



## CIVIL CONSULTANTS

*Engineers*

*Planners*

*Surveyors*

*P.O. Box 100*

*293 Main Street*

*South Berwick*

*Maine*

*03908*

*207-384-2550*

September 19, 2017

Nate Poissant, President  
CasaPro Builders  
PO Box 425  
Biddeford, ME 04007

Re: Beam Sizing  
41 Stevens Avenue, Portland, ME

Mr. Poissant:

Per your request, an analysis has been performed to determine the support beam needed to allow the removal of an existing wall at the above referenced property, per the requirements of the 2009 International Residential Code.

All information used in this evaluation was obtained through the floor plan drawings prepared by Noteworthy Designs, provided by your office via e-mail on August 15<sup>th</sup>, 2017. No site visit was made by representatives from this office. Any assumed dimensions described below shall be verified prior to starting work, with any discrepancies resolved to the satisfaction of the engineer and homeowner.

It is proposed that a 12'-0" section existing wall of the one story portion of the house be removed and replaced with an engineered lumber beam to allow for an open concept kitchen/dining area. It is assumed that the supported area will be used as attic storage (20 psf) on existing ceiling joists. These joists are assumed to be adequate to tie the bearing ends of the roof rafters and maintain the stability of the structure as it exists. Capacities of the joists have not been evaluated as part of this evaluation as no change in loading or support is proposed. If the framing varies in any way from a simple roof rafter and ceiling joist system, beam sizing indicated in the following paragraphs shall be re-evaluated along with any new framing that may be required to support the proposed modifications.

It is assumed that all roof loading will be supported by the exterior walls and no loads will be directed to the beam in question.

In order to support the second floor live loads and associated dead loads, a header consisting of two 1 3/4"x9 1/2" Versa-Lam 2.0 3100 engineered lumber members is required. Each member of the built-up beam is assumed to be continuous. The header is to be installed below the existing ceiling joists so as to not require cutting into the existing framing. The manufacturer's requirements are to be followed with regard to connecting the separate beam plies. Simpson H2.5A ties are to be installed connecting the header to the joists at a maximum spacing of 24" on center.

Bearing members below the beam shall consist of SPF studs providing full bearing to the supporting basement framing. It is assumed that these studs will be blocked solid to the foundation below. No evaluation of the floor framing or foundation has been performed as part of this review. If required, posts and foundation elements shall be sized to safely support 3,000 lbs at both beam bearing locations.

Existing framing shall be adequately supported during construction with temporary bearing walls on either side of the proposed opening until the new header is installed and all connectors have been installed.

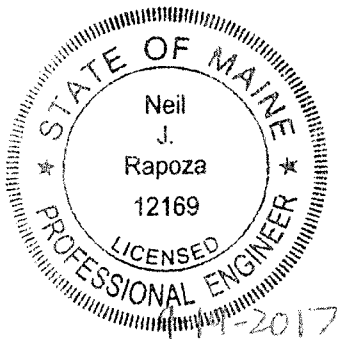
No other aspect of building framing beyond the header in question has been evaluated as a part of this review. No review with regard to Life Safety or building envelope items has been performed.

Please do not hesitate to call if you have questions.

Sincerely,  
CIVIL CONSULTANTS



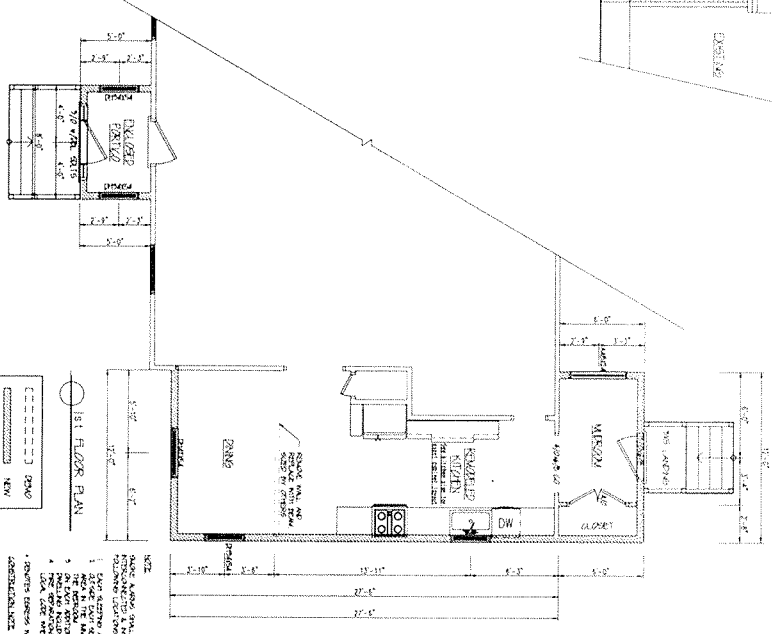
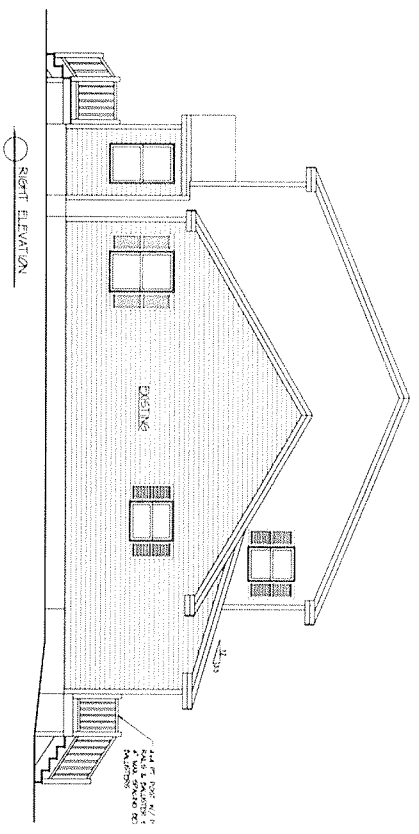
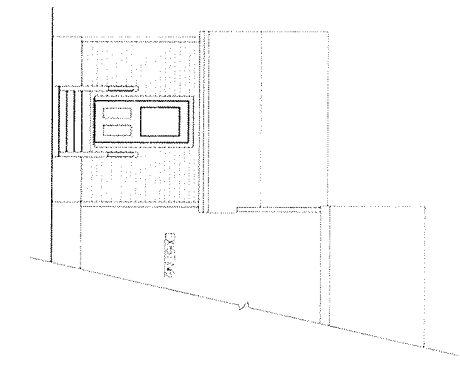
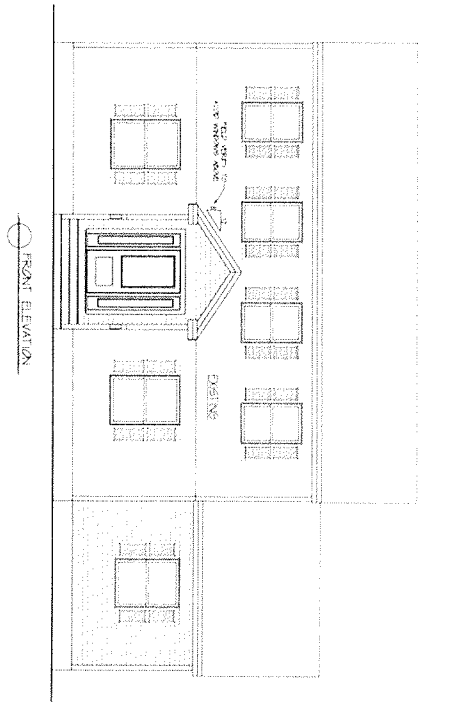
Neil J. Rapoza, P.E.  
Structural Engineer



Enclosed: Reference floor plans, beam in question is "BEAM SIZED BY OTHERS" indicated on sheet 2 of 2

cc: OUT, file

J:\aaa\2017\1725500\20170919-FramingLetter.docx



- NOTE: FINISH FLOOR SHALL BE INDICATED BY A DOTTED LINE IN THE ARCHITECTURAL DRAWINGS.
1. FINISH FLOOR SHALL BE INDICATED BY A DOTTED LINE IN THE ARCHITECTURAL DRAWINGS.
  2. FINISH FLOOR SHALL BE INDICATED BY A DOTTED LINE IN THE ARCHITECTURAL DRAWINGS.
  3. FINISH FLOOR SHALL BE INDICATED BY A DOTTED LINE IN THE ARCHITECTURAL DRAWINGS.
  4. FINISH FLOOR SHALL BE INDICATED BY A DOTTED LINE IN THE ARCHITECTURAL DRAWINGS.
- CONTRACTOR TO VERIFY GRADE AND ALL DIMENSIONS BEFORE BEGINNING WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FOR CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FOR CONSTRUCTION.

Stair/railing details:  
 2x12 PT STRIPPERS @ 12" O/C  
 2x10 PT RAILINGS @ 16" O/C  
 supported by 4x4 PT posts on 6" sand blocks, anchored w/ 5/8" post brackets

RISER STAIRS = 7"  
 TREAD STAIRS = 11"  
 PT POSTS (RAIL) DIA 1.5" . 1" MAX SPACING

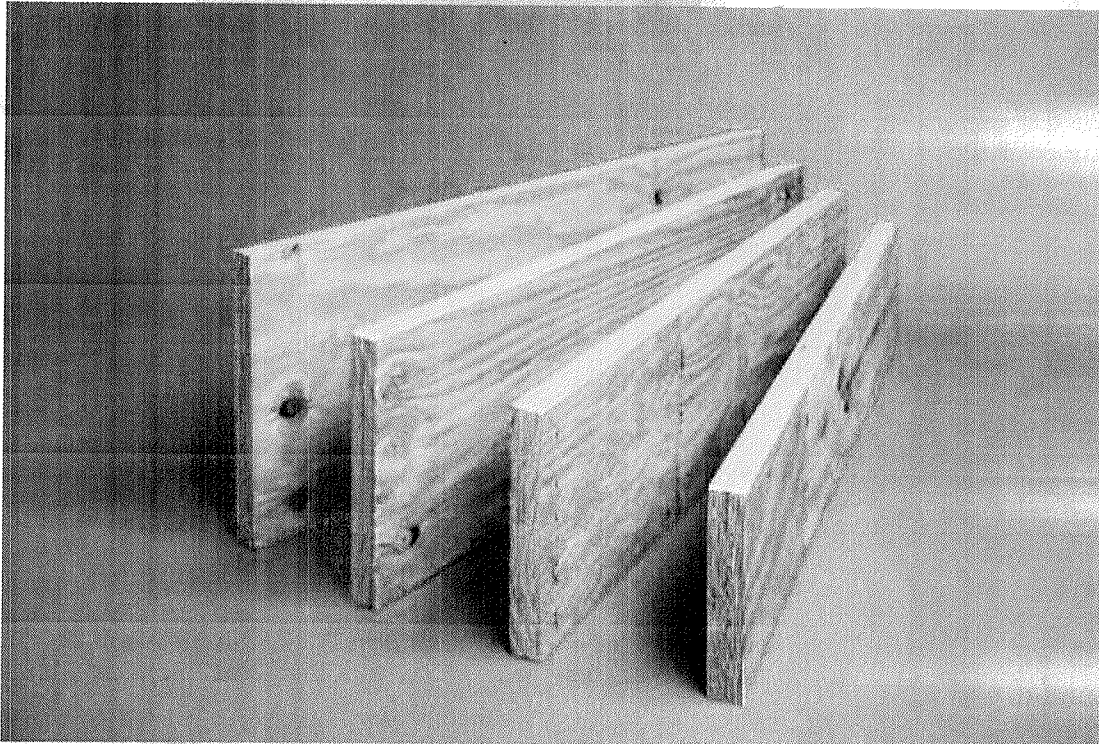
<p>DATE: 6/19/17          SCALE: 1/4" = 1'-0"          DRAWN BY: TJS          PROJECT: 201817          SHEET NUMBER: 1-0-2</p>		<p>CUSTOMERS SHOULD APPRECIATE THAT THIS INFORMATION IS NOT THE PRODUCT OF AN ARCHITECT. NEITHER NOTEWORTHY DESIGN'S NOR ANY OF ITS EMPLOYEES ARE REGISTERED ARCHITECTS AND CUSTOMERS MAY WANT TO CONSULT WITH AN ARCHITECT BEFORE TAKING FINAL ACTION WITH REGARD TO ANY BUILDING OR STRUCTURE. CUSTOMERS SHOULD ALSO APPRECIATE THAT, BY PROVIDING CUSTOMERS WITH THIS INFORMATION, NOTEWORTHY DESIGN'S DOES NOT GUARANTEE THE SOUNDNESS OR SUITABILITY OF THE INFORMATION FOR ANY PURPOSE OF THE CUSTOMER.</p>	<p>FINAL PLAN - BERRY PROJECT          PORTLAND, ME          Casa Pro Builders</p>	
--	--	---	--	--





**Boise Cascade**  
*Engineered Wood Products*

# 1 1/2" VERSA-LAM® 2.0 3100



**for beams and headers**

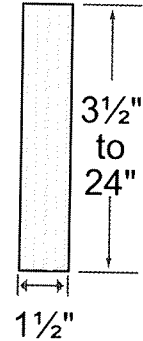
# VERSA-LAM® Products

## An Introduction to VERSA-LAM® Products

When you specify VERSA-LAM® laminated veneer headers/beams, you are building quality into your design. They are excellent as floor and roof framing supports or as headers for doors, windows and garage doors and columns.

Because they have no camber, VERSA-LAM® LVL products provide flatter, quieter floors, and consequently, the builder can expect happier customers with significantly fewer call backs.

### VERSA-LAM® 2.0 3100



## 1 1/2" VERSA-LAM® 2.0 3100 Design Values

Design Property		2.0 3100
Grade		2.0 3100
Modulus of Elasticity	$E (x 10^6 \text{ psi})^{(1)}$	2.0
Bending	$F_b \text{ (psi)}^{(2)(3)}$	3100
Horizontal Shear	$F_v \text{ (psi)}^{(2)(4)}$	285
Tension Parallel to Grain	$F_t \text{ (psi)}^{(2)(5)}$	2150
Compression Parallel to Grain	$F_{c  } \text{ (psi)}^{(2)}$	3000
Compression Perpendicular to Grain	$F_{c\perp} \text{ (psi)}^{(1)(6)}$	750
Equivalent Specific Gravity for Fastener Design	(SG)	0.5

Width [in]	Depth [in]	Weight [lb/ft]	Allowable Shear [lb]	Allowable Moment [ft-lb]	Moment of Inertia [in <sup>4</sup> ]
1 1/2"	3 1/2	1.4	998	907	5.4
	5 1/2	2.2	1568	2131	20.8
	7 1/4	2.9	2066	3590	47.6
	9 1/4	3.8	2636	5688	98.9
	9 1/2	3.9	2708	5982	107.2
	11 1/4	4.6	3206	8233	178.0
	11 1/2	4.8	3384	9118	209.3
	14	5.7	3990	12443	343.0
	16	6.5	4560	16013	512.0
	18	7.3	5130	20003	729.0
	20	8.1	5700	24408	1000.0
	24	9.8	6840	34443	1728.0

- This value cannot be adjusted for load duration.
  - This value is based upon a load duration of 100% and may be adjusted for other load durations.
  - Fiber stress bending value shall be multiplied by the depth factor,  $(12/d)^{1/9}$  where  $d$  = member depth [in].
  - Stress applied perpendicular to the gluelines.
  - Tension value shall be multiplied by a length factor,  $(4/L)^{1/8}$  where  $L$  = member length [ft]. Use  $L = 4$  for members less than four feet long.
  - Stress applied parallel to the gluelines.
- \* Design properties are limited to dry conditions of use where the maximum moisture content of the material will not exceed 16%.

## VERSA-LAM® Beam Details

<p><b>Bearing at concrete/masonry walls</b></p> <p>Provide moisture barrier at support and lateral restraint.</p> <p>1/2" air space required between concrete and wood.</p> <p><b>B01</b></p>	<p><b>Bearing for door or window header</b></p> <p>Strap per code if top plate is not continuous over header.</p> <p>Trimmers</p> <p><b>B02</b></p>	<p><b>Beam to beam connector</b></p> <p>Verify hanger capacity with hanger literature</p> <p><b>B03</b></p>	<p><b>Bearing at column</b></p> <p>VERSA-LAM® column</p> <p>Note: Drilling permitted for standard connectors.</p> <p><b>B04</b></p>
<p><b>Slope seat cut</b></p> <p>Sloped seat cut. Not to exceed inside face of bearing.</p> <p>Provide adequate lateral support</p> <p><b>B06</b></p>	<p><b>Bevel cut</b></p> <p>DO NOT bevel cut VERSA-LAM® beyond inside face of wall without approval from Boise Cascade EWP Engineering or BC CALC® software analysis.</p> <p><b>B07</b></p>	<p><b>Beam to concrete/masonry walls</b></p> <p>Wood top plate must be flush with inside of wall</p> <p>Hanger</p> <p>Moisture barrier between concrete and wood</p> <p><b>B08</b></p>	<p><b>Bearing framing into wall</b></p> <p>Strap per code if top plate is not continuous</p> <p><b>B09</b></p>

### VERSA-LAM® Installation Notes

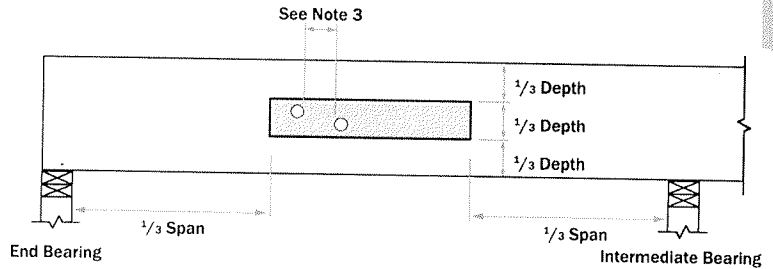
- Minimum of 1/2" air space between beam and wall pocket or adequate barrier must be provided between beam and concrete/masonry wall.
- Adequate bearing shall be provided. If not shown on plans, please refer to load tables in your region's Specifier Guide.
- VERSA-LAM® beams are intended for interior applications only and should be kept as dry as possible during construction.
- Continuous lateral support of top of beam shall be provided (side or top bearing framing).

# Allowable Holes in VERSA-LAM® Beams

## Notes

1. Square and rectangular holes are not permitted.
2. Round holes may be drilled or cut with a hole saw anywhere within the shaded area of the beam.
3. The horizontal distance between adjacent holes must be at least two times the size of the larger hole.
4. Do not drill more than three access holes in any four foot long section of beam.
5. The maximum round hole diameter permitted is:

Beam Depth	Max. Hole Diameter
5½"	¾"
7¼"	1"
9¼" and greater	2"



6. These limitations apply to holes drilled for plumbing or wiring access only. The size and location of holes drilled for fasteners are governed by the provisions of the National Design Specification® for Wood Construction.
7. Beams deflect under load. Size holes to provide clearance where required.
8. This hole chart is valid for beams supporting uniform load only. For beams supporting concentrated loads or for beams with larger holes, contact Boise Cascade EWP Engineering.

## Multiple Member Connectors

Side-Loaded Applications								
Number of Members	Maximum Uniform Side Load [plf]							
	Nailed		½" Dia. Through Bolt <sup>(1)</sup>			¾" Dia. Through Bolt <sup>(1)</sup>		
	2 rows 16d Sinkers @ 12" o.c.	3 rows 16d Sinkers @ 12" o.c.	2 rows @ 24" o.c. staggered	2 rows @ 12" o.c. staggered	2 rows @ 6" o.c. staggered	2 rows @ 24" o.c. staggered	2 rows @ 12" o.c. staggered	2 rows @ 6" o.c. staggered
1½" VERSA-LAM® (Depths of 18" and less)								
2	470	705	435	870	1735	480	965	1930
3 <sup>(2)</sup>	350	525	325	650	1300	360	725	1450
4 <sup>(3)</sup>	use bolt schedule		290	580	1155	320	640	1285
1½" VERSA-LAM® (Depths of 24")								
	Nailed		½" Dia. Through Bolt <sup>(1)</sup>			¾" Dia. Through Bolt <sup>(1)</sup>		
	3 rows 16d Sinkers @ 12" o.c.	4 rows 16d Sinkers @ 12" o.c.	3 rows @ 24" o.c. staggered	3 rows @ 18" o.c. staggered	3 rows @ 12" o.c. staggered	3 rows @ 24" o.c. staggered	3 rows @ 18" o.c. staggered	3 rows @ 12" o.c. staggered
	2	3	4	4	4	6	6	4
2	705	940	650	870	1300	725	965	1450
3	525	705	485	650	975	540	725	1085
4 <sup>(3)</sup>	use bolt schedule		430	575	865	480	640	965

1. Design values apply to common bolts that conform to ANSI/ASME standard B18.21-1981 (ASTM A307 Grades A&B, SAE J429 Grades 1 or 2, or higher). A washer not less than a standard cut washer shall be between the wood and the bolt head and between the wood and the nut. The distance from the edge of the beam to the bolt holes must be at least 2" for ½" bolts and 2½" for ¾" bolts. Bolt holes shall be the same diameter as the bolt.
2. The nail schedules shown apply to both sides of a three member beam.
3. 6" wide beams must be top-loaded or loaded from both sides.

## Top-Loaded Applications

For top-loaded beams and beams with side loads with less than those shown:

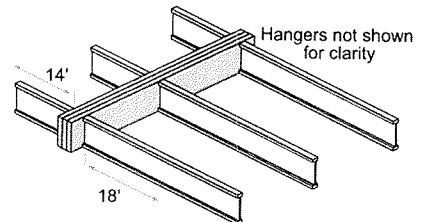
Ply	Depth	Nailing	Maximum Uniform Load From One Side
(2) 1½" plies	Depth 11½" & less	2 rows 16d box/sinker nails @ 12" o.c.	410 plf
	Depth 14" - 18"	3 rows 16d box/sinker nails @ 12" o.c.	615 plf
	Depth = 24"	4 rows 16d box/sinker nails @ 12" o.c.	825 plf
(3) 1½" plies <sup>(2)</sup>	Depth 11½" & less	2 rows 16d box/sinker nails @ 12" o.c.	305 plf
	Depth 14" - 18"	3 rows 16d box/sinker nails @ 12" o.c.	460 plf
	Depth = 24"	4 rows 16d box/sinker nails @ 12" o.c.	615 plf
(4) 1½" plies	Depth 18" & less	2 rows ½" bolts @ 24" o.c., staggered	290 plf
	Depth = 24"	3 rows ½" bolts @ 24" o.c., staggered every 8"	435 plf

1. Beams wider than 6" must be designed by the engineer of record.
2. All values in these tables may be increased by 15% for snow-load roofs and by 25% for non-snow load roofs where the building code allows.
3. Use allowable load tables or BC CALC® software to size beams.
4. An equivalent specific gravity of 0.5 may be used when designing specific connections with VERSA-LAM®.
5. Connection values are based upon the 2012 NDS.
6. **FastenMaster TrussLok, Simpson Strong-Tie SDW, and USP WS screws may also be used to connect multiple member VERSA-LAM® beams, contact Boise Cascade EWP Engineering for further information.**

## Designing Connections for Multiple VERSA-LAM® Members

When using multiple ply VERSA-LAM® beams to create a wider member, the connection of the plies is as critical as determining the beam size. When side loaded beams are not connected properly, the inside plies do not support their share of the load and thus the load-carrying capacity of the full member decreases significantly. The following is an example of how to size and connect a multiple ply VERSA-LAM® floor beam.

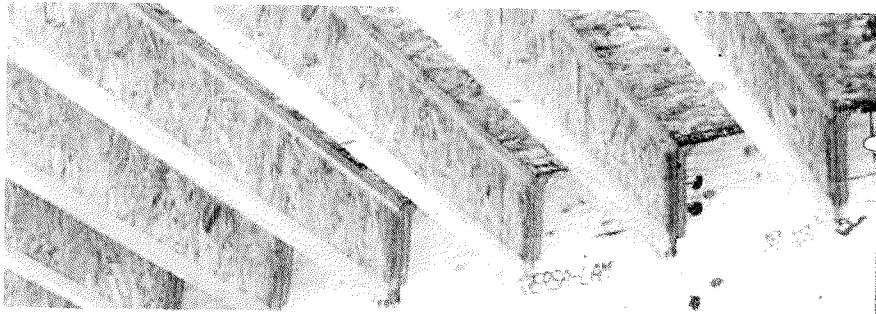
Given: Beam shown below is supporting residential floor load (40 psf live load, 10 psf dead load) and is spanning 16'-0" Beam depth is limited to 14".



Find: A multiple 1½" ply VERSA-LAM® that is adequate to support the design loads and the member's proper connection schedule.

1. Calculate the tributary width that beam is supporting:  
 $14' / 2 + 18' / 2 = 16'$
2. Use BC CALC® to size beam.  
A Triple VERSA-LAM® 2.0 3100 1½" x 14" is found to adequately support the design loads.
3. Calculate the maximum plf load from one side (the right side in this case).  
Max. Side Load =  $(18' / 2) \times (40 + 10 \text{ psf}) = 450 \text{ plf}$
4. Go to the Side-Loaded Applications Table, 3 members
5. The proper connection schedule must have a capacity greater than the max. side load:

Nailed: 3 rows 16d sinkers @ 12" o.c. (both sides):  
525 plf is greater than 450 plf OK  
Bolts: ½" diameter 2 rows @ 12" staggered:  
650 plf is greater than 450 plf OK



If in doubt, ask!  
For the closest  
Boise Cascade EWP  
distributor/support center,  
call

★1-800-232-0788★



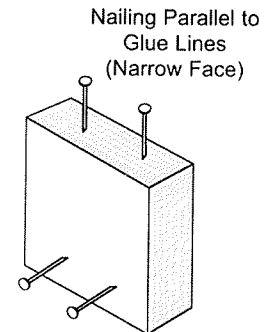
### Lifetime Guaranteed Quality and Performance

Boise Cascade warrants its BCI<sup>®</sup> Joist, VERSA-LAM<sup>®</sup>, and ALLJOIST<sup>®</sup> products to comply with our specifications, to be free from defects in material and workmanship, and to meet or exceed our performance specifications for the normal and expected life of the structure when correctly stored, installed and used according to our Installation Guide.



### Closest Allowable Nail Spacing

Nail Size	1½" VERSA-LAM <sup>®</sup> 2.0 3100			
	Nailing Parallel to Glue Lines (Narrow Face)		Nailing Perpendicular to Glue Lines (Wide Face)	
	O.C. [inches]	End [inches]	O.C. [inches]	End [inches]
8d Box	3	1½	2	½
8d Common	3	2	2	1
10d & 12d Box	3	2	2	1
16d Box	3	2	2	1
10d & 12d Common	4	3	2	2
16d Sinker	4	3	2	2
16d Common	6	4	2	2



Nailing Perpendicular to Glue Lines (Wide Face)

Simpson Strong-Tie A35 and LPT4 connectors may be attached to the side VERSA-LAM<sup>®</sup>. Use nails as specified by Simpson Strong-Tie.

BOISE CASCADE, TREE-IN-A-CIRCLE, BCI, BC CALC, BC COLUMN, BC FRAMER, BC RIM BOARD, BOISE GLULAM, SIMPLE FRAMING SYSTEM, VERSA-LAM, VERSA-RIM, VERSA-STRAND, and VERSA-STUD are trademarks of Boise Cascade, L.L.C. or its affiliates.

Your Dealer is:

If no dealer is listed, call 1-800-232-0788

For information about  
Boise Cascade Engineered Wood Products,  
including sales terms and conditions,  
warranties and disclaimers,  
visit our website at [www.BCewp.com](http://www.BCewp.com)



**Boise Cascade**  
Engineered Wood Products

*Great products are only the beginning.*