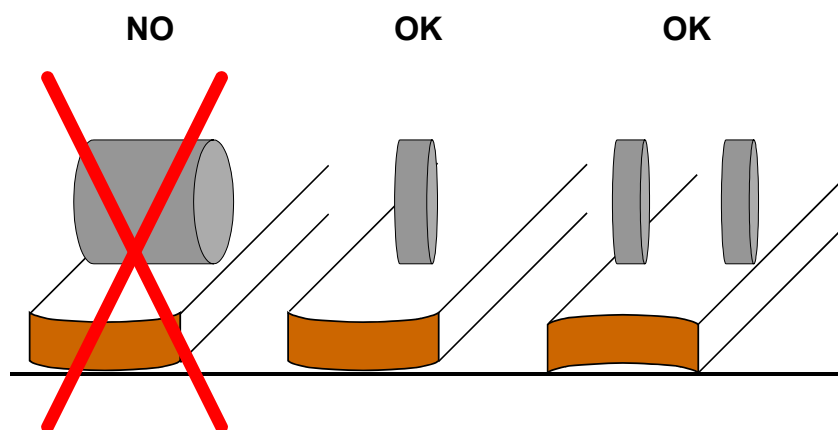


# ThermoWood® Quality Planing Handbook



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## 1. Introduction

This planing quality handbook has been produced by members of the Finnish ThermoWood association. The document is based of practical working experiences given by members and also sub contract planing companies who have been planing ThermoWood for a longer period of time. The intention is to pass on these experiences to re-manufacturers so as to reduce the risks of unwanted results when planing ThermoWood and to increase the overall level of knowledge of working with ThermoWood on an industrial scale.

The document will give recommendations for planing ThermoWood Pine, Spruce, Birch and Aspen. These species currently make up the majority of material that is produced to ThermoWood in the World today.

As a result of the ThermoWood process, the colour, structure and moisture content of the material is changed significantly. The material becomes more susceptible to mechanical damages and this must be taken into account when handling the material.

It is hoped that with this document will prove to be an invaluable and authoritative guide to the planing of ThermoWood and will lead to excellent planing results for all those re-manufacturing the material.

## 2. Raw material

### **2.1 General Raw material quality and species**

#### Soft woods

It is very important to select rawmaterial that is containing fresh knots. Dead knots tend to drop out after thermal treatment or during the planing process. In pine rawmaterial from top logs tends to give the largest amount of fresh knots. Care must be taken to consider the maximum knot size in relation to end use. For material that is to be planed to decking or other light load bearing uses the size of the knot will have an major impact on the strength of the product in end use. When selecting raw material care should also be take to avoid log/heart shake , after thermal treatment the heart shake will make the piece un-useable. Side board material is not suitable for ThermoWood production, it should always be through cut material form the centre section of the logs, this also gives more fresh knotted material. Where possible more vertical grained material leads to better end results.

#### Hard woods

With hardwoods the target should be select predominantly knotless raw materials. Soft rot and blue stain should also be avoided along with heart shakes. Side board material should be avoided.

## **2.2 Optimum moisture content**

It has been found that with higher moisture contents the planing results improve. The standard moisture content of ThermoWood ranges from 4-6%, this moisture content fits with the equilibrium moisture content in relative humidity of 65%. If the moisture content is made too high then it can lead to shrinkage in end use especially if the product is to be used internally where the relative humidity is low.

## **2.3 Moisture gradient**

It is important to have a minimal gradient between surface and middle of the wood piece, too large a gradient can lead to distortion immediately after planing or deep cutting. Too large a gradient can also lead to the risk of surface fissures occurring.

## **2.4 Storing**

It is important to store the raw material prior to planing in a dry and well ventilated environment such as a warehouse. Care should also be taken during colder periods that the material is not frozen when starting to plane or further process, this can lead to poor surfacing. Stacking should also be made so as there is sufficient amount of bearers underneath the packs so that distortion does not occur. Storage of raw material outside prior to thermal treatment can lead to end shakes and surface fissures occurring as a result of the sunlight leading to rapid natural drying, this is especially the case with green raw material. Ready treated ThermoWood which is stored outside with out covering is susceptible to colour change due to UV degradation and general dirt in the environment- therefore under cover storage is recommended.

# **3. Planing equipment**

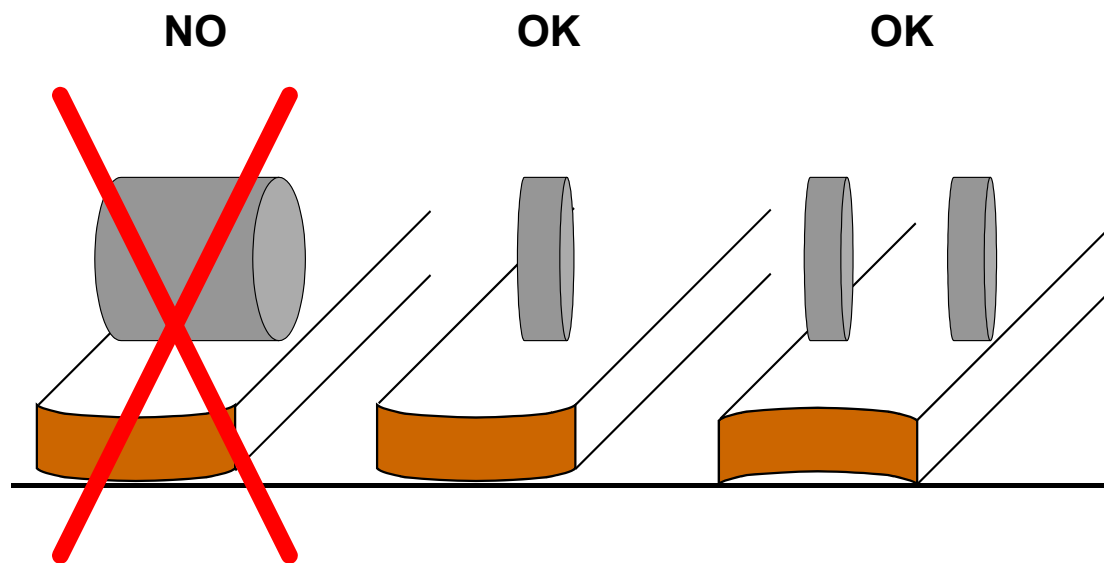
## **3.1 Pre-planing handling equipment**

Where possible horizontal conveyor systems should be used to minimise edge damages and breakage of the material. Standard piece discharging equipment may be used but suction lifting systems will cause less damage as is the case with handling all wood materials. All the measuring devices and light cells/sensors must be adjusted to recognise the darker wood. This is especially the case when needing to turn the boards prior to infeed.

### 3.2 Infeed roller type

As a result of cupping in the ThermoWood sawn raw material is necessary when planing timber pieces which have not been re-cut before planing to install infeed rollers that meet one of the two following types:

Two narrow wheels so the contact with the piece is on the out edges of the face with the cup round up or a single narrow wheel could be used turning the piece so that cup round is down, see the illustration below. With both methods this enables a flat surface to be formed as the piece proceeds through the planer, thus reducing the risk of surface cracking and enabling higher infeed roller pressure.



*Illustration of recommended infeed rollers to avoid cracking of the boards.*

### 3.3 Cutter types, angles

Seinäjäki Polytechnic has made test series about planing of ThermoWood. They tested several cutter angles. According to these test all angles worked well and also the surface quality was good. Better results are achieved with hard metal blades in cutters, like working with hardwood species.

The main point to focus on is how the cutters are settled on the cutter head, they have to be on same radius. It has been found that similar cutter types as would normally be used when planing hardwoods or more brittle wood species such Western Red Cedar bring good results.

More recent tests have found that by using spiral cutters there is less damage to the knots and the material around the knots. Results have shown that star shakes which are typically found in Spruce and to a lesser extent in pine have less tendency to break out when using the spiral cutters and similar results can be obtained as with normal kiln dried Spruce and Pine.

### ***3.4 After planing handling equipment***

As with the pre handling equipment, big drops or too heavy handling and turning devices should be avoided to minimise edge damages and breakage. It is advisable All planed goods should be protected with shrink wrap or other cover.

### ***3.5 Sharpness of tools and effects of dulling***

It has been found that it is essential to keep good sharpness of the cutters, once dulling starts to occur the damage to the knots and material around the knots increases and also splintering of the arises increases. Effects of dulling can be seen from the surface of the material. It has been found that dulling occurs more quickly than when planing normal kiln dried pine or spruce but at about the same rate as hardwoods and western red cedar.

### ***3.6 Dust Extraction systems***

Dust is more micronic compared to normal wood so that must be taken into account when designing the equipment. The dust particles are a similar size to that of Western red cedar and hardwoods. The dust cannot be used for making pellets.

## **4. Planer set up and through put**

### ***4.1 Number of cutter heads, knives and jointing***

The normal rule for through put speed to number of cutter heads of 10m/min for each cutter applies when planing ThermoWood. It is not necessary to joint if the cutters are set to be in the same radius.

### ***4.2 Infeed and roller pressures***

Infeed rollers must be adjusted with lower pressures to avoid cracking of the boards. The pressure of rollers as well the speed and other parameters are highly dependant on the planing line and machinery. Therefore any general values cannot be given, but as a guideline, ThermoWood should be processed with parameters that are adjusted more for hardwood than for softwood.

#### **4.3 Through put speed – number of cutter heads**

In some planing lines also the speed must be decreased e.g. in one case from 80 m/min to 60 m/min, and in another case from 100m/min to 80m/min. If infeed speed is decreased, corresponding adjustment should be to the rotation speed of cutters. Too high rotation speed in proportion to infeed speed can cause wood surface to burn.

The rotation speed of the cutter heads must be in right level compared to infeed speed because too high rotation of cutter might cause that wood cells on the surface to closes and this can lead to difficulties when applying surface coatings.

#### **4.4 Optimum planing volume before re-tooling**

Can be seen from surface when it starts to get rougher is time to change the blades. With hardwoods cutters becomes dull faster compared to soft woods.

### **5. Other key factors effecting planing quality**

To avoid the risk of year ring loosening in end use it is important to plane the weather exposed surface to the outer side of the board and the heart side/pith to the backside or under side. This is especially important with ThermoWood Spruce, but can also be considered as important when planing other ThermoWood treated species.

The rawmaterial quality and number, size and type of knots has an effect on dulling of the cutters. Results have found that planing the boards so that the bottom end of the tree is put to the planer first brings better results. Too high pressure from the rollers and incorrect angles on the cutters can cause delaminating and year ring loosening.