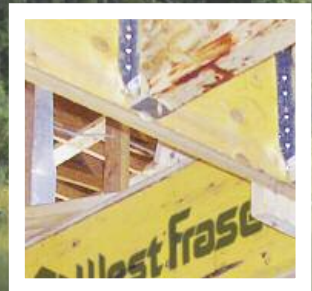




# West Fraser™ LVL

## LVL User's Guide

Technical Data for LVL Headers, Beams, Column Applications  
for Residential Floor and Roof Systems



# Quality Products – Committed Service

## OUR HISTORY

In 1955, three Ketcham brothers, Henry Jr., William, and Samuel, started West Fraser by acquiring a small lumber planing mill in Quesnel, BC. Throughout the years, they continued to make various sawmill acquisitions in the interior of British Columbia, which included the associated timber rights. In 1979, West Fraser entered the pulp industry, constructing a joint venture mill in Quesnel. West Fraser's expansion continued into Alberta in 1989 when they entered into a joint venture newsprint mill in Whitecourt. The Company's growth continued in Alberta with the acquisition of a sawmill, MDF plant, and pulp mill in 1995 and a plywood mill, stud mill and veneer mill in 1999. In 2000, West Fraser entered the United States by

acquiring two sawmills in the U.S. south. A major acquisition occurred in 2005 with the purchase of Weldwood of Canada. With this purchase, West Fraser entered the engineered wood business by acquiring the world's first continuous laminated veneer lumber press.

West Fraser expanded further in 2007 when the Company acquired 13 additional sawmills in the southern U.S. from International Paper Co. This added 1.8 billion board feet of lumber capacity to West Fraser for a total capacity of more than 6 billion board feet, making West Fraser one of the largest lumber producers in North America.

## OUR ENVIRONMENTAL STEWARDSHIP

West Fraser Timber Co. Ltd. is committed to responsible stewardship of the environment. A philosophy of continual improvement of our forest practices and manufacturing procedures has been adopted to optimize the use of resources and minimize or eliminate the impact of our operations on the environment.

West Fraser recognizes that environmental excellence is an integral aspect of long-term business success. Our Company and its employees are committed to the following:

- Complying with all applicable environmental laws and regulations, and with other requirements to which the organization subscribes.

- Preventing pollution and continuing to improve our environmental performance by setting and reviewing environmental objectives and targets.
- Conducting periodic environmental audits.
- Providing training for employees and contractors to ensure environmentally responsible work practices.
- Communicating our environmental performance to employees, customers, shareholders, local communities and other stakeholders.
- Reviewing, on a regular basis, this policy to ensure that it reflects the Company's ongoing commitment to environmental stewardship.

## OUR VISION

West Fraser's vision is to be the leading forest products company in Canada. Our goals are simple – leadership in profits, responsibility in communities, excellence in people and strength in products.

# A Word About LVL Grades

## DID YOU KNOW THAT . . .

If you are using 2.0E beams and headers exclusively in residential wood construction, you are leaving money on the table approximately 85% of the time.

When sizing beams and headers, you need to have sufficient moment capacity ( $F_b$ ), sufficient shear capacity ( $F_v$ ), sufficient stiffness ( $EI$ ) to satisfy the live and total load deflection criteria and you need to have adequate bearing sizes ( $F_{c\perp}$ ).

The industry markets LVL beams and headers based on the MOE value (modulus of elasticity =  $E$ ) which along with the size of the beam (moment of inertia =  $I$ ) determines the stiffness ( $EI$ ) of the beam. The stiffness of a beam determines how much deflection a beam will experience under a given load. Deflection is a performance criteria established by

building codes ( $L/360$ ). Stiffness is not the same as strength!

Not all applications are controlled by stiffness, many are controlled by strength ( $F_b$  and  $F_v$ ). In some applications, a 1.9E or 2.0E beam cannot be used as a substitute for a 1.8E beam that has superior strength properties ( $F_b$  and  $F_v$ ).



A beam 16' long, carrying 300 PLF, with 1.9E material will deflect 0.0344 inches less ( $1/32"$ ) under total load compared to the same beam with 1.8E material. This is not much, especially when you consider the premium you pay for high MOE products.



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# PRODUCT LINE



With the use of ultrasonic grading technology, West Fraser wisely utilizes the inherent attributes of its wood resources to manufacture products that effectively satisfy the needs of the market while at the same time, contribute to a greener, more sustainable environment. In addition, these attributes also allow for superior fiber bending strength and workability.

## West Fraser™ LVL 3100F<sub>b</sub>-2.0E

- 1¾" and 3½" thick in I-Joist and lumber compatible depths to 24" deep

## West Fraser™ LVL 3000F<sub>b</sub>-1.9E

- 1¾" thick in I-Joist and lumber compatible depths to 24" deep

## West Fraser™ LVL 3000F<sub>b</sub>-1.8E

- 1½", 1¾", and 3½" thick in I-Joist and lumber compatible depths to 18". (1¾" and 3½" to 24"), 3½" thick in columns

## West Fraser™ LVL 2750F<sub>b</sub>-1.7E

- 1¾" and 3½" thick in I-Joist and lumber compatible depths to 24" deep

All products have face, back and edges sealed for improved performance under normal construction exposure

**CODE EVALUATION REPORT NUMBERS:** CCMC 12904-R

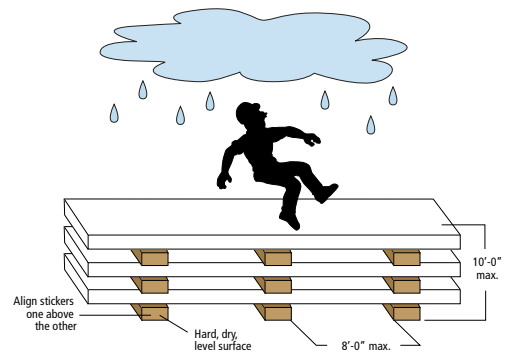
Check product availability with supplier prior to specifying LVL sizes.

## STORAGE, HANDLING AND INSTALLATION

Failure to follow good procedures for installation, storage and handling could result in unsatisfactory performance and unsafe structures.

- West Fraser™ LVL should be stored lying flat and protected from the weather.
- Stickers to be aligned one above the other and spaced no more than 8'-0" apart.
- Do not exceed a storage bundle height of 10'-0".
- Keep the material above ground to minimize the absorption of ground moisture and allow circulation of air.
- Report all forklift damage prior to shipment.
- West Fraser™ LVL is for use in covered, dry conditions only. Protect from the weather on the job site both before and after installation.
- Except for cutting to length, West Fraser™ LVL shall not be cut, drilled or notched. Heel cuts may be possible. Contact your West Fraser representative.
- Place first set of stickers on hard, level dry surface.
- **Do not install any damaged LVL.**

**CAUTION: Wrap may be slippery when wet**



**These are general recommendations and in some cases, additional precautions may be required.**



West Fraser™ LVL

3100F<sub>b</sub> – 2.0E LVL



# 3100F<sub>b</sub> – 2.0E 1<sup>3</sup>/<sub>4</sub>" and 3<sup>1</sup>/<sub>2</sub>" THICK

## HEADERS AND BEAMS

### DESIGN PROPERTIES

#### 3100F<sub>b</sub>-2.0E 1<sup>3</sup>/<sub>4</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11¾"	14"	16"	18"	24"
Moment (ft.lbs.)	4134	6967	11037	11608	16652	17693	24146	31073	38816	66835
Shear (lbs.)	3199	4217	5381	5526	6690	6908	8144	9307	10471	13961
Moment of Inertia (in <sup>4</sup> )	24	56	115	125	222	244	400	597	851	2016
Weight (lbs./lin.ft.)	2.7	3.6	4.6	4.7	5.7	5.9	7.0	8.0	9.0	12.0

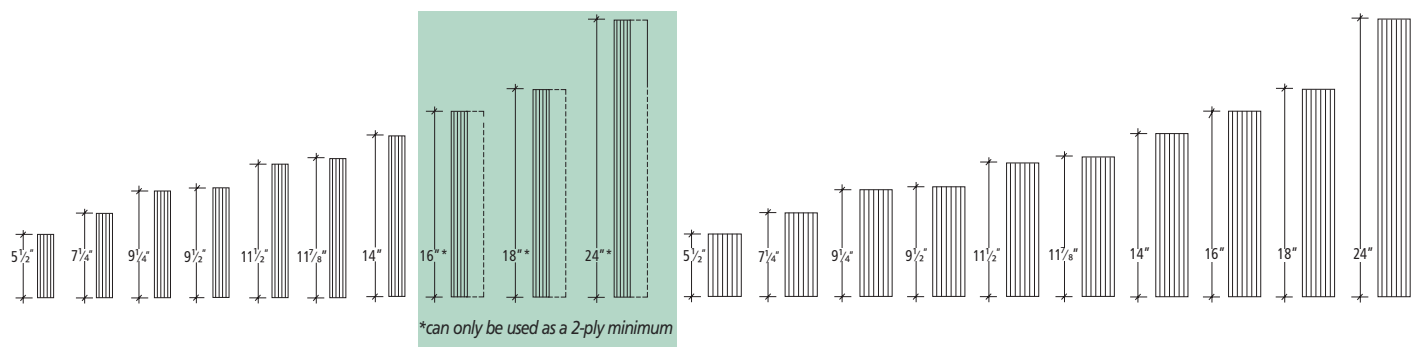
1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.
3. All 16" and greater beam depths are to be used in multiple member units only.

#### 3100F<sub>b</sub>-2.0E 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11¾"	14"	16"	18"	24"
Moment (ft.lbs.)	8269	13933	22075	23215	33305	35386	48292	62146	77631	133669
Shear (lbs.)	6398	8434	10762	11052	13380	13816	16288	18614	20942	27922
Moment of Inertia (in <sup>4</sup> )	49	111	231	250	444	488	800	1195	1701	4032
Weight (lbs./lin.ft.)	5.5	7.2	9.2	9.5	11.5	11.8	14.0	15.9	17.9	23.9

1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.

#### 3100F<sub>b</sub> -2.0E 1<sup>3</sup>/<sub>4</sub>" AND 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL AVAILABLE SIZES



#### 3100F<sub>b</sub> -2.0E WEST FRASER™ LVL SPECIFIED STRENGTHS (STANDARD TERM)

Modulus of Elasticity

$$E = 2.0 \times 10^6 \text{ psi}$$

Bending Stress

$$F_b = 5729 \text{ psi}$$

Shear (joist)

$$F_v = 554 \text{ psi}$$

Compression Perpendicular to Grain (joist)

$$F_{c(\text{perp})} = 1300 \text{ psi}$$

Compression Parallel to Grain

$$F_{c(\text{para})} = 4786 \text{ psi}$$

1.  $F_b$  based on 12" depths. For other depths, multiply by  $(12/d)^{(1/9)}$ .

2.  $F_{c(\text{perp})}$  and  $E$  shall not be increased for duration of load.

# FACTORED RESISTANCE TABLES

## GENERAL NOTES

- Tables are for one-ply 1¾" beams. When properly connected, double the values for two-ply beams, triple for three. Minimum bearing lengths shown for one-ply will be the same for two-ply and three-ply. See page 9 for multiple-ply connection details.
- Resistances shown are the maximum factored and/or unfactored resistances, in pounds per lineal foot, that can be applied to the beam in addition to its own weight.
- Tables are based on uniform loads and the most restrictive of simple or continuous spans and dry-use conditions. Refer to West Fraser's sizing software for other loads or span configurations.
- Lateral support of beam compression edges is required at intervals of 24" o/c or closer.
- Lateral support of beams is required at bearing locations.
- Spans of multiple spans must be at least 40% of adjacent span.
- West Fraser™ LVL beams are made without camber; therefore, in addition to complying with the deflection limits of the applicable building code, other deflection considerations, such as long term deflection under sustained loads (including creep), must be evaluated.
- All 16" and deeper beams are to be used in multiple member units only.
- Unfactored total load resistance is limited to a deflection of L/240. Unfactored live load resistance is based on a deflection of L/360. Check local code requirements for other deflection criteria.
- For an unfactored live load deflection limit of L/480, multiply UNFACTORED LOAD L/360 resistance by 0.75. The resulting unfactored live load shall not exceed the total factored load shown.
- Roof must have positive slope in order to prevent ponding.
- Tables will accommodate beam slopes to a maximum of 2:12.
- Bearing lengths are based on 1300 psi specified strength for 3100F<sub>b</sub>-2.0E Grade materials which cannot be increased for duration of load. Bearing length may need to be increased if support member's allowable bearing stress is less.
- Spans shown are measured centre-to-centre of bearing.

## INSTRUCTIONS FOR USE

1. Determine the factored total load and unfactored total and live load on the beam in pounds per lineal foot (plf).
2. Locate a span that meets or exceeds the required beam span, centre-to-centre of bearing.
3. Scan from left to right within the SPAN row until you find a cell where; (1) the UNFACTORED LOAD L/360 resistance meets or exceeds the unfactored live load, (2) the UNFACTORED LOAD L/240 resistance meets or exceeds the unfactored total load and (3) the FACTORED TOTAL LOAD resistance meets or exceeds the factored total load. All three rows must be checked and satisfied. Where no unfactored resistances are shown, factored total load will control.
4. To size a member for a span not shown, use capacities for the next larger span shown.

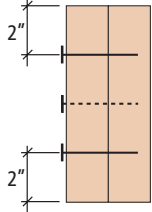
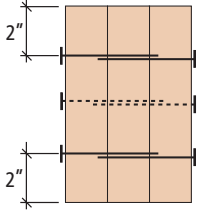
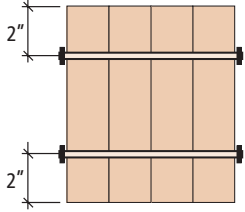




# MULTIPLE MEMBER CONNECTIONS FOR SIDE-LOADED BEAMS: 3100F<sub>b</sub> – 2.0E

Verify adequacy of beam in uniform load tables prior to using values listed below.

## 3100F<sub>b</sub>-2.0E 1¾" WEST FRASER™ LVL

Maximum Factored Uniform Load (PLF) Applied to Either Outside Member			 2-PLY LVL	 3-PLY LVL	 4-PLY LVL*
Connector	Spacing	Rows	Nails On One Side or Through Bolts	Nails Both Sides or Through Bolts	Through Bolts Only
16d (3½") Common Wire Nails	12" o.c.	2 Rows	885	663	Not Applicable
		3 Rows	1327	995	
	6" o.c.	2 Rows	1770	1326	Not Applicable
		3 Rows	2654	1990	
	4" o.c.	2 Rows	2655	1989	Not Applicable
		3 Rows	3981	2985	
½" A307 Through Bolts	24" o.c.	2 Rows	671	503	448
	12" o.c.	2 Rows	1342	1006	895
	6" o.c.	2 Rows	2684	2012	1790

\* 4-ply beams should only be side-loaded when loads are applied to both sides of the member.

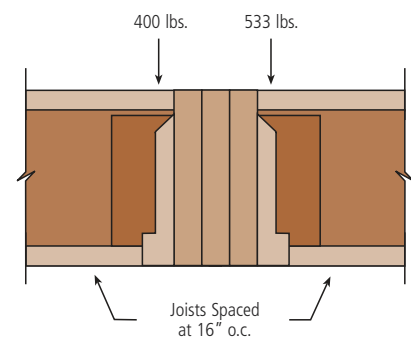
1. Nails to be located a minimum of 2" from the top and bottom of the member. Start all nails a minimum of 2½" in from ends.

2. Bolts are to be material conforming to ASTM Standard A307. Bolt holes are to be the same diameter as the bolt, and located 2" from the top and bottom of the member. Washers should be used under head and nut. Start all bolts a minimum of 2½" in from ends.

3. Values listed are for standard term loading.

### EXAMPLE (All loads shown are total factored)

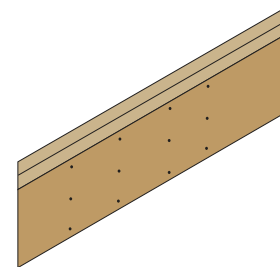
First, convert joist reactions to plf load on each side of the beam by taking the joist reaction (lbs.) divided by the joist spacing (ft.). 400 lbs/(16/12) = 300 plf and 533 lbs/(16/12) = 400 plf. Check factored resistance tables to verify that 3 plys can carry the total factored load of 700 plf. The maximum load applied to either outside member is 400 plf. Use 2 rows of 16d (3½") common wire nails at 12" o.c. (good for 663 plf).



## CONNECTION OF MULTIPLE PIECES FOR TOP-LOADED BEAMS

2.0E (1¾" wide pieces)

- Minimum of 2 rows of 16d (3½") nails at 12" o.c. for 5½" through 11⅞" beams
- Minimum of 3 rows of 16d (3½") nails at 12" o.c. for 14" through 24" beams







West Fraser™ LVL

3000F<sub>b</sub> – 1.9E LVL



# LVL 3000F<sub>b</sub> – 1.9E 1<sup>3</sup>/<sub>4</sub>" THICK

## HEADERS AND BEAMS

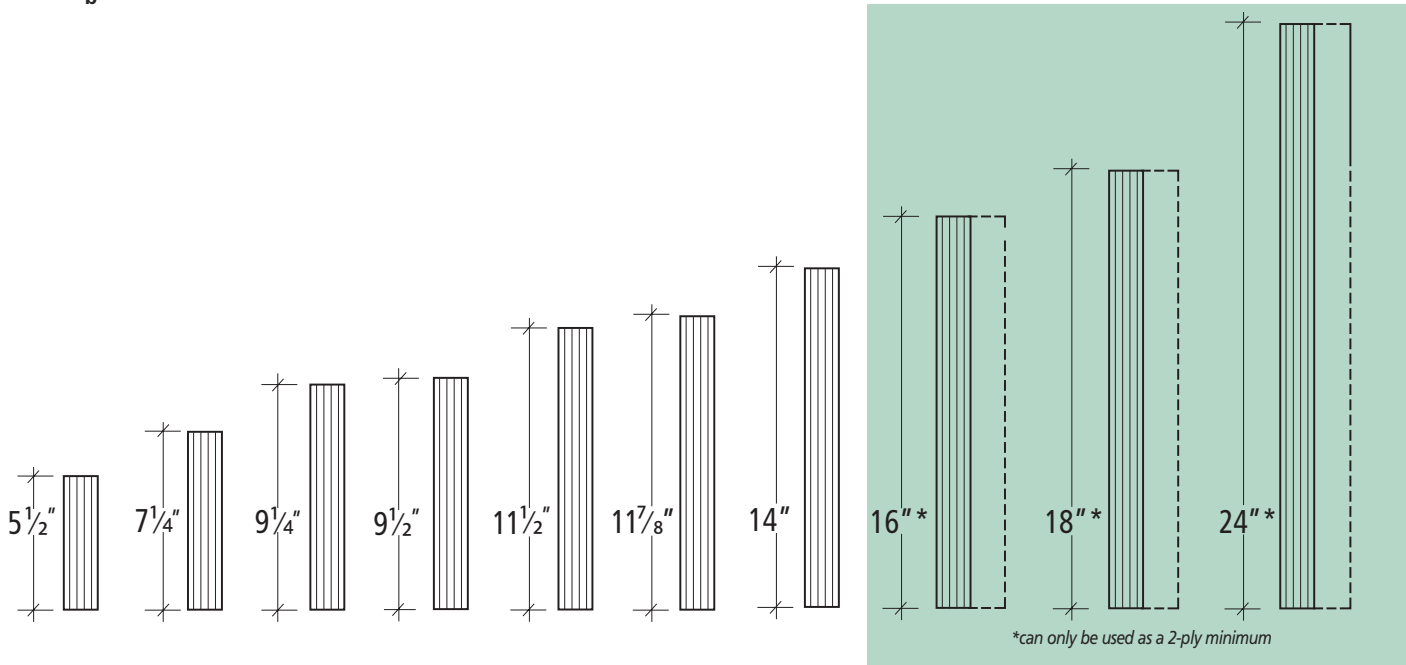
### DESIGN PROPERTIES

#### 3000F<sub>b</sub>-1.9E 1<sup>3</sup>/<sub>4</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11⅞"	14"	16"	18"	24"
Moment (ft.lbs.)	4079	6827	10751	11299	16132	17126	23277	29855	37184	63568
Shear (lbs.)	3199	4217	5381	5526	6690	6908	8144	9307	10471	13961
Moment of Inertia (in <sup>4</sup> )	24	56	115	125	222	244	400	597	851	2016
Weight (lbs./lin.ft.)	2.7	3.6	4.6	4.7	5.7	5.9	7.0	8.0	9.0	12.0

- Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
- Lateral support of beam is required at bearing locations.
- All 16" and greater beam depths are to be used in multiple member units only.

#### 3000F<sub>b</sub> - 1.9E 1<sup>3</sup>/<sub>4</sub>" WEST FRASER™ LVL AVAILABLE SIZES\*



#### 3000F<sub>b</sub> - 1.9E WEST FRASER™ LVL SPECIFIED STRENGTHS (STANDARD TERM)

Modulus of Elasticity	E = 1.9 x 10 <sup>6</sup> psi
Bending Stress	F <sub>b</sub> = 5544 psi
Shear (joist)	F <sub>v</sub> = 554 psi
Compression Perpendicular to Grain (joist)	F <sub>c(perp)</sub> = 1300 psi
Compression Parallel to Grain	F <sub>c(para)</sub> = 4000 psi

- F<sub>b</sub> based on 12" depths. For other depths, multiply by (12/d)<sup>(1/7.35)</sup>.
- F<sub>c(perp)</sub> and E shall not be increased for duration of load.

# FACTORED RESISTANCE TABLES

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## GENERAL NOTES

- Tables are for one-ply 1¾" beams. When properly connected, double the values for two-ply beams, triple for three. Minimum bearing lengths shown for one-ply will be the same for two-ply and three-ply. See page 15 for multiple-ply connection details.
- Resistances shown are the maximum factored and/or unfactored resistances, in pounds per lineal foot, that can be applied to the beam in addition to its own weight.
- Tables are based on uniform loads and the most restrictive of simple or continuous spans and dry-use conditions. Refer to West Fraser's sizing software for other loads or span configurations.
- Lateral support of beam compression edges is required at intervals of 24" o/c or closer.
- Lateral support of beams is required at bearing locations.
- West Fraser™ LVL beams are made without camber; therefore, in addition to complying with the deflection limits of the applicable building code, other deflection considerations, such as long term deflection under sustained loads (including creep), must be evaluated.
- All 16" and deeper beams are to be used in multiple member units only.
- Unfactored total load resistance is limited to a deflection of L/240. Unfactored live load resistance is based on a deflection of L/360. Check local code requirements for other deflection criteria.
- For an unfactored live load deflection limit of L/480, multiply UNFACTORED LOAD L/360 resistance by 0.75.
- Roof must have positive slope in order to prevent ponding.
- Spans of multiple spans must be at least 40% of adjacent span.
- Bearing lengths are based on 1300 psi specified strength for 1.9E Grade materials which cannot be increased for duration of load. Bearing length may need to be increased if support member's allowable bearing stress is less.
- Tables will accommodate beam slopes to a maximum of 2:12.

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## INSTRUCTIONS FOR USE

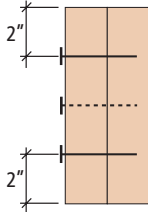
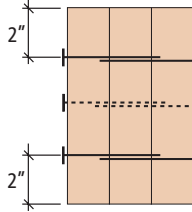
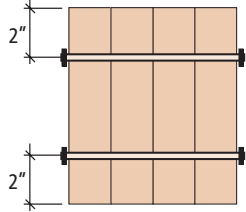
1. Determine the factored total load and unfactored total and live load on the beam in pounds per lineal foot (plf).
2. Locate a span that meets or exceeds the required beam span, centre-to-centre of bearing.
3. Scan from left to right within the SPAN row until you find a cell where; (1) the UNFACTORED LOAD L/360 resistance meets or exceeds the unfactored live load, (2) the UNFACTORED LOAD L/240 resistance meets or exceeds the unfactored total load and (3) the FACTORED TOTAL LOAD resistance meets or exceeds the factored total load. All three rows must be checked and satisfied. Where no unfactored resistances are shown, factored total load will control.
4. To size a member for a span not shown, use capacities for the next larger span shown.



# MULTIPLE MEMBER CONNECTIONS FOR SIDE-LOADED BEAMS: $3000F_b - 1.9E$

Verify adequacy of beam in uniform load tables prior to using values listed below.

## $3000F_b - 1.9E$ $1\frac{3}{4}$ " WEST FRASER™ LVL

Maximum Factored Uniform Load (PLF) Applied to Either Outside Member					
Connector	Spacing	Rows	Nails On One Side or Through Bolts	Nails Both Sides or Through Bolts	Through Bolts Only
16d (3½") Common Wire Nails	12" o.c.	2 Rows	827	620	Not Applicable
		3 Rows	1241	930	
	6" o.c.	2 Rows	1654	1240	Not Applicable
		3 Rows	2482	1860	
	4" o.c.	2 Rows	2481	1860	Not Applicable
		3 Rows	3723	2790	
½" A307 Through Bolts	24" o.c.	2 Rows	671	503	448
	12" o.c.	2 Rows	1342	1006	895
	6" o.c.	2 Rows	2684	2012	1790

\* 4-ply beams should only be side-loaded when loads are applied to both sides of the member.

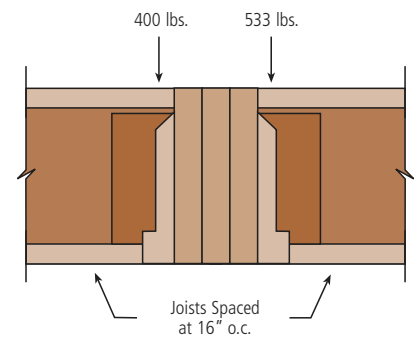
1. Nails to be located a minimum of 2" from the top and bottom of the member. Start all nails a minimum of 2½" in from ends.

2. Bolts are to be material conforming to ASTM Standard A307. Bolt holes are to be the same diameter as the bolt, and located 2" from the top and bottom of the member. Washers should be used under head and nut. Start all bolts a minimum of 2½" in from ends.

3. Values listed are for standard term loading.

### EXAMPLE (All loads shown are total factored)

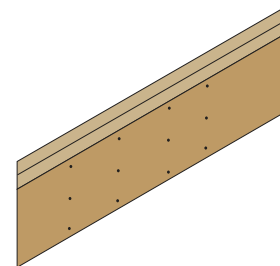
First, convert joist reactions to plf load on each side of the beam by taking the joist reaction (lbs.) divided by the joist spacing (ft.).  $400 \text{ lbs}/(16/12) = 300 \text{ plf}$  and  $533 \text{ lbs}/(16/12) = 400 \text{ plf}$ . Check factored resistance tables to verify that 3 plys can carry the total factored load of 700 plf. The maximum load applied to either outside member is 400 plf. Use 2 rows of 16d (3½") common wire nails at 12" o.c. (good for 620 plf).



### CONNECTION OF MULTIPLE PIECES FOR TOP-LOADED BEAMS

1.9E (1¾" wide pieces)

- Minimum of 2 rows of 16d (3½") nails at 12" o.c. for 5½" through 11⅞" beams
- Minimum of 3 rows of 16d (3½") nails at 12" o.c. for 14" through 24" beams









West Fraser™ LVL

3000F<sub>b</sub> – 1.8E LVL



# LVL 3000F<sub>b</sub> – 1.8E 1½" THICK

## HEADERS AND BEAMS

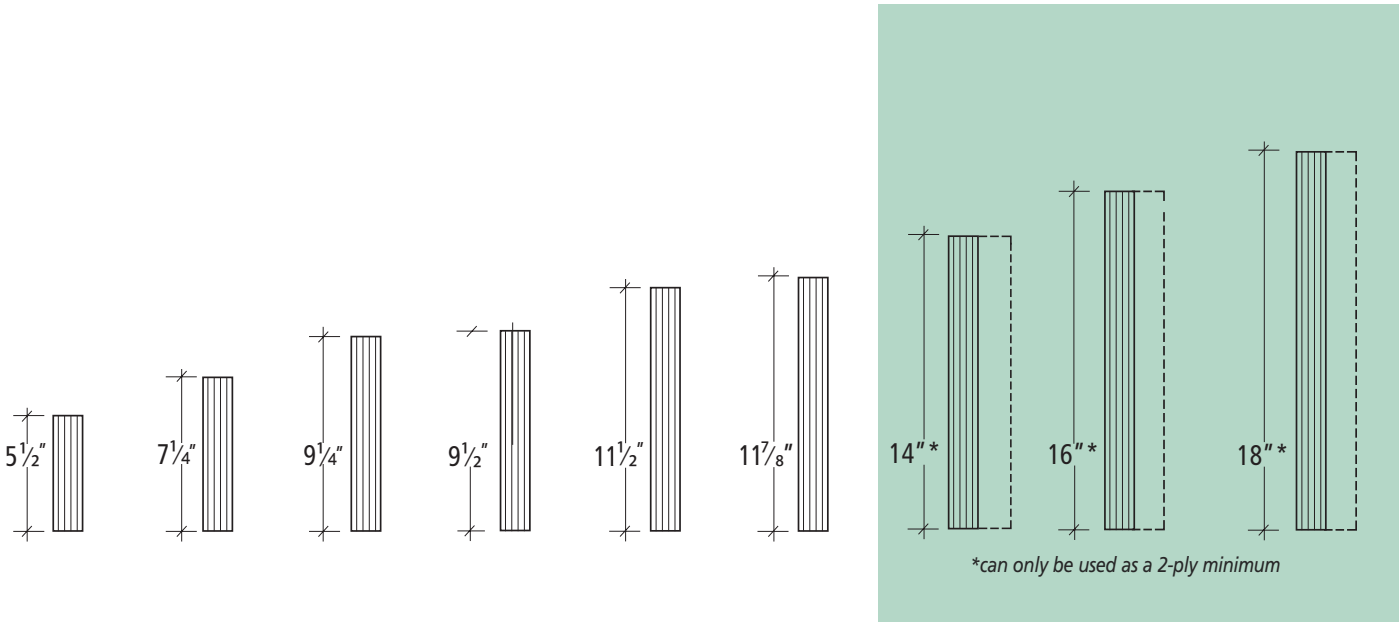
### DESIGN PROPERTIES

#### 3000F<sub>b</sub>-1.8E 1½" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth								
	5½"	7¼"	9¼"	9½"	11½"	11⅞"	14"	16"	18"
Moment (ft.lbs.)	3497	5852	9215	9684	13827	14679	19951	25590	31872
Shear (lbs.)	2653	3497	4462	4583	5548	5729	6754	7718	8683
Moment of Inertia (in <sup>4</sup> )	21	48	99	107	190	209	343	512	729
Weight (lbs./lin.ft.)	2.1	2.8	3.6	3.7	4.4	4.6	5.4	6.2	6.9

- Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
- Lateral support of beam is required at bearing locations.
- All 14" and greater beam depths are to be used in multiple member units only (1½" thick).

#### 3000F<sub>b</sub>-1.8E 1½" WEST FRASER™ LVL AVAILABLE SIZES



#### 3000F<sub>b</sub>-1.8E WEST FRASER™ LVL SPECIFIED STRENGTHS (STANDARD TERM)

Modulus of Elasticity	E = 1.8 x 10 <sup>6</sup> psi
Bending Stress	F <sub>b</sub> = 5544 psi
Shear (joist)	F <sub>v</sub> = 536 psi
Compression Perpendicular to Grain (joist)	F <sub>c(perp)</sub> = 1365 psi
Compression Parallel to Grain	F <sub>c(para)</sub> = 3750 psi

- F<sub>b</sub> based on 12" depths. For other depths, multiply by (12/d)<sup>(1/7.35)</sup>.
- F<sub>c(perp)</sub> and E shall not be increased for duration of load.

# FACTORED RESISTANCE TABLES

## GENERAL NOTES

- Tables are for one-ply 1½" beams. When properly connected, double the values for two-ply beams, triple for three. Minimum bearing lengths shown for one-ply will be the same for two-ply and three-ply. See page 21 for multiple-ply connection details.
- Resistances shown are the maximum factored and/or unfactored resistances, in pounds per lineal foot, that can be applied to the beam in addition to its own weight.
- Tables are based on uniform loads and the most restrictive of simple or continuous spans and dry-use conditions. Refer to West Fraser's sizing software for other loads or span configurations.
- Lateral support of beam compression edges is required at intervals of 24" o/c or closer.
- Lateral support of beams is required at bearing locations.
- West Fraser™ LVL beams are made without camber; therefore, in addition to complying with the deflection limits of the applicable building code, other deflection considerations, such as long term deflection under sustained loads (including creep), must be evaluated.
- All 14" and deeper beams are to be used in multiple member units only.
- Unfactored total load resistance is limited to a deflection of L/240. Unfactored live load resistance is based on a deflection of L/360. Check local code requirements for other deflection criteria.
- For an unfactored live load deflection limit of L/480, multiply UNFACTORED LOAD L/360 resistance by 0.75.
- Roof must have positive slope in order to prevent ponding.
- Spans of multiple spans must be at least 40% of adjacent span.
- Bearing lengths are based on 1365 psi specified strength for 1.8E Grade materials which cannot be increased for duration of load. Bearing length may need to be increased if support member's allowable bearing stress is less.
- Tables will accommodate beam slopes to a maximum of 2:12.

## INSTRUCTIONS FOR USE

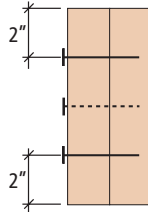
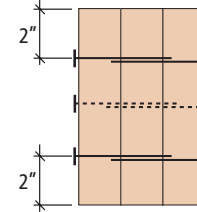
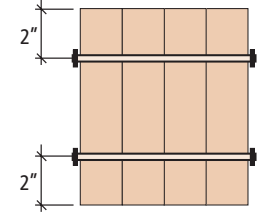
1. Determine the factored total load and unfactored total and live load on the beam in pounds per lineal foot (plf).
2. Locate a span that meets or exceeds the required beam span, centre-to-centre of bearing.
3. Scan from left to right within the SPAN row until you find a cell where; (1) the UNFACTORED LOAD L/360 resistance meets or exceeds the unfactored live load, (2) the UNFACTORED LOAD L/240 resistance meets or exceeds the unfactored total load and (3) the FACTORED TOTAL LOAD resistance meets or exceeds the factored total load. All three rows must be checked and satisfied. Where no unfactored resistances are shown, factored total load will control.
4. To size a member for a span not shown, use capacities for the next larger span shown.



# MULTIPLE MEMBER CONNECTIONS FOR SIDE-LOADED BEAMS: $3000F_b - 1.8E$

Verify adequacy of beam in uniform load tables prior to using values listed below.

## $3000F_b - 1.8E$ 1½" WEST FRASER™ LVL

Maximum Factored Uniform Load (PLF) Applied to Either Outside Member					
Connector	Spacing	Rows	Nails On One Side or Through Bolts	Nails Both Sides or Through Bolts	Through Bolts Only
10d (3") Common Wire Nails	12" o.c.	2 Rows	698	524	Not Applicable
		3 Rows	1047	785	
	6" o.c.	2 Rows	1396	1048	Not Applicable
		3 Rows	2094	1570	
	4" o.c.	2 Rows	2094	1572	Not Applicable
		3 Rows	3141	2355	
½" A307 Through Bolts	24" o.c.	2 Rows	575	432	384
	12" o.c.	2 Rows	1150	863	767
	6" o.c.	2 Rows	2300	1726	1534

\* 4-ply beams should only be side-loaded when loads are applied to both sides of the member.

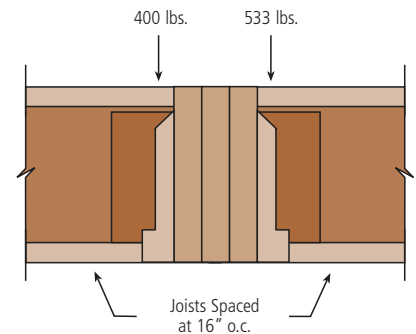
1. Nails to be located a minimum of 2" from the top and bottom of the member. Start all nails a minimum of 2½" in from ends.

2. Bolts are to be material conforming to ASTM Standard A307. Bolt holes are to be the same diameter as the bolt, and located 2" from the top and bottom of the member. Washers should be used under head and nut. Start all bolts a minimum of 2½" in from ends.

3. Values listed are for standard term loading.

### EXAMPLE (All loads shown are total factored)

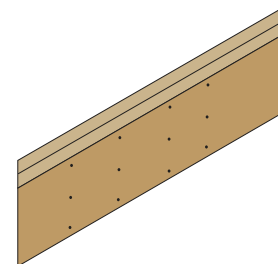
First, convert joist reactions to plf load on each side of the beam by taking the joist reaction (lbs.) divided by the joist spacing (ft.).  $400 \text{ lbs}/(16/12) = 300 \text{ plf}$  and  $533 \text{ lbs}/(16/12) = 400 \text{ plf}$ . Check factored resistance tables to verify that 3 plys can carry the total factored load of 700 plf. The maximum load applied to either outside member is 400 plf. Use 2 rows of 10d (3") common wire nails at 12" o.c. (good for 524 plf).



## CONNECTION OF MULTIPLE PIECES FOR TOP-LOADED BEAMS

1.8E (1½" wide pieces)

- Minimum of 2 rows of 10d (3") nails at 12" o.c. for 5½" through 11⅞" beams
- Minimum of 3 rows of 10d (3") nails at 12" o.c. for 14" through 18" beams



# 3000F<sub>b</sub> – 1.8E 1<sup>3</sup>/<sub>4</sub>" and 3<sup>1</sup>/<sub>2</sub>" THICK

## HEADERS AND BEAMS

### DESIGN PROPERTIES

#### 3000F<sub>b</sub>-1.8E 1<sup>3</sup>/<sub>4</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11¾"	14"	16"	18"	24"
Moment (ft.lbs.)	4079	6827	10751	11299	16132	17126	23277	29855	37184	63568
Shear (lbs.)	3095	4080	5206	5347	6472	6683	7879	9005	10130	13507
Moment of Inertia (in <sup>4</sup> )	24	56	115	125	222	244	400	597	851	2016
Weight (lbs./lin.ft.)	2.5	3.3	4.2	4.3	5.2	5.3	6.3	7.2	8.1	10.8

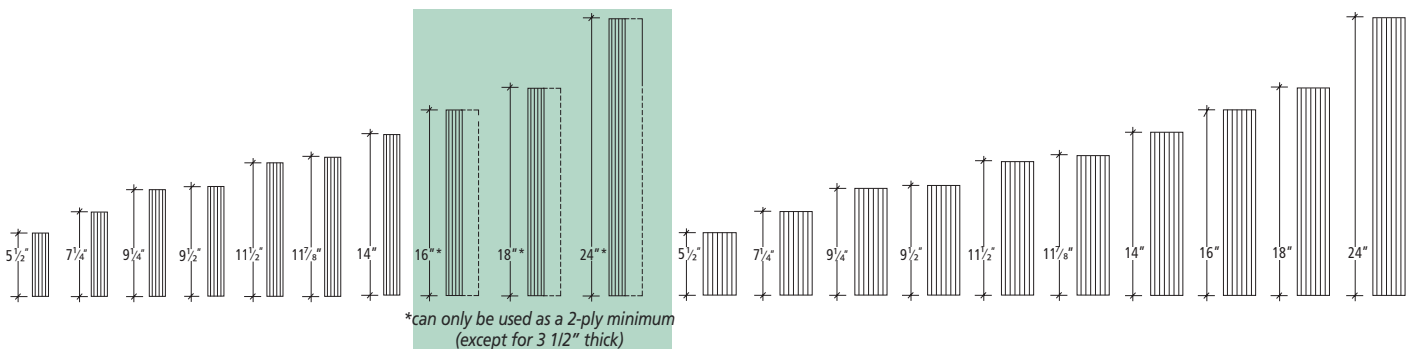
1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.
3. All 16" and greater beam depths are to be used in multiple member units only.

#### 3000F<sub>b</sub>-1.8E 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11¾"	14"	16"	18"	24"
Moment (ft.lbs.)	8159	13654	21501	22597	32264	34252	46553	59709	74368	127136
Shear (lbs.)	6191	8161	10412	10693	12944	13367	15758	18010	20261	27014
Moment of Inertia (in <sup>4</sup> )	49	111	231	250	444	488	800	1195	1701	4032
Weight (lbs./lin.ft.)	4.9	6.5	8.3	8.5	10.3	10.7	12.6	14.4	16.2	21.6

1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.

#### 3000F<sub>b</sub> - 1.8E 1<sup>3</sup>/<sub>4</sub>" AND 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL AVAILABLE SIZES



#### 3000F<sub>b</sub>-1.8E WEST FRASER™ LVL SPECIFIED STRENGTHS (STANDARD TERM)

Modulus of Elasticity

$$E = 1.8 \times 10^6 \text{ psi}$$

1. F<sub>b</sub> based on 12" depths. For other depths, multiply by (12/d)<sup>^(1/7.35)</sup>.

Bending Stress

$$F_b = 5544 \text{ psi}$$

2. F<sub>c(perp)</sub> and E shall not be increased for duration of load.

Shear (joist)

$$F_v = 536 \text{ psi}$$

Compression Perpendicular to Grain (joist)

$$F_{c(perp)} = 1365 \text{ psi}$$

Compression Parallel to Grain

$$F_{c(para)} = 3750 \text{ psi}$$

# FACTORED RESISTANCE TABLES

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## GENERAL NOTES

- Tables are for one-ply 1¾" beams. When properly connected, double the values for two-ply beams, triple for three. Minimum bearing lengths shown for one-ply will be the same for two-ply and three-ply. See page 25 for multiple-ply connection details.
- Resistances shown are the maximum factored and/or unfactored resistances, in pounds per lineal foot, that can be applied to the beam in addition to its own weight.
- Tables are based on uniform loads and the most restrictive of simple or continuous spans and dry-use conditions. Refer to West Fraser's sizing software for other loads or span configurations.
- Lateral support of beam compression edges is required at intervals of 24" o/c or closer.
- Lateral support of beams is required at bearing locations.
- West Fraser™ LVL beams are made without camber; therefore, in addition to complying with the deflection limits of the applicable building code, other deflection considerations, such as long term deflection under sustained loads (including creep), must be evaluated.
- All 16" and deeper beams are to be used in multiple member units only.
- Unfactored total load resistance is limited to a deflection of L/240. Unfactored live load resistance is based on a deflection of L/360. Check local code requirements for other deflection criteria.
- For an unfactored live load deflection limit of L/480, multiply UNFACTORED LOAD L/360 resistance by 0.75.
- Roof must have positive slope in order to prevent ponding.
- Spans of multiple spans must be at least 40% of adjacent span.
- Bearing lengths are based on 1365 psi specified strength for 1.8E Grade materials which cannot be increased for duration of load. Bearing length may need to be increased if support member's allowable bearing stress is less.
- Tables will accommodate beam slopes to a maximum of 2:12.

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## INSTRUCTIONS FOR USE

1. Determine the factored total load and unfactored total and live load on the beam in pounds per lineal foot (plf).
2. Locate a span that meets or exceeds the required beam span, centre-to-centre of bearing.
3. Scan from left to right within the SPAN row until you find a cell where; (1) the UNFACTORED LOAD L/360 resistance meets or exceeds the unfactored live load, (2) the UNFACTORED LOAD L/240 resistance meets or exceeds the unfactored total load and (3) the FACTORED TOTAL LOAD resistance meets or exceeds the factored total load. All three rows must be checked and satisfied. Where no unfactored resistances are shown, factored total load will control.
4. To size a member for a span not shown, use capacities for the next larger span shown.

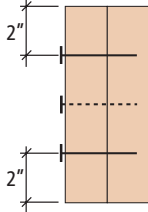
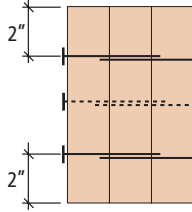
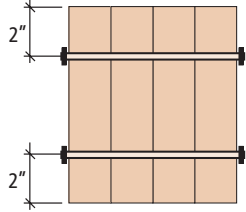




# MULTIPLE MEMBER CONNECTIONS FOR SIDE-LOADED BEAMS: $3000F_b - 1.8E$

Verify adequacy of beam in uniform load tables prior to using values listed below.

## $3000F_b - 1.8E$ $1\frac{3}{4}$ " WEST FRASER™ LVL

Maximum Factored Uniform Load (PLF) Applied to Either Outside Member					
Connector	Spacing	Rows	Nails On One Side or Through Bolts	Nails Both Sides or Through Bolts	Through Bolts Only
16d (3½") Common Wire Nails	12" o.c.	2 Rows	827	620	Not Applicable
		3 Rows	1241	930	
	6" o.c.	2 Rows	1654	1240	Not Applicable
		3 Rows	2482	1860	
	4" o.c.	2 Rows	2481	1860	Not Applicable
		3 Rows	3723	2790	
½" A307 Through Bolts	24" o.c.	2 Rows	671	503	448
	12" o.c.	2 Rows	1342	1006	895
	6" o.c.	2 Rows	2684	2012	1790

\* 4-ply beams should only be side-loaded when loads are applied to both sides of the member.

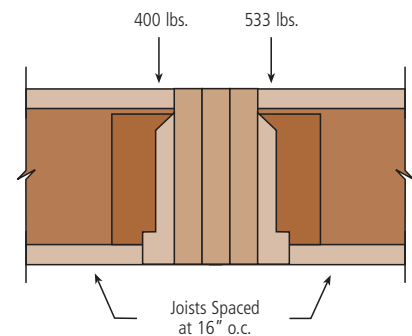
1. Nails to be located a minimum of 2" from the top and bottom of the member. Start all nails a minimum of 2½" in from ends.

2. Bolts are to be material conforming to ASTM Standard A307. Bolt holes are to be the same diameter as the bolt, and located 2" from the top and bottom of the member. Washers should be used under head and nut. Start all bolts a minimum of 2½" in from ends.

3. Values listed are for standard term loading.

### EXAMPLE (All loads shown are total factored)

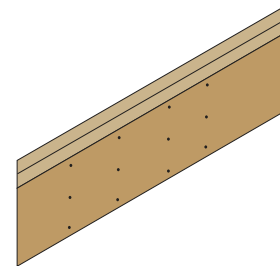
First, convert joist reactions to plf load on each side of the beam by taking the joist reaction (lbs.) divided by the joist spacing (ft.).  $400 \text{ lbs}/(16/12) = 300 \text{ plf}$  and  $533 \text{ lbs}/(16/12) = 400 \text{ plf}$ . Check factored resistance tables to verify that 3 plys can carry the total factored load of 700 plf. The maximum load applied to either outside member is 400 plf. Use 2 rows of 16d (3½") common wire nails at 12" o.c. (good for 620 plf).



### CONNECTION OF MULTIPLE PIECES FOR TOP-LOADED BEAMS

1.8E (1¾" wide pieces)

- Minimum of 2 rows of 16d (3½") nails at 12" o.c. for 5½" through 11⅞" beams
- Minimum of 3 rows of 16d (3½") nails at 12" o.c. for 14" through 24" beams



# COLUMNS: $3000F_b - 1.8E$

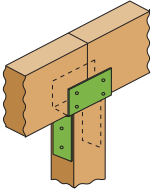
## ALLOWABLE FACTORED AXIAL LOADS (LBS)

Column Length (ft)	3½" x 3½"	3½" x 4¾"	3½" x 5½"	3½" x 7¼"	3½" x 8½"
3	29528	35645	42891	52930	59895
4	26678	32173	38688	47748	54072
5	23161	27939	33629	41606	47232
6	19503	23568	28442	35350	40283
7	16124	19541	23671	29592	33872
8	13219	16076	19558	24602	28289
9	10814	13200	16129	20413	23576
10	8856	10849	13312	16947	19653
12	5993	7390	9137	11753	13729
14	4132	5120	6367	8256	9701

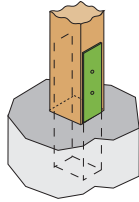
1. Loads are based on the allowable crushing of the LVL material, i.e., steel bearing connections.

## COLUMN DETAILS

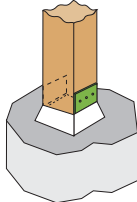
BEAM ON COLUMN CAP



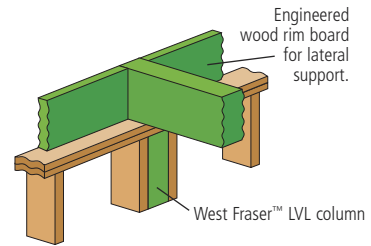
COLUMN BASE



ELEVATED COLUMN BASE



BEAM ON COLUMN



## ALLOWABLE FACTORED AXIAL LOADS (LBS) – WOOD PLATE BEARING CONNECTIONS

Column Length (ft)	3½" x 3½"	3½" x 4¾"	3½" x 5½"	3½" x 7¼"	3½" x 8½"
3 – 9	7526	9408	11827	15590	18547
10	7526	9408	11827	15590	18547
12	5993	7390	9137	11753	13729
14	4132	5120	6367	8256	9701

1. Loads are based on the allowable crushing of a wood plate (SPF, any grade),  $F_{CP} = 768$  psi.

## GENERAL NOTES

- Tables apply to solid, one-piece members only.
- Tables assumes that columns are unbraced, except at column ends.
- Column members to be used in dry service conditions only.
- Column length is the distance between the centers of restraining members.
- Tables include an eccentricity equal to 1/6 of the larger column dimension (thickness or width).
- Loads are based on simple axial loaded columns. For side loads or other combined bending and axial loads, see the provisions of CSA Standard 086-09.
- Factored resistances are based on standard term loading.



West Fraser™ LVL

2750F<sub>b</sub> – 1.7E LVL



# 2750F<sub>b</sub> – 1.7E 1<sup>3</sup>/<sub>4</sub>" and 3<sup>1</sup>/<sub>2</sub>" THICK

## HEADERS, BEAMS AND COLUMNS

### DESIGN PROPERTIES

#### 2750F<sub>b</sub>-1.7E 1<sup>3</sup>/<sub>4</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11 <sup>7</sup> / <sub>8</sub> "	14"	16"	18"	24"
Moment (ft.lbs.)	3667	6180	9791	10297	14772	15695	21419	27564	34432	59287
Shear (lbs.)	3095	4080	5206	5347	6472	6683	7879	9005	10130	13507
Moment of Inertia (in <sup>4</sup> )	24	56	115	125	222	244	400	597	851	2016
Weight (lbs./lin.ft.)	2.5	3.3	4.2	4.3	5.2	5.3	6.3	7.2	8.1	10.8

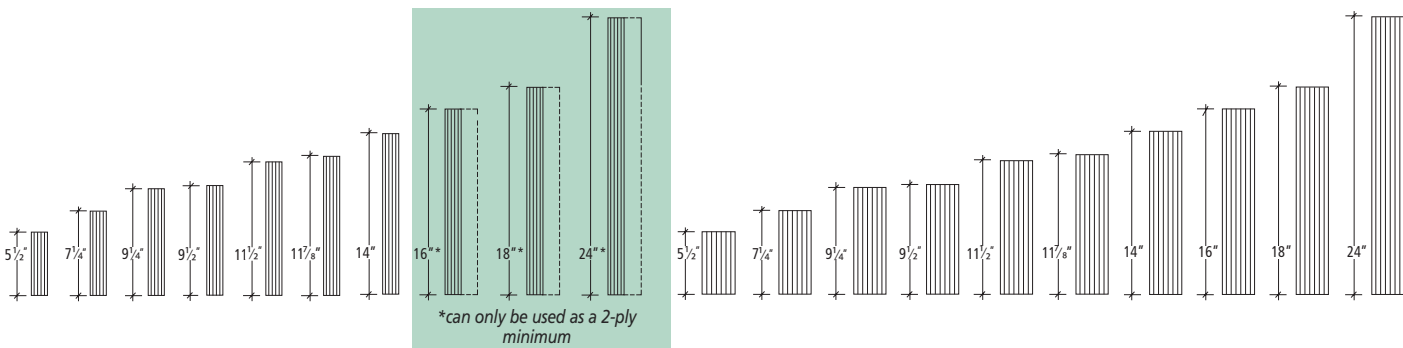
1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.
3. All 16" and greater beam depths are to be used in multiple member units only.

#### 2750F<sub>b</sub>-1.7E 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL FACTORED RESISTANCES (STANDARD TERM)

Design Property	Depth									
	5½"	7¼"	9¼"	9½"	11½"	11 <sup>7</sup> / <sub>8</sub> "	14"	16"	18"	24"
Moment (ft.lbs.)	7335	12360	19582	20594	29544	31390	42838	55128	68864	118573
Shear (lbs.)	6191	8161	10412	10693	12944	13367	15758	18010	20261	27014
Moment of Inertia (in <sup>4</sup> )	49	111	231	250	444	488	800	1195	1701	4032
Weight (lbs./lin.ft.)	4.9	6.5	8.3	8.5	10.3	10.7	12.6	14.4	16.2	21.6

1. Lateral support of beam compression edge is required at intervals of 24" o/c or closer.
2. Lateral support of beam is required at bearing locations.

#### 2750F<sub>b</sub> - 1.7E 1<sup>3</sup>/<sub>4</sub>" AND 3<sup>1</sup>/<sub>2</sub>" WEST FRASER™ LVL AVAILABLE SIZES



#### 2750F<sub>b</sub> - 1.7E WEST FRASER™ LVL SPECIFIED STRENGTHS (STANDARD TERM)

Modulus of Elasticity	E = 1.7 x 10 <sup>6</sup> psi	1. F <sub>b</sub> based on 12" depths. For other depths, multiply by (12/d) <sup>(1/9)</sup> .
Bending Stress	F <sub>b</sub> = 5082 psi	2. F <sub>c(perp)</sub> and E shall not be increased for duration of load.
Shear (joist)	F <sub>v</sub> = 536 psi	
Compression Perpendicular to Grain (joist)	F <sub>c(perp)</sub> = 1363 psi	
Compression Parallel to Grain	F <sub>c(para)</sub> = 3756 psi	



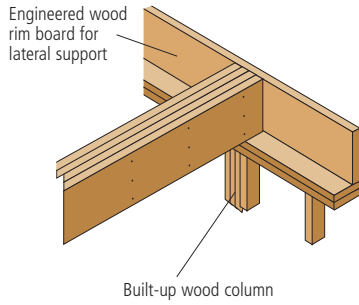
West Fraser™ LVL

## Miscellaneous Details, Software and Warranty Information

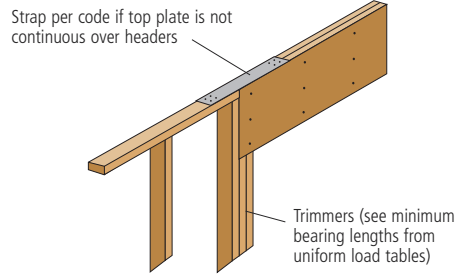


# BEARING DETAILS

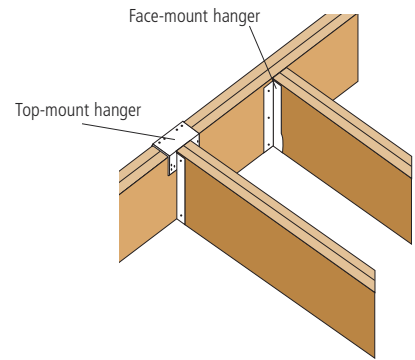
## B1 BEARING AT WALL



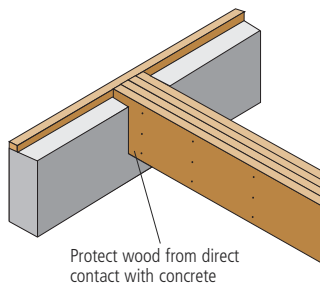
## B2 BEARING FOR DOOR OR WINDOW HEADER



## B3 BEAM-TO-BEAM CONNECTION

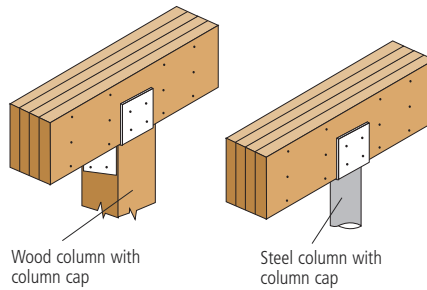


## B4 BEARING AT CONCRETE WALL



## B5 BEARING AT WOOD OR STEEL COLUMN

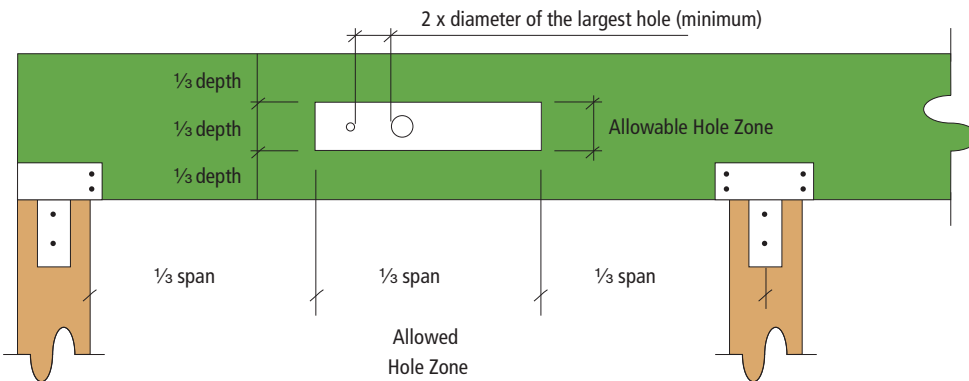
Verify column capacity and bearing length.



## BEARING LENGTH IS EXTREMELY CRITICAL AND MUST BE CONSIDERED FOR EACH APPLICATION.

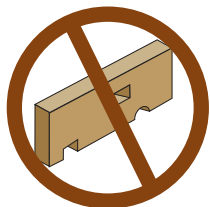
Multiple pieces of West Fraser™ LVL can be nailed or bolted together to form a header or beam of the required size, up to a maximum width of 5 inches for 1¼" wide pieces and 7 inches for 1¾" wide pieces. See pages 9, 15, 21 and 25 for details.

# ALLOWABLE HOLES



## GENERAL NOTES

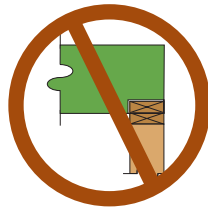
- The Allowed Hole Zone in this chart is suitable for **Uniformly loaded beams** using maximum loads for any tables listed. For other load conditions or hole configurations, please contact West Fraser.
- If more than one hole is to be cut in the beam, the length of the uncut beam between holes must be a minimum of twice the diameter of the largest hole.
- Rectangular holes are not allowed.
- Holes in cantilevers require additional analysis.
- For beam depths of 3½", 5½" and 7¼", the maximum hole diameter is ¾", 1⅞" and 1½" respectively. For deeper beams, the maximum hole diameter is 2". The maximum number of holes for each span is limited to 3.



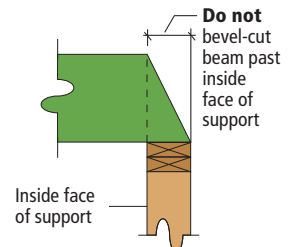
**Do not** cut, notch or drill holes in West Fraser™ LVL except as indicated in illustration for allowable holes



**Do not** overhang seat cuts on West Fraser™ LVL beams from inside face of support member



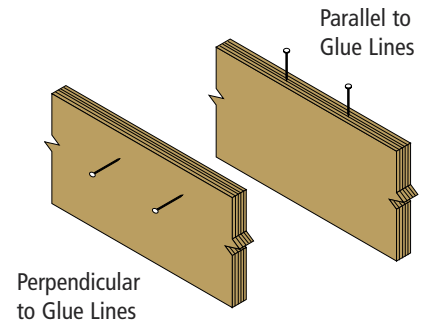
**Do not** notch underside of beam at bearing location



# MINIMUM NAIL SPACING

Connector	Nailing Parallel to Glue Line	Nailing Perpendicular to Glue Line
8d Box	3"	2"
8d Common	3"	2"
10d and 12d Box	4"	2"
10d and 12d Common	4"	3"
16d Common	8"*	3"

\* Not allowed on product thickness less than 1½"



# OUR WEATHER RESISTANT COATING

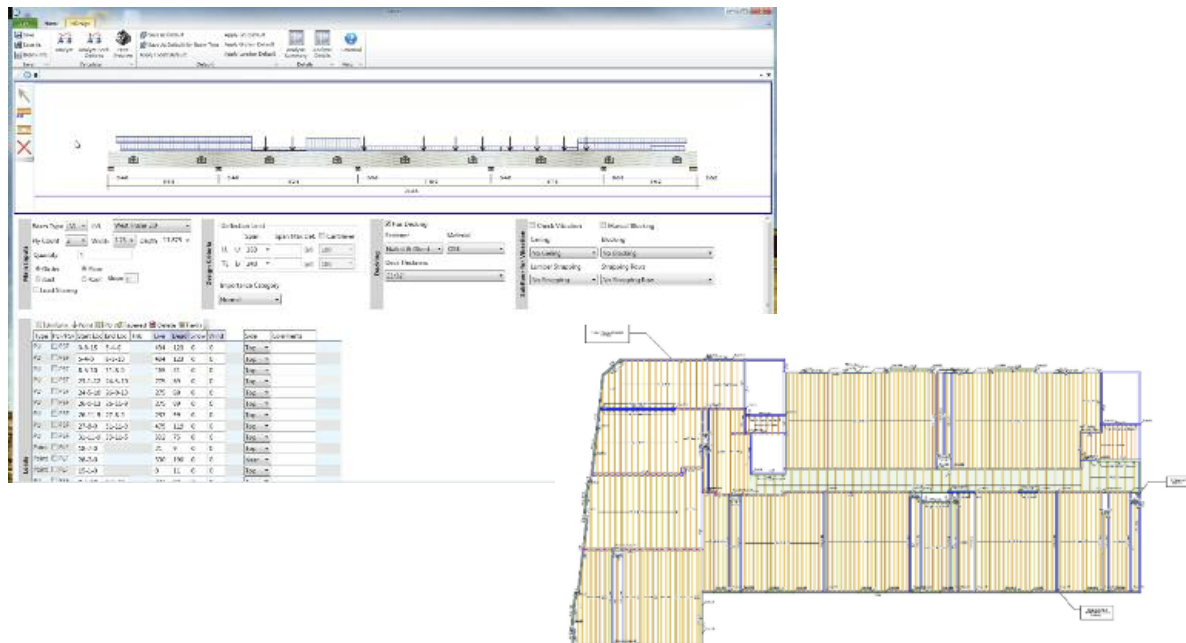


Photo shows example of the beading that occurs because of our coating process.

One of the inherent problems with LVL is its inability to resist the effects of moisture. West Fraser addresses this problem by coating all our LVL beams and headers with a protective sealer. This sealer gives our LVL superior resistance to warping, cupping, and swelling compared to other unprotected competitive products. While this coating is not intended to provide long-term protection, it does improve protection against the moisture associated with the construction process.

# OUR SOFTWARE

West Fraser provides its LVL customers with quality design software. Using the latest technology it's fast and reliable, providing you with an easy to understand output. Our software will enhance your in-house design capabilities and productivity.



## LIMITED LIFETIME WARRANTY

(\*to non-consumer buyers)

Sundre Forest Products Inc. warrants that its WEST FRASER™ LVL is free from defects in materials and workmanship, and, when correctly installed, will perform in accordance with Sundre Forest Products Inc.'s published specifications for the lifetime of the building.

West Fraser™ LVL used anywhere else except as shown in our published specifications is not covered in this warranty.

*\*A non-consumer is a person or entity who purchases a product for purposes of resale or to incorporate into another product which will be resold.*

### LIMITATIONS

Sundre Forest Products Inc. must be given a reasonable opportunity to inspect its WEST FRASER™ LVL before it will honor any claims under the above warranty.

If, after inspection, Sundre Forest Products Inc. determines that a product failure exists covered by the above warranty, Sundre Forest Products Inc. will pay to the owner of the structure an amount equal to the reasonable cost of labor and materials required to remove and replace or repair the defective product. The product must be protected from exposure to moisture from whatever source in accordance with provisions of the applicable building standards. Failure to protect the product from moisture, except for incidental exposure during construction, may cause the product to fail to perform as warranted and will void this limited lifetime warranty. Exposure to standing water and accumulations of snow and ice without reasonably prompt removal thereof will void this limited lifetime warranty.

### DISCLAIMER

Except for the express warranty and remedy set out above, Sundre Forest Products Inc. disclaims all other warranties and guaranties, express or implied, including implied warranties of merchantability or fitness for a particular purpose. No other warranty or guaranty will be made by or on behalf of the manufacturer or the seller or by operation of law with respect to the product or its installation, storage, handling, maintenance, use, replacement or repair. Neither Sundre Forest Products Inc. nor the seller shall be liable by virtue of any warranty or guaranty, or otherwise, for any special, incidental or consequential loss or damage resulting from the use of the product. Sundre Forest Products Inc. makes no warranty or guaranty with respect to installation of the product by the builder or the builder's contractor or any other installer.

For information on the above warranty, contact West Fraser LVL Sales Office at 250-991-5350.



(250) 991-5350

EMAIL: [LVL@WESTFRASER.COM](mailto:LVL@WESTFRASER.COM)

[WWW.WESTFRASER.COM/PRODUCTS/LVL-LAMINATED-VENEER-LUMBER](http://WWW.WESTFRASER.COM/PRODUCTS/LVL-LAMINATED-VENEER-LUMBER)

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