

Substitution of Glulam Beams for Steel or Solid-Sawn Lumber



WOOD

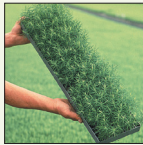
The Natural Choice



Engineered wood products are a good choice for the environment. They are manufactured for years of trouble-free, dependable use. They help reduce waste by decreasing disposal costs and product damage. Wood is a renewable resource that is easily manufactured into a variety of viable products.

A few facts about wood.

■ *We're growing more wood every day.* Forests fully cover one-third of the United States' and one-half of Canada's land mass. American landowners plant more than two billion trees every year. In addition, millions of trees seed naturally. The forest products industry, which comprises about 15 percent of forestland ownership, is responsible for 41 percent of replanted forest acreage. That works out to more than one billion trees a year, or about three million trees planted every day. This high rate of replanting accounts for the fact that each year, 27 percent more timber is grown than is harvested. Canada's replanting record shows a fourfold increase in the number of trees planted between 1975 and 1990.



■ *Life Cycle Assessment shows wood is the greenest building product.*

A 2004 Consortium for Research on Renewable Industrial Materials (CORRIM) study gave scientific validation to the strength of wood as a green building product. In examining building products' life cycles – from extraction of the raw material to demolition of the building at the end of its long lifespan – CORRIM found that wood was better for the environment than steel or concrete in terms of embodied energy, global warming potential, air emissions, water emissions and solid waste production. For the complete details of the report, visit www.CORRIM.org.

■ *Manufacturing wood is energy efficient.*

Wood products made up 47 percent of all industrial raw materials manufactured in the United States, yet consumed only 4 percent of the energy needed to manufacture all industrial raw materials, according to a 1987 study.

Material	Percent of Production	Percent of Energy Use
Wood	47	4
Steel	23	48
Aluminum	2	8



■ *Good news for a healthy planet.* For every ton of wood grown, a young forest produces 1.07 tons of oxygen and absorbs 1.47 tons of carbon dioxide.

Wood: It's the natural choice for the environment, for design and for strong, lasting construction.

SUBSTITUTION OF GLULAM BEAMS FOR STEEL OR SOLID-SAWN LUMBER

Introduction

Glued laminated timber (glulam) beams of equal or greater strength and stiffness can often be substituted for sawn lumber or steel beams. This APA publication provides tables for equivalent glulam beams.

APA – The Engineered Wood Association offers a comprehensive set of services and tools for design and construction professionals who specify and use engineered wood products and building systems. APA glulam member manufacturers certify their products with the trademark APA EWS. This mark of quality is supported by comprehensive services for quality validation, product research, testing and marketing. The mark appears only on products manufactured by APA members and signifies that beams are produced to the requirements of American National Standards Institute (ANSI) Standard A190.1. This is the national consensus standard sponsored by APA and recognized by all model code agencies for the manufacture and trademarking of glulam.

How to Use This Publication

Use the Substitution Table Index below to find the correct table for a specific application. The examples on page 4 show how to use the tables to select a glulam beam that can be substituted for a solid-sawn lumber or steel beam.

For More Information

For additional information on APA engineered wood products, contact APA's Product Support Help Desk at (253) 620-7400 or visit our web site, www.apawood.org.

SUBSTITUTION TABLE INDEX

Substituted Beam		Equivalent 24F-1.8E Glulam Beam		
		Roof – Non-Snow Loads (LDF ^(a) = 1.25)	Roof – Snow Loads (LDF ^(a) = 1.15)	Floor (LDF ^(a) = 1.00)
Sawn Lumber	3x _ Douglas-fir	Table 1	Table 2	Table 3
	4x _ Douglas-fir	Table 4	Table 5	Table 6
	6x _ Douglas-fir	Table 7	Table 8	Table 9
	3x _ Southern pine	Table 10	Table 11	Table 12
	4x _ Southern pine	Table 13	Table 14	Table 15
	6x _ Southern pine	Table 16	Table 17	Table 18
Steel	W shape	Table 19	Table 20	Table 21

(a) LDF = Load duration factor.

Special Considerations

In addition to the notes given under each table, users should be aware of the following considerations that were used in the development of the tabulated information:

- The tables are intended for preliminary design only. Substitutions should be checked by a design professional.
- Design stresses for sawn lumber are based on the Supplement to the 2012 National Design Specification for Wood Construction (NDS) published by the American Wood Council.
- The equivalent glulam member shown can support the same or greater applied loads than the beam being replaced. The tables assume that the original solid sawn or steel beams were designed correctly and are not intended to evaluate the appropriateness of the design for the original beams.
- Uniform load capacity used in the development of the tables is the minimum capacity due to bending, shear or deflection considerations, whichever governs. Weights of the original beam and the substitute glulam were deducted from the uniform load capacities before determining the size of the substitute glulam. Tolerances on equivalence, which may be judged satisfactory by practicing design professionals, were not considered when comparing the beam capacities. This will sometimes result in a conservative glulam beam size.
- Since the glulam size shown is based on equivalent or higher capacity than the substituted member, a seemingly inconsistent glulam size may result from the varying controlling capacities as the span changes.
- Repetitive member factor is assumed to be 1.0 for sawn lumber and glulam members.

EXAMPLES

The following examples show how to use the tables to select a glulam beam to be substituted for a solid-sawn lumber or steel beam.

Example 1

Question: A design calls for a 4 x 14 Douglas-fir Select Structural sawn lumber beam spanning 16 feet (simple span) to support floor loads. What are the equivalent sizes using Douglas-fir glulam?

Solution: From Table 6, either 2-1/2- x 13-1/2-inch or 3-1/8- x 13-1/2-inch 24F-1.8E Douglas-fir glulam can be used with the final selection depending on availability, cost, and other considerations.

Example 2

Question: A design calls for a W8 x 10 steel beam spanning 16 feet (simple span) to support roof snow loads. What are the equivalent sizes using Southern pine glulam?

Solution: From Table 20A, either 3- x 12-3/8-inch, 5- x 11-inch, or 6-3/4- x 9-5/8-inch 24F-1.8E Southern pine glulam can be used with the final selection depending on availability, cost, and other considerations.

SAMPLE SUBSTITUTION TABLE

Span (ft)	Uniform Load Capacity (lb/ft) ^(a)								
	Original Beam: 4 x 10 SS Douglas-fir Lumber				Substitute Beam: 24F-1.8E Douglas-fir Glulam				
	Bending	Shear	Defl.	Control	Glulam Size	Bending	Shear	Defl.	Control
12	408	640	462	408 (bending)	2-1/2 x 10-1/2	504	898	459	459 (defl.)
14	298	547	288	288 (defl.)	2-1/2 x 12	483	876	430	430 (defl.)
16	226	478	190	190 (defl.)	2-1/2 x 10-1/2	281	644	190	190 (defl.)
18	177	424	131	131 (defl.)	2-1/2 x 10-1/2	220	564	131	131 (defl.)

(a) Beam weight is assumed to be 35 pcf for both sawn lumber and glulam. Beam weight is not included in above number. Load duration factor = 1.0. Uniformly loaded, simply supported beam.

TABLE 1

24F-1.8E GLULAM EQUIVALENTS FOR 3x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	3 x 8 Douglas-fir		3 x 10 Douglas-fir		3 x 12 Douglas-fir		3 x 14 Douglas-fir	
		No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
		Glulam Equivalent (in.)							
10	Douglas-fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 2 sawn lumber members: $F_b = C_F \times 900$ psi; $F_v = 180$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 2

24F-1.8E GLULAM EQUIVALENTS FOR 3x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	3 x 8 Douglas-fir		3 x 10 Douglas-fir		3 x 12 Douglas-fir		3 x 14 Douglas-fir	
		No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
		Glulam Equivalent (in.)							
10	Douglas-fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 2 sawn lumber members: $F_b = C_F \times 900$ psi; $F_v = 180$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 3

24F-1.8E GLULAM EQUIVALENTS FOR 3x DOUGLAS-FIR-LARCH LUMBER FLOOR BEAMS**Load Duration Factor = 1.00**

Span (ft)	Glulam Species	3 x 8 Douglas-fir		3 x 10 Douglas-fir		3 x 12 Douglas-fir		3 x 14 Douglas-fir	
		No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
		Glulam Equivalent (in.)							
10	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 11
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 11
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 11	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 2 sawn lumber members: $F_b = C_F \times 900$ psi; $F_v = 180$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 4

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	4 x 6 Douglas-fir		4 x 8 Douglas-fir		4 x 10 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 4 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	4 x 12 Douglas-fir		4 x 14 Douglas-fir		4 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
12	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
14	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
16	Douglas-fir	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8
18	Douglas-fir	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8
20	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 13-3/4 3 x 12-3/8
22	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 15-1/8 3 x 15-1/8	2-1/2 x 13-3/4 3 x 12-3/8
24	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 16-1/2 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 16-1/2 3 x 15-1/8	2-1/2 x 13-3/4 3 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 5

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	4 x 6 Douglas-fir		4 x 8 Douglas-fir		4 x 10 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > $3/4$.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 5 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	4 x 12 Douglas-fir		4 x 14 Douglas-fir		4 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
12	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
14	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
16	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
18	Douglas-fir	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8
20	Douglas-fir	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8
22	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 13-3/4 3 x 12-3/8
24	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 15-1/8 3 x 15-1/8	2-1/2 x 13-3/4 3 x 12-3/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 6

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER FLOOR BEAMS**Load Duration Factor = 1.00**

Span (ft)	Glulam Species	4 x 6 Douglas-fir		4 x 8 Douglas-fir		4 x 10 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine), $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 6 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 4x DOUGLAS-FIR-LARCH LUMBER FLOOR BEAMS**Load Duration Factor = 1.00**

Span (ft)	Glulam Species	4 x 12 Douglas-fir		4 x 14 Douglas-fir		4 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
12	Douglas-fir	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11
14	Douglas-fir	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8
16	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 13-1/2	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 12
	Southern Pine	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 13-3/4 3 x 12-3/8
18	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 16-1/2 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 16-1/2 3 x 15-1/8	2-1/2 x 13-3/4 3 x 13-3/4
20	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 13-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 16-1/2 3-1/8 x 15	2-1/2 x 15 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 15-1/8 3 x 13-3/4	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 16-1/2 3 x 15-1/8	2-1/2 x 13-3/4 3 x 13-3/4
22	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 12	2-1/2 x 15 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 16-1/2 3-1/8 x 16-1/2	2-1/2 x 15 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 15-1/8 3 x 15-1/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 16-1/2 3 x 16-1/2	2-1/2 x 15-1/8 3 x 13-3/4
24	Douglas-fir	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 16-1/2 3-1/8 x 15	2-1/2 x 13-1/2 3-1/8 x 13-1/2	2-1/2 x 18 3-1/8 x 16-1/2	2-1/2 x 15 3-1/8 x 13-1/2
	Southern Pine	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 15-1/8 3 x 15-1/8	2-1/2 x 13-3/4 3 x 13-3/4	2-1/2 x 17-7/8 3 x 16-1/2	2-1/2 x 15-1/8 3 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 180$ psi; $E = 1.9 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1000$ psi; $F_v = 180$ psi; $E = 1.7 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine), $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 7

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	6 x 8 Douglas-fir		6 x 10 Douglas-fir		6 x 12 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 7-1/2 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 7-1/2	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 9-5/8	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 8-1/4	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 9-5/8
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 11
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 11
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 11
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 3-1/8 x 6 and 5-1/8 x 6 (Douglas-fir), and 3 x 5-1/2 and 5 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE CONTINUED ON NEXT PAGE

TABLE 7 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	6 x 14 Douglas-fir		6 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
18	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
20	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
22	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4
24	Douglas-fir	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load $> 3/4$.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 3-1/8 x 6 and 5-1/8 x 6 (Douglas-fir), and 3 x 5-1/2 and 5 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 8

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	6 x 8 Douglas-fir		6 x 10 Douglas-fir		6 x 12 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 7-1/2 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 7-1/2	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 9-5/8	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 9-5/8
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 9-5/8
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 11
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 11
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 8 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	6 x 14 Douglas-fir		6 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
18	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
20	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
22	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
24	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 9

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER FLOOR BEAMS**Load Duration Factor = 1.00**

Span (ft)	Glulam Species	6 x 8 Douglas-fir		6 x 10 Douglas-fir		6 x 12 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 9-5/8	3 x 9-5/8 5 x 8-1/4	3 x 13-3/4 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 11
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 10-1/2	3-1/8 x 10-1/2 5-1/8 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 9 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 6x DOUGLAS-FIR-LARCH LUMBER FLOOR BEAMS**Load Duration Factor = 1.00**

Span (ft)	Glulam Species	6 x 14 Douglas-fir		6 x 16 Douglas-fir	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 17-7/8 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4
18	Douglas-fir	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 17-7/8 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4
20	Douglas-fir	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 15
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 16-1/2 5 x 15-1/8
22	Douglas-fir	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 18 5-1/8 x 15
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 17-7/8 5 x 15-1/8
24	Douglas-fir	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 18 5-1/8 x 15
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 17-7/8 5 x 15-1/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1600$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 170$ psi; $E = 1.6 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 10

24F-1.8E GLULAM EQUIVALENTS FOR 3x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
ROOF BEAMS - NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam species	3 x 8 Southern Pine		3 x 10 Southern Pine		3 x 12 Southern Pine	
		No. 1	No. 2	No. 1	No. 2	No. 1	No. 2
		24F-1.8E Glulam Equivalent (in.)					
10	Douglas- fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8
12	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8
14	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
16	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
18	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
20	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
22	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
24	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 No. 1 sawn lumber members: $F_b = 1,250$ (3 x 8), 1,050 (3 x 10), 1,000 (3 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 No. 2 sawn lumber members: $F_b = 925$ (3 x 8), 800 (3 x 10), 750 (3 x 12) psi, $F_v = 175$ psi, $E = 1.4 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 11

24F-1.8E GLULAM EQUIVALENTS FOR 3x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
ROOF BEAMS - SNOW LOADS
LOAD DURATION FACTOR = 1.15

Span (ft)	Glulam Species	3 x 8 Southern Pine		3 x 10 Southern Pine		3 x 12 Southern Pine	
		No.1	No. 2	No.1	No. 2	No.1	No. 2
		24F-1.8E Glulam Equivalent (in.)					
10	Douglas-fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
24	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = L/180 under total load.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions -
 No. 1 sawn lumber members: $F_b = 1,250$ (3 x 8), 1,050 (3 x 10), 1,000 (3 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 No. 2 sawn lumber members: $F_b = 925$ (3 x 8), 800 (3 x 10), 750 (3 x 12) psi, $F_v = 175$ psi, $E = 1.4 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 12

24F-1.8E GLULAM EQUIVALENTS FOR 3x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
FLOOR BEAMS
Load Duration Factor = 1.00

Span (ft)	Glulam species	3 x 8 Southern Pine		3 x 10 Southern Pine		3 x 12 Southern Pine	
		No.1	No. 2	No.1	No. 2	No.1	No. 2
		24F-1.8E Glulam Equivalent (in.)					
10	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8
12	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4
14	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4
16	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
18	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4
20	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 9-5/8
22	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
24	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/360$ under live load based on live/total load = 0.8.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 No. 1 sawn lumber members: $F_b = 1,250$ (3 x 8), 1,050 (3 x 10), 1,000 (3 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 No. 2 sawn lumber members: $F_b = 925$ (3 x 8), 800 (3 x 10), 750 (3 x 12) psi, $F_v = 175$ psi, $E = 1.4 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 13

24F-1.8E GLULAM EQUIVALENTS FOR 4x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
ROOF BEAMS - NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	4 x 6 Southern Pine		4 x 8 Southern Pine		4 x 10 Southern Pine		4 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		24F-1.8E Glulam Equivalent (in.)							
10	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4
12	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
14	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
16	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 9-5/8
18	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11
20	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11
22	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11
24	Douglas- fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = L/180 under total load.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select Structural sawn lumber members: $F_b = 2,100$ (4 x 6), $1.1 \times 1,950$ (4 x 8), $1.1 \times 1,700$ (4 x 10), $1.1 \times 1,600$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.8 \times 10^6$ psi.
 No. 1 sawn lumber members: $F_b = 1,350$ (4 x 6), $1.1 \times 1,250$ (4 x 8), $1.1 \times 1,050$ (4 x 10), $1.1 \times 1,000$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 14

24F-1.8E GLULAM EQUIVALENTS FOR 4x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
ROOF BEAMS - SNOW LOADS
LOAD DURATION FACTOR = 1.15

Span (ft)	Glulam species	4 x 6 Southern Pine		4 x 8 Southern Pine		4 x 10 Southern Pine		4 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		24F-1.8E Glulam Equivalent (in.)							
10	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 5-1/2 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4
12	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 6-7/8	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4
14	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
16	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
18	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 9-5/8
20	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11
22	Douglas- fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11
24	Douglas- fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = L/180 under total load.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select Structural sawn lumber members: $F_b = 2,100$ (4 x 6), $1.1 \times 1,950$ (4 x 8), $1.1 \times 1,700$ (4 x 10), $1.1 \times 1,600$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.8 \times 10^6$ psi.
 No. 1 sawn lumber members: $F_b = 1,350$ (4 x 6), $1.1 \times 1,250$ (4 x 8), $1.1 \times 1,050$ (4 x 10), $1.1 \times 1,000$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 15

24F-1.8E GLULAM EQUIVALENTS FOR 4x SOUTHERN PINE LUMBER
NEW SOUTHERN PINE LUMBER DESIGN VALUES EFFECTIVE JUNE 1, 2013
FLOOR BEAMS

Load Duration Factor = 1.00

Span (ft)	Glulam species	4 x 6 Southern Pine		4 x 8 Southern Pine		4 x 10 Southern Pine		4 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
24F-1.8E Glulam Equivalent (in.)									
10	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 7-1/2 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 9-5/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8
12	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 9 3-1/8 x 9	2-1/2 x 12 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 8-1/4	2-1/2 x 12-3/8 3 x 11	2-1/2 x 11 3 x 9-5/8
14	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 9	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 10-1/2 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 12-3/8 3 x 12-3/8	2-1/2 x 11 3 x 11
16	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 9	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 9-5/8 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 11 3 x 11
18	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 10-1/2
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11
20	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 11
22	Douglas-fir	2-1/2 x 7-1/2 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 12-3/8
24	Douglas-fir	2-1/2 x 6 3-1/8 x 6	2-1/2 x 6 3-1/8 x 6	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 9 3-1/8 x 7-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 10-1/2 3-1/8 x 10-1/2	2-1/2 x 13-1/2 3-1/8 x 12	2-1/2 x 12 3-1/8 x 12
	Southern Pine	2-1/2 x 6-7/8 3 x 6-7/8	2-1/2 x 6-7/8 3 x 5-1/2	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 8-1/4 3 x 8-1/4	2-1/2 x 11 3 x 11	2-1/2 x 11 3 x 9-5/8	2-1/2 x 13-3/4 3 x 12-3/8	2-1/2 x 12-3/8 3 x 12-3/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/360$ under live load based on live/total load = 0.8.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select Structural sawn lumber members: $F_b = 2,100$ (4 x 6), $1.1 \times 1,950$ (4 x 8), $1.1 \times 1,700$ (4 x 10), $1.1 \times 1,600$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.8 \times 10^6$ psi.
 No. 1 sawn lumber members: $F_b = 1,350$ (4 x 6), $1.1 \times 1,250$ (4 x 8), $1.1 \times 1,050$ (4 x 10), $1.1 \times 1,000$ (4 x 12) psi, $F_v = 175$ psi, $E = 1.6 \times 10^6$ psi.
 Glulam members: $F_{bx} = C_v \times 2,400$ psi; $F_{vx} = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 16

24F-1.8E GLULAM EQUIVALENTS FOR 6x SOUTHERN PINE LUMBER
ROOF BEAMS – NON-SNOW LOADS
Load Duration Factor = 1.25

Span (ft)	Glulam Species	6 x 8 Southern Pine		6 x 10 Southern Pine		6 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 7-1/2 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 8-1/4	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 9-5/8
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 11
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 3-1/8 x 6 and 5-1/8 x 6 (Douglas-fir), and 3 x 5-1/2 and 5 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi; where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 16 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 6x SOUTHERN PINE LUMBER**ROOF BEAMS – NON-SNOW LOADS****Load Duration Factor = 1.25**

Span (ft)	Glulam Species	6 x 14 Southern Pine		6 x 16 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
18	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
20	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
22	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4
24	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 3-1/8 x 6 and 5-1/8 x 6 (Douglas-fir), and 3 x 5-1/2 and 5 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 17

24F-1.8E GLULAM EQUIVALENTS FOR 6x_ SOUTHERN PINE LUMBER
ROOF BEAMS – SNOW LOADS
Load Duration Factor = 1.15

Span (ft)	Glulam Species	6 x 8 Southern Pine		6 x 10 Southern Pine		6 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 7-1/2 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 9
	Southern Pine	3 x 8-1/4 5 x 6-7/8	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 9-5/8	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 9-5/8
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 11
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 17 (CONTINUED)

24F-1.8E GLULAM EQUIVALENTS FOR 6x SOUTHERN PINE LUMBER**ROOF BEAMS – SNOW LOADS****Load Duration Factor = 1.15**

Span (ft)	Glulam Species	6 x 14 Southern Pine		6 x 16 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
18	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
20	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
22	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4
24	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > $3/4$.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 18

**24F-1.8E GLULAM EQUIVALENTS FOR 6x SOUTHERN PINE LUMBER
FLOOR BEAMS****Load Duration Factor = 1.00**

Span (ft)	Glulam Species	6 x 8 Southern Pine		6 x 10 Southern Pine		6 x 12 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)					
10	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 8-1/4 5 x 6-7/8	3 x 11 5 x 9-5/8	3 x 9-5/8 5 x 8-1/4	3 x 12-3/8 5 x 9-5/8	3 x 12-3/8 5 x 9-5/8
12	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 12 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 12-3/8 5 x 11	3 x 12-3/8 5 x 11
14	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 12 5-1/8 x 10-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4	3 x 9-5/8 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 12-3/8 5 x 11
16	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
18	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
20	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
22	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11
24	Douglas-fir	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 9 5-1/8 x 7-1/2	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 10-1/2 5-1/8 x 9	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12
	Southern Pine	3 x 8-1/4 5 x 8-1/4	3 x 8-1/4 5 x 8-1/4	3 x 11 5 x 9-5/8	3 x 11 5 x 9-5/8	3 x 13-3/4 5 x 11	3 x 13-3/4 5 x 11

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 18 (CONTINUED)

**24F-1.8E GLULAM EQUIVALENTS FOR 6x SOUTHERN PINE LUMBER
FLOOR BEAMS****Load Duration Factor = 1.00**

Span (ft)	Glulam Species	6 x 14 Southern Pine		6 x 16 Southern Pine	
		Select Struc.	No. 1	Select Struc.	No. 1
		Glulam Equivalent (in.)			
10	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 10-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 11	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 12-3/8	3 x 16-1/2 5 x 12-3/8
12	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 11	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
14	Douglas-fir	3-1/8 x 15 5-1/8 x 12	3-1/8 x 13-1/2 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 13-3/4 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 12-3/8
16	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 12-3/8	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4
18	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 13-1/2
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 12-3/8	3 x 16-1/2 5 x 15-1/8	3 x 16-1/2 5 x 13-3/4
20	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 16-1/2 5-1/8 x 15
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 16-1/2 5 x 15-1/8
22	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 18 5-1/8 x 15
	Southern Pine	3 x 16-1/2 5 x 13-3/4	3 x 16-1/2 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 17-7/8 5 x 15-1/8
24	Douglas-fir	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2	3-1/8 x 18 5-1/8 x 15	3-1/8 x 18 5-1/8 x 15
	Southern Pine	3 x 15-1/8 5 x 13-3/4	3 x 15-1/8 5 x 13-3/4	3 x 17-7/8 5 x 15-1/8	3 x 17-7/8 5 x 15-1/8

Notes:

- (1) Span = uniformly loaded simply supported beam.
- (2) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > $3/4$.
- (3) Service condition = dry.
- (4) Beam weights for sawn and glulam members are assumed to be the same.
- (5) Minimum glulam sizes considered in the table are: 2-1/2 x 6 and 3-1/8 x 6 (Douglas-fir), and 2-1/2 x 5-1/2 and 3 x 5-1/2 (southern pine).
- (6) Design properties at normal load duration and dry-use service conditions:
 Select structural sawn lumber members: $F_b = C_F \times 1500$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 No. 1 sawn lumber members: $F_b = C_F \times 1350$ psi; $F_v = 165$ psi; $E = 1.5 \times 10^6$ psi, where C_F = size factor per NDS.
 Glulam members: $F_b = C_v \times 2400$ psi; $F_v = 265$ psi (Douglas-fir) or 300 psi (southern pine); $E = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 19A

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR SIMPLE-SPAN APPLICATIONS – NON-SNOW LOADS
Load Duration Factor for Glulam = 1.25

Span (ft)	Glulam Species	W6x9	W8x10	W12x14	W12x16	W12x19	W10x22
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 7-1/2 6-3/4 x 7-1/2	3-1/8 x 12 5-1/8 x 9 6-3/4 x 7-1/2	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4 6-3/4 x 6-7/8	3 x 12-3/8 5 x 9-5/8 6-3/4 x 8-1/4	3 x 16-1/2 5 x 12-3/8 6-3/4 x 11	3 x 16-1/2 5 x 13-3/4 6-3/4 x 11	3 x 19-1/4 5 x 15-1/8 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
12	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 7-1/2	3-1/8 x 12 5-1/8 x 9 6-3/4 x 9	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8 5 x 8-1/4 6-3/4 x 8-1/4	3 x 12-3/8 5 x 9-5/8 6-3/4 x 8-1/4	3 x 16-1/2 5 x 12-3/8 6-3/4 x 11	3 x 16-1/2 5 x 13-3/4 6-3/4 x 11	3 x 19-1/4 5 x 15-1/8 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
14	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 7-1/2	3-1/8 x 12 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 11 5 x 8-1/4 6-3/4 x 8-1/4	3 x 12-3/8 5 x 9-5/8 6-3/4 x 9-5/8	3 x 16-1/2 5 x 12-3/8 6-3/4 x 11	3 x 16-1/2 5 x 13-3/4 6-3/4 x 11	3 x 19-1/4 5 x 15-1/8 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
16	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 9	3-1/8 x 12 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 11 5 x 9-5/8 6-3/4 x 8-1/4	3 x 12-3/8 5 x 11 6-3/4 x 9-5/8	3 x 16-1/2 5 x 12-3/8 6-3/4 x 11	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
18	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 9	3-1/8 x 12 5-1/8 x 10-1/2 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 11 5 x 9-5/8 6-3/4 x 8-1/4	3 x 12-3/8 5 x 11 6-3/4 x 9-5/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
20	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 9	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2
	Southern Pine	3 x 11 5 x 9-5/8 6-3/4 x 8-1/4	3 x 12-3/8 5 x 11 6-3/4 x 9-5/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4
22	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 9	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 15	3-1/8 x 19-1/2 5-1/8 x 16-1/2 6-3/4 x 15
	Southern Pine	3 x 11 5 x 9-5/8 6-3/4 x 8-1/4	3 x 13-3/4 5 x 11 6-3/4 x 9-5/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 16-1/2 5 x 15-1/8 6-3/4 x 13-3/4	3 x 19-1/4 5 x 15-1/8 6-3/4 x 13-3/4	3 x 19-1/4 5 x 16-1/2 6-3/4 x 15-1/8
24	Douglas-fir	3-1/8 x 10-1/2 5-1/8 x 9 6-3/4 x 9	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 19-1/2 5-1/8 x 16-1/2 6-3/4 x 15
	Southern Pine	3 x 11 5 x 9-5/8 6-3/4 x 8-1/4	3 x 13-3/4 5 x 11 6-3/4 x 9-5/8	3 x 16-1/2 5 x 13-3/4 6-3/4 x 12-3/8	3 x 17-7/8 5 x 15-1/8 6-3/4 x 13-3/4	3 x 19-1/4 5 x 16-1/2 6-3/4 x 15-1/8	3 x 19-1/4 5 x 16-1/2 6-3/4 x 15-1/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 19A (CONTINUED)

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR SIMPLE-SPAN APPLICATIONS – NON-SNOW LOADS

Load Duration Factor for Glulam = 1.25

Span (ft)	Glulam Species	W12x22	W14x22	W12x26	W14x26	W16x26	W12x30
Glulam Equivalent (in.)							
10	Douglas- fir	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2
12	Douglas- fir	3-1/8 x 21	3-1/8 x 21	3-1/8 x 24	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2
14	Douglas- fir	3-1/8 x 21	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8
16	Douglas- fir	3-1/8 x 21	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8
18	Douglas- fir	3-1/8 x 21	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4	5 x 20-5/8
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8
20	Douglas- fir	3-1/8 x 21	3-1/8 x 21	3-1/8 x 24	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 24-3/4
		5 x 16-1/2	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 19-1/4	5 x 20-5/8
		6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8
22	Douglas- fir	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 24-3/4	3 x 26-1/8
		5 x 16-1/2	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 20-5/8	5 x 20-5/8
		6-3/4 x 15-1/8	6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8
24	Douglas- fir	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 19-1/2
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18
	Southern Pine	3 x 20-5/8	3 x 22	3 x 23-3/8	3 x 24-3/4	3 x 26-1/8	3 x 26-1/8
		5 x 16-1/2	5 x 17-7/8	5 x 19-1/4	5 x 19-1/4	5 x 20-5/8	5 x 20-5/8
		6-3/4 x 15-1/8	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 16-1/2	6-3/4 x 17-7/8	6-3/4 x 17-7/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 19B

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR MULTIPLE-SPAN APPLICATIONS – NON-SNOW LOADS
Load Duration Factor for Glulam = 1.25

Span (ft)	Glulam Species	W6x9	W8x10	W12x14	W12x16	W12x19	W10x22
Glulam Equivalent (in.)							
10	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 24
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 12	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 7-1/2	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 22
		5 x 8-1/4	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4
12	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 21	3-1/8 x 22-1/2
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 12	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 15
		6-3/4 x 7-1/2	6-3/4 x 7-1/2	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8	3 x 12-3/8	3 x 16-1/2	3 x 16-1/2	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4
14	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 16-1/2	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 12	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8	3 x 12-3/8	3 x 16-1/2	3 x 16-1/2	3 x 19-1/4	3 x 19-1/4
		5 x 8-1/4	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
16	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 16-1/2	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 9	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 9-5/8	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8
		6-3/4 x 8-1/4	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
18	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 16-1/2	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
20	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 16-1/2	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 9-5/8	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
22	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 12-3/8	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
24	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 19-1/2
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
- (5) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (6) Beam weight for steel and glulam members are included.
- (7) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi when tension zone is stressed in tension or $C_v \times 1600$ psi when compression zone is stressed in tension;
 $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 19B (CONTINUED)

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR MULTIPLE-SPAN APPLICATIONS – NON-SNOW LOADS
Load Duration Factor for Glulam = 1.25

Span (ft)	Glulam Species	W12x22	W14x_22	W12x26	W14x_26	W16x26	W12x30
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 25-1/2 5-1/8 x 18 6-3/4 x 15	3-1/8 x 27 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 30 5-1/8 x 22-1/2 6-3/4 x 18	3-1/8 x 31-1/2 5-1/8 x 22-1/2 6-3/4 x 18	3-1/8 x 33 5-1/8 x 24 6-3/4 x 19-1/2	3-1/8 x 33 5-1/8 x 24 6-3/4 x 19-1/2
	Southern Pine	3 x 23-3/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 26-1/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 28-7/8 5 x 20-5/8 6-3/4 x 16-1/2	3 x 28-7/8 5 x 20-5/8 6-3/4 x 16-1/2	3 x 30-1/4 5 x 22 6-3/4 x 17-7/8	3 x 31-5/8 5 x 22 6-3/4 x 17-7/8
12	Douglas-fir	3-1/8 x 24 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 25-1/2 5-1/8 x 18 6-3/4 x 15	3-1/8 x 28-1/2 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 30 5-1/8 x 21 6-3/4 x 16-1/2	3-1/8 x 31-1/2 5-1/8 x 22-1/2 6-3/4 x 18	3-1/8 x 31-1/2 5-1/8 x 22-1/2 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 13-3/4	3 x 24-3/4 5 x 17-7/8 6-3/4 x 15-1/8	3 x 26-1/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 27-1/2 5 x 19-1/4 6-3/4 x 16-1/2	3 x 28-7/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 28-7/8 5 x 20-5/8 6-3/4 x 17-7/8
14	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 24 5-1/8 x 18 6-3/4 x 15	3-1/8 x 27 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 27 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 30 5-1/8 x 21 6-3/4 x 18	3-1/8 x 30 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8
16	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 15	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
18	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
20	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
22	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
24	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 20-5/8 5 x 16-1/2 6-3/4 x 13-3/4	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
- (5) Maximum deflection = $L/180$ under total load. Deflection under non-snow load must be verified when non-snow/total load > 3/4.
- (6) Beam weight for steel and glulam members are included.
- (7) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi when tension zone is stressed in tension or $C_v \times 1600$ psi when compression zone is stressed in tension;
 $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 20A

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR SIMPLE-SPAN APPLICATIONS – SNOW LOADS
Load Duration Factor for Glulam = 1.15

Span (ft)	Glulam Species	W6x9	W8x10	W12x14	W12x16	W12x19	W10x22
Glulam Equivalent (in.)							
10	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
12	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
14	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
16	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
18	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
20	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 13-1/2	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
22	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 13-1/2	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 12	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 13-1/2	6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 15
	Southern Pine	3 x 11	3 x 13-3/4	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 15-1/8	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4	6-3/4 x 15-1/8
24	Douglas- fir	3-1/8 x 10-1/2	3-1/8 x 13-1/2	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 12	5-1/8 x 15	5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 13-1/2	6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 15
	Southern Pine	3 x 11	3 x 13-3/4	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 15-1/8	6-3/4 x 15-1/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/180$ under total load. Deflection under snow load must be verified when snow/total load > 3/4.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 20A (CONTINUED)

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR SIMPLE-SPAN APPLICATIONS – SNOW LOADS**Load Duration Factor for Glulam = 1.15**

Span (ft)	Glulam Species	W12x22	W14x22	W12x26	W14x26	W16x26	W12x30
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 24 5-1/8 x 18 6-3/4 x 15	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
12	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 15	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
14	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 15	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
16	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
18	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
20	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
22	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 16-1/2	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 15-1/8	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 24-3/4 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8
24	Douglas-fir	3-1/8 x 21 5-1/8 x 16-1/2 6-3/4 x 15	3-1/8 x 22-1/2 5-1/8 x 18 6-3/4 x 16-1/2	3-1/8 x 24 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 25-1/2 5-1/8 x 19-1/2 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18	3-1/8 x 27 5-1/8 x 21 6-3/4 x 18
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/180$ under total load. Deflection under snow load must be verified when snow/total load > 3/4.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 20B

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR MULTIPLE-SPAN APPLICATIONS – SNOW LOADS
Load Duration Factor for Glulam = 1.15

Span (ft)	Glulam Species	W6x9	W8x10	W12x14	W12x16	W12x19	W10x22
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 18	3-1/8 x 21	3-1/8 x 24	3-1/8 x 25-1/2
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 16-1/2	5-1/8 x 18
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 17-7/8	3 x 19-1/4	3 x 22	3 x 23-3/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
12	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 22-1/2	3-1/8 x 24
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 22
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
14	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 7-1/2	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 19-1/4	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 6-7/8	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
16	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 9	5-1/8 x 13-1/2	5-1/8 x 13-1/2	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 8-1/4	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
18	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 7-1/2	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 20-5/8
		5 x 8-1/4	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 15-1/8	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
20	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 9	6-3/4 x 12	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 20-5/8
		5 x 9-5/8	5 x 9-5/8	5 x 13-3/4	5 x 13-3/4	5 x 16-1/2	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
22	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 9	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 13-1/2	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 16-1/2	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 11	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4
24	Douglas-fir	3-1/8 x 10-1/2	3-1/8 x 12	3-1/8 x 16-1/2	3-1/8 x 18	3-1/8 x 19-1/2	3-1/8 x 21
		5-1/8 x 9	5-1/8 x 10-1/2	5-1/8 x 13-1/2	5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 16-1/2
		6-3/4 x 9	6-3/4 x 10-1/2	6-3/4 x 12	6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 15
	Southern Pine	3 x 11	3 x 12-3/8	3 x 16-1/2	3 x 17-7/8	3 x 20-5/8	3 x 20-5/8
		5 x 9-5/8	5 x 11	5 x 13-3/4	5 x 13-3/4	5 x 16-1/2	5 x 16-1/2
		6-3/4 x 8-1/4	6-3/4 x 9-5/8	6-3/4 x 12-3/8	6-3/4 x 12-3/8	6-3/4 x 13-3/4	6-3/4 x 13-3/4

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
- (5) Maximum deflection = $L/180$ under total load. Deflection under snow load must be verified when snow/total load > $3/4$.
- (6) Beam weight for steel and glulam members are included.
- (7) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi, when tension zone is stressed in tension or $C_v \times 1600$ psi, when compression zone is stressed in tension;
 $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 20B (CONTINUED)

24F-1.8E GLULAM EQUIVALENT TO STEEL ROOF BEAMS FOR MULTIPLE-SPAN APPLICATIONS – SNOW LOADS**Load Duration Factor for Glulam = 1.15**

Span (ft)	Glulam Species	W12x22	W14x22	W12x26	W14x26	W16x26	W12x30
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 27	3-1/8 x 28-1/2	3-1/8 x 31-1/2	3-1/8 x 33	3-1/8 x 34-1/2	3-1/8 x 34-1/2
		5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 22-1/2	5-1/8 x 24	5-1/8 x 25-1/2	5-1/8 x 25-1/2
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 19-1/2	6-3/4 x 19-1/2	6-3/4 x 21	6-3/4 x 21
	Southern Pine	3 x 24-3/4 5 x 17-7/8 6-3/4 x 15-1/8	3 x 27-1/2 5 x 19-1/4 6-3/4 x 15-1/8	3 x 30-1/4 5 x 22 6-3/4 x 17-7/8	3 x 30-1/4 5 x 22 6-3/4 x 17-7/8	5 x 23-3/8 6-3/4 x 19-1/4 6-3/4 x 19-1/4	5 x 23-3/8 6-3/4 x 19-1/4 6-3/4 x 19-1/4
12	Douglas-fir	3-1/8 x 25-1/2	3-1/8 x 27	3-1/8 x 30	3-1/8 x 31-1/2	3-1/8 x 33	3-1/8 x 33
		5-1/8 x 16-1/2	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 22-1/2	5-1/8 x 24	5-1/8 x 24
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 23-3/8 5 x 16-1/2 6-3/4 x 15-1/8	3 x 26-1/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 28-7/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 28-7/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 31-5/8 5 x 22 6-3/4 x 17-7/8	3 x 31-5/8 5 x 22 6-3/4 x 17-7/8
14	Douglas-fir	3-1/8 x 22-1/2	3-1/8 x 25-1/2	3-1/8 x 28-1/2	3-1/8 x 30	3-1/8 x 31-1/2	3-1/8 x 31-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 21
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 26-1/8 5 x 19-1/4 6-3/4 x 16-1/2	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 28-7/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 28-7/8 5 x 20-5/8 6-3/4 x 17-7/8
16	Douglas-fir	3-1/8 x 21	3-1/8 x 24	3-1/8 x 27	3-1/8 x 27	3-1/8 x 28-1/2	3-1/8 x 30
		5-1/8 x 18	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 21
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 16-1/2 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8
18	Douglas-fir	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2	3-1/8 x 27	3-1/8 x 27
		5-1/8 x 18	5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 21
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8
20	Douglas-fir	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2	3-1/8 x 27	3-1/8 x 27
		5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 21
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8
22	Douglas-fir	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2	3-1/8 x 27	3-1/8 x 27
		5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 16-1/2	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8
24	Douglas-fir	3-1/8 x 22-1/2	3-1/8 x 24	3-1/8 x 25-1/2	3-1/8 x 25-1/2	3-1/8 x 27	3-1/8 x 27
		5-1/8 x 18	5-1/8 x 19-1/2	5-1/8 x 21	5-1/8 x 21	5-1/8 x 22-1/2	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 18	6-3/4 x 18	6-3/4 x 19-1/2	6-3/4 x 19-1/2
	Southern Pine	3 x 22 5 x 17-7/8 6-3/4 x 15-1/8	3 x 23-3/8 5 x 17-7/8 6-3/4 x 16-1/2	3 x 24-3/4 5 x 19-1/4 6-3/4 x 17-7/8	3 x 26-1/8 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8	3 x 27-1/2 5 x 20-5/8 6-3/4 x 17-7/8

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
- (5) Maximum deflection = $L/180$ under total load. Deflection under snow load must be verified when snow/total load > $3/4$.
- (6) Beam weight for steel and glulam members are included.
- (7) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi, when tension zone is stressed in tension or $C_v \times 1600$ psi, when compression zone is stressed in tension;
 $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 21A

24F-1.8E GLULAM EQUIVALENT TO STEEL FLOOR BEAMS FOR SIMPLE-SPAN APPLICATIONS
Load Duration Factor for Glulam = 1.00

Span (ft)	Glulam Species	W8x10	W8x13	W8x15	W8x18	W8x21	W10x12
Glulam Equivalent (in.)							
10	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 18 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 9	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 10-3/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 11-3/4	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 10-3/8
12	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 12	3-1/8 x 18 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 18-5/8 5 x 14-1/2 6-3/4 x 11-3/4	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 10-3/8
14	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
16	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
18	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
20	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
22	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 14-1/2 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
24	Douglas-fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 14-1/2 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/360$ under live load based on live/total load = 0.8.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 21A (CONTINUED)

**24F-1.8E GLULAM EQUIVALENT TO STEEL FLOOR BEAMS FOR
SIMPLE-SPAN APPLICATIONS****Load Duration Factor for Glulam = 1.00**

Span (ft)	Glulam Species	W10x19	W10x22	W12x26
		Glulam Equivalent (in.)		
10	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 30
		5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 22-3/4	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 13-1/8	6-3/4 x 14-1/2	6-3/4 x 18-5/8
12	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 21	3-1/8 x 28-1/2
		5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 22-3/4	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 13-1/8	6-3/4 x 14-1/2	6-3/4 x 18-5/8
14	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 21	3-1/8 x 28-1/2
		5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 22-3/4	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 13-1/8	6-3/4 x 14-1/2	6-3/4 x 18-5/8
16	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 21	3-1/8 x 28-1/2
		5-1/8 x 15	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 22-3/4	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 18-5/8
18	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 21	3-1/8 x 28-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 21-3/8	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
20	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 19-1/2	3-1/8 x 28-1/2
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 21-3/8	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
22	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 19-1/2	3-1/8 x 27
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 22-1/2
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 18-5/8	3 x 20	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 21-3/8
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
24	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 19-1/2	3-1/8 x 27
		5-1/8 x 16-1/2	5-1/8 x 16-1/2	5-1/8 x 21
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 18-5/8	3 x 20	3 x 26-7/8
		5 x 15-7/8	5 x 17-1/4	5 x 21-3/8
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to simple-span applications.
- (3) Service condition for glulam members = dry.
- (4) Maximum deflection = $L/360$ under live load based on live/total load = 0.8.
- (5) Beam weight for steel and glulam members are included.
- (6) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (7) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2400$ psi; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine);
 $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

TABLE 21B

24F-1.8E GLULAM EQUIVALENT TO STEEL FLOOR BEAMS FOR MULTIPLE-SPAN APPLICATIONS
Load Duration Factor for Glulam = 1.00

Span (ft)	Glulam Species	W8x10	W8x13	W8x15	W8x18	W8x21	W10x12
Glulam Equivalent (in.)							
10	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 21 5-1/8 x 15 6-3/4 x 12	3-1/8 x 24 5-1/8 x 16-1/2 6-3/4 x 13-1/2	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 9	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 10-3/8	3 x 20 5 x 14-1/2 6-3/4 x 11-3/4	3 x 22-3/4 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 10-3/8
12	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 19-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 21 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 9	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 10-3/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 11-3/4	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 10-3/8
14	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 9	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 12	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 9	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 10-3/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 11-3/4	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 10-3/8
16	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 10-1/2 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 12 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 12	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2
	Southern Pine	3 x 13-1/8 5 x 10-3/8 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 10-3/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 18-5/8 5 x 14-1/2 6-3/4 x 11-3/4	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 11-3/4 6-3/4 x 11-3/4
18	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 16-1/2 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 12 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 18-5/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 20 5 x 15-7/8 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
20	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 19-1/2 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
22	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 14-1/2 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 18-5/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4
24	Douglas- fir	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 13-1/2 5-1/8 x 12 6-3/4 x 10-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12	3-1/8 x 16-1/2 5-1/8 x 13-1/2 6-3/4 x 13-1/2	3-1/8 x 18 5-1/8 x 15 6-3/4 x 13-1/2	3-1/8 x 15 5-1/8 x 13-1/2 6-3/4 x 12
	Southern Pine	3 x 13-1/8 5 x 11-3/4 6-3/4 x 10-3/8	3 x 14-1/2 5 x 11-3/4 6-3/4 x 11-3/4	3 x 14-1/2 5 x 13-1/8 6-3/4 x 11-3/4	3 x 15-7/8 5 x 14-1/2 6-3/4 x 13-1/8	3 x 17-1/4 5 x 14-1/2 6-3/4 x 13-1/8	3 x 15-7/8 5 x 13-1/8 6-3/4 x 11-3/4

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
- (5) Maximum deflection = $L/360$ under live load based on live/total load = 0.8.
- (6) Beam weight for steel and glulam members are included.
- (7) Design properties for steel members: $F_b = 0.66 \times 36 \text{ ksi}$, $F_v = 0.4 \times 36 \text{ ksi}$, $E = 29 \times 10^6 \text{ psi}$.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions:
 $F_{bx} = C_v \times 2,400 \text{ psi}$, when tension zone is stressed in tension or $C_v \times 1,600 \text{ psi}$, when compression zone is stressed in tension;
 $F_{vx} = 265 \text{ psi}$ (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6 \text{ psi}$, where C_v = volume factor per NDS.

(TABLE CONTINUED ON NEXT PAGE)

TABLE 21B (CONTINUED)

**24F-1.8E GLULAM EQUIVALENT TO STEEL FLOOR BEAMS FOR
MULTIPLE-SPAN APPLICATIONS****Load Duration Factor for Glulam = 1.00**

Span (ft)	Glulam Species	W10x19	W10x22	W12x26
		Glulam Equivalent (in.)		
10	Douglas- fir	3-1/8 x 24	3-1/8 x 27	3-1/8 x 36
		5-1/8 x 16-1/2	5-1/8 x 19-1/2	5-1/8 x 28-1/2
		6-3/4 x 13-1/2	6-3/4 x 16-1/2	6-3/4 x 22-1/2
	Southern Pine	3 x 22-3/4	3 x 25-1/2	3 x 35-1/8
		5 x 15-7/8	5 x 18-5/8	5 x 25-1/2
		6-3/4 x 13-1/8	6-3/4 x 14-1/2	6-3/4 x 21-3/8
12	Douglas- fir	3-1/8 x 22-1/2	3-1/8 x 25-1/2	3-1/8 x 36
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 25-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 21
	Southern Pine	3 x 21-3/8	3 x 24-1/8	3 x 33-3/4
		5 x 15-7/8	5 x 17-1/4	5 x 24-1/8
		6-3/4 x 13-1/8	6-3/4 x 14-1/2	6-3/4 x 20
14	Douglas- fir	3-1/8 x 21	3-1/8 x 24	3-1/8 x 34-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 24
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 19-1/2
	Southern Pine	3 x 20	3 x 22-3/4	3 x 32-3/8
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 13-1/8	6-3/4 x 15-7/8	6-3/4 x 20
16	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 33
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 22-1/2
		6-3/4 x 13-1/2	6-3/4 x 15	6-3/4 x 21
	Southern Pine	3 x 20	3 x 22-3/4	3 x 31
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 13-1/8	6-3/4 x 15-7/8	6-3/4 x 20
18	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 30
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 22-1/2
		6-3/4 x 13-1/2	6-3/4 x 16-1/2	6-3/4 x 21
	Southern Pine	3 x 20	3 x 22-3/4	3 x 28-1/4
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
20	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 28-1/2
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 24
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 21
	Southern Pine	3 x 20	3 x 22-3/4	3 x 29-5/8
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
22	Douglas- fir	3-1/8 x 21	3-1/8 x 22-1/2	3-1/8 x 30
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 24
		6-3/4 x 15	6-3/4 x 16-1/2	6-3/4 x 21
	Southern Pine	3 x 20	3 x 22-3/4	3 x 29-5/8
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20
24	Douglas- fir	3-1/8 x 19-1/2	3-1/8 x 22-1/2	3-1/8 x 30
		5-1/8 x 16-1/2	5-1/8 x 18	5-1/8 x 24
		6-3/4 x 15	6-3/4 x 15	6-3/4 x 21
	Southern Pine	3 x 20	3 x 21-3/8	3 x 29-5/8
		5 x 15-7/8	5 x 17-1/4	5 x 22-3/4
		6-3/4 x 14-1/2	6-3/4 x 15-7/8	6-3/4 x 20

Notes:

- (1) For preliminary design use only. Final design should include a complete analysis, including bearing stresses and lateral stability.
- (2) Applicable to multiple-span applications.
- (3) The end-spans shall be 40% or more of the adjacent span.
- (4) Service condition for glulam members = dry.
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- (7) Design properties for steel members: $F_b = 0.66 \times 36$ ksi, $F_v = 0.4 \times 36$ ksi, $E = 29 \times 10^6$ psi.
- (8) Design properties for glulam members at normal load duration and dry-use service conditions: $F_{bx} = C_v \times 2,400$ psi, when tension zone is stressed in tension or $C_v \times 1,600$, when compression zone is stressed in tension; $F_{vx} = 265$ psi (Douglas-fir) and 300 psi (southern pine); $E_x = 1.8 \times 10^6$ psi, where C_v = volume factor per NDS.

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