

Prefere 6151

Emulsionpolymer/isocyanate for the wood industry (EPI-adhesive)

Use

Prefere 6151 is always used with hardener Prefere 6651 and is as such a two-component adhesive system based on an emulsion polymer and an isocyanate (EPI-adhesive) used in the manufacture of load bearing timber structures with a glue line thickness up to 0,2mm. Prefere 6151 is well suited for cold, hot and radio frequency curing. The glue lines of this adhesive system are light-coloured.

When the gluing is carried out in accordance with the instructions in this Technical Data Sheet, Prefere 6151 gives bonds with excellent durability, water- and heat-resistance conforming to Adhesive Type 1 of the European standards for adhesives for load-bearing wooden structures (EN 16254:2013).

Prefere 6151 can also be used for gluing of load-bearing wooden structures made from larch (*Larix decidua*) and birch (*Betula pendula*), gluing of wood to aluminium and is suitable for a wide range of special applications.

Prefere 6151 is tested by MPA (Otto-Graf-Institut, Stuttgart) according to DIN 68 141 and is approved as an adhesive system Type 1 for manufacturing of load-bearing wooden structures and finger joints by DIBt (Deutsches Institut für Bautechnik) (allgemeine bauaufsichtliche Zulassung Nr Z-9.1-634). DIBt has also approved Prefere 6151 for contactless application finger jointing and for finger jointing of larch (*Larix decidua*).

Prefere 6151 with hardener 6651 has been tested by NTI (Norsk Treteknisk Institutt, Oslo) according to EN 16254:2013 and fulfils the requirements for the gluing of load-bearing wooden structures and structural finger jointing according to EN 14080:2013 and EN 15497:2014.

The adhesive system fulfils herewith the requirements according to EN 16254:2013 and is classified as a general purpose and finger jointing adhesive for mix-in use, for the gluing of Norway spruce (*Picea abies*), Scots pine (*Pinus sylvestris*), Silver fir (*Abies alba*) and European larch (*Larix decidua*) with the following class designations:

EN 16254-I-70-SD-0,2-M
EN 16254-I-70-FJ-0,1-M

Prefere 6151 has been tested by NTI according to JIS K 6806 and was found to be suitable for production of small- and medium-sized laminated timber structures for exposure condition C according to JAS MAFF.

Prefere 6151 is tested by TECO (USA) and fulfils the requirements in ASTM D2559-12a for gluing of Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris*) for load bearing timber structures.

The system is also approved by KOMO (Netherlands) and FCBA (France) as adhesive Type I.

Prefere 6151 fulfils the requirements for production of CE-labelled solid wood panels (Multi-Layer-Boards) according to EN 13353.

Prefere 6151 conforms to Durability class D4 and C4 of the European standards EN 204 and EN 12765 with good margin. For details on these and other approvals, please contact our marketing department.

Prefere 6151 is completely formaldehyde free and pH-neutral.

Technical data for the adhesive

Appearance	White, viscous liquid
Solids content (2 h at 120°C)	59-61%
Viscosity at 25°C	6000-10000 mPa.s *
pH	6,5-8,5
Density at 25°C/4°C	1,26 ±0,02 g/cm ³

*The viscosity is measured by Brookfield, RVT, spindle 4 at 20 rpm.

Storage of the adhesive

Prefere 6151 can be stored for six months at the recommended temperature of 15–25°C. It must be protected from freezing.

Technical data for the hardener

Appearance	Brown liquid
Solids content (2 h at 120°C)	n.a. **
Viscosity at 25°C	250-400 mPa.s *
Density at 25°C/4°C	1,24 ±0,02 g/cm ³

*The viscosity is measured by Brookfield, RVT, spindle 4 at 20 rpm.

** Prefere 6651 contains 100 % MDI (monomer / oligomer). Before handling see Safety Data Sheet.

Storage of the hardener

Hardener Prefere 6651 has a storage stability of 12 months from production date if stored according to recommended conditions. Prefere 6651 should be stored at 10-35°C in closed containers, drums etc. Storage at lower temperature is not recommended since this may lead to some crystallization.

It is necessary to protect the hardener from moisture since it will react and loose efficiency as well as produce CO₂ gas. During storage the container must be sealed and when in production a moisture absorbent filter must be installed.

The wood

All data for assembly time, pressing time and time to full water resistance refers to production using Norway Spruce (*Picea abies*). However, Prefere 6151 can be used for a wide range of species. For details please contact Dynea's Technical Service Department.

To ensure optimum bond quality when producing laminated timber structures the lamellas should be freshly planned and the moisture content of the wood should be between 8 and 15% with a maximum difference in moisture content between lamellas of 4%.

When making finger-joints the moisture content can vary between 8 and 23% with a maximum difference of 5%.

For other applications moisture contents down to 0% can be used.

Glue mix preparation

Prior to use, Prefere 6151 must be thoroughly mixed with hardener Prefere 6651 with mixing ratio as shown in the table below.

Prefere 6151	100 pbw
Prefere 6651	15 pbw

The maximum allowable tolerance of the hardener dosage for face gluing is ± 1 pbw. For production of finger joints the tolerance can be ± 3 parts by weight.

Glue application

It must be demonstrated that automatic metering/mixing equipment to be used is suitable for this special operation. Note that foaming can occur.

If adhesive and hardener are mixed by hand, one should be aware that the adhesive has a different specific gravity than the hardener. In order to obtain a homogeneous glue mix it is therefore advisable to stir from the bottom.

Pot life

At 5-20°C the pot life of the glue mix is ca 45 minutes. The pot life is not determined by increasing viscosity but by the chemical reactions. It is therefore crucial to use the glue mix within the time limit set by the pot life. If the pot life is exceeded the quality of the glue line will be reduced. The moisture resistance of the bond will especially be affected. Furthermore, the maximum assembly time is also influenced by the age of the glue mix.

Glue spread

In the manufacture of laminated timber structures the adhesive should be applied to one surface only at a rate of 175-400 g/m². Lower glue spread can be sufficient depending on production technique, planing quality, required assembly time and pressing process. This should only be done after seeking technical advice from Dynea.

Application to both surfaces can be advantageous when bonding difficult-to-bond wood species.

Assembly time

Assembly time is the time elapsed between glue application and pressure application. It can be subdivided into open (from glue application until assembly of the adherents) and closed assembly time (from assembly until pressure is applied).

Open assembly time should be kept as short as possible. On the other hand, 5 minutes closed assembly time is beneficial, in particular when dense wood is being bonded.

Maximum closed assembly time depends first of all on the open assembly time, the glue spread rate, further on wood species, temperature and moisture content of the wood, temperature, relative humidity and air circulation in the workshop.

The lower the spread rate, the higher the temperature, the drier the air and the drier the wood, the shorter will the assembly time be. At a spread rate of 250 g/m² on softwood with 12% wood moisture content, the maximum closed assembly time at 20°C/ 65% RH is approx. 15 minutes provided the laminations are assembled immediately (max. 1 min) after glue application. Under ideal conditions the system may handle longer assembly times when using glue spreads up to 400 g/m².

Under all circumstances the time from the glue is mixed until pressing should not exceed the pot-life of the system (40 minutes at 5-20°C).

Pressure

The pressure is dependent on the wood species (softwood or hardwood) and on the type of bonding operation.

In the manufacture of laminated timber structures the pressure should be 0.6-1.0 N/mm² with softwoods and 0.8-1.2 N/mm² with hardwoods. In other bonding operations lower or higher pressures may be sufficient.

In finger jointing the end (longitudinal) pressure should be adapted to the joint profile, wood species, the moisture content and the cross section of the timber, thus it should therefore be determined accordingly. For most softwoods an end pressure of the order of 5-8 N/mm² will be sufficient for finger joints over 25 mm in length. For shorter joints an end pressure of 8-12 N/mm² is necessary. If pre-heated wood is used, there is a risk that the pressure may cause compression fracture of the wood, in particular if the moisture content of the wood is high. In such cases the pressure must be reduced.

Pressing properties

a) Laminated timber structures

In the table below, the minimum pressing times when manufacturing straight beams with a maximum glue line thickness of 0,1 mm at an application rate of 200 g/m² are given.

Dosage (pbw)	Pressing time in minutes at				
	15°C	20°C	25°C	30°C	40°C
100:15	30	20	15	12	10

The stated pressing times are guidelines for sufficient bond strength to allow further processing when gluing on spruce with moisture content of 10 – 12 %. Curved constructions, higher glue spread rate, thicker glue lines, higher moisture content of the adherents and dense wood (hardwood) call for longer pressing times.

b) Finger jointing

Prefere 6151 is very well suited for finger jointing. The system will cure rapidly at temperatures down to 5°C. Several factors will influence the necessary curing time after the pressure is released, such as the dimension of the timber, the finger geometry, glue spread, process etc. The exact required curing times can be determined by bending strength tests.

c) Radio frequency curing

Prefere 6151 is well suited for curing under radio frequency heating conditions.

Since the necessary pressing times depend on a number of factors, such as the shape of the adherents, the position of the electrodes, the generator effect, etc., it is recommended to establish the pressing time by trials.

Experience has shown that too high field strength is unfavorable. Field strengths of approx. 2,0 W/cm² glue line have been found to be suitable, and the generator should be shut off after approx. 2/3 of the total pressing time. A general guideline is that the glue line temperature at the time of the pressure release should be maximum 50 °C.

Post curing

After expiration of the above pressing times the adhesive is sufficiently cured to allow for machining. Full water resistance of the bonds will however only be reached after some time. The necessary time depends on the glue line thickness, pressing time and the temperature during pressing and post curing. The following table shows minimum post curing times for laminated timber structures as well as for finger joints with a glue line thickness of 0,1 mm to reach full water resistance.

Dosage (pbw)	Time to full water resistance in hours at				
	5°C	10°C	20°C	30°C	40°C
100:15	24	10	5	2	1

During the post curing period the structures should not be exposed to strains which may weaken the glue bond.

Cleaning

The hardener must not be mixed with water. For cleaning of the hardener special solvents are needed. Dynea's Technical Service Department can give recommendations about suitable cleaning liquids. Crystallized hardener is insoluble and must be scraped off.

The mixing and spreading equipment should be cleaned at the end of each working day. If the glue mix thickens in the application equipment, the equipment must be immediately emptied and cleaned; otherwise, there is a risk that the glue mix will cure. Cured glue is insoluble and must be scraped off. For easier removal of cured glue it is recommended to cover exposed metal parts with self-attaching plastic foil.

Cleaning of glue and glue mix residues is most easily done with warm water (50-60°C) but water down to 25°C can be used. Before cleaning of the equipment is started, the water pipes should be drained of cold water.

Advice on safe handling of glue remainders and wash water can be found in our Technical Information Leaflet No. 2E "Glue waste disposal - Prevention of pollution".

Safety precautions

Reference is made to the Safety Data Sheet for Prefere 6151 and hardener Prefere 6651.

When the adhesive and the hardener are mixed a chemical reaction will start. The isocyanate content in the glue mix will diminish over time and a polymer will be formed.

When handling Prefere 6151, hardener Prefere 6651 and the glue mix, it is recommended that certain precautions normally taken when handling chemicals is observed. Skin contact with the uncured glue should be avoided, since people with particularly sensitive skin may be affected. It is recommended to wear protective gloves, likewise eye protection where there is a risk of splashes. Hands and forearms should be thoroughly washed with soap and warm water at the end of the working day.

Adequate ventilation of the workshops should be maintained.

Notice

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The manufacture of laminated timber structures normally is subject to control procedures implemented by the authorities or other regulatory bodies. To satisfy these requirements, certain guidelines have to be followed in the production. These guidelines vary from country to country. They may, on some points, differ from the instructions given above. In such cases the manufacturer must obey the regulations applicable.

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