Finnforest USA, Engineered Wood Division

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Contact a Finnforest USA representative for more information about Master Plank® LVL boards.

LEGACY REPORT

NER-555

Reissued April 1, 2008

ICC Evaluation Service, Inc.
www.icc-es.org

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Legacy report on the 2000 *International Building Code*®, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code*©, and the 1997 *Uniform Building Code*™

DIVISION: 06—WOOD AND PLASTICS
Section: 06170—Prefabricated Structural Wood

EVALUATION SUBJECT:

Master Plank®

MANUFACTURER:

Finnforest Oy
Kerto Division
P.O. Box 24, FIN-08101
Lohja, FINLAND

ADDITIONAL LISTEE:

Finnforest-USA, Engineered Wood Division
32205 Little Mack Avenue
Roseville, MI 48066

1.0 SUBJECT

Master Plank® laminated veneer lumber.

2.0 PROPERTY FOR WHICH EVALUATION IS SOUGHT

Structural Wood

3.0 DESCRIPTION

3.1 GENERAL

Master Plank® laminated veneer lumber (LVL) is manufactured by Finnforest Oy, of Finland, distributed by Finnforest-USA, Engineered Wood Division, of Roseville, MI., and used as joists, rafters, beams, headers and planks. Master Plank® LVL is manufactured by laminating veneers in a continuous process with the grain parallel to the length of the member in accordance with the Quality Control Manual for Master Plank®. Veneers are between 0.122 and 0.133 inches (3.1 and 3.4 mm) thick. Master Plank® LVL members are available in thicknesses from $^{3}/_{4}$ to 3 1/2 inches (9 to 89 mm) and nominal depths of $3^{1}/_{2}$ to 24 inches (92 to 610 mm) and lengths up to 60 feet (18 m).

3.2 DESIGN AND ALLOWABLE STRESSES

3.2.1 General

Allowable unit stresses are presented in Table 1 of this report and are for loads of a normal duration. The allowable unit stresses are for covered dry conditions of use as described in Section 7.3 of this report. The structural design provisions for solid-sawn lumber, as contained in the 2000 *International Building Code*®, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code*©, and the 1997 *Uniform Building Code*™, as applicable, apply to Master Plank® LVL except where noted otherwise in this report.

The allowable design stresses noted in Table 1 of this report are to be adjusted for duration of load. Where members qualify as repetitive members the allowable flexural stress is permitted to be increased 4 percent.

3.2.2 Connections

Allowable withdrawal nail values, for nails installed perpendicular or parallel to glue lines, shall be as provided for in the applicable code for solid-sawn lumber with a specific gravity of 0.48.

Allowable lateral nail values, for nails installed perpendicular to glue lines, shall be as provided for in the applicable code for solid-sawn lumber with a specific gravity of 0.46.

Allowable lateral nail values, for nails installed parallel to glue lines, shall be as provided for in the applicable code for solid-sawn lumber with a specific gravity of 0.44.

Allowable lateral bolt values for bolts installed perpendicular or parallel to glue lines shall be as provided in the applicable code for solid-sawn lumber with a specific gravity of 0.51.

Minimum nail spacing shall be 2 inches (51 mm) on center.

4.0 INSTALLATION

Master Plank® LVL shall be installed in accordance with the applicable code, the approved construction documents, this report, and manufacturer's installation instructions. This report shall be complied with should the manufacturer's installation instructions conflict with this report.

5.0 IDENTIFICATION

Master Plank® LVL shall be identified with a stamp noting the product manufacturer (Finnforest Oy), product distributor (Finnforest-USA, Engineered Wood Division), product name, product grade, the quality control agency VTT Building Technology (AA–670), and this evaluation report number.

6.0 EVIDENCE SUBMITTED

6.1 VTT Building Technology, Research Report, dated February 9, 1995, signed by Tuija Vihavainen, Research Professor, and Mikael Fonselius, Research Scientist. The report includes the following:

6.1.1 Data regarding sampling of the Master Plank® to be used for material testing;

6.1.2 Test data regarding edgewise bending of Master Plank®;

6.1.3 Test data regarding flatwise bending of Master Plank®;

6.1.4 Test data regarding tension parallel to grain of Master Plank®;

6.1.5 Test data regarding compression parallel to grain of Master Plank®;

6.1.6 Test data regarding compression perpendicular to grain (beam) of Master Plank®;

6.1.7 Test data regarding compression perpendicular to grain (plank) of Master Plank®;

6.1.8 Test data regarding horizontal shear (beam) of Master Plank®; and

6.1.9 Test data regarding horizontal shear (plank) of Master Plank®.

6.2 Analysis and Report, dated September 16, 1998, signed and sealed by Kirk Grundahl, P.E.

6.3 Paper entitled, *Effect of size on the bending strength of laminated veneer lumber*, by Mikael Fonselius.

6.4 VTT Building Technology, Research Report, dated November 14, 1997, signed by Tuija Vihavainen, Research Professor, and Mikail Fonselius, Research Scientist. The report includes test data regarding long term creep of, and connections to, Master Plank®.

6.5 Research Report entitled, *The Creep Properties of Kerto-Laminated-Veneer-Lumber*, prepared by Tomi Toratti, dated 1988, containing results of long-term creep testing of the Master Plank® LVL.

6.6 Letter dated March 27, 1999, by Kirk Grundahl of Qualtim, containing results of nail-split testing performed by Kirk Grundahl of Qualtim on March 17, 1999.

6.7 Letter dated October 22, 2001, signed by Antti Järvi and Mikail Fonselius of VTT, and Tero Nokelainen of Finnforest, containing an analysis resulting in revisions to the tension parallel to grain design value and the modulus of elasticity for plank applications.

6.8 Letter dated December 7, 2003, from Kirk Grundahl of Qualtim, containing an analysis resulting in connector, MOE and shear values.

6.9 VTT Building Technology, Inspection Report, dated March 4, 2003, signed by Liisa Rautiainen, Assessment Manager and Mikael Fonselius, Senior Research Scientist, containing results of density, MOR, MOE and tension testing.

6.10 VTT Building Technology, Research Report, dated July 24, 2001, signed by Heikki Kukko, Research Professor, and Ari Kevarinmäki, Senior Research Scientist, containing lateral load testing of nails for Master Plank® LVL.

6.11 VTT Building Technology, Inspection Report, dated March 4, 2003, signed by Liisa Rautiainen, Assessment Manager and Mikael Fonselius, Senior Research Scientist, containing results of shear testing on structural-size Master Plank® LVL

6.12 VTT Building Technology, Research Report, dated July 24, 2001, signed by Matti Kokkala, Research Professor, and Ari Kevarinmäki, Senior Research Scientist, containing lateral load testing of bolts for Master Plank® LVL.

6.13 *Quality Control Manual for Master Plank®*, signed by representatives of Finnforest Oy and the third party inspection agency, VTT Building Technology, dated January 1, 2003.

7.0 CONDITIONS OF USE

The ICC-ES Subcommittee for the National Evaluation Service finds that Master Plank® LVL is an alternative material to that specified in the 2000 *International Building Code®*, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code©*, and the 1997 *Uniform Building Code™*, subject to the following conditions:

7.1 Fabrication shall be in the Finnforest Oy facilities, located in Finland, with quality control inspections by VTT Building Technology (AA-670).

7.2 The design stresses shall not exceed those set forth in this report and shall be adjusted with the applicable load duration factor specified by the 2000 *International Building Code®*, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code©*, and the 1997 *Uniform Building Code™*, as applicable.

7.3 The service conditions for Master Plank® LVL shall be in covered dry conditions of use. Dry conditions of use are those conditions of use represented by sawn lumber at which the moisture content is less than 16 percent.

7.4 Master Plank® LVL having fire-retardant or preservative chemical treatments is outside the scope of this report.

7.5 Fastener design values shall be as specified in Section 3.2.2 of this report.

7.6 Cutting and notching of Master Plank® LVL is beyond the scope of this report.

7.7 Minimum bearing length and anchorage of Master Plank® LVL shall meet the requirements of Chapter 23 of the 2000 *International Building Code®*, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code©*, and the 1997 *Uniform Building Code™*, as applicable, for solid sawn lumber.

7.8 Design calculations and details for specific applications shall be furnished to the code official verifying compliance with this report and the 2000 *International Building Code*®, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code*©, and the 1997 *Uniform Building Code*™, as applicable. The individual preparing such documents shall possess the necessary credentials regarding competency and qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken.

7.9 This report is subject to re-examination on a periodic basis. For information on the current status of this report, contact the ICC-ES.

TABLE 1—ALLOWABLE STRESSES FOR MASTER PLANK® LVL

FLEXURAL STRESS (BEAM) F_b[2,4] (psi)	FLEXURAL STRESS (PLANK) F_b (psi)	TENSION PARALLEL TO GRAIN F_t[5] (psi)	COMPRESSION PARALLEL TO GRAIN F_c (psi)	COMPRESSION PERPENDICULAR TO GRAIN $Fc_\perp$[3] (psi)		HORIZONTAL SHEAR F_v (psi)		MODULUS OF ELASTICITY E[3,6] (psi)	
				DIRECTIONS:		DIRECTIONS:		DIRECTIONS:	
				BEAM	PLANK	BEAM	PLANK	BEAM	PLANK
2900	3200	2300	2700	870	435	320	320	1.9×10^6	1.9×10^6

Notes to Table 1:

1. Allowable design stresses are based on covered dry conditions of use. See Section 7.3 of this report.
2. The tabulated flexural stresses are based on loads of a normal duration and a referenced depth of 12 inches. For other depths, the tabulated flexural stress shall be adjusted by a size factor adjustment of $(12/d)^{0.15}$. For depths less than $3^1/_2$ inches, use the value for $3^1/_2$ inches.
3. The tabulated design stresses provided in this Table are based on a normal duration. Loads of longer or shorter duration shall be adjusted in accordance with the 2000 *International Building Code*®, the BOCA® *National Building Code*/1999, the 1999 *Standard Building Code*©, and the 1997 *Uniform Building Code*™, as applicable. Duration of load adjustments shall not be applied to $Fc_\perp$ and E.
4. The allowable bending stress increase for repetitive members shall not exceed 4 percent.
5. The tabulated tension stress is based on a length of 55 inches (1397 mm). For lengths longer than 55 inches, the tabulated tension stress shall be adjusted by a factor of $(55/L)^{0.125}$. The tabulated values for lengths shorter than 55 inches shall not be increased.
6. The values in this column reflect the Apparent MOE. The True MOE for both the beam and plank direction is 2.0×10^6.
7. 1 psi = 0.00689 MPa

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CITY OF NEW YORK
DEPARTMENT OF BUILDINGS

Pursuant to Administrative Code Section 27-131, the following equipment or material has been found acceptable for use in accordance with the Report of the Material and Equipment Acceptance (MEA) Division.

Patricia J. Lancaster, A.I.A., Commissioner

MEA 186-02-E
Report of Material and Equipment Acceptance Division

- **Manufacturer** - Finnforest OY, Kerto Division, Lohja Finland
- **Trade Name** - **MASTER PLANK**®
- **Product** - Laminated Veneer Lumber
- **Pertinent Code Sections** - RS 10 Subchapter 10, Article 7
- **Prescribed Tests** - Tension, Compression, Shear and Bending
- **Laboratory** - VTT Technical Research Centre of Finland
- **Test Reports** - RTE30434/95, Sampling, Bending, Size Effect, Flatwise Bending, Tension, Compression Parallel to Grain, Compression Perpendicular to Grain, Horizontal Shear (beam), Horizontal Shear (plank), the Quality Control Manual.
  Extrapolation of design values was sealed by Isaac Sheppard, New York State Professional Engineer License No. 042942
- **Description** - **MASTER PLANK** is manufactured from spruce (Picea abies). After debarking, the logs are stored in a water basin.

  The manufacturing process starts with the cutting of the logs to peeler length. Then they are rotary peeled into veneers, which are dried. After the drying process the veneers are sorted according to their moisture content, surface appearance and density. Inferior veneers are rated. In order to get a more uniform quality of the characteristics of the product, the veneers are in turn placed in different stacks. The size and location of knots and other discontinuities are then spread.

  The adhesive used is a phenol-formaldehyde adhesive. The adhesive fulfils the requirements given for glue bonding class 3 of EN 314-2. This bonding class is designed for exposure of plywood to weather over sustained periods. Additionally, the adhesive fulfils the requirements given in ASTM D2559, DIN 68705 BFU 100 and BS 6566 Part 8/Type WBP.

  The application of the glue on the veneers is one-sided. The glued veneers are laid up to a continuous panel, so that the overall grain direction of each veneer is the same as the length direction of the panel. The scarf joints of the veneers are tapered and gradually shifted in the layers. The panel is pressed in a hot press. After the pressing the panel is sawn into beams.

- **MASTER PLANK** members are available in thicknesses from ¾" to 3 1/2" and nominal depths of 3 ½" to 24" and lengths up to 60 feet.

- **MASTER PLANK** can be used as structural members in applications such as beams, joists, decking, rafters, truss chords, or wood I-joist flanges.

The allowable stresses for MASTER PLANK follow:

MASTER PLANK® 2.0E Design Values[1,2,3,4]	
Beam MOE (True)	2,000,000 psi
Beam MOE (Apparent, includes shear)	1,900,000 psi
Beam Bending	2900 psi
Beam Tension	2300 psi
Beam Compression Parallel	2700 psi
Beam Compression Perpendicular	870 psi
Beam Shear	265 psi
Plank MOE (True)	2,000,000 psi
Plank MOE (Apparent, includes shear)	1,900,000 psi
Plank Bending	3200 psi
Plank Compression Perpendicular	435 psi
Plank Shear	200 psi

1. The bending size effect factor is (12/d)0.15. This translates in to a factor of 1.203 for 3.5 inch, 1.124 for 5.5 inch, 1.078 for 7.25 inch, 1.073 for 7.5 inch, 1.040 for 9.25 inch, 1.036 for 9.5 inch, 1.010 for 11.25 inch, 1.002 for 11.875 inch, 0.977 for 14 inch, 0.958 for 16 inch, and 0.941 for 18 inch depths.
2. The COV for the MOE value to use is 0.11.
3. The repetitive member factor on bending to use is 1.04.
4. The tension value is 2300 psi x (55/L)^0.125 where L is LVL length in inches and no less than 55.
5. Adjustments to the allowable design stresses, except for E and compression perpendicular to grain, shall be in accordance with the New York City Building Code.

Recommendations - **MASTER PLANK** as described above shall be accepted on condition that all uses, locations and installations shall comply with all the applicable requirements of the New York City Building Code and on further condition that the design provisions and specifications as listed in the above laboratory report shall apply and on further condition that:

1) Structures designed using **MASTER PLANK** shall conform to the manufacturer's specifications except that the appropriate design load(s), deflection limitation(s) and other performance standards of the New York City Building Code shall apply.
2) **MASTER PLANK** shall be for interior use only and stamped MEA 186-02-E on each beam.
3) **MASTER PLANK**, when stored out of doors or exposed to wet weather conditions during construction, shall be inspected by the user for swelling or warping and be replaced if damaged.
4) The glue used shall not delaminate during a fire.
5) All shipments and deliveries of such material shall be provided with a permanent marking suitably placed, certifying that the materials shipped or delivered is equivalent to those tested and accepted for use, as provided for in Section 27-131 of the Building Code.