

Technological process of making wooden staircases

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1. Abstract

From the day when first stair was invented until this day its meaning remained the same, easier overcoming the height difference in human's body movement. Wooden staircases opposed to contemporary materials such as glass or metal, give the surrounding interior genuine warmth and beauty of nature, regardless of the wood type. Wood with its texture, colour and good acoustic and thermal properties is suitable for interior furnishing and decoration because it gives the sense of comfort and warmth of residential areas.

In this term paper the technological process of making wooden staircases is presented from the aspect of staircase construction and their specific production and implementation.

2. Introduction

Staircases could be defined as stepped footpaths with the angle not less than 200° and not greater than 480° . Optimal slope for staircases is from 300° to 450° . Every material type from which a stair could be made gives a certain visual impact on the area in which it is located and one should always have in mind the initial idea with which we started designing residential area.

To make wooden staircases fit as a part of bigger complex, it's necessary to combine them with details such as wooden doors and windows. Staircases can fully or partially cover concrete or metal load-bearing construction.

For wooden staircases manufacturing mainly hardwood is being used, before all oak wood, although in exceptional cases we can use softwood. Wood has to fulfill certain structural requirements so we only use healthy wood without any greater structural anomaly, without putridity and insect attack.

3. Construction of staircases

Basic staircases elements are stair stringer, stair, stair fence and a platform. Stair stringer has a role of holding the stairs. Based on the place where it's located we distinguish free and wall stringers. Wall stringer is located on the wall and often secured on it while the free stringer is on the opposite side of the stair and mainly stair fences are located on it. Stringer thickness in wooden stairs is from 4 to 8 cm, and width from 26 to 32 cm, depending on staircase slope.

Stair is a constructive element of staircases with which we successfully overcome the height. Step is composed of tread and riser. Thickness of the tread is 4 to 8 cm, width is 25 to 30 cm while its length depends on the staircase width. Thickness of the riser is 2-3cm, width depends on the height of step and it's in the range of 15-19 cm, while its length also depends on the staircase width.

Staircase fence is set on the free stringer, and its assignment is to increase safety while moving on the staircases. Fence height should be 80-90 cm to have its function.

Platform is a flat area square or rectangular shape and is typically used to allow stairs to change directions or to allow the user a rest.

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3.1. Staircase classification by construction

By its construction staircases can be classified as it follows:

- staircase with embedded tread
- staircase with set tread
- staircase with seeded tread
- spiral staircase

Staircases with embedded tread are usually used as smaller addition or for lower level apartments. The stringer on these stairs has a groove made on the inner side, whose width matches the thickness of the tread. Space between grooves matches the height of the tread.

Treads can be set into the stair from the front or back side, although for practical reasons the first way has the advantage. To prevent the stringer deflection, they are being secured with metal bars whose ends have groove on them where metal screw is placed.

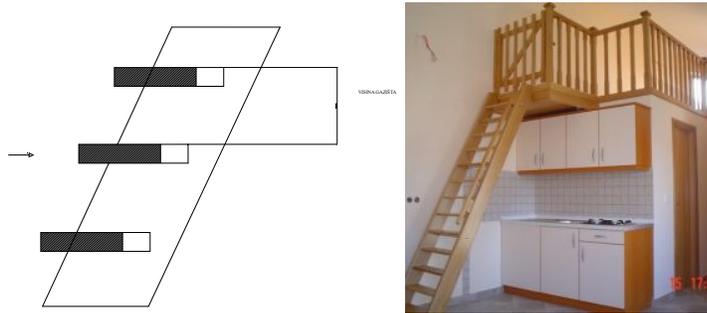


Image 3.1. Staircases with embedded tread

Staircases with set tread are different from the previous ones because they are being made as closed staircases, i.e. the space between steps is being closed with the stair riser and the ends of the tread and stair riser are being set into the stringer grooves and grooves are closed from the front and back side.

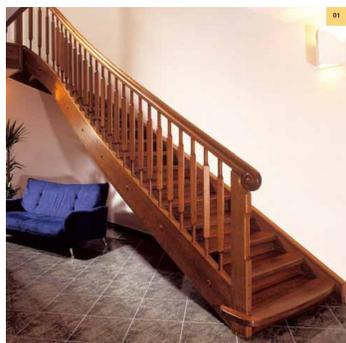


Image 3.2. Staircase with set tread

Staircases with seeded tread are mainly different from the previous ones by the fact that their treads and risers are being seeded on the serrated upper sides of the stringer so the upper

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sides of staircases with overhanging treads are completely visible from the side while from the other side they are being covered by stringers.



Image 3.3. Staircases with seeded tread

Spiral staircases showed as a need and tendency for maximum space in the living areas. Those staircases regarding the previously described ones are taking up the least space in the apartment. Because of the uniqueness of wood, i.e. the disruption of the tree rings due to the processing of spiral stringers, those elements lose their firmness and load-bearing ability. Because of that we are making only shorter pieces of stringers from wood which are combined with longer flat pieces or made in segments with those shorter pieces.

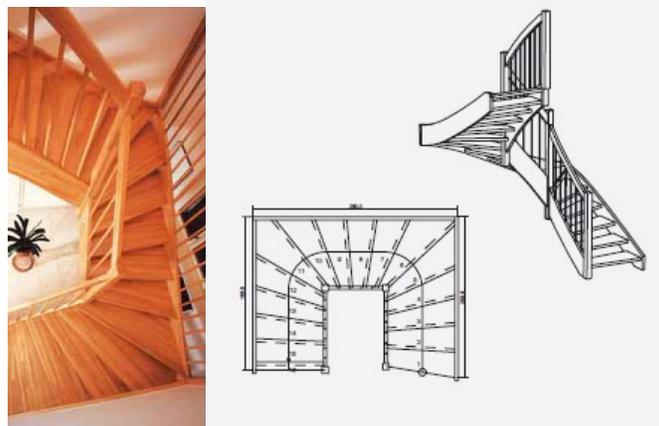


Image 3.4. Spiral staircases

These are only basic variants of these staircase types and depending on the space and architectural requests it is possible to combine these groups.

4. Technological process of making wooden staircases

Planning the technological process has its technology. It is being reflected in the gradualness of the planned activities execution which are necessary for completing the technological process. That gradualness is being reflected in the following:

- dividing the technological process on the operation
- list and order of the operations with marked work places and machines on which are the operations being performed
- specifying the needed quantity of the basic and additional material by the dimensions and quality
- defining the processing regime of every operation
- determining the time needed to complete every operation

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- choosing tools and machines for the operations that require them
- defining the instruments for measurement and control of the operations
- evaluation of the technological process economical indicators

If we assume that the staircase is made of massive solid boards which were made by gluing elements of solid wood, technological phases in the making of the staircases are:

- formatting the wooden elements
- making elements for boards
- gluing and veneering the board
- leveling and calibration of boards
- sawing out the elements of staircase from the board
- processing the staircase elements and making the elements for joint
- varnishing staircase elements
- montage of the staircases on the object

Recently, instead of classical technology new intelligent systems are being implemented which are ensuring significantly more profitable production, greater processing accuracy, shorter time of making and number of executors. These systems can merge and perform greater number of operations at the same time or linked. The example of one intelligent system like that is processing center whose purpose is making joinery but it is possible to process other products with it, such as: balcony fences, staircases, production of massive furniture. Possibility of sawing, milling, drilling, sanding and forming each elements into different contours at once. Fast, precise and with maximum accuracy it has the possibility processing in individual and serial production. It has multiple advantages: high production capacity, perfect precision, high surface quality, production without discontinuance due to changing tools, automatized production, drastically lower expenses by the product unit, visibly lower storage expenses.

5. Conclusion

Although modern civil engineering techniques, replace traditional material with newer, wood has still kept its important place because of its good properties and showed possibility to be used in many modern constructions. Reasons why wood is still being kept in the center regardless the new composite materials, are its great flexural strength, tensile strength and shearing, very satisfying resilience and low weight, resistancy on the chemical material influences and good thermal and acoustic isolation.

Earlier standard staircases process where massive solid wood was being used is replaced by the massive solid boards. Massive boards are created by using contemporary glues and narrower elements of wood and by gluing them we got boards of required width. By sorting and selecting we can manage wood waste by minimizing the oversize and in that way affecting the raw material utilization.

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