Durability of Oriented Strandboard: Effect of Short-term Water Soaking

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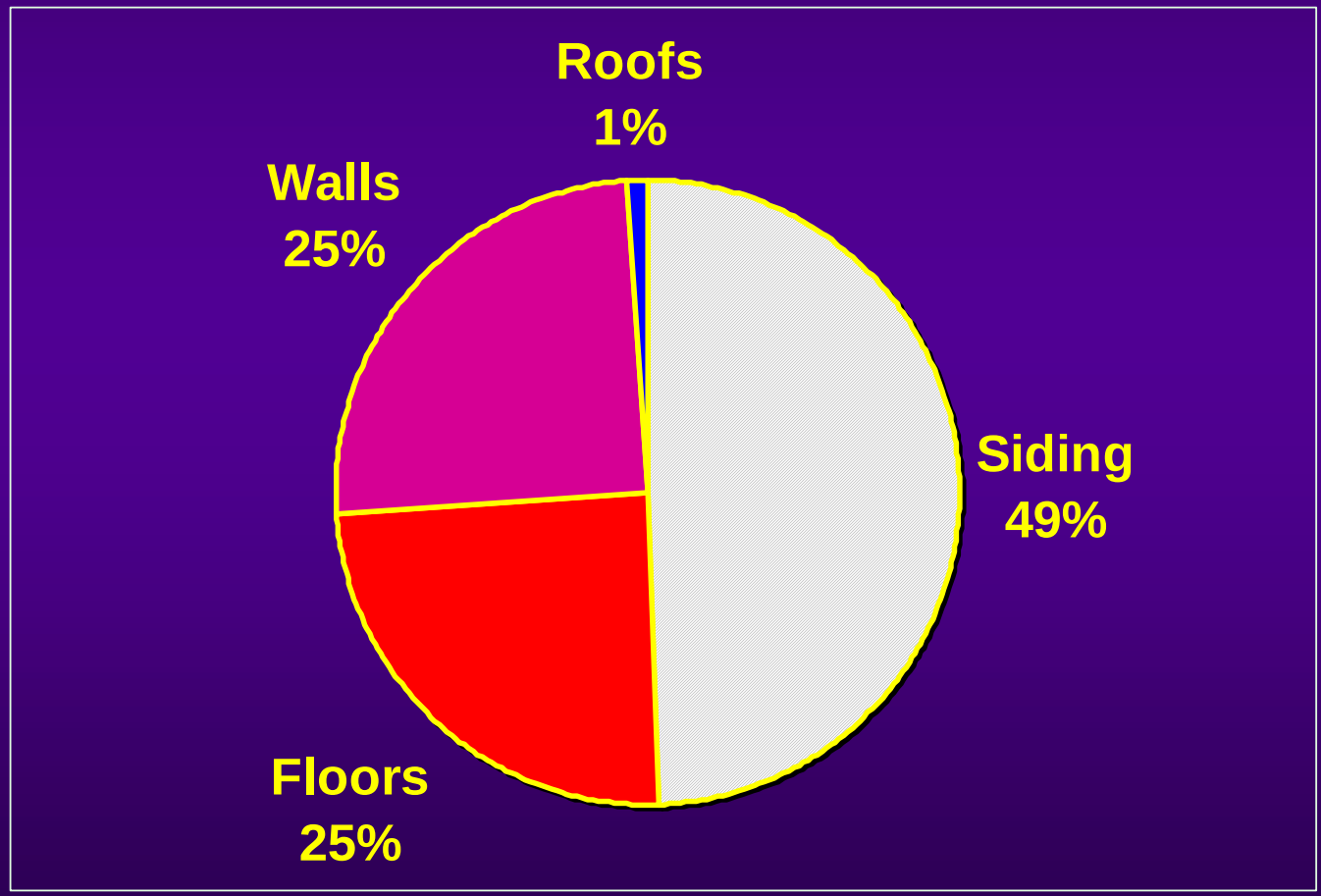
Background- OSB Markets



Background

Durability & Product Acceptance

- Long-term cyclic humidity exposure
- Short-term water soaking environment

Background

- Earlier work on C-OSB (24-hr WS)

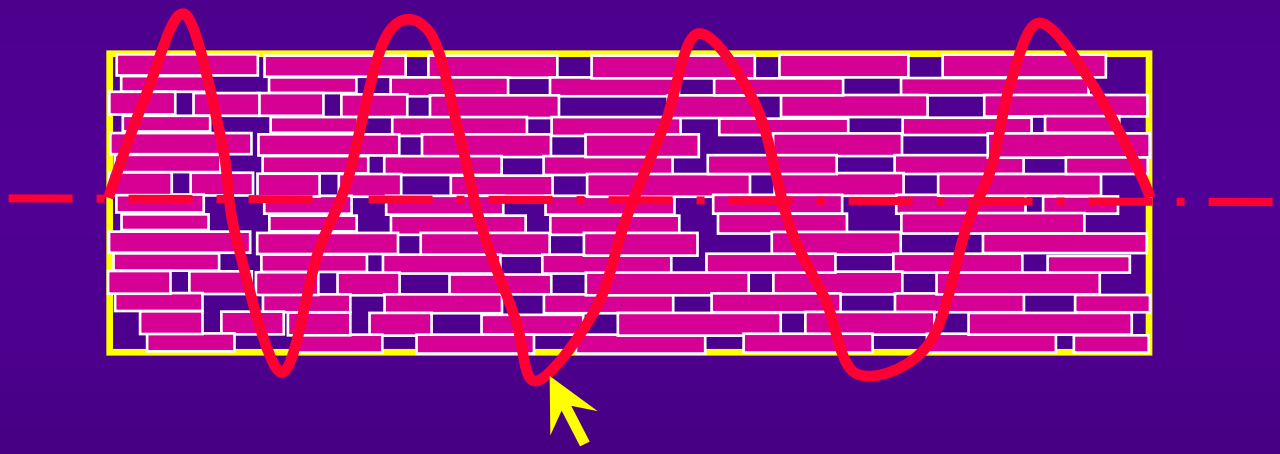
  TTS = 17.5%

  NTS = 13.1%

  IB loss = 49.2%

- ~ 2 PSI IB strength loss per %NTS

VOIDS IN OSB AND ITS EFFECTS



- In-plane Density Variation
- Large Thickness Swelling
- Panel Strength Loss

Objectives

- To characterize water soaking process of OSB
- To assess associated TS and IB strength loss (durability)

Experimental

- Panel Production
- Specimen Preparation
- Soaking Experiments
- TS and IB Strength Tests

TABLE: Laboratory-made OSB

Property	One-layer	Three-layer
Alignment	HAL, LAL, RAL	HAL, LAL
S Gravity	0.5, 0.7, 0.9, 1.1	0.70
S-Ratio	/	30/70, 40/60, 50/50, 60/40
R.C. (%)	4, 6	4, 6
Replication	2	2
Boards Made	44	32

Methods

- Test Scheme: 1st OD -> 48 hr water soaking -> 2nd OD -> IB strength testing
- Measurements : WA, TS (TTS, RTS, & NTS) and IB strength
- Control: IB strength at 6% MC level

IB Strength Retention Rate (IBSRR)

IBSRR (%) =

[$IB_{Treatment}$ / $IB_{Control}$] x 100%

Data Analysis

$$Y = a\,SG^{b}RC^{c}\,AL^{d}\,SR^{e}$$

where

Y = Property (WA, TS, or IB)
SG = Specific gravity
RC = Resin content
AL = Alignment level
SR = Shelling ratio

RESULTS
Basic Panel Properties

- Flake alignment distribution
- Vertical density profile

RESULTS
Single-layer Board

- WA and TS Rates
- Total WA and TS
- Residual IB Strength
- IB Strength Retention Rate

TS Rate: 1-Layer Boards (%TTS/%WA)

$$Y = 0.78\ SG^{1.12}\ RC^{-0.35}$$

Correlation coefficient = 0.67

IBSRR (%)
Single-Layer Boards

$$Y = 76.4\ SG^{0.379}$$

Correlation coefficient = 0.30

RESULTS
Three-layer Board

- WA and TS Rates
- Total WA and TS
- Residual IB Strength
- IB Strength Retention Rate

TS Rate: 3-Layer Boards (%TTS/%WA)

$$Y = 1.69\ SG^{2.09}\ RC^{-0.35}$$

Correlation coefficient = 0.71

IBSRR (%)
Three-Layer Boards

$$Y = 17.6\ RC^{0.795}$$

Correlation coefficient = 0.48

CONCLUSIONS

- Density
- Resin Content
- Flake Alignment Level
- Shelling Ratio