MASS PLY
BY FRERES

MASS PLY DESIGN & CONSTRUCTION GUIDE

CONTENTS

WHO WE ARE

Freres Engineered Wood is an Oregon-based, premier wood products manufacturing company, specializing in creating high-quality, durable, and renewable veneer-based wood building materials for progressive developers, architects, and engineers.

Freres provides innovative, efficient, and environmentally friendly wood products to the market while managing healthy forests. With a reputation for integrity and a commitment to its community, the company's ability to keep an eye on the future has kept this family-owned and -operated business thriving for more than 100 years.

The Freres companies include Freres Engineered Wood, Freres Timber, and Evergreen BioPower, LCC. Each of the three operations provides local, family-wage jobs and uses 100 percent of its materials in beneficial, value-added products.

Freres is a closely held family business with more than three generations of combined experience in the timber and wood products industries. More than 400 employees support, and are supported by, these operations. The company's team members are what make Freres one of the premier veneer and panel manufacturers in the world.

Contributing to, and connecting with, the community is core to the company's values, as is a deep respect for protecting the environment and the fiber that comes from our forests. The company's long history of innovation has allowed them to create "more with less," using one of the world's most valuable resources.

That innovative drive inspired Freres to evolve its lumber business to veneer manufacturing in 1958. It led the company into plywood manufacturing in 1998, and it encouraged the company in 2007 to build a cogeneration facility that supplies renewable power to the utility grid. In 2017, Freres developed what could possibly be the most significant new mass timber product in the world: Mass Ply.

Freres traces its roots to the hills above the Little North Fork of the N. Santiam River in 1922, nurtured by the patriarch of the Freres family, T.G. Freres. What began a century ago with one man, today employs hundreds of Oregonians and remains a strong presence in Oregon's Santiam Canyon.

VISION

We strive to create the wood products of the future through continuous innovation, envisioning a time when cities and communities are built with wood from healthy, actively managed forests, providing a wide array of environmental, societal, and economic benefits.

BUILDING FORWARD

For Freres, wood products aren't just a legacy, they're the future, with Mass Ply offering more strength per pound than concrete and steel, plus carbon-sequestering benefits. From harvest to end product, Freres' commitment to ongoing innovation seeks to build a strong tomorrow for our forests, our industry, and our communities.

> **We look to the future and recognize that we are not just producing lumber, but the advanced, engineered wood products of the future.**
>
> – Kyle Freres, VP of Operations

FRERES OPERATES SIX PLANTS

- **P1** Small Log Veneer + Lumber Studmill
- **P2** Large Log Veneer
- **P3** Panel Mill, Plywood + Structural Composite Lumber
- **P4** Veneer Drying and Merchandising
- **P5** Evergreen BioPower Cogeneration
- **P6** Mass Ply Facility

SUSTAINABILITY

SUSTAINABILITY IN PRACTICE

SUSTAINING TIMBERLAND

Freres' commitment to sustainability starts in the forest. All of our wood comes from a 150-mile radius from the mill and is harvested from sustainably managed forests as a renewable resource. Freres Timber's 17,000 acres of timberland are harvested on a sustained yield basis. This allows Freres Timber to provide high-quality timber today, while managing a healthy forest and providing timber production for future generations.

On Labor Day 2020, the Beachie Creek Fire burned through the Santiam Canyon, devastating Detroit, Gates, Mill City, and 192,000 acres of the North Santiam Forest. Freres Timber lost 5,800 acres of mixed-age stands in the Santiam Canyon. Through expedient and efficient salvage operations over the next year, Freres was able to recover 98% of the burnt timber into usable forest products while also replanting the burnt lands with over 2 million seedlings. We intend to keep our forests as forests forever.

As a veneer-based product, Mass Ply allows the use of small-diameter trees. The preferred tree type can be found in forests that have a suppressed understory; these trees grow slower, are smaller in diameter, and are not the best candidate for dimensional lumber, whereas the veneer process can recover this fiber effectively and efficiently. These trees also produce wood that is denser due to the slower growth and therefore yield higher strength and stiffness values.

Thinning operations are a perfect means of harvest for small-diameter trees, resulting in a low-impact method of harvest to promote a healthy forest. Such harvests are helpful given the excessive wildland fires that are a serious threat to the health and safety of our communities and forest habitat. Thinning reduces the fuel load and thus reduces the intensity and the spread of wildland fires.

WASTE NOTHING

Freres uses nearly all of the fiber delivered to its plants from timber harvesting. As part of our no-waste culture, we are always looking for ways to improve efficiency. Freres' veneer products are made with a lathe that peels thin layers from logs as small as 6 inches in diameter.

This process reduces waste since more of the wood goes into the final product than cutting square lumber from round trees. Freres produces and sells residuals such as bark dust, chips, sawdust, and biochar, which are used in a variety of industries such as farms and nurseries.

RENEWABLE ENERGY COGENERATION PLANT

Recycled urban wood and residuals from manufacturing operations provides renewable biomass energy to Freres' Evergreen BioPower cogeneration plant. Biomass energy, a renewable energy, is obtained from combusting wood debris to generate steam, which is then either utilized as heat in manufacturing processes or used to generate electricity. Steam-generated electricity from Freres' cogeneration plant supplies the local utility with enough energy to power more than 5,000 households while also delivering heat for plant production processes.

MASS PLY: BUILDING THE FUTURE WITH WOOD

Multi-story, mass timber buildings are rapidly increasing in popularity for a number of reasons. From an environmental standpoint, wood is a natural and renewable resource. New engineered SCL products use less wood, are strong and lightweight, and achieve excellent performance in seismic integrity and fire resistance.

Freres' cogeneration plant can supply renewable energy for its production plus

5,000 HOMES

We are stewards of the land, using, protecting, and nurturing our forests in the most sustainable way possible.

Freres has received Chain of Custody Certification under ASTM D7612 for its products. This certification demonstrates that we source our timber responsibly, meeting or exceeding the requirements of the Oregon Forest Practices Act.

WOOD VS. CONCRETE & STEEL

ENERGY

Wood uses far less energy during primary manufacturing than concrete and steel. During its service life, engineered wood has insulative value, thermal mass, and a tighter building envelope. At the end of its life, wood is recyclable, reusable, and reclaimable.

CARBON

Since it takes less energy to produce wood products compared to concrete and steel, the manufacturing process also generates less carbon. Additionally, trees are one of the most advanced carbon-sequestering vehicles on earth! Trees sequester carbon in their cells as they grow, which is retained after harvest and through the life of the wood product.

According to the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks (1990-2013), carbon dioxide (CO_2) emitted from iron, steel, and cement production are the first and second largest sources of industrial CO_2 emissions in the U.S. Forests absorb CO_2 and store carbon. Carbon is stored in the harvested timber for the lifetime of the structure. Meanwhile, more trees are replanted that pull more CO_2 out of the atmosphere. This is why mass timber is said to be carbon negative.

ADVANTAGES OF VENEER-BASED MASS TIMBER PRODUCTS

Large dimensional lumber requires a larger diameter log than comparable veneer-based products. Veneer is peeled on a lathe that produces a continuous ribbon of product from a larger round block diameter to core limit at 2' 7/8". Lumber production cuts a rectangular board from a round tree, which creates additional waste.

Defects affect the performance of lumber-based mass timber products. Defects are therefore often cut from the board and boards are finger-jointed back together, generating another point of waste. In veneer-based products, the defects are distributed throughout the product, and this distribution allows the natural defect to be retained without affecting performance.

Since our Mass Ply products typically perform better by volume than other mass timber products, less fiber is used in the design and construction of Mass Ply buildings.

RESINS

All resins in the Mass Ply contain formaldehyde. Formaldehyde is a Volatile Organic Compound (VOC) that occurs in nature, the manufacturing process, and in the products themselves. The exemption of plywood and engineered wood products from applicable domestic and international air quality standards indicate that formaldehyde is not a primary concern.

FORMALDEHYDE TABLE

SOURCE	EXPECTED EXPOSURE (PPB)
Human Breath	~2
Typical Indoor Air	10-30
Urban Air	5-100
Rural Air	.8-5
Raw Wood	20
Structural Plywood	10-40

The California Air Resource Board (CARB) is a highly regarded regulatory standard that is commonly adopted by the many green rating programs such as LEED and National Green Building Council. CARB exempts plywood and LVL as low-risk if manufactured compliant with the PS-1 Voluntary Product Standard or ASTM D5456.

Formaldehyde breaks down easily. When emitted in the air it can take less than a few hours to break down.

LEED POINTS

Mass Ply has the potential to maximize the points for your next LEED-certified building. Mass Ply inherently aligns with the U.S. Green Building Council's (USBG) principles with its reduced energy capabilities and its environmental benefits. Our Life Cycle Analysis (LCA) and Environmental Product Declaration (EPD) are both available on our website.

BUILDING FOR THE FUTURE: WHY MASS TIMBER

Building with wood has significant benefits over concrete and steel. Construction of multi-story, mass timber buildings is rapidly increasing for a variety of reasons.

- Wood is renewable, sustainable, and aesthetically appealing.
- Mass timber products perform predictably in fires and during earthquakes.
- The manufacturing of wood products requires much less energy and generates fewer greenhouse gas emissions than concrete and steel.
- Wood sequesters carbon for the life of the product, and new trees are planted to continue the carbon-sequestration process.
- Pre-fabrication allows for rapid construction times with a smaller workforce than multi-story concrete structures.

WHY MASS PLY

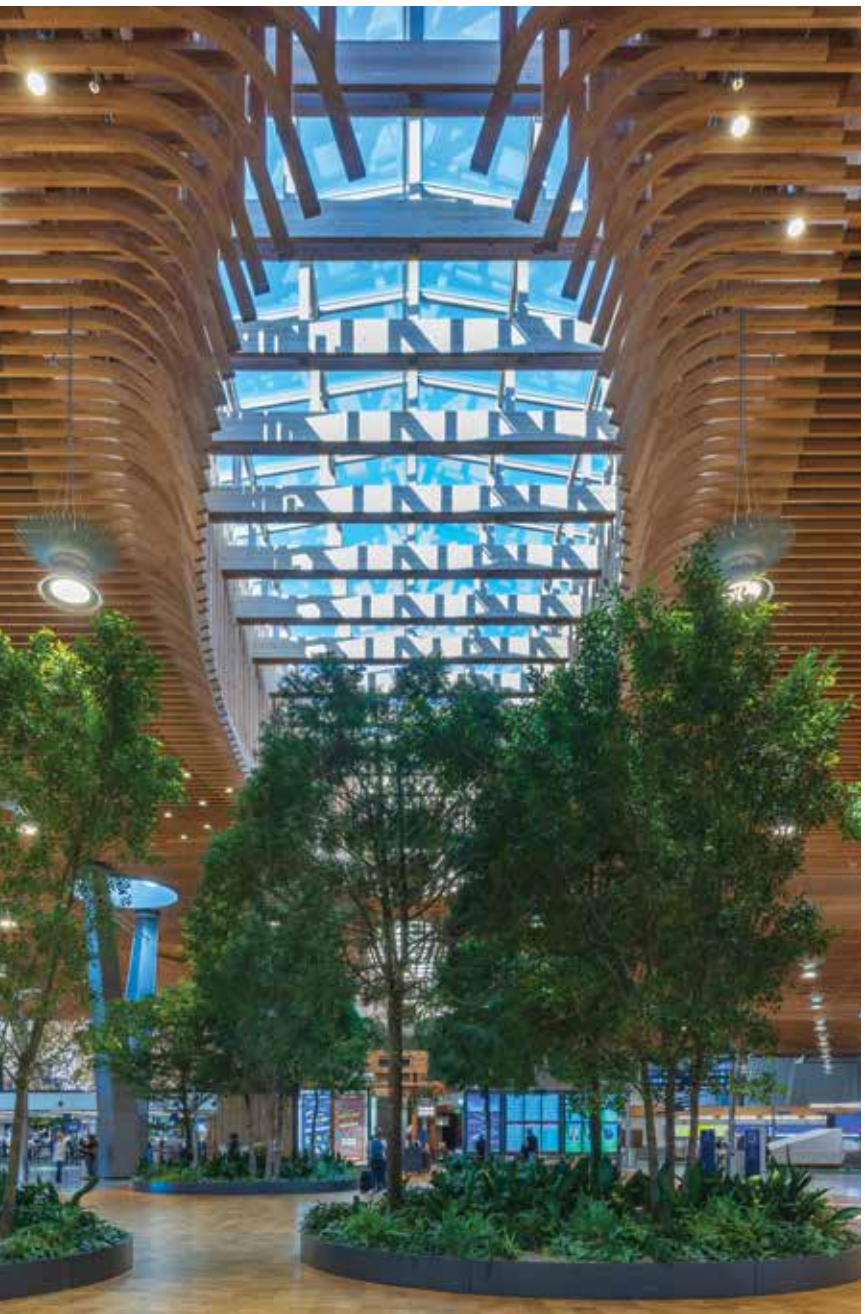
Mass Ply products can outperform lumber-based mass timber construction in many ways.

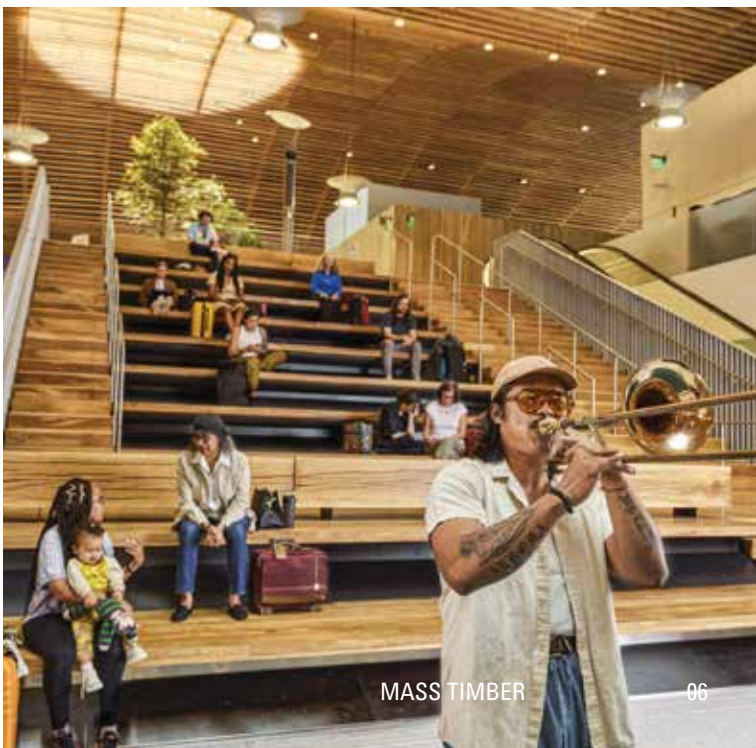
- Mass Ply provides better dimensional stability with lower moisture content.
- Mass Ply is created with small-diameter trees to help thin dense forests and mitigate wildfire risk.
- Mass Ply products offer the same or better structural integrity and greater flexibility than many alternative wood products.

LUMBER-BASED CLT VS. VENEER-BASED CLT

MASS TIMBER

Captures and stores carbon while building with wood to new heights.





MASS PLY

MASS PLY PRODUCTS

Mass Ply Panels (MPP) are the next evolution of Cross Laminated Timber (CLT). They are patented, veneer-based, large-format engineered wood products that can be used in any mass timber application. APA – The Engineered Wood Association has performed extensive testing to certify our products under ASTM D5456 and PRG 320.

The building block of Mass Ply products is Freres' Structural Composite Lumber (SCL), which consists of multiple layers of density-graded Douglas fir veneers. These veneers are glued and pressed in a variety of combinations and orientations, and finally joined together to create lamellas.

The versatility and consistency of Freres' process provides the ability to create engineered mass timber products for an array of applications.

These include wide-format panels, beams and columns, and just about any industrial application that has favored heavy timbers. A Computer Numeric Control (CNC) machine can cut these products to desired specifications.

Mass Ply Lams (MPL) can replace glu-lam beams or columns. Freres developed Mass Ply to maximize the natural strength of wood while adding dimensional stability. Mass Ply uses bonded veneer layers to provide longer spans of wood that are strong, stable, and fire-resistant—all while producing fewer CO_2 emissions than other building materials, such as concrete or steel.

Mass Ply products are available in:

- Widths: 4', 6', 8', 10', and 12' nominal
- Lengths: up to 48'
- Thicknesses: up to 12" panel thickness and up to 24" beam and column thickness

All this leads to decreased assembly times and an economical building solution. Mass Ply products provide an ideal building material for structures up to 18 stories. They are also lighter and more environmentally sustainable than concrete and steel.

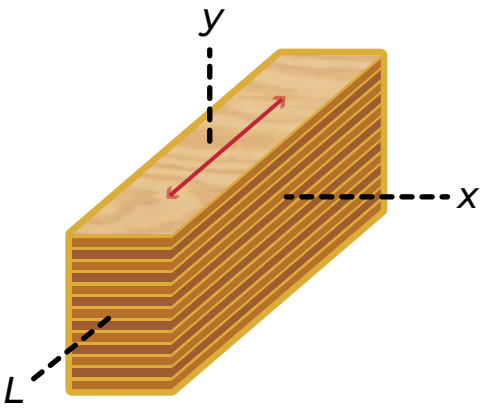
FAST COMPANY MOST INNOVATIVE COMPANIES 2019

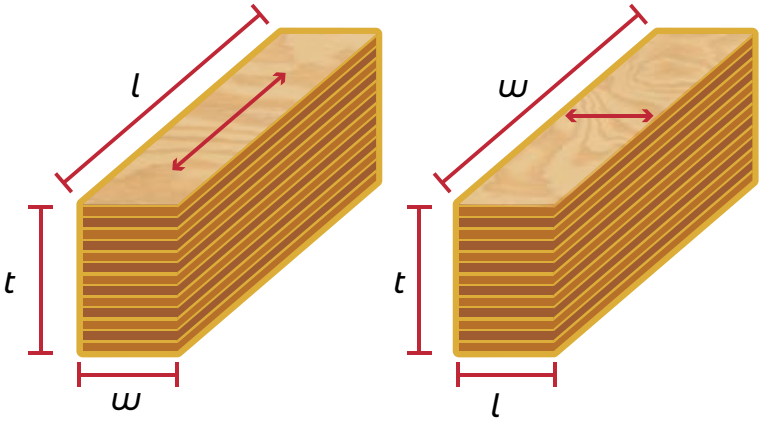
COOLEST THING Made in Oregon OBI

WINNER A|N Best of Products

AMERICAN TREE FARM SYSTEM WOOD WATER RECREATION WILDLIFE

MASS PLY NOMENCLATURE





LEGEND

MAJOR STRENGTH DIRECTION
Grain orientation of outer veneer

MAJOR AXIS ORIENTATION

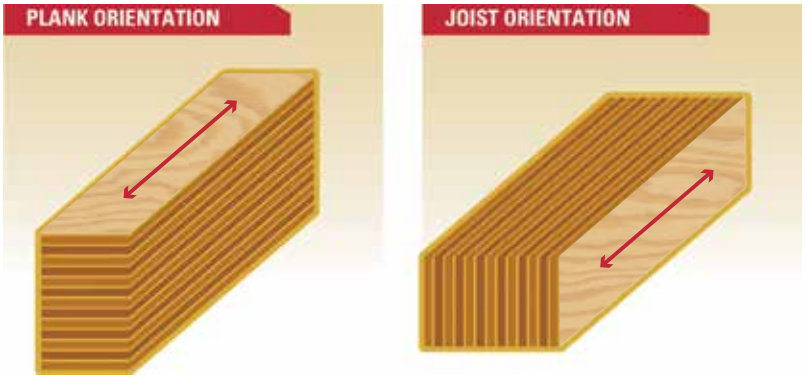
DIMENSION SYMBOL

t **THICKNESS**
Distance perpendicular to face of veneer

w **WIDTH**
Distance parallel to face of veneer & perpendicular to major strength direction

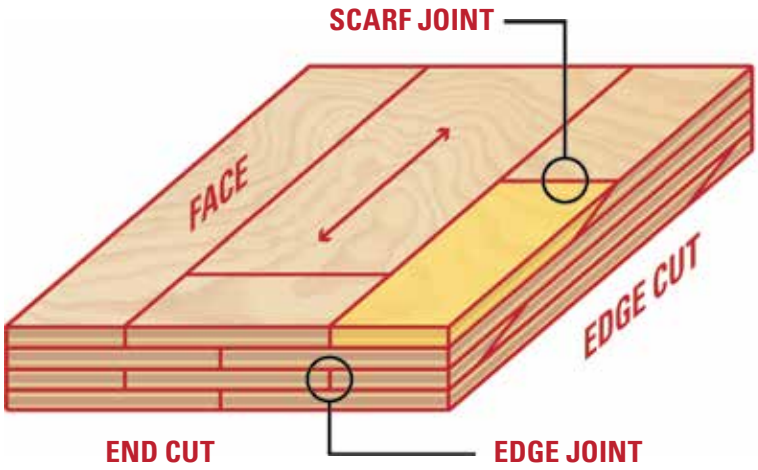
l **LENGTH**
Distance parallel to face veneer & parallel to major strength direction

NOTE: *Nomenclature and axes referenced from ASTM D5456 Figures 1 and A4.1. These orientations may be considered on a lamella or a Mass Ply level. While lamella may lack some of the joints, the orientation of the faces or planes will always be consistent.*



PLANK ORIENTATION
Also known as flat bending

JOIST ORIENTATION
Also known as edge bending



END CUT
A cut face of the Mass Ply with EDGE joints present. This face will always be on the X-Y plane or the t-w plane of the panel according to the nomenclature above.

EDGE JOINT
A joint visible on end cut face of a panel.

EDGE CUT
A cut face of the Mass Ply showing no edge joints. This cut face will always be on the L-Y or the t-L plane according to the above nomenclature.

SCARF JOINT
A joint visible from the face and the edge cuts. This joint comes from the lamella assembly process and is randomly distributed throughout the panel.

APPLICATIONS

MASS PLY PANEL APPLICATIONS

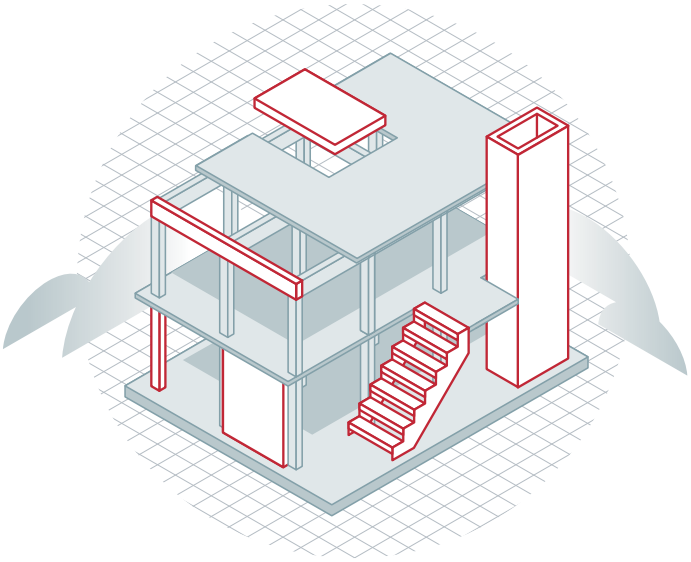
Freres Engineered Wood's Mass Ply Panels (MPP) offer a strong and durable solution for modern construction projects and a viable alternative to concrete and steel. Our customizable systems allow for seamless integration into a wide range of building configurations. MPP is ideal for projects seeking design flexibility while taking advantage of mass timber benefits.

Among many benefits, these prefabricated, engineered wood products enable fast, efficient installation, which reduces waste, construction time, and labor costs. MPP provides excellent fire resilience and thermal insulation, contributing to energy efficiency and a more comfortable indoor environment. Finally, MPP systems offer excellent load-bearing capacity and structural integrity, making these systems suitable for residential and commercial buildings.

Below are the primary applications of MPP offered by Freres Engineered Wood:

F16 MPP

- Floor System Panels
- Roof System Panels
- Bearing and Shear Walls
- Stairwell System: Landings, Stringers, Guardrails, and Treads
- Elevator and Stairwell Shafts



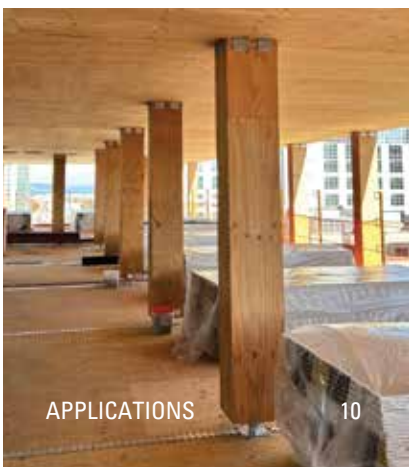
F10 MPP

- Point-Supported Floor Systems
- Point-Supported Roof Systems
- Corridors
- Shear Walls

F16, F16A, F19, F19A, F21, AND F21A MASS PLY LAM (MPL)

- Beams and Joists
- Stair Stringers
- Columns (F16 and F19)

For additional information about the applications of Mass Ply Panels in residential and commercial construction, please visit **frereswood.com/resources** for our product reports.



SPECIFICATIONS

CERTIFIED MPP AND MPL

MPP are certified as Cross Laminated Timber per PRG 320. MPP lamellas are Laminated Veneer Lumber and certified under ASTM D5456. Secondarily laminated LVL form the MPP and MPL products. Freres also produces certified single-ply LVL for rim board in thicknesses from 1" to 1.5".

PRODUCT REPORTS

Product reports are available from APA – The Engineered Wood Association (APA) and the International Code Council Evaluation Service (ICC-ES). Reports are available on the Freres, APA, and ICC-ES web sites.

Scan to see APA reports online, or visit ***apawood.org***

- APA Product Report PR-L324 (PR-L324) Freres Single-Ply Laminated Lumber
- APA Product Report PR-L325 (PR-L325) Freres Mass Ply Panels (MPP) and Mass Ply Lam (MPL) Beams and Columns
- ICC-ESR 4759 (ESR 4759) Freres Single-Ply Laminated Lumber
- ICC-ESR 4760 (ESR 4760) Freres Mass Ply Panels (MPP) and Mass Ply Lam (MPL) Beams and Columns

ESR 4759 and ESR 4760 include the following supplements:

- City of Los Angeles Building Code (LABC)
- City of Los Angeles Residential Code (LARC)
- California Building Code (CBC)
- California Residential Code (CRC)

MPP GRADES (PR-L325 AND ESR 4760)

MPP are available in two grades: F10 and F16. F10 and F16 lamellas are respectively the 1.0 E and 1.6 E LVL grades. The F16 has a better performance than the F10 in the major strength axis while the F10 performs better than the F16 in the minor strength axis. Both products are available in the following thicknesses: 2.04", 3.06", 4.08", 5.10", 6.12", 7.14", 9.16", 9.18", 10.20", 11.22", and 12.24".

MPL GRADES

MPL are available in thicknesses from 2" to 24.5" dependent upon grade (See PR-L325 and ESR - 4760). Grades designated with “A” are made in a process that requires reduction in certain design values and specifies how the beam will be processed on the CNC machine.

- F10 MPL: PR-L325 and ESR – 4760
- F16 MPL: PR-L325 and ESR – 4760
- F19 MPL: PR-L325 and ESR - 4760
- F21 MPL: PR-L325 and ESR - 4760
- Enhanced F10 MPL: PR-L325

SINGLE-PLY LVL

LVL is available in thicknesses from 1" to 1.5" and the following grades:

- 1.0 E: PR-L324 and ESR 4759
- 1.55 E: PR-L324 and ESR 4759 (Rim Board)
- 1.6 E: PR-L324 and ESR 4759
- 1.9 E: PR-L324
- 2.1 E: PR-L324
- Enhanced 1.0 E: PR-L324

PANEL PROPERTIES

VENEER
Density graded Douglas fir/larch

MOISTURE CONTENT
8% ± 3%

RESIN SPECIFICATIONS
Meet the requirements of ASTM D5456 and PRG 320. MPP and MPL are CARB exempt.

DIMENSIONAL TOLERANCES
Thicknesses: Target +/- 2%
Width: Target +/- ⅛" (+⅛", 0 for Rim Board)
Length: Target +/- ¼"

SQUARENESS
Diagonals shall not vary more than 1/64" per foot of length

STRAIGHTNESS
Maximum 1/16" deviation of straight edge

LINEAR EXPANSION
0.16% along major axis
0.27% across major axis

R-VALUE
1.25 per inch

THERMAL CONDUCTIVITY
K-Value 0.798 per inch

MATERIALS

LVL: DOUGLAS FIR, LARCH
CERTIFIED UNDER ASTM D5456

- **APA: PR-L324**
- **ICC-ESR 4759**

MPP/MPL: DOUGLAS FIR, LARCH
CERTIFIED UNDER PRG 320

- **APA: PR-L325**
- **ICC-ESR 4760**

APPEARANCE GRADES

All appearance grades are made from Oregon grown Douglas fir, harvested within 100 miles of our plant in Lyons, OR. Panels can be manufactured with upgraded appearance grades on one face or both, allowing designers to balance aesthetics and budget.

STANDARD LAMELLA STYLES

INDUSTRIAL

Made from standard construction-grade plywood veneers, this is the standard appearance for industrial applications and non-visible faces. Knots and knotholes up to 2.5" width with limited splits.

NATURAL ARCHITECTURAL

Our base-grade veneer, Natural Architectural highlights the natural beauty of Douglas fir with tight knots. This grade is standard for visible faces in structural applications.

CLEAR ARCHITECTURAL

Looking for a clean, refined appearance for your project? Clear Architectural is made from primarily knot-free veneers. Freres efficiently creates these veneers by stitching together strips of clear veneer cut from otherwise unusable sheets to highlight the perfection found in nature.

UPGRADED LAMELLA STYLES

EDGE GRAIN

Have you seen the edge grain on LVL? Now imagine an appearance that showcases the rich complexity of the veneer layers that make up Mass Ply.

NATURAL BOARD FACE

Made from Oregon's natural fiber, featuring small, closed knots typical of trees responsibly thinned from dense forests. Ripped into 9.5" boards to evoke the familiar, solid-sawn look of conventional CLT.

CLEAR BOARD FACE

Clear veneer is carefully selected and assembled for a cleaner aesthetic. With a mostly knot-free face, it is puttied, sanded, and then ripped into 9.5" boards, recreating the solid-sawn look of conventional CLT — but without the knots.

FLOORS AND ROOFS

MPP are suited for floor and roof applications. The inherent MPP performance can result in simplification of structural support systems. MPP can be installed quickly and easily, reducing installation time and expense. Freres can manufacture connections, penetrations, and other features prior to shipment to the job site, which further reduces time and expense. Refer to the table below for guidance during the design process. Tables do not substitute for a design professional's work.

FLOOR SPAN TABLES

- F16 Mass Ply Maximum Span Floor Table - Major Strength Axis
- F16 Mass Ply Maximum Span Floor Table - Major Strength Axis with 2" Concrete
- F10 Mass Ply Maximum Span Floor Table - Major Strength Axis
- F10 Mass Ply Maximum Span Floor Table - Major Strength Axis with 2" Concrete
- F10 Mass Ply Maximum Span Floor Table - Minor Strength Axis
- F10 Mass Ply Maximum Span Floor Table - Minor Strength Axis with 2" Concrete

*Scan to see up-to-date tables online, or visit **frereswood.com**.*

ROOF SPAN TABLES

- F16 Mass Ply Maximum Span Roof Table - Major Force Direction
- F10 Mass Ply Maximum Span Roof Table - Major Force Direction
- F10 Mass Ply Maximum Span Roof Table - Minor Force Direction

POINT-SUPPORTED SYSTEMS

Take advantage of MPP's superior strength in the major and minor force direction for point-supported structural systems. Achieve 12'x16' grids to maximize column spacing and decrease installation time. To learn more about point-supported systems, scan the QR code to view the WoodWorks case study on the tallest mass timber building on the West Coast, 1510 Webster, utilizing Freres Mass Ply panels (MPP) and columns (MPL).

*Scan to see case study online, or visit **woodworks.org**.*

PROVEN FIRE PERFORMANCE

The F10-6 and F16-6 MPP have a 2-hour floor rating and a 2-hour wall rating (with plywood spline joint). MPL has the same fire performance as LVL. MPP design capacities are predictable after a fire event. An F16-6 will have two inches of char after one hour in a fire for an equivalent cross section to an F16-4. ASTM E119 and E84 test reports are available upon request.

*Scan to see fire reports online, or visit **frereswood.com**.*

WALLS

Wall applications resist gravity and lateral loads (wind and seismic). The wall loading tables are for gravity loads only. Tables do not substitute for a design professional's work.

WALL LOADING TABLES

- F16 Mass Ply Wall Loading Table (Axial Loads Only) in Kips
- F10 Mass Ply Wall Loading Table (Axial Loads Only) in Kips

Scan to see up-to-date tables online, or visit ***frereswood.com****.*

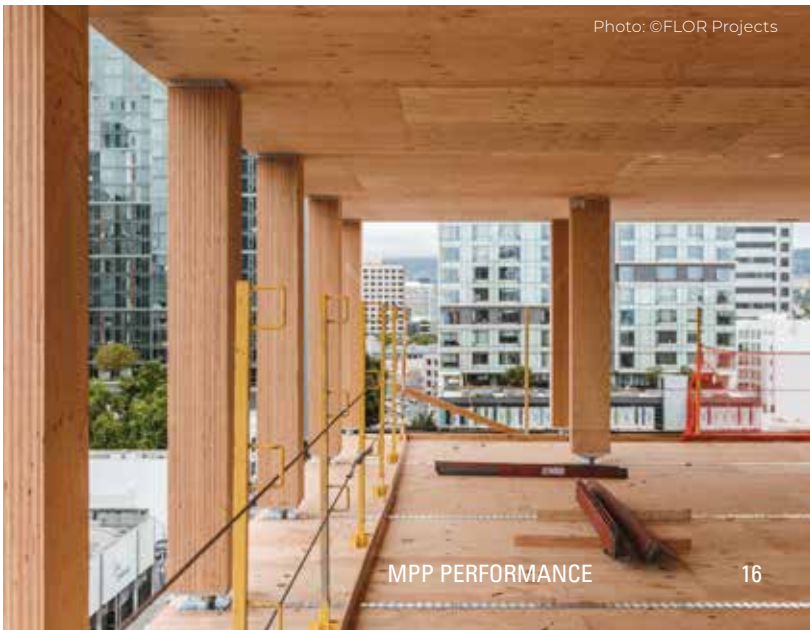


Photo: ©FLOR Projects

MPL PERFORMANCE

GRADES

Joist orientation beams are available in widths from 2" to 24.5" and depths from 1" to 72". Plank orientation beams are available in widths from 1" to 47.5" and depths from 2" to 24.5". MPL beams are available in the F10, F16/16A, F19, and F21 grades. Please contact our sales specialists for more information.

MPL BEAM CALCULATOR

- For F16, F19, and F21 grades loaded in the joist orientation.
- Contact our sales specialist for beams greater than 24" in depth.
- Beam calculator does not substitute for the work of a design professional.

*Scan to see calculator online, or visit **frereswood.com**.*

MPL COLUMNS

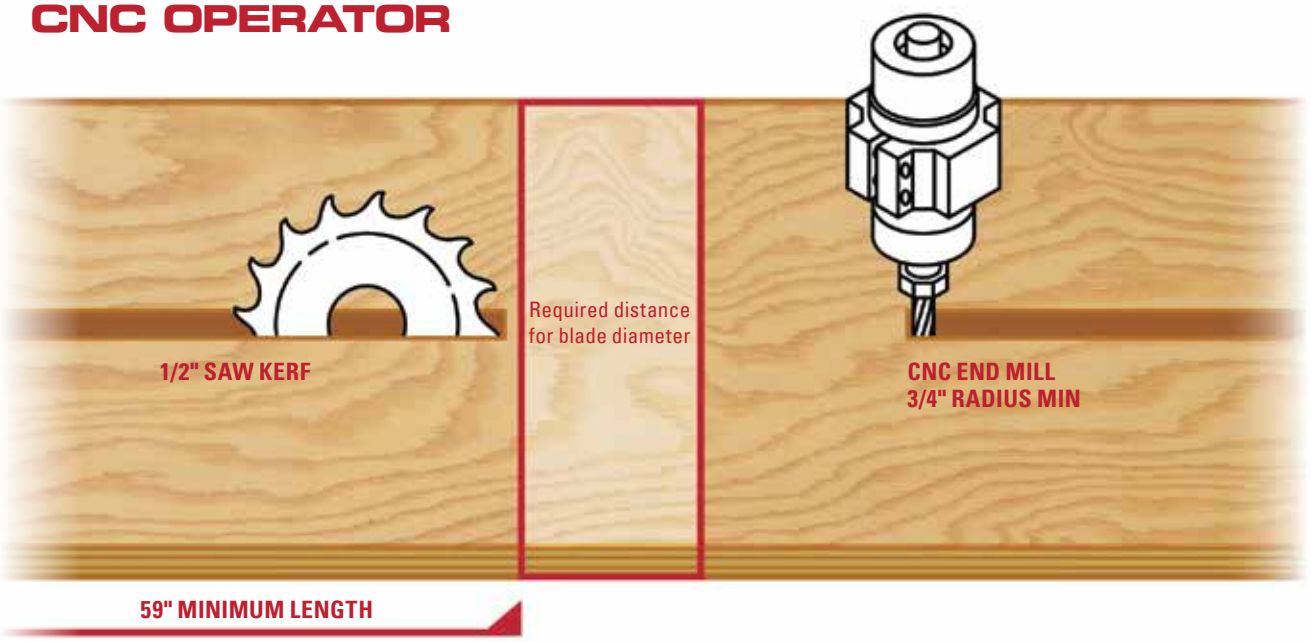
Columns are available in the F16 and F19 grades. Contact our sales specialists for more information and product offers. Tables do not substitute for a design professional's work.

COLUMN LOADING TABLE

- F16 Mass Ply Column Loading Table (Axial Loads Only) in Kips
- F19 Mass Ply Column Loading Table (Axial Loads Only) in Kips

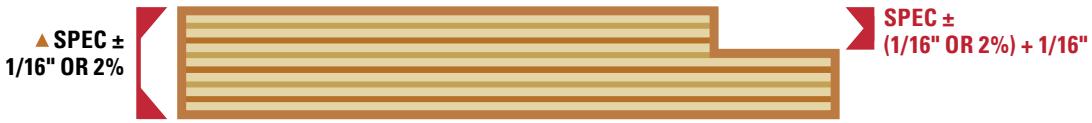
*Scan to see up-to-date tables online, or visit **frereswood.com**.*

CNC OPERATOR

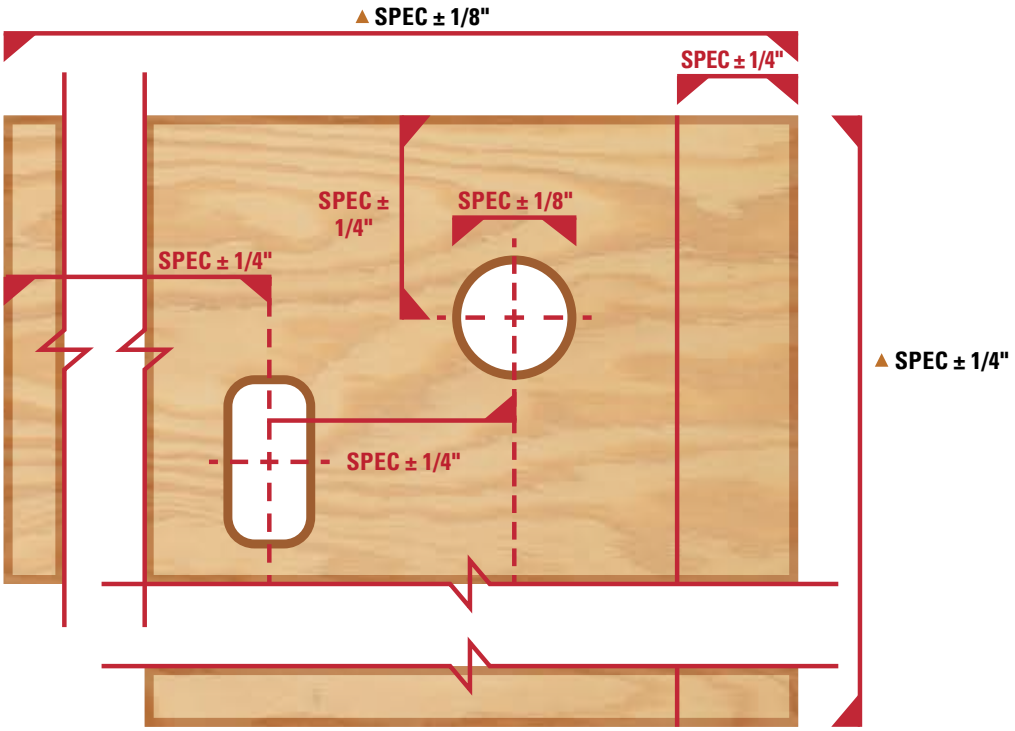


TOLERANCES ON CUTS

END VIEW

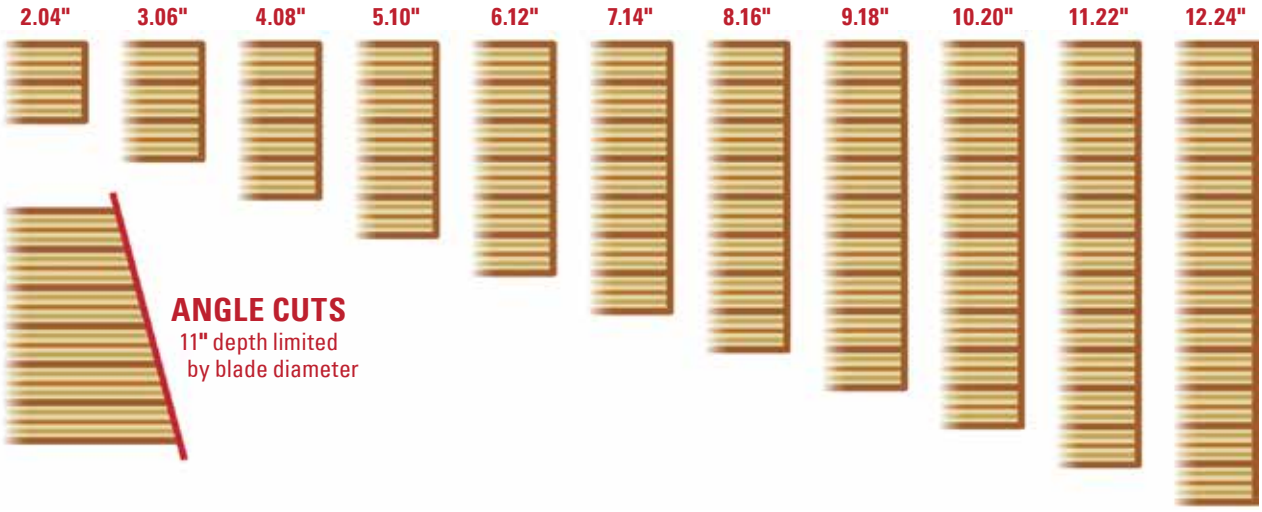


TOP VIEW



▲ PRG-320 MANDATED TOLERANCE

UTILIZE MINIMUM THICKNESS

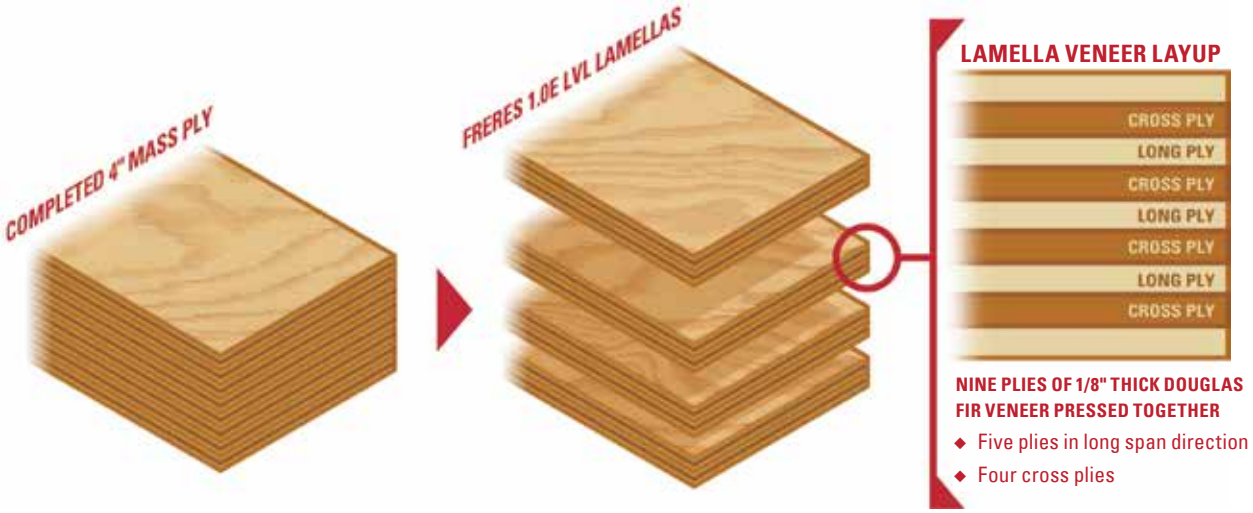


PANEL WIDTH

Full width panels available at EOR and Freres' discretion.

REQUIRE SPECIAL PERMITS FOR TRUCKING

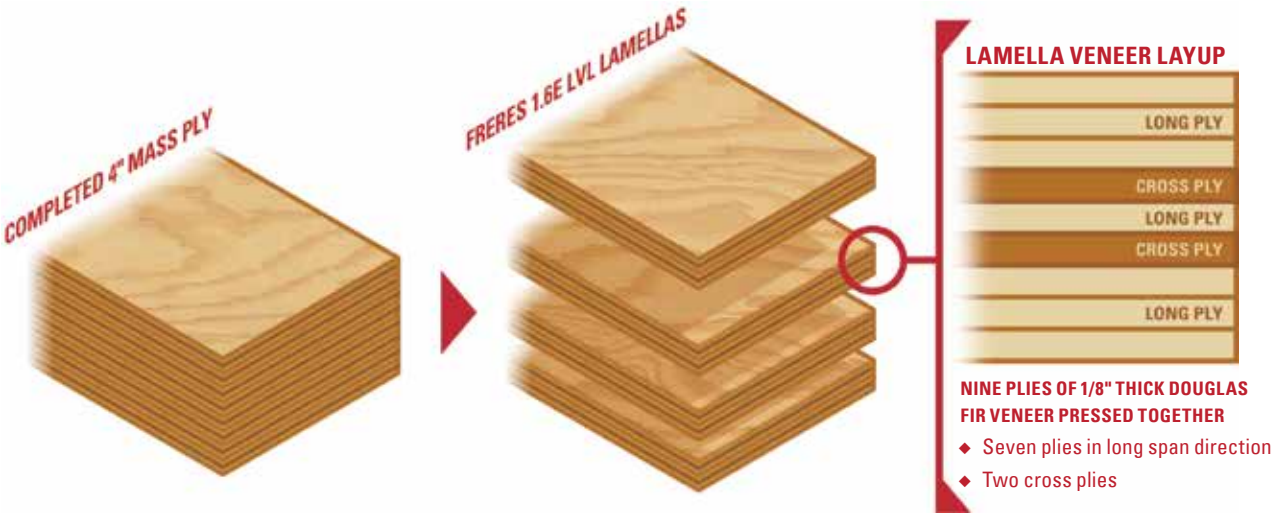
F10 MASS PLY LAYUP



NINE PLIES OF 1/8" THICK DOUGLAS FIR VENEER PRESSED TOGETHER

- Five plies in long span direction
- Four cross plies

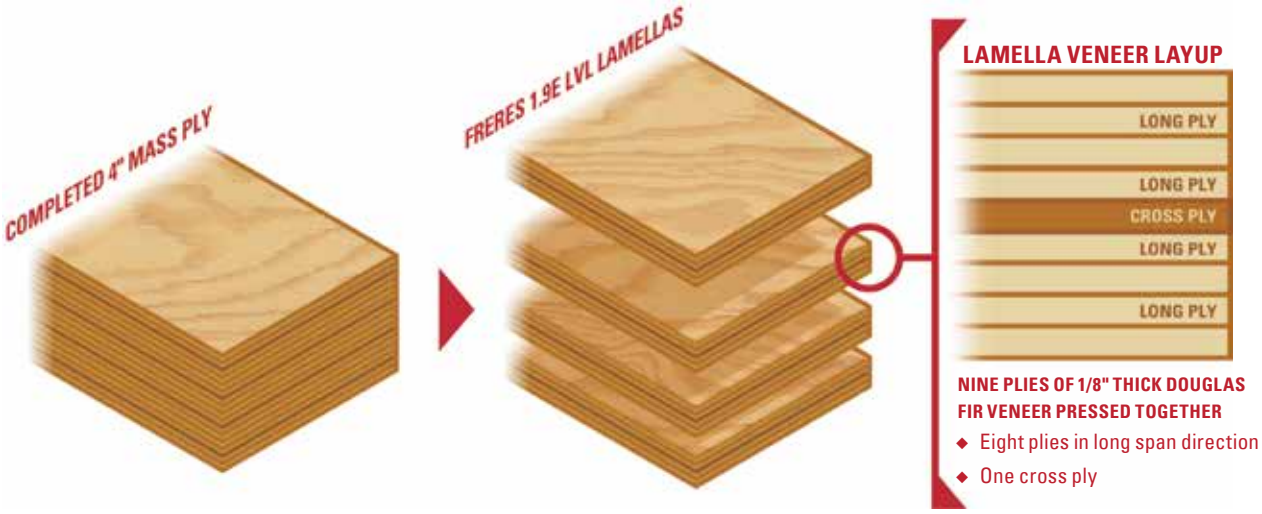
F16 MASS PLY LAYUP



NINE PLIES OF 1/8" THICK DOUGLAS FIR VENEER PRESSED TOGETHER

- Seven plies in long span direction
- Two cross plies

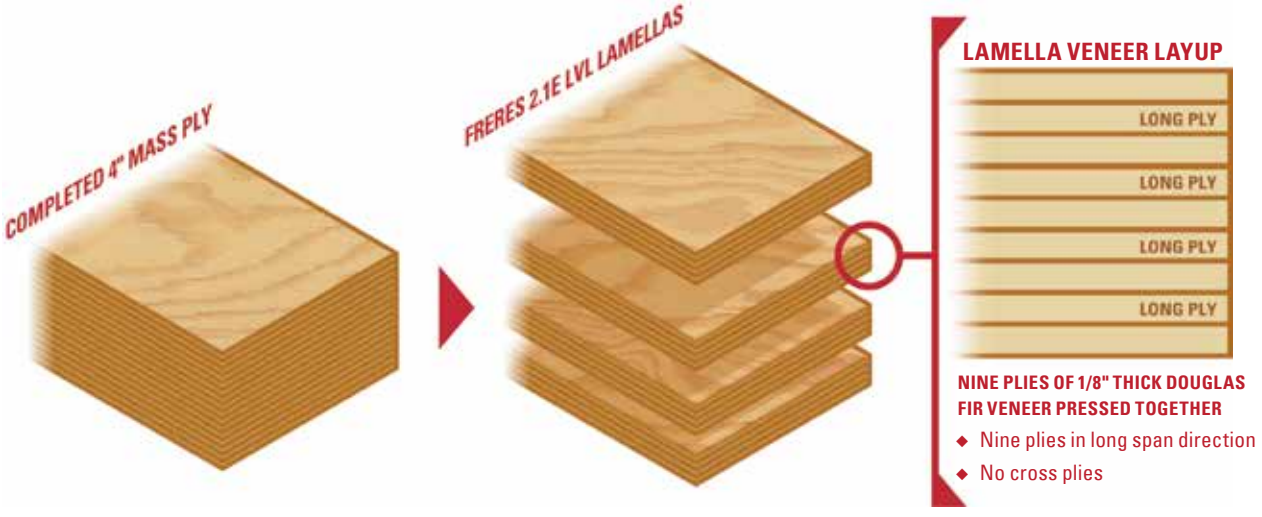
F19 MASS PLY LAYUP



NINE PLIES OF 1/8" THICK DOUGLAS FIR VENEER PRESSED TOGETHER

- Eight plies in long span direction
- One cross ply

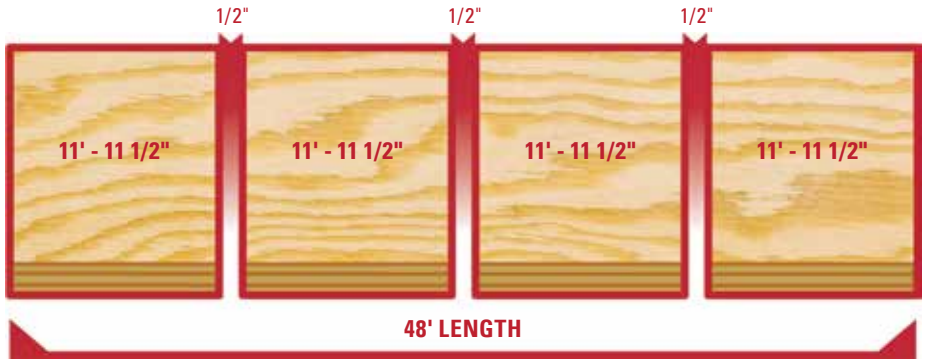
F21 MASS PLY LAYUP



NINE PLIES OF 1/8" THICK DOUGLAS FIR VENEER PRESSED TOGETHER

- Nine plies in long span direction
- No cross plies

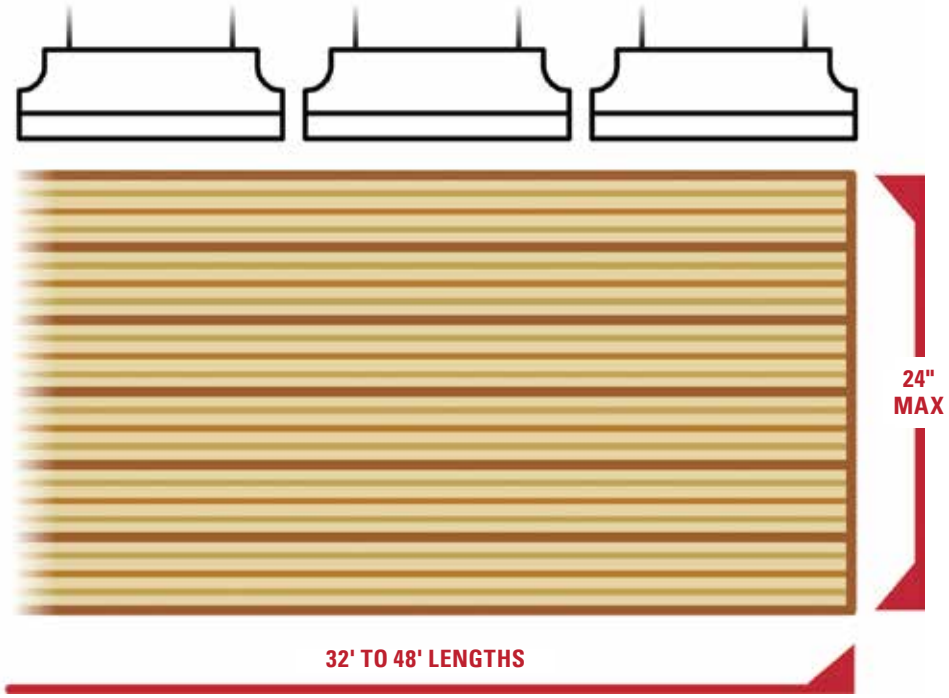
CUTTING MULTIPLES OUT OF PANEL



OPTIMIZE MATERIAL IN YOUR MASS PLY DESIGN

- Effective billet widths after pressing: 11'11", 9'11", 7'11", and 3'11.5"
- Optimal lengths between 32' and 48' at 6" increments

PRESS LOAD PARAMETERS



The example above shows six 4" panels being pressed simultaneously.

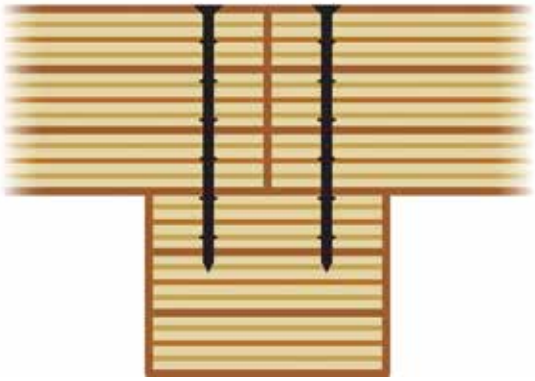
CONNECTIONS

CONNECTION REFERENCE

CLASS 1

Requires only mass timber elements and fasteners.

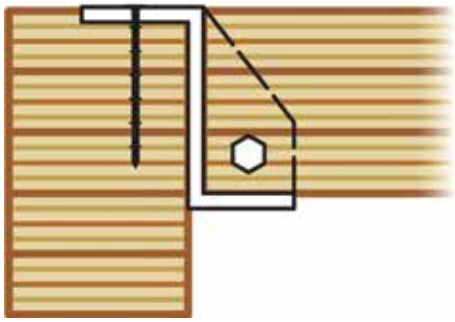
BEAM BEARS ON GIRDER



CLASS 2

Utilizes steel fabricated elements, with components such as angles and plates, and includes fasteners.

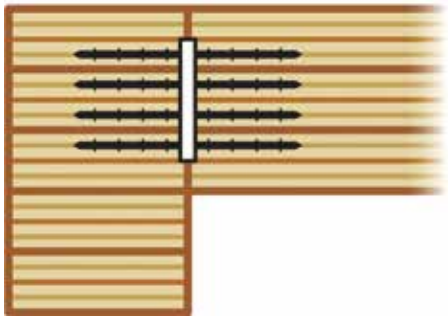
BEAM BEARS ON STEEL BEARING SEAT WITH KNIFE PLATE



CLASS 3

Prefabricated proprietary connectors.

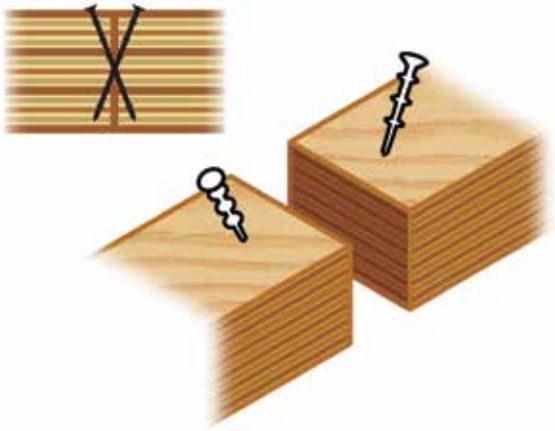
BEAM CONNECTED TO GIRDER WITH PROPRIETARY CONCEALED CONNECTOR



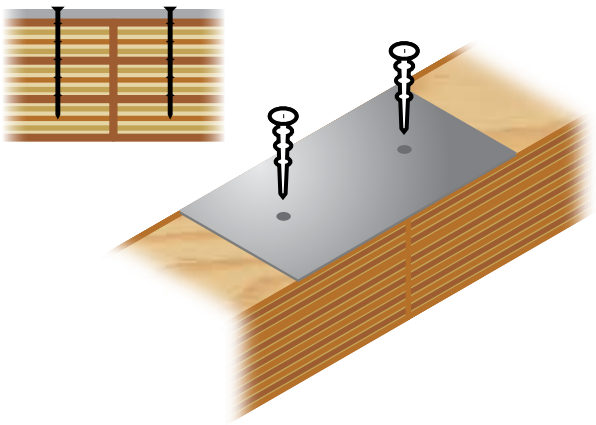
FOR ADDITIONAL JOINT REFERENCE, SEE FRERESWOOD.COM/MTMINDEX

COMMON JOINTS

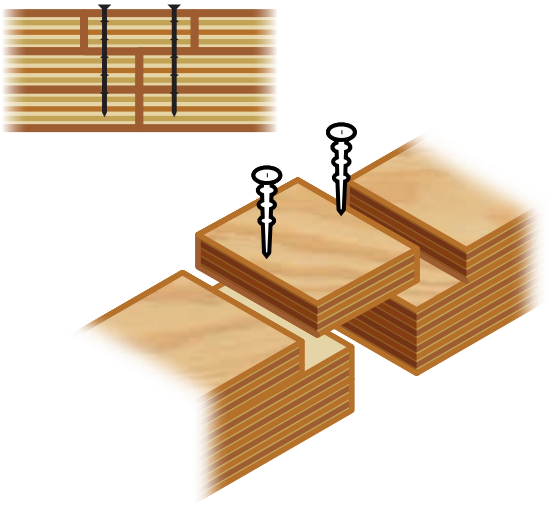
TOE-NAILED SCREWS WITH BUTT-JOINT

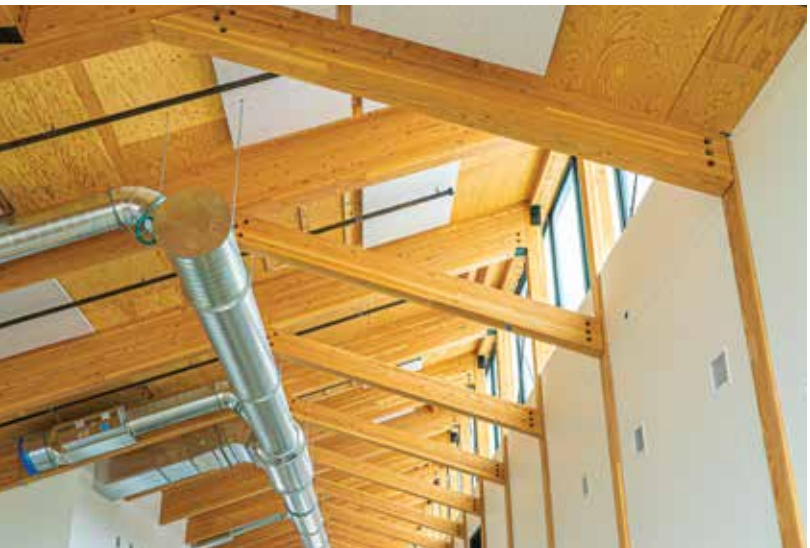


STEEL SURFACE SPLINE



SINGLE SURFACE SPLINE





SHIPPING & HANDLING

SHIPPING

Freres will load trucks to a specific load diagram to facilitate just-in-time delivery requirements. Freres provides stickers to separate material units for easy access with unloading equipment. Freres can provide trucking services or will coordinate with your preferred shipper. Freres recommends tarping to protect the product during shipping.

HANDLING

Care should be taken while unloading trucks to prevent damage to the MPP and MPL products. Some products may require special rigging to avoid damage; consult with the Freres sales department. Freres does not provide nor design rigging systems. Freres has the following handling recommendations:

- Unload trucks and move panels with lifting equipment.
- Do not drag, dump, or drop material.
- Specify off-loading equipment to the maximum panel weight of the project.
- Use wide fabric, corner/edge protectors or slings that will not mar the wood.
- Use face-mounted D-rings where applicable.
- Provide blocking or padding when chains or cables are used to transport material.

STORAGE

Store MPP and MPL to protect panels from the elements and to prevent damage while handling. Like other wood products, MPP and MPL are susceptible to exposure from precipitation and ultraviolet (UV) light. Freres will package MPP and MPL in lumber wrap, for a fee, upon request. Freres does not apply sealants, stains, or vapor barriers in-house. Contact sales department to coordinate application of sealants, stains, and vapor barriers. Recommended storage practices are:

- Store materials on a level surface.
- Separate panels to allow for air movement around the panels.
- Elevate Mass Ply products to prevent contact with the ground and standing water.
- Cover Mass Ply products to protect from precipitation and UV exposure.
- Avoid long-term UV exposure even when covered and/or indoors.

WHY MOISTURE MANAGEMENT?

A moisture management plan is critical to a successful project involving mass timber. MPP/MPL, like all wood products, are susceptible to climatic conditions and precautions must be taken to protect building materials during construction and storage. Preventing exposure to the elements will help meet construction deadlines.

The moisture management plan should include provisions to prevent moisture egress and movement into the building envelope. The moisture management plan should include plans to store and protect material (see Shipping, Handling, and Storage). Freres is available to review your moisture management plan.

PRECIPITATION, MOISTURE, AND UV EXPOSURE

Rain and snow can stain unprotected MPP/MPL. Metal fasteners exposed to precipitation and moisture will stain unprotected MPP/MPL. Moisture affects product performance and wet material may delay project completion.

Exposure to UV light will change the color of all wood species because ultraviolet light oxidizes wood fiber. Douglas-fir fibers darken as a result of UV light. The color differences will dissipate and, in most instances, disappear. UV light does not affect product performance.

RECOMMENDATIONS

- Remove snow and standing water from unprotected surfaces.
- Clean the wood surfaces after any metal work.
- Ensure that metal fasteners and connectors are free of oil to avoid staining.
- Use galvanized bolts and connectors to minimize staining.
- Follow the recommendations in “Shipping, Handling, and Storage” section.

SEALING THE BUILDING ENVELOPE

MPP/MPL exposed to moisture may have higher moisture content than environmental moisture conditions which may delay project completion. If the wood moisture content is too high for the project requirements, the following are steps that can be taken to mitigate the moisture content:

- Provide adequate time for the wood to equalize with environmental conditions.
- Use fans to circulate air from heat sources.
- Monitor relative humidity throughout the conditioning process.

PANELS SHOULD BE PROTECTED FROM MOISTURE, OILS, AND UV LIGHT/HEAT DURING TRANSPORTATION, STORAGE, AND CONSTRUCTION.

FAQS

WHAT IS MASS PLY?

Mass Ply is a patented, veneer-based engineered wood product developed by Freres. Mass Ply is a mass timber panel assembled by combining thin layers of stress-rated Douglas fir veneer, in the long and cross direction, creating a large-format wood platform that is then prefabricated to exact dimension with a CNC machine. Mass Ply is strong, fire-resistant, and lighter per volume than concrete and steel.

WHY FRERES MPP?

Mass Ply is a sustainable building product with excellent strength and stiffness performance that is competitive with other products on the market. Mass Ply is manufactured in 1" thickness increments to more effeciently match the project requirements without extra structurally unnecessary thickness. The panel is prefabricated in the factory for fast installation on the jobsite. Because it is a veneer-based product, MPP utilizes more of the log than solid-sawn lumber and lends itself to harvesting practices that are considered to be more environmentally friendly.

HOW IS MPP MANUFACTURED?

The Mass Ply Panel (MPP) is composed of 1" x 4' x 8' layers of Laminated Veneer Lumber (LVL), a veneer-based engineered wood product certified under ASTM D5456. The LVL layups have cross plies, which allow the mass timber panel to have strength and stability across both axes of the panel. Our higher performance layups have more long plies than cross plies to achieve greater spans. The 4' x 8' sheets are scarf-jointed together to achieve a length up to 48'. A width up to 11'11" is achieved by using 4' and 2' wide panels and staggering the edge-joints on adjacent lamellas as the billet is built to the desired thickness.

HOW WILL MASS PLY BE USED IN CONSTRUCTION?

MPP is a versatile building product. MPP is used in floors, walls, and roofs. MPL is used as beams and columns. MPP/MPL allow rapid construction in multi-story structures. Mass Ply products have been used in residential and warehouse construction.

WHAT TESTS HAS FRERES DONE ON THE INTEGRITY OF MASS PLY?

Freres has conducted extensive product testing on Mass Ply for structural, fire, acoustics, moisture, and point-supported-slab stability. The APA has performed extensive testing to certify our products under ASTM D5456 and PRG 320. This combination of certifications is unique to Mass Ply compared to CLT, as we have to comply with the rigorous testing of both the CLT and LVL standard. We are also working to establish design values outside those required by these standards with partners at Oregon State University, The Tallwood Design Institute, and other labs across the country. These tests include seismic loading, fastener performance, impact loading, blast resistance, ballistics, acoustics, and additional fire testing.

WHAT IS CROSS LAMINATED TIMBER (CLT)?

CLT is a type of mass timber panel constructed of either machine-graded or visually graded dimensional lumber, typically consisting of odd layers of dimension lumber oriented perpendicular to one another and then glued to form structural panels.

HOW IS MASS PLY DIFFERENT FROM CLT PRODUCTS?

Mass Ply uses veneer as the primary raw material to create an LVL panel, which is then used to create a mass timber panel; whereas CLT uses dimensional lumber as the primary raw material.

Each veneer is electronically graded. Numerous layers of veneer effectively distribute and reduce the effect of defects such as knots. Greater flexibility in layups means that applications can be optimized both structurally and economically. As a result, the panels have a more predictable performance than lumber-based products.

HOW DOES WEATHER AFFECT THE PRODUCT?

Mass Ply is made to handle exterior exposure criteria much like plywood and other engineered wood products. It can be exposed during construction periods, but precautions must be taken to minimize exposure, and Mass Ply must be dried out before putting protective covering over it. Expansion and contraction from moisture need to be considered as well. Mass Ply is not meant to be permanently exposed to the elements. Appropriate siding products should be used in conjunction with the structural panels.

CAN THE PANELS BE PRESSED IN A WAY TO MAKE THEM CURVED?

The standard Mass Ply format is flat. We can route out a curve on the face of the panel; however, router depth limits panel thickness to 7". We do not have direct test data for this type of application.

HOW DOES MASS PLY COMPARE TO CONCRETE AND STEEL CONSTRUCTION?

Increasingly, mass timber is being used as an alternative to concrete and steel construction for mid-rise building construction. Mass timber products have a number of advantages over steel and concrete. Mass Ply products are renewable, have a significantly smaller carbon footprint, have more aesthetic value, and are often cost-effective because they are much faster to install.

HOW DO THE PIECES OF MASS PLY CONNECT TO ONE ANOTHER?

Many of the traditional timber joints may be used when constructing with Mass Ply. Plywood spline joint or top mounted steel strap are the most common methods when connecting one Mass Ply panel to another. The particular joint used will depend on the specific application.

HOW ARE MPP/MPL TRANSPORTED TO THE JOB SITE?

Mass Ply is transported by either rail or by truck. Rail loading facilities have been constructed at our manufacturing facility so that we may load a variety of rail cars for shipping long distances. Due to limitations with rail transportation, please contact our sales team. Freres Engineered Wood operates an over-the-road trucking fleet. We will work with your over-the-road provider as well.

WHAT RESINS ARE USED IN MASS PLY PRODUCTION?

Freres bonds the veneer in the lamellas with phenol-formaldehyde resin in a hot press. Freres bonds the lamellas in the billet with melamine-formic acid resin in a cold press.

DO THE MPP RESINS EMIT FORMALDEHYDE?

Formaldehyde emmissions from all Freres Engineered Wood Products are at such a low level that they are California Resources Board (CARB) exempt. For more information, please reference APA technical note J330E “Formaldehyde and Engineered Wood Products” available at **apawood.org**.

DOES FRERES OWN ANY PATENTS?

Freres patented our Mass Ply Panel engineered process. Freres’ Mass Ply has earned patents in the United States, Canada, Australia, and New Zealand.

ARE THERE ANY OTHER MASS PLY PRODUCTS ON THE MARKET?

No. This is a new product designed from the ground up by the Freres family. We have a variety of engineered wood products including the Mass Ply Panel, Mass Ply Lam (beams and columns), and Mass Ply Industrial (mats).

GLOSSARY

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

APA - THE ENGINEERED WOOD ASSOCIATION

is a trade organization representing manufacturers of plywood, OSB, glued laminated timber, I-Joists, Rim Board®, and structural composite lumber (SCL). The Association has three main functions: research to improve wood structural panels (plywood and OSB) and other engineered wood products and systems, quality inspection and testing to assure the manufacture of high-quality wood structural panels and engineered wood products, and promotion of engineered wood products and building systems. It was previously called the American Plywood Association and is commonly referred to as “APA.”

CALIFORNIA AIR RESOURCES BOARD (CARB)

is the “clean air agency” in the government of California. Established in 1967 when then-governor Ronald Reagan signed the Mulford-Carrell Act, combining the Bureau of Air Sanitation and the Motor Vehicle Pollution Control Board, CARB is a department within the cabinet-level California Environmental Protection Agency.

COMPUTER NUMERICAL CONTROL (CNC)

machines are electro-mechanical devices that manipulate machine shop tools using computer programming inputs. Machining is a general way to transform a piece of material like plywood and arrive at a finished product, like a wall with cutout doors and windows. CNC relies on digital instructions from a Computer Aided Manufacturing (CAM) or Computer Aided Design (CAD) file. The CNC machine interprets the design instructions into cutting instructions.

CROSS-LAMINATED TIMBER (CLT)

a prefabricated engineered wood product made of at least three orthogonal layers of graded sawn lumber or structural composite lumber (SCL) that are laminated by gluing with structural adhesives.

STRUCTURAL COMPOSITE LUMBER (SCL)

is an engineered wood product designed for structural use. SCL is manufactured from wood strands or veneers bonded with adhesives and created using a layering technique where the outcome is a block known as a billet. Similar to conventional-sawn lumber and timber, SCL products are used for common structural applications and include laminated veneer lumber (LVL), parallel strand lumber (PSL), laminated strand lumber (LSL), and oriented strand lumber (OSL).

ENGINEERED WOOD PRODUCTS

are structural wood products that are manufactured by bonding together wood strands, veneers, lumber, or other forms of wood fiber to produce a larger and integral composite unit with consistent performance characteristics. These high-performance building components achieve predictable and reliable performance characteristics with the efficient use of natural resources.

INTERNATIONAL BUILDING CODE (IBC)

is a model building code developed by the International Code Council (ICC). It has been adopted for use as a base code standard by most jurisdictions in the United States.

INTERNATIONAL CODE COUNCIL (ICC)

evaluation service is one of a number of organizations that studies applications for new proprietary products that fall outside the scope of the model code. Evaluation reports are then issued that indicate product equivalency to specific sections of the code.

PRG 320

is an ANSI/APA standard that covers the manufacturing, qualification, and quality assurance requirements for CLT.

LAMINATED VENEER LUMBER (LVL)

is a high-strength engineered wood product made from veneers bonded together under heat and pressure. Veneers in a LVL billet are typically constructed in a parallel format. It is used for permanent structural applications including beams and rafters.

MASS PLY PANEL

is a mass timber panel, similar in application to cross-laminated timber, that was developed, produced, and patented by Freres Engineered Wood. Layers of structural composite lumber are assembled and glued to produce a panel up to 12' wide and 48' long, meeting the requirements of ANSI/APA PRG 320, and designed to be used in the construction of mid-rise to high-rise structures.

MASS TIMBER

is a product category and framing style characterized by the use of large, solid wood panels for wall, floor, and roof construction. Mass timber panels are 6' or more in width or depth.

SCARF JOINT

is an angled or beveled joint in plywood, splicing pieces together. The length of the scarf is eight times the thickness required by PS1.

VENEER

is a thin sheet of wood — typically no thicker than 0.125" (3 mm) — laminated with others under heat and pressure to form plywood, or used for faces of composite panels. Also called “ply.”

VENEER GRADE

is the standard grade designation of softwood veneer used in panel manufacture. Veneer grade designations for plywood are outlined in product standard PS1-09. Veneer grades for engineered wood products are based on tested strength and density properties.

MASS PLY FAST FACTS

LESS WASTE

Veneer uses more of the log by peeling on a lathe.

LOW MOISTURE

Veneer is dried to a 4-6% moisture content in as little as six minutes.

LESS ENERGY

Veneer requires less energy to produce than other building materials.

LOW IMPACT

Veneer uses smaller trees from thinning operations: a low-impact means of harvest.

CONTACT

OUR SALES AND ENGINEERING TEAM IS AVAILABLE TO ASSIST WITH YOUR PROJECT. CONTACT US EARLY IN THE DESIGN PHASE, AS OUR CAPABILITIES ARE ALWAYS EVOLVING.

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