



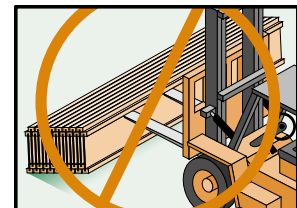
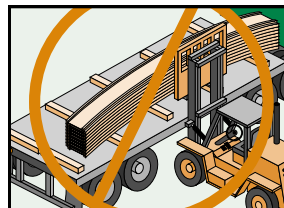
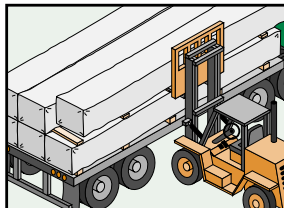
PROPER STORAGE AND HANDLING OF I-JOISTS AND LVL

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As with all other high quality products, engineered wood products (EWPs) such as I-joists and laminated veneer lumber (LVL) require proper storage and handling during distribution and at the jobsite in order to protect the product from damage. This technical note provides a review of techniques for safe and proper handling to minimize physical or moisture damage to I-joists and LVL.

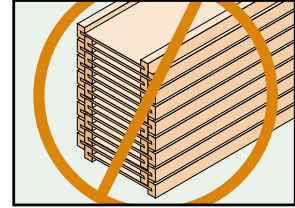
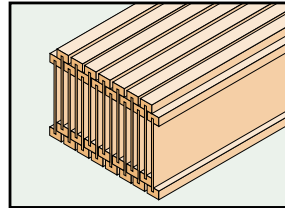
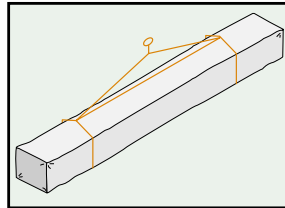
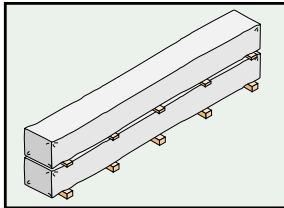
SAFE HANDLING DURING DISTRIBUTION

1. Bundle wrap can be slippery. Avoid walking on wrapped bundles. Stacks of I-joists and LVL may be unstable or slippery, especially when wet. Avoid walking on the material.
2. Follow good forklift safety procedures when handling I-joists and LVL at the yard.
 - Use wide forks to handle long length material
 - Forklifts should have structural safety cage
 - Storage yard should be maintained to provide flat, well drained and level driving surface
 - Do not handle or rotate loads over people
 - Yard workers should wear hard hats
 - Post and follow safe load limits on all handling equipment
 - Do not bounce or jerk loads
 - Maintain low forklift speeds and brake smoothly to prevent accidentally dumping a load
 - Stabilize the load if there is a possibility of shifting
 - Maintain load height within safe limits
3. When cutting I-joists and LVL, follow these safety procedures.
 - Saws should have proper safety guards in place and operating
 - Workers must wear safety equipment, including hard hats, gloves, eye and ear protection
 - Provide uncluttered work area with good footing and good lighting
4. Store longest material lowest to the ground.
5. When handling with a crane, pick up the load using a spreader if necessary to minimize handling stresses. Always keep I-joists vertical.
6. Do not lift I-joist by top flange.
7. Post and follow load limits on storage racks.



STORAGE DURING DISTRIBUTION

1. Keep wrapped to protect from weather.
2. Use stickers to separate bundles.
3. Use stickers every 8 feet and maintain vertical alignment of the stickers.
4. Always store, stack and handle I-joists vertically and level – never flatwise.
5. Do not store I-joists and LVL in direct contact with the ground.
6. For optimal moisture protection, keep at least 12 inches up from the ground.
7. To protect from dirt and weather, delay unwrapping the bundles until the time of installation or cut-up for delivery.
8. Take care to avoid forklift damage. If the ground is unlevel in the storage area, reduce forklift speed to avoid “bouncing” the load.
9. When handling with a crane, pick up the load using a spreader if necessary to minimize handling stresses. Keep I-joists vertical.
10. Maintain stack height within safe limits.
11. Do not stack other material on top of I-joists and LVL.



BEST PRACTICES FOR MATERIAL CUT-UP AT DISTRIBUTION

I-joists and LVL make economical and ecological use of forest resources. These advantages are optimized by minimizing waste and by avoiding cutting into short, unusable lengths. The following tables provide guidance on best practices for cut-up at the distribution yard.

- Cut-up should not leave any residual pieces that fall into the shaded area.
- Cut pieces that fall into the shaded area should not be returned to inventory.

Cut Length	I-Joist Depth			
	9-1/2"	11-7/8"	14"	16"
10'	NO CUTS 10 FEET OR SHORTER			
12'				
14'				
16'				
18'				
20'				

Cut Length	Product Depth							
	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	14"	16"	18"
6'	NO CUTS 6 FEET OR SHORTER							
8'								
10'								
12'								
14'								
16'								

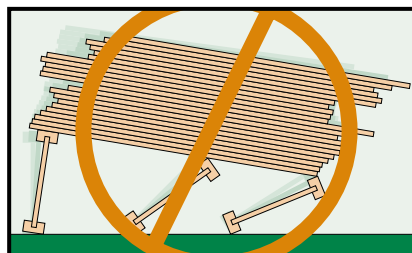
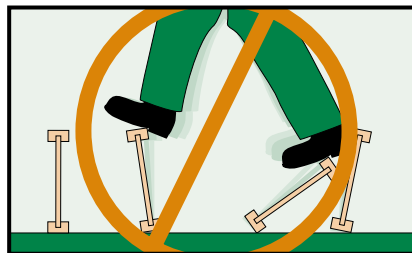
Difficult to sell/unuseable lengths

PROPER HANDLING AT THE JOBSITE

1. Do not drop I-joists or LVL off the delivery truck. Best practice is use of a forklift or boom.
2. Store on level well-drained area.
3. Keep on stickers spaced every 8' and at least 6" off the ground at the jobsite.
4. Keep material covered to protect from weather.
5. Don't stack other material on top of the products.
6. Always store I-joists vertically.
7. Never use or try to repair damaged products. If defective material is discovered prior to or during installation, cease installation and contact the supplier.
8. When unbundling and handling the I-joists, do not twist or apply loads to the I-joists when horizontal. NEVER load I-joists in a horizontal orientation.

SAFETY AT THE JOBSITE

1. Bundle wrap can be slippery. Avoid walking on wrapped bundles. Stacks of I-joists and LVL may be unstable or slippery, especially when wet. Avoid walking on the material.
2. I-joists are unstable until completely installed with panels fully fastened to the top flanges.
3. Do not walk on I-joists until fully fastened and braced.
4. Never stack building materials over unsheathed I-joists. Once sheathed, do not over-stress I-joists with concentrated loads from building materials.
5. Follow all installation procedures of manufacturer and/or APA EWS.



MOISTURE EFFECTS

I-joists and LVL are manufactured under carefully controlled conditions that assure they are dry. As with all other wood products, the moisture content will change depending upon humidity, exposure to wetting, and drying conditions. Moisture exposure will lead to dimensional change. While the products will withstand normal exposure, excessive exposure during distribution, storage or construction may lead to dimensional changes that affect serviceability. These changes include cupping, bowing or expansion to dimensions beyond the specified tolerance of the product in the “as-manufactured” condition. Excessive moisture exposure can cause I-joist webs to swell which can split the LVL or lumber flanges.

As an organic material, mold and mildew may grow on wood products if moisture is present. Prolonged periods of high moisture may also support the growth of wood decay fungi, which is another reason why it is important to follow proper methods of design, handling, installation and maintenance to protect wood building materials from moisture.

The protective wrap will protect the products from direct wetting and minimize moisture uptake during transportation and storage. Once unwrapped, subsequent wetting on the jobsite can lead to increased moisture content. LVL producers may include a protective coating that retards moisture uptake during exposure. Recoating cut ends of such products helps retard moisture absorption. Moisture increase is expected under normal construction situations and does not adversely affect the performance of the products if good building practices are followed to minimize exposure and to provide proper conditions for the products to re-equilibrate to dry conditions.

The table below shows the moisture content of LVL and I-joist components as a function of humidity.

MOISTURE CONTENT OF WOOD PRODUCTS (%)¹				
Relative Humidity (%)	Lumber	LVL	OSB I-joist Web	I-joist²
10	2.5	1.2	0.8	2.5
20	4.5	2.8	1.0	3.5
30	6.2	4.6	2.0	5.5
40	7.7	5.8	3.6	6.5
50	9.2	7.0	5.2	8.0
60	11.0	8.4	6.3	10.0
70	13.1	11.1	8.9	12.0
80	16.0	15.3	13.1	15.5
90	20.5	19.4	17.2	20.0

1. Approximate moisture content at 70 degrees F.
2. I-joists with lumber flanges.

Engineered wood products are designed for use in construction applications where the long-term moisture content is less than 16%. As noted in the table above, the moisture content resulting from humidity exposure in all but the most extreme condition will be well within this limit. Nonetheless, good building practices must be followed to prevent excessive moisture conditions in buildings. See the references at the end of this publication for sources of literature on proper building practices.

All APA EWS engineered wood products are manufactured in a dry condition to specified dimensional tolerances as shown in the table below. These tolerances apply at the time of manufacturing.

Dimensional tolerance in the "as-manufactured" condition		
	Width	Depth
I-joist	+/- 1/32" for flange	+0, -1/8"

Dimensional tolerance in the "as-manufactured" condition		
	Thickness	Width
LVL Rim Board (1-1/4" thick, typ.)	+/- 5%	+1/8", -0
LVL (1-1/2" thick)	+1/16", -1/16"	+0, -1%
LVL (1-3/4" thick)	+0.08", -0.10"	+0, -1%
LVL (3-1/2" thick)	+0.10", -0.15"	+0, -1%

Wetting during construction may lead to temporary elevated moisture content and dimensional changes. Once covered, the I-joists or LVL will ultimately dry and re-equilibrate to the ambient humidity conditions, but some expansion or swelling may remain after redrying. The following table shows typical dimension change of I-joist components from jobsite wetting.

Normal dimensional changes from wetting ¹			
	Dimension dry	After direct wetting on jobsite	When redried
Lumber flange width	2 -1/2"	2-5/8"	2-1/2"
LVL flange width	1-3/4"	1-7/8"	1-3/4"
I-joist depth	11-7/8"	12"	11-7/8"+
Web thickness	3/8"	7/16"	3/8" +

¹ Assumes I-joists exposed such that the moisture content of all I-joist components reach 25% moisture content or greater. This would be characterized by several weeks of exposure or more and represents near-worst conditions.

When engineered wood products are exposed to normal jobsite wetting and then dried to long-term moisture conditions, the structural properties are not compromised. It's important, however, to minimize excessive moisture exposure with proper handling and construction techniques. The publications from APA's *Build A Better Home* program, available at www.apawood.org or www.buildabetterhome.org, are designed to provide builders and homeowners with the construction guidelines they need to protect against excessive moisture.

ADDITIONAL REFERENCES:

APA Technical Note: *Controlling Decay in Wood Construction*, Form R495

Build A Better Home Series:

Foundations, Form A520

Mold and Mildew, Form A525

Walls, Form A530

Roofs, Form A500

APA Engineered Wood Construction Guide, Form E30

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