# REHABILITATION OF METAL / WOODEN PITCHED ROOFS.

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**IS IT:**

- [ ] *Product*
- [X] *Technology*
- [ ] *Equipment*

**APPLICABLE FOR:**

- [X] *Restoration*
- [X] *Rehabilitation*
- [X] *New Construction*

**APPLICABLE ON:**

- [ ] *1. Foundations and underground structures*
- [ ] *2. Vertical structures*
- [X] *3. Horizontal structures and vertical connections*
- [X] *4. Roof and terraces*
- [ ] *5. Façade and building envelope*
- [ ] *6. Finishes and completion elements*
- [ ] *7. Integrated services*
- [X] *8. General strategies for building recovery*

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***Related companies:*** *No companies; university research; structural study.*

## DESCRIPTION

Rehabilitation of pitched roofs of wood or metal structure, even with tile finish, under consideration of light roofing.

## WHY TO USE

To reduce the fire requirement of the roof structure, or even to avoid it in secondary elements (joists, purlins).

## HOW TO USE AND APPLY

In metal or wood roofs of existing buildings, with or without heritage protection, the preservation of the exposed structure is difficult due to the nowadays prescriptive fire requirements. Often, the necessary fire protection worsens or makes it impossible to leave the metal structures visible, or leads to oversizing the wood structures.

The key to the system is the rehabilitation of the roof by means of a new lightweight enclosure, even maintaining the original finish of Arabic tile.

The consideration of light roofing (≤1.00 kN/m²) is essential for a reduced fire requirement. Under this consideration, regardless of the interior use, it is possible to assign a roof fire rating of R-30 for the main elements (trusses or girders) and zero (R-0) for the secondary elements (purlins, battens). Thus, for the latter, it is not necessary to protect or increase the cross-section of these elements due to the effect of fire.

The system tries to take advantage of the current fire regulations, in order to achieve a light roof, with an appearance like the original one in case of renovation, which allows a reduced fire requirement.

This is achieved by means of a lightweight construction system, without a mortar layer to hold the ceramic tiles. Also, since a panel can be placed under the tiles to guarantee the waterproofing of the roof, they no longer need to protect against water infiltration, so it is possible to reduce the overlap between them, thus reducing the original surface weight, while guaranteeing the use of the same original tiles even taking into account the loss by breakage of a small part of them during their dismantling and repositioning.

## TECHNICAL CHARACTERISTICS

The technical characteristics of the elements to be used will be those required for a pitched roof, depending on its constructive section, which can be of many types.

However, the key point will be that the weight due to its enclosure alone does not exceed 1.00 kN/m². That is, without taking into account the structure (trusses, beams, girders, purlins, etc.).

A typical typical section is a composite board (prefabricated or in-situ), with a bottom timber layer, insulation and top timber layer, on top of which the exterior finish is placed.

If the exterior finish element is heavy (tile, slate, etc.), it will be unfeasible to place a mortar layer underneath, as it will certainly exceed the maximum weight to be considered a lightweight roof. Therefore, in these cases, the exterior finishing pieces should be placed without mortar (nailed, screwed, interlocked,etc.).

In the case of wanting to recover the existing Arabic tiles, it is recommended to place a waterproof sheet or plate underneath them. Thus, the tiles cease to have the requirement to ensure water tightness, becoming a finish. In this way, they may not overlap each other so much that their surface weight is reduced. In cases of reuse of the original tile, it is common for many of them to break during the construction process. Thus, it is common to use recovered shingles for the cover shingles, and new shingles for the channel shingles (which will be largely hidden).

## RECOMMENDATIONS AND OTHER INFORMATION

It is recommended to consult with the competent fire authority (fire department) to ensure a positive report on the compliance of the system, covered by the current regulations, since this possibility is often unknown.

It should be noted that the system can only be used on main (R30) and secondary (R0) structures supporting only light roofs that do not compromise evacuation and the rest of the structure in case of collapse.

## EXAMPLES

Rehabilitation of existing traditional pitched roofs, of wood or metal structure, in which the execution of new light roofs is a priority. [see attached images at the end of this sheet].

## REFERENCES / SOURCES AND LITERATURE

Regulation: CTE DB-SI.

## WEBSITE OF THE COMPANY

www.bisstructures.com

## IMAGES AND CAPTIONS

Fig.1-4: Originally a factory building, rehabilitated as a school. Before and after renovation. © *bisstructures*

Fig.5-6: Interior view of the roof, before and after rehabilitation. The roof deck is completely new, with insulation. The upper finish is the original tiles recovered, with a waterproof layer underneath that allows a greater distance between them, so that the weight of the roof due only to the enclosure is less than 1.00 kN/m². Thus, the original trusses have been preserved, restored, and must comply only with R-30. Without the consideration of light roofing, the general fire requirement according to the use of the building would have made the use of the original trusses impossible or very complicated. The purlins have also been replaced with new ones, which, with the consideration of light roofing, do not have any fire requirement (R-0). © *bisstructures*

Fig.7: Interior view after the intervention. © *bisstructures*