and in combination.

This property allows a very high versatility when it comes to solving one of the most complex situations such as corner or nooks.

Verification of the execution of these joints, in any of the three admissible options of the system, and of the 2 mm expansion joint in the corners, and of a watertight execution in the corners. Installation of corner profiles if required.

TABIHAUS® panels offer three options or solutions for resolving corner joints and corners, which are described below:

A) 45° cut

The panels are received with the aforementioned dimensions and panel cut at 90 degrees, without flaws, using the appropriate tools such as a cutter for cutting the XPS or a circular saw for the salt board. The working sequence to be followed is as follows:

Step 1: a **45 degree** cut will be made to divide the panel into two pieces.

Step 2: a **second 45-degree cut** will be made to fit and adapt to the shape of the corner in question.

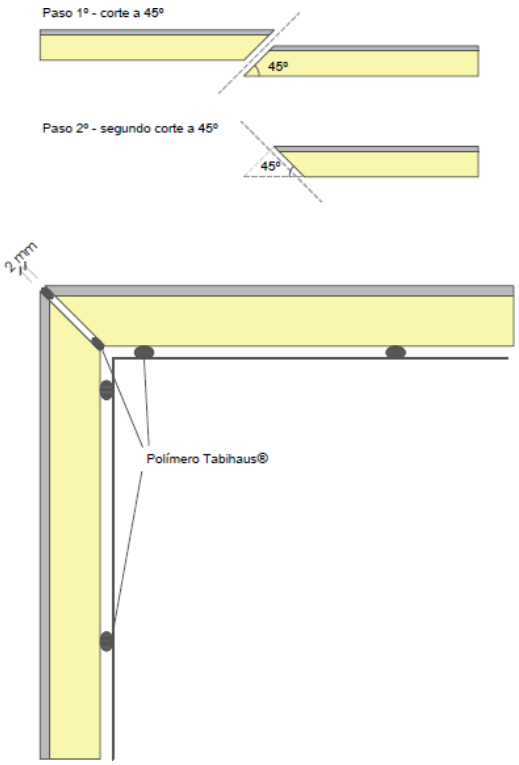
Step 3: a **2 mm** TABIHAUS® shim will be placed to separate the panels and create the joint.

Step 4: Apply TABIHAUS® polymer for **sealing** to the joint itself, as well as to the exposed face of the XPS that will be facing the surface that will receive the panel for sealing and bonding.

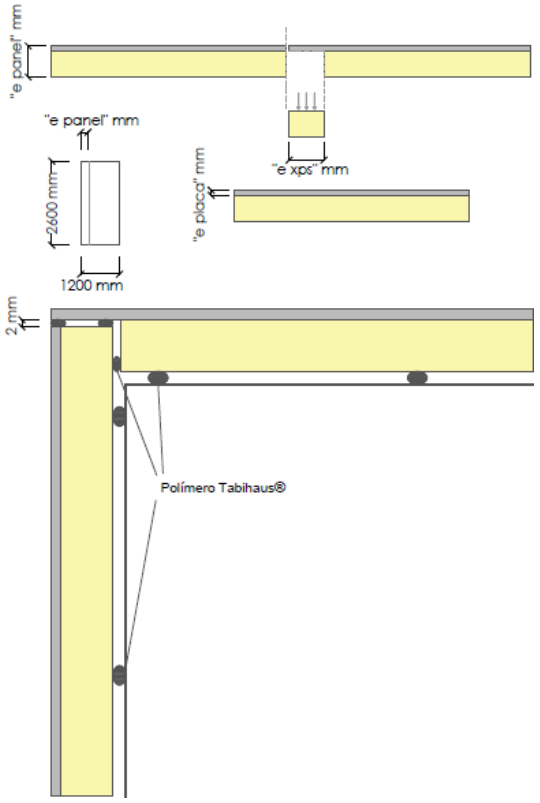
Graphic example:

The first piece cut at 45 degrees is placed on the left side, after the second cut the panel piece obtained is placed on the upper side to close the corner shown.

Under no circumstances may the XPS of the TABIHAUS® panel be visible or exposed.



B) Tongue and groove cut or cutter cut ‘in situ’.



The panels are received with the aforementioned dimensions and panel cut at 90 degrees, without flaws, using the appropriate tools such as a cutter for cutting the XPS or a circular saw for the salt board.

We start from a panel with thickness ‘e panel’, being as an example 8 mm of board and 14 mm of XPS; so that the thickness ‘e board’ will be equal to 8 mm, the thickness ‘e XPS’ will be equal to 14 mm and the total thickness ‘e panel’ will be equal to 22 mm. The procedure to be followed is as follows:

Step 1: according to the thickness ‘e panel’, cut the proportional dimension of XPS with a cutter. So that the **cut thickness of XPS is equal to the total thickness of the panel** (e panel = e XPS), resulting in a tongue and groove joint.

Step 2: A **2 mm** TABIHAUS® shim will be placed to separate the panels and create the joint.

Step 3: Apply TABIHAUS® polymer for **sealing** on the joint itself, as well as on the exposed face of the XPS that will be facing the surface that will receive the panel for sealing and bonding.

Resolution of window and door openings

TABIHAUS® panels are available in 2600 mm x 1200 mm or 3000 mm x 1200 mm. They are isotropic, so they can be installed vertically or horizontally, or in combination.

This property allows a very high versatility when it comes to solving one of the most complex situations such as encounters in openings of any kind.

Verification of the execution of these joints, in any of the three admissible options of the system, and the 2 mm expansion joint in the openings. Installation of corner bead profiles or drip caps, if applicable.

TABIHAUS® panels allow two options or solutions for the resolution of openings, valid for both doors and windows, which we will explain below:

A) 45° cut

The panels are received with the aforementioned dimensions and panel cut at 90 degrees, without flaws, using the appropriate tools such as a cutter for cutting the XPS or a circular saw for the salt board. The working sequence to be followed is as follows:

Step 1: a **45-degree cut** will be made to divide the first panel into two pieces.

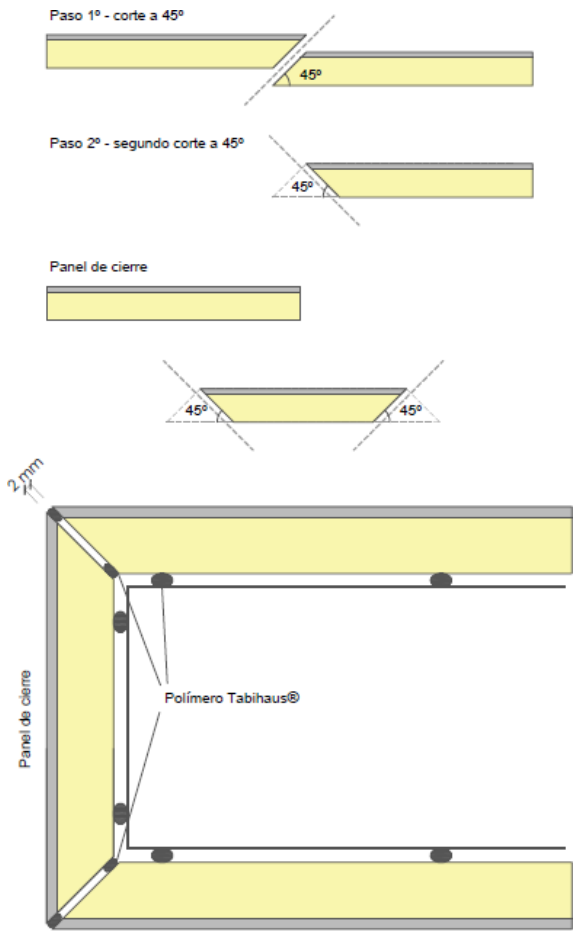
Step 2: a **second 45-degree cut** will be made for laying to fit the shape of the span itself.

Step 3: A first **2 mm** TABIHAUS® shim will be placed to separate the panels and create the joint.

Step 4: The closing panel requires two cuts of 45 degrees each as shown in the picture below. A 2 mm joint is made as before.

Step 5: apply TABIHAUS® polymer for **sealing** to the joint itself, as well as to the exposed face of the XPS that will be facing the surface that will receive the panel for sealing and bonding.

Graphic example:



The first piece resulting from the 45 degree cut is placed on the upper side, after the second cut the panel piece obtained is placed on the lower side, and finally the closing piece for the represented opening.

Under no circumstances may the XPS of the TABIHAUS® panel be visible or exposed.

B) Head-to-head cut (closing panel only board)

The panels are received with the aforementioned dimensions and panel cut at 90 degrees, without damage, using the appropriate tools such as a cutter for cutting the XPS or a circular saw for the salt board.

In this case we can only use a salt board to complete the closure of the span that we are going to solve, because the thermal conductivity required at that point does not negatively influence the thermal bridge break, the value of the board being sufficient as it increases in the longitudinal direction (y-axis). The work sequence to be followed is as follows:

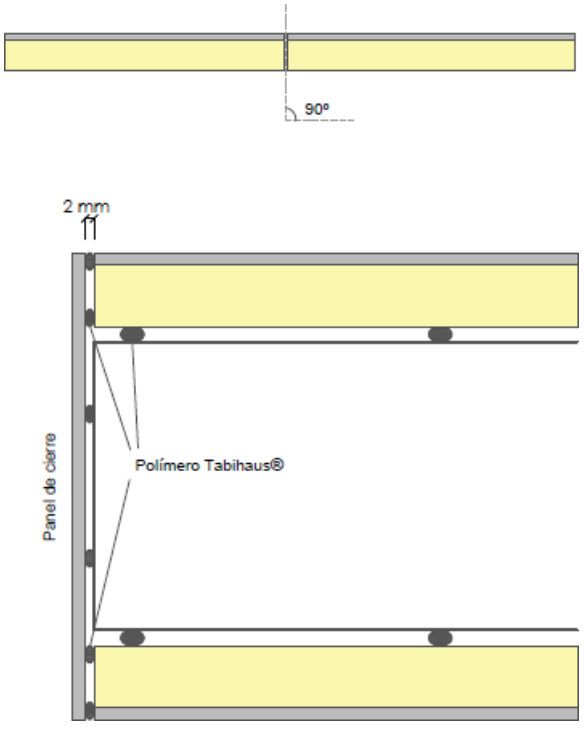
Step 1: a **90 degree** cut will be made to divide the first panel into two pieces, where necessary.

Step 2: a first **2 mm** TABIHAUS® shim will be placed for the panel separation and to create the joint.

Step 3: the closing panel or more precisely the closing board only of the aforementioned 2 mm gap for the joint and the sealing by TABIHAUS® polymer.

Step 4: apply TABIHAUS® polymer for **sealing** in the joint itself.

Graphical example:



The pieces resulting from the 90-degree cut are placed on the upper and lower side, finally, the closing plate will be placed supported and glued by means of TABIHAUS® polymer to complete the represented span.

Under no circumstances may the XPS of the TABIHAUS® panel be visible or exposed.

Working methodology for the use of the TABIHAUS® panel

Practical and theoretical example

In this section we focus on the process and work methodology used by the TABIHAUS® architecture department, specifically for the correct use of TABIHAUS® panels throughout the development of the composition of façades, walls, floors and roofs; including the design standards and criteria of compulsory compliance described above, but which may be applicable to any project.

We start from a theoretical assumption, where we will deal with the standard module of a rectangular prism with dimensions of 6.8 metres (6800 mm) in length by 3.4 metres (3400 mm) in width and 3.35 metres (3350 mm) in height. This module will not have in any case defined thicknesses of the supporting structure or substructure, but the type, dimensions and minimum spacing between supports recommended for the correct placement of TABIHAUS® panels will be indicated.

As has already been explained, the surfaces to be worked on, in theory, are the façades, floor and roof of the proposed module. This has been chosen because the dimensions, as well as the window and door openings, make it necessary to make cuts without allowing us to use the panels with the factory measurements in any case, so that we can apply the necessary criteria for understanding the manual work methodology.

The following plans are attached for a better understanding.

Drawing TBH-01-TYPE-METHODOLOGY TABIHAUS®-MODULE®

The first of the sheets has all the dimensions and annotations required to know the project. As it is a prism, it has 4 faces; a floor face, specifically the interior, which would be the most interesting for its execution; and finally, the roof face.

In each of the situations described, the most suitable solution for the use of the TABIHAUS® panel will be chosen. The procedure to be followed will be set out below:

Step 1:

Once the graphic documentation has been received from the client, a proposal is drawn up with the types and composition of TABIHAUS® panels best suited to each use.

- Exterior wall or façade: the exterior wall that closes the module is a tubular profile structure plus a PYL framework, therefore, in this case the **façade** will be built with a panel with a single salt board plus a thickness of XPS, specifically the standardised configuration for this use will be a **TABIHAUS® panel with a total thickness of 38 mm**, of which **8 mm** correspond to the **salt board** and **30 mm XPS**.
- Floor: for this theoretical case the interior floor has a support structure of tubular profiles plus a framework, therefore, the **floor** will be executed with a double salt board panel and a thickness of XPS in its interior, this is because it is intended for a walkable use, it will always require a double board panel in these cases to avoid deformations.

  Finally, the standard configuration chosen for this use will be a **TABIHAUS® panel with a total thickness of 48 mm**, of which the **8 mm salt board** corresponds to a **32 mm XPS** and a second **8 mm board**.

- Roof: in the case of the roof, we have a support structure of tubular sections plus a framework. Although the **roof** is **not walkable**, it will be built with a double salt board panel plus the thickness of XPS in the inner layer, thus avoiding deformations, for example, during installation. Remember that if it were walkable, the same configuration would be used. Finally, the standard configuration chosen for this use will be a TABIHAUS® panel with a **total thickness of 44 mm**, of which the **8 mm salt board** corresponds to a **28 mm XPS** and a second **8 mm board**.

Step 2:

Having established the criteria for sizing the TABIHAUS® panels in the project we are dealing with, we must be clear about certain aspects and **standards of the system**.

In any case, the panels are received with the dimensions established by the TABIHAUS® Efficient Building System, **being the panel 2600 x 1200 mm**. Likewise, for the purposes of pre-dimensioning in the project, a **2 mm joint** must be considered for the **start of the façade**, for its **encounter with the roof**, and in the **corners** of the façade (the panel can be cut on site for correct modularisation and installation for these purposes) and the distance between openings or between opening and corner must be greater than or equal to 15 cm. In continuous 14-metre panels, a **6 mm thick joint** must be maintained to absorb external thermal expansions, however, **in our practical case it is not applicable** since we are not going to exceed this dimension.

TABIHAUS® panels are not self-supporting, therefore, they will always require a structural or auxiliary element for their correct **support**, which may be a masonry wall, steel frame, light wooden or metal framework, hot-rolled tubular profiles, laminated plaster profiles (PYL), etc. In any of the cases involving modulation, the separation between supports **must never exceed 600 mm** in the **transversal** direction (a total of 3 supports per panel unit) and, likewise, in the longitudinal direction, **it may never exceed 650 mm** (a total of 5 supports per panel unit).

In light truss construction systems, the layout is smaller, but the **distances mentioned above must be checked** so that they **do not exceed 600 mm and 650 mm**, so that the panels are never overhung during installation.

In any case, and independently of the modularisation of these profiles, additional **perimeter profiles must be installed around the openings**, so that the panels do not overhang in these areas.

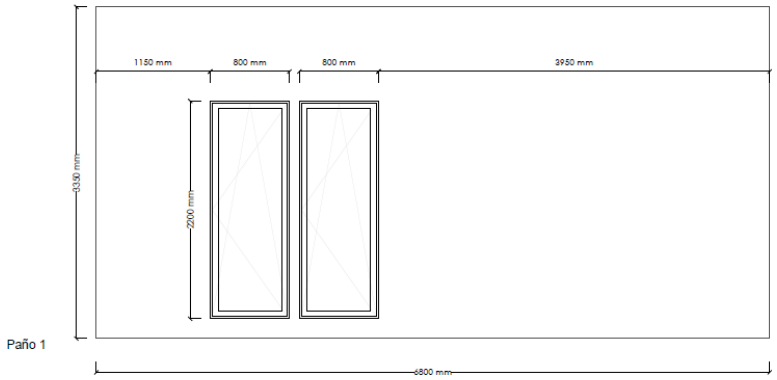
During the pre-dimensioning process, all the aforementioned aspects must be taken into consideration to guarantee the correct installation of the TABIHAUS® panels.

Drawing TBH-02-TYPE-MODULE TYPE-METHODOLOGY TABIHAUS®

In the second of the proposed sheets for the study module, we focus on the pre-dimensioning and placement of the panels on all façade planes.

Step 1:

Firstly, we locate panel 1, which has two windows with a height of 2200 mm x 800 mm wide, and separated from the floor by 200 mm. As shown in the following image:



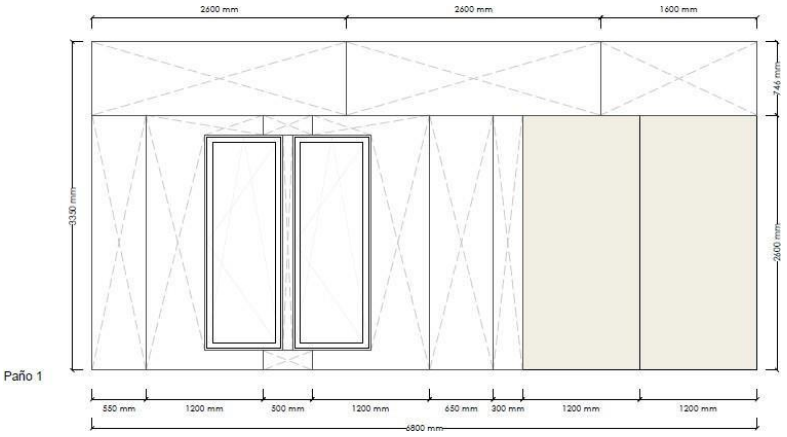
Knowing the measurements of the TABIHAUS® panel and those of the project itself, we can apply as a first criterion that the most appropriate way to start laying them is in a vertical position, at the same time starting from the bottom right-hand corner. In any case, we will leave a **2 mm** gap at the **start of the façade** as described above. We will then place another complete panel.

Next, given that the façade openings are one of the most conflictive points, we will see what the most suitable solution may be. As they are windows of the same size, we can manually place a panel superimposed on the window, but being aware that **in no case can one edge of the panel coincide with another edge of the opening itself**, to avoid cracks. It will be placed on the axis of the panel, and we cut the excess part in a 'U' shape, thus adapting it to the shape of the opening. We will repeat the process symmetrically for the adjoining window, the parts already cut are useful to complete and 'close' the remaining sections between the two openings.

Since this is the first panel that we are building, the end panels do not need the 2 mm separation at the corners, in this way we can use a new panel and cut it into two halves, the first will have a dimension of 550 mm wide by 2600 mm, we place it at the left end of the panel and complete the remaining gap next to the opening; the second piece, the result of the same cut, only 650 mm wide by 2600 mm, will be placed to the right of the second opening.

We will complete this section with a piece of 300 mm wide by 2600 mm high, the remaining material can be placed horizontally from the left end, this will have a dimension of 2600 mm long by 746 mm, since we will also subtract the **2 mm** needed to **finish off the roof**.

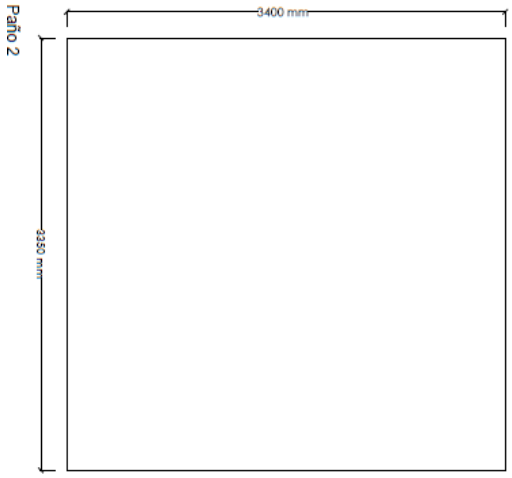
Here is where we can check the versatility of the panel, since the remaining section (without placing panels) is 746 mm high by 4200 mm long, and it will be perfectly valid to place the TABIHAUS® panel vertically or horizontally, however, the criterion we are interested in meeting is the optimisation and speed of execution, so that if it is placed horizontally, the panel will only be divided into two parts, the first of 2600 mm by 746 mm and the second of 1600 mm by 746 mm, thus completing the first panel. The result will look like this:



As a result, **a total of eight TABIHAUS® panel units** will have been used to build panel 1.

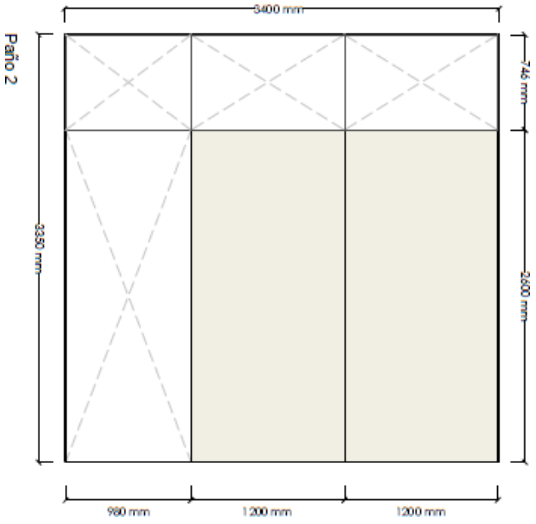
Step 2:

The next step will be to execute panel 2 by pre-dimensioning it 'by hand', being the only blind façade, so that we can continue the direction from right to left with respect to the placement of the panels. The dimensions are 3.35 metres high and 3.40 metres long, as shown in the following image:

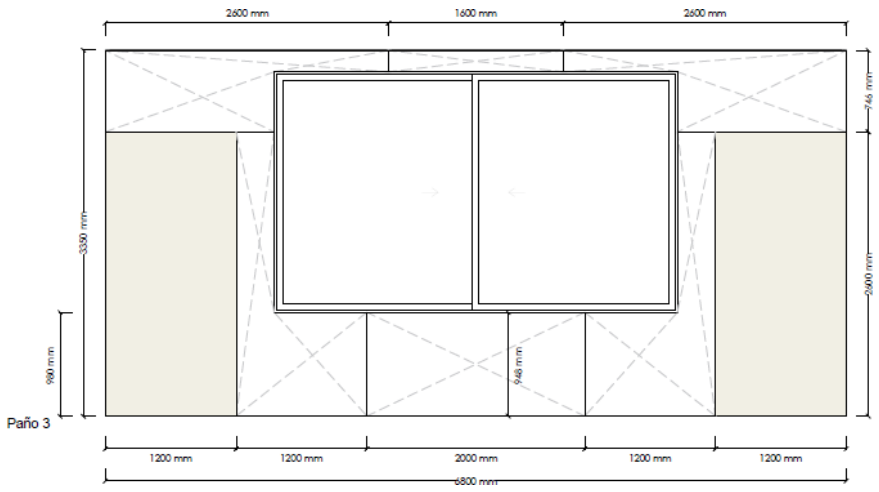


The design criteria will be the same as we have already stated above, we maintain the 2 mm at the start of the façade wall. To start placing the first panel (2600 mm x 1200 mm) we will do it from the right end to continue the sequence of panel 1, forming the tongue and groove corner, we continue placing a new complete panel, the façade panel is closed with the remaining dimension, however, we have to subtract both the 2 mm of the joint and the 8 mm of the edge of a panel to form the corner of the left end, having a dimension of 2600 mm by 980 mm; the remaining upper area will be executed with a panel cut in three pieces, two of them measuring 1200 mm by 746 mm and the last one measuring 980 mm by 746 mm.

It is essential to remember that the **XPS** must **never** be **visible** and to leave a **2 mm gap at the corner joint**. In any case, TABIHAUS® polymer must be used for sealing and gluing the panels.

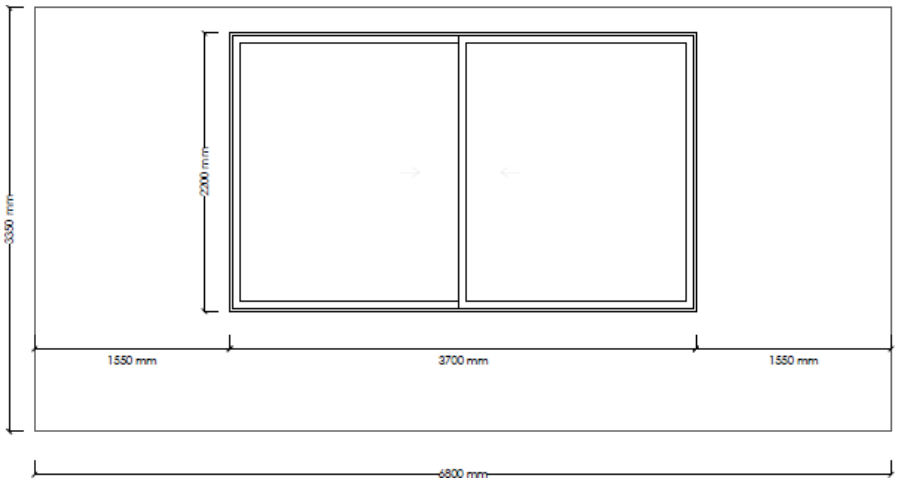


The previous image shows the result after the panels have been installed in panel 2, having started from the right-hand side to the left, so that the left-hand end will have to adapt to the **tongue and groove form** that we have used previously. At the same time, you can see the **2 mm** spacing that must be maintained **at the corner joints**, wall start and roof edge. The following image shows the correct way to execute this joint:



As a result, **a total of four units of TABIHAUS® panels** will have been used to build panel 2.

In this practical example we will continue executing the TABIHAUS® panels in the pre-dimensioning phase following the marked order, therefore, we will start with panel 3. In this case we have a window with a height of 2200 mm x 3700 mm wide, and separated from the floor at a height of 950 mm; the façade panel measures 6.80 m long by 3.35 m high, as shown in the following image:



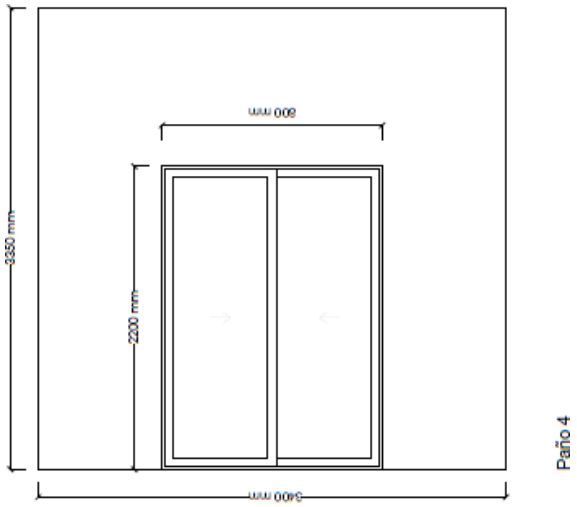
We will continue the process by applying the design criteria set out above, so that we have to consider the 2 mm at the start of the façade wall and roof coping. In this case, we continue from left to right, so it is not necessary to leave 2 mm of separation in the corner as it starts flush to close the corner between panel 2 and the panel. In the same way we execute the opposite side (right) with a whole panel of 2600 mm by 1200 mm, the next one that we must place in the cloth will be adapted to the window opening in an 'L' shape to avoid that edges of the panel **never coincide with the same span**, the process must be repeated on the opposite side, the remaining material in this example cannot be reused due to the measurements of the project.

We will use the same criteria, added to the **2 mm** that we need to keep in the **roof edge** to finish the upper part of the perimeter of the span, also with an 'L' shape, this time placed horizontally. The remaining sections will have the following measurements, at the bottom, 2000 mm by 948 mm and at the top 1600 mm by 198 mm. The result will be as follows:

It is essential to remember that the **XPS must never be visible** and to leave **a 2 mm gap at the corner joint** to complete the rest of the panel. In any case, TABIHAUS® polymer must be used for sealing and gluing the panels.

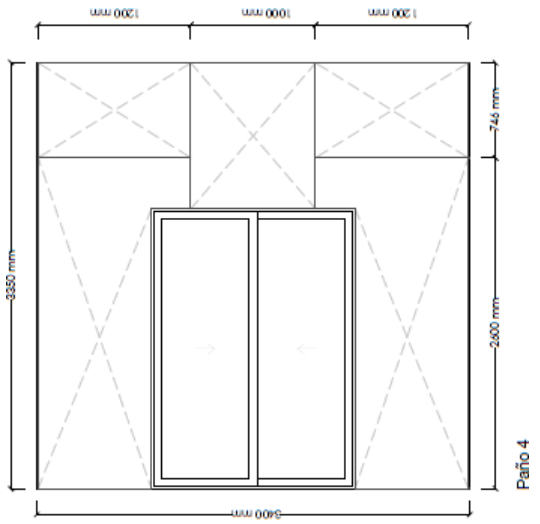
As a result, **a total of seven units of TABIHAUS® panels** will have been used for the execution of panel 1.

The last of the façade panels will be panel 4, thus completing the entire vertical envelope of the module we are building. The dimensions will be 3.35 metres high and 3.40 metres long, as shown in the following image:



This is a new opening, although it is a door 2200 mm high and 800 mm wide, therefore, it is flush with the ground level, it will only be necessary to maintain the distance of 2 mm at the start of the wall at the ends. Regarding the roof coping or the corners, it must be applied in any case to complete the envelope following the guidelines already described.

Since the remaining distance from the end of the panel to the beginning of the span is 900 mm on both sides, we can execute it with whole TABIHAUS® panels adapted to the shape of the span and cutting the excess material, we cannot reuse it due to the dimensions of the project. The remaining sections at the top can be executed with a single panel, cut with the following dimensions, two pieces of 1200 mm by 746 mm and one-piece of 1000 mm by 1148 mm, thus completing the entire façade. The result will be as shown in the image:



As a result, a **total of three units of TABIHAUS® panels** will have been used to build panel 1.

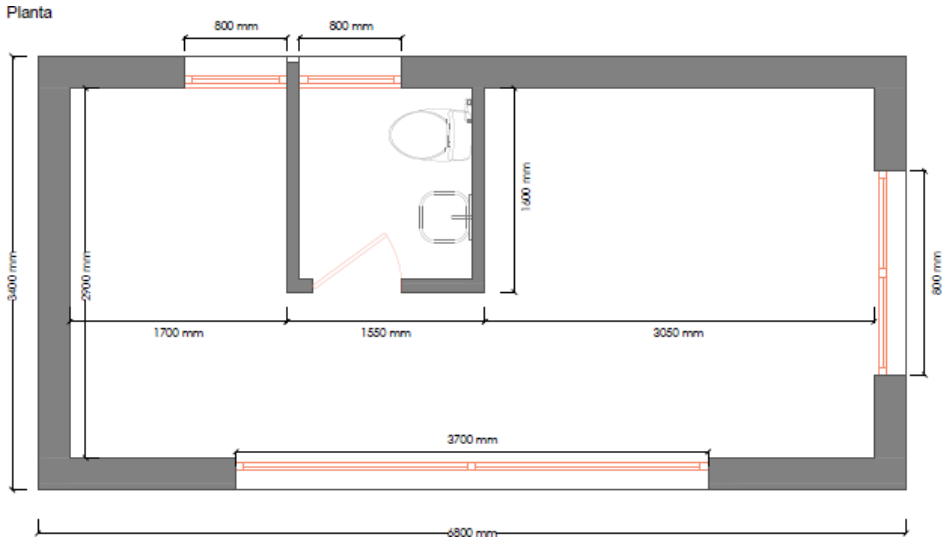
A **total of 22 units of TABIHAUS® panels** with the configuration (8+30) of 8mm of panel and 30 mm of XPS will have been used in the execution of the façade envelope of the module.

Drawing TBH-03-TYPE MODULE-METHODOLOGY TABIHAUS®

In the third of the sheets proposed for the module type of study we will focus on the pre-dimensioning and configuration of the panels in all the horizontal planes the interior floor and the roof; all of them will be correctly dimensioned for its comprehension.

Previously we have already defined the type configuration chosen for the use of the floor will be a **TABIHAUS® panel** with a total thickness of 48 mm, of which correspond to the **8 mm salt board** and a **32 mm XPS** and a second 8 mm board. It should be remembered that as it is a walkable floor with lattice supports, it must have this double panel arrangement to guarantee stability.

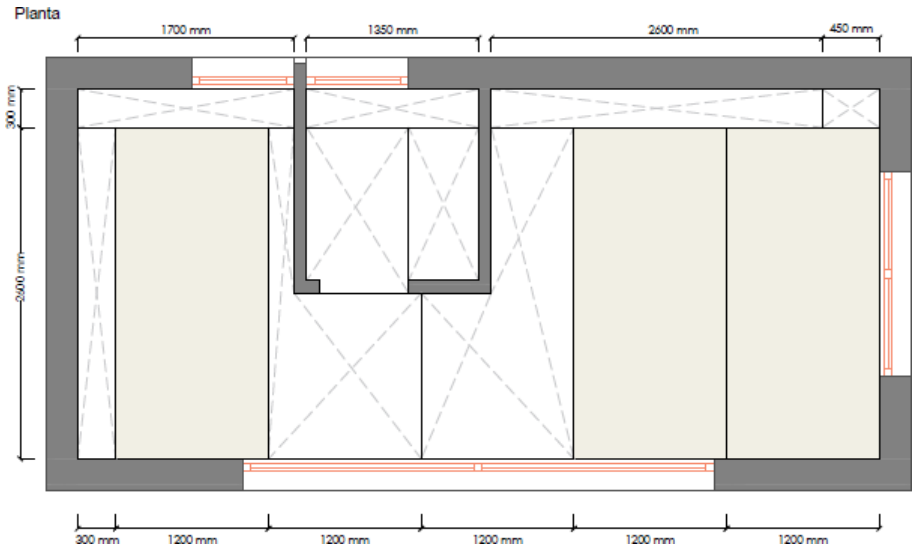
The distribution of the plant has an outer perimeter of 3'40 metres wide by 6'80 metres long, on the other hand, the inner perimeter has dimensions of 2'90 metres wide by 6'30 metres long. The plan shows all the dimensions and dimensions for your understanding as shown in the following image:



Continuing with the execution of the pre-dimensioning we must take into consideration the following criteria, firstly, as it is an interior space it does not 'suffer' the same weather conditions of the outdoors, therefore, **it will not be necessary** to leave expansion joints, i.e. **2 mm joints on the perimeter or between panels**. With regard to the laying of the panels, we will start, in this case, from right to left, with a complete TABIHAUS® panel in the bottom right corner, followed by a second one, the next one should be cut to fit the shape of the surface with the partition walls of the toilet, however, the remaining material of 1200 mm by 550 mm can be used for the interior of the toilet.

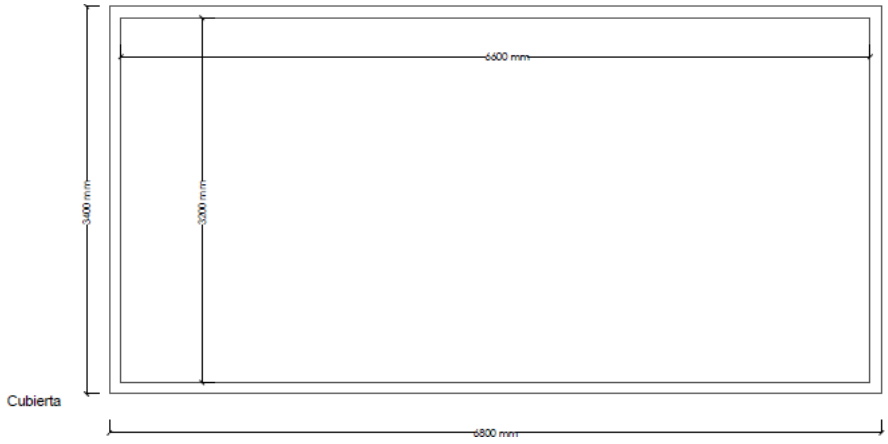
All panels are laid head-to-head. We continue with a new panel to complete the perimeter of the toilet and will cut it again in the shape of an 'L', and being able to use the remaining piece of 1300 mm by 800 mm.

Following the sequence we will place a new complete panel; this will leave only spaces that we can finish with a single TABIHAUS® panel, we will cut it into two pieces of 2600 mm by 300 mm, one of them will be placed at the left end and the other at the top of the floor, another cut will generate a piece of 1700 mm by 300 mm, one more of 1350 mm by 300 mm and finally a rectangle of 450 x 300 mm. The result obtained will be as follows:



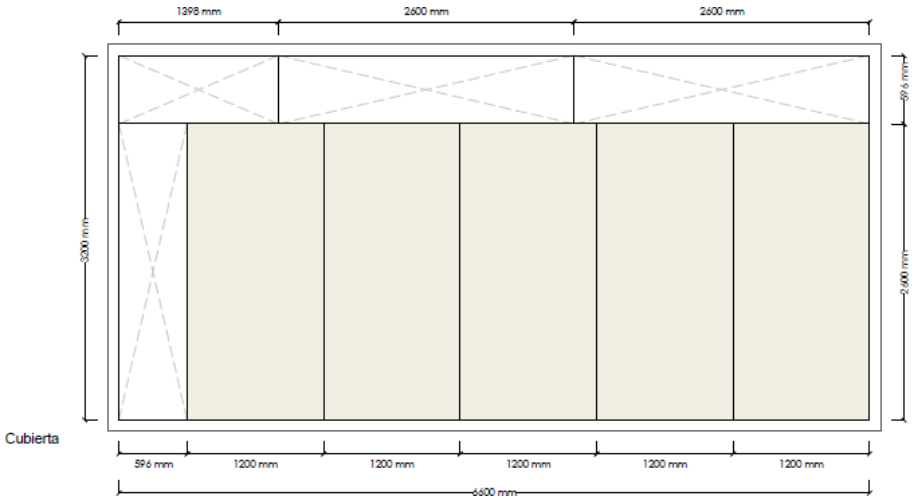
A total of six units of TABIHAUS® panels with an 8+30 configuration and a total thickness of 38 mm will be required on the ground floor.

Finally, we are going to build the roof, for which we will use TABIHAUS® panels with double panels as they will be supported on tubular profiles and thus avoid deformations during the installation process. **The total thickness configuration is 44 mm**, corresponding to the **8 mm salt board** and a **28 mm XPS** and a second 8 mm board. The dimension is 6.80 metres long by 3.40 metres wide, and a 10 cm thick pretiling, as shown in the plan and in the following image:



In this case we must consider a **separation of 2 mm around the perimeter** of the roof for the placement of the TABIHAUS® panels, if there is a continuous surface greater than 14 metres it will be 6 mm. We will start by executing the complete panel from the right end, in a sequential way we can place five panels, finishing the opposite end with a cut piece of 2600 mm by 596 mm; with this cut we can obtain a piece of the same dimensions and place it horizontally.

The remaining roof space is made up of two pieces, one 2600 mm by 596 mm and the other 1398 mm by 596 mm. In this way we will have completed the entire envelope with TABIHAUS® panels. The result will have the following layout:



A total of seven units of TABIHAUS® panels of 8+28 configuration and a total thickness of 44 mm will be required to build the entire roof.

In summary, the following units will have been required depending on their configuration and the use to which the TABIHAUS® panels are to be put, as follows:

- Façade: twenty-two units (**22 pcs**) of TABIHAUS® panel with a **total thickness of 38 mm**, configuration (**8+30**) of which 8 mm of salt plate and 30 mm of XPS.
- Floor: six units (**6 pcs**) of TABIHAUS® panel with a **total thickness of 48 mm**, configuration **(8+32+8)** of which 8 mm salt board, 32 mm XPS and a second 8 mm salt board.
- Roof: seven units (**7 pcs**) of TABIHAUS® panel with a **total thickness of 44 mm**, configuration **(8+28+8)** of which 8 mm salt board, 28 mm XPS and a second 8 mm salt board.

Use	Type of panel	Total thickness (mm)	Configuration	Nomenclature
Façade	Simple single-board	38	(8+30)	38 mm TABIHAUS® panel (8+30)
Floor	Double board	48	(8+32+8)	38 mm TABIHAUS® panel (8+32+8)
Roof	Double board	44	(8+28+8)	38 mm TABIHAUS® panel (8+30)

The aim of this practical exercise was to resolve any doubts that may arise when using the TABIHAUS® Efficient Building System.

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