APA PRODUCT REPORT®

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AinsworthEngineered® Durastrand® LSL & OSL PR-L260
Ainsworth Lumber Co. Ltd. Revised December 2, 2011

Products: ***Ainsworth****Engineered* Durastrand® 1.7E LSL, 1.5E OSL, 1.3E OSL, and 0.8E OSL
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1. Basis of the product report:
   - 2012 and 2009 International Building Code (IBC): Sections 104.11 Alternative Materials and 2303.1.9 Structural composite lumber
   - 2012 and 2009 International Residential Code (IRC): Section R104.11 Alternative Materials
   - ASTM D5456-09 and ASTM D5456-05a recognized by the 2012 and 2009 IBC, respectively
   - APA Reports T99Q-22, T2003Q-25, T2006P-59, T2006P-60, T2006P-61, T2006P-62, T2006P-67, T2006P-69, T2006P-91, T2007P-53, T2008P-87, T2008P-88, T2011P-21, and other qualification data and engineering analyses

2. Product description:
   AinsworthEngineered Durastrand LSL and OSL are made with strands of various species and strand classifications in accordance with the in-plant manufacturing standard approved by APA. AinsworthEngineered Durastrand 1.7E LSL, 1.5E OSL and 1.3E OSL are available in thicknesses from 1-3/4 to 5-1/4 inches, widths up to 24 inches, and lengths up to 48 feet. AinsworthEngineered Durastrand 0.8E OSL is available in a thickness of 1-1/4 inches, widths up to 24 inches, and lengths up to 24 feet.

3. Design properties:
   Table 1 lists the design properties, Table 2 lists the equivalent specific gravities for fastener design for AinsworthEngineered Durastrand LSL and OSL, Table 3 lists the allowable loads for rim boards, and Table 4 lists the allowable nail spacing. The allowable spans for AinsworthEngineered Durastrand LSL and OSL shall be engineered using the information provided in this report. Table 5 presents the allowable spans for 1-1/4-inch AinsworthEngineered Durastrand 0.8E OSL when used as residential stair stringers.

4. Product installation:
   AinsworthEngineered Durastrand LSL and OSL shall be installed in accordance with the engineering drawing approved by the engineer of record. Permissible details and allowable hole sizes shall be in accordance with the engineering drawing. When used as rim boards, AinsworthEngineered Durastrand LSL and OSL shall be permitted to be constructed in accordance with the *Rim Board Hole Specifications* provided by APA *Performance Rated I-Joists*, Form Z725 (www.apawood.org/publications). When used as residential stair stringers, AinsworthEngineered Durastrand 0.8E OSL shall be constructed in accordance with the *Durastrand OSL Rimboard – for Stair Stringers Technical Bulletin* (www.ainsworthengineered.com/Rimboard-Stair-Stringer-Tech-Aug07.pdf).

5. Fire-rated assemblies:
   The provisions of IBC Section 721.6.3, design of fire-resistant exposed wood members, shall be applicable to AinsworthEngineered Durastrand LSL and OSL. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by APA Design/Construction Guide: *Fire-Rated Systems*, Form W305 (www.apawood.org/publications).

6. Limitations:
   a) AinsworthEngineered Durastrand LSL and OSL shall be designed in accordance with the applicable code using the design properties specified in this report.
   b) AinsworthEngineered Durastrand LSL and OSL are limited to dry service conditions where the average equilibrium moisture content of sawn lumber is less than 16 percent.
   c) AinsworthEngineered Durastrand LSL and OSL is produced by Ainsworth Lumber Co. Ltd. at Ainsworth's facilities in Grande Prairie, Alberta, and 100 Mile House, British Columbia, under a quality assurance program audited by APA.
   d) This report is subject to re-examination in one year.

7. Identification:
   The AinsworthEngineered Durastrand LSL and OSL described in this report are identified by a label bearing the manufacturer's name and/or trademark (***Ainsworth****Engineered*®), the APA assigned plant number (454 for the Grande Prairie Plant, and 445 for the 100 Mile House Plant), the product grade, the APA logo, the report number PR-L260, and a means of identifying the date of manufacture.

Table 1. Design Properties (Allowable Stress Design) for ***Ainsworth****Engineered* Durastrand LSL and OSL[a]

GRADE	E[b] (10^6 psi)	AXIAL (psi)		JOIST/BEAM EDGE LOADING[c] (psi)			PLANK FACE LOADING (psi)		
		F_t[d,e]	F_c	F_b[f,g,h]	F_v	$F_{c\perp}$	F_b[f]	F_v	$F_{c\perp}$
1.7E	1.7	2,050	2,050	2,150	400	1,200	2,800	150	325
1.5E	1.5	1,775	1,775	1,750	400	1,150	2,550	130	325
1.3E	1.3	1,300	1,300	1,625	350	1,150	2,000	115	285
0.8E	0.8	680	1,100	1,130	355	1,415	-	-	-

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lbf =4.448 N, 1 psi = 6.9 kPa

[a] The tabulated values are design values for normal duration of load. All values, except for E and $F_{c\perp}$, are permitted to be adjusted for other load durations as permitted by the code. The design stresses are limited to conditions in which the maximum moisture content of sawn lumber is less than 16 percent.

[b] For uniformly loaded simple-span beams on edge, deflection is calculated as follows:

$$\delta = \frac{270\,w L^4}{E b h^3} + \frac{28.8\,w L^2}{E b h}$$

For uniformly loaded simple-span beams on face, deflection is calculated as follows:

$$\delta = \frac{270\,w L^4}{E b h^3} + \frac{86.0\,w L^2}{E b h}$$

Where: δ = Estimated deflection, inches, w = uniform load, plf
L = span, feet, E = tabulated modulus of elasticity, psi
b = beam width, inches, and h = beam depth, inches

[c] Joist = load parallel to glueline.

[d] F_t value for 0.8E OSL is applicable to lengths up to 24 feet.

[e] The tabulated values are based on a reference length of 4 feet. For other lengths, the allowable tensile stress shall be modified by $(4/\ell)^{1/8}$, where ℓ = length in feet. For lengths less than 4 feet, use the allowable tension stresses in Table 1 unadjusted.

[f] Tabulated flexural stress (F_b) may be increased by 4 percent when the member qualifies as a repetitive member as defined in the NDS.

[g] Edgewise F_b value for 0.8E OSL is applicable to a 16-inch depth or less.

[h] The tabulated values are based on a reference depth of 12 inches. For other depths, when loaded edgewise, the allowable bending stress (F_b) shall be modified by $(12/d)^{1/4}$, as shown in the following table. For depths less than 2-1/2 inches, the factor for the 2-1/2-inch depth shall be used.

Depth (in.)	2-1/2	5-1/2	7-1/4	9-1/4	11-1/4	12	16	18	20	24
Multiply by	1.48	1.22	1.13	1.07	1.02	1.0	0.93	0.90	0.88	0.84

Table 2. Fastener Design for *AinsworthEngineered* Durastrand LSL and OSL

GRADE	EQUIVALENT SPECIFIC GRAVITY (S.G.)						LATERAL LOAD[a] (pounds)
	NAILS				BOLTS		LAG BOLT
	Withdrawal Load		Lateral Load		Lateral Load		Installed in Face
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Installed in Face		
					Parallel to Grain	Perpendicular to Grain	
1.7E	Red pine (0.44)	Mixed southern pine (0.51)	Douglas fir-larch North (0.49)	Red maple (0.61)	Mixed southern pine (0.51)	Red oak (0.66)	400
1.5E	Red pine (0.44)	Douglas fir-larch (0.50)	Hem-fir North (0.46)	Mixed maple (0.55)	Douglas fir-larch North (0.49)	Red maple (0.60)	400
1.3E	Red pine (0.44)	Douglas fir-larch North (0.49)	Eastern hemlock (0.41)	Mixed southern pine (0.51)	Englemann spruce-lodgepole pine (0.38)	Southern pine (0.55)	400
0.8E	Northern white cedar (0.32)	Hem-fir (0.43)	-	Douglas fir-larch (0.50)	Northern white cedar (0.32)	Red maple (0.61)	400

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 6.9 kPa

[a] The lateral capacity is for a 1/2 -inch diameter lag bolt installed into the face of Durastrand® based on 1-1/2-inch-thick spruce-pine-fir side member and 1/2-inch-thick sheathing with a full penetration of the Durastrand® by the lag bolt.

Table 3. ***Ainsworth****Engineered* Durastrand Allowable Loads for Rim Board Applications

GRADE	Thickness (in.)	VERTICAL LOAD[a]				LATERAL CAPACITY[c,d,e,f,g] (pounds per foot)	
		Uniform[b] (pounds per foot)		Concentrated (pounds)		Nails Spaced at 6 inches o.c.	Nails Spaced at 4 inches o.c.
		Depths ≤ 16 in.	24 in. ≥ Depth > 16 in.	Depth ≤ 16 in.	24 in. ≥ Depth > 16 in.		
1.3E	1-3/4	7,000	4,350	5,200	5,200	240	– –
0.8E	1-1/4	5,700	3,500	5,900	5,500	240	330

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 6.9 kPa

[a] The vertical load capacities are based on the normal load duration (10 years), which are not permitted to be increased for any shorter load durations.
[b] The allowable vertical uniform load capacity is based on the strength of the rim board and may need to be reduced based on the bearing capacity of the supporting wall plate.
[c] The tabulated lateral load capacity is based on the short-term load duration (10 minutes).
[d] Durastrand® may be substituted for solid-sawn framing in horizontal wood diaphragms as shown in Table 2306.3.1 of the IBC, provided the maximum shear values for the diaphragms are limited to the allowable lateral capacity noted in this table.
[e] Toe-nailed connections are not limited by the 150 lbs/ft lateral load capacity noted for Seismic Design Categories D, E, and F in Section 2305.1.4 of the IBC.
[f] 8d common nails shall be used to connect the floor sheathing to the Durastrand® and to connect the Durastrand® to the sill plate (toe nail). The nails shall be spaced as noted in the table. Two 8d nails are required to connect each floor joist to the sill plate, and two 8d nails are required to connect the Durastrand® to the end of each floor joist.
[g] See Table 4 for minimum nail spacing requirements.

Table 4. Minimum Allowable Nail Spacings for ***Ainsworth****Engineered* Durastrand LSL and OSL

CONNECTOR SIZE	NAILS INSTALLED IN THE NARROW FACE[a]		NAILS INSTALLED IN THE WIDE FACE[b]	
	ON-CENTER SPACING (in.)	END DISTANCE (in.)	ON-CENTER SPACING (in.)	END DISTANCE (in.)
8d box and common nail or smaller	3	2	1	1/2
10d box and common nail	4	2	1	1/2
16d box nail	4	2	1	1/2
16d sinker (12d common) nail	4	2	1	1/2
16d common nail	5	2-1/2	1	7/8

For SI: 1 inch = 25.4 mm

[a] Multiple rows of nails are allowed, with a minimum of 1/2-inch spacing between rows and when applied to the edge. Rows are to be equal distance from centerline.

[b] In general, the minimum on-center spacing permitted for nails installed in the wide face of Durastrand is the same as that permitted by the applicable code for solid-sawn lumber.

Table 5. Maximum Total Rise & Run for ***Ainsworth****Engineered* Durastrand 0.8E OSL under Residential Loading (40 psf Live Load and 12 psf Dead Load)[a,b,c,d,e,f,g,h]

			36” Tread Width		42”	44”	48”
			2 Stringers	3 Stringers	3 Stringers	3 Stringers	3 Stringers
Stair Stringer Depth	9-1/2"	Total Run	5'-10"	5'-10"	5'-10"	5'-10"	5'-10"
		Total Rise	4’-9”	4’-9”	4’-9”	4’-9”	4’-9”
	11-7/8”	Total Run	8’-4”	10'-0”	9’-2”	9’-2”	9’-2”
		Total Rise	6’-6”	7’-8”	7’-1”	7’-1”	7’-1”
	14”	Total Run	11’-8”	12’-6”	12’-6”	12’-6”	11’-8”
		Total Rise	8’-10”	9’-5”	9’-5”	9’-5”	8’-10”
	16”	Total Run	14’-2”	15’-10”	15’-0”	15’-0”	15’-0”
		Total Rise	10’-7”	11’-9”	11’-2”	11’-2”	11’-2”

For SI: 1 inch = 25.4 mm, 1 ft = 304.8 mm, 1 psf = 47.88 Pa

[a] Consult designer or engineer of record for loading conditions and stair configurations not shown.

[b] Stringer deflection is limited to L/360 at live load and L/240 at total load.

[c] Stairway assembly is unstable until treads have been installed.

[d] Use subfloor adhesive to improve stair performance and minimize squeaks.

[e] The span table requires the use of risers and treads.

[f] Span tables are based on 7-in. maximum rise and 10-in. minimum run. Local regulations may be more restrictive.

[g] Tread nosing should comply with the International Building Code (IBC) or other local building code requirements.

[h] The performance of a three-stringer assembly is particularly sensitive to the stiffness of the stair tread used and its ability to distribute the loads to each of the three stringers. These span tables are based on tests performed with stair stringer assemblies constructed with 1-1/4-in. 0.8E Durastrand stair stringers and *AinsworthEngineered* SteadiTred® 1-in. stair tread OSB.

APA – The Engineered Wood Association is an accredited certification body under ISO 65 by Standards Council of Canada (SCC) and an accredited inspection agency by the International Code Council (ICC) International Accreditation Service (IAS) under ISO/IEC 17020. APA is also an accredited testing organization recognized by IAS and SCC under ISO/IEC 17025. APA is a recognized testing laboratory by Miami-Dade County, and a Product Testing Laboratory, Product Quality Assurance Entity, and Product Validation Entity by the Florida Department of Community Affairs (DCA).

APA – THE ENGINEERED WOOD ASSOCIATION

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