



THERMOWOOD  
TECHNICAL SPECIFICATIONS

novathermowood®



## Thermowood:

Heat treatment of wood was first made by German scientists Stamm and Hansen in the 1930s and by the American scientist White in the 1940s. Bavendam, Runkel and Buro in the 1950s continued their research on this subject in the 1950s. At the beginning of the 1990s, VTT (Finland Research Center) deepened its research on heat treatment.

Thermowood production method has been developed by VTT. Thermowood process is the process of exposing the wood material to heat treatment up to 180 °C and protecting it with the steam. Thermowood process reveals some chemical changes that occur in the wood besides the steam protection.

Thermowood brand is a process applied only by the International Thermowood Association manufacturers, and the use of the brand belongs only to the members of the association. With the Thermowood process, the color of the wood varies due to caramelization of the glucose contained in it. It is more stable, resistant to rotting and it has improved insulation properties. The working tendency of the material is also greatly reduced.

## Thermowood Process:

Heat treatment application in industrial sense has been developed by VTT in collaboration with the Finnish wood industry. Thermowood method is licensed by the International Thermowood Association and its members.

**novathermowood®** products are offered in two different processes;

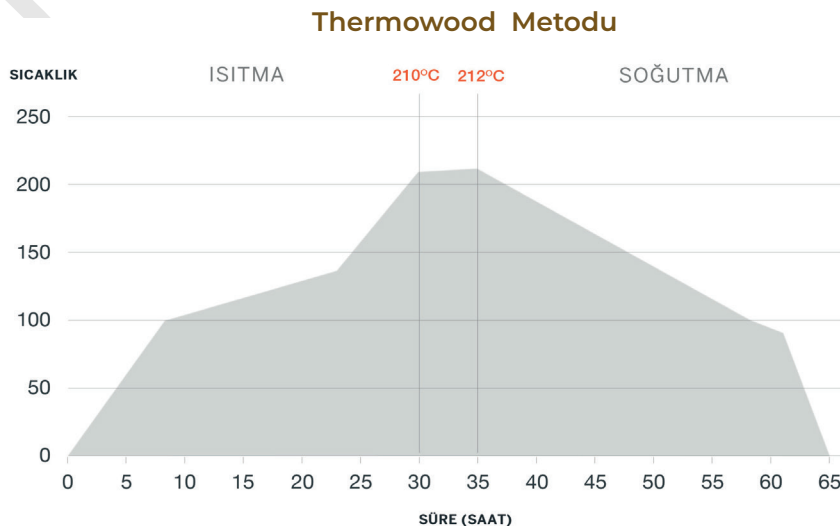
- Thermo-S (For interior applications with a thermally modification process of 180 °C - Pine, Ash and Iroko wood species)
- Thermo-D (For exterior applications with a thermally modification process of between 200 °C - 212 °C Pine, Ash and Iroko wood species).

## The thermal wood process can be divided into three main stages:

**Stage 1:** By the use of temperature, the temperature of the oven is rapidly increased to 100 °C. Then, the temperature is steadily raised to 130 °C, during this time the wood is dried and the moisture content is nearly reduced to zero.

**Stage 2:** The temperature inside the wood is increased by water vapor to 180 °C (Thermo S) and 212 °C (Thermo D). Once the target level has been reached, the temperature remains constant for 2-3 hours.

**Stage 3:** It is the cooling and humidification stage. In this last section, by using the water spray system, the wood's temperature is reduced to 80 °C - 90 °C and it is continued until the moisture of the wood reaches 4-6%.





## MAIN SPECIFICATION

### Stability:

As a result of the Thermowood process, the stability is increased compared to regular wood. Due to structural changes of the wood with high heat treatment, the internal stress has been reduced. Also, thanks to the Thermowood process, the equilibrium moisture content and the permeability of the wood has been reduced. As a fact, the working and the twisting tendency compared to regular wood has been minimized.

### Durability:

During the thermowood process, the biological durability of Novathermowood® products are being increased due to the hemicellulose breakdown (arabinose, galactose, xylose, mannose). As these are the nutrients of the bacteria causing decay and fungus which are pulled out during the Thermowood process, it is not possible for the bacteria to attack the wood.

novathermowood® products have a durability against various types of fungus.

novathermowood® products are durable against wood destroying basidiomycetes.

The thermowood process does not protect the materials from algae and fungus on the surface. These organisms feed from the environment (>23% humidity and over) and they don't cause any structural changes on Novathermowood® products. The algae on the surface which can be seen as an aesthetic problem can be easily prevented through the surface treatment (such as wood preservative oil, water based varnish).

### Service Life:

Novathermowood® products are 80% more efficient than normal wood in outdoor weather conditions. Its working tendency is minimized and its resistance against decay is developed with the natural methods. They are completely natural and human friendly products. Novathermowood® products comply with the European norms EN 350 and EN 335-1 classes. It has been documented with Thermowood Certificate that Novathermowood® products have sufficient biological resistance according to CEN / TS 15083-1: 2005 technical norms.

### Density:

It is known that Nova-Ash products have an average range of 595-629 kg/m<sup>3</sup> at 65% relative humidity and 20 °C ambient temperature when the specific gravity moisture content is 6%.

The specific weight of Nova-Pine products is in the range of 362-404 kg /m<sup>3</sup>. This is the case when the moisture content is 6%, 65% relative humidity and 20 °C ambient temperature.

The specific weight of Nova-Iroko products is measured as in the range of 576-650 kg/m<sup>3</sup>, when it is at the level of 6% wood moisture, and the relative humidity in the environment is 65% and the ambient temperature is 20 °C.

*Note: Since Novathermowood® products are 100% natural products, there may be 10% differences in specific weight changes between the parts.*



### **Modulus of Elasticity and Strength:**

Due to lack of humidity and the structural changes caused by the thermowood process, the bending and compression strength has been reduced for the products that have undergone thermowood process compared to the regular wood. However, considering the relationship with the regular wood, great differences do not arise.

### **Nail and screw holding strength:**

The nail and screw holding strength of Novathermowood<sup>®</sup> products does not reveal a significant difference compared to the regular wood. However, as the cell wall should be changed during the thermowood process, the screw and nail holding power decreases by 20%. This deficiency can be easily overcome by using stainless A2 screws and nails.

### **Adhesion:**

The findings on the gluing of Novathermowood<sup>®</sup> products are at the same level of untreated wood. Recommended adhesives are MUF, polyurethane and epoxy.

### **Brinell Hardness:**

After the Thermowood process, the Brinell hardness of the wood is higher than the products that are not subjected to heat treatment.

- Brinell hardness degree of Nova-Ash products are 30.5 N/mm<sup>2</sup>.
- Brinell hardness of Nova-Pine products are 15 N/mm<sup>2</sup>.
- Brinell hardness of Nova-Iroko products are 40 N/mm<sup>2</sup>.

### **Emission:**

Thermowood process has its own characteristic odor. With many tests performed by VTT by using the KET 3300495 test method, it is proved that these emissions are harmful in outdoor conditions.

It has also been revealed with these test results that the volatile organic compound (TVOC - Total Volatile Organic Compounds) values are much lower than the regular woods.

The odor of Thermowood products will disappear within a few days, but then it may reappear for a short time in cases such as surface treatment and rain.

### **Fire Resistance:**

According to the results of European norms EN 13501 (SBI-Test), the reaction class of thermowood products against fire is defined as "B-s1, d0". By using fire retardant chemicals, the fire resistance of Novathermowood<sup>®</sup> products has been upgraded to the "B-s1, d0" class.

### **Insulation:**

The thermal conductivity of Novathermowood<sup>®</sup> products are reduced by 20%. In the light of the tests performed by VTT, the thermal conductivity of Nova-Pine materials is 0.099 W/(m K), while the pine without thermowood treatment, the value of the materials is 0.12 W/(m K).

According to these values, it turns out that Novathermowood<sup>®</sup> products are a very suitable material for outdoor cladding, saunas, windows and doors.



## Color:

Since Novathermowood® products are completely natural products, it is known that the color they get during production is directly proportional to the amount of glucose in the wood. Through the high heat, the sugar in the wood is caramelized which changes the color of the wood.

- Nova-Ash and Nova-Tulipwood products are dark brown.
- Nova-Pine products have a light brown tint.
- Nova-Iroko and Nova-Ayous products are honey color.

It is a natural phenomenon that Novathermowood® products, which are natural product, turns into silver gray in time due to UV effect. The change in color has no negative effect on the durability of the wood. In order to prevent graying, the maintenance of the products should be done as described in our maintenance guides.

## Moisture Content:

The moisture content of Novathermowood® products are between 4-6% during the production process. This ratio may vary depending on the atmospheric environment of the area where the material will be applied. The equilibrium moisture content of the Novathermowood® products are in the range of 10-12% in the environments with 95% relative humidity and dry air.

## Maintenance:

Novathermowood® products are suitable for maintenance. With the proper care, they can maintain first day appearance even after years.

It is recommended that the distance between Nova-deck products and the ground is in the range of 4-6 cm.

## Environment:

Novawood® is a FSC and PEFC Certified organization, and all of the products it supplies are obtained from sustainable forests.

## 1) Working with Products

Novathermowood® products can be cut just like the regular wood. Considering that the material is drier, it should be kept in mind that the wood chips are thinner and more volatile. It is mandatory to use masks and glasses during the application and material cutting process.

## 2) Health and Safety

Novathermowood® products are completely natural products that do not contain any chemicals (toxic and harmful substances). Therefore, Novathermowood® products do not contain any substances that are harmful to human and nature health and they are completely healthy.

During the application, it is recommended to remove the splinter quickly in case of sinking. In addition, since the wood chips of thermowood products are very thin, asthma patients must wear a dust mask during the application/cutting.



### 3) Storage

It is recommended to store Novathermowood<sup>®</sup> products horizontally by using the supporting wedges with a distance of 60 cm. Vertically stacked materials are likely to bend.

The material brought to the plant should be stacked in a suitable and closed stock area that is safe and clean. The wood brought to the site which is ready for installation, should be stored on the pallets on a dry floor, with the original packagings of the manufacturer firm and they should be protected from the external weather conditions.

It is recommended that Novathermowood<sup>®</sup> facade products be stored in their original packagings until the installation begins. If there are cladding products that are needed to be returned, then the storage conditions should be provided as similar to the original packaging. When the products are received, the conditions of the packages must be checked.

