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 To: Ryan Loe, Shelter Forest Products
From: Scott Leavengood
Re: Results of panel testing

Ryan:

We have completed the tests of the plywood that April dropped off a couple weeks ago. Results are as follows:

Bending:
As before, we first ripped the panels into 3, 3"x12" strips leaving a 4th strip that was 2 to 2½" wide. Therefore, there were 360 pieces total, 40 pieces from each panel type. There were calculation errors (values reported by the testing software as ******) for one C and one E specimen and hence the sample sizes were 39 for these two panel types. All tests were conducted on an 11" span with a head speed of 0.1 in/min.

The results are as follows in the table and figure (note: MOE is divided by 100 vs. 1000 in the figure so as to be able to use the same y-axis as MOR) below:
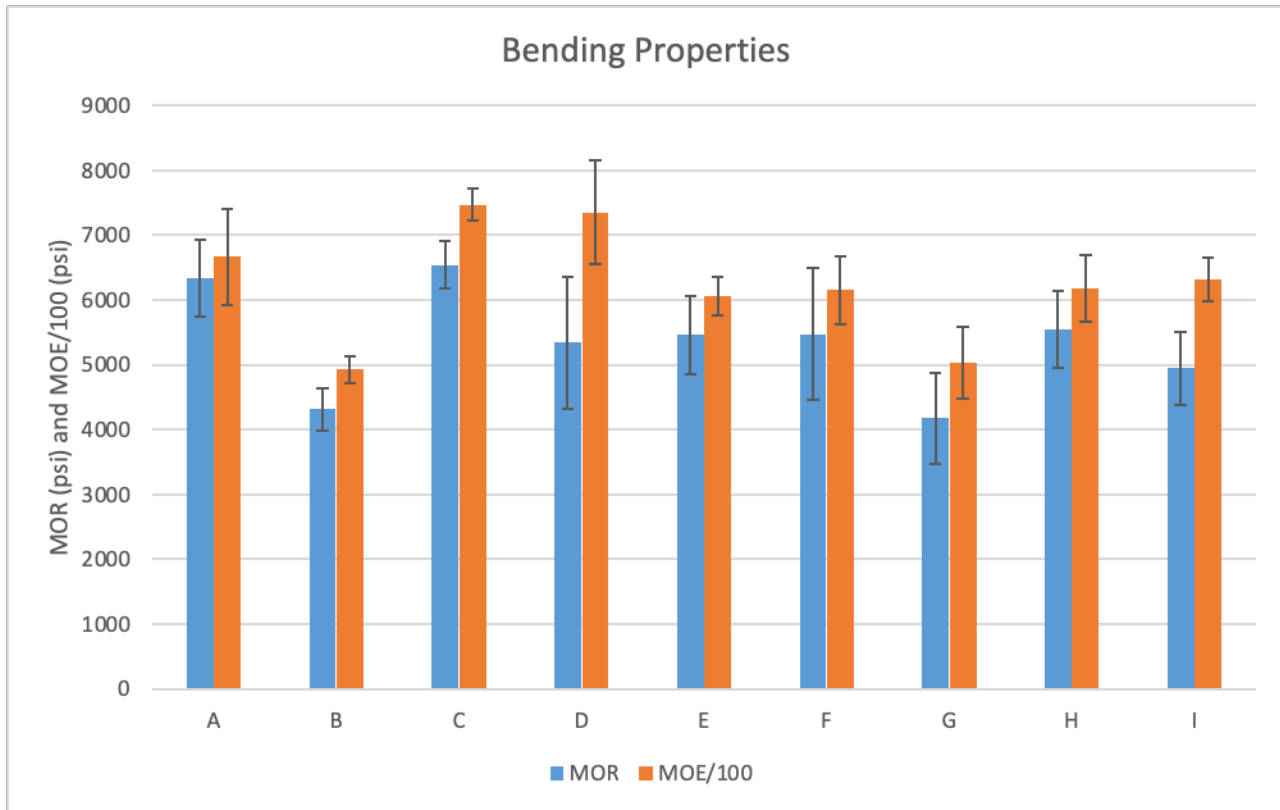
Core ID	Average MOR - bending strength [psi] (std. dev.)	Average MOE - bending stiffness [1000 psi] (std. dev.)
A	6338 (584)	667 (74)
B	4317 (326)	493 (21)
C	6543 (373)	747 (25)
D	5340 (1018)	735 (80)
E	5460 (598)	606 (30)
F	5472 (1017)	615 (53)
G	4177 (701)	504 (55)
H	5542 (592)	618 (51)
I	4945 (564)	632 (34)

There was noticeably high variability in the MOR for D and F and for A and D on MOE, as highlighted in the table.

We ran statistical analysis (ANOVA) on the results and all the samples are significantly different than each other with the exception of the following:

MOR	MOE
A and C	B and G
B and G	C and D
D, E, F, and H	E, F, and H
	F, H, and I

Or said another way, the samples in the table above are essentially the same with respect to the property listed – e.g., MOR and MOE of B and G are essentially the same. However, all the other combinations not listed can be considered to be statistically different, e.g., C and D are similar, but stiffer than all other panels.

Bending Properties

A chart titled "Bending Properties" with the y-axis labeled "MOR (psi) and MOE/100 (psi)" ranging from 0 to 9000. The x-axis shows categories A through I, each with two bars: MOR (blue) and MOE/100 (orange), with error bars.

Legend: MOR (blue), MOE/100 (orange)

Screw Withdrawal:
Kreg® Pocket-Hole Screws, #SML-C2/2.5, 2" and 2½" long were inserted through the thickness (approximately ¾") of 2 of each panel type, i.e., 20 pieces for each of the panel type or 180 panels total. Screws were extracted at 0.1 in/min. Given the relative consistency of the results, it was deemed unnecessary to test all 360 specimens. Results were as follows:

Core ID	Average Screw Withdrawal strength [lbs.] (std. dev.)
A	408 (44.8)
B	393 (15.5)
C	566 (48.3)
D	329 (37.9)
E	472 (43.9)
F	481 (54.1)
G	452 (37.1)
H	411 (37.5)
I	412 (30.9)

We ran statistical analysis (ANOVA) on the results and all the samples are significantly different than each other with the exception of the following:

Screw Withdrawal
A, B, H, I
E and F
E and G
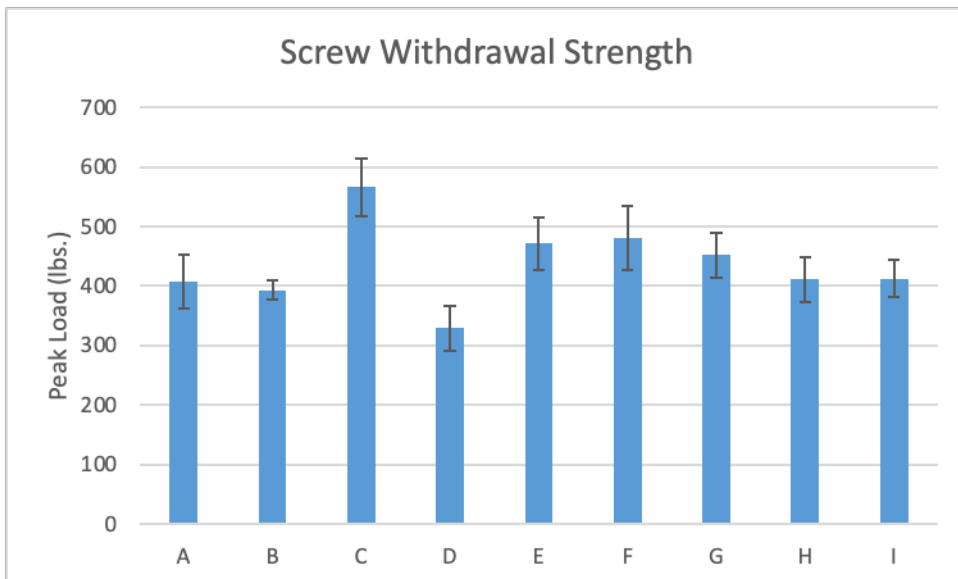
One interesting item of note is the apparent discrepancy in values between bending strength and screw withdrawal strength. For example, for bending strength, panel types A and H are the second and third strongest, whereas for screw withdrawal these panel types rank 6th and 7th.