

ASPECTS REGARDING THE MANUFACTURE OF MULTI-LAYER WOOD “TERMOPAN” WINDOWS

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Abstract

This paper refers to the design, study and execution of multi-layer wood “termopan” windows, the types of joints, profiles and necessary tools, as well as cutting, milling, mounting and finishing technologies.

The right choice of the tools for the milling of the massive-wood profiles, of the mills that manufacture in a single gesture the compound profile of the window, constitutes a major aspect of the “termopan” windows manufacture.



INTRODUCTION

Multi-layered wood carpentry offers almost unlimited possibilities from the structural point of view. This is due not only to the various types of wood but also to the wide range of colors. The easy processing of the wood makes possible the manufacture of any model. This is why, in order to be able to choose a long-lasting carpentry, it is important to take into consideration a few important quality criteria.

In order to admire the shine of the internal part of the multi-layered wood carpentry, without caring about the external part, affected by bad weather, you can forget about the old-fashioned maintenance measures. After the apparition of the multi-layered wood carpentry, foiled with aluminum, the constructive elements combine the advantages of the multi-layered wood with the resistance of aluminum to the external factors.

In order to obtain high quality products, the wood surface of the carpentry is treated with a special method, that starts with wood preservation and ends with a 4-colors structure. Regardless of the chosen color shades, the wood surface is ideally prepared in terms of bad-weather protection.

Layered wood pieces are made of three layers of wood that are placed fiber against fiber so as to cancel the inner tensions and exclude the possibility of distortion in time. The first and third layer cannot contain falling nodes. The layering is realized in special presses, with waterproof adhesives.



The drying of the wood material is made artificial in drying rooms. In these rooms, lumber can be brought to the desired humidity. By a proper drying of the wood, the following can be achieved:

- ensuring the shape stability and dimensions;
- avoiding wood damage caused by fungi and insects that appear when the humidity is between 20-100%.
- facilitation of manual processing of the wood.
- maximum admitted humidity for the material used in wood profiles is 12%.
- various wood essences can be used (fir, oak-tree, cherry-tree, etc.) that can be combined with aluminum elements.

The main operations in the manufacture industry of the multi-layered “termopan” windows are the following:

- a) bonding the pieces together to obtain the layered wood;
- b) leveling a side and an edge;
- c) planning the thickness and width of the pieces
- d) cleaning and milling

- e) milling the profiles on the edges of the sheaths and frames
- f) closing the sheaths and frames
- g) finishing with 80 and 100 sand paper
- h) assembling the iron parts or hasp
- i) passing the stain and the lacquer
- j) assembling the fitting
- k) mounting the bug-net if case.

- a) The bonding operation is made of 3 pieces of 2,5", manufactured in special pneumatic presses.
- b) The leveling operation is made with the MI-500 leveling device, having a 100 mm diameter knife-shaft. 3 knives.
- c) the planning operation in thickness is made at the plane-device, . MRG-8 thickness, having a 100 mm diameter knife-shaft. 4 knives
- d) the planning and milling operation is made with the MNF-10 milling device with vertical shaft, this device works at very high speed-rotations 3000/6000/9000 rpm.
- e) the milling operation of the profiles on the edges of the sheath & frame are made with the milling device MNF-10
- f) the closing operation of the sheaths and frame is performed manually.
- g) the finishing operation is made at the polishing device with horizontal mesh. This operation is performed in two rounds:
 - the first round is made with sand paper – granulation 80
 - the second round is made with sand paper – granulation 180
- h) the assembling of the iron parts or the hasps is performed manually
- i) the operation of passing the stain and the lacquer is made with the spray-pistol.
- j) the operation of mounting the fittings is performed manually and they are mounted in their proper space.
- k) the assembling of the bug-net is made on the external part of the carpentry with clips, upon the clients request.

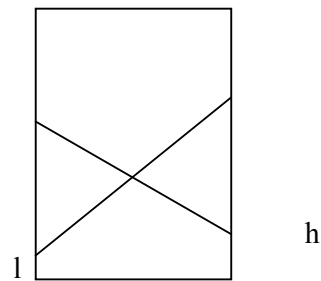
Opening types

- swing
- oscillating

Swing

The horizontal opening is the most common one. This is also called normal (simple) opening or swinging. This is the classic method, with vertical hasp catching on the frame. It is also true that the classical method is more comfortable, simplifying the things in the easiest way. (fig.1)

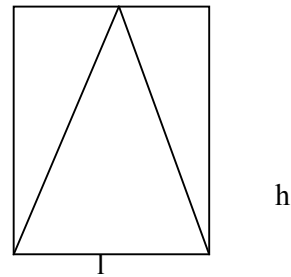
Fig.1



Oscillating

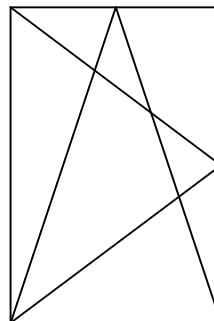
The vertical opening is known under the name of “oscillating” or scissor-type. The channel is caught in fixed hasps either on the internal horizontal part of the frame or in the upper part, according to the necessities and preferences. The advantages of this type of opening is the greater safety against breaking-in, if the windows is kept open for aeration. (fig.2)

Fig.2



So, in order to chose a multi-layer wood “termopan” window from the above presentations, you can chose either a oscillating-swinging opening or with a double opening. (fig.3)

Fig.3



Materials used for the construction of the window:



Nr.	Dimension of gauge	L/mm	l/mm	î/mm	g/mm
1	Dimension of cadre outwards	1.400		1.200	
2	Dimension of frieze		87		72
3	Dimension of glass termopan				24
4	Size	The second leaf			
5	Opening	By an opening oscillating			

From the point of view of the manufacture of a window, there are three main elements: the glass, the profile and the ironware.

The window occupies the main surface through which the heat and transfer process takes place, the thermo-insulation being the main properties required by the client. The heat transfer coefficient is expressed by its thermal transfer coefficient, noted with K , that indicates the energy loss through a surface that separates two spaces situated at a temperature difference $[K]=W/mpK$.

The higher this value, the lower the thermal insulation of that surface. So, in order for a surface to be better insulated, the “ K ” index needs to be lower.

One sheet of glass has $K = 5,8 W/mpK$, for a window made of two sheets of glass with an air-tight insulating pillow, the heat transfer can be maximum $4 W/mpK$, condition that can be satisfied using a LOW-E glass.

The benefits of supplementary thermo-insulation are the prevention of the condensation on the window surfaces and the saving of the expenses for the maintenance of the indoor heat.

The profile is an element that constitutes a windows, because it offers stability to the window support. The most used materials for the realization of the profiles of modern carpentry is multi-layered wood.

The multi-layered stratified profile is normally domestic. Wood is a good thermal insulator, from the point of view of the thermal transfer. The

multi-layered wood profile is mostly used for rustic aspect, where traditionalism is preferred in carpentry.

Ironware is the element that offers functionality to the mobile parts. At the manufacturing of the carpentry it is very important that the pieces match with the adopted profile systems.

The proofing fitting used in the “termopan” carpentry is made of a special material that offers different properties:

- bad-weather resistance;
- long life
- elasticity
- high resistance to chemical agents
- easy to replace

Rigidity-elements: all the profiles used in carpentry are stiffened with laminated profiles made of zinc-steel mounted on the edges of the frames. This is assembled with auto-rotating screws.

CONCLUSIONS

Advantages:

- Natural elements in home design, esthetic.
- A wide range of colors and essences
- Can be manufactured from several species
- Ecologic properties
- Healthy and relaxing micro-climate
- Allows any type of curvature

Disadvantage:

- Reduced resistance in case of direct ultra-violet rays and rain.
- In time, the wood keeps on working, generating cracks
- If the wood is not dried enough, there will be big problems in time.
- Requires time-maintenance: lacquering, painting.
- High-costs

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