

LP[®] SOLIDSTART[®] LSL PRESCRIPTIVE ROOF FRAMING U.S. (ASD) TECHNICAL GUIDE

1.35E and 1.55E

LP **SolidStart**[®]
ENGINEERED WOOD



U.S. Technical Guide

Table of Contents

Important Notes	2
Introduction to Prescriptive Rafter Framing	3
Prescriptive Rafter Span Tables: 1-1/2" LP® SolidStart® LSL	4-5
Rafter/Ceiling Joint Heel Connections	6
Prescriptive Rafter and Ceiling Connection Details	7
Installation Details	8
Required Length for Sloped Members	9
Ceiling Joist Span Tables: 1-1/2" LP SolidStart LSL	10
Product Specifications & Design Value	11
Handling and Storage Guidelines	12

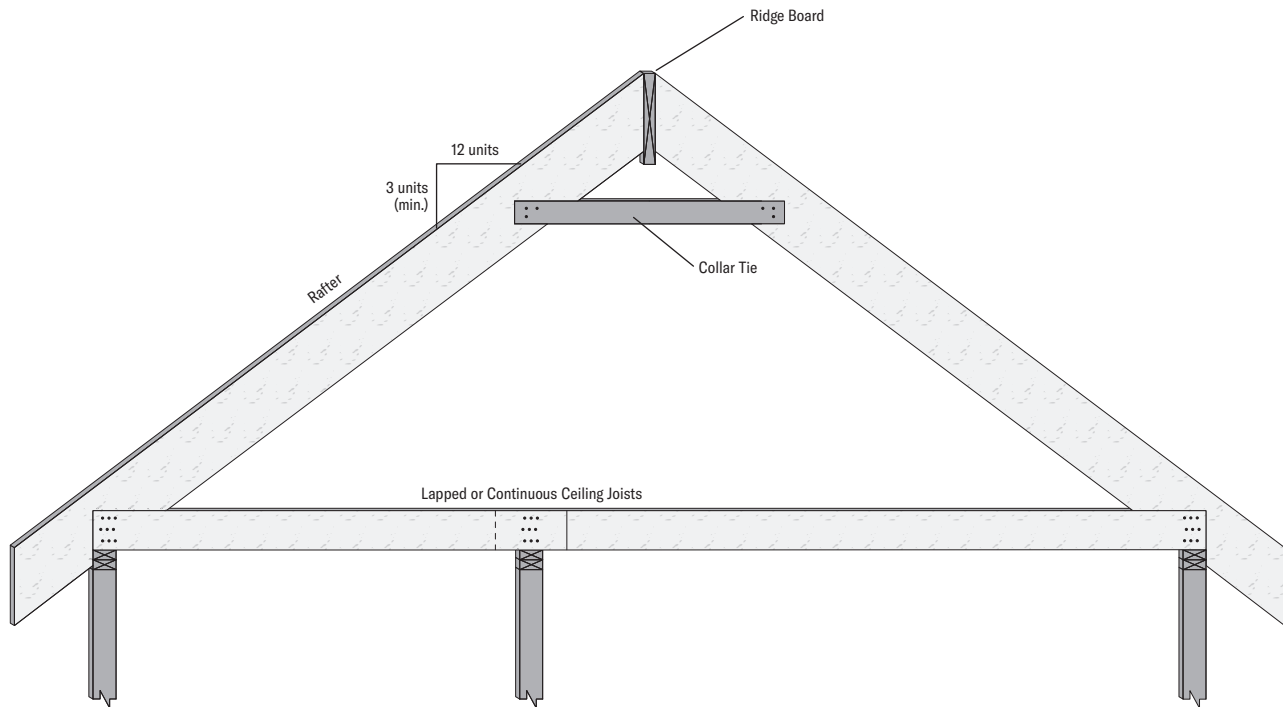


IMPORTANT NOTES

1. LP SolidStart LSL shall be designed for dry-use conditions only. Dry-use applies to products installed in dry, covered and well ventilated interior conditions in which the equivalent equilibrium moisture content in lumber will not exceed 16%.
2. This guide is valid only for LP SolidStart LSL members supporting loads applied parallel to the face of the strands or veneers ("edge" orientation).
3. Ensure that the design loads, duration of load increases and deflection limits that you use to select products from this guide are appropriate for your application and comply with local code requirements. If you do not know the correct design criteria and all the loads imposed on the component from all parts of the structure, seek qualified help from the architect, engineer or designer of the structure. Additional reference data on wood construction is available in the form of building codes, code evaluation reports and other design references.
4. The rafter spans in this guide are based on the horizontal distance from the outside face of the exterior wall to the centerline of the ridge board.
5. Total load deflections are based on instantaneous loading. Long term deflection (creep) under sustained load has not been considered.

Introduction to Prescriptive Roof Framing

TYPICAL PRESCRIPTIVE ROOF FRAMING



PRESCRIPTIVE ROOF CONSTRUCTION

The International Residential Code (IRC) and the International Building Code (IBC) set out specific guidelines within which conventional light-frame wood structures may be built without the need for engineering analysis of each component. This is known as “prescriptive” framing.

The provisions for prescriptive roof construction are found in the IRC and IBC. Within limitations which include, among others, building size, roof pitch and design loads, the allowed span for conventional “rafters” can be selected from tables rather than designed through engineering calculations. The size of the ridge board and hip and valley rafters is prescribed as are the connections of these members.

The diagram above depicts the cross-section of a typical prescriptive roof consisting of the rafters, a ridge board, ceiling joists and collar ties. Not shown are the hip and valley rafters needed to tie the roof together where the rafters are framed at an angle to each other.

In a rafter roof, all of these components are required to provide a stable roof. The function of each component is:

- The rafters carry the applied loads to the exterior walls. Rafters act more like the top chord of a roof truss than as a roof “joist”.

- The ridge board is non-load-bearing and merely provides the point of connection for the opposing rafters and is only a nominal 1" thick.
- Similarly, hip and valley rafters provide the point of connection for roof rafters framed at angles. However, since there is some load transfer with these members, the code requires a nominal 2" thickness and bracing to a load-bearing partition at the upper end or to be designed as a beam with proper supports.
- The ceiling joists restrain the exterior walls from being thrust outwards as gravity loads (such as snow) push down on the roof.
- Collar ties are required in the upper third of the roof system to provide restraint against the roof being pulled upward and outward from wind.

The Prescriptive Rafter Span Tables on pages 4 and 5 are modeled on the tables in the IRC and are subject to the restrictions for rafters as defined in both the IRC and IBC.

Prescriptive Rafter Span Tables: 1-1/2" LP® SolidStart® LSL

20 PSF ROOF LIVE OR SNOW LOAD (125% OR 115%)																
Spacing	Grade	10 psf Dead Load							20 psf Dead Load							
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	
No Supported Ceiling (L/180)	12"	1.35E LP LSL	10'-2"	16'-0"	21'-1"	-	26'-0"	-	26'-0"	9'-3"	14'-6"	19'-2"	-	25'-1"	-	26'-0"
		1.55E LP LSL	10'-8"	16'-9"	22'-1"	26'-0"	26'-0"	26'-0"	26'-0"	9'-8"	15'-2"	20'-0"	25'-7"	26'-0"	26'-0"	26'-0"
	16"	1.35E LP LSL	9'-3"	14'-6"	19'-2"	-	25'-1"	-	26'-0"	8'-4"	13'-2"	17'-4"	-	22'-9"	-	26'-0"
		1.55E LP LSL	9'-8"	15'-2"	20'-0"	25'-7"	26'-0"	26'-0"	26'-0"	8'-9"	13'-9"	18'-2"	23'-3"	23'-10"	26'-0"	26'-0"
	19.2"	1.35E LP LSL	8'-8"	13'-8"	18'-0"	-	23'-7"	-	26'-0"	7'-10"	12'-4"	16'-4"	-	21'-5"	-	26'-0"
		1.55E LP LSL	9'-1"	14'-3"	18'-10"	24'-1"	24'-8"	26'-0"	26'-0"	8'-3"	12'-11"	17'-1"	21'-10"	22'-5"	26'-0"	26'-0"
	24"	1.35E LP LSL	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"	7'-3"	11'-6"	15'-1"	-	19'-10"	-	24'-10"
		1.55E LP LSL	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"	7'-8"	12'-0"	15'-10"	20'-3"	20'-9"	24'-7"	26'-0"
Supported Ceiling (L/240)	12"	1.35E LP LSL	8'-10"	13'-11"	18'-5"	-	24'-1"	-	26'-0"	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"
		1.55E LP LSL	9'-3"	14'-7"	19'-3"	24'-7"	25'-3"	26'-0"	26'-0"	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"
	16"	1.35E LP LSL	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"	7'-3"	11'-6"	15'-1"	-	19'-10"	-	24'-10"
		1.55E LP LSL	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"	7'-8"	12'-0"	15'-10"	20'-3"	20'-9"	24'-7"	26'-0"
	19.2"	1.35E LP LSL	7'-7"	11'-11"	15'-8"	-	20'-7"	-	25'-8"	6'-10"	10'-9"	14'-3"	-	18'-8"	-	23'-4"
		1.55E LP LSL	7'-11"	12'-5"	16'-5"	21'-0"	21'-6"	25'-6"	26'-0"	7'-2"	11'-4"	14'-11"	19'-0"	19'-6"	23'-2"	24'-5"
	24"	1.35E LP LSL	7'-0"	11'-0"	14'-6"	-	19'-1"	-	23'-10"	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"
		1.55E LP LSL	7'-4"	11'-7"	15'-3"	19'-5"	20'-0"	23'-8"	25'-0"	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"

30 PSF SNOW LOAD (115%)																
Spacing	Grade	10 psf Dead Load							20 psf Dead Load							
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	
No Supported Ceiling (L/180)	12"	1.35E LP LSL	8'-10"	13'-11"	18'-5"	-	24'-1"	-	26'-0"	8'-7"	13'-5"	17'-9"	-	23'-3"	-	26'-0"
		1.55E LP LSL	9'-3"	14'-7"	19'-3"	24'-7"	25'-3"	26'-0"	26'-0"	8'-11"	14'-1"	18'-7"	23'-9"	24'-4"	26'-0"	26'-0"
	16"	1.35E LP LSL	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"	7'-9"	12'-2"	16'-1"	-	21'-1"	-	26'-0"
		1.55E LP LSL	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"	8'-1"	12'-9"	16'-10"	21'-6"	22'-1"	26'-0"	26'-0"
	19.2"	1.35E LP LSL	7'-7"	11'-11"	15'-8"	-	20'-7"	-	25'-8"	7'-3"	11'-6"	15'-1"	-	19'-10"	-	24'-8"
		1.55E LP LSL	7'-11"	12'-5"	16'-5"	21'-0"	21'-6"	25'-6"	26'-0"	7'-8"	12'-0"	15'-10"	20'-3"	20'-9"	24'-7"	26'-0"
	24"	1.35E LP LSL	7'-0"	11'-0"	14'-6"	-	19'-1"	-	23'-10"	6'-9"	10'-7"	13'-10"	-	17'-10"	-	22'-0"
		1.55E LP LSL	7'-4"	11'-7"	15'-3"	19'-5"	20'-0"	23'-8"	25'-0"	7'-1"	11'-2"	14'-8"	18'-9"	19'-3"	22'-10"	24'-1"
Supported Ceiling (L/240)	12"	1.35E LP LSL	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"	7'-5"	11'-9"	15'-6"	-	20'-3"	-	25'-4"
		1.55E LP LSL	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"	7'-10"	12'-3"	16'-2"	20'-8"	21'-3"	25'-2"	26'-0"
	16"	1.35E LP LSL	7'-3"	11'-6"	15'-1"	-	19'-10"	-	24'-10"	6'-9"	10'-7"	14'-0"	-	18'-5"	-	23'-0"
		1.55E LP LSL	7'-8"	12'-0"	15'-10"	20'-3"	20'-9"	24'-7"	26'-0"	7'-1"	11'-2"	14'-8"	18'-9"	19'-3"	22'-10"	24'-1"
	19.2"	1.35E LP LSL	6'-10"	10'-9"	14'-3"	-	18'-8"	-	23'-4"	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"
		1.55E LP LSL	7'-2"	11'-4"	14'-11"	19'-0"	19'-6"	23'-2"	24'-5"	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"
	24"	1.35E LP LSL	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"	5'-11"	9'-3"	12'-2"	-	16'-0"	-	20'-0"
		1.55E LP LSL	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"	6'-2"	9'-8"	12'-10"	16'-4"	16'-9"	19'-11"	21'-0"

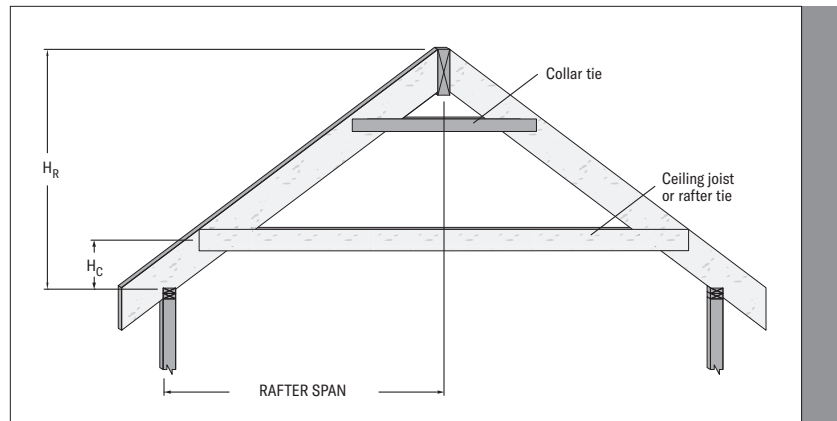
NOTES:

- These tables are to be used in accordance with the conventional light-frame construction provisions of the IRC and IBC.
- The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

H_C/H_R Rafter Span Adjustment Factor	
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

Where: H_C = Height of ceiling joists or rafter ties measured vertically from the top of the rafter support walls to the center of the ceiling joist or rafter tie.

H_R = Height of roof ridge measured vertically from the top of the rafter support walls.



Prescriptive Rafter Span Tables: 1-1/2" LP® SolidStart® LSL

50 PSF SNOW LOAD (115%)

Spacing	Grade	10 psf Dead Load							20 psf Dead Load							
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	
No Supported Ceiling (L/180)	12"	1.35E LP LSL	7'-5"	11'-9"	15'-6"	-	20'-3"	-	25'-4"	7'-5"	11'-9"	15'-6"	-	20'-3"	-	25'-4"
		1.55E LP LSL	7'-10"	12'-3"	16'-2"	20'-8"	21'-3"	25'-2"	26'-0"	7'-10"	12'-3"	16'-2"	20'-8"	21'-3"	25'-2"	26'-0"
	16"	1.35E LP LSL	6'-9"	10'-7"	14'-0"	-	18'-5"	-	23'-0"	6'-9"	10'-7"	14'-0"	-	18'-5"	-	22'-10"
		1.55E LP LSL	7'-1"	11'-2"	14'-8"	18'-9"	19'-3"	22'-10"	24'-1"	7'-1"	11'-2"	14'-8"	18'-9"	19'-3"	22'-10"	24'-1"
	19.2"	1.35E LP LSL	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"	6'-4"	10'-0"	13'-1"	-	16'-10"	-	20'-10"
		1.55E LP LSL	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"
24"	1.35E LP LSL	5'-11"	9'-3"	12'-2"	-	16'-0"	-	20'-0"	5'-10"	9'-0"	11'-8"	-	15'-1"	-	18'-7"	
	1.55E LP LSL	6'-2"	9'-8"	12'-10"	16'-4"	16'-9"	19'-11"	21'-0"	6'-2"	9'-8"	12'-10"	16'-4"	16'-9"	19'-11"	21'-0"	
Supported Ceiling (L/240)	12"	1.35E LP LSL	6'-9"	10'-7"	14'-0"	-	18'-5"	-	23'-0"	6'-8"	10'-5"	13'-9"	-	18'-1"	-	22'-7"
		1.55E LP LSL	7'-1"	11'-2"	14'-8"	18'-9"	19'-3"	22'-10"	24'-1"	7'-0"	10'-11"	14'-5"	18'-5"	18'-11"	22'-5"	23'-8"
	16"	1.35E LP LSL	6'-1"	9'-8"	12'-8"	-	16'-8"	-	20'-10"	6'-0"	9'-6"	12'-6"	-	16'-5"	-	20'-6"
		1.55E LP LSL	6'-5"	10'-1"	13'-4"	17'-0"	17'-6"	20'-8"	21'-10"	6'-4"	9'-11"	13'-1"	16'-9"	17'-2"	20'-4"	21'-6"
	19.2"	1.35E LP LSL	5'-9"	9'-1"	11'-11"	-	15'-8"	-	19'-7"	5'-8"	8'-11"	11'-9"	-	15'-5"	-	19'-3"
		1.55E LP LSL	6'-0"	9'-6"	12'-6"	16'-0"	16'-5"	19'-5"	20'-6"	5'-11"	9'-4"	12'-4"	15'-9"	16'-2"	19'-2"	20'-2"
24"	1.35E LP LSL	5'-4"	8'-5"	11'-1"	-	14'-6"	-	18'-2"	5'-3"	8'-3"	10'-10"	-	14'-3"	-	17'-10"	
	1.55E LP LSL	5'-7"	8'-9"	11'-7"	14'-10"	15'-2"	18'-0"	19'-0"	5'-6"	8'-8"	11'-5"	14'-7"	14'-11"	17'-9"	18'-8"	

70 PSF SNOW LOAD (115%)

Spacing	Grade	10 psf Dead Load							20 psf Dead Load							
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"	
No Supported Ceiling (L/180)	12"	1.35E LP LSL	6'-8"	10'-5"	13'-9"	-	18'-1"	-	22'-7"	6'-8"	10'-5"	13'-9"	-	18'-1"	-	22'-7"
		1.55E LP LSL	7'-0"	10'-11"	14'-5"	18'-5"	18'-11"	22'-5"	23'-8"	7'-0"	10'-11"	14'-5"	18'-5"	18'-11"	22'-5"	23'-8"
	16"	1.35E LP LSL	6'-0"	9'-6"	12'-6"	-	16'-5"	-	20'-6"	6'-0"	9'-6"	12'-6"	-	16'-3"	-	20'-1"
		1.55E LP LSL	6'-4"	9'-11"	13'-1"	16'-9"	17'-2"	20'-4"	21'-6"	6'-4"	9'-11"	13'-1"	16'-9"	17'-2"	20'-4"	21'-6"
	19.2"	1.35E LP LSL	5'-8"	8'-11"	11'-9"	-	15'-5"	-	19'-3"	5'-8"	8'-11"	11'-6"	-	14'-10"	-	18'-4"
		1.55E LP LSL	5'-11"	9'-4"	12'-4"	15'-9"	16'-2"	19'-2"	20'-2"	5'-11"	9'-4"	12'-4"	15'-9"	16'-2"	19'-2"	20'-2"
24"	1.35E LP LSL	5'-3"	8'-3"	10'-10"	-	14'-1"	-	17'-5"	5'-2"	7'-11"	10'-4"	-	13'-4"	-	16'-5"	
	1.55E LP LSL	5'-6"	8'-8"	11'-5"	14'-7"	14'-11"	17'-9"	18'-8"	5'-6"	8'-8"	11'-5"	14'-7"	14'-11"	17'-9"	18'-8"	
Supported Ceiling (L/240)	12"	1.35E LP LSL	6'-0"	9'-6"	12'-6"	-	16'-5"	-	20'-6"	6'-0"	9'-6"	12'-6"	-	16'-5"	-	20'-6"
		1.55E LP LSL	6'-4"	9'-11"	13'-1"	16'-9"	17'-2"	20'-4"	21'-6"	6'-4"	9'-11"	13'-1"	16'-9"	17'-2"	20'-4"	21'-6"
	16"	1.35E LP LSL	5'-5"	8'-7"	11'-4"	-	14'-10"	-	18'-7"	5'-5"	8'-7"	11'-4"	-	14'-10"	-	18'-7"
		1.55E LP LSL	5'-9"	9'-0"	11'-10"	15'-2"	15'-7"	18'-5"	19'-6"	5'-9"	9'-0"	11'-10"	15'-2"	15'-7"	18'-5"	19'-6"
	19.2"	1.35E LP LSL	5'-1"	8'-1"	10'-8"	-	13'-11"	-	17'-5"	5'-1"	8'-1"	10'-8"	-	13'-11"	-	17'-5"
		1.55E LP LSL	5'-4"	8'-5"	11'-2"	14'-3"	14'-7"	17'-4"	18'-3"	5'-4"	8'-5"	11'-2"	14'-3"	14'-7"	17'-4"	18'-3"
24"	1.35E LP LSL	4'-9"	7'-6"	9'-10"	-	12'-11"	-	16'-2"	4'-9"	7'-6"	9'-10"	-	12'-11"	-	16'-2"	
	1.55E LP LSL	5'-0"	7'-10"	10'-4"	13'-2"	13'-6"	16'-1"	16'-11"	5'-0"	7'-10"	10'-4"	13'-2"	13'-6"	16'-1"	16'-11"	

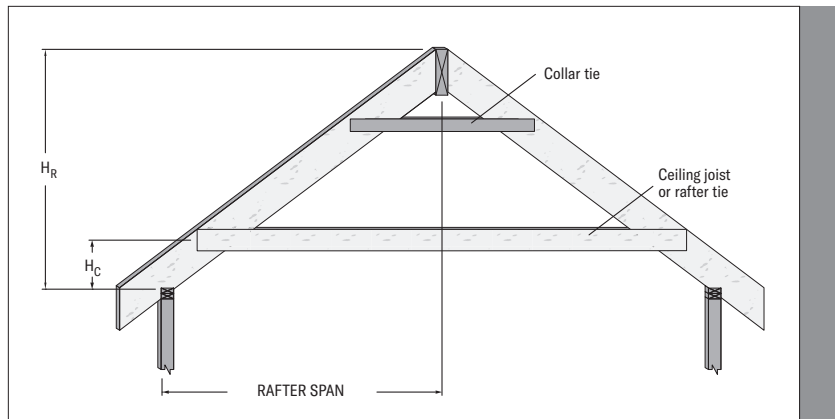
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- The tabulated rafter spans assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the rafter spans shall be multiplied by the factors given below:

H_C/H_R Rafter Span Adjustment Factor	
1/3	0.67
1/4	0.76
1/5	0.83
1/6	0.90
1/7.5 or less	1.00

Where: H_C = Height of ceiling joists or rafter ties measured vertically from the top of the rafter support walls to the center of the ceiling joist or rafter tie.

H_R = Height of roof ridge measured vertically from the top of the rafter support walls.



Rafter/Ceiling Joint Heel Connections

		Roof Assembly: 20 psf Dead Load																	
		Roof Live or Snow Load				Snow Load													
		20 psf				30 psf				50 psf				70 psf					
		Rafter Slope		Rafter Spacing		Roof Span (feet)													
12'	20'					28'	36'	12'	20'	28'	36'	12'	20'	28'	36'	12'	20'	28'	36'
		Required number of 16d (0.131" x 3-1/4") nails per heel joint splices																	
3:12	12"	5	8	11	13	6	9	13	-	8	13	-	-	10	-	-	-		
	16"	6	10	14	-	8	12	-	-	11	-	-	-	13	-	-	-		
	19.2"	7	12	-	-	9	15	-	-	13	-	-	-	-	-	-	-		
	24"	9	15	-	-	11	-	-	-	-	-	-	-	-	-	-	-		
4:12	12"	4	6	8	10	5	7	10	13	6	10	14	-	8	13	-	-		
	16"	5	8	11	13	6	9	13	-	8	13	-	-	10	-	-	-		
	19.2"	6	9	13	-	7	11	-	-	10	-	-	-	12	-	-	-		
	24"	7	11	-	-	9	14	-	-	12	-	-	-	15	-	-	-		
5:12	12"	3	5	7	8	4	6	8	10	5	8	11	14	6	10	14	-		
	16"	4	7	9	12	5	8	12	15	7	12	-	-	9	15	-	-		
	19.2"	5	8	11	14	6	10	13	-	8	13	-	-	10	-	-	-		
	24"	6	9	13	-	7	11	-	-	10	-	-	-	12	-	-	-		
6:12	12"	3	4	6	7	3	5	7	9	4	7	9	12	5	9	12	15		
	16"	3	5	7	9	4	6	9	11	6	9	12	-	7	11	-	-		
	19.2"	4	7	9	12	5	8	11	15	7	11	-	-	9	15	-	-		
	24"	5	8	11	14	6	10	14	-	8	14	-	-	11	-	-	-		
7:12	12"	3	4	5	6	3	5	6	8	4	6	8	11	5	8	11	14		
	16"	3	5	6	8	4	6	8	10	5	8	11	14	6	10	14	-		
	19.2"	3	5	7	9	4	7	9	12	6	9	13	-	7	12	-	-		
	24"	4	6	9	11	5	8	11	14	7	11	15	-	9	14	-	-		
8:12	12"	3	3	4	5	3	4	5	7	3	5	7	9	4	7	9	11		
	16"	3	4	6	7	3	5	7	9	4	7	9	12	5	9	12	15		
	19.2"	3	5	7	8	4	6	8	10	5	8	11	14	6	10	14	-		
	24"	4	6	8	10	5	7	10	13	6	10	14	-	8	13	-	-		
9:12	12"	3	3	4	5	3	3	5	6	3	5	6	8	4	6	8	10		
	16"	3	4	5	6	3	4	6	8	4	6	8	11	5	8	11	13		
	19.2"	3	4	6	7	3	5	7	9	5	7	10	13	6	9	13	-		
	24"	3	5	7	9	4	6	9	11	6	9	12	-	7	11	-	-		
10:12	12"	3	3	4	4	3	3	4	5	3	4	6	7	3	5	7	9		
	16"	3	3	5	6	3	4	6	7	4	6	8	10	4	7	10	12		
	19.2"	3	4	5	7	3	5	7	8	4	7	9	11	5	8	11	14		
	24"	3	5	7	8	4	6	8	10	5	8	11	14	6	10	14	-		
11:12	12"	3	3	3	4	3	3	4	5	3	4	5	7	3	5	7	8		
	16"	3	3	4	5	3	4	5	6	3	5	7	9	4	6	9	11		
	19.2"	3	4	5	6	3	4	6	8	4	6	8	10	5	8	10	13		
	24"	3	4	6	8	3	5	7	9	5	7	10	13	6	9	13	-		
12:12	12"	3	3	3	4	3	3	4	5	3	4	5	6	3	5	6	8		
	16"	3	3	4	5	3	3	5	6	3	5	6	8	4	6	8	10		
	19.2"	3	3	5	6	3	4	6	7	4	6	8	10	4	7	10	12		
	24"	3	4	6	7	3	5	7	9	4	7	9	12	5	9	12	15		

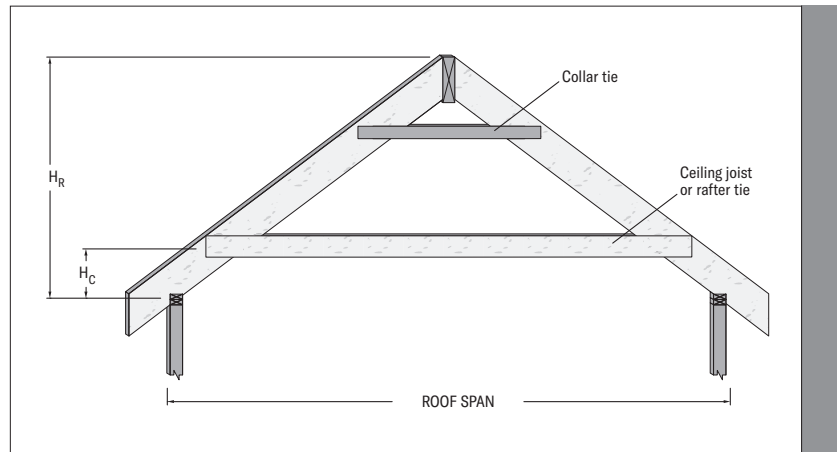
NOTES:

1. These tables are to be used in accordance with the conventional light-frame construction provisions of the IRC and IBC.
2. The tabulated heel connections assume that ceiling joists are located at the bottom of the attic space or that some other method of resisting the outward push of the rafters on the bearing walls, such as rafter ties, is provided at that location. When ceiling joists or rafter ties are located higher in the attic space, the number of nails shall be multiplied by the factors, but shall not exceed 15 nails.
3. Where number of nails is designated as "-" or the number of required nails as defined in #2 exceeds 15, connection shall be evaluated by a design professional.

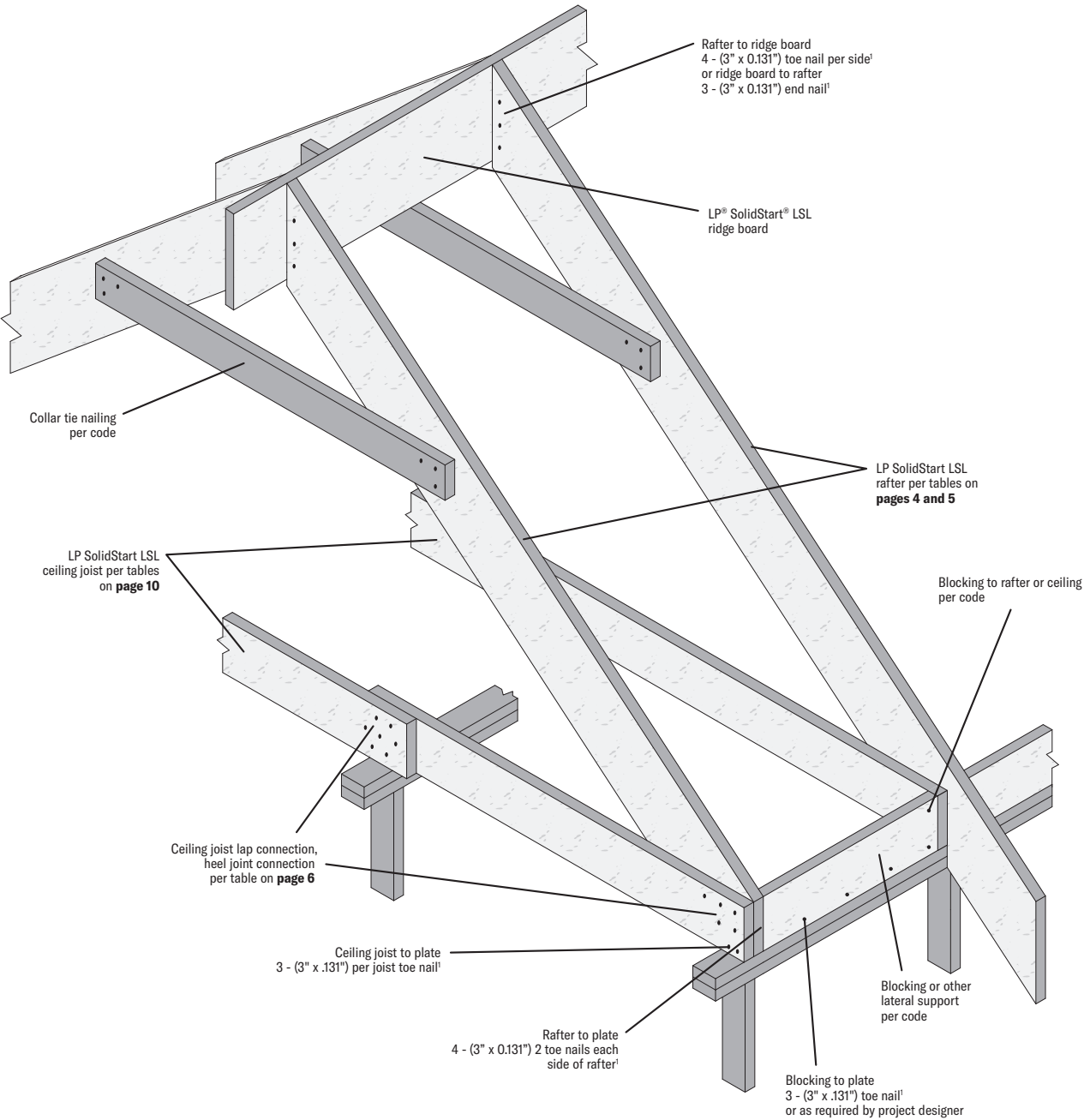
H_C/H_R Heel Joint Connection Adjustment Factor	
1/3	1.50
1/4	1.33
1/5	1.25
1/6	1.20
1/10 or less	1.11

Where: H_C = Height of ceiling joists or rafter ties measured vertically from the top of the rafter support walls to the center of the ceiling joist or rafter tie.

H_R = Height of roof ridge measured vertically from the top of the rafter support walls.



Prescriptive Rafter and Ceiling Connection Details



Note:
1. Or nailing as defined in Table R602.3(1) in the IRC

Installation Details

H11 BIRD'S MOUTH
(Lower Bearing Only)

LSL rafter

LSL/LVL blocking

Don't cut beyond inside face of bearing

H6 BLOCKING AT BEARING

3" diameter max. in mid-depth and middle 1/3 length

3" x 3" max. in center and middle 1/3 length

LSL rafter

K8x KNEE WALL
(Non-Load Bearing)

Do not allow contact when non-load bearing support

Rafter

Simpson® STC, USP® TR, or equal

Gap = Live/Snow Load deflection, to prevent bearing

Knee wall

Ceiling joist

H9 HIP/VALLEY SEAT CUT
(Minimum Depth at Bearing)

Hip or valley beam

d_h

d

MINIMUM DEPTH d_h REQUIRED AT BEARING	
Member Type	LP® SolidStart® LSL
Hip Member	.60d
Valley Member	.75d

K8 INTERIOR BEARING

LSL rafter

LSL/LVL blocking per code or project engineer

Bevel bearing plate or variable slope connector

NO seat cut at interior support

X3r LSL HOLE DETAILS

1 foot

1 foot

Maximum 2x diameter of larger hole

Area A

Area B

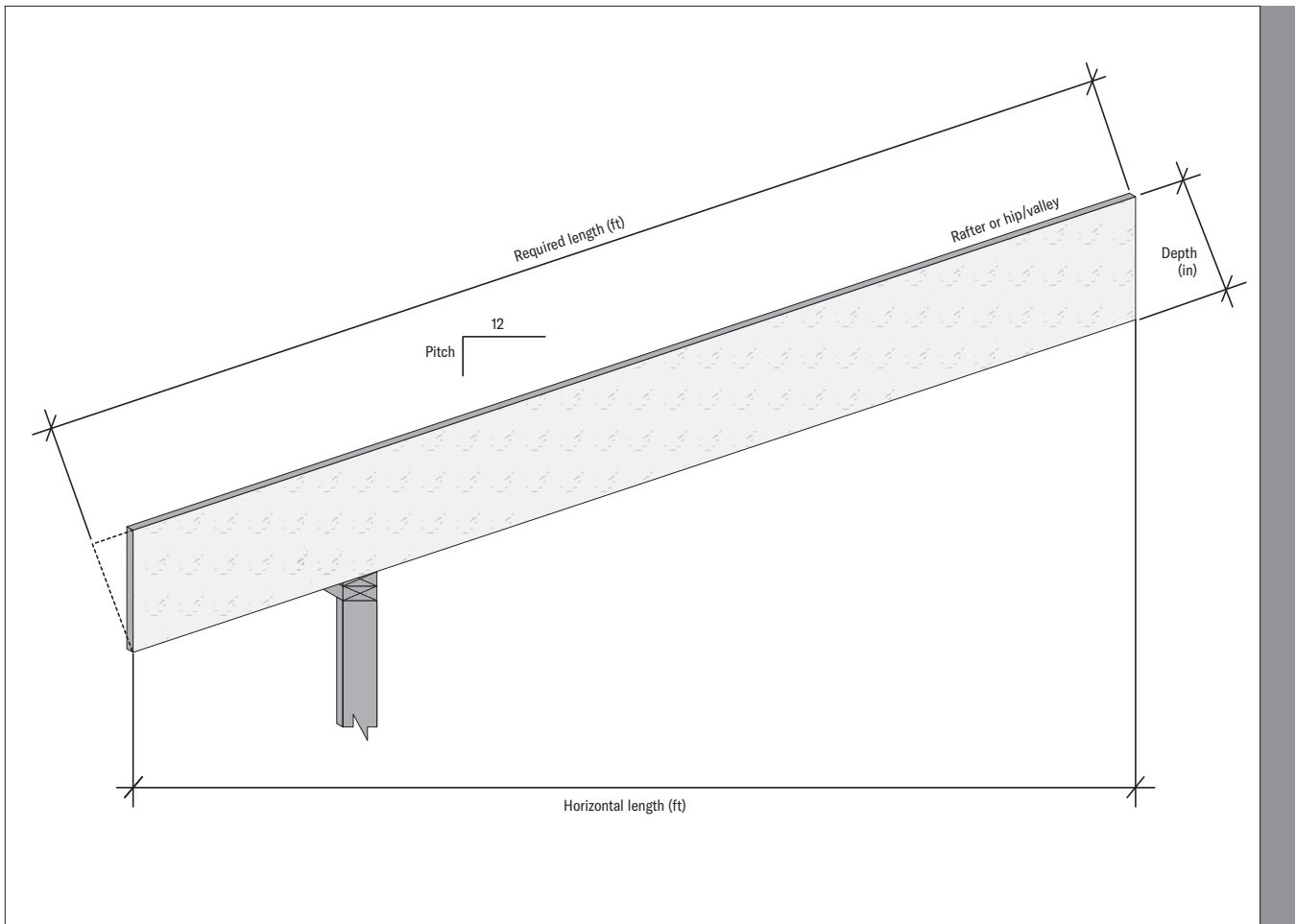
1/3 span length Clear length

1/3 Beam depth

NOTES:

- These guidelines apply to uniformly loaded rafter/beams selected from these tables. For all other applications, such as rafter/beams with concentrated loads, please contact your LP Engineered Wood Products distributor for assistance.
- Round holes can be drilled anywhere in "Area A" provided that: no more than four holes are cut, with the minimum spacing described in the diagram. The maximum hole size is 1-1/2" for depths up to 9-1/4", and 2" for depths greater than 9-1/4".
- Up to three 3/4" holes may be drilled in "Area B" to accommodate wiring and/or water lines. These holes must be at least 12" apart. The holes should be located in the middle third of the depth, or a minimum of 3" from the bottom of the beam. For rafter/beams shallower than 9-1/4", locate holes at mid-depth.
- Rectangular holes are NOT allowed.
- DO NOT drill holes in overhang without prior approval from the project designer.
- Other hole sizes and configurations MAY be possible with further engineering analysis. For more information, contact your LP Engineered Wood Products distributor.

Required Length for Sloped Members



PITCH FACTOR (symmetric roof pitches)										
Roof Pitch	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
Rafter	1.031	1.054	1.083	1.118	1.158	1.202	1.250	1.302	1.357	1.414
Hip / Valley	1.016	1.027	1.042	1.061	1.082	1.106	1.132	1.161	1.192	1.225

DEPTH FACTOR (symmetric roof pitches)										
Roof Pitch	3:12	4:12	5:12	6:12	7:12	8:12	9:12	10:12	11:12	12:12
Rafter	0.021	0.028	0.035	0.042	0.049	0.056	0.063	0.069	0.076	0.083
Hip / Valley	0.015	0.020	0.025	0.029	0.034	0.039	0.044	0.049	0.054	0.059

RAFTER LENGTH CALCULATOR

$$\text{Rafter Length (ft)} = \text{Horizontal Length (ft)} * \text{Pitch Factor} + \text{Depth (in)} * \text{Depth Factor}$$

HIP OR VALLEY LENGTH CALCULATOR

$$\text{Hip or Valley Length (ft)} = 1.414 * \text{Horizontal Length (ft)} * \text{Pitch Factor} + \text{Depth (in)} * \text{Depth factor}$$

Ceiling Joist Span Tables: 1-1/2" LP® SolidStart® LSL

LIVE LOAD = 10 PSF (UNINHABITABLE ATTIC WITHOUT STORAGE)								
Spacing	Grade	DEAD LOAD = 5 PSF						
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"
12"	1.35E LP LSL	11'-2"	17'-7"	23'-3"	-	26'-0"	-	26'-0"
	1.55E LP LSL	11'-9"	18'-5"	24'-4"	26'-0"	26'-0"	26'-0"	26'-0"
16"	1.35E LP LSL	10'-2"	16'-0"	21'-1"	-	26'-0"	-	26'-0"
	1.55E LP LSL	10'-8"	16'-9"	22'-1"	26'-0"	26'-0"	26'-0"	26'-0"
19.2"	1.35E LP LSL	9'-7"	15'-0"	19'-10"	-	26'-0"	-	26'-0"
	1.55E LP LSL	10'-0"	15'-9"	20'-9"	26'-0"	26'-0"	26'-0"	26'-0"
24"	1.35E LP LSL	8'-10"	13'-11"	18'-5"	-	24'-1"	-	26'-0"
	1.55E LP LSL	9'-3"	14'-7"	19'-3"	24'-7"	25'-3"	26'-0"	26'-0"

LIVE LOAD = 20 PSF (UNINHABITABLE ATTIC WITH LIMITED STORAGE)								
Spacing	Grade	DEAD LOAD = 10 PSF						
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"
12"	1.35E LP LSL	8'-10"	13'-11"	18'-5"	-	24'-1"	-	26'-0"
	1.55E LP LSL	9'-3"	14'-7"	19'-3"	24'-7"	25'-3"	26'-0"	26'-0"
16"	1.35E LP LSL	8'-0"	12'-8"	16'-8"	-	21'-10"	-	26'-0"
	1.55E LP LSL	8'-5"	13'-3"	17'-6"	22'-4"	22'-11"	26'-0"	26'-0"
19.2"	1.35E LP LSL	7'-7"	11'-11"	15'-8"	-	20'-7"	-	25'-8"
	1.55E LP LSL	7'-11"	12'-5"	16'-5"	21'-0"	21'-6"	25'-6"	26'-0"
24"	1.35E LP LSL	7'-0"	11'-0"	14'-6"	-	19'-1"	-	23'-10"
	1.55E LP LSL	7'-4"	11'-7"	15'-3"	19'-5"	20'-0"	23'-8"	25'-0"

LIVE LOAD = 30 PSF (HABITABLE ATTIC OR UNINHABITABLE ATTIC SERVED BY FIXED STAIR)								
Spacing	Grade	DEAD LOAD = 10 PSF						
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"
12"	1.35E LP LSL	7'-0"	11'-0"	14'-6"	-	19'-1"	-	23'-10"
	1.55E LP LSL	7'-4"	11'-7"	15'-3"	19'-5"	20'-0"	23'-8"	25'-0"
16"	1.35E LP LSL	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"
	1.55E LP LSL	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"
19.2"	1.35E LP LSL	6'-0"	9'-5"	12'-5"	-	16'-3"	-	20'-4"
	1.55E LP LSL	6'-3"	9'-10"	13'-0"	16'-7"	17'-0"	20'-2"	21'-3"
24"	1.35E LP LSL	5'-6"	8'-8"	11'-6"	-	15'-0"	-	18'-10"
	1.55E LP LSL	5'-9"	9'-1"	12'-0"	15'-4"	15'-9"	18'-8"	19'-9"

LIVE LOAD = 40 PSF (HABITABLE ATTIC)								
Spacing	Grade	DEAD LOAD = 10 PSF						
		3-1/2"	5-1/2"	7-1/4"	9-1/4"	9-1/2"	11-1/4"	11-7/8"
12"	1.35E LP LSL	6'-4"	10'-0"	13'-2"	-	17'-3"	-	21'-7"
	1.55E LP LSL	6'-8"	10'-6"	13'-10"	17'-8"	18'-1"	21'-5"	22'-8"
16"	1.35E LP LSL	5'-9"	9'-1"	11'-11"	-	15'-8"	-	19'-7"
	1.55E LP LSL	6'-0"	9'-6"	12'-6"	16'-0"	16'-5"	19'-5"	20'-6"
19.2"	1.35E LP LSL	5'-5"	8'-6"	11'-3"	-	14'-8"	-	18'-5"
	1.55E LP LSL	5'-8"	8'-11"	11'-9"	15'-0"	15'-5"	18'-3"	19'-3"
24"	1.35E LP LSL	5'-0"	7'-10"	10'-5"	-	13'-7"	-	17'-0"
	1.55E LP LSL	5'-3"	8'-3"	10'-11"	13'-11"	14'-3"	16'-11"	17'-10"

DESIGN ASSUMPTIONS:

1. These tables are to be used in accordance with the conventional light-frame construction provisions of the IRC and IBC.
2. Live load deflection is limited to a minimum of L/360 for habitable attic, L/240 for uninhabitable attic. Total load deflection is limited to a minimum of L/240 for habitable attic, L/180 for uninhabitable attic. Long term deflection (creep) has not been considered.
3. For conditions not shown, use LP's design software or contact your LP SolidStart Engineered Wood Products distributor for assistance.
4. These tables assume full lateral support of the compression edge. Full support is considered to be a maximum unbraced length of 24".

Product Specifications & Design Values

ALLOWABLE STRESS DESIGN VALUES (PSI)					
Material	Grade	Bending Stress ⁴ F _b	Modulus of Elasticity ⁵ E (x10 ⁹)	Shear Stress F _v	Compression Stress (perpendicular to grain) F _{c⊥}
LP® SolidStart® LSL	1730F _b -1.35E	1730	1.35	410	750
	2360F _b -1.55E	2360	1.55	410	875

NOTES:

- LP SolidStart LSL shall be designed for dry-use conditions only. Dry-use applies to products installed in dry, covered and well ventilated interior conditions in which the equivalent moisture content in lumber will not exceed 16%. Adjustments for high temperature are beyond the scope of this guide.
- The allowable stress design values in this table are for loads applied parallel to the wide face of the strands.
- The allowable strengths and stiffness are for normal load duration (10 year). Bending and Shear shall be adjusted according to code. Modulus of Elasticity and Compression perpendicular-to-grain shall not be adjusted.
- The allowable Bending, F_b, for LP SolidStart LSL is tabulated for a standard 12" depth. For depths other than 12", multiply F_b by (12/depth)^{0.120}. For depths less than 3-1/2", adjust F_b by 1.159.
- Deflection calculations for LP SolidStart LSL shall include both bending and shear deformations.

Deflection for a simple span,
uniform load:

$$\Delta = \frac{270wl^4}{Ebd^3} + \frac{28.8wl^2}{Ebd}$$

Where: Δ = deflection (in)
w = uniform load (plf)
L = design span (ft)

E = modulus of elasticity (psi)
b = width (in)
d = depth (in)

Equations for other conditions can be found in engineering references.

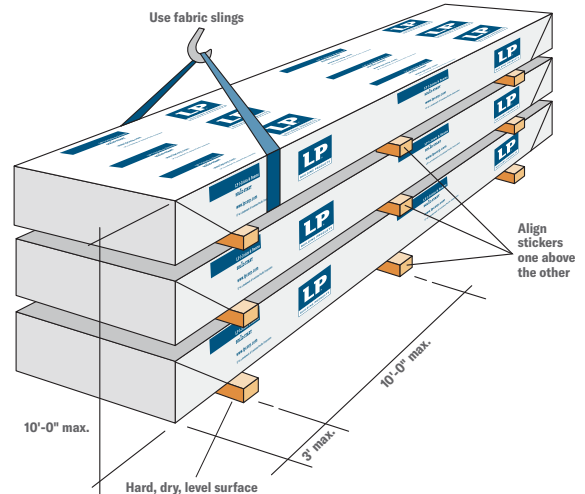
NAIL SPACING REQUIREMENTS					
LSL Ply Thickness	Fastener Orientation	Nail Size (common or box)	Minimum End Distance	Minimum Nail Spacing per Row	
				Single Row	Multiple Row
≥ 1-1/2"	Edge ⁷	8d & smaller	2"	3"	3"
		10d & 12d	2"	3"	4"
		16d ⁵	2-1/2"	4" ⁴	6"
	Face ⁸	8d & smaller	7/8"	1"	
		10d & 12d	7/8"	1"	
		16d ⁵	7/8"	1-1/2"	

NOTES:

- Edge distance shall be such that the nails do not cause splitting.
- Multiple rows of nails shall be offset at least 1/2" and staggered, and equally spaced about the centerline of the edge or face (whichever applies).
- Edge orientation refers to nails driven into the narrow edge of the LSL, parallel to the face of the strands. Face orientation refers to nails driven into the wide face of the LSL, perpendicular to the face of the strands. (See Fastener & Load Orientation details above.)
- Single row spacing for 16d nails into the edge can be reduced to 3" for 1-3/4" or thicker LSL.
- 16d sinkers (3-1/4" x 0.148"Ø) can be spaced the same as the 10d and 12d nails.
- Minimum end distance may be reduced to 2" when the nail penetration into the edge of the LSL does not exceed more than 1-3/8".
- Nail penetration for edge nailing must not exceed 2 inches for 16d common nails (0.162" diam. x 3-1/2") and 2-1/2" for all other nails with a smaller shank diameter.
- Minimum nail spacing for the face orientation is applicable to nails that are installed in rows that are parallel to the length of the LSL. For nails driven into the face in rows that are perpendicular to the length of the LSL, the minimum spacing must be sufficient to prevent splitting of the wood.

HANDLING & STORAGE GUIDELINES

- **WARNING:** Failure to follow proper procedures for handling, storage and installation could result in unsatisfactory performance, unsafe structures and possible collapse.
- Keep LP® SolidStart® Engineered Wood Products dry. These products are intended to resist the effects of moisture on structural performance from normal construction delays but are not intended for permanent exposure to the weather.
- Unload products carefully, by lifting. Support the bundles to reduce excessive bowing. Individual products should be handled in a manner which prevents physical damage during measuring, cutting, erection, etc. I-Joists shall be handled vertically and not flatwise.
- Keep products stored in wrapped and strapped bundles, stacked no more than 10' high. Support and separate bundles with 2 x 4 (or larger) stickers spaced no more than 10' apart. Keep stickers in line vertically.
- Product must not be stored in contact with the ground, or have prolonged exposure to the weather.
- Use forklifts and cranes carefully to avoid damaging product.
- Do not use a visually damaged product. Call your local LP SolidStart Engineered Wood Products distributor for assistance when damaged products are encountered.
- For satisfactory performance, LP SolidStart Engineered Wood Products must be used under dry, covered and well-ventilated interior conditions in which the equivalent moisture content in lumber will not exceed 16%.
- For built-up members, LP SolidStart I-Joists, LSL and LVL shall be dry before nailing or bolting to avoid trapping moisture.
- LP SolidStart I-Joists, LSL and LVL shall not be used for unintended purposes such as ramps and planks.



LP SolidStart LSL

1.35E and 1.55E

Standard Thickness of 1-1/2" (also available in 1-3/4" and 3-1/2")

Standard Depths of 3-1/2", 5-1/2", 7-1/4", 9-1/4" (1.55E only), 9-1/2", 11-1/4" (1.55E only) and 11-7/8" (other depths are available)

Lengths up to 48". Longer lengths may be available for 1-3/4" and 3-1/2" thicknesses.

Not all grades are available in all sizes, contact your local distributor for availability.

CODE EVALUATION

Code evaluation reports can be obtained at www.lpcorp.com

ICC-ES ESR-2403

APA PR-L280

Florida FL15228

LP City RR-25783

For more information on the full line of LP SolidStart Engineered Wood Products or the nearest distributor, visit our web site at LPCorp.com.

Phone: 1-888-820-0325

E-mail: customer.support@LPCorp.com.

LP SolidStart Engineered Wood Products are manufactured at different locations in the United States and Canada.

Please verify availability with the LP SolidStart Engineered Wood Products distributor in your area before specifying these products.



Good for you. Good for our forests.
www.sfi.org

BV-SFICOC-US09000262



PEFC/29-31-102



For product catalog & complete warranty details, visit LPCorp.com

Cal. Prop 65 Warning:



WARNING: Drilling, sawing, sanding or machining wood products can expose you to wood dust, a substance known to the State of California to cause cancer. Avoid inhaling wood dust or use a dust mask or other safeguards for personal protection. For more information go to www.P65Warnings.ca.gov/wood.

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