

IMPACT OF THE ECOLOGICAL TREND UPON HOUSE BUILDING

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Abstract

The American and Romanian house market has imposed harmonious and comfortable living in ecological houses whose building does not affect the environment. The implementation of modern and efficient building of long-term sustainable houses has resulted in a new ecological building technology by the Wood Framing System which is developed and applied on a large scale in the US. This system is a cheap and accessible method to build houses and preserve them in time, as well as provide all the comfort demands. Also, the houses built within this system are adapted to any architecture style (traditional, contemporary, and futurist). The house structures built within the Wood Framing System are conspicuous through the optimum use of the wooden material, resistance, stability, ductility, low weight which thus reduces the earthquake impact, durability, high thermal comfort, competitive price. At the same time, the building time on the site is up to 70% lower, compared with the brick-based houses. Within the framing system, a wooden-structure house provides important advantages, and thus has become of interest on the Romanian market.

Key words: drywall, extruded polystyrene, foundation, mineral wool, roof, waterproofing, wood

INTRODUCTION

Wood is the only healthy, natural material of construction [1].

We like to go back to the woods because this material emits sensory stimuli that we agree [3]:

- the warmth and the decorative safety of its colour, its texture, direct links with nature, harmony, beauty, atmosphere, brilliance, delightful smell, acoustics, grace.

- so-called diseases of civilization: stress, aggression and other psychological trauma manifest themselves very rarely to those who live in an environment rich in wood [6].

A cut tree is a symbol. The dominant quality of the fir-tree is fluidity [4]. It helps us to overcome energy bottlenecks created by fatigue and stress [2].

In and around spruce and fir trees, choleric people calm down, their hot temper finds a balance. The two trees clean and open respiratory pathways, strengthen the lungs and helps us breathe more deeply. Spending some time in the vicinity of spruce and fir trees, we find activation of blood circulation and strengthening of the nervous system.

Houses built on wooden structure to customize the exceptional qualities of thermal and noise insulating floors that adjusts vertically and transfers heat very effectively dampens even the most bothersome noises [12].

Wooden structures can get more easily and cost-effectively, varied and spectacular finishes.

Due to the low weight, the foundation needed to ensure the sustainability of construction is much lower than that required of a house brick, thus significantly decreasing the cost of construction of a wooden house without the required safety level also decreased [7].

Because wood is an environmentally friendly material that consumes less energy in industrial processes [8], is a biodegradable material, well adjusted the temperature and humidity in the house, it is recommended and preferred builders beneficiaries.

Great flexibility offered by wooden architectural avoids high energy consumption and hence energy savings [9].

In case of fire, wood is the only material that preserves the mechanical properties in seismic zones is recommended only wooden houses [10].

MATERIALS AND METHODS

Construction material used in making houses Residence Wood Framing system is wood. These green house offers the opportunity to achieve at a very reasonable price and in a short time

The technology used for building insulation prevents exchange with the outside temperature thereby keeping very cool part of the house in summer and warm in winter. To be as fire resistant as any other building, there is the possibility of treating the wood with fire resistant solution, but at the same time does not affect the health of occupants of the house.

Because construction is easy to apply technological system and good elasticity, wooden houses made in this way provides a far superior seismic durability of masonry houses. Internal vapour barrier and anti-moisture exterior finishes provide protection against moisture structure of any kind.

The walls are made of prefabricated panels form through modern technology and which considerably reduces the execution time of construction, thus decreasing the cost of labor for installation and therefore the building.

RESULTS AND DISCUSSIONS

Building new houses using the Wood Framing highlights the strength, stability, ductility, low weight of its own (thus reducing the impact of earthquakes), durability, comfort and competitive price. Also, the execution of such houses is up to 70% less than for the houses based on a masonry structure. The advantages of a house made of Wood Residence achieving walls in the form of prefabricated panels, leads to an increase in the quality execution of these elements, through their factory with modern machines and technologies, and an appropriate technical and at the same time reduced prefabrication during the construction of the building, thus decreasing the mounting labor cost and building default.

Due to low weight, the foundation needed to ensure sustainability of the building is much

reduced compared to that required by a house brick, thus significantly reducing the cost of house construction o, without diminishing the desired safety.

Houses built on wooden structure are conspicuous by the exceptional thermal and sound-isolating qualities of their floors. They adjust vertical heat transfer and lower even the most disturbing noises very effectively (noises made by the high heel shoes, children's trample, the falling of a heavy object).

Wooden structures can receive varied and spectacular finishes more easily and at lower costs. A well-executed floor, according to details of the structure, is as strong as one of reinforced concrete. Because of the lightweight construction, the technological system applied and their very good elasticity, prefabricated houses made in this way offer higher earthquake durability than the masonry-based houses. The internal barrier against steam finishes and anti-humidity structures provide protection against moisture of any kind.

The technology used for building insulation prevents the temperature exchange with the outside, therefore it keeps the coolness of the house very much during summer and warmth during the winter. To be as fire resistant as any other construction, it is possible to perform a wood treatment solution to fire resistance, which it does not affect the house residents' health.

The ecological green houses on wood structure has several advantages such as:

»Wood structure is light in comparison with masonry, it requires a simple foundation is elastic, providing increased resistance to the construction.

»High heat and sound coefficient.

»Reduced execution time (2-3 months maximum).

»It creates an interior and exterior finishing based on latest materials.

»Pleasant appearance (can build different shapes and patterns).

»The inside of the apparent beams and framework.

»Modules are executed and finished in the factory, the assembly in the field takes maximum 48 hours.

Foundation

The foundation is made of reinforced concrete in Amvic casings (casings of expanded polystyrene) that provides both resistance and thermal insulation at this level.

House base

It is a basic element of construction, which runs through tracing and attachment wall structure for resistance to the building foundation.

It is made up of a wooden cupboard with sizes 45x90, 45x135mm, having the same width with a wall that supports it.

The house base is placed on a waterproof layer and provisionally set in the first phase hobnailed or wood screws and, after mounting on the ground floor walls, they are connected through reinforcing-steel clips existing in the foundation.

House girdle

It provides link to the top of the prefabricated panels. The girdle is fixed to the upper side of the prefabricated panels by knocking in nails.

It consists in a wooden cupboard with sizes 45x90, 45x135mm, having the same width with the wall which it supports.

It is fixed to the connection sections of the prefabricated panels in lagging sections.

Walls

The walls are the main elements of strength and stability of construction, providing vertical takeover of the floor and framework weight, as well as horizontal loads from earthquake and wind load and transmit them to the foundation.

An important advantage of the framing system is the possibility to make the walls in the form of prefabricated panels. This leads to increased quality of execution of these elements, through their factory with modern machines and technologies and an appropriate technical control; at the same time, prefabrication significantly reduces the execution time on the field of construction, thus decreasing time length of the construction on the field, the default cost and building cost.

The items of the vertical resistance walls are fixed to the girdles of the horizontal panels with square nails and galvanized metal. The exterior wall panels are usually coated with OSB plates of 12mm in size, which provides rigidity and work plan of the lateral sides, thus resulting in a rigid wall in its plan. The interior wall panels are arranged against the wind by horizontal and bent rulers between the pillars.

The walls can be as follows:

- resistance of wood reinforced with metal attachment and special nails.
- exterior walls: expanded polystyrene, OSB, wood wardrobe, mineral wool, metallic structure for gypsum board, gypsum board.
- interior walls (for compartmenting): gypsum board, steel structure for gypsum board, wood wardrobe, mineral wool.



Fig. 1. Structure of ecological house



Fig. 2. Foundation and structure of ecological wooden houses

Floors

The floor is made of wooden beams over the foundation, special metal sets that fix the foundation beams, OSB panels, extruded polystyrene, light blankets.

The floors are the horizontal building loads of weight taking over people and furniture and walls, and transmitting their weight to the walls; at the same time, they ensure the cooperation of walls and horizontal distribution of horizontal wind loads and earthquake.

The main elements of resistance are the floor beams. The beams consist of closet resinous wood, sections of 50x135, 50x180, 50x230, 50x280mm, interspaces placed at 400 and 600mm, rigid in connection with transverse distance of the closet with the same section. The system of beams and cross distance with the floor form solid and rigid assembly with a rigid washer.

The beams are connected to the girdles by nails, bolts, cupboards and galvanized shackles

The support layer is put over the pillars, and it consists of: wood floor plane of 22 and 45mm in thickness, the floor 24 and blind 45mm, OSB plates of 22mm in thickness. The floor is available in a single layer or two layers in different directions.

On the bottom of the floor, beams can directly strike the layer of finish: gypsum board, panelling, etc. or may remain apparent and is varnished.

Floor above the ground floor: It is made of gypsum board, steel structure for gypsum board, wood beams, mineral wool, OSB, extruded polystyrene, special metal attachment.

The framework is built of wood shingle oil, metal tiles or Metrobond tiles.

The roof resistance structure can be run in two variants, namely: chairs on roof framing, and roof framing beams on the lattice.

Frameworks are composed of a bucket and squared pane of resinous wood, sections of 90x90, 90x135, 135x135, 135x180, 135x230mm together forming a rigid stiff resistance by windproof and roe buck which supports the pane, the chert merge. The roof

timbers have section dimensions 50x90, 50x135, 50x180, 50x230mm.

The floors on lattice beams are composed of strong wooden lattice, made in closets of 45x90mm, and merge the nodes with feathered claws by pressing. The lattice beams are windproof on the upper foundation to create a rigid cover plan.

In both cases, the cover support consists of 24mm in thickness or OSB plate of 12 mm.

Waterproof of bitumen membrane is placed over the layer support of the cover

As cover material, there can be used: tile, galvanized, onduline sheets of bardolyne, Lindab board, eternite, etc.

Ceilings inclined to the attic, consisting of the structure itself, are thermally isolated with mineral wool mattresses, with of 150, 200mm in thicknesses.

Finishes

Finishes are made as follows:

- decorative plaster on the outside or American Siding PVC
- washable dye works in the interior.
- wooden staircase.
- PVC joinery plus double glazing windows.
- interior doors wooden cell.
- exterior doors in PVC, metal or wood.
- sanitary, heating and electrical installations.
- central heating.
- steel radiators or heating in the floor.
- doubleclick parquet.
- tiles and faience in the bathroom and kitchen.
- sanitary items.
- treated and flame retardant fir.



Fig. 3. Ecological house built in Wood Framing System



Fig. 4. Ecological house built in Wood Framing System

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CONCLUSIONS

Due to the advantages of running costs and reduced time to achieve these green houses Wood Framing system, they are very popular at the moment compared to conventional systems implementation and execution of the houses.

Because of the lightweight construction, applied technology system and good elasticity, wooden houses made in this way provides a far superior seismic durability of masonry houses.

Increasingly, more and more builders and beneficiaries choose this system of construction of green houses, especially at the holiday because wood has special qualities. Wood is flexible and easy it more resistant to earthquakes to masonry or concrete house. With a large number of advantages in the realization of timber houses, is a material becoming more preferably in construction.

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