Construction-grade wood adhesion

Construction-grade adhesion: requires high strength bonding and durability.

The components of wood adhesion:

- Cohesion
- Chemical adhesion
- Mechanical adhesion

Adhesion methods:

- Cold pressing
- Hot pressing
- Dielectric heating

Cold pressing:

- gluing on or near room temperature (18-28°C
- structural adhesion is mostly done with cold pressing
- advantage: cheap
- disadvantage: requires special adhesives and takes a long time!

Hot pressing

- increased temperature accelerates the bonding process
- Temperate gluing: 30-50°C (heating the surrounding air)
- Warm gluing: 50-100°C
- Hot gluing: above 100 °C

Dielectric heating

- Internal heat generation through the dielectric nature of water
- Radio frequency heating
- Microwave heating

Bottom line: bonding should be as strong as wood itself – or better.

Factors affecting gluline strength:

- wood species
- moisture content
- surface roughness
- adhesive type
- gluing parameters

The effect of wood species:

- softer woods are easier to glue, but reqire more resin (resin penetrates into the wood.)
- harder species are hard to glue – little penetration, low mechanical adhesion (plus high strength required!)
- some species also contain inhibitors (resins, oils, acids, etc.)

The effect of moisture content

- Most adhesives require a MC of 8–15 %.
- Some adhesives extend this range either down or upwards (5–20%).
- Construction grade adhesives always have a certificate that contains the applicable moisture range.
- Within the range: choose the moisture content according to the EMC in service conditions.

The effect of surface roughness

- Most adhesives do not have good gap-filling capabilites
- Usually fine planed or sanded surface is required
- In case of rough surfaces, fillers may be used – not recommended for structural adhesion!

Adhesive type

- As detailed at the raw materials
- Always use adhesives certified for structural use
- Make sure the adhesive is not expired (storage conditions matter!)

Gluing parameters

- technological times
- resin quantity
- pressure
- pressing time

Technological times

- pot life, open and closed times, pressing time
- contradictory requirements
- solution nr. 1: hot pressing
- solution nr. 2: two-component systems

Resin quantity

- depends on the kind of resin used
- even spreading is important!

Pressure

- softwood / low density hardwoods: 0.4 – 0.8 N/mm2
- hardwoods (high density): 1.0 – 1.6 N/mm2
- curved beams require higher pressures
- may be increased further if necessary

Pressing time

- standard requirement: reaching a glueline strength of 4 N/mm2
- in practice: attempting to scratch the glue pushed out of the gluelines
- typically 8 hours (cold pressing)
- setting slows in cold wheather
- final strength requires several days to develop!