

Imported Chinese LVL Scaffold Plank

EXECUTIVE SUMMARY

Results obtained from limited samples tested in this study show that the bending stiffness of the imported Chinese laminated veneer lumber (LVL) scaffold plank products is 20% below the value labeled on the product. Similarly, the bending strength is about 30% below the comparable 2.2E LVL scaffold planks manufactured in the U.S. In addition, the data indicate that glue bond performance is inconsistent and the bond durability does not meet the PS 1 requirements. The poor adhesive and low bending performance of the Chinese LVL scaffold planks is not only a serviceability concern, but more importantly a life safety issue. These products also do not meet the certification requirements of the OSHA scaffold plank regulations and ANSI A10.8, *Safety Requirements for Scaffolding – American National Standard for Construction and Demolition Operations*.

BACKGROUND

In January and February 2008, APA evaluated industrial LVL scaffold plank imported into the U.S. from China to compare the adhesive and mechanical properties of the imported planks relative to similar products manufactured in the U.S. and Canada. The sample size was limited and should not be construed as representing all Chinese LVL scaffold plank production.

- The Chinese LVL scaffold planks sampled were labeled as “2.2E proof tested,” as shown in the image below. Also note that the products are labeled with “OSHA” on each piece, thereby inferring compliance with the OSHA scaffold plank regulations.

SAMPLES TESTED:

- Two lots of 1-1/2-inch (38.1-mm) Chinese manufactured LVL scaffold plank
- One lot of 1-1/2-inch (38.1-mm) U.S. manufactured Douglas-fir LVL



PROPERTIES EVALUATED AND RESULTS:

- Adhesive bond quality
- Bending stiffness and strength

Flatwise bending properties were evaluated only on Lot 2 of the Chinese LVL planks. Limitations on the amount of available materials from Lot 1 of Chinese LVL planks prohibited the bending evaluation.

Adhesive Results – LVL products manufactured in the U.S. are required to meet glue bond durability requirements. For scaffold plank applications, the PS 1 exterior bond classification is considered appropriate. Samples were cut to 1- x 3-1/4-inch strips, kerfed to an inner glueline and exposed to both vacuum-pressure-soak and boil cycles. The samples were sheared and evaluated for wood failure based on PS 1 procedures, the standard method of evaluating exterior bonds in plywood.



TABLE 1

ADHESIVE PERFORMANCE OF CHINESE AND U.S. LVL

BATCH	TYPE AND (NO. OF PLANKS)	PS 1 VACUUM-PRESSURE SOAK WOOD FAILURE RESULT	PS 1 BOIL CYCLE WOOD FAILURE RESULT
1	Chinese LVL (3)	78% (Fail) ^(b)	95% (Pass)
2	Chinese Masson pine LVL ^(a) (10)	93% (Pass)	93% (Fail) ^(c)
3	U.S. Douglas-fir LVL (1)	100% (Pass)	100% (Pass)

(a) Assumed species based on the manufacturer's literature.

(b) PS 1 Exterior bond classification requires 85% wood failure for vacuum-pressure-soak and boil cycles, and when more than one panel is tested:

- (i) At least 90% of the panels represented by the test pieces shall have 60% wood failure or better, and
- (ii) At least 95% of the panels represented by the test pieces shall have 30% wood failure or better.

(c) One plank failed to meet the minimum wood failure criteria.

While overall boil cycle results were favorable (95% and 93% compared to the exterior bond requirement of 85%), a low wood failure value in one panel precluded the Masson pine LVL from meeting PS 1 bond requirements. The Chinese LVL scaffold planks failed the vacuum-pressure-soak cycle due to a low average wood failure of 78%. The delamination results indicate that the planks were probably manufactured with water-resistant adhesive(s). However, the failing glue bond durability from each tested lot suggests that the glue bond quality may be inconsistent.

TABLE 2

BENDING VALUES OF CHINESE LVL SCAFFOLD PLANK FROM LOT 2

	Modulus of Elasticity, MOE (10 ⁶ psi)	Modulus of Rupture, MOR (psi)
No. of specimens	30	30
Mean value	1.81	6,083
Maximum value	2.17	7,624
Minimum value	1.63	4,439
COV (%)	6.9	9.8
Adjustment Factors		
(Strength at End-use MC)/(Strength at Tested MC) ^(a)		0.95
(Strength at Actual Plank Size)/(Strength at Tested Size)		1.00
Adjust to End-use Conditions: 6,083 x 0.95 x 1.00		5,779
SF _{ANSI} Reduction Factor ^(b)		2.76
Allowable Design Value	1.81 (Fail)	2,100

(a) Account for the differences in strength from the as-tested moisture content of 10% to the standard moisture content of 12%.

(b) Based on the 9.8% COV from test results. Actual production COV is typically higher, which will reduce the calculated allowable design value. For example, if the production COV is 15%, the calculated allowable design value would be reduced to 1,950 psi.

Bending Test Results – Test results indicate that the 2.2E scaffold planks, as labeled on each piece of the Chinese product, are only good for 1.8E (20% below the proclaimed value). Based on the procedures for deriving the allowable design values specified in ANSI A10.8, the Chinese LVL scaffold planks achieved a level of only 2,100 psi. This performance level is about 30% lower than comparable 2.2E LVL scaffold planks manufactured in the U.S., which typically have an allowable bending stress of 2,900 psi for 1-3/4 inches or less in thickness.

Certification Requirements – It is required by OSHA regulations and ANSI 10.8 that “all laminated scaffold shall bear the seal of an independent, nationally recognized inspection agency certifying compliance with the design criteria referenced in the standard.” It is clear from the product labeling, as shown in the front page of this document, that these scaffold plank products are not certified by an independent inspection agency recognized in the U.S.

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