

Joint Evaluation Report

ESR-2725

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This report also contains:


- CBC Supplement

- FBC Supplement

- LABC Supplement

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<p>DIVISION: 06 00 00— WOOD, PLASTICS AND COMPOSITES</p> <p>Section: 06 17 25— Laminated Strand Lumber</p>	<p>REPORT HOLDER: TOLKO INDUSTRIES LTD., ATHABASCA DIVISION</p>	<p>EVALUATION SUBJECT: TOLKO LAMINATED STRAND LUMBER (LSL) AND ZB TREATED LSL</p>	
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1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2021, 2018, 2015, 2012, and 2009 *International Building Code*® (IBC)
- 2021, 2018, 2015, 2012, and 2009 *International Residential Code*® (IRC)

For evaluation in compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see [ESR-2725 LABC and LARC Supplement](#).

Properties evaluated:

- Structural
- Fire resistance
- Preservative Treatment

1.2 Evaluation to the following green code(s) and/or standards:

- 2022 California Green Building Standards Code (CALGreen), Title 24, Part 11
- 2020, 2015, 2012 and 2008 ICC 700 *National Green Building Standard*™ (ICC 700-2020, ICC 700-2015, ICC 700-2012 and ICC 700-2008)

Attributes verified:

See Section 3.0.

2.0 USES

Tolko laminated strand lumber (LSL) and ZB Treated LSL are used for structural applications, such as beams, headers, joists, rafters, columns, wall studs, and rim board. It is also used as components in built-up structural members, such as flanges for I-joists and chords for trusses. Tolko ZB Treated LSL may be used as sill plates.

3.0 DESCRIPTION

Tolko 1.35E and 1.55E LSL and ZB Treated LSL described in this report comply with the requirements noted in Section 2303.1.10 of the 2021, 2018 and 2015 IBC (Section 2303.1.9 of the 2012 and 2009 IBC), for allowable stress design in accordance with the 2021 and 2018 IBC Section 2302.1(1) and 2015, 2012, and 2009 IBC Section 2301.2(1). They may also be used in structures regulated under the IRC when an engineered design is submitted in accordance with IRC Section R301.1.3.

The attributes of the LSL have been verified as conforming to the provisions of (i) CALGreen Section A4.404.3 for efficient framing techniques; (ii) ICC 700-2020 Sections 608.1(2), 11.608.1(2) and 13.104.1(4) and ICC 700-2015 and ICC 700-2012

Section 608.1(2), 11.608.1(2) and 12(A).608.1 for resource-efficient materials; and (iii) ICC 700-2008 Section 607.1(2) for resource-efficient materials. Note that decisions on compliance for those areas rest with the user of this report. The user is advised of the project-specific provisions that may be contingent upon meeting specific conditions, and the verification of those conditions is outside the scope of this report. These codes or standards often provide supplemental information as guidance.

Tolko LSL consists of wood strands bonded together using an exterior-type structural adhesive. The wood strand properties and species, adhesive, manufacturing parameters and finished product dimensions and tolerances are as specified in the approved quality documentation and manufacturing standard.

Tolko ZB Treated LSL are treated with zinc borate (ZB) for protection against decay and termites, and is limited to interior locations, continuously protected from the weather and not in contact with the ground, but may be subject to dampness (such as in sill plates over concrete footings and slabs) as defined by the American Wood Protection Association (AWPA) Use Category UC2 as defined in AWPA U1. Unless noted otherwise within this report, all design provisions for Tolko LSL apply also to ZB Treated LSL.

4.0 DESIGN AND INSTALLATION

4.1 General:

Design and installation of Tolko LSL and ZB Treated LSL must be in accordance with this report, the applicable code provisions and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at the jobsite at all times during installation. The requirements specified for allowable stress design in accordance with the 2021 and 2018 IBC Section 2302.1(1) and 2015, 2012, and 2009 IBC Section 2301.2(1), and the design provisions for structural composite lumber in the ANSI/AWC *National Design Specification (NDS) for Wood Construction* are applicable to Tolko LSL and ZB treated LSL, except as modified within this report. Reference design values for each grade of Tolko LSL and ZB Treated LSL are provided in Table 1.

4.2 Connections:

The design of mechanical connections in Tolko LSL and ZB Treated LSL must be in accordance with the NDS. Equivalent specific gravities for the design of nail, bolt and lag screw connections under dry use conditions are provided in Table 2. Minimum nail spacing and end distance requirements are provided in Table 3. Nailing requirements for the attachment of wall sheathing are given in Section 4.3.3.

Exception: Lag screw connections between Tolko LSL and ZB Treated LSL rim board and lumber deck ledgers have allowable lateral loads as specified in Table 4, provided all of the following conditions are met:

1. Lag screws must have a minimum diameter of $\frac{1}{2}$ inch (12.7 mm), and sufficient length such that the lag screw shank penetrates through the rim board (not including the length of the tapered tip).
2. Deck ledgers must consist of lumber having a minimum thickness of $1\frac{1}{2}$ inches (38 mm) and a minimum assigned specific gravity of 0.42.
3. The sheathing between the rim board and the deck ledger must consist of wood structural panels meeting U.S. DOC PS-1 or PS-2, and be attached to the rim board in accordance with the applicable code.
4. One flat washer must be used between the deck ledger and the lag screw head.
5. Edge distances from the center of the lag screw to the edges of the rim board and deck ledger must be 2 inches (51 mm) or greater. End distances must be 4 inches (102 mm) or greater.
6. Adjustment factors in accordance with the NDS must be applied as applicable.
7. Rim board and deck ledgers must be checked for load-carrying capacity at connections in accordance with Section 11.1.2 of the 2018 and 2015 NDS (Section 10.1.2 of the 2012 NDS).

4.3 Wall Studs:

Prescriptive Wall Framing: Tolko LSL and ZB Treated LSL are considered equivalent to sawn lumber studs for prescriptive wall framing applications in accordance with Section 2308.5 of the 2021, 2018 and 2015 IBC (2308.9 of the 2012 and 2009 IBC) and Section R602 of the IRC, subject to the following conditions:

1. Tolko LSL and ZB Treated LSL studs must have a thickness of $1\frac{1}{2}$ inches (38 mm) or greater.
2. Cutting, notching, and boring of 3.5-inch-deep (89 mm) and 5.5-inch-deep (140 mm) Tolko LSL and ZB Treated LSL studs used in prescriptive wall framing is permitted in accordance with Sections 2308.5.9 and 2308.5.10 of the 2021, 2018 and 2015 IBC (2308.9.10 and 2308.9.11 of the 2012 and 2009 IBC), and Section R602.6 of the IRC.
3. Connections between wall sheathing and Tolko LSL or Tolko ZB Treated LSL framing must meet the requirements of Section 4.3.2.

4.3.1 Engineered Wall Framing: Tolko LSL and ZB Treated LSL may be used in engineered wall framing applications, subject to the following conditions:

1. Tolko LSL and ZB Treated LSL studs are equivalent to sawn lumber studs with a maximum specific gravity of 0.50.
2. Tolko LSL and ZB Treated LSL studs must have a thickness of $1\frac{1}{2}$ inches (38 mm) or greater.

3. Notching and boring of Tolko LSL and ZB Treated LSL studs is permitted in engineered wall assemblies. The design must be based on net-section analysis in accordance with the NDS, and is subject to the following additional conditions and allowable stress reductions:
 - a. Holes up to 40 percent of the depth of the stud are permitted anywhere along the stud length, except that a hole must not be placed within 6 inches (152 mm) of the end of the stud. A minimum edge distance, measured from the edge of the hole to the edge of the member, must be maintained for all holes as follows (see Figure 2):
 - (1) $\frac{5}{8}$ inch (16 mm) for studs 5.5 inches deep (140 mm) or less, or
 - (2) 12 percent of the stud depth for studs more than 5.5 inches deep (140 mm).
 - b. Notches up to 20 percent of the depth of the stud are permitted anywhere along the stud length, except that a notch must not be placed within 6 inches (152 mm) of the end of the stud. The notch length must not exceed 8 inches (203 mm).
 - c. Holes and notches must not be cut in the same cross section and must be separated by a clear, vertical distance of two times the larger of the hole diameter or the notch height, whichever is greater.
 - d. The reference design stresses for bending, axial compression, and axial tension must be multiplied by a stress reduction factor to account for stress concentrations at notches and holes, as given in Table 5.
4. Connections between wall sheathing and Tolko LSL and ZB Treated LSL framing must meet the requirements of Section 4.3.2.

4.3.2 Nailing Requirements: When Tolko LSL and ZB Treated LSL members are used as wall studs, the sheathing-to-stud and stud-to-stud connections must meet the following requirements:

1. A single $1\frac{1}{2}$ -inch-thick (38 mm) stud may be used for framing at adjoining panel edges for wall sheathing attached as follows:
 - a. 10d common nails [3 inches (76 mm) by 0.148 inch (3.76 mm) in diameter] spaced no closer than 6 inches (152 mm) on center, or 8d common nails [$2\frac{1}{2}$ inches (64 mm) by 0.131 inch (3.33 mm) in diameter] spaced no closer than 4 inches (102 mm) on center.
2. A minimum $2\frac{1}{2}$ -inch-thick (64 mm) single stud or a double $1\frac{1}{2}$ -inch (38 mm) or thicker stud is required for framing at adjoining panel edges for wall sheathing attached as follows:
 - a. 10d common or 8d common nails spaced no closer than 3 inches (76 mm) on center and staggered a minimum of $\frac{1}{4}$ inch (6.4 mm) horizontally.
3. Where double studs are required at adjoining panel edges, they must be connected together as follows:
 - a. For stud wall applications in accordance with the IRC and the conventional light-frame provisions of the Section 2308 of the IBC and Table 2304.10.1 of the 2021, 2018 and 2015 IBC (Table 2304.9.1 of the 2012 and 2009 IBC), double Tolko LSL and ZB Treated LSL studs must be stitch-nailed together with a minimum of two staggered rows of 10d nails [$2\frac{7}{8}$ inches (73 mm) by 0.120 inch (3.05 mm) in diameter] spaced 8 inches (203 mm) on center in each row.
 - b. For engineered stud wall applications, double Tolko LSL and ZB Treated LSL studs must be stitch-nailed together with a connection designed to transfer the required lateral shear, using an assumed equivalent specific gravity of 0.50. When stitch-nailing two $1\frac{3}{4}$ -inch-thick (44 mm) studs, 3-inch (76 mm) or longer nails are required.
 - c. The stitch nails must be driven in two lines spaced approximately 1 inch (25 mm) from each stud edge.
4. Where double studs are required at adjoining panel edges, the panel-edge nails must be installed with a minimum $\frac{1}{2}$ -inch (12.7 mm) edge distance from the panel edges, and staggered a minimum of $\frac{1}{4}$ inch (6.4 mm) horizontally within each line of nails. The minimum edge distance for panel-edge nails may be reduced to $\frac{3}{8}$ inch (9.5 mm).
5. Nails between sheathing and wall framing must not be spaced closer than as specified in Sections 4.3.2(1) and 4.3.2(2). Nails must also be staggered where required in Sections 4.3.2(1) and 4.3.2(2).
6. The maximum allowable nail size for attaching wall sheathing to the edge of a stud is 10d common [3 inches (76 mm) by 0.148 inch (3.76 mm) in diameter].

4.3.3 Wall Plates: Tolko LSL and ZB Treated LSL may be used as bottom (sole) plates and top plates, except where preservative-treated wood is required by Section 2304.12 of the 2021, 2018 and 2015 IBC (2304.11 of the 2012 and 2009 IBC) and Sections R317 and R318 of the 2021, 2018, 2015 and 2012 IRC (R319 and R320 of the 2009 IRC). Tolko ZB Treated LSL may be used as sill plates where preservative-treated wood is required but is limited to AWPA Use Category UC2 (Interior/Damp) as defined in AWPA U1. Stresses resulting from applied loads must not exceed the adjusted design values determined in accordance with Section 4.1 of this report.

4.4 Rim Board and Blocking:

When used as rim board, Tolko LSL and ZB Treated LSL must be continuously supported across the full width (except as noted in Section 4.3.2), and must be located at the joist elevation either perpendicular to, or parallel to, the joist framing. It must be the full depth of the joist space and be used for any combination of the following:

- To transfer, from above to below, all vertical loads at the rim board location. Allowable vertical loads are given in Table 4.
- To provide diaphragm attachment (sheathing to top edge of rim board).
- To transfer in-plane lateral loads from the diaphragm to the wall plate below. Allowable in-plane lateral loads are given in Table 4.
- To provide lateral support to the joist or rafter (resistance against rotation) through attachment to the joist or rafter.
- To provide closure for ends of joists or rafters.
- To provide an attachment base for siding and/or an exterior deck ledger.

4.4.1 Rim board must be installed in accordance with the prescriptive provisions of the applicable code, and design loads must not exceed those given in Table 4.

4.4.2 Installation of Tolko LSL and ZB Treated LSL rim board over wall openings is permitted, provided the rim board is designed for all applicable stresses in accordance with Sections 4.1 and 4.2 adjusted by the applicable adjustment factors. Joints in the rim board are not allowed within 12 inches (305 mm) of the opening.

4.4.3 Tolko LSL and ZB Treated LSL having minimum thicknesses as given in Table 4 may be used as direct replacements for the nominally 2-inch-thick solid blocking specified in Section 2308.4.2.3 of the 2021, 2018 and 2015 IBC (Section 2308.8.2 of the 2012 and 2009 IBC) and Section R502.7 of the IRC.

4.5 Fire Resistance and Fire Blocking:

4.5.1 Calculated Fire Resistance: The fire resistance of exposed Tolko LSL and ZB Treated LSL may be calculated in accordance with Chapter 16 of the NDS.

4.5.2 Fire-resistance-rated Floor and Roof Systems: Tolko LSL and ZB Treated LSL may be used as direct replacements for non-fire-retardant-treated sawn lumber, of equivalent size, in the prescriptive fire-resistance-rated floor and roof assemblies listed in Table 721.1(3) of the 2021, 2018, 2015, and 2012 IBC (Table 720.1(3) of the 2009 IBC).

4.5.3 Fire Protection of Floors: Tolko LSL and ZB Treated LSL having a minimum thickness of 1½ inches (38 mm) and a minimum depth of 9¼ inches (235 mm), are considered equivalent to lumber joists in accordance with Exception 4 to Section R302.13 of the 2021, 2018 and 2015 IRC (R501.3 of the 2012 IRC).

4.5.4 Fire-resistance-rated Wall Assemblies (1-Hour): Tolko LSL and ZB Treated LSL wall studs described in Section 4.3 are permitted to be used in 1-hour fire-resistance-rated wall assemblies as follows:

1. For conventional light-frame construction, Tolko LSL and ZB Treated LSL may be used as direct replacements for non-fire-retardant-treated sawn lumber studs, of equivalent-sized No. 2 or lower grade, in the prescriptive fire-resistance-rated wall assemblies 15-1.12, 15-1.13, 15-1.14 and 15-1.15 in Table 721.1(2) of the 2021, 2018, 2015 and 2012 IBC, and Table 720.1(2) of the 2009 IBC, with the exception of the following conditions:
 - a. Minimum 2.5 pcf (40 kg/m³) mineral wool insulation must be placed in each stud cavity.
 - b. Tape and joint compound must be applied to fastener heads and gypsum wallboard joints on exposed surfaces.
2. For engineered, load-bearing wall construction, Tolko LSL and ZB Treated LSL are permitted to be used in 1-hour fire-resistance-rated wall assemblies meeting the following conditions:
 - a. The minimum stud size must be 1½ inches (38 mm) by 3½ inches (89 mm) or greater.
 - b. Studs must be spaced no more than 24 inches (610 mm) on center.
 - c. Minimum 5/8-inch (15.9 mm) Type X gypsum wallboard conforming to ASTM C36 or ASTM C1396 must be attached with 2¼-inch-long (57 mm) Type S drywall screws spaced 7 inches (178 mm) on center along each stud.
 - d. Minimum 2.5 pcf (40 kg/m³) mineral wool insulation must be filled each stud cavity.
 - e. Tape and joint compound must be applied to fastener heads and gypsum wallboard joints on the exposed surface(s) in accordance with ASTM C840 or GA-216.
 - f. The design axial compressive stress within the studs must not exceed the least of the following:
 - i. 435 psi (2999 kPa).
 - ii. When the slenderness ratio exceeds 33, $0.78F_c'$ for 1.35E LSL or $0.76 F_c'$ for 1.55E LSL, where F_c' is the compression design value parallel-to-grain, adjusted for all applicable adjustment factors in accordance with the NDS, including the column stability factor, C_p .

4.5.5 Fire Blocking: Tolko LSL and ZB Treated LSL are permitted to be used as fire blocking in accordance with Section 718.2.1 of the 2021, 2018, 2015, and 2012 IBC (717.2.1 of the 2009 IBC) and Section R602.8 of the IRC as follows:

1. Tolko LSL and ZB Treated LSL having a minimum thickness of 1¼ inches (31.8 mm) are permitted to be used as an alternate to nominally 2-inch lumber fire blocking.
2. Tolko LSL and ZB Treated LSL having a minimum thickness of 1 inch (25.4 mm) are permitted to be used as an alternate to 23/32 inch (18.3 mm) wood structural panel fire blocking, provided the joints are backed accordingly.

4.5.6 Roof and Ceiling Framing: Tolko LSL and ZB Treated LSL may be used as ceiling joists and rafter framing in conventional light-frame construction in accordance with Section 2308.7 of the 2021, 2018 and 2015 IBC (2308.10 of the 2012, 2009 IBC) and Section R802 of the IRC.

5.0 CONDITIONS OF USE:

Tolko LSL and ZB Treated LSL described in this report comply with, or are suitable alternatives to what is specified in, those codes specifically listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Fabrication, design, installation, and connection restrictions must comply with this report and the manufacturer's published installation instructions. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.
- 5.2 Use of Tolko LSL and ZB Treated LSL must be limited to dry, well-ventilated interior applications in which the in-service average moisture content of lumber is less than 16 percent. Use of Tolko LSL and ZB Treated LSL must be limited to interior locations, continuously protected from the weather, and cannot be in contact with the ground, but may be subject to dampness, as defined by the American Wood Protection Association (AWPA) Use Category UC2. Applications of ZB treated LSL within the building envelope are to be in accordance with 2021, 2018 and 2015 IBC Section 2304.12 and 2021, 2018 and 2015 IRC Section R317.1.
- 5.3 Calculations and drawings demonstrating compliance with this report must be submitted to the code official. The calculations and drawings must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4 Tolko LSL and ZB Treated LSL are produced by the Tolko Industries, Ltd. facility in Slave Lake, Alberta, Canada under a quality control program with inspections by ICC-ES and APA—The Engineered Wood Association (AA-649). The ZB treatment is under a quality control program with inspections by ICC-ES and Timber Products Inspection, Inc. (AA-696).

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Structural Wood-based Products (AC47), dated June 2017 (editorially revised February 2021).
- 6.2 Data in accordance with the ICC-ES Acceptance Criteria for Wood-based Studs (AC202), dated June 2009 (editorially revised February 2021), including reports of ASTM E119 testing.
- 6.3 Data in accordance with the ICC-ES Acceptance Criteria for Rim Board Products (AC124), dated June 2019 (editorially revised February 2021).
- 6.4 Data in accordance with the ICC-ES Acceptance Criteria for Zinc Borate (ZB) Preservative Treatment of Structural Composite Wood Products by Non-pressure Processes (AC203), dated August 2017 (editorially revised February 2021).

7.0 IDENTIFICATION

- 7.1 Tolko LSL is identified with stamps noting the Tolko Industries, Ltd name or logo, plant number, product designation, grade, production date and shift, evaluation report number (ESR-2725), and the third-party inspection agency (APA—The Engineered Wood Association). Tolko ZB Treated LSL is identified with the designation of "AWPA UC2" with the third-party inspection agency (Timber Products Inspection, Inc.).
- 7.2 The report holder's contact information is the following:

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TABLE 1—REFERENCE DESIGN VALUES FOR TOLKO LSL and ZB TREATED LSL ^{1,2,3}

GRADE	BEAM ORIENTATION					PLANK ORIENTATION					AXIAL	
	Modulus of Elasticity		Bending ^{6,7} F _b (psi)	Shear F _v (psi)	Compr. Perp-to-Grain F _{c⊥} ⁹ (psi)	Modulus of Elasticity		Bending F _b (psi)	Shear F _v (psi)	Compr. Perp-to-Grain F _{c⊥} ⁹ (psi)	Compr. F _c (psi)	Tension ⁸ F _t (psi)
	E ⁴ (x10 ⁶ psi)	E _{min} ⁵ (x10 ⁶ psi)				E ⁴ (x10 ⁶ psi)	E _{min} ⁵ (x10 ⁶ psi)					
1.35E	1.35	0.70	1,850 ⁹	330	750	1.35	0.70	2,060	115	690	1,650	1,300
1 ¹ / ₈ -inch 1.55E	1.55	0.80	2,360	455	900	1.55	0.80	2,620	140	775	1,950	1,650
1 ¹ / ₄ -inch and 1 ¹ / ₂ -inch 1.55E	1.55	0.80	2,360	525	900	1.55	0.80	2,620	155	775	2,175	1,750

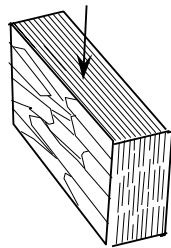
For SI: 1 psi = 6.89 kPa, 1 inch = 25.4 mm.

- ¹Reference design values apply only to dry, well-ventilated interior applications where the equivalent moisture content in lumber is less than 16 percent.
- ²Reference design values are for normal load duration. Tabulated values must be adjusted by the applicable adjustment factors in accordance with the NDS. Modulus of elasticity and compression perpendicular-to-grain must not be adjusted for duration of load.
- ³Reference design values given for Beam Orientation refer to loads applied parallel to the wide face of the strands (applied to the edge of the member). Plank Orientation refers to loads applied perpendicular to the wide face of the strands (applied to the face of the member). See Figure 1.
- ⁴The reference E value is the apparent modulus of elasticity and include the effect of shear deformations. For uniformly loaded simple-span beams, deflection is calculated using the tabulated apparent MOE as follows:

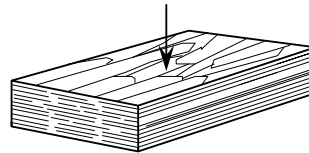
$$\delta = \frac{270 \omega L^4}{Ebd^3}$$

where δ = calculated deflection (in.), ω = uniform load (lb/ft), L = design span (ft), b = beam width (in.), d = beam depth (in.), and E = apparent modulus of elasticity (psi).

- ⁵E_{min} is the reference modulus of elasticity for beam stability and column stability calculations.
- ⁶Reference bending design values in the beam orientation, F_b, may be increased by 4% when the member qualifies as a repetitive member, in accordance with Section 8.3.7 of the NDS.
- ⁷Reference bending design values in the beam orientation, F_b, are assigned for a standard depth of 12 inches. For other depths greater than 2¹/₂ inches, multiply F_b by a volume factor of (12/d)^{0.125}, where d is the depth of the member in inches. For depths 2¹/₂ inches or less, the factor for the 2¹/₂-inch depth shall be used.
- ⁸Reference tension design values, F_t, are assigned for a standard length of 3 feet. For other lengths, the allowable tensile stress shall be modified by (3/L)^(1/16), where L = length in feet. For lengths less than 3 feet, use the allowable tension stress in Table 1 unadjusted.
- ⁹When designing with the tabulated compressive stress perpendicular to grain (F_{c⊥}), the Bearing Area Factor (C_b) stipulated in Section 3.10.4 of the NDS shall be permitted to be applied.



Beam Orientation



Plank Orientation

FIGURE 1—BEAM AND PLANK ORIENTATION AS NOTED IN TABLE 1

TABLE 2—EQUIVALENT SPECIFIC GRAVITY FOR FASTENER DESIGN ^{1,2,3}

GRADE	EQUIVALENT SPECIFIC GRAVITY					
	NAILS AND SCREWS				BOLTS AND LAG SCREWS ^{4,5}	
	Withdrawal		Dowel Bearing		Dowel Bearing (Installed in Face)	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Load Applied Parallel to Grain	Load Applied Perpendicular to Grain
1.35E and 1.55E	0.42	0.44	0.47	0.50	0.50	0.50

- ¹Fastener types and orientation not specifically described above are outside the scope of this report.
- ²Fastener design values calculated using the tabulated equivalent specific gravities given above must be adjusted by the applicable adjustment factors specified in the NDS for connections.
- ³Minimum nail spacing and end distance must be as specified in Table 3. Minimum spacing, end and edge distances for bolts and lag screws must be as specified in the NDS.
- ⁴Equivalent specific gravity values apply only to bolts and lag screws installed into the face of the LSL, such that the bolt axis is perpendicular to the wide faces of the strands or veneers.
- ⁵The allowable lateral loads for lag screw connections between Tolko LSL or ZB Treated LSL rim board and deck ledgers complying with the exception to Section 4.2 are given in Table 4.

TABLE 3—NAIL SPACING REQUIREMENTS FOR TOLKO LSL AND ZB TREATED LSL ¹

MEMBER THICKNESS (in.)	FASTENER ORIENTATION ²	COMMON NAIL SIZE ^{3,4}	MINIMUM END DISTANCE (in.)	MINIMUM NAIL SPACING (in.)	
				Single Row	Multiple Rows ^{5,6}
1 ¹ / ₈ ≤ Thickness < 1 ¹ / ₄	Edge ⁷	8d & smaller	2	4	NA ⁹
		10d & 12d	2 ¹ / ₂	5	NA ⁹
		16d	3	6	NA ⁹
	Face ⁸	8d & smaller	7 ⁷ / ₈	1	1
		10d & 12d	7 ⁷ / ₈	1	1
		16d	7 ⁷ / ₈	1 ¹ / ₂	1 ¹ / ₂
1 ¹ / ₄ ≤ Thickness < 1 ¹ / ₂	Edge ⁷	8d & smaller	2	4	NA ⁹
		10d & 12d	2	4	NA ⁹
		16d	2 ¹ / ₂	5	NA ⁹
	Face ⁸	8d & smaller	7 ⁷ / ₈	1	1
		10d & 12d	7 ⁷ / ₈	1	1
		16d	7 ⁷ / ₈	1 ¹ / ₂	1 ¹ / ₂
1 ¹ / ₂ ≤ Thickness < 3 ¹ / ₂	Edge ⁷	8d & smaller	1 (or 1 ¹ / ₂) ¹⁰	2	3
		10d & 12d	2	3	4
		16d	2 ¹ / ₂	3	4
	Face ⁸	8d & smaller	1 ¹ / ₂	1	1
		10d & 12d	1 ¹ / ₂	1	1
		16d	7 ⁷ / ₈	1 ¹ / ₂	1 ¹ / ₂

For SI: 1 inch = 25.4 mm.

¹Edge distance must be sufficient to prevent splitting.

²Face orientation applies to nails driven into the face of the LSL member, such that the long axis of the nail is perpendicular to the wide faces of the strands. Edge orientation applies to nails driven into the edge of the LSL member.

³16d sinkers (3³/₄ in. x 0.148 in. diameter) are considered equivalent to 12d common nails for the purpose of this table.

⁴Nails listed are common wire nails. For box nails, the spacing and end distance requirements of the next shorter common nail may be used (e.g., a 16d box nail may be spaced the same as a 10d and 12d common nail). Larger nail sizes and shank types not specifically described above are outside the scope of this report.

⁵For multiple rows of nails, the rows must be offset 1/2 inch or more from each other, and staggered, as shown in Figure 2.

⁶For multiple rows of nails, the rows must be equally spaced about the centerline of the edge or face (whichever applies).

⁷Nail penetration for edge nailing must not exceed 2 inches for 16d common nails (3¹/₂ in. by 0.162 in. diameter) and 2¹/₂ inches for all nails with a smaller shank diameter.

⁸Minimum nail spacing for the face orientation is applicable to nails that are installed in rows that are parallel to the direction of the grain (length) of the LSL. For nails driven into the face in rows that are perpendicular to the direction of the grain (width/depth) of the LSL, the minimum spacing must be sufficient to prevent splitting of the wood.

⁹Not available.

¹⁰ The multiple end row spacing is 1-1/2-inches.

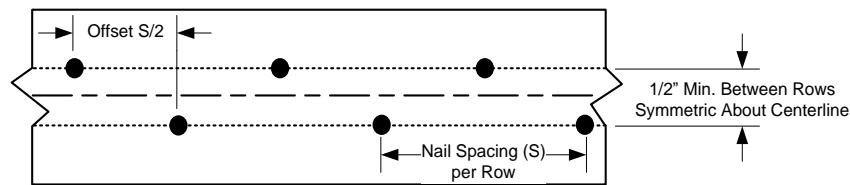


FIGURE 2—SPACING OF MULTIPLE ROWS OF NAILS

TABLE 4—ALLOWABLE DESIGN LOADS FOR TOLKO LSL AND ZB TREATED RIM BOARD^{1,2}

GRADE	THICKNESS (in.)	LATERAL LOAD CAPACITY ^{3,4,5} (lbf/ft)	VERTICAL LOAD CAPACITY			¹ / ₂ -INCH DIA. LAG SCREW CAPACITY FOR DECK LEDGER ⁷ (lbf)
			Uniform Load ⁶ (lbf/ft)		Concentrated (lbf)	
			Depth ≤ 16"	16" < Depth ≤ 24"	Depth ≤ 24"	
1.35E	1 ¹ / ₄	250	5,400	4,350	3,800	610
	1 ¹ / ₂	225	6,450	5,500	5,000	560
	1 ³ / ₄	200	7,550	7,550	7,000	560
1.55E	1 ¹ / ₈	220	4,850	3,400	4,600	440
	1 ¹ / ₄	230	5,400	5,150	4,600	600
	1 ¹ / ₂	200	6,450	6,000	4,600	600

For SI: 1 inch = 25.4 mm, 1 LB. = 4.45 N, 1 lbf/ft = 14.6 N/m.

¹Allowable design loads in this table cannot be increased for load duration.

²See Table 3 for minimum nail spacing requirements.

³The lateral load capacity is for seismic design and is permitted to be multiplied by 1.4 for wind load applications. For shear loads of normal or permanent load duration as defined by the NDS, the values in the table shall be multiplied by 0.63 or 0.56, respectively.

⁴Toe-nailed connections are not limited by the 150 lbf/ft lateral load capacity noted for Seismic Design Categories D, E, and F in Section 4.1.7 of the ANSI/AWC *Seismic Design Provisions for Wind & Seismic* (SDPWS)..

⁵The nailing schedule for sheathing-to-rim and rim-to-sill plate (toe-nailed) is based on minimum 8d box nails (2¹/₂ in x 0.113 in. diameter) at 6 inches on center. Commercial framing connectors fastened to the face of the rim board and wall plates may be used to achieve lateral load capacities exceeding values in this table. Calculations must be based on equivalent specific gravity listed in Table 2, and must not exceed the nail spacing requirements of Table 3.

⁶The 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.

⁷Lag screw connections between Tolko LSL or ZB treated LSL rim board and deck ledgers have allowable lateral loads as specified in this table, provided the conditions under the exception to Section 4.2 are met.

TABLE 5—STRENGTH REDUCTION FACTORS FOR NOTCHES AND HOLES IN TOLKO LSL AND ZB TREATED LSL STUDS^{1,2,3}

Material	Notches			Holes		
	Bending	Compression	Tension	Bending	Compression	Tension
1.35E LSL	0.90	1.00	0.75	1.00	1.00	1.00
1.55E LSL	0.85	0.98	0.70	0.90	0.90	0.90

¹Design of Tolko LSL and ZB Treated LSL studs with notches and holes used in engineered wall framing must be based on a net-section analysis in accordance with the NDS. See Section 4.3 of this report for limitations on the allowed size and placement of notches and holes.

²The reference design values for bending, axial compression and axial tension from Table 1 must be multiplied by the strength reduction factors given above for studs with notches or holes in engineered wall framing.

³See Section 4.3.2 for notching in Tolko LSL and ZB Treated LSL studs used in prescriptive wall framing.

DISCLAIMER

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 25—Laminated Strand Lumber

REPORT HOLDER:

TOLKO INDUSTRIES LTD., ATHABASCA DIVISION

EVALUATION SUBJECT:

TOLKO LAMINATED STRAND LUMBER (LSL) AND ZB TREATED LSL

1.0 REPORT PURPOSE AND SCOPE**Purpose:**

The purpose of this evaluation report supplement is to indicate that Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in ICC-ES evaluation report [ESR-2725](#), have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in Sections 2.0 through 7.0 of the evaluation report [ESR-2725](#), comply with the LABC Chapter 23, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Tolko laminated strand lumber (LSL) and ZB Treated LSL described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-2725](#).
- The design, installation, conditions of use and identification are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-2725](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.

This evaluation report supplement expires concurrently with the evaluation report ESR-2725, reissued February 2023 and revised December 2023.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 17 25—Laminated Strand Lumber

REPORT HOLDER:

TOLKO INDUSTRIES LTD., ATHABASCA DIVISION

EVALUATION SUBJECT:

TOLKO LAMINATED STRAND LUMBER (LSL) AND ZB TREATED LSL

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in ICC-ES evaluation report ESR-2725, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in Sections 2.0 through 7.0 of the ICC-ES evaluation report ESR-2725, comply with the CBC Chapter 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of 2019 CBC Chapters 16, 17 and 23, as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in Sections 2.0 through 7.0 of the evaluation report ESR-2725, comply with the CRC, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report and the additional requirements of 2019 CRC Chapter 3, as applicable.

This evaluation report supplement expires concurrently with the evaluation report ESR-2725, reissued February 2023 and revised December 2023.

DIVISION: 06 00 00—WOOD, PLASTICS, AND COMPOSITES**Section: 06 17 25—Laminated Strand Lumber****REPORT HOLDER:****TOLKO INDUSTRIES LTD., ATHABASCA DIVISION****EVALUATION SUBJECT:****TOLKO LAMINATED STRAND LUMBER (LSL) AND ZB TREATED LSL****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in ICC-ES evaluation report ESR-2725, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 *Florida Building Code—Building*
- 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Tolko laminated strand lumber (LSL) and ZB Treated LSL, described in Sections 2.0 through 7.0 of the evaluation report ESR-2725, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design requirements are determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in the evaluation report ESR-2725 for the 2018 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Tolko laminated strand lumber (LSL) and ZB Treated LSL for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential* has not been evaluated and is outside the scope of this evaluation report.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official, when the report holder does not possess an approval by the Commission).

This evaluation report supplement expires concurrently with the evaluation report ESR-2725, reissued February 2023 and revised December 2023.