

THE THERMO TREATED WOOD

WORKING WITH THE MATERIAL

The performance of thermo treated wood differs from normal wood. Several considerations have to be taken into account when using the material. As the wood has become brittle, sharp blades have to be used to prevent the wood from ripping. Wood dust coming from the process is very finely divided and dry. The material absorbs slowly water and water based glues. That is why longer pressing times are needed, making the gluing more difficult. The darkened color created in the process is not durable in UV-light, unless the surface is treated with UV-resistant coating. Normal painting processes present no problems. Thermo treated wood is more susceptible to mechanical damages compared to untreated wood. Thermo treated wood can be sawn and worked in the same way as ordinary untreated lumber. It is easy to use all sorts of hand tools for cutting, drilling and planing. An excellent surface can be created without any difficulty, and drilling through knots is also easy.

Storage

Thermo treated wood can be stored for unlimited time in a dry place, including unheated warehouse, but there is no special need for controlled climate systems. The packages should be stored off the ground and flat with sufficient supports between packs to avoid distortion.

Raw material

Preliminary K/D must be soft and slow to avoid honeycombs and reduce tension. It is very important to select raw material without heart shakes, soft rot, blue stain and dead knots, which are likely to drop out during thermo treatment. Side board material is less suitable for thermo treatment process. More vertical grained material leads to better end results.

Mechanical treatment

All working techniques (sawing, planing, milling, drilling, turning and sanding) can be carried out with the regular tools and according to established working practices. To achieve the best results the use of well-sharpened hard metal blades is recommended. The following measures can lead to further improvements in quality.

- Increasing the cutting angle and also if possible, the clearance angle
- Increasing cutting speed
- Using tools with the highest possible number of blades
- Using parallel feed whenever possible
- Due to the intensity of thermo treated wood is much more brittle than untreated wood and therefore sharp edges (via chamfering or rounding) should be avoided.

Fixing

Adhesive Fixing

Since the wood is entirely dried out, cases of insufficient adhesive strength may arise. It is important to carefully check if the required adhesive stability can be achieved when using water-based glues. Water-based glues such as PVA require longer compression and drying time. Due to brittleness of thermo treated wood high compression pressures should be avoided. The glue used should also contain a high proportion of solid material.

Chemically hardening glues (such as polyurethane, glue based on polyvinyl acetate + hardener, resorcinol-phenol and melamine resin) can be used with thermo treated wood in the same way as with ordinary wood.

As levels of expansion and contraction in thermo-treated wood are 50% lower than ordinary wood, it cannot simply be attached to untreated wood. In these cases, careful preparation of both the thermo-treated and untreated wood is necessary.

If raw plugs are to be used, then these should also be thermo

treated. Alternatively, plastic raw plugs could be used.

Up to now, no guaranteed results have been obtained on the performance of thermo-treated wood when adhesives are applied for external use. It is recommended not to use glue for external use.

When gluing thermo treated wood, the glue manufacturer's specific instructions must always be referred to.

Screwing

Thermo treatment reduces splitting strength of wood. The use of self-tapping or countersinking screws or pre-drilling of holes must be made to avoid cracking of the material. It is recommended to use less threaded screws compared with untreated wood. Stainless steel screws with countersunk heads are most suitable in outdoor applications.

Nailing

When fixing thermo-treated wood it is extremely important to use stainless steel – rust free or fully galvanized nails. Using normal wire nails or staples will lead to rust stains and overall deterioration in the fixing. Small oval head nails reduce the risk of splitting. Nails should be sunk to a depth of about 1mm.

Best results are gained when using a compressed air nail gun with adjustable nailing depth on the gun. Attention must be paid to the correct pressure and the nailer's drive length.

Using a normal hammer increases risk of splitting due to accidental hammer contact with the wood.

Due to the brittleness fixing with nails, nail plates (gang nails) and staples is only of limited use of the material.

Recommended amount of fixings and positioning

The nail position from the bottom of the board must be a minimum 2 times and maximum 3 times the thickness of the board. When fixing also at the upper part of the board the nail should be positioned minimum 2 times and maximum 3 times the thickness of the board at its thickest point down from the top of the board. The importance of this is that there should be sufficient overlap between adjacent boards, but it is important not to have the fixing too close to the point where the overlap occurs. It is absolutely crucial that the fixings are not positioned through the two adjoining boards. A sufficient clearance gap between each board should be maintained to allow for tangential movement and also free space for drying when the material is wet. The recommended clearance gap is between 2–3% of the total width of the board.

Planing

Planing of thermo treated wood can be made by using standard planing machines, which work well and also the surface quality is high. Good results are achieved with hard metal blades in cutters - the best results are achieved with carbide-tipped cutters.

Some care should be taken in the set up of the infeed rollers to reduce the risk of material cracking. Due to the cupping of pieces that may occur as a result of thermo treatment it is recommended that when planing pieces not previously re-cut to change the infeed roller to one that has

two narrow wheels so the contact with the piece is at the outer edges of the convex face. Alternatively, a single narrow wheel can be used so that the piece is turned with the convex face down. Both methods enable 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. In order to avoid cracking of the boards, it is advisable to make a flat base surface with a planer or band saw first before profiling.

Due to the lack of resin thermo treated pieces cause less friction during infeed and enable a smoother planing process. On the other hand, since the strength of the material is lower, the infeed rollers must be adjusted to lower pressures to avoid cracking of the boards. In some planing lines, the infeed speed must also be decreased (with correspondingly decreasing of rotation speed of the cutters). The exact thermo treated wood planing parameters are set separately for each planing machine.

To achieve the best possible planing results and minimize loosening of the wood's annual rings, it is recommended to use material that has been cut as parallel to the grain as possible. In addition, considering the best face of the board when planing improves the result. There is a close connection between the infeed roller type and pressure, the grain direction, cupping, cutter sharpness, and throughput speed. When these variables are carefully harmonised, the best results are achieved.

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.

The raw material 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.

The planning parameters of thermally processed softwood should be adjusted more for those used for hardwood. Efficient dust extractions systems will be needed.

It has been found that with higher moisture contents the planing results improve. The standard moisture content of thermo-treated wood ranges from 4-6%, this moisture content fits will 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.

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

Sawing

Sawing of thermo treated wood does not differ from sawing of untreated wood. Sharp tools are recommended to achieve the best results. As the resinous substances have been removed during the thermo treatment process, the machines work well and are cleaner after processing.

Since gap-toothed saw blades can cause chipping in the edges of thermo treated pieces, fine-toothed blades are recommended. Blades with carbide or similar tips extend the saw blade's maintenance and sharpening intervals.

The only problem is the wood dust. For that reason special attention has to be paid to the operation of an appropriate dust extraction system.

Milling

In order to achieve a good surface quality – especially in milling – the cutters must be sharp; otherwise tearing will occur. A higher level of tearing was observed when the wood was milled across the grain. The greatest problems with tearing occurred at the start of the milling and at the end, when the cutter comes out of the wood. The cutting speed also affects the result.

Milling thermo treated wood can be regarded as similar to working with hard, brittle hardwoods.

It was found that the working order has an influence on the working properties of wood. The best results were achieved when there was enough solid wood material behind the cutter. Therefore, processing must be preplanned carefully. The cutters wear more slowly than with normal wood.

Sanding

General working is equivalent to working with untreated wood; no problems have been reported. In many cases there is no need for sanding, as thermo treated wood has a good surface quality after planing or milling.

The dust generated has a small particle size, which is to be taken into account in planning dust extraction.

Surface treatment

Reduced equilibrium moisture content of thermo treated wood improves its stability, which in turn reduces the cracking and flaking of the surface coating in changing weather conditions. Water based surface treatment products require slightly longer drying/absorbing time.

As the resin is removed from the wood, knots do not necessarily require special procedures during the surface treatment.

To prevent color changes and surface shakes it is recommended that surface treatment against ultra violet radiation is used. Normal painting processes present no problems, but when electrostatic painting is used, heat-treated wood requires extra moisturizing. Coatings specifically designed for timber (such as water-borne, solvent-borne (sometimes referred to as oil based) or high solids solvent-borne in nature) can be used.

To prevent color changes, the treatment substance should contain pigment. This usually results in a slightly darker appearance. Different surface treatments have different maintenance intervals.

The endprotection is very important to decrease water absorption through the end-grains.

Health and safety

There is no major difference in health and safety considerations for thermo treated wood as compared to untreated lumber. The only detectable differences: the smell of the material and the dust generate in the processing of thermo treated wood.

Thermo treated wood has a smoke-like smell, which likely comes from chemical compounds called furfurals. Although the smell is easily detectable and seems stronger than that of untreated wood, the tests show opposite results.

In processing of thermo treated wood, special attention has to be paid to the operation of an appropriate dust extraction system. The standard dust extraction systems in industrial environments meet this requirement without requiring special adjustments.

Persons who are exposed to the dust on a daily basis should protect themselves with, for example, dust masks. When gluing or painting thermo treated wood, always follow the paint or adhesive manufacturers' specific health and safety instructions.

Handling of residual and discarded products

When not glued or painted, thermo treated wood waste can be handled like any other untreated wood waste.

Thermo treated wood can be burned.

Pelletizing and briquetting is possible, if a mixture with normal sawdust is used.