

BUILDING AND CONSTRUCTION TECHNOLOGY

College of Natural Sciences | Department of Environmental Conservation

THE EVOLUTION OF ENGINEERED WOOD I-JOISTS

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For years engineered I-joists have been pricey framing options in high-end custom homes. Expanded product lines and competitive market forces now provide builders with high performance at entry-level cost.

by Paul Fisette-© 2000

Trus Joist Corporation (TJ) invented the wood I-joist industry. "The year was 1969. Apollo 11 lands on the moon and Trus Joist Corporation makes the first wood I-beam." TJ not only pioneered the development of this industry, but has maintained a clear leadership role in a hotly contested market. Stiff competition and rapid technological advancement has been good for builders. At one time there was one product and one price — TJ's. Builders now have a list of brands, prices, service levels, and product lines to choose from.

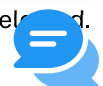
Cost and performance drove the development of wood I-joists. Contemporary designs, first made popular in the 1970's, were inspired by homeowners who wanted open floorplans. Open layouts require long clearspans. You could buy lumber joists that were longer than 20-feet, but they were expensive, hard to find, and lacked the adequate load-carrying ability required for long spans. Enter I-joists: products made with deep plywood webs edged by strong lumber flanges. Designers now had a free hand to fashion less restrictive load-bearing strategies. Early versions of I-joists were not cheap. But they were straight, lightweight and did the job without breaking a sweat. More recently, the "timber crisis" of the 1990's has made prices of engineered wood more stable than lumber. This is a very attractive feature for builders quoting bids.

Product Innovation

I-Joists were made with plywood webs and solid lumber flanges until 1977. Then TJ tweaked its design using one of its own inventions. Microllam™! the first Laminated Veneer Lumber (LVL) replaced solid lumber as TJ's flange stock. TJ was first, but other manufacturers quickly followed. It was about this time that residential builders began to consider I-Joists as a serious framing option for floors in expensive custom homes.

To the untrained eye, LVL looks like plywood. Thin veneers are glued together like plywood, but the grain of every veneer runs in the same direction. This alignment takes advantage of the natural strength properties of wood. Some very apparent advantages resulted from this innovation. Production of LVL is more or less a continuous process. The continuous flanges means that I-Joists can be made in very long lengths. Veneers used to fabricate the LVL are carefully selected. Defects are culled. Strength and stiffness is maximized. Structural values of the LVL flanges are very high.

Got a Question?



Columbia EX2152

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Another watershed event in I-Joist technology was the switch from plywood to oriented strandboard web material. This occurred in 1990. Osb is less expensive, more available, and stronger than plywood in shear because all the strands interlock. TJ once again lead the charge. Today virtually every I-Joist manufacturer uses only osb webs in their residential and commercial product lines. Recently, we have seen an unexpected trend emerge. There is increasing demand for solid sawn flanges. Between 15%-20% of the I-joists sold, now have solid sawn flanges.

Market Profile

TJ's corporate evolution spawned technological advancements that essentially shaped the I-joist industry. TJ International, a holding company for TJ Corporation, entered a joint-venture partnership with MacMillan Bloedel in 1991. MacMillan, a large Canadian forest products company, wound up owning 49% of the newly-formed Trus Joist MacMillan (TJM). More recently Weyerhaeuser Company, our nation's largest forest products company, has become both TJM's largest supplier of raw materials and its largest purchaser of I-Joists. Some industry insiders put TJM's sales to Weyerhaeuser at 50% of TJM's overall production. To complicate matter, this year, Weyerhaeuser purchased MacMillan Bloedel. And just last month, Weyerhaeuser purchased Trus Joist. It is unclear how this acquisition will impact TJ and the I-Joist industry as a whole.

Trus Joist dominates the I-joist market. TJ claimed roughly 55% of the estimated \$750 million national I-joist plum in 1999. TJ positioned itself through smart marketing. It also developed an impressive family of structural products required to build a complete engineered wood floor system. LVL, Timberstrand (laminated strand lumber – LSL), Parallam (parallel strand lumber-PSL) and I-Joists were all developed under the Trus Joist technological umbrella. As might be expected, the technology required to manufacture LVL and I-joists has been adopted by a host of newcomers. There are more than a dozen manufacturers now spewing I-Joists from assembly units at a rate exceeding 300 feet per minute (see directory at end of article.)

Exact market shares are closely guarded, but it is safe to say that 5 manufacturers sell 80% of the I-Joists. TJ clearly leads with about 55%. Boise Cascade, Louisiana-Pacific, Willamette Industries, and Georgia Pacific equally share 20%-25% of the annual US sales volume. There are a growing number of smaller companies fighting hard for market position. And it's the builders who are winning. Many smaller manufacturers offer great products at low prices.

Performance

Wood I-joists offer many advantages over sawn lumber. Explaining a few concepts helps to demonstrate the inherent mechanical advantages of wood I-beams.

Geometry, Stress and Strain

Imagine what happens to a joist as you add weight to the floor. Intuition and experience tells you that the joist bends (deflects). The joist essentially forms an arc as it is stressed and deflects in bending. What happens to wood fibers in a stressed joist is predictable, but perhaps not intuitive.

Floor loads act downward. Yet, wood fibers are stressed horizontally – along the length of the joist. As the joist bends, the top edge gets shorter and its fibers are compressed. At the same time, wood fibers along the bottom of the joist are stretched or placed in tension. The top and bottom edges are moving in different directions. So, at some point between the top and bottom edges, the wood fibers are neither compressed nor pulled apart. This point is called t.

Got a Question?



The I-shape takes advantage of this fact. I-joists don't waste fiber where it isn't needed: at its center! I-joists have a thin web. I-joist designers use sections of strong fiber in the top and bottom flanges where the stress is maximum. Some characteristics of lumber with rectangular cross sections are worth noting.

Strength of a joist is determined by wood species, grade and size.

- choose a species and grade of lumber that is twice as strong and it will carry twice the load.
- double the thickness of a joist and it will carry twice the load.
- double the depth of a joist and it will carry **4 times** the load.

Stiffness is also affected by species, grade and size.

- use a species and grade of lumber that is twice as stiff (E value indicates stiffness) and deflection is cut in half.
- double the thickness of a joist and the deflection is cut in half.
- double the depth of a joist and the deflection is **reduced to 1/8**.

These facts demonstrate why I-joists perform so efficiently. Adding depth to a joist is smart. It exponentially increases strength, stiffness and potential clearspan. A minimal amount of wood fiber is required to increase the depth of an I-joist. I-joist engineers recognize the importance of flange design as well. Most LVL flanges sold are 1-1/2" x 1-1/2". The strongest, stiffest and most expensive fiber is limited to an area where it is needed most. Solid sawn lumber flanges are made from either 2"x3" or 2"x4" that have been specially selected and finger jointed for high strength and stiffness. While the sawn flanges may not have design values as high as LVL, they make up the difference with larger cross sections. Well-made solid flange I-joists can span distances equal to the best LVL versions. And the kicker is: solid flange I-joists typically cost 20% less than their LVL cousins.

Sawn Lumber vs. I-Joists

Ask any of the I-joist manufacturers who their biggest competitor is and you're sure to hear a resounding "Trus Joist". Right? Wrong! I-joist makers will tell you the competition is sawn lumber. More than 70% of all floors are framed with dimension lumber. Performance of I-Joists is clearly superior to that provided by dimension lumber. I-Joists provide:

- design flexibility with increased span potential
- increased on-center spacings and longer lengths that save time.
- improved strength
- improved stiffness
- more consistent sizes, appearance and performance
- dimensional stability
- lighter weight to handle
- webs that are easier to drill for HVAC, plumbing, and electrical
- less waste

High prices and unfamiliarity with a new product have kept I-joists away from most job sites. Until recently, it was difficult for I-joists to compete with sawn lumber on starter homes and houses with a basic design. A recent market survey found that 80% of builders want to learn how to use the engineered wood. I-Joists are becoming more familiar and less intimidating. Manufacturers and a variety of builder associations provide training. The mystique of building with an "engineered" material is being unveiled. During the last 5 years we have seen exponential growth in this market. Predictions indicate that sales of engineered I-joists will increase 50% within 4 years.

Got a Question? 



Lumber joists are typically available in lengths up to 16-feet and installed at 16-inch on-center spacings. A supporting beam is usually dropped below the joists at mid-span. Lumber joists are installed across the front and the back of the house. If a builder uses I-joists the number of joists is instantly cut in half. I-joists are available in lengths up to 60 feet, so reaching across the house from sill-to-sill is not a problem. You can buy I-joists that comfortably span 28-feet without needing a center girder. But these deep models are expensive. Installing a center beam under long I-joists provides a more economical floor-framing system.

Another benefit of I-joists is that in most cases, on-center spacing can be increased to 19.2- or 24-inches. Performance is better than lumber frames with 16-inch on-center spacings. The reduction in the number of joists translates to less nailing of decks and rim joists. Labor savings aren't as great if a flush beam is installed. Every joist must be hung from the center beam just like dimension lumber, but fewer members are required. I-joists do require special details during installation.

I-joists are used to frame some cathedral roofs. They provide designers with the ability to build expansive clearspan roof sections and they offer an energy conserving benefit as well. Deep I-joist rafters give builders the opportunity to install deep blankets of roof insulation leaving plenty of room for soffit-to-ridge roof venting above the insulation.

Products

So how does a person choose the right brand of I-joist? I-joists are not the most complicated devices invented by man. I-joists are simply 3 pieces of wood glued together. Sure, they represent advancement in our industry. Many years of research and product development lead to the great products we have today. But manufacturers have the process figured out by now. The truth is, there is very little difference in performance among most brands. Market pressures have forced products to be equally good. Service and price are different stories.

Span capability is important. That's the sales pitch that got us swinging toward I-joists. The ability of an I-joist to span a given distance is controlled by wood quality, size, and species. There are no scientific mysteries here. The same wood is available to every manufacturer. Manufacturers have settled on using wood with similar design properties for their respective product lines. Typically each manufacturer offers two blends of strength & stiffness. Engineers have mastered the most efficient cross sectional geometry and assembly methods. In fact, if you look at the technical specifications of all major brands you will find virtually no difference in sizes and span ratings when comparing competing product lines.

Service is a critical component and should be considered carefully by builders. This is perhaps the area with the widest divergence in the marketplace. Most manufacturers have established a 2-step distribution system: they sell to wholesale distributors who in turn sell to retailers that sell to builders. Typically, manufacturers educate distributors and provide them with the computer software and technical tools required to service builders. Retailers don't normally provide technical support directly to builders.

I have never heard anyone say: "We provide better service than TJ." Everyone seems to measure his or her own technical support and service against what TJ offers. I can't tell you how often I have heard; "Our software is just as good as TJ Expert." TJ has the most extensive distribution network. It also has more than 170 field representatives working the widest customer base in the business. But you pay for this service. Even TJ Sales Representatives admit their product is 10% higher than the nearest competitor. Most manufacturers, even the big ones, have only 4 or 5 field representatives left to distributors. Well trained distributors provide efficient sizing and support services. This approach generally works well.

Got a Question?



Before you buy I-joists ask some very specific questions:

- Who provides the engineering service – dealer, distributor or manufacturer?
- How long will it take to size the joists in a set of plans?
- What technical information will I get?
 - joist layout?
 - hanger locations?
 - performance specs?
- How long will it take for delivery once the order is placed?
- What happens if my customer changes a stair-layout?
 - who engineers the change?
 - how long will it take to make the changes?
 - what do I have to do to get answers?
- What is the policy if I receive, what I think is, defective material on site?
- Who is the person I will be working directly with?

Sizes offered are standard throughout the industry. Lengths up to 60' are available. Forty-eight footers are more common. Most manufacturers sell a residential series in the following depths: 9-1/2", 11-7/8", 14" and 16". You do have a choice when it comes to the size and material used for flanges. LVL, visually graded lumber, and machine stress rated (MSR) lumber are available. Typically LVL flanges for residential joists are either 1-1/2" x 1-1/2" or 1-1/2" x 1-3/4" (width x depth). Sawn flanges are finger jointed 2x3's or 2x4's. Many manufacturers market a commercial series too, with depths reaching 32" and LVL flanges up to 3-1/2" wide.

Some companies like Trus Joist almost exclusively sell LVL-flange products. TJM has developed a TimberStrand-flange product (TJI Pro 120 TS) with limited distribution from a facility in eastern Kentucky. Other companies like Willamette and Georgia Pacific sell both sawn and LVL versions. While still others, like Alliance Forest Products and NASCOR Incorporated, sell only sawn-flange joists (see directory at end of article). LVL may be stronger, but inch-for-inch it is more expensive. The balance of cost vs performance is leaning in favor of sawn flanges for residential applications. Many builders prefer sawn flanges.

Builders Perspective

Once builders use I-joists they are usually converted for life. Art Pakatar, construction coordinator and head designer for Belmonte Builders, Albany, NY expresses the views of many when he says, "We changed to I-joists a few years back and will never use lumber joists again. We save money, improve performance and feel like we're helping the environment." Pakatar builds 70 custom homes per year and has a problem with the span limitations of lumber joists. But like many builders who have used LVL- and sawn-flange versions Pakatar thinks sawn-flange products are a bargain.

Sawn-flange products typically cost less and perform as well as LVL models. They are easier and faster to install. Pakatar was happy using I-joists made by TJM and Louisiana-Pacific (LP). Then he tried a solid-flange product called ALLJoist, manufactured by Alliance Forest Products, Inc., Montreal, Canada. Pakatar reports, "My estimates show that I save \$1400 off the cost of building one of my 3,200 foot model homes."

Generally, builders claim there is less splitting when I-joists are nailed to sills and tops of walls. There is more room to place the nail. Solid lumber flanges are more stable during installation. Long lengths of thin-flanged LVL joists v  like spaghetti as you lay them up. The wider lumber flanges are much more rigid during installation. Lumber flanges

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balance the I-joist nicely on a sill while you nail them off because they have a wider contact area to rest on. The wider flange also makes the joist run more true across the span. You don't have to straighten the joist as much when you install decking. Solid flanges provide a wider target area when you nail your deck. The larger solid flange provides a bigger gluing area. The bond between subflooring and I-joist is significantly improved. Since the flange is wider, the space between the joists is reduced by 1-inch, making the subfloor a little more stiff. One of the biggest advantages is that the lumber flange looks more familiar to builders and potential homeowners.

Like Pakatar, many builders appreciate the consistency that all I-joists provide. I-joists are straight, so floors and ceilings are dead flat. The products are more stable because they are manufactured at a moisture content more closely matched to the environment they are used in. Shrinkage, nail-pops and floor squeaks are a thing of the past.

Promotional literature does make some exaggerated claims. It promises big savings when it comes to installing plumbing, electrical, and mechanical systems. The word from the field is that builders just don't see the savings. You can cut bigger holes in the webs, but the subtrades just don't mark down their estimates for I-joist jobs. Also, the labor saved to install I-joists is not always as great as predicted. I-joists must be cut and then fastened into expensive metal hangers when they are flush-mounted against the face of beams. Some of the more complicated attachments require framers to receive additional training. Good advice is to provide detail sheets to the job foreman and crew. Carefully index locations for special fastening details right on the blueprints.

Certain brands and sizes may be hard to find in some regions. While TJ has exhaustive coverage across the nation, smaller companies often sell in limited regional pockets. Even large companies have spotty distribution. For example, Boise Cascade and Willamette have developed a strong Western and Mid-western presence, while they build Eastern markets. Alliance on the other hand, has developed its Eastern and Central distribution network, but is still awaiting code approval in Western regions. Not all sizes and depths are stockpiled by wholesale distributors who supply your region. Plan ahead for special orders.

Standardization

Perhaps the hottest issue in the world of I-joists involves product standardization. Currently each manufacturer provides its own specifications and span recommendations. How would you like to see the maximum span allowed for a particular joist stamped right on its side in big black letters? APA The Engineered Wood Association, Tacoma, WA is betting you do. The APA stamps maximum spans for each of 12"-, 16"-, 19.2"- and 24"-inch on-center spacings for simple and multiple spans on every joist produced by its member mills.

APA has a long history of advancing the quality of structural wood products used in the building industry. Consumers have benefited by the standardization of plywood, OSB and other panel products. In large part, APA is credited with the reliable high-performance of the structural panels we use. APA began to explore the idea of standardizing I-joist production in the mid 1990's.

APA reviewed several market studies conducted by a variety of research organizations and performed their own surveys too. Retailers, builders and building officials who participated in the surveys overwhelmingly supported the standardization of sizes, performance, and span tables. One study shows that nearly 100% of building officials want a uniform identification system for I-joists. Tom Williamson, APA's Technical Director was a distributor of T. He recognizes a significant level of confusion is caused by having too many proprietary product specifications.

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Williamson says, “It became obvious to us that we had to standardize to make it easier for specifiers to specify, suppliers to inventory, and builders to buy.” The APA Performance Rated I-Joist (PRI) standard was brought into the marketplace in 1997. Manufacturers who like the idea can buy into the plan and use the PRI standard.

APA’s standard basically creates a family of I-joist products and assigns them to groups having similar design properties. It then develops span tables based on performance levels. PRI stamped products are recognized by all model building codes. The APA [Design and Construction Guide](#) looks very much like the guides provided by individual manufacturers. APA span tables provide data for I-joists with sawn and LVL flanges, plywood and OSB webs, and depths ranging from 9-1/2” to 16”. It’s a residential standard. APA issues “series” designations like PRI-15, PRI-25, etc. to its family of products just like manufacturers do. The technical guide provides explanations of terminology. It provides construction details for blocking, fasteners, rim joists, and cantilevers. The guide also supplies charts for making holes in webs. All information follows the format used by most manufacturers. If all manufacturers participated in this program, we would have one standard set of instructions. But so far only 20% of the I-joists sold follow this standard.

It’s interesting. Everyone agrees the difference between brands is minimal. Demands of the marketplace have pushed performance of products closer and closer together. Williamson says, “There is a defacto standard already. We overlaid the span capabilities of each product line of major players and found that the spans were almost identical.” Yet manufacturers strive to differentiate their products and carve market share. Every time a builder buys a new product, there is a whole new set of rules to follow. For example, even clearspans are expressed differently from manufacturer to manufacturer. Some measure center-of-bearing to center-of-bearing while others use a face-to-face measurement. APA’s goal is to put everything in one unified document. Not everyone is pleased with this idea.

Manufacturers who make 80% of the I-joists do not support APA’s plan. GP and Willamette are the only 2 large manufacturers participating in the PRI program. The political motives for choosing sides is clear. APA wants to increase membership revenue. Established manufacturers want to maintain control of the market share they have fought to pioneer. There are substantive issues beyond that however.

Some people fear that setting a standard will drive products to the lowest common denominator. Superior products will not receive the credit they deserve. A standard might remove the incentive for innovation and development of new products. Many argue that I-joists are structural elements that require careful engineering. I-joists are not direct substitutes for lumber joists. Builders may see the span listings stamped on the side of the I-joists and install them based on that recommendation alone. They won’t consider point-loads, off-set loads and special fastening requirements. Standardization clearly does not eliminate the need for technical support and design services. Builders need expert advice for structural design.

Thomas Denig, President & CEO of TJM points out, “With price as the primary differentiator, manufacturers will most likely seek to reduce costs by reducing or eliminating sales and technical design assistance, software, dealer and contractor training, and jobsite support.” APA only has 20 field representatives and 10 engineers to cover the entire country. They can’t, and don’t want to provide technical support for all manufacturers. It is APA’s view that distributors currently provide this service and should continue to do so. However, if standardization homogenizes I-joists into a commodity product, reduced profit margins won’t pay distributors to maintain technical staff. And builders won’t receive the high level of service they currently receive. Denig warns that the proposed ability to mix I-joist brands

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system is a bad idea. He maintains, “Manufacturers will no longer be in a position to provide homeowners with warranties for the system.” APA’s Williamson admits that these are legitimate concerns, but thinks the problems are solvable. There is an upside and a downside to this story. Stay tuned.

Cost Profile

Cost is king in the entry-level home category. We know that I-joists are the solution for elaborate large-span designs. Now let’s see how they compare to a 2” x 10” floor frame in a basic ranch.

Our case house measures 44’0” long by 28’0” wide. It has a center girder that is dropped below the joists. The cost estimate I provide compares prices for Louisiana-Pacific’s LVL-flange I-joists (LPI 26 @ 9-1/2”), ALLJoist’s, solid-flange I-joists (AJS 10 @ 9-1/2”) and KD #2 SPF 2” x 10” lumber. We look at 2 joist spacings: 16-, and 24-inch on-center. The cost-out does not include the girder, subflooring, adhesive, nails, sill or hangers, since these items will cost the same for lumber and I-joists.

Prices I use were quoted in June 1999, by a mid-sized retailer who sells to a pro-builder client base in the Northeast. The price of lumber is a moving target . But a few calls around the Northeast region left me gagging for air. “Builder” prices for #2 SPF ran as high as \$1.50 per LF for 2”x10”s and \$1.80 per LF for 2”x12”s! The price of LPI 26 is typical for most brands of 9-1/2” LVL-flange I-joists. TJM is the exception, usually costing at least 10% more. I think the AJS 10s are a bargain, selling at what appears to be a 10% discount over other solid-flange products sold in my region.

Prices Used in Cost-Out:

Material	Cost
LPI 26 @ 9-1/2” (1-1/2”x1-1/2” flange)	\$1.45/LF
AJS10 @ 9-1/2” (1-1/2”x1-1/2” flange)	\$1.12/LF
KD SPF #2	\$1.22/LF (730/M)
1” x 9-1/2” OSB Rim Stock	\$1.65/LF

It is important to know what level of performance you are getting for your money. Design parameters for this floor are 40 psf live load (LL) and 15 psf dead load (DL). The building code sets the maximum allowable deflection at L/360 for floors (L= inches of span). This means that in our case with a 14-foot span: 168 inches/360 = 0.47-inch deflection is allowed if the floor is loaded to its maximum design load. No designer worth his or her salt would set the bar this low more responsible deflection limit. However, I have used L/360 for dimension lumber and upped the bar to L/480 for I-joists in this analysis.

[Click here to view Table.](#)

Got a Question?



We see in the illustration that at 16-inch on-center spacings, 2" x 10"s are in a virtual dead heat with ALLJoist. Frame costs are \$1,346.88 and \$1,359.04 respectively. The LP product is about \$360 more. A few things are worth noting: 30 fewer framing members are required to build the I-joist frames. A significant difference in labor. Also, if you work out the design calculations you quickly see that both of the I-joist floors are grossly overbuilt. The calculated deflection under maximum load for LPI's is L/700 and ALLJoist's is L/850. These products haven't even flexed their muscles. Yet, if you held 2x10's to a L/480 deflection threshold, they would fail.

Push the on-center spacing of the joists to 24-inches and note how the picture changes. The 2x10's and 2x12's are just not strong enough to do the job. But both I-joist products easily exceed load and deflection limits. At this point ALLJoist cost \$1,025.28 with L/625 and LP costs \$1,280.70 with L/510. I-joists leave lumber joists in the dust. The material cost is lower and they require even fewer building elements to install. Keep in mind that as you reduce the number of joists, you also reduce the amount of adhesive and number of nails used to fasten subflooring.

It is obvious to me that I-joists are worth considering when you order your next frame. Production builders and first-time home buyers can now use I-joists to cut costs and improve quality. The confluence of rising lumber prices, improved I-joist technology, and increased competition have provided builders with an opportunity to offer more for less. I certainly don't know how prices will track in the future. But my bet is that I-joists are here to stay.

Additional information:

Alliance Forest Products, Inc.
1000 De La Gauchetiere West, Suite 2820
Montreal, PQ H3B 4W5
Phone 514-954-2137
www.alliance-forest.com
sawn lumber flanges

APA The Engineered Wood Assoc.
7011 S. 19th St., P.O.Box 11700
Tacoma, WA 98411-0700
Phone 253-565-6600
www.apawood.org

Boise Cascade Corporation
P.O. Box 50
Boise, ID 83728
Phone 208-384-6161
www.bc.com
LVL flanges

Georgia-Pacific Corporation
2300 Windy Ridge Parkway, 7th floor
Atlanta, GA 30339

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Phone 1-800-839-2588

www.gp.com

sawn lumber and LVL flanges

International Paper (Union Camp)

Two Manhattanville Road

Purchase, NY 10577

Phone 914-397-1500

www.internationalpaper.com

LVL flanges

Jager Industries, Inc.

8835 Macleod Tr., S.W.

Calgary, AB T2H 0M3, Canada

Phone 403-259-0700

www.jagerind.com

sawn lumber flanges

Juniper Lumber Co. Ltd.

35 Juniper Mill Road

P.O. Box 120

Juniper, NB E7L 1J3 Canada

Phone 506-246-5611

sawn lumber flanges

Louisiana-Pacific Corporation

111 S.W. Fifth Avenue

Portland, OR 97204

Phone (Oregon Only) 503-821-5100

(Outside Oregon) 1-800-547-6331

www.lpcorp.com

sawn lumber and LVL flanges

Nascor Incorporated

1212-34 Avenue S.E.

Calgary, Alberta T2G 1V7 Canada

Phone 1-800-792-9555

www.nascor.com

sawn lumber flanges

Pacific Woodtech Corporation

P.O. Box 465

Burlington, WA 98233

Phone 360-707-2200

Sawn lumber and LVL flanges



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Poutrelles International Inc.
480, rue Jocelyn-Bastille, C.P. 10
Pohenegamook, PQ G0L 4J0 Canada
Phone 418-893-1515

Standard Structures Inc.
340 Standard Avenue, P.O. Box K
Santa Rosa, CA 95402
phone 707-544-2982
www.standardstructures.com
sawn lumber flanges

Stark Structures, Inc.
109 Miles Avenue SW
Canton, OH 44710
Phone 330-478-2100

Trus Joist MacMillan
200 East Mallard Drive
Boise ID 83706
Phone 208-364-1200
www.tjm.com LVL flanges

Web Joist Northwest, Corp.
118 Borovec Road
Chehalis, WA 98532
Phone 888-748-1173
sawn lumber flanges

Weyerhaeuser Company
33663 Weyerhaeuser Way
Tacoma, WA 98477
Phone 253-924-2345
www.weyerhaeuser.com
LVL flanges

Willamette Industries
1300 S.W. Fifth Avenue, Suite 3800
Portland, OR 97201
phone 800-942-9927
www.wii.com
sawn lumber and LVL flanges

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