MICHIGAN GREEN BUILDING COLLABORATIVE
MiGBC + MASS TIMBER @MSU WEBINAR

Mass Timber Webinar Series

Leading with Lumber:

The DNR's Mass Timber Center and Michigan Red Pine's Role

DEPARTMENT OF NATURAL RESOURCES DNR MICHIGAN
LORD AECK SARGENT
VAAGEN TIMBERS
Walbridge BUILT FOR GOOD
Clark

Presented by:

MiGBC
MICHIGAN GREEN BUILDING COLLABORATIVE

E3M SOLUTIONS

Michigan Energy Codes Deep Dive

Grand Rapids – Thursday, July 10

Detroit – Wednesday, July 16

Lansing – Tuesday, July 22

MICHIGAN 2030 DISTRICTS®

ASHRAE®

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DTE

Consumers Energy
Count on Us®

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

LANSING BWL
Hometown People. Hometown Power.

IS THE PLANET WORTH SAVING
WEGE FOUNDATION

Panelists

Sandra Lupien
Director
MassTimber@MSU
Moderator

Michelle Crook
Senior Project Engineer
Michigan Dept. of Natural Resources
Owner/Project History

Anna Anderson
Senior Project Manager
Lord Aeck Sargent
Architect

Jason Kuckuk
Assistant Project Manager
Walbridge
Construction Manager

Russ Vaagen
CEO
Vaagen Timbers
Mass Timber Supplier

Nate Gabel
Estimator / Project Manager
Clark Contracting Services
Installer

Kayla Snyder
Senior Programs Manager
MiGBC
Host

MassTimber@MSU leverages research, education, outreach, communications, policy, and partnerships to advance sustainable mass timber construction and manufacture in Michigan, the Great Lakes region and beyond.

canr.msu.edu/masstimber/
#MIMassTimberMomentum

TYPES OF MASS TIMBER

Glue-laminated Timber (Glulam)

Cross-Laminated Timber (CLT)

Mass Plywood Panels

Nail-Laminated Timber

Dowel Laminated Timber

Laminated Veneer Lumber

MASS TIMBER CAN:

Fostering a Mass Timber Ecosystem

MICHIGAN STATE
UNIVERSITY

Mass Timber Projects in Michigan:

~65 Complete or in the Pipeline

- K-12 schools, Universities
- Training Facilities, Community Centers, Government Buildings
- Apartments & Condos
  Affordable Housing
  Single-Family Home
- Hotel

MASS TIMBER @MSU

MICHIGAN STATE UNIVERSITY

Contact

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510-681-3171

Mobilizing education, science, outreach, and communication to advance mass timber construction and manufacture in Michigan and the surrounding region.

@MassTimberatMSU

canr.msu.edu/masstimber/

Newberry, MI
MDNR
Customer Service Center


MICHIGAN DNR


• 10,000 sq ft
• Office Space
• Community Center

DNR NEWBERRY CUSTOMER SERVICE CENTER
NEWBERRY, MICHIGAN
ANNA ANDERSON, AIA LEED
BD&C

LORD AECK SARGENT

LORD AECK SARGENT

Walbridge

Hardy Wentzel
Think Mass Timber

DTMB
Technology, Management & Budget

MICHIGAN STATE UNIVERSITY
College of Agriculture & Natural Resources
Mass Timber

Clark
CONTRACTING SERVICES

EQUILIBRIUM

BIEWER LUMBER

Peter Basso Associates
CONSULTING ENGINEERS

sdi structures

VAAGEN TIMBERS

LORD AECK SARGENT

OFFICES, HQ:

ATLANTA DETROIT

LEXINGTON

AUSTIN CHAPEL

HILL

WASHINGTON DC

LORD AECK SARGENT

A History of Sustainability

Green Design Before LEED® and Since

95 Green Building Certifications
5.644 million square feet
4,295 LEED® points earned

1989 1991 1993 1995 1998 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

USGBC launches the LEED® Rating System

A **Manufacturing Research Center**
Georgia Institute of Technology

B **Ichauway Plantation**
Joseph W. Jones Ecological Research Center

C **Action Resource Center**
Zoo Atlanta

D **Georgia Public Health Laboratory**

LEED® Accreditation Exam Launched
First LAS employee earns accreditation

LAS integrates energy and daylight modeling capabilities

LAS becomes a carbon-neutral organization

FIRST LEED PROJECT **1**
Twin Creeks Science & Education Center
National Park Service
LEED® Gold

FIRST LEED PLATINUM **2**
The Eco Office
Southface Energy Institute
LEED® Platinum

3 **Biodesign Institute**
Arizona State University
LEED® Platinum (Bldg. B)
LEED® Gold (Bldg. A)

4 **Global Institute of Sustainability**
Arizona State University
LEED® Silver

2030 CHALLENGE
LAS is among the first signatories of The 2030 Challenge

WALKING THE WALK **5**
LAS' new Atlanta Office achieves LEED® Platinum certification

JUST LABEL
LAS is among the first 20 architecture firms in the world to earn a JUST Label

AIA COTE TOP TEN
Kendeda Building wins prestigious award for integration of design excellence and environmental performance

LIVING BUILDING CHALLENGE **6**
The Kendeda Building for Innovative Sustainable Design
Georgia Tech's Kendeda Building earns full Living Building Challenge, **LEED Zero Energy, LEED Zero Water**, and **LEED Platinum** Certifications

Milestone Projects

Pre-LEED® projects

LEED® certified

Daylight harvesting makes the Center one of LAS's first structures to include sustainable features after the merger (1991 High Honors R&D Lab of the Year).

Site-harvested lumber and one of the first pervious pavement applications in Georgia.

Extensive use of recycled, salvaged, and renewable building materials; the "living roof" was the first vegetated roof in Atlanta.

Extensive daylight and views, recycled and salvaged building materials, featured by the EPA as a LABS 21 Case Study and showcased in a Daylighting Best Practice Guide (1998 R&D Lab of the Year).

LAS's first registered project features daylight harvesting, natural ventilation, bio-retention of stormwater. *2008 EDRC Award, 2008 AIA COTE Atlanta Award, 2009 AIA Award*

The **Platinum-certified** Eco Office features a photo-voltaic array, electro-chromic glazing and composting toilets. *2007 AIA COTE Atlanta Award, 2009 Conserve Georgia Water Award*

On of the firm's largest LEED® certified project to date at 350,000 sf has become a model facility. *2006 R&D Lab of the Year, LAS in collaboration with Gould Evans*

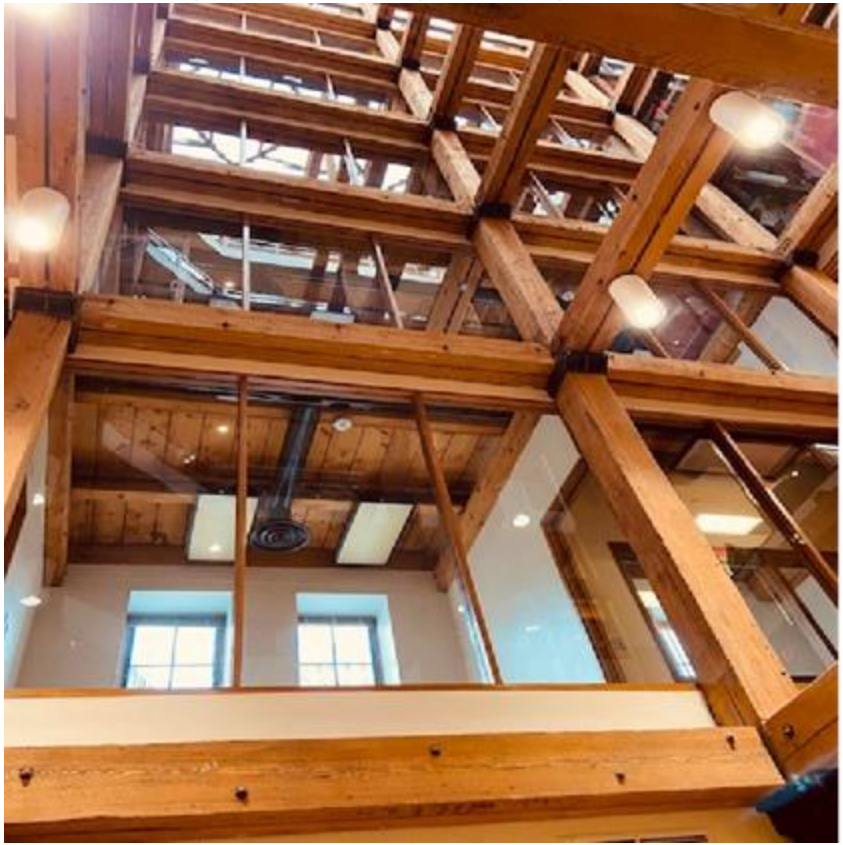
The nation's first school of sustainability features parapet-mounted wind turbines. Daylighting was enhanced by replacing existing corners with glass. *2009 EDRC Award*

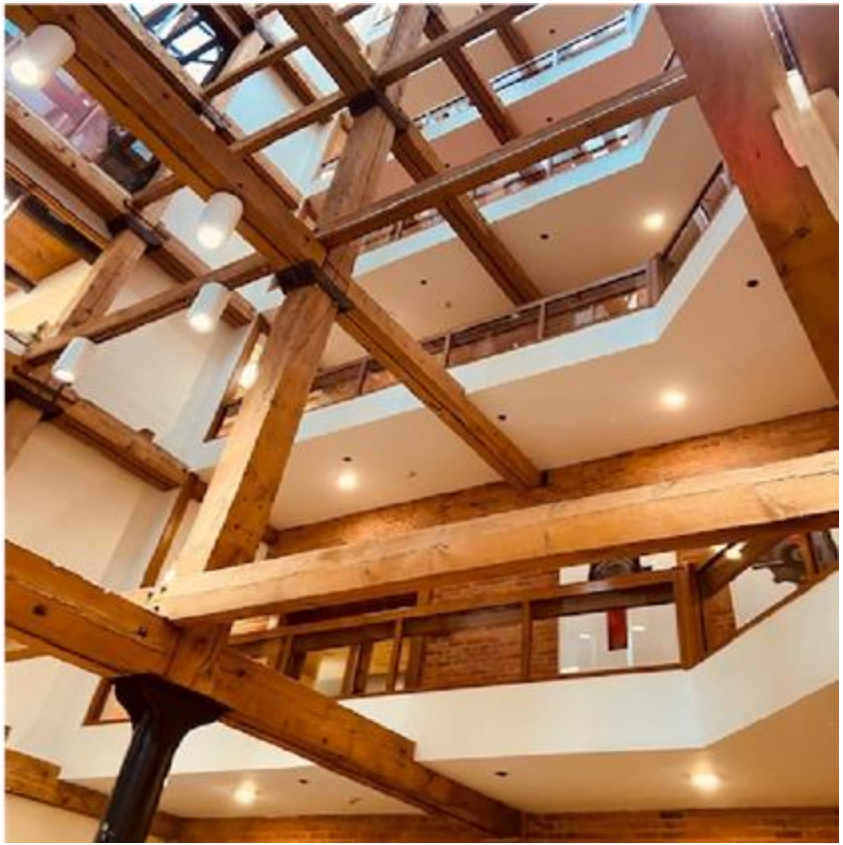
Lord Aeck Sargent's LEED Platinum Certified office is a physical testament to the firm's commitment to sustainable design and meeting the 2030 Challenge.

Designed by LAS and The Miller Hull Partnership, **The Kendeda Building at Georgia Tech** is the most environmentally advanced education and research building in the Southeast. *2011 AIA COTE Top Ten*

Globe TabacoCo. factory(Bricktown) Detroit, MI -1888

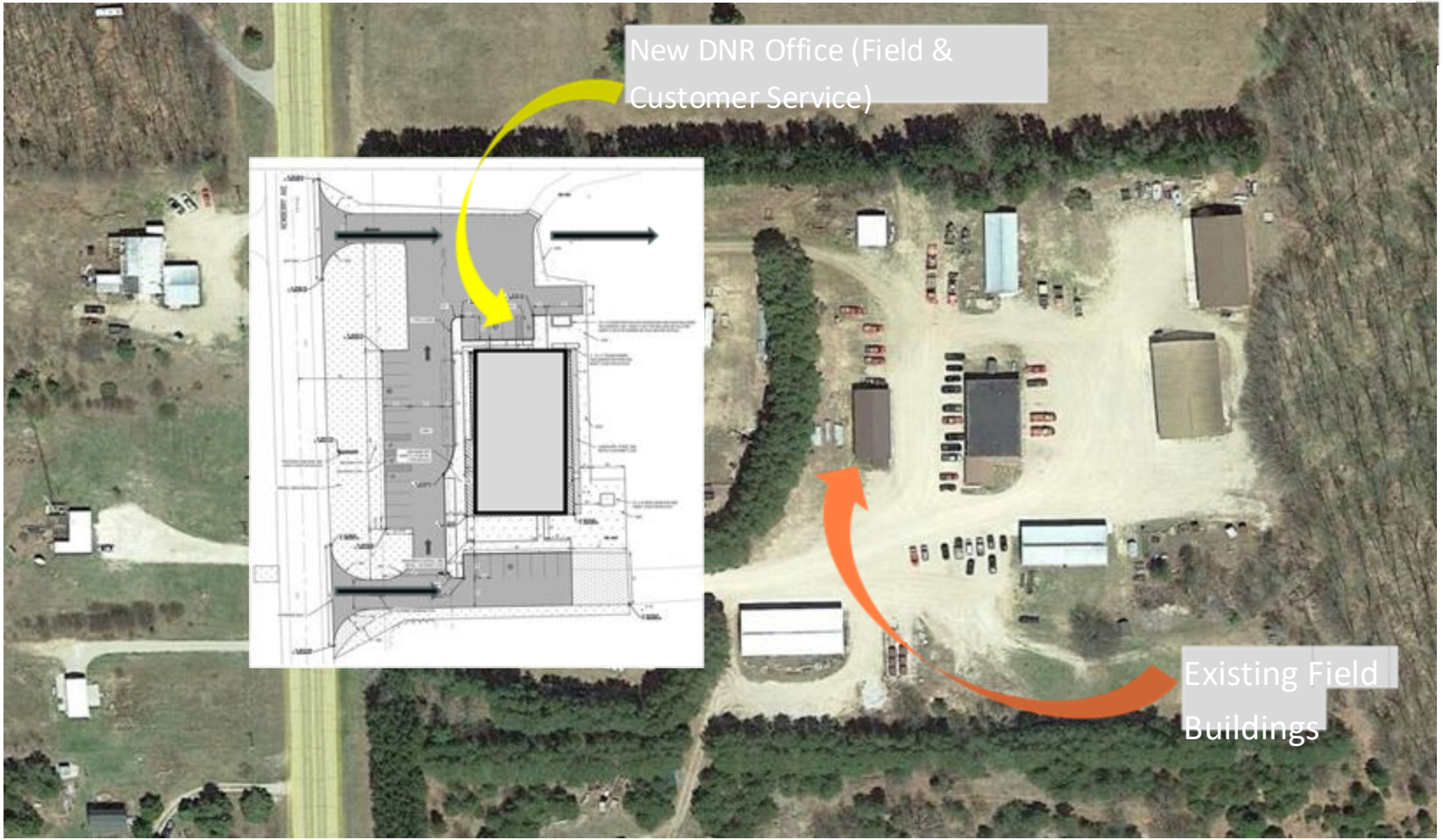
6 stories, 50,000 sqft. the Globe Building was designed by architecture firm William Scott & Co.Construction method ‘ slow burning mill construction’ popular in 19thcentury industrial buildingsusingheavymasonry load bearing walls and heavy timber beams spaces approx. 4’ apart. Those beams were supported by girders and columns forming compact fireproof ceiling. The design allowed for further spans and was endorsed by insurance companies of the time to reduce fire risks. Wood waslocally sources,wood species; white pine or eastern white oak.






Sudbury
Algonquin Provincial Pa
Newberry
Manitoulin Island
Lake Huron
Traverse City
WISCONSIN
Green Bay
Appleton
Huron-Manistee National Forests
MICHIGAN
Toronto
Mississauga
Hamilton
Buffalo
Madison
Milwaukee
Grand Rapids
Detroit
Ann Arbor
Lake Erie
Rockford

LORD AECK SARGENT



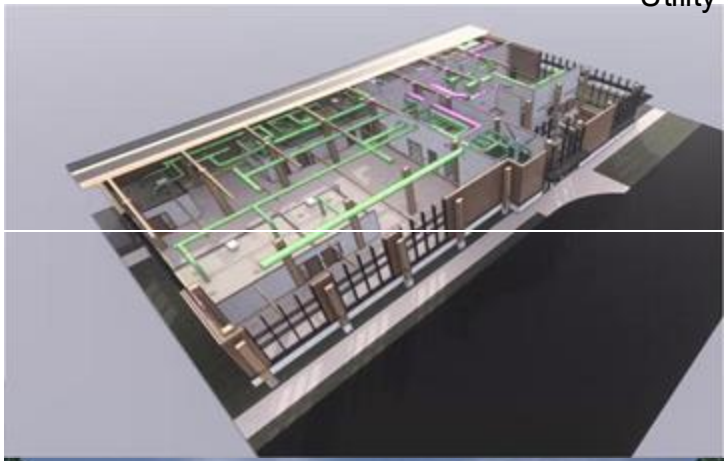
Client: MI Department of Natural Resources –MI DTMB DNR – Customer Service Center : -Offices for : Fisheries and Wildlife, Law Enforcement, Parks and Recreation, Forest Resources Division

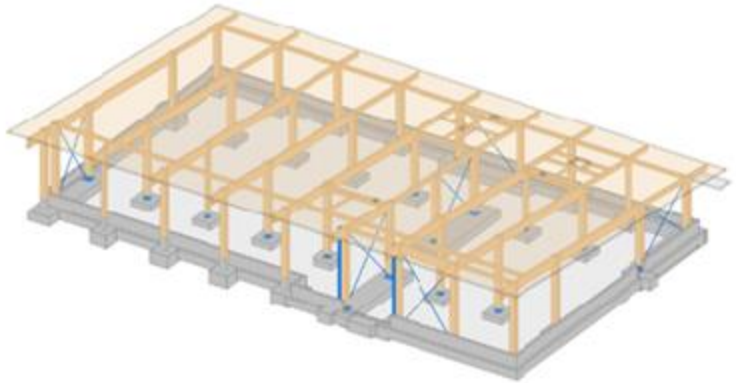
Building –11,000 SF

- Offices
- Display Area: Mass Timber
- Showcase, Multi-Purpose Room –
- Town Hall Newberry First Response Area Storage and Utility Spaces

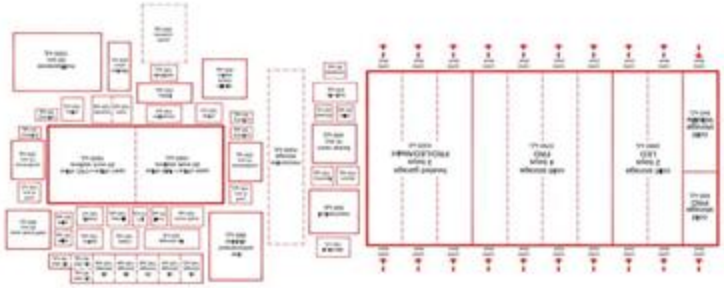
Construction

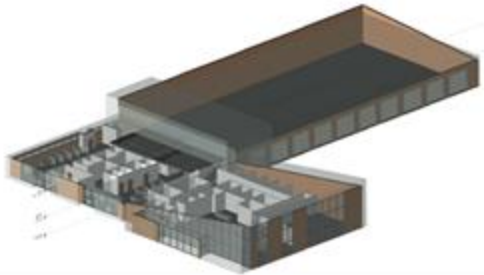
- 5 Ply CLT roof decking (Red
- Pine -SPF S) 3 Ply exterior walls
- (Red Pine -SPF S) Post & Beam GLT (Douglas Fir)





PROCESS





LORD
AECK
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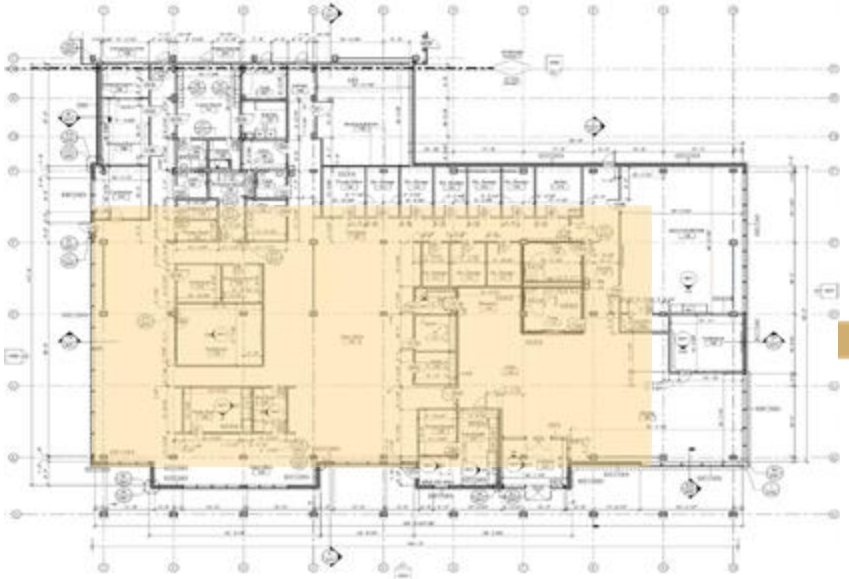

LORD
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SARGENT

PROJECT SHOWCASING ONE OF MICHIGAN'S TOP INDUSTRIES – FORESTRY AND TIMBER PRODUCTS

LORD AECK SARGENT

MORE THAN ½ OF MI ARE FOREST
95% -CAN BE USED FOR PRODUCTION OF TIMBER

STATE OF MICHIGAN –MANAGES 21%

FIND TREES IN MICHIGAN

FIND SAWMILL

FIND MANUFACTURER

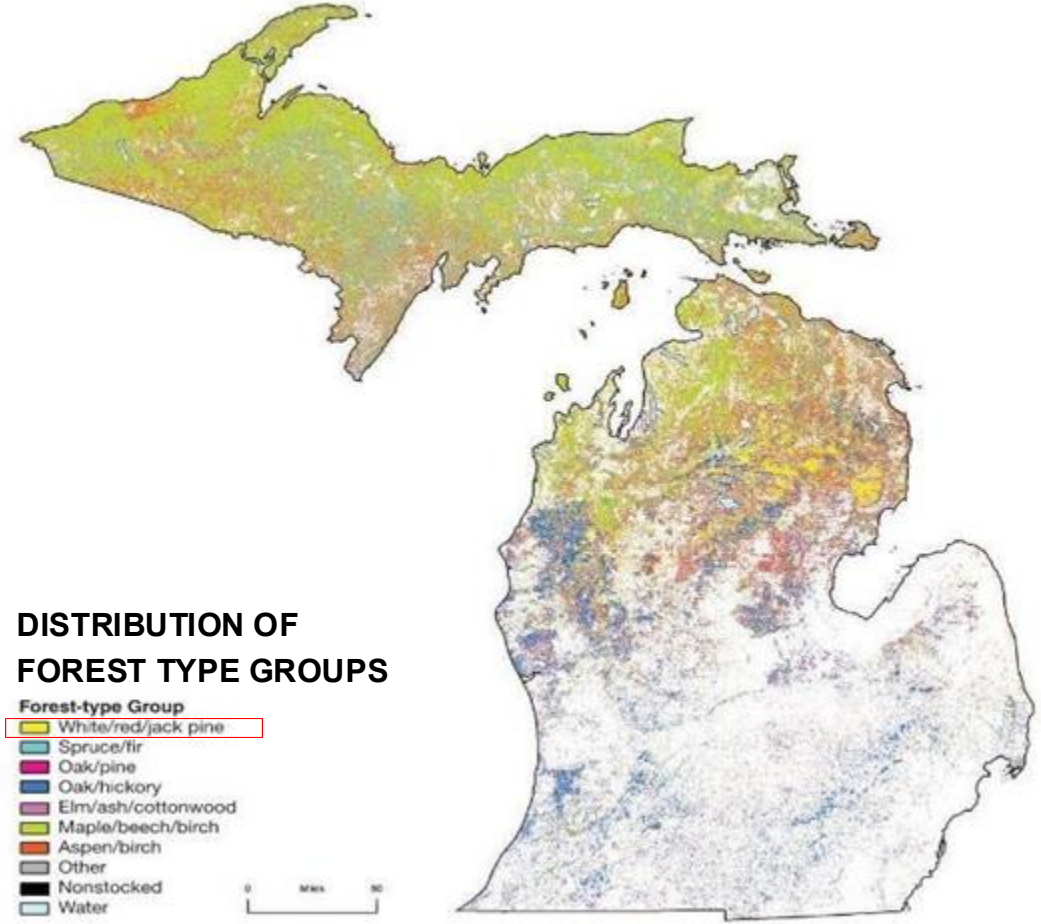
CONFIRM SPECIES STANDARDS (NDS, ANSI), APA CERTIFICATION

THE PATH TO MICHIGAN SOURCED CLT

The forest products industry provides 96,000 jobs and contributes $22 billion to Michigan's economy.

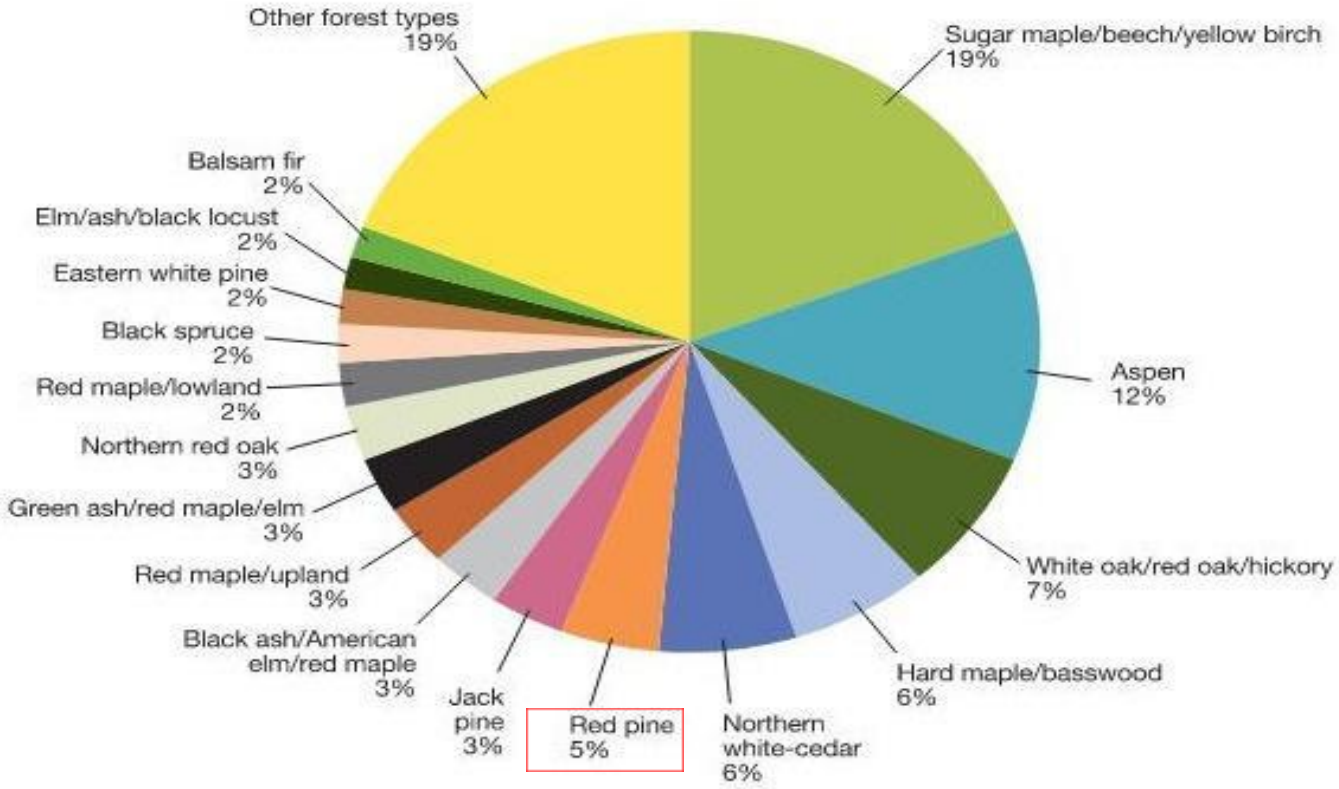
LORD AECK SARGENT

DISTRIBUTION OF FOREST TYPE GROUPS



- Michigan State University's Forestry Department and School of Planning, Design and Construction has done extensive research on Michigan tree species and the viability of using each species in building construction.

Source: United States Department of Agriculture, Michigan Forest 2014



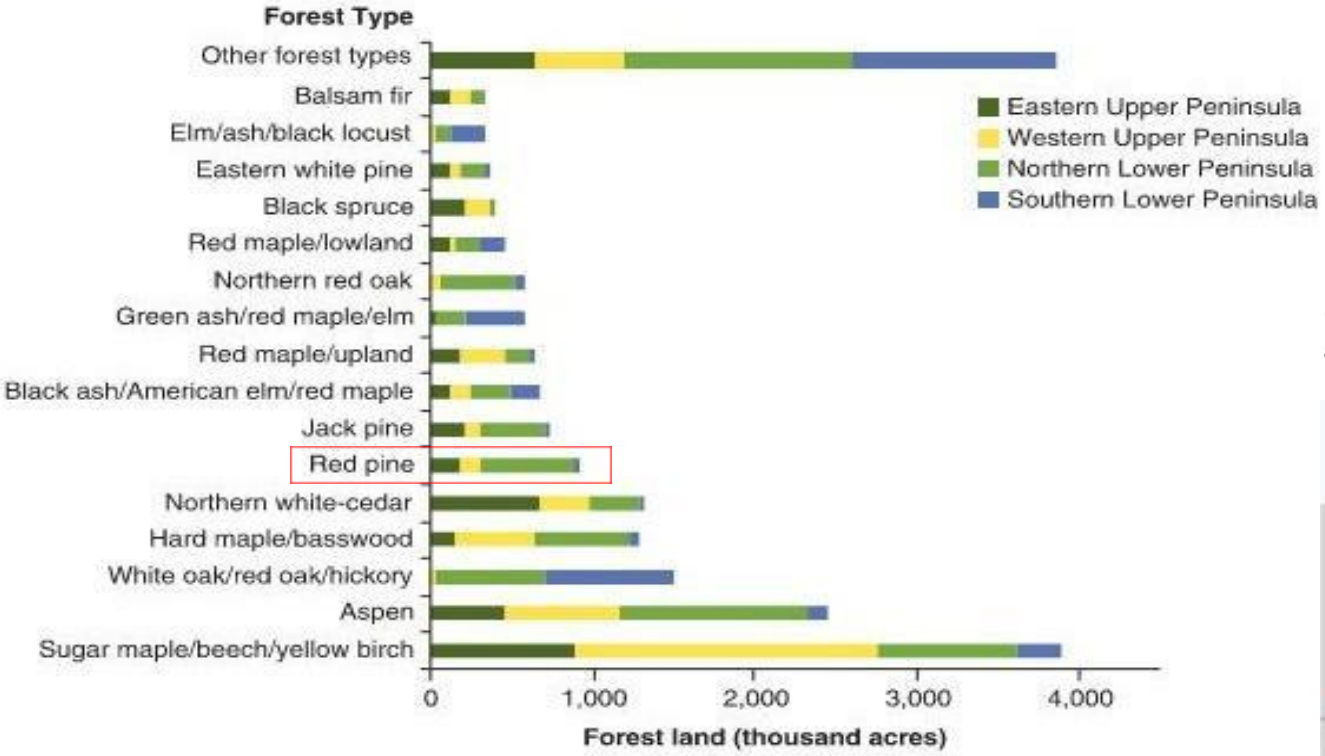
PERCENTAGE OF FOREST LAND BY FOREST TYPE

Source: United States Department of Agriculture, Michigan Forest 2014

MICHIGAN HAS DIVERSE OF FOREST TYPES,

MOST FOREST CATEGORIZED AS HARDWOOD:

- HARDWOOD (73%) SOFTWOOD (24%) MIXED
- (3%) (OAK, ASPEN, JACK, RED PINES)
-



AREA OF FOREST LAND BY FOREST TYPE AND REGION

Source: United States Department of Agriculture, Michigan Forest 2014

Pinus resinosa, known asRed pine (alsoNorway pineinMinnesota),is apinenative toNorth America

USDA United States Department of Agriculture
Forest Service
North Central Research Station
General Technical Report NC-264

A Revised Managers Handbook for Red Pine in the North Central Region

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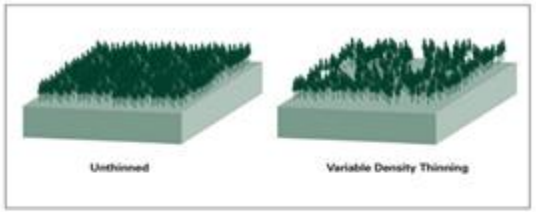
- Grows best on well-drained sandy to loamy sand soils, most common on sandy soils Average height 45-75 feet
- at 50 years of age Shade intolerant at drier sites and soils Mid-successional species, replaced by early
- successional species Can reach 400 years, most stands live no longer that 200 years Flowers in the spring,
- both female and male, cones ripen next summer dispersing seeds for up to a year Uses: pulpwood (paper),
- cabin logs, saw logs, veneer, pilings Common spacing 7'x7' Clear-cutting followed by planting –most common
- way for regeneration of red pine forest Poor habitat for game birds and animals
-
-
-
-



In general, economic rotation age is linked to culmination of mean annual increment; this occurs somewhere between 50 and 90 years in unthinned red pine. If ecological complexity is a primary goal, there is little reason to base rotation age for such a long-lived species only on growth and economic factors. Rather, stands should be allowed to develop sufficient structural and compositional complexity and spatial heterogeneity, a process that can be accelerated with appropriate intermediate treatments.

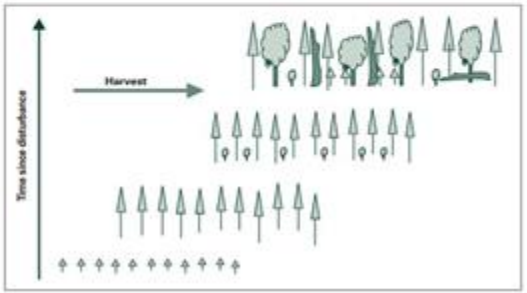


Figure 6.— Development of ecological complexity in a red pine stand over time.

- Even though lumber is standardized across North America it is rare that a log yields one homogenous grade of wood
- Severaldimensions and grades are cut out of a given log
- Log quality dictates lumber quality, and this impacts the technical requirements for Mass Timber products
- Ultimately, the primary goal of lumber production is maximum utilization of each log harvested
- Lumber is sold as a true commodity across all species

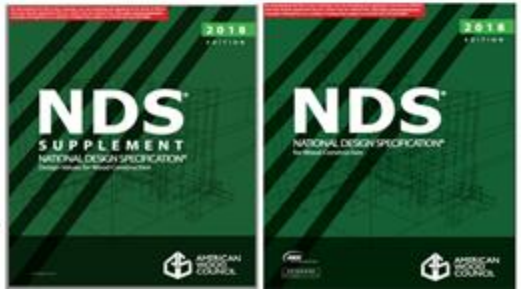
LORD AECK SARGENT

2.1 List of Sawn Lumber Species Combinations

Species or Species Combination	Species That May Be Included in Combination	Grading Rules Agencies	Design Values Provided in Tables
Alaska Cedar		WCLIB	4A
Alaska Hemlock		WWPA	4A
Alaska Spruce	Alaska Sitka Spruce Alaska White Spruce	WWPA	4A
Alaska Yellow Cedar		WCLIB, WWPA	4A
Aspen	Big Tooth Aspen Quaking Aspen	NELMA WWPA	4A
Baldcypress		SPIB	4A, 4D
Balsam Fir		NELMA	4D, 4E
Beech-Birch-Hickory	American Beech Bitternut Hickory Mockernut Hickory Nutmeg Hickory Pecan Hickory Pignut Hickory Shagbark Hickory Shellbark Hickory Sweet Birch Water Hickory Yellow Birch	NELMA	4A, 4D
Coast Sitka Spruce		NLGA	4A, 4D, 4E
Coast Species	Amabilis Fir Coast Sitka Spruce Douglas Fir Western Hemlock Western Larch	NLGA	4E
Cottonwood		NELMA	4A
Douglas Fir-Larch	Douglas Fir Western Larch	WCLIB WWPA	4A, 4C, 4D, 4E
Douglas Fir-Larch (North)	Douglas Fir Western Larch	NLGA	4A, 4C, 4D, 4E
Douglas Fir-South		WWPA	4A, 4C, 4D, 4E
Eastern Hemlock		NELMA	4D
Eastern Hemlock-Balsam Fir	Balsam Fir Eastern Hemlock Tamarack	NELMA	4A
Eastern Hemlock-Tamarack	Eastern Hemlock Tamarack	NELMA	4A, 4D, 4E
Eastern Hemlock-Tamarack (North)	Eastern Hemlock Tamarack	NLGA	4D, 4E
Eastern Softwoods	Balsam Fir Black Spruce Eastern Hemlock Eastern White Pine Jack Pine Norway (Red) Pine Pitch Pine Red Spruce Tamarack White Spruce	NELMA	4A

2.1 List of Sawn Lumber Species Combinations (Cont.)

Species or Species Combination	Species That May Be Included in Combination	Grading Rules Agencies	Design Values Provided in Tables
Sitka Spruce		WWPA, WCLIB	4D, 4E
Southern Pine	Loblolly Pine Longleaf Pine Shortleaf Pine Slash Pine	SPIB	4B, 4C, 4D, 4E
Spruce-Pine-Fir	Alpine Fir Balsam Fir Black Spruce Engelmann Spruce Jack Pine Lodgepole Pine Red Spruce White Spruce	NLGA	4A, 4C, 4D, 4E
Spruce-Pine-Fir (South)	Balsam Fir Black Spruce Engelmann Spruce Jack Pine Lodgepole Pine Norway (Red) Pine Norway Spruce Red Spruce Sitka Spruce White Spruce	NELMA WCLIB WWPA	4A, 4C, 4D, 4E
Western Cedars	Alaska Cedar Incense Cedar Port Orford Cedar Western Red Cedar	WCLIB WWPA	4A, 4C, 4D, 4E
Western Cedars (North)	Pacific Coast Yellow Cedar Western Red Cedar	NLGA	4D, 4E
Western Hemlock		WWPA, WCLIB	4D, 4E
Western Hemlock (North)		NLGA	4D, 4E
Western White Pine		NLGA	4D, 4E
Western Woods	Any species in the Douglas Fir-Larch, Douglas Fir-South, Hem-Fir, and Spruce-Pine-Fir (South) species combinations, plus any or all of the following: Idaho White Pine Mountain Hemlock Ponderosa Pine Subalpine Fir Sugar Pine	WCLIB WWPA	4A, 4C, 4D, 4E



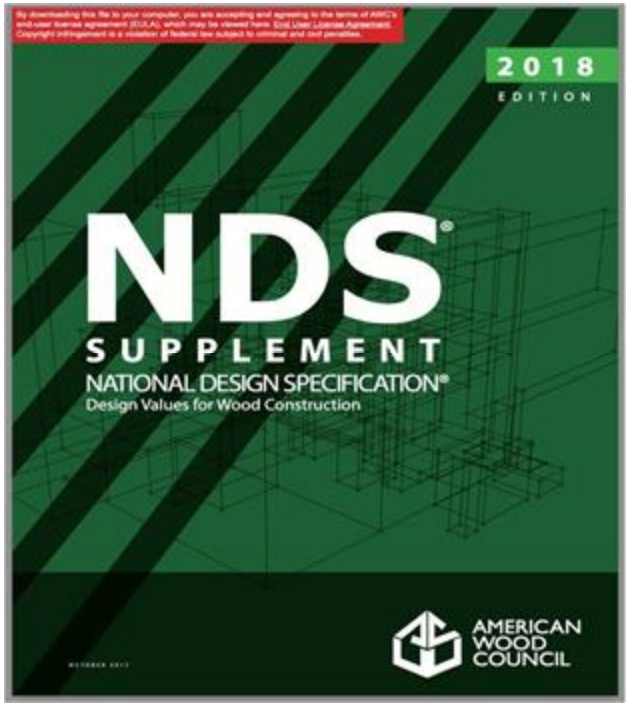
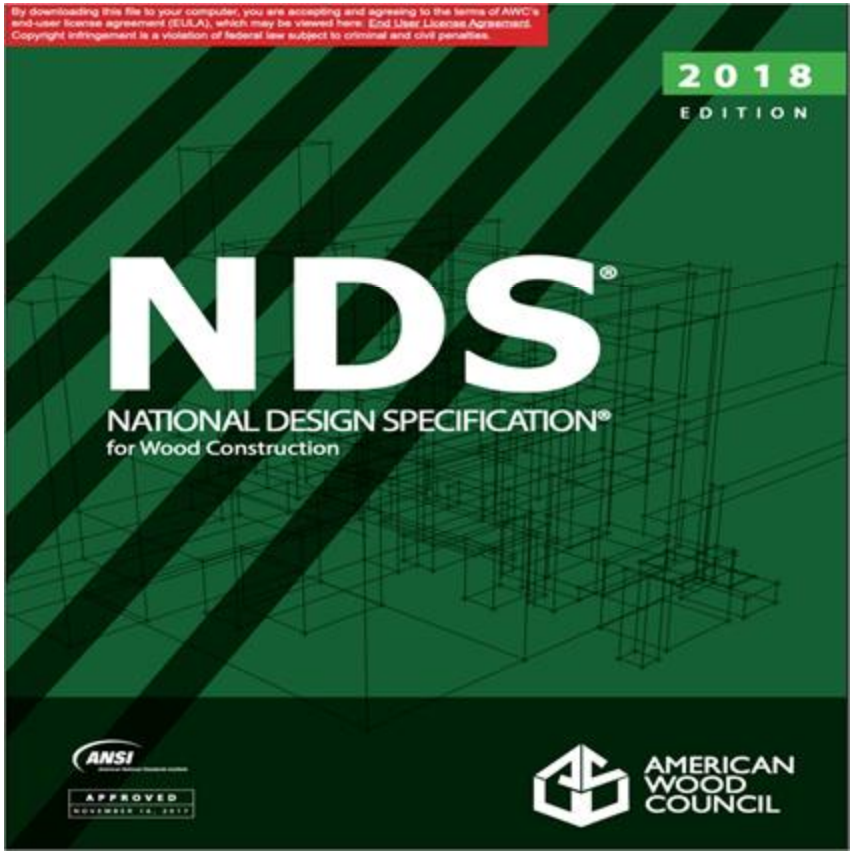


Table 4A (Cont.) **Reference Design Values for Visually Graded Dimension Lumber (2" - 4" thick)[1,2,3]**

(All species except Southern Pine — see Table 4B) (Tabulated design values are for normal load duration and dry service conditions. See NDS 4.3 for a comprehensive description of design value adjustment factors.)

USE WITH TABLE 4A ADJUSTMENT FACTORS

Species and commercial grade	Size classification	Design values in pounds per square inch (psi)							Specific Gravity[4]	Grading Rules Agency
		Bending F_b	Tension parallel to grain F_t	Shear parallel to grain F_v	Compression perpendicular to grain $F_{c\perp}$	Compression parallel to grain F_c	Modulus of Elasticity E	Modulus of Elasticity E_{min}	G	
RED OAK										
Select Structural	2" & wider	1,150	675	170	820	1,000	1,400,000	510,000	0.67	NELMA
No. 1		825	500	170	820	825	1,300,000	470,000		
No. 2		800	475	170	820	625	1,200,000	440,000		
No. 3		475	275	170	820	375	1,100,000	400,000		
Stud	2" & wider	625	375	170	820	400	1,100,000	400,000		
Construction	2" - 4" wide	925	550	170	820	950	1,200,000	440,000		
Standard		525	300	170	820	650	1,100,000	400,000		
Utility		250	150	170	820	425	1,000,000	370,000		
REDWOOD										
Select Structural	2" & wider	1,100	625	160	425	1,100	1,100,000	400,000	0.37	RIS
No. 1		775	450	160	425	900	1,100,000	400,000		
No. 2		725	425	160	425	700	1,000,000	370,000		
No. 3		425	250	160	425	400	900,000	330,000		
Stud	2" & wider	575	325	160	425	450	900,000	330,000		
Construction	2" - 4" wide	825	475	160	425	925	900,000	330,000		
Standard		450	275	160	425	725	900,000	330,000		
Utility		225	125	160	425	475	800,000	290,000		
SPRUCE-PINE-FIR										
Select Structural	2" & wider	1,250	700	135	425	1,400	1,500,000	550,000	0.42	NLGA
No. 1/ No. 2		875	450	135	425	1,150	1,400,000	510,000		
No. 3		500	250	135	425	650	1,200,000	440,000		
Stud	2" & wider	675	350	135	425	725	1,200,000	440,000		
Construction	2" - 4" wide	1,000	500	135	425	1,400	1,300,000	470,000		
Standard		550	275	135	425	1,150	1,200,000	440,000		
Utility		275	125	135	425	750	1,100,000	400,000		
SPRUCE-PINE-FIR (SOUTH)										
Select Structural	2" & wider	1,300	575	135	335	1,200	1,300,000	470,000	0.36	NELMA WCLIB WWPA
No. 1		875	400	135	335	1,050	1,200,000	440,000		
No. 2		775	350	135	335	1,000	1,100,000	400,000		
No. 3		450	200	135	335	575	1,000,000	370,000		
Stud	2" & wider	600	275	135	335	625	1,000,000	370,000		
Construction	2" - 4" wide	875	400	135	335	1,200	1,000,000	370,000		
Standard		500	225	135	335	1,000	900,000	330,000		
Utility		225	100	135	335	675	900,000	330,000		
WESTERN CEDARS										
Select Structural	2" & wider	1,000	600	155	425	1,000	1,100,000	400,000	0.36	WCLIB WWPA
No. 1		725	425	155	425	825	1,000,000	370,000		
No. 2		700	425	155	425	650	1,000,000	370,000		
No. 3		400	250	155	425	375	900,000	330,000		
Stud	2" & wider	550	325	155	425	400	900,000	330,000		
Construction	2" - 4" wide	900	475	155	425	850	900,000	330,000		
Standard		450	275	155	425	650	800,000	290,000		
Utility		225	125	155	425	425	800,000	290,000		
WESTERN WOODS										
Select Structural	2" & wider	900	400	135	335	1,050	1,200,000	440,000	0.36	WCLIB WWPA
No. 1		675	300	135	335	950	1,100,000	400,000		
No. 2		675	300	135	335	900	1,000,000	370,000		
No. 3		375	175	135	335	525	900,000	330,000		
Stud	2" & wider	525	225	135	335	575	900,000	330,000		
Construction	2" - 4" wide	775	350	135	335	1,100	1,000,000	370,000		
Standard		425	200	135	335	925	900,000	330,000		
Utility		200	100	135	335	600	800,000	290,000		



10.1 General

10.1.1 Application

10.1.1.1 Chapter 10 applies to engineering design with performance-rated cross-laminated timber.

10.1.1.2 Design procedures, reference design values and other information provided herein apply only to performance-rated cross-laminated timber produced in accordance with ANSI/APA PRG-320.

10.1.2 Definition

Cross-Laminated Timber (CLT) – a prefabricated engineered wood product consisting of at least three layers of solid-sawn lumber or structural composite lumber where the adjacent layers are cross-oriented and bonded with structural adhesive to form a solid wood element.

10.1.3 Standard Dimensions

10.1.3.1 The net thickness of a lamination for all layers at the time of gluing shall not be less than 5/8 inch or more than 2 inches.

10.1.3.2 The thickness of cross-laminated timber shall not exceed 20 inches.

10.1.4 Specification

All required reference design values shall be specified in accordance with Section 10.2.

10.1.5 Service Conditions

Reference design values reflect dry service conditions, where the moisture content in service is less than 16%, as in most covered structures. Cross-laminated timber shall not be used in higher moisture service conditions unless specifically permitted by the cross-laminated timber manufacturer.

10.2 Reference Design Values

10.2.1 Reference Design Values

Reference design values for cross-laminated timber shall be obtained from the cross-laminated timber manufacturer's literature or code evaluation report.

10.2.2 Design Section Properties

Reference design values shall be used with design section properties provided by the cross-laminated timber manufacturer based on the actual layup used in the manufacturing process.

MASS TIMBER MANUFACTURING STANDARDS

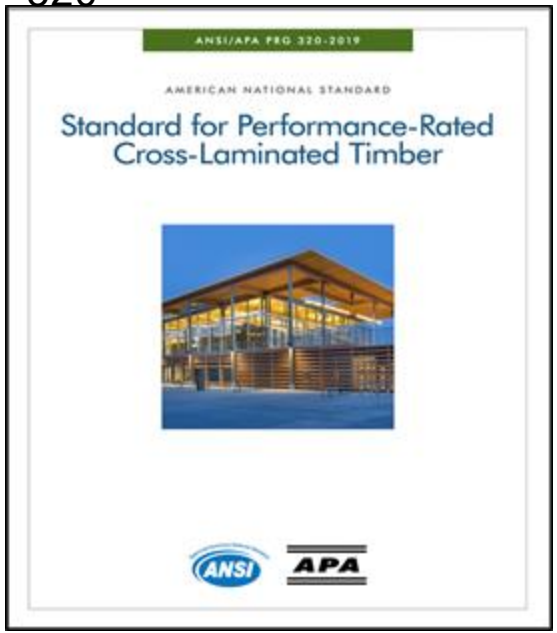
ANSI APA PRG 320

6.1.2 Sawn lumber laminations

a. Lumber species – Lumber of any softwood species or species combinations recognized by American Lumber Standards Committee (ALSC) under PS 20 or Canadian Lumber Standards Accreditation Board (CLSAB) under CSA O141 with a minimum published specific gravity of 0.35, as published in the National Design Specification for Wood Construction (NDS) in the U.S. and CSA O86 in Canada, shall be permitted.

b. Lumber grades – The minimum grade of lumber in the longitudinal layers of CLT shall be 1200f-1.2E MSR or visual grade No. 2. The minimum grade of lumber in the transverse layers of CLT shall be visual grade No. 3. Remanufactured lumber shall be considered as equivalent to solid-sawn lumber when qualified in accordance with Section 5.4 of ANSI A190.1 in the U.S. or SPS 1, 2, 4, or 6 in Canada. Proprietary lumber grades meeting or exceeding the mechanical properties of the lumber grades specified above shall be permitted for use provided that they are qualified in accordance with the requirements of an *approved agency*.

Note 7: *ASTM D5055 provides guidance for proprietary lumber grades used specifically in I-joist applications.*



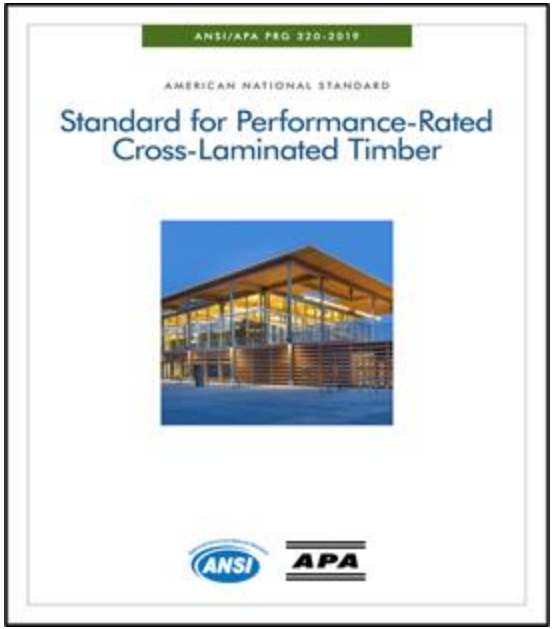
ANNEX A. Design Properties for PRG-320 CLT (Mandatory)

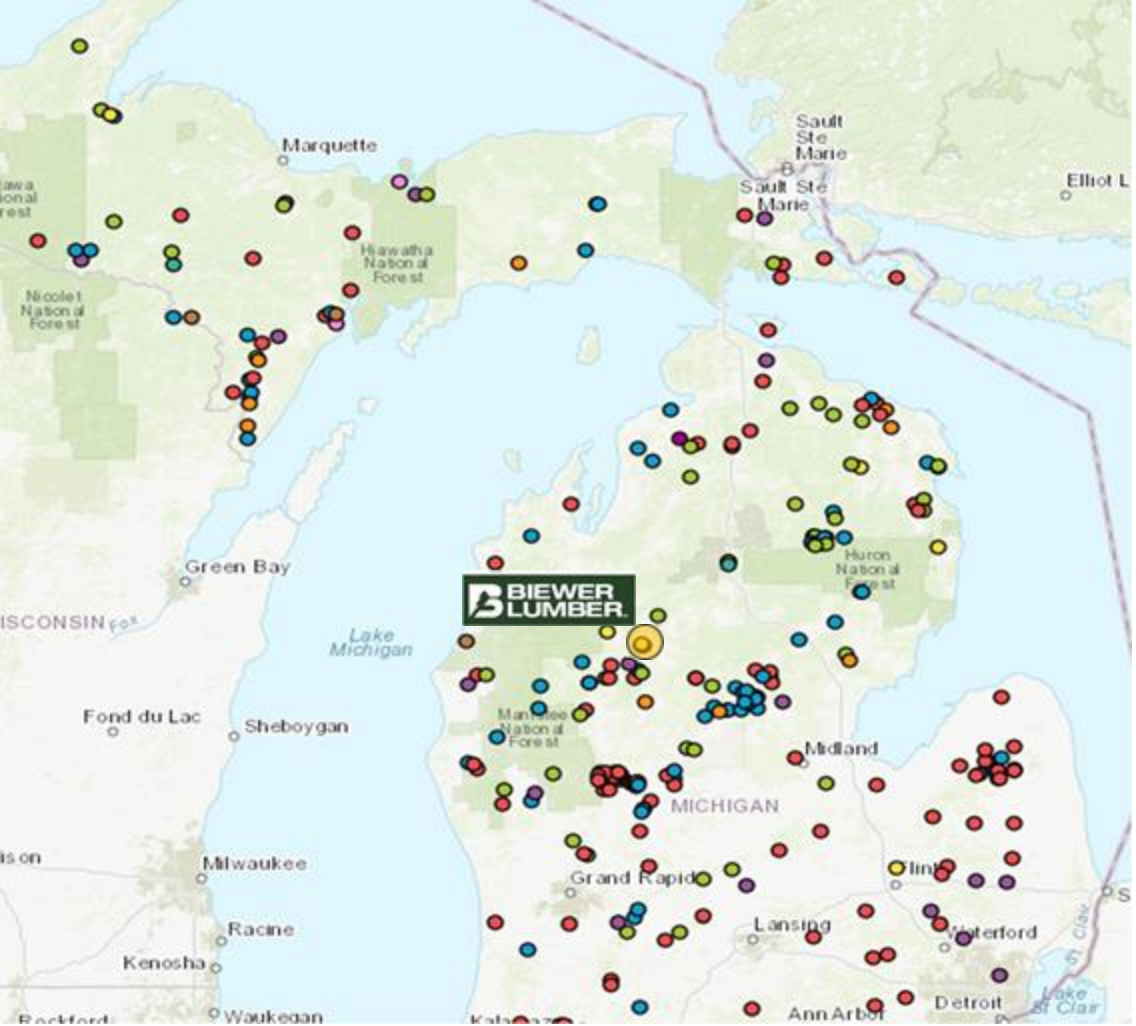
This Annex provides the design properties for basic CLT grades and layups listed in Table A2 using the lamination design values provided in Table A1. The CLT grades and layups represent the CLT production intended for use by the CLT manufacturers in North America and are based on the following:

- E1: 1950f-1.7E Spruce-pine-fir MSR lumber in all longitudinal layers and No. 3 Spruce-pine-fir lumber in all transverse layers
- E2: 1650f-1.5E Douglas fir-Larch MSR lumber in all longitudinal layers and No. 3 Douglas fir-Larch lumber in all transverse layers
- E3: 1200f-1.2E Eastern Softwoods, Northern Species, or Western Woods MSR lumber in all longitudinal layers and No. 3 Eastern Softwoods, Northern Species, or Western Woods lumber in all transverse layers
- E4: 1950f-1.7E Southern pine MSR lumber in all longitudinal layers and No. 3 Southern pine lumber in all transverse layers
- E5: 1650f-1.5E Hem-fir MSR umber in all longitudinal layers and No. 3 Hem-fir lumber in all transverse layers
- V1: No. 2 Douglas fir-Larch lumber in all longitudinal layers and No. 3 Douglas fir-Larch lumber in all transverse layers
- V1(N): No. 2 Douglas fir-Larch (North) lumber in all longitudinal layers and No. 3 Douglas fir-Larch (North) lumber in all transverse layers
- V2: No. 1/No. 2 Spruce-pine-fir lumber in all longitudinal layers and No. 3 Spruce-pine-fir lumber in all transverse layers
- V3: No. 2 Southern pine lumber in all longitudinal layers and No. 3 Southern pine lumber in all transverse layers
- V4: No. 2 Spruce-pine-fir South lumber in all longitudinal layers and No. 3 Spruce-pine-fir South lumber in all transverse layers
- V5: No. 2 Hem-fir lumber in all longitudinal layers and No. 3 Hem-fir lumber in all transverse layers

ANSI APA PRG 320

V4: No2 Spruce-pine-fir South lumber in all longitudinal layers and No. 3 Spruce-pine-fir South lumber in all transverse layers





MICHIGAN SAW MILLSLOCATIONS

A to Z Forest Restoration Project

The A to Zproject is acollaborative forest restoration project that is approximately 54,000 acres of forest land in NE Washington. Focused on creating healthy, resilient forests that can be used and enjoyed by generations to come

~~Small Log Harvest~~

Vaagen Bros. Lumber is our supply partner,2x6, originating from logs that are typically smaller than 8 inches

~~RED PINE timber AT BIEWER LUMBER, MICHIGAN. ...~~

RED PINE ARRIVED AT COLEVILLE, WA

DNR, MSU, WALBRIDGE, CLARK CONSTRUCTION, LORD AECK SARGENT & EQUILIBRIUM VISITS VAAGEN TIMBERS

3PLY CLT WALL RED PINE PANEL

5PLY CLT ROOF RED PINE PANEL

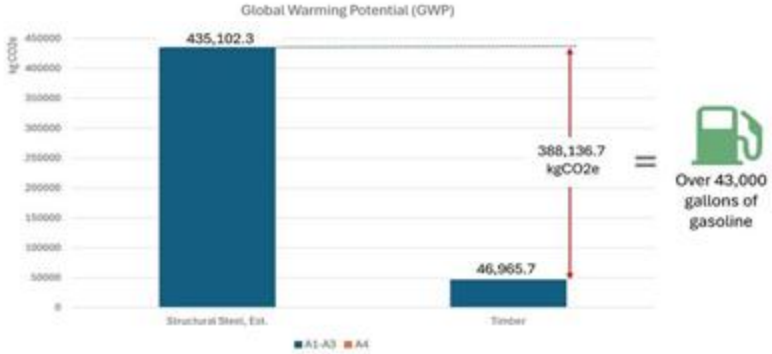
RED PINE CLT GOING THROUGH FINAL CERTIFICATION TESTING (SPF-S)

MASS TIMBER –19 DAYS


LORD
AECK
SARGENT

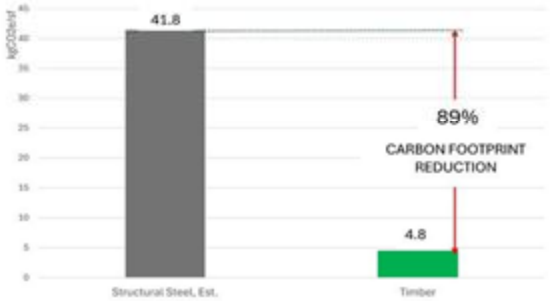

LORD
AECK
SARGENT

Material material	Quantity quant	Quantity Unit quant_unit	GWP gwp	GWP Unit gwp_unit	GWP Total gwp_total	A2 Dists distanc	A2 Dist distanc	A4 Distar distance	A4 Distz distanc	Transit Carbon Fa gwp_transit	Transit Factor Unit gwp_transit_unit	Total Trucks total_shipments	A2 Carbon a2_gwp	A4 Carbon a4_gwp	Total A1-A4	
3- AND 5-Ply CrossLam Timber	252.13	m3	136.11	kgCO2e/m3	34317.41	2134	mi	1810	mi							
Glulam Beams	42.58	m3	136.11	kgCO2e/m3	5795.284	2134	mi	1810	mi	1.407	gCO2e/vehicle-mile	10	30.02538	25.4667		
Glulam Columns	49.94	m3	136.11	kgCO2e/m3	6797.489	2134	mi	1810	mi						46,965.68	46.97
Structural Steel, Est.	841360	lbs	1140	kgCO2e/mt	435063.8			434	mi	0.211	gCO2e/ton-mile			38.52335	435,102.34	435.10
Timber																
															Delta	
															(388,136.67)	(388.14)
															kgCO2e	mtCO2e



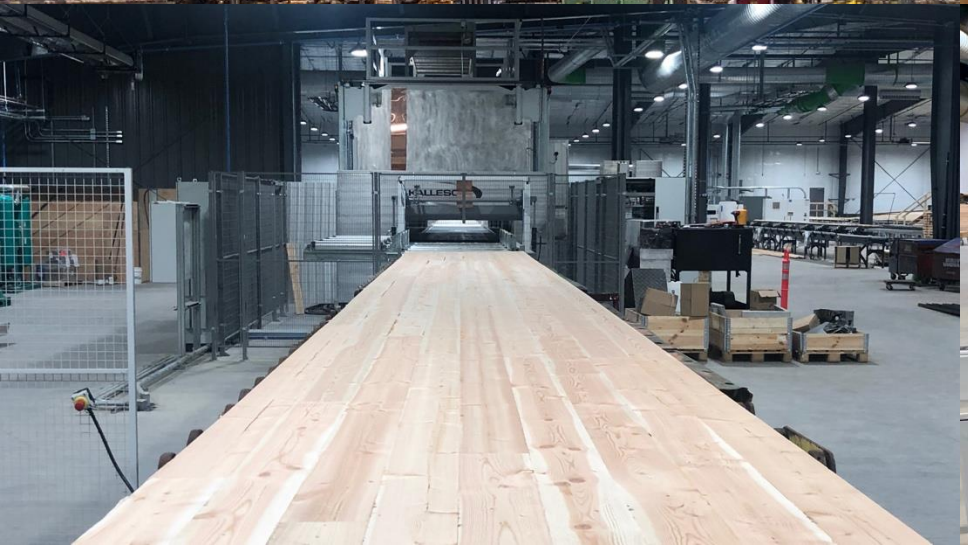
	(kgCO2e) A1-A3	(kgCO2e) A4	Total GWP kgCO2e	 mtCO2e	kgCO2e/sqft	Gallons of Gas carbon equivalent
Structural S	435063.82	38.52	435102.34	435.10	41.37	48959.42
Timber	46940.21	25.47	46965.68	46.97	4.47	5284.76
			388136.67	388.14	36.91	43674.66
			Difference			

0.89



VAAGEN TIMBERS

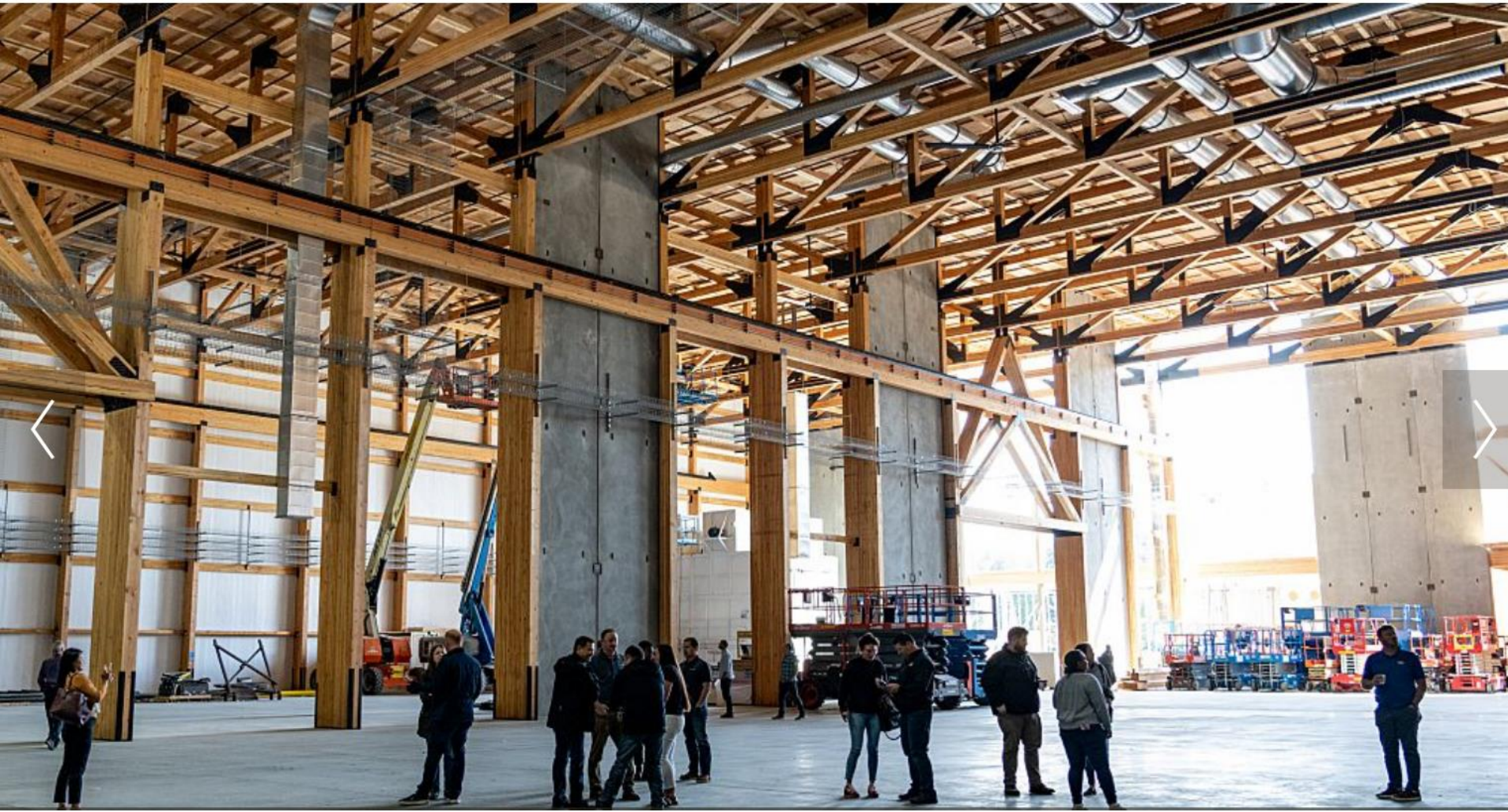
Forest to Frame

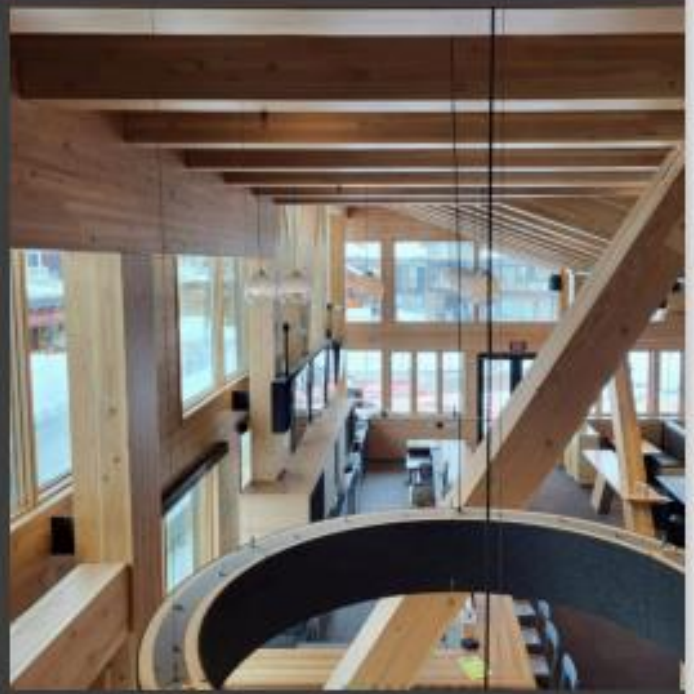


BENEFITS OF TIMBER SEQUENCE PRO (TSP):

- Integrates project schedule with 'on the fly' flexibility to accommodate modifications in production for sequenced delivery.
- Graphical logistics tool visually demonstrates how each piece/part of our product will be staged, loaded, delivered and erected.
- Beginning with the end in mind, TSP provides the project team visual clarity for the mass timber building.


CROW'S BENCH





VAAGEN
TIMBERS

VAAGENTIMBERS.COM | INFO@VAAGENTIMBERS.COM | COLVILLE, WA

Jason Kuckuk
Walbridge
Assistant Project Manager

Nate Gabel
Clark Contracting Services
Estimator Project Manager

Walbridge

Where We've Worked Office Locations

About Us

- 0.45 EMR - 2022
- Top 50 construction company in the U.S.
- 106-years experience, founded in 1916
- $ 6 billion annual sales
- More than 12.5M+ annual craft hours
- Experts in delivering complex & technical Projects
- 8 domestic U.S. / 3 international office locations
- 1,500 global team members
- 95% repeat clients

Single Source

- Consulting
- Planning
- Procurement
- Construction
- Process Equipment Install
- Facility Management
- Concrete
- Technology
- Architecture / Engineering

Locations

- Atlanta, Georgia
- Charlotte, North Carolina
- Detroit, Michigan (HQ)
- **Kalamazoo, Michigan**
- Kokomo, Indiana
- Mexico City, Mexico
- Pittsburgh, Pennsylvania
- Sao Paulo, Brazil
- Tampa, Florida
- Windsor, Canada

Delivery Systems

- FEL Studies
- Preconstruction
- Construction Management
- Design-Build
- General Contracting
- Program Management
- Integrated Project Delivery
- EPC / EPCM
- Facility Management

2021-22 ENR Rankings

#1 – Automotive *(19 of the last 20 years)*
#2 – Manufacturing
#3 – Co-generation
#7 – Aerospace
#8 – Steel & Non-ferrous Plants
#12 – Data Centers
#14 – Telecom
#39 – ENR Top 400
#46 – Industrial Process
#48 – Power

Self-Perform

- Design
- Structural Concrete / Placement
- Structural Steel Erection
- Selective Demolition
- Heavy Rigging
- Emergency Shutdowns
- Plant Relocation / Shutdowns
- Tooling / Equip. Shutdown
- Technology (Field / Radar / Laser / etc.)

Mass Timber Safety Moment

Safety Moment

Safety Motto

"If it's NOT safe, I won't do it and I won't let others do it."

When working with wood it is important to always wear gloves to protect your hands from slivers and the appropriate safety glasses to protect your eyes from saw dust.

Walbridge requires cut resistant Level 4 gloves at all times while working with material.

Ensure your safety glasses are Z87 rated meaning that they meet or exceed requirements of the American National Standards Institute (ANSI)

Ratings Chart

Markings & Indications

ANSI LEVEL	A1 CUT	A2 CUT	A3 CUT	A4 CUT	A5 CUT	A6 CUT	A7 CUT	A8 CUT	A9 CUT
Weight (grams) needed to cut through material	≥ 200	≥ 500	≥ 1000	≥ 1,500	≥ 2,200	≥ 3000	≥ 4000	≥ 5000	≥ 6000
TYPICAL TASKS	General Purpose, Warehousing, Small Parts Assembly	General Purpose, Plastics Injection and Moulding, Pulp and Paper	Raw Material Handling, General Manufacturing, Construction	HVAC, Aerospace, Food Prep	Glass or Metal Sheet Handling, Automotive Assembly, HVAC	Metal Fabrication, Glass Manufacturing, Changing Blades	Meat Prep/ Processing, Glass Manufacturing, Metal Stamping	Metal Stamping, Recycling, Heavy Assembly	Sharp metal Stamping, Recycle Sorting, Metal Fabrication

988 SUICIDE & CRISIS LIFELINE
24/7 CALL, TEXT, CHAT

Walbridge | DIG | DEVON INDUSTRIAL GRP. | DFM | CARLSON Design Group

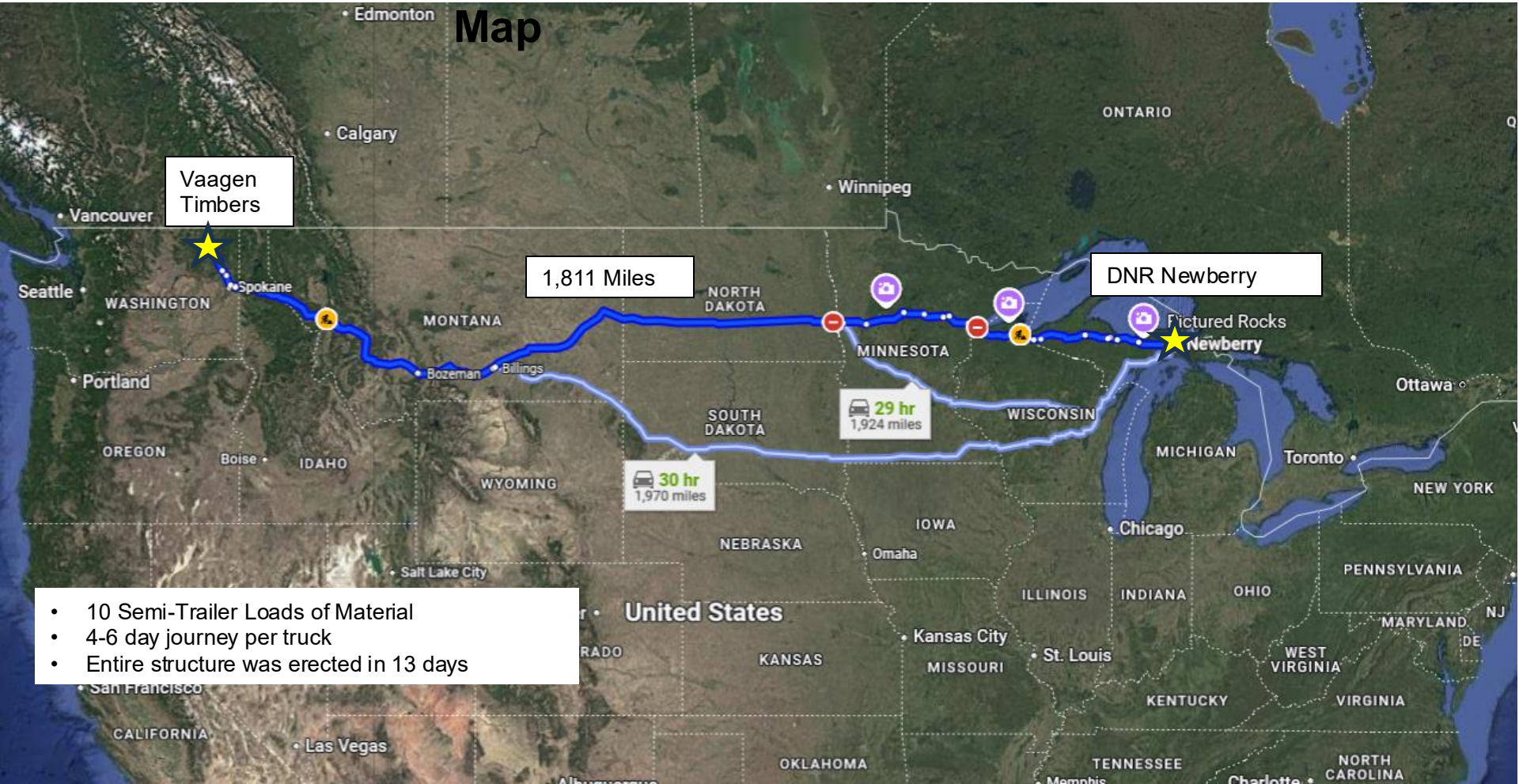
Walbridge

- Pre- Construction & Construction Manager

Key Project Milestones:

- The DNR engaged Walbridge early on, while the project was still in the design phase.
- Walbridge worked with Biewer Lumber in McBain Michigan to provide the lumber to the mass timber fabricator.
- Vaagen Timber's was engaged during the bidding process of the mass timber fabrication package.
- The team identified Michigan Red pine as a viable option for the CLT structure.
- Vaagen procured specific APA certification to produce the Red Pine CLT.
- Clark Contracting was engaged to provide mass timber erection services.

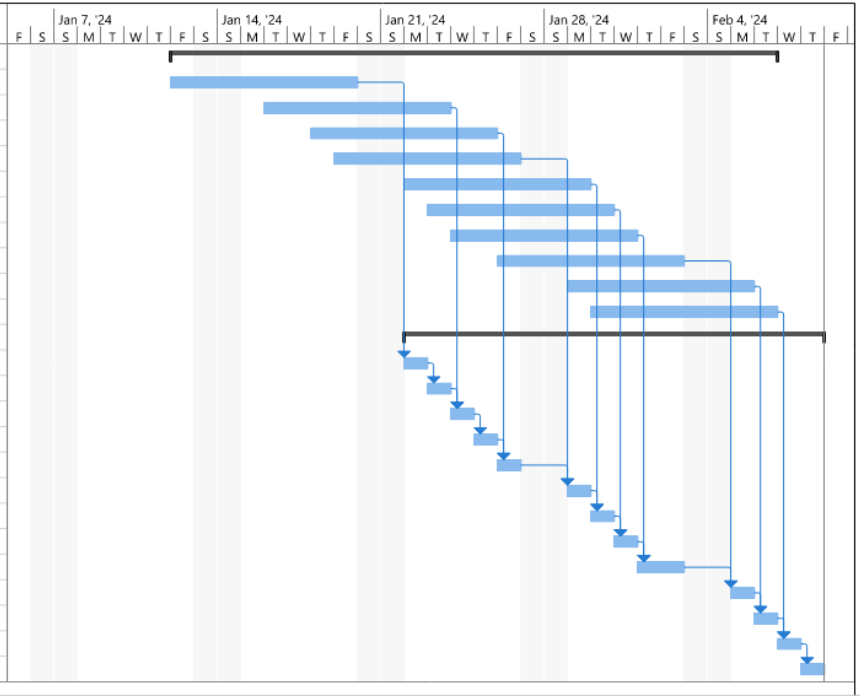
Mass Timber Delivery Map



- 10 Semi-Trailer Loads of Material
- 4-6 day journey per truck
- Entire structure was erected in 13 days

Project Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecess	Succ	Truck Color
121		**Shipping/Delivery**	**18 days**	**Fri 1/12/24**	**Tue 2/6/24**			
122		Truck1	6 days	Fri 1/12/24	Fri 1/19/24	84	133	Red
123		Truck2	6 days	Tue 1/16/24	Tue 1/23/24	88	135	Green
124		Truck 3	6 days	Thu 1/18/24	Thu 1/25/24	92	137	Purple
125		Truck 4	6 days	Fri 1/19/24	Fri 1/26/24	96	138	Yellow
126		Truck 5	6 days	Mon 1/22/24	Mon 1/29/24	100	139	Blue
127		Truck 6	6 days	Tue 1/23/24	Tue 1/30/24	104	140	Magenta
128		Truck 7	6 days	Wed 1/24/24	Wed 1/31/24	108	141	Yell-Grn
129		Truck 8	6 days	Fri 1/26/24	Fri 2/2/24	112	142	Brown
130		Truck 9	6 days	Mon 1/29/24	Mon 2/5/24	116	143	Hot Pink
131		Truck 10	6 days	Tue 1/30/24	Tue 2/6/24	120	144	Pink
132		**Installation Schedule**	**14 days**	**Mon 1/22/24**	**Thu 2/8/24**			
133		Set 19 Columns (Truck 1)	1 day	Mon 1/22/24	Mon 1/22/24	122	134	Red
134		Set 18 Columns (Truck 1)	1 day	Tue 1/23/24	Tue 1/23/24	133	135	Red
135		Set Perimeter Beams (Truck 2)	1 day	Wed 1/24/24	Wed 1/24/24	134,123	136	Green
136		Set Z1 Wall Panels (Truck 2)	1 day	Thu 1/25/24	Thu 1/25/24	135	137	Green
137		Set Z1 Beams (Truck 3)	1 day	Fri 1/26/24	Fri 1/26/24	136,124	138	Purple
138		Set Z1 Roof Panels (Truck 4)	1 day	Mon 1/29/24	Mon 1/29/24	137,125	139	Yellow
139		Set Z1 Roof Panels (Truck 5)	1 day	Tue 1/30/24	Tue 1/30/24	138,126	140	Blue
140		Set Z1 Roof Panels (Truck 6)	1 day	Wed 1/31/24	Wed 1/31/24	139,127	141	Magenta
141		Finish Z1 Roof, Z2 Wall Panels (Truck 7)	2 days	Thu 2/1/24	Fri 2/2/24	140,128	142	Yell-Grn
142		Z2 Beams and Start Roof Panels (Truck 8)	1 day	Mon 2/5/24	Mon 2/5/24	141,129	143	Brown
143		Z2 Roof Panels (Truck 9)	1 day	Tue 2/6/24	Tue 2/6/24	142,130	144	Hot Pink
144		Z2 Roof Panels (Truck 10)	1 day	Wed 2/7/24	Wed 2/7/24	143,131	145	Pink
145		Finish/Pickup Work	1 day	Thu 2/8/24	Thu 2/8/24	144		



- Erecting a mass timber structure is roughly 25% faster than traditional concrete and steel

Vaagen Timber Sequence Pro – Mass Timber Delivery & Erection Coordination

- Michigan Red Pine Feedstock from Biewer Lumber at Vaagen Timbers Shop

Mass Timber Column and Panel Delivery

Column Base - Knife Plate Connections

Top of Column and Beam Concealed Hardware

Column Rigging & Placement

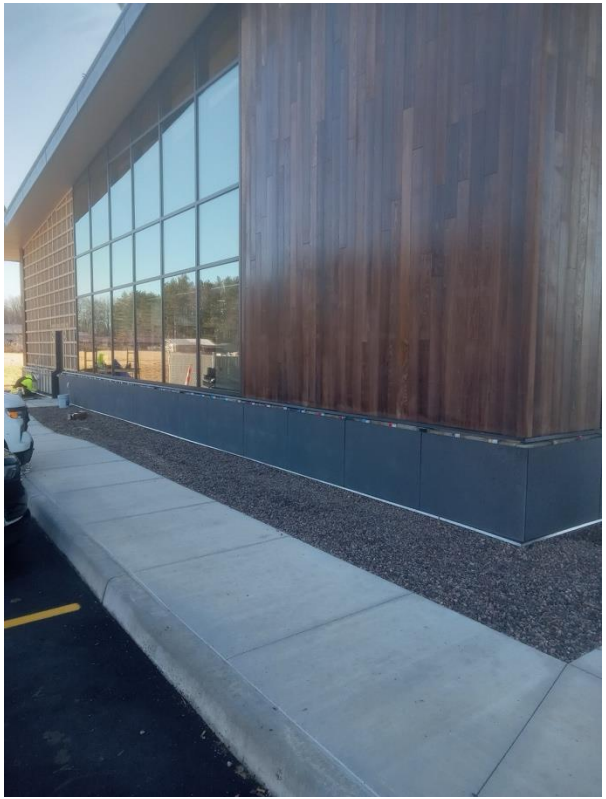
Exterior CLT Wall Panels

CLT Roof Panel

- Plywood Spline
- Factory applied vapor barrier

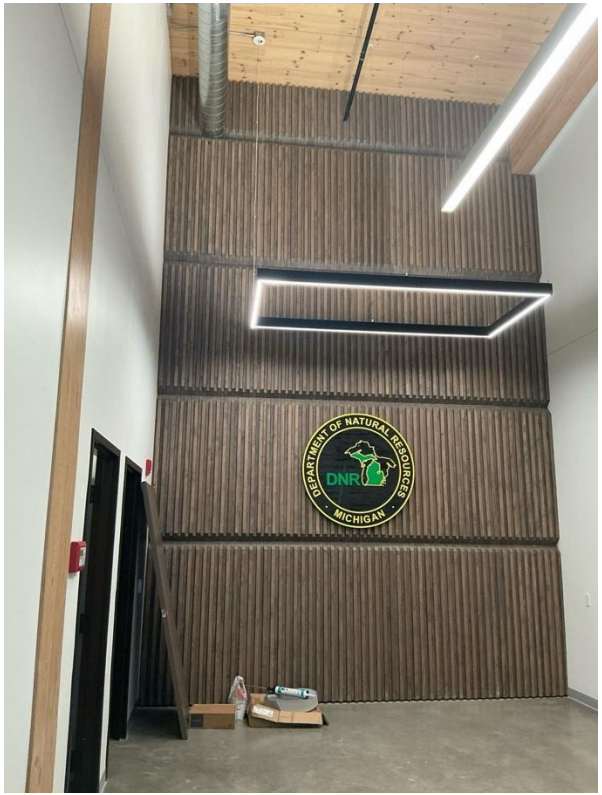

Genie
4x4


JLG




JLG
2632ES
16261535
JLG


ACE


DEPARTMENT OF NATURAL RESOURCES
DNR
MICHIGAN

Panelists

Sandra Lupien
Director
MassTimber@MSU
Moderator

Michelle Crook
Senior Project Engineer
Michigan Dept. of Natural Resources
Owner/Project History

Anna Anderson
Senior Project Manager
Lord Aeck Sargent
Architect

Jason Kuckuk
Assistant Project Manager
Walbridge
Construction Manager

Russ Vaagen
CEO
Vaagen Timbers
Mass Timber Supplier

Nate Gabel
Estimator / Project Manager
Clark Contracting Services
Installer

Kayla Snyder
Senior Programs Manager
MiGBC
Host

MiGBC
MICHIGAN GREEN BUILDING COLLABORATIVE
A USGBC COMMUNITY

+

MASS TIMBER @MSU

Thank You!

DEPARTMENT OF NATURAL RESOURCES DNR MICHIGAN

LORD AECK SARGENT

VAAGEN TIMBERS

Walbridge
BUILT FOR GOOD®

Clark

DTE

Consumers Energy
Count on Us®

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

THE PLANET NORTH AMERICA NEEDS FOUNDATION