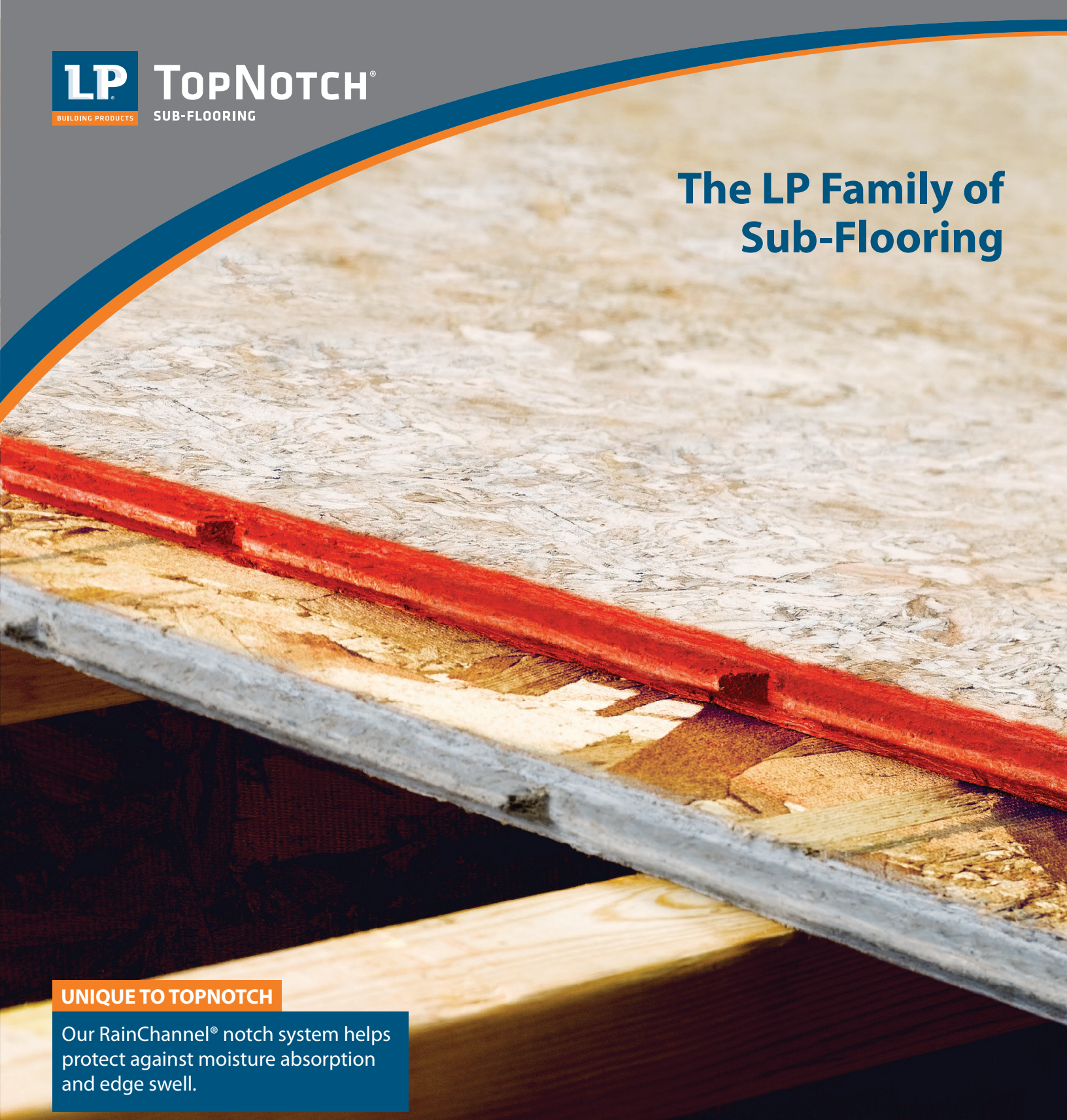
LP BUILDING PRODUCTS

TopNotch®
SUB-FLOORING

The LP Family of Sub-Flooring



UNIQUE TO TOPNOTCH

Our RainChannel® notch system helps protect against moisture absorption and edge swell.

- Engineered specifically for sub-flooring applications
- Designed for strength and moisture resistance
- Easy installation
- Available in two performance solutions: 250 and 350

Technical Guide

LPCorp.com

LP TopNotch® SUB-FLOORING

LP® TOPNOTCH® SUB-FLOORING

Engineered specifically for sub-flooring applications, LP® TopNotch® Sub-Flooring delivers the strength and moisture resistance you need at a price you can afford. Since climates and building practices vary, we offer two different solutions in the LP TopNotch line. All LP TopNotch products feature a self-spacing tongue-and-groove profile for easy installation, as well as our RainChannel® notch system that helps protect against moisture absorption and edge swell. LP TopNotch products are backed by up to a 200-Day No-Sand Warranty and up to a 50-Year Transferable Limited Warranty.

RainChannel® Self-Draining Notch System

The RainChannel® self-draining notch system—utilized in every LP TopNotch solution—allows water to drain quickly from the surface. Combined with a moisture-resistant edge seal, the RainChannel system helps fight moisture absorption and edge swell, reducing the need for sanding.

Product Standards and Certifications

LP® OSB structural panels are trademarked by the APA and manufactured in conformance with U.S. Voluntary Product Standard PS2, which is recognized in the International Building Code and the International Residence Code. LP OSB structural panels meet the requirements specified in the International Code Council Evaluation Service (ICC-ES) Evaluation Report ESR-2586 and HUD Use of Materials Bulletin No. 40c.

LP OSB panels sold in Canada are also manufactured in conformance with CSA 0325, which is recognized in the National Building Code of Canada.

The Product You Need, When You Need It

LP is a leader in strand technology across a variety of engineered wood products. Consistent product quality and regional product availability help ensure that LP TopNotch sub-flooring is available where and when you need it. And when you use LP products, you have access to world-class customer service and local market product support.

LP TopNotch 250 OSB Sub-Flooring

The Leading Commodity Tongue-And-Groove Sub-Flooring

The best-selling commodity sub-flooring, LP® TopNotch® 250 OSB Sub-Flooring is designed for optimum stability in both directions. Used by top builders and carried by leading suppliers, LP TopNotch 250 is backed by a 25-Year Transferable Limited Warranty.

- Unique RainChannel® Notch System
- Easy Self-Spacing Tongue-And-Groove Design
- 25-Year Transferable Limited Warranty

LP® TopNotch®250 Series 25 YEAR TRANSFERABLE LIMITED WARRANTY

See full warranty details at LPCorp.com or call 1-888-820-0325.

LP TopNotch 350 OSB Sub-Flooring

The Best Value In Durable Sub-Flooring

Used by top builders and carried by leading suppliers, LP® TopNotch® 350 durable sub-flooring is designed for optimum stability in both directions, and its smooth surface is sanded to lay flat. LP TopNotch 350 creates a strong, smooth foundation for a variety of finished flooring. We back LP TopNotch 350 with a 200-day "no-sand" warranty and a 50-year transferable limited warranty.

- Unique RainChannel® Notch System
- Strength, Stiffness And Moisture Resistance At A Great Price
- Easy Self-Spacing Tongue-And-Groove Design
- 200-Day "No-Sand" Warranty
- 50-Year Transferable Limited Warranty

LP® TopNotch®350 Series 50 YEAR TRANSFERABLE LIMITED WARRANTY

See full warranty details at LPCorp.com or call 1-888-820-0325.

Which Solution Is Right For You?

	Strength	Moisture Resistance	Fully Sanded Face	No-Sand Warranty	Transferable Limited Warranty
LP TOPNOTCH 250	Excellent	Excellent	No	N/A	25 Years
LP TOPNOTCH 350	Excellent	Superior	Yes	200 Days	50 Years

Available Performance Categories*

Sub-flooring panels are available in the following Performance Categories: 19/32, 5/8, 23/32, 3/4, 7/8, 1, 1 1/8

* This designation is related to the panel thickness range that is linked to the nominal panel thickness designations used in the International Building Code (IBC) and International Residential Code (IRC).

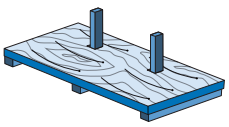
Product Design Capacities

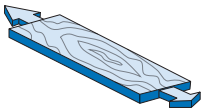
The design capacities listed in Table 1 below are based on information from the APA publication *Panel Design Specifications* and represent capacities for the span rating and performance categories. They do not have to be adjusted for grade. For Structural 1 Grade, it is acceptable to multiply the tabulated capacity by the multiplier in the far right column of the table.

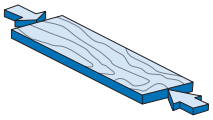
Table 1

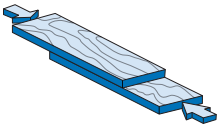
Panel Design Capacity Values for LP TopNotch Flooring (TN250 & TN350)							
	Span Rating/ Performance Category	**Stress Applied To[a]**	**20 oc 19/32, 5/8**	**24 oc 23/32**	**32 oc 7/8**	**48 oc 1-1/8**	**Structural 1 Multiplier[e]**
Bending[b]	Stiffness, EI (lb-in^2/ft of panel width)	Primary Axis	210,000	300,000	650,000	1,150,000	1.0
		Secondary Axis	40,500	80,500	235,000	495,000	1.6
	Strength, F_bS (lb-in/ft of panel width)	Primary Axis	575	770	1,050	1,900	1.0
		Secondary Axis	250	385	685	1,200	1.5
Axial[c]	Tension, F_tA (lb/ft of panel width)	Primary Axis	2,900	3,350	4,000	5,600	1.0
		Secondary Axis	2,100	2,550	3,250	4,750	1.0
	Compression, F_cA (lb/ft of panel width)	Primary Axis	4,200	5,000	6,300	8,100	1.0
		Secondary Axis	4,000	4,300	6,200	6,750	1.0
	Stiffness, EA (lb/ft of panel width)	Primary Axis	5,000,000	5,850,000	7,500,000	8,200,000	1.0
		Secondary Axis	2,900,000	3,300,000	4,200,000	4,600,000	1.0
Shear[d]	Shear In The Plane, F_s(lb/Q) (lb/ft of panel width)	Primary Axis	205	250	300	385	1.0
		Secondary Axis	205	250	300	385	1.0
	Rigidity Through The Thickness, G_vt_v (lb/in of panel depth)	Primary Axis	87,000	93,000	110,000	155,000	1.0
		Secondary Axis	87,000	93,000	110,000	155,000	1.0
	Shear Through The Thickness, F_vt_v (lb/in of shear-resisting panel length)	Primary Axis	195	215	230	305	1.0
		Secondary Axis	195	215	230	305	1.0

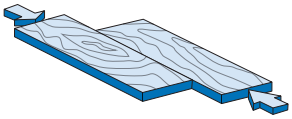
(a) Unless otherwise noted, the Primary Axis is the long dimension of the panel.
(b) Testing according to the principles of ASTM D 3043 Method C (Stiffness and Strength).
(c) Testing according to the principles of ASTM D 3500 Method B (Tension), ASTM D 3501 Method B (Compression and Stiffness).
(d) Testing according to the principles of ASTM D 2718 (Plane), ASTM D 2719 (Rigidity Through the Thickness and Shear Through the Thickness).
(e) For Structural 1 Grade panels, use multiplier to increase values.


Bending


Axial Tension


Axial Compression


Shear-in-the-Plane


Shear-through-the-Thickness

Fastener Properties and Adjustment Tables

Dowel bearing strength is a component in fastener yield equations, as found in the National Design Specification (NDS) for Wood Construction. Table 2 below summarizes the dowel bearing strength for nail connections of TopNotch products, using terminology contained in the NDS.

The design capacity values apply to panels under moisture conditions that are continuously dry in service, where moisture content is expected to be < 16%. Table 3 below contains adjustment factors to be used when moisture conditions exceed 16%.

Table 2

Dowel Bearing Properties (TN250 & TN350)		
Product	**Lateral Equivalent Specific Gravity, ESG**	**Dowel Bearing Strength[(a)], F_e**
All Grades	0.50	4,650 psi (32 MPa)

(a) Dowel Bearing Strength testing is in accordance with the principles of ASTM D 5764.

Table 3

Moisture Adj. Factors (TN250 & TN350)	
Capacity	**Moisture Content Adjustment Factor C_m**
Strength (F_bS, F_tA, F_cA, $F_s[Ib/Q]$, F_vt_v)	0.75
Stiffness (EI, EA, G_vt_v)	0.85
Bearing ($F_{C\perp}A$)	0.20

The design capacity values are based on "normal duration of load" as traditionally used for solid wood in accordance with National Design Specifications (NDS) Appendix B, and also apply to structural panels. Where applicable, the design capacity "strength" values can be adjusted with the factors in Table 4.

Wood-based panels under constant load may creep (deflection will increase) over time. Under normal construction applications, panels are not under constant load. When panels sustain permanent loads that stress the panels to > 1/2 of their design strength capacity, account for creep by using the adjustment factors in Table 5 for calculating deflection.

Table 4

Duration of Load Adj. Factors (TN250 & TN350)	
Time Under Load	**DOL Adjustment Factor* C_D**
Permanent	0.90
Normal	1.00
Two Months	1.15
Seven Days	1.25
Wind or Earthquake	1.60**

* Adjustment for impact load does not apply to structural-use panels.
** Check local building code.

Table 5

Creep Adj. Factors (TN250 & TN350)	
Moisture Condition	**Creep Adjustment Factor (C_c) for Permanent Loads**
Dry	1/2
16% m.c. or greater	1/6

Property Stresses

Design stresses can be calculated by dividing the design capacity values, found in Table 1, by the sectional properties in Table 6. The values in Table 6 do not have to be adjusted for panel grade.

Table 6

Panel Section Properties[(a)] (TN250 & TN350)							
Performance Category	**Nominal Thickness (in)**	**Approximate Weight[(b)] (psf)**	**Area A (in^2/ft)**	**Moment of Inertia I (in^4/ft)**	**Section Modulus S (in^3/ft)**	**Statical Moment Q (in^3/ft)**	**Shear Constant Ib/Q (in^2/ft)**
19/32″	0.594	2.0	7.125	0.209	0.705	0.529	4.750
5/8″	0.625	2.1	7.500	0.244	0.781	0.586	5.000
23/32″	0.719	2.4	8.625	0.371	1.033	0.775	5.750
3/4″	0.750	2.5	9.000	0.422	1.125	0.844	6.000
7/8″	0.875	2.9	10.500	0.670	1.531	1.148	7.000
1″	1.000	3.3	12.000	1.000	2.000	1.500	8.000
1-1/8″	1.125	3.6	13.500	1.424	2.531	1.898	9.000

Note: 1″ = 25.4 mm; 1 psf = 4.88 kg/m^2; 1 in^2/ft width = 2116.67 mm^2/m width; 1 in^3/ft width = 53763 mm^3/m width; 1 in^4/ft width = 1.3656x10^6 mm^4/m width.
(a) Properties are based on rectangular cross-section of 1-ft width. (b) Approximate weight of OSB made with predominantly Aspen species. Add 10% to value for OSB made with predominantly Southern Pine species.

Builder Considerations for a Better Floor

Allow panels to acclimate to the surrounding atmospheric moisture conditions, ensuring the panels are as dimensionally stable as possible before installation and before applying finished floor products. In the event panels become saturated after installation, allow them to dry before reconditioning the surface—sanding swollen ends/edges—before installing finished flooring.

Design floor systems to exceed Local Code minimum standards. To increase stiffness and strength capacity, help avoid unwanted noise and improve the overall feel of the floor, consider the following:

- Glue and nail flooring to the supports, using glues conforming to the AFG-01 Performance Standard.
- Apply a thin bead of glue in the groove of each panel prior to installation.
- Choose a panel with a greater span rating than required (e.g. apply a TopNotch panel rated for 24" o.c. over supports spaced 16" o.c.).
- Use larger supports or narrow support spacing. To learn more about the influence of these variables, use LP's system design software, "Wood-E," obtainable at: http://lpcorp.com/wood-e/resources/

See LP's TopNotch installation instructions for complete details.

Uniform Loads

The uniform load values in Table 7 apply to all TopNotch single-layer flooring panels manufactured in accordance to the Voluntary Product Standard PS 2. These values were calculated using the design capacity values in Table 1. These loads are recommended when engineering principles are used for design.

Table 7

Uniform Loads (psf) on LP TopNotch Flooring (TN250 & TN350)
Multi-Span, Normal Duration of Load, Dry Conditions, Panels 24 Inches or Wider.

			Strength Axis[a]										Strength Axis[a]		
Span Rating[b]		Load Governed By	Perpendicular to Supports Span Center-to-Center of Supports (inch)										Parallel to Supports Span Center-to-Center of Supports (inch)		
			12	16	19.2	24	30	32	36	40	48	60	12	16	24
20 oc	Deflection	L/480	685	258	141	68	33	27	24	17	11		132	50	17
		L/360	914	344	188	91	45	36	32	23	15		176	66	22
		L/240	1,370	516	282	137	67	55	48	34	22		264	99	34
		L/180	1,827	687	376	182	89	73	64	46	30		352	133	45
		Bending	479	270	187	120	77	67	43	35	24		208	117	42
		Shear	390	283	232	182	144	134	114	102	88		390	283	175
24 oc	Deflection	L/480	979	368	201	98	48	39	34	25	16	8	263	99	33
		L/360	1,305	491	269	130	64	52	46	33	21	10	350	132	44
		L/240	1,958	736	403	195	96	78	69	49	32	16	525	198	67
		L/180	2,610	982	537	260	128	104	91	66	43	21	700	263	89
		Bending	642	361	251	160	103	90	57	46	32	21	321	180	64
		Shear	476	345	282	222	175	164	139	125	108	85	476	345	213
32 oc	Deflection	L/480	2,121	798	437	211	104	84	74	53	35	17	767	288	97
		L/360	2,828	1,064	582	282	138	113	99	71	46	23	1,022	385	130
		L/240	4,242	1,596	873	423	207	169	148	107	70	34	1,534	577	195
		L/180	5,656	2,128	1,164	564	276	225	198	142	93	45	2,045	769	260
		Bending	875	492	342	219	140	123	78	63	44	28	571	321	114
		Shear	571	414	339	267	211	197	167	150	129	102	571	414	256
48 oc	Deflection	L/480	3,752	1,412	772	374	183	149	131	94	62	30	1,615	608	205
		L/360	5,003	1,882	1,030	499	244	199	175	126	82	40	2,154	810	273
		L/240	7,505	2,823	1,545	748	367	299	263	189	123	60	3,230	1,215	410
		L/180	10,006	3,764	2,060	998	489	399	350	252	164	80	4,307	1,620	547
		Bending	1,583	891	618	396	253	223	141	114	79	51	1,000	563	200
		Shear	733	531	435	342	270	252	214	192	166	131	733	531	329

(a) The strength axis is the long panel dimension unless otherwise identified.
(b) Nominal thickness may vary within Span Rating. For range of thicknesses, see Table 5 of APA's Panel Design Specifications, Form D510.

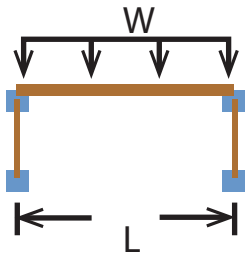
Additional Notes

When strength axis is perpendicular to supports:
- Used 3-span condition formulas for supports ≤ 32″ oc.
- Used 2-span condition formulas for supports > 32″ oc.
- Assume 2x support members for spans < 48″ oc (actual 1.5″).
- Assume 4x support members for spans ≥ 48″ oc (actual 3.5″)

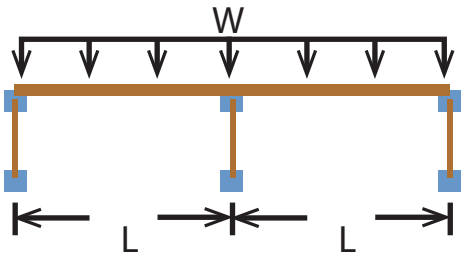
When strength axis is parallel to supports:
- Used 3-span condition formulas for supports ≤ 16″ oc.
- Used 2-span condition formulas for supports > 16″ oc.
- Assumed 2x support members for all spans (actual 1.5″).

Calculations for Uniform Load Table

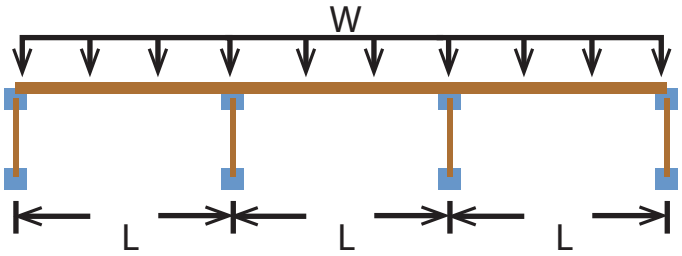
	One-Span Equations	Two-Span Equations	Three-Span Equations
Deflection EI	$W_d = \frac{\Delta\ 921.6\ EI}{\ell_3^4}$	$W_d = \frac{\Delta\ 2220\ EI}{\ell_3^4}$	$W_d = \frac{\Delta\ 1743\ EI}{\ell_3^4}$
Bending Capacity F_bS	$W_b = \frac{96\ FbS}{\ell_1^2}$	$W_b = \frac{96\ FbS}{\ell_1^2}$	$W_b = \frac{120\ FbS}{\ell_1^2}$
Shear Capacity F_s(lb/Q)	$W_s = \frac{24\ F_s(lb/Q)}{\ell_2}$	$W_s = \frac{19.2\ F_s(lb/Q)}{\ell_2}$	$W_s = \frac{20\ F_s(lb/Q)}{\ell_2}$



One-Span



Two-Span



Three-Span

The following definitions apply to the formulas used to calculate uniform loads:

W Uniform Load (psf)
W_b Uniform Load based on Bending Capacity (psf)
W_d Uniform Load based on Deflection (psf)
W_s Uniform Load based on Shear Capacity (psf)
Δ Deflection (in) (e.g. L/360)
L Span (in)
ℓ_1 Span - center to center of supports (in)
ℓ_2 Clear Span - center to center of supports minus support width (in)
ℓ_3 Clear Span + SW (in)
SW Support width factor (in)
- 0.25 for 2x lumber
- 0.625 for 4x lumber

F_bS Design Bending Strength Capacity
EI Design Bending Stiffness Capacity
F_s(lb/Q) Design Shear (In the Plane) Capacity

Example of Calculating Uniform Load

Problem: Calculate the maximum allowable uniform loads (psf) for 19/32˝ flooring (span rated a 20 oc) applied with the panel's long axis perpendicular to supports spaced at 19.2˝.

Key Variables and Assumptions
- 19/32˝ panel with 20 oc Span Rating
- 2X (actual 1.5˝) supports spaced 19.2˝
- Strength Axis of panel applied perpendicular to supports
- Panels are full size (4´ x 8´)
- Use the 3-Span formula
- Deflection Limit = L/360

Calculate uniform load based on Bending Stiffness

$$W_d = \frac{\Delta\ 1743\ EI}{\ell_3^4}$$

Retrieve EI (Primary Axis) for the 20 oc span from Table 1
$W_d = (L/360 \times 1{,}743 \times 210{,}000)/\ell_3^4$
$W_d = (19.2/360 \times 1{,}743 \times 210{,}000)/(17.7 + 0.25)^4$
$W_d = 19{,}521{,}600/103{,}814$
$W_d = 188$ psf

Calculate uniform load based on Bending Strength

$$W_b = \frac{120\ F_bS}{\ell_1^2}$$

Retrieve F_bS (Primary Axis) for the 20 oc span from Table 1
$W_b = 120 \times 575/\ell_1^2$
$W_b = 69{,}000/(19.2)^2$
$W_b = 69{,}000/369$
$W_b = 187$ psf

Calculate uniform load based on Shear Capacity

$$W_s = \frac{20\ F_s(Ib/Q)}{\ell_2}$$

Retrieve $F_s(Ib/Q)$ (Primary Axis) for the 20 oc span from Table 1
$W_s = (20 \times 205)/\ell_2$
$W_s = 4{,}100/(19.2 - 1.5)$
$W_s = 4{,}100/17.7$
$W_s = 232$ psf

Note: In addition to panel span ratings, floor performance is also influenced by support member size, spacing and span. To see the influence of these variables on floor performance, use LP's Wood-E Design Software or Solutions Software, obtainable at: http://lpcorp.com.

Proper Storage and Handling

LP TopNotch Series products are manufactured to the Exposure 1 Bond Classification, meaning they are suitable for uses not permanently exposed to the weather elements and they are intended to resist the effects of moisture on structural performance due to construction delays or other conditions of similar severity. As such, proper handling and storage is advised.

Follow these basic rules for best possible results:
- Store units at least 4" off of the ground and preferably on higher ground, not by puddles or surface water.
- Support the units with dunnage placed in the center and 12"–16" from each end.
- Place a sheet of plastic or tarping over the unit in a manner that allows air to circulate around the unit. This may require pulling the bottom of the sheet away from the unit and staking it into the ground.
- Handle the units with care when moving them with heavy equipment.

LP BUILDING PRODUCTS TopNotch® SUB-FLOORING

For more information on LP products, visit our website at LPCorp.com.

Phone: 1-888-820-0325
Fax: 1-877-523-7192
Email: customer.support@lpcorp.com

⚠ Cal. Prop 65 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

SUSTAINABLE FORESTRY INITIATIVE
SFI-00003