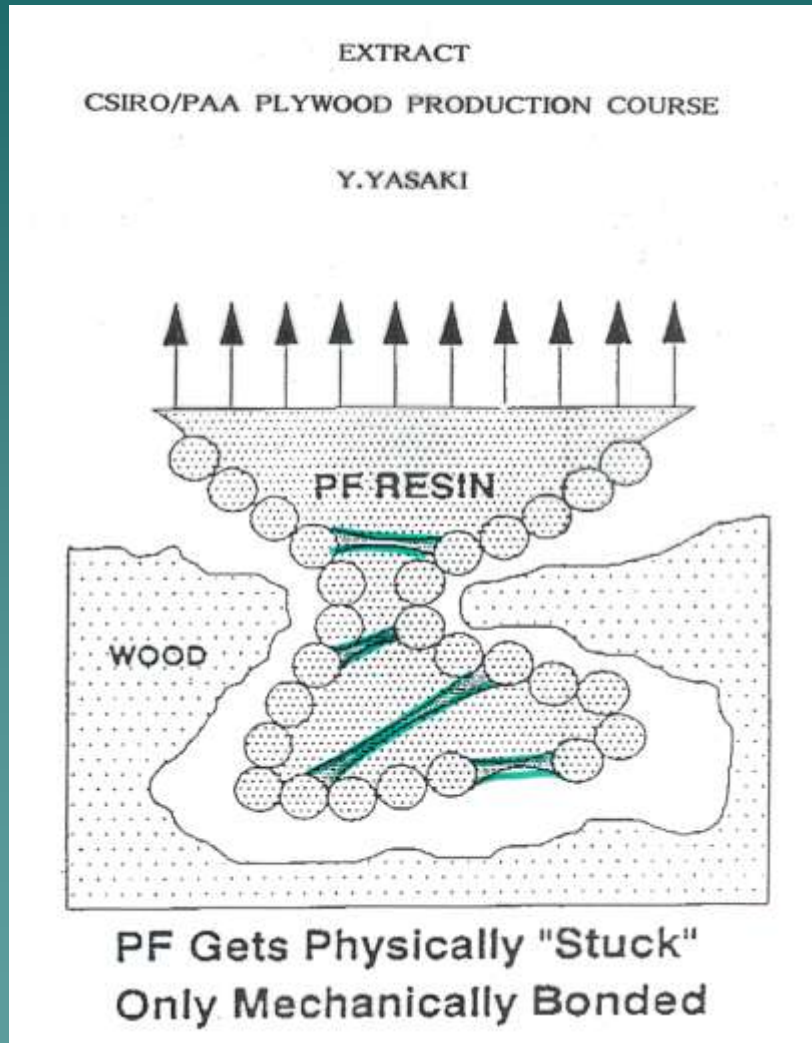


BASICS OF GLUES AND GLUING

Simon Dorries
General Manager
Engineered Wood Products Assoc.

A stylized silhouette of a mountain range in a teal color, located in the bottom right corner of the slide.

BASICS OF BOND FORMATION



Bonding in formaldehyde based adhesives is the result of a **mechanical** bond not a chemical bond.

DESIRABLE PROPERTIES OF STRUCTURAL WOOD ADHESIVES

1. STRENGTH

THE COHESIVE STRENGTH OF THE
ADHESIVE MUST BE AT LEAST
EQUAL TO THE PARENT WOOD.
(DESIGN AROUND WOOD ELEMENTS ONLY)

WHEN TESTED 50% WOOD FIBRE
FAILURE





2. DURABILITY

DEPENDS ON:

1. ENVIRONMENT

2. CHEMICAL NATURE OF THE ADHESIVE

MUST BE EQUAL TO THE INTENDED SERVICE
LIFE OF THE PRODUCT

SHOULD HAVE A SHORT TERM DURABILITY TEST

3. CREEP RESISTANT

THE ADHESIVE MUST REMAIN
RIDGED AND NOT CREEP WHEN
SUBJECTED TO LONG TERM
LOADS

4. GAP FILLING

THE ADHESIVE MUST BE ABLE TO
BRIDGE GAPS BETWEEN
LAMINATES AND RETAIN
SUFFICIENT COHESIVE
STRENGTH

5. WATER PROOF

THE ADHESIVE SHOULD NOT REACT WITH WATER EITHER AS LIQUID WATER OR IN THE FORM OF WATER VAPOUR.


RESISTANT TO CYCLIC CHANGES TO EQUILIBRIUM TIMBER MOISTURE CONTENT

6. NON- SHRINKING

THE ADHESIVE SHOULD NOT SHRINK DUE TO CHANGES IN MOISTURE CONTENT OR TEMPERATURE AND HAVE LONG TERM STABILITY

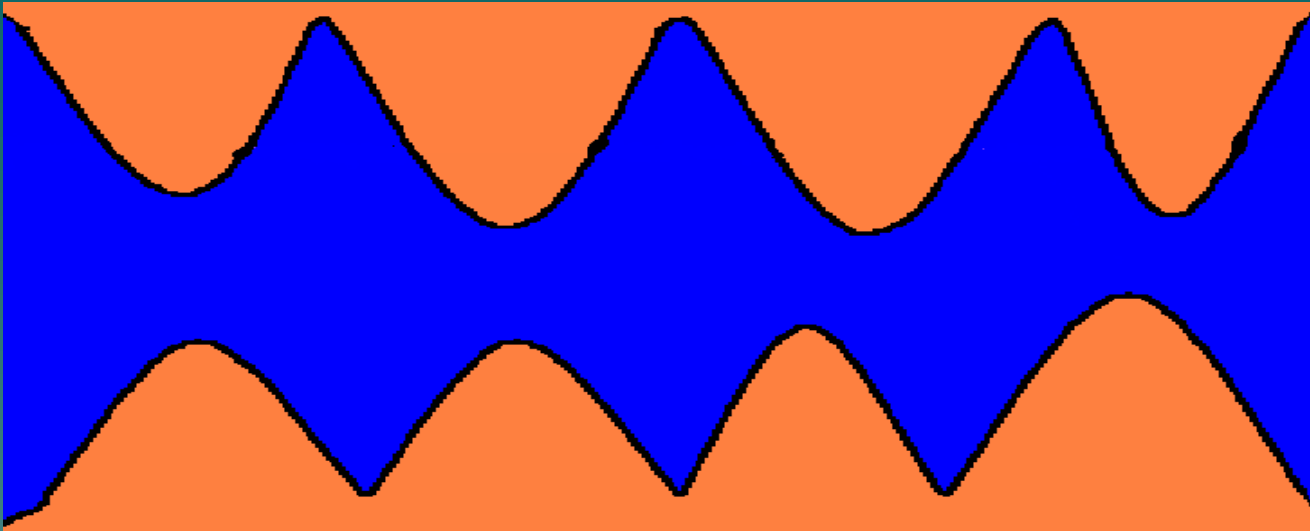
7. NON- BRITTLE

THE ADHESIVE MUST ACCOMMODATE
THE NORMAL HYGROSCOPIC
MOVEMENT OF TIMBER

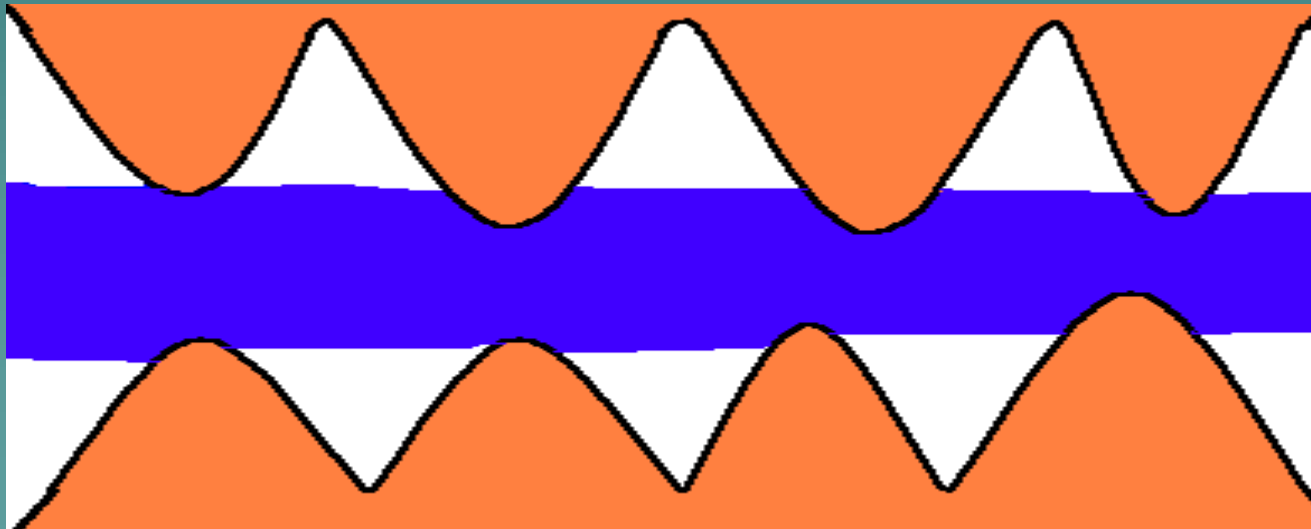


8. Wetting Ability

- ◆ THE ADHESIVE SYSTEM MUST ALLOW INTIMATE CONTACT BETWEEN THE ADHESIVE AND LAMINATES.
- ◆ DETERMINED BY SURFACE TENSION.
- ◆ LIQUID ADHESIVE SYSTEMS



Good Wetting



Poor Wetting

TYPES OF ADHESIVES

The background is a solid teal color. In the bottom right corner, there is a stylized, dark teal silhouette of a mountain range with jagged peaks.

TWO BROAD CATEGORIES OF ADHESIVES

1. THERMOSET- Once cured a form a ridged glueline that will not replasticeise if reheated.

DO NOT CREEP - STRUCTURAL ADHESIVES

eg. formaldehyde based adhesives

2. THERMOPLASTIC -replasticeise when heated. eg. PVA

CREEP UNDER LONG TERM STRESS

THERMOSET ADHESIVES

The image features a solid teal background. In the bottom right corner, there is a stylized, jagged silhouette of a mountain range in a slightly darker shade of teal. The main text, 'THERMOSET ADHESIVES', is centered in the upper half of the image in a bold, white, sans-serif font with a subtle drop shadow.

1. PHENOLIC BASED (TYPE A)

“PHENOLIC IS A GENERIC TERM INCLUDES SYNTHETIC PHENOL AND RESORCINOL, NATURAL TANNINS AND COPOLYMERS OF THE ABOVE.



THE REACTION IS IRREVERSIBLE

BLACK IN COLOUR

PHENOLIC DURABILITY

FULL EXPOSURE	50+ years
DAMP (SEMI EXTERIOR)	indefinitely
DRY INTERIOR	indefinitely
STRESS	indefinitely

Only adhesive suitable for structural applications in all exposure conditions

DURABILITY TEST - 72hrs Boiling Water or
6hr steam

2. AMINO PLASTIC (I) (TYPE B)

- ◆ Melamine Urea Formaldehyde (MUF)
- ◆ Melamine Formaldehyde (MF)

MELAMINE FORMALDEHYDE DURABILITY

FULL EXPOSURE	5-10 years
DAMP (SEMI EXTERIOR)	10-20 years
DRY INTERIOR	indefinitely
STRESS (DRY INTERIOR ONLY)	indefinitely

DURABILITY TEST 6 hrs Boiling Water

3. CASEIN

- ◆ PROTEIN (Milk) ADHESIVE NOW RARELY USED
- ◆ Could make a comeback due to environmental concerns (formaldehyde free, not derived from oil, renewable)

CASEIN DURABILITY

FULL EXPOSURE

NON DURABLE

DAMP CONDITIONS

NON DURABLE

DRY INTERIOR (<25% MC)

INDEFINITE

STRESS (DRY INTERIOR)

INDEFINITE

5. AMINO PLASTIC (II) (TYPE C&D)

UREA FORMALDEHYDE

TYPE C (LOW EXTENSION)

TYPE D (HIGHLY EXTENDED)

UREA FORMALDEHYDE DURABILITY

FULL EXPOSURE
DAMP CONDITIONS
DRY INTERIOR
STRESS

NON DURABLE
NON DURABLE
INDEFINITE
NON DURABLE

DURABILITY TESTS

TYPE C 3hrs (70 C)

TYPE D 24hrs (cold soak)

4. URETHANE/ ISOCYANATE

- ◆ API (Aqueous polymer isocyanate)
- ◆ MDI (diphenyl methane diisocyanate)
- ◆ Only covalent wood adhesive?? (latest research questions this)
- ◆ Very fast cure times
- ◆ Durability determined by resin/hardener ratio
- ◆ High Durability 100:15
- ◆ Low Durability 100:5
- ◆ Formaldehyde free
- ◆ Clear glueline

URETHANE DURABILITY

◆ FULL EXPOSURE	UNKNOWN
◆ DAMP	PROBABLY DURABLE
◆ DRY INTERIOR	INDEFINITE
◆ STRESS (Dry Interior)	DURABLE

(FWPA has funded a major project to determine the durability of urethane based adhesives)

Formaldehyde Emissions

Phenolic – E_0 (A Bond)

Resorcinol- E_0 - E_3 (Depends upon catalyst)

Amino Plastic – E_1 (B, C and D Bond)

Isocyanate- E_0

Casein - E_0