Vandermeer V-Plank Laminated Veneer Lumber (LVL) **TER No. 1705-01**

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DIVISION: 06 00 00 – WOOD, PLASTICS AND COMPOSITES
Section: 06 17 00 – Shop-Fabricated Structural Wood
Section: 06 17 13 – Laminated Veneer Lumber

1. Products Evaluated:

1.1. Vandermeer V-Plank Laminated Veneer Lumber (LVL)

1.2. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state professional engineering and code compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state professional engineering and code compliance laws.

1.3. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found here) and covered by an IAF MLA Evaluation per the Purpose of the MLA (as an example, see letter to ANSI from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other IAF MLA Signatory Countries and have their products readily approved by authorities having jurisdiction using DrJ's ANSI accreditation.

1.4. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in *IBC* Section 1703. Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's website. For more information, see drjcertification.org.

1.5. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.

1.6. DrJ's code compliance work:

1.6.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.

1.6.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:[1]

2.1. *2012*, *2015* and *2018 International Building Code (IBC)*

2.2. *2012*, *2015* and *2018 International Residential Code (IRC)*

2.3. *2010 and 2015 National Building Code of Canada (NBC)*

2.4. *ANSI/AWC – National Design Specification (NDS) for Wood Construction*

2.5. *CAN/CSA-086-14 – Engineering Design in Wood*

2.6. *CAN/CSA-S269.2-16 – Access Scaffolding for Construction Purposes*

2.7. *American National Standards Institute (ANSI) and American Society of Safety Engineers (ASSE), ANSI/ASSE A10.8 – 2011 Scaffolding Safety Requirements*

2.8. *United States Department of Labor, Occupational Safety & Health Administration (OSHA), 29 CFR 1926, Subpart L, Appendix A – Scaffold Specifications and 29 CFR 1910.28 Safety Requirements for Scaffolding*

2.9. *ASTM D143 – Standard Test Methods for Small Clear Specimens of Timber*

2.10. *ASTM D198 – Static Tests of Lumber in Structural Sizes*

2.11. *ASTM D2559 – Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions*

2.12. *ASTM D5456 – Standard Specification of Evaluation of Structural Composite Lumber Products*

3. Performance Evaluation:

3.1. V-Plank was evaluated to determine its resistance properties, which are used to develop reference design values for Allowable Stress Design (ASD) and specified strength and modulus of elasticity values for Limit States Design (LSD). This TER examines Vandermeer V-Plank for:

3.1.1. Use in flatwise bending as a scaffold plank as defined by *ANSI* A10.8, Section 3.59

3.1.2. Use in flatwise bending as a scaffold plank as defined by *OSHA* 29 CFR 1926.450(b)

3.1.3. Use in flatwise bending as a scaffold plank as defined by *CAN/CSA-S2.69.2*

3.2. Any code compliance issues not specifically addressed in this section are outside the scope of this evaluation.

4. Product Description and Materials:

4.1. V-Plank is distributed by Vandermeer Forest Products at its facility in Lynnwood, Washington.

4.2. V-Plank is manufactured by laminating wood veneers with an exterior type adhesive (complying with *ASTM D2559*) in a continuous process with the grain of the wood oriented parallel to the length of the member in accordance with an ISO 9001 quality certification system.

4.3. The wood veneer properties and species, adhesive, manufacturing parameters, and finished product dimensions and tolerances are specified in the approved quality documentation and in-plant manufacturing standard.

[1] Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, *ASCE 7*, *SDPWS* and *WFCM*. This product also complies with the 2000-2015 versions of the *IBC* and *IRC* and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see Section 8.

4.4. Material Availability

4.4.1. Thickness: 1-1/2" (38 mm)

4.4.2. Widths: 8-7/8" (225 mm), 9-1/4" (235 mm) & 11-1/4" (286 mm)

4.4.3. Lengths: up to 60' (18,288 mm)

5. Applications:

5.1. Structural applications include use in flatwise bending as a scaffold plank.

5.2. Design

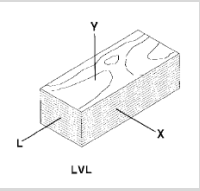
5.2.1. Design of V-Plank is governed by the applicable code and the provisions for Structural Composite Lumber (SCL) in *NDS* and Structural Composite Lumber Products in *CAN/CSA-086*.

5.2.2. Unless otherwise noted, adjustment of the design stresses for duration of load shall be in accordance with the applicable code.

5.2.2.1. The design provisions for wood construction noted in *IBC* Section 2301.2 and *IRC* Section R301.1.3 apply to V-Plank for ASD, unless otherwise noted in this report. Allowable unit stresses for V-Plank are specified in Table 1.

Flatwise Use Design Values				
Moisture Content	Bending, F_b (psi) [Mpa]	Horizontal Shear, F_v (psi) [Mpa]	Plank Modulus of Elasticity, E (psi) [Mpa]	
	Plank[2,5]	Plank[2,6]	Apparent[4]	True[4]
MC ≤ 16%	(2,900) [20.0]	(100) [0.69]	(1,900,000) [13,100]	(2,000,000) [13,790]
16% < MC ≤ 30%	(2,300) [15.9]	(100) [0.69]	(1,500,000) [10,3442]	(1,600,000) [11,0342]

1. 1 psi = 0.00689 MPa or 1 MPa = 145 psi.
2. The reference design values in this table are for normal load duration. Loads of longer or shorter duration shall be adjusted in accordance with the applicable code. Duration of load adjustments shall not be applied to E.
3. Orientation nomenclature for Vandermeer V-Plank.



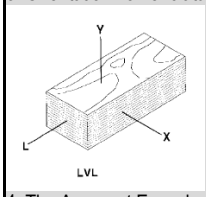
4. The Apparent E can be used directly in traditional beam deflection formulas. Using True E, deflection is calculated as follows for uniformly loaded simple span beams.
   $\Delta = [5WL^4/(32Ebh^3)] + [12WL^2/(5Ebh)]$
   where: Δ = deflection in inches
   W = uniform load in pli
   L = span in inches
   E = modulus of elasticity in psi
   b = width of beam in inches
   h = depth of beam in inches
5. The bending values in these tables are based on a referenced depth of 1-1/2".
6. Horizontal shear value for X-L plane only.
7. V-Planks are generally used in elevated locations with good air circulation conducive to drying of the wood fibers.
8. These design values have been developed in accordance with ANSI A10.8 Appendix C.
9. Values are for new or like-new product.

Table 1: Reference Design Values for V-Plank (Allowable Stress Design)

5.2.2.2. The design provisions for wood construction noted in CAN/CSA-086 Section 13.4 apply to V-Plank for Limit States Design, unless otherwise noted in this report. Specified strength and modulus of elasticity values for V-Plank are specified in Table 2.

Flatwise Use Specified Strength and Modulus of Elasticity Values				
Moisture Content	**Bending, F_b (psi) [Mpa]**	**Horizontal Shear, F_v (psi) [Mpa]**	**Plank Modulus of Elasticity, E (psi) [Mpa]**	
	Plank[2,5]	**Plank[2,6]**	**Apparent[4]**	**True[4]**
MC ≤ 16%	(5,200) [35.9]	(190) [1.31]	(1,900,000) [13,100]	(2,000,000) [13,790]
16% < MC ≤ 30%	(4,100) [28.3]	(190) [1.31]	(1,500,000) [10,342]	(1,600,000) [11,032]

1. 1 psi = 0.00689 MPa or 1 MPa = 145 psi.
2. The specified strength and modulus of elasticity values in this table are for standard term load duration. Loads of longer or shorter duration shall be adjusted in accordance with the applicable code. Duration of load adjustments shall not be applied to E.
3. Orientation nomenclature for Vandermeer V-Plank.



4. The Apparent E can be used directly in traditional beam deflection formulas. Using True E, deflection is calculated as follows for uniformly loaded simple span beams.
   $\Delta = [5WL^4/(32Ebh^3)] + [12WL^2/(5Ebh)]$
   where: Δ = deflection in inches
   W = uniform load in pli
   L = span in inches
   E = modulus of elasticity in psi
   b = width of beam in inches
   h = depth of beam in inches
5. The bending values in these tables are based on a referenced depth of 1-$^1/_2$".
6. Horizontal shear value for X-L plane only.
7. V-Planks are generally used in elevated locations with good air circulation conducive to drying of the wood fibers.
8. The specified strength and modulus of elasticity values have been developed in accordance with ANSI A10.8 Appendix C and CAN/CSA-O86.
9. Values are for new or like-new product.

Table 2: Specified Strength and Modulus of Elasticity Values for V-Plank (Limit States Design)

5.2.2.3. Allowable spans for live load conditions defined in *ANSI* A10.8 are provided in Table 3 for various member sizes.

V-Plank Allowable Spans (ft-in) [mm][1] – U.S.			
Size	**Live Load[2]**	**MC ≤ 16 %**	**16% ≤ MC ≤ 30%**
1.5" x 8.85" (38mm x 225mm)	**One Person Load**	(9' - 10") [2,995]	(8' - 8") [2,652]
	Two Person Load	(7' - 11") [2,403]	(7' - 2") [2,178]
	Three Person Load	(6' - 2") [1,885]	(5' - 4") [1,618]
	Light Duty (25 psf)	(9' - 10") [2,995]	(8' - 8") [2,652]
	Medium Duty (50 psf)	(9' - 10") [2,995]	(8' - 8") [2,652]
	Heavy Duty (75 psf)	(8' - 11") [2,724]	(8' - 3") [2,506]
1.5" x 9.25" (38mm x 235mm)	**One Person Load**	(10' - 0") [3,054]	(8' - 10") [2,703]
	Two Person Load	(8' - 0") [2,444]	(7' - 3") [2,214]
	Three Person Load	(6' - 4") [1,941]	(5' - 5") [1,662]
	Light Duty (25 psf)	(10' - 0") [3,054]	(8' - 10") [2,703]
	Medium Duty (50 psf)	(10' - 0") [3,054]	(8' - 10") [2,703]
	Heavy Duty (75 psf)	(8' - 11") [2,724]	(8' - 3") [2,506]
1.5" x 11.25" (38mm x 286mm)	**One Person Load**	(10' - 11") [3,322]	(9' - 8") [2,938]
	Two Person Load	(8' - 8") [2,640]	(7' - 10") [2,383]
	Three Person Load	(7' - 2") [2,174]	(6' - 2") [1,881]
	Light Duty (25 psf)	(10' - 11") [3,322]	(9' - 8") [2,938]
	Medium Duty (50 psf)	(10' - 2") [3,087]	(9' - 4") [2,834]
	Heavy Duty (75 psf)	(8' - 11") [2,724]	(8' - 3") [2,506]

1. Allowable spans are determined through an evaluation of bending stress, horizontal shear stress, and an allowable deflection of L/60 using the live loads shown. The member self-weight is included in all span determinations. Spans shown are center of bearing to center of bearing. Always use appropriate length planks for the span condition. Refer to OSHA for minimum and maximum cantilever requirements.
2. Live loads are as defined in *ANSI* A10.8 Section 5.1.2. Proper scaffold plank selection must be based on the most restrictive load case anticipated when planks are in service.

Table 3*:* Allowable Spans for V-Plank used in the United States

5.2.2.4 Allowable spans for several live load conditions defined in CAN/CSA 269.2 are provided in Table 4 for various member sizes.

V-Plank Allowable Spans (ft-in) [mm][1]- Canada			
Size	**Live Load[2]**	**MC ≤ 16 %**	**16% ≤ MC ≤ 30%**
1.5" x 8.85" (38mm x 225mm)	50 psf	(9' - 6") [2,895]	(8' - 9") [2,667]
	75 psf	(8' - 3") [2,514]	(7' - 8") [2,336]
	500 lbs	(5' - 1") [1,549]	(4' - 1") [1,244]
	25 psf + 250 plf	(8' - 4") [2,540]	(7' - 6") [2,286]
	75 psf + 265 plf	(6' - 8") [2,032]	(5' - 8") [1,727]
1.5" x 9.25" (38mm x 235mm)	50 psf	(9' - 6") [2,895]	(8' - 9") [2,667]
	75 psf	(8' - 3") [2,514]	(7' - 8") [2,336]
	500 lbs	(5' - 4") [1,633]	(4' - 3") [1,295]
	25 psf + 250 plf	(8' - 4") [2,554]	(7' - 6") [2,286]
	75 psf + 265 plf	(6' - 8") [2,032]	(5' - 8") [1,730]
1.5" x 11.25" (38mm x 286mm)	50 psf	(9' - 6") [2,895]	(8' - 9") [2,667]
	75 psf	(8' - 3") [2,514]	(7' - 8") [2,336]
	500 lbs	(6' - 5") [1,995]	(5' - 1") [1,549]
	25 psf + 250 plf	(8' - 4") [2,540]	(7' - 6") [2,286]
	75 psf + 265 plf	(6' - 8") [2,032]	(5' - 8") [1,727]

1. Allowable spans are determined through an evaluation of ultimate bending strength/4, ultimate horizontal shear strength/4, Live Load/80. The member self-weight is included in the span checks for bending and shear strength. Spans shown are center of bearing to center of bearing. Always use appropriate length planks for the span condition. Refer to CSA for minimum and maximum cantilever requirements.
2. Loads are as defined in Clause 6 of *CAN/CSA-S269.2*. PLF loads are applied across the plank width at mid span. Proper scaffold plank selection must be based on the most restrictive load case anticipated when planks are in service.

Table 4*:* Allowable Spans for V-Plank used in Canada.

6. Installation:

6.1. V-Plank is part of an overall scaffolding system. Consult the *OSHA* or *OHS* regulations on installation and the use of V-Plank referenced in Section 2.8.

7. Test and Engineering Substantiating Data:

7.1. Test reports and data in accordance with *ASTM D143, ASTM D198, ASTM D2559,* and *ASTM D5456*.

7.2. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.

7.3. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

7.4. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.

7.5. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.

7.6. DrJ's responsibility for data provided by approved sources conforms with *IBC* Section 1703 and any relevant professional engineering law.

7.7. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS, NDS, ACI, AISI, PS-20, PS-2*, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings:

8.1. V-Plank meets all applicable requirements for use as scaffold plank in accordance with *ANSI A10.8*, *CAN/CSA-086*, and *CAN/CSA-S269.2*.

8.2. V-Plank meets the requirements of OSHA 29 CFR 1926.451 and *NBC*.

8.3. *IBC* Section 104.11 and *IRC* Section R104.11 (*IFC* Section 104.9 is similar) state:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material, design or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code. … Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.

8.4. This product has been evaluated with the codes listed in Section 2, and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:

8.4.1. No known variations

8.5. This TER uses professional engineering law, the building code, *ANSI/ASTM* consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.

9. Conditions of Use:

9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.

9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.

9.3. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the Building Designer (e.g., Owner, Registered Design Professional, etc.).

9.4. Design

9.4.1. Building Designer Responsibility

9.4.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with *IRC* Section R106 and *IBC* Section 107.

9.4.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *IRC* Section R301 and *IBC* Section 1603.

9.4.2. Construction Documents

9.4.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

9.5. Responsibilities

9.5.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.

9.5.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.

9.5.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.

9.5.4. This product is manufactured under a third-party quality control program in accordance with *IRC* Section R104.4 and R109.2 and *IBC* Section 104.4 and 110.4.

9.5.5. The actual design, suitability and use of this TER, for any particular building, is the responsibility of the Owner or the Owner's authorized agent, and the TER shall be reviewed for code compliance by the Building Official.

9.5.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10. Identification:

10.1. V-Plank described in this TER is identified by a label on the board or packaging material bearing the manufacturer's name, product name, TER number, and other information to confirm code compliance.

10.2. Additional technical information can be found at www.vandermeerfp.com

11. Review Schedule:

11.1. This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.

11.2. For information on the current status of this TER, contact DrJ Engineering.

- Mission and Professional Responsibilities
- Product Evaluation Policies
- Product Approval – Building Code, Administrative Law and P.E. Law