

Light Wood-Frame Shaft Wall Detailing for Code Compliance and Constructability

Presented by:

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Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.



Aubrey Yerger, PE

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Aubrey Yerger is a structural engineer at Morrison-Maierle who provides a wide variety of structural services including the firm's expansion into mass timber design. Although her background is diverse, her passion is the structural design of architectural buildings. Aubrey enjoys a challenge and loves to work through specialized structural detailing to help her clients' visions come to life.



Nick Diggins, AIA

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Nick's background as a former Marine brings a focus for keeping projects efficient, innovative, and client-centric. His teams are innovative and not afraid of fast schedules and tough timelines by harnessing new technology for streamlined design delivery to construction documentation. Pushing the profession to new heights and collaborating early are ideas in action with Mosaic's collaborative planning, design and construction teams.

United States Forest Service: Mission

- Use of product harvested
- CLT uses small diameter timbers
- Showcase use of product



Nez Perce-Clearwater National Forest Supervisor's Office: The Story

Today's case study origin point.

- The Forest Service wanted to showcase wood construction in their new facility.
- The building needed to tell a story to the public and other FS regions, but also fit into its context of Kamiah.
- New shared type spaces and scaled to house all their staff under one roof. Better public service in a single location.
- Wood, wood, wood! "It's who we are".



Nez Perce-Clearwater National Forest Supervisor's Office: The Story



- Site Plan Legend**
- 1 Site Entry
 - 2 Building Main Entry
 - 3 Lower Level Entry
 - 4 Visitor Parking
 - 5 Secure Fleet Parking
 - 6 Storm-water Management
 - 7 Connecting Trails
 - 8 Existing Office
 - 9 Existing Shop
 - 10 Existing Bunkhouse

- Occupancy Classification: B
- Type of Construction: V-B
- 16,000 GSF
- Sprinklered: Yes
- 2 levels utilizing Topography, Elevator required

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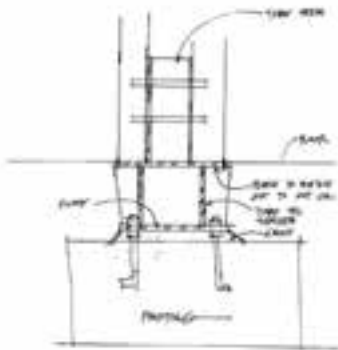
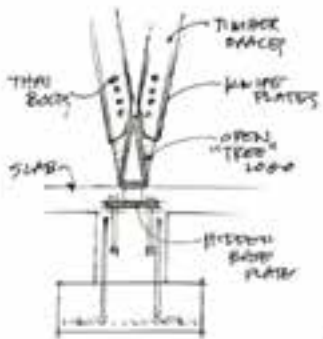
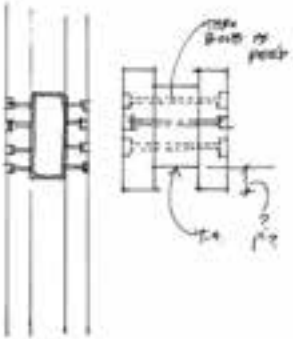
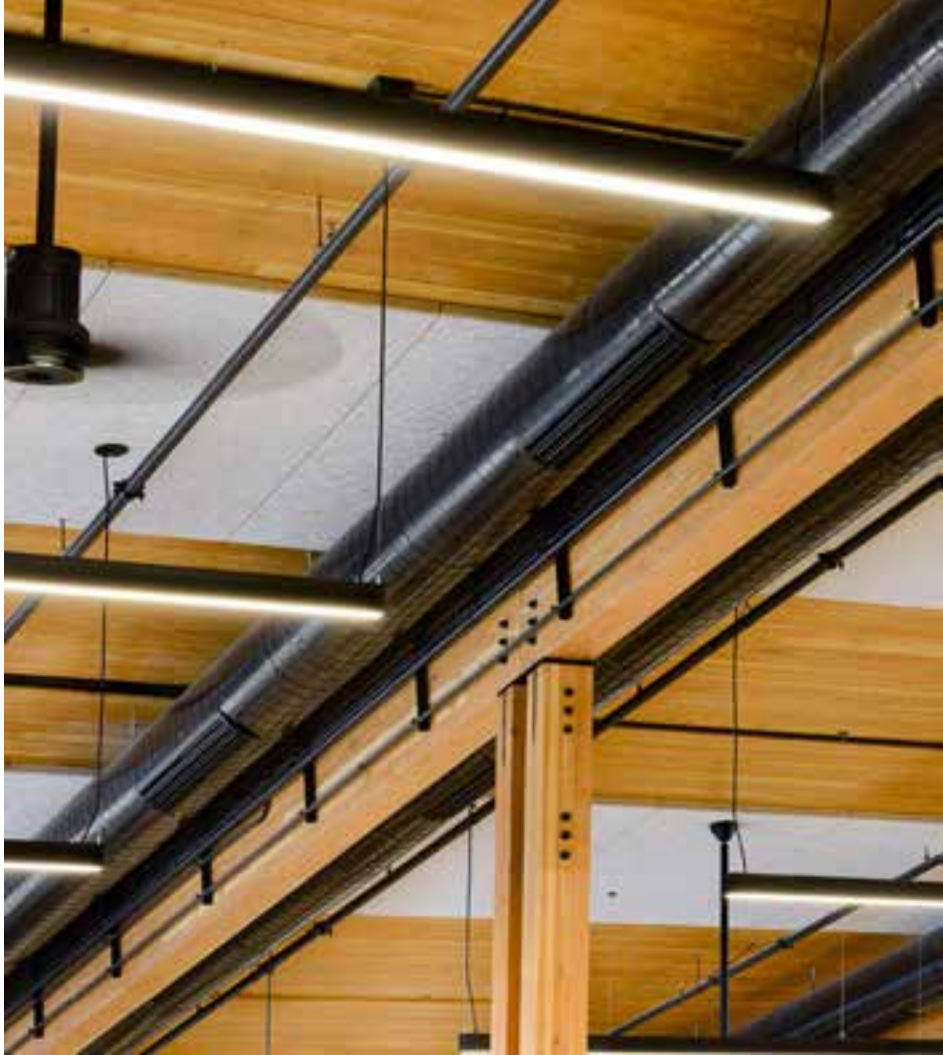
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Structural System Selection

- Tall vaulted space, reconfigurable/flexible, structure as the organization for design elements.
- Initial LCA showed reduced carbon in a lighter framed building of wood (reduction in concrete foundations).
- The topic of using wood innovations pushed the options of CLT and post and beam construction ahead.
- Remote location and minimal labor force prefabrication type products was a benefit for schedule as well.
- Factors to consider along the way – completely new systems for contractor but intuitive nature of wood construction reduced complexity.
- Strong support from manufacture and supplier (3D BIM Reviews).



Exposure/Showcasing of Wood



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Elevator Shaft Framing Alternatives

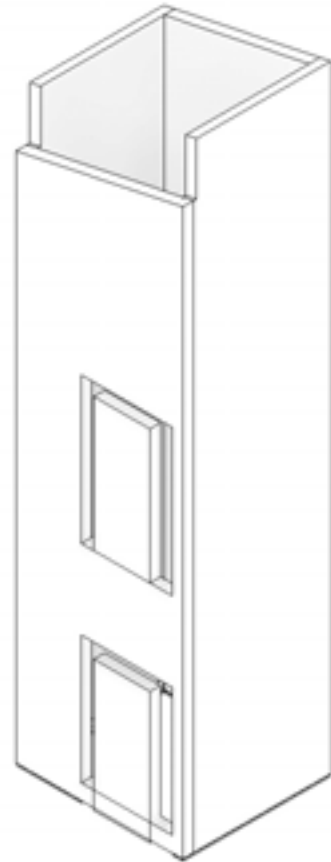
Shaft Wall Framing Options: 1-hour Assembly

- Conventional wood-framed shaft
- CMU shaft
- CLT shaft



Elevator Shaft Details

- Bent Plate base attachment for flush CLT to finish floor
- Continuous Shaft
- Openings framed in with typical rated wall details, and trimmed with mass timber
- Beam penetration at top was sealed and confirmed with simple Engineering Judgment detail
- ifc 3D shop drawing review process



Elevator Shaft: The Story

- Initial shaft inspection (remote location)
- CLT supplier provides documentation
- Reports delivered = inspection passed

Fire Design of Mass Timber Code Applications, Construction Types and

For many years, increased heavy timber framing elements have been permitted in U.S. buildings due to their inherent fire-resistance properties. The predictability of wood's char rate has been well established for decades and has long been recognized in building codes and standards.

Today, one of the exciting trends in building design is the growing use of mass timber—i.e., large solid wood panel products such as cross-laminated timber (CLT) and nail-laminated timber (NLT)—for floor, wall and roof construction. Like heavy timber, mass timber products have inherent fire resistance that allows them to be left exposed and still achieve a fire-resistance rating. Because of their strength and dimensional stability, these products also offer an alternative to steel, concrete, and masonry for many applications, but have a much lighter carbon footprint. It is the combination of exposed structure and strength that developers and designers across

with all but Type III and IV, Type III framing through both are used in timber buildings.

Type III IBC 602.6.1 – Permitted in exterior walls required to have a fire-resistance rating of 2 hours or less.

Type V IBC 602.6.2 – Timber elements can be used throughout the structure, including floors, roofs and both interior and exterior walls.

Type IV IBC 602.6.3 – Commonly referred to as “heavy timber” construction, this option has been in the building code for over a

• Test 7: Manufacture: Inwood, Inc. Douglas fir-larch (DF-L) timbers with polyurethane adhesive. Moisture content: 11.4%. Mass: 92.8 lb (north panel); 91.5 lb (south panel).

Time (min)	Deflection (in)
0:00	0.00
0:15	0.02
0:30	0.05
0:45	0.10
1:00	0.15
1:15	0.20
1:30	0.25
1:45	0.30
2:00	0.35
2:15	0.40
2:30	0.45
2:45	0.50
3:00	0.55
3:15	0.60
3:30	0.65
3:45	0.70
4:00	0.75
4:15	0.80
4:30	0.85
4:45	0.90
5:00	0.95
5:15	1.00
5:30	1.05
5:45	1.10
6:00	1.15
6:15	1.20
6:30	1.25
6:45	1.30
7:00	1.35
7:15	1.40
7:30	1.45
7:45	1.50
8:00	1.55
8:15	1.60
8:30	1.65
8:45	1.70
9:00	1.75
9:15	1.80
9:30	1.85
9:45	1.90
10:00	1.95
10:15	2.00
10:30	2.05
10:45	2.10
11:00	2.15
11:15	2.20
11:30	2.25
11:45	2.30
12:00	2.35
12:15	2.40
12:30	2.45
12:45	2.50
13:00	2.55
13:15	2.60
13:30	2.65
13:45	2.70
14:00	2.75
14:15	2.80
14:30	2.85
14:45	2.90
15:00	2.95
15:15	3.00
15:30	3.05
15:45	3.10
16:00	3.15
16:15	3.20
16:30	3.25
16:45	3.30
17:00	3.35
17:15	3.40
17:30	3.45
17:45	3.50
18:00	3.55
18:15	3.60
18:30	3.65
18:45	3.70
19:00	3.75
19:15	3.80
19:30	3.85
19:45	3.90
20:00	3.95
20:15	4.00
20:30	4.05
20:45	4.10
21:00	4.15
21:15	4.20
21:30	4.25
21:45	4.30
22:00	4.35
22:15	4.40
22:30	4.45
22:45	4.50
23:00	4.55
23:15	4.60
23:30	4.65
23:45	4.70
24:00	4.75

Horizontal deflection measurements (Figure 7) were taken every five minutes at three locations along the horizontal surface on the unexposed sample surface to monitor horizontal movement of the sample. The average horizontal deflection away from the furnace showed little difference during the first 100 min of the test and gradually increased to 1" by the end of the test. The vertical deflection showed no significant difference for the first 80 min with gradual increase with a value of 0.05" at the end of the test.

Additional Information

Following the test (Figure 8), the assembly was removed from the furnace and flames were extinguished. During the test and/or during extinguishment, up to 2 layers of the wood ply failed during the test. The sample was returned to Oregon State for further detailed analysis.

➤ QUESTIONS?

This concludes The American
Institute of Architects Continuing
Education Systems Course

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