

Designing with Glulams and Timber

The Art of Engineering
Really Cool Structures



Jim DeStefano, P.E. AIA. F.SEI

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Course Description

For architecturally exposed structures, nothing beats the look and feel of timber when drama is needed and a more mundane structure just won't do. Glue-laminated timber (glulam) has long been used as an architectural element, but there's a new tradition emerging that combines glulams and traditional timber frame construction with mass timber panels. The engineering of a dramatic glulam structure is as much an art as it is science, particularly the design of timber connections that complement the architecture. This entertaining and informative presentation will cover the basics of designing and engineering such a building. Topics will include a review of traditional and contemporary approaches to glulam construction, connection design, and design and detailing considerations such as durability and fire resistance.



Learning Objectives

1. Highlight the proper application of glulam timber construction.
2. Review the design principles of mass timber.
3. Discuss the guiding principles of glulam connection design.
4. Demonstrate how durability can be achieved as a design criteria in glulam structures.



Modern Architecture – Form Follows Function



Post Modernism – Structure is Irrelevant



Timber Form in Architecture



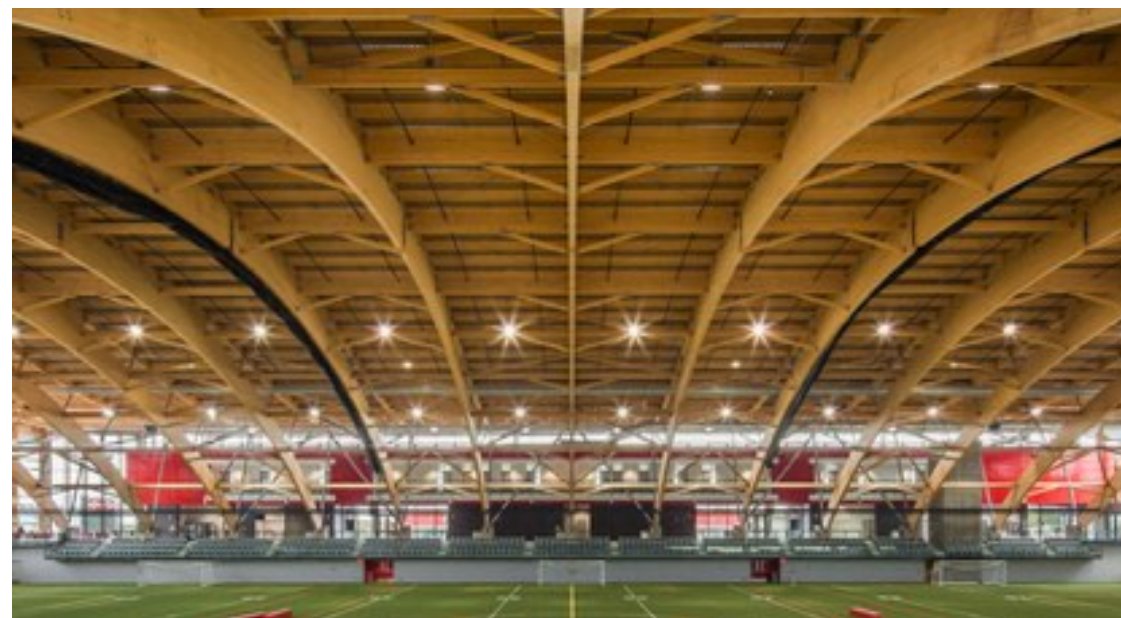
Mass Timber



Glulam Tradition



Photo credit – Nordic Structures





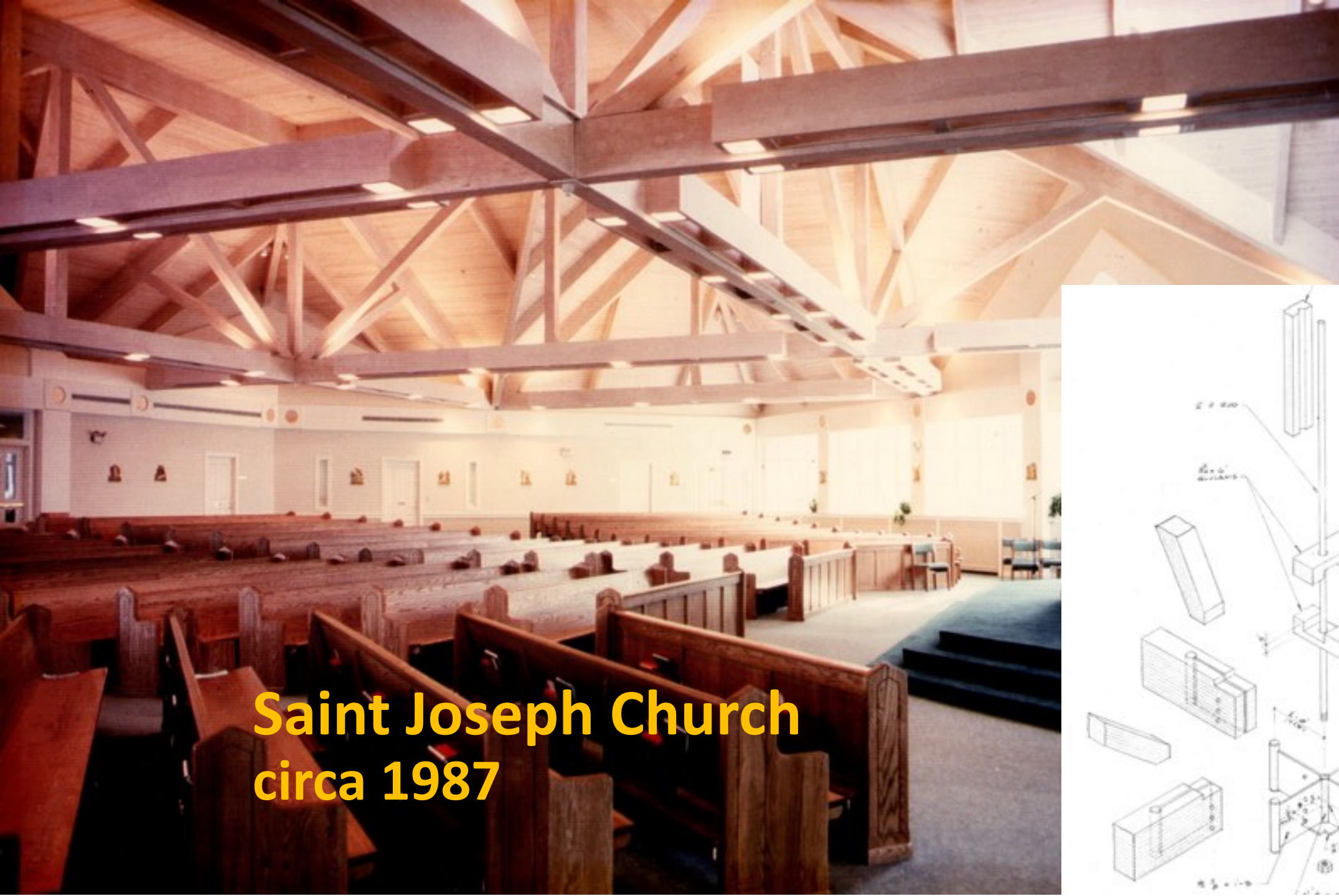
New Canaan Library
circa 1977



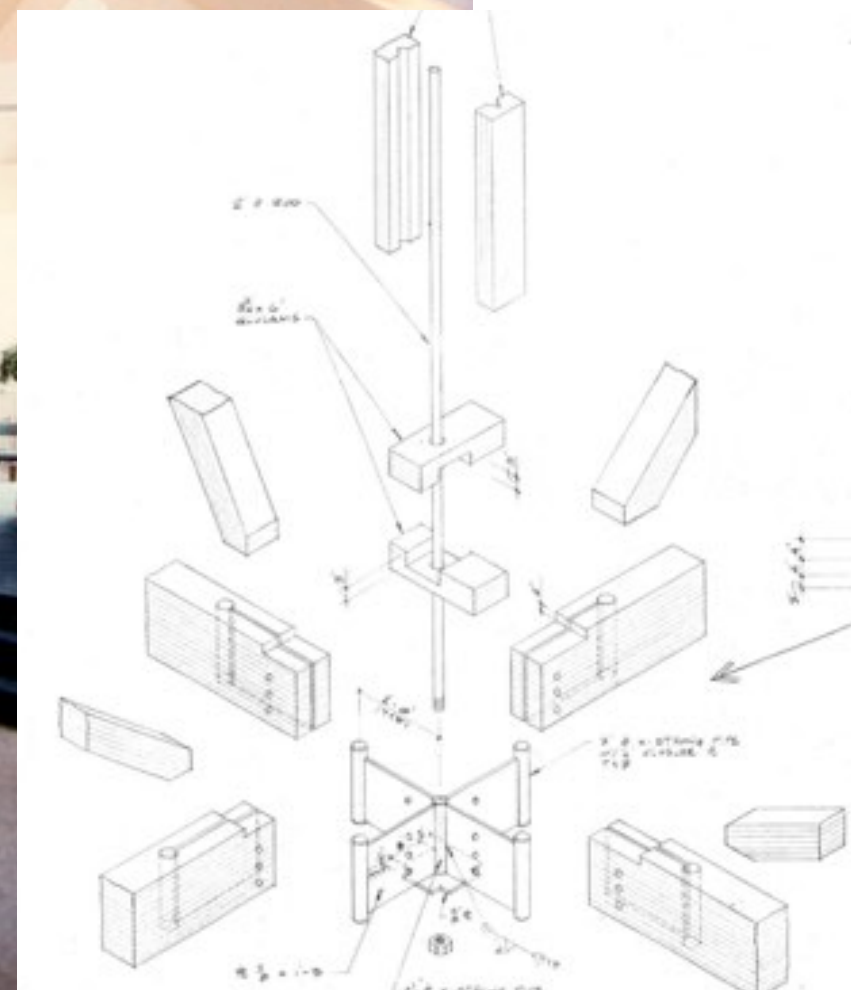
Church of the Holy Spirit

circa 1985





**Saint Joseph Church
circa 1987**



Saint Patrick Church

circa 2007



Winchendon School



Rockport Concert Hall

SER - LeMessurier





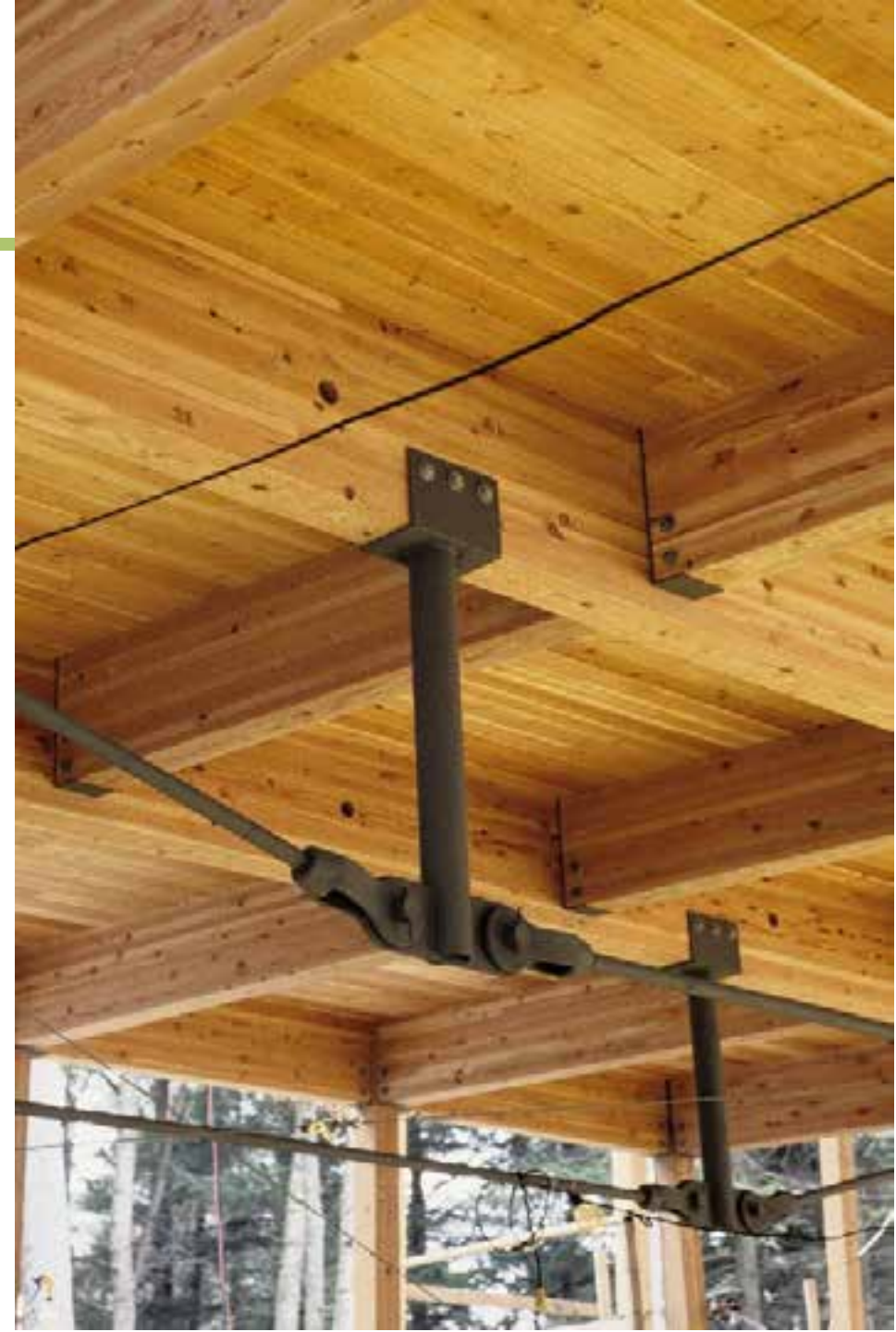
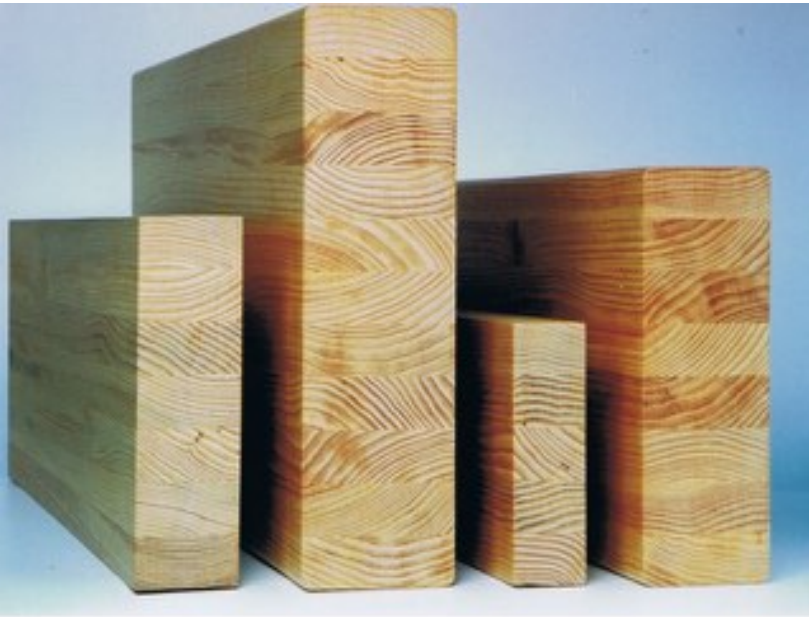
The image shows the interior of the Beaverton Public Library, a modern building with a prominent wooden structural system. The ceiling is a complex, exposed wooden truss system with large, angled beams. The walls are also made of wood, and there are large windows on the upper level. The ground floor features several computer workstations with large monitors and keyboards. In the background, there are bookshelves filled with books. The overall atmosphere is warm and modern.

Beaverton Public Library

SER – KPFF Portland

Glulam Timbers

- Douglas Fir
- Southern Pine

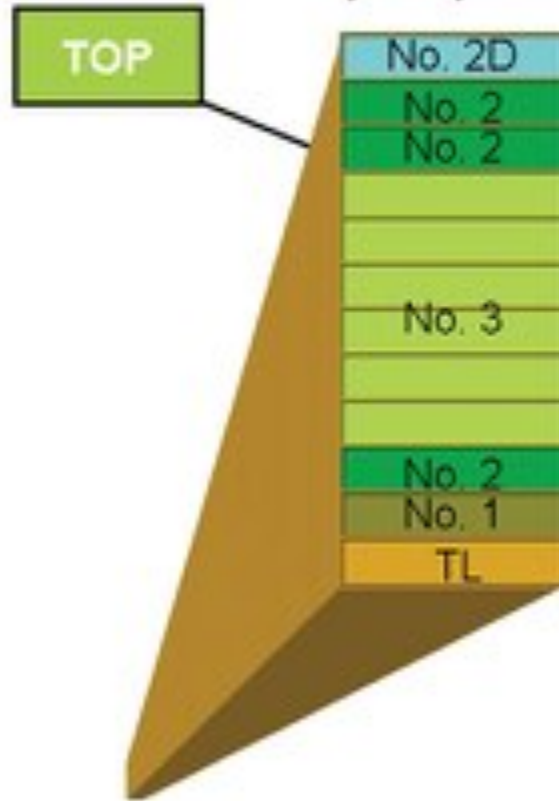


Glulam Layup



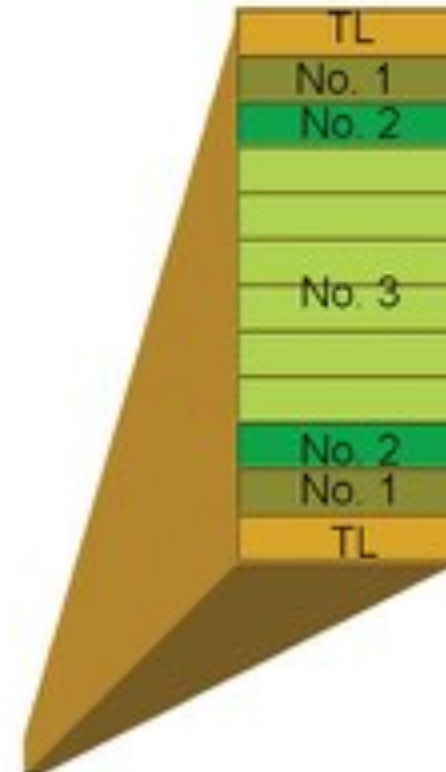
Unbalanced

Simple Spans



Balanced

Continuous Spans or Cantilevered



TL=Tension
Lamination

Certifying Agencies

- AITC
- APA - EWS

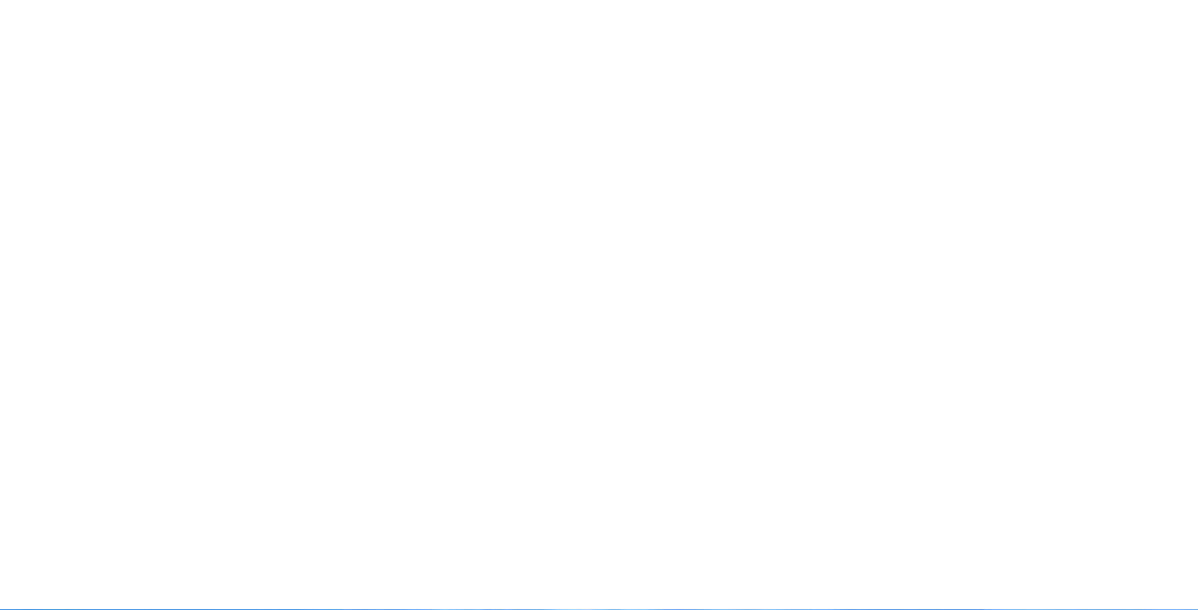


Portland Jetport



Frame Erection





Hotchkiss Biomass Plant



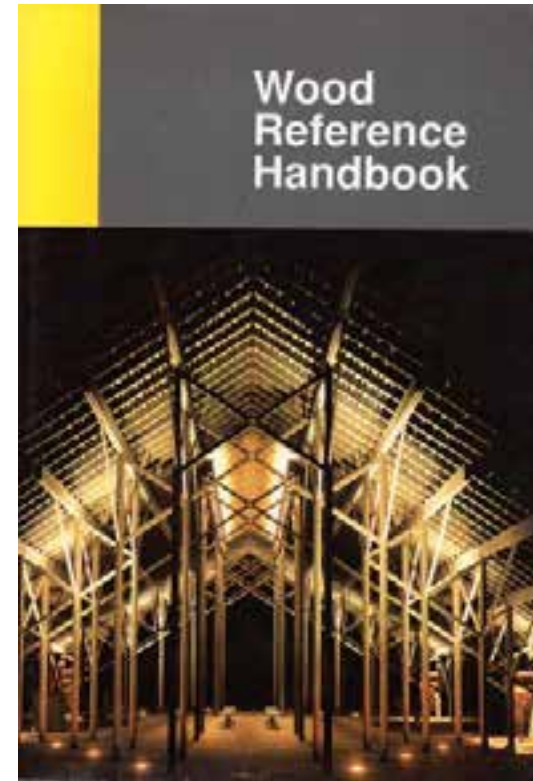


Curved Timbers



Minimum Radius

1 ½" lam	35'-6"
1" lam	20'-4"
¾" lam	12'-6"



Lamination Shop



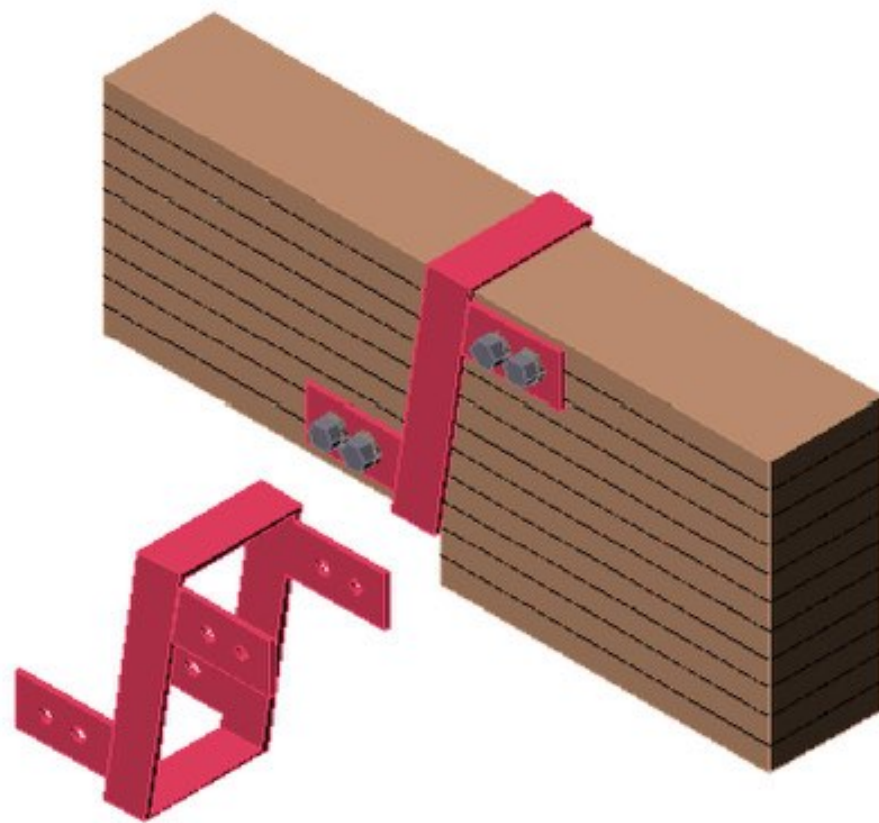
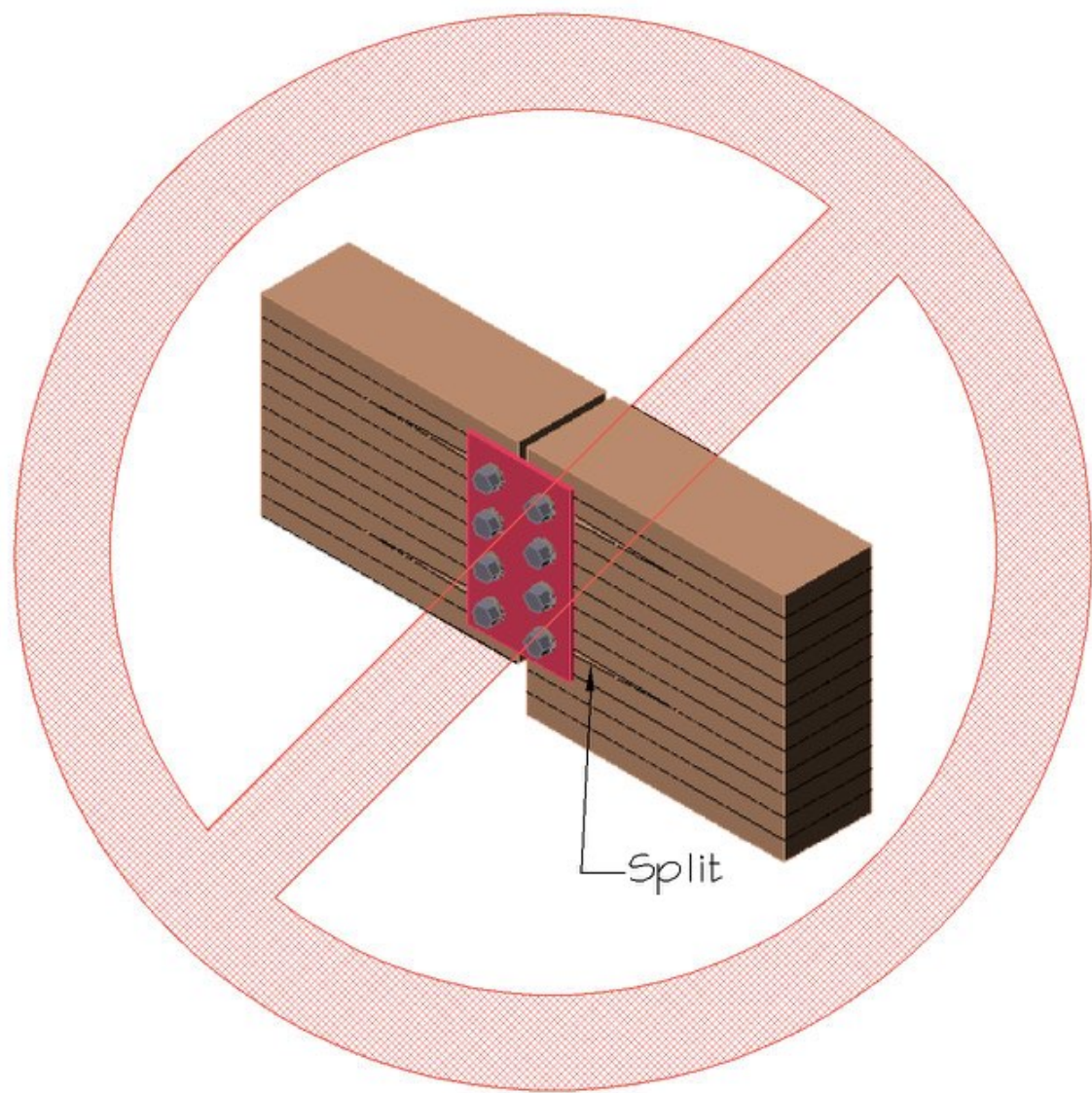
Haystack Mountain

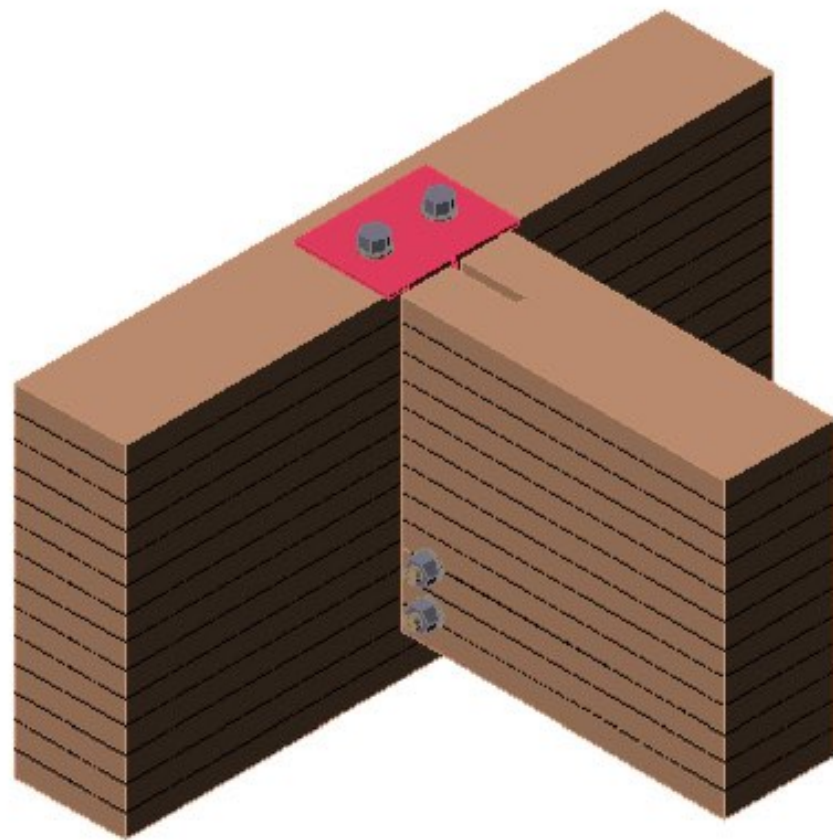
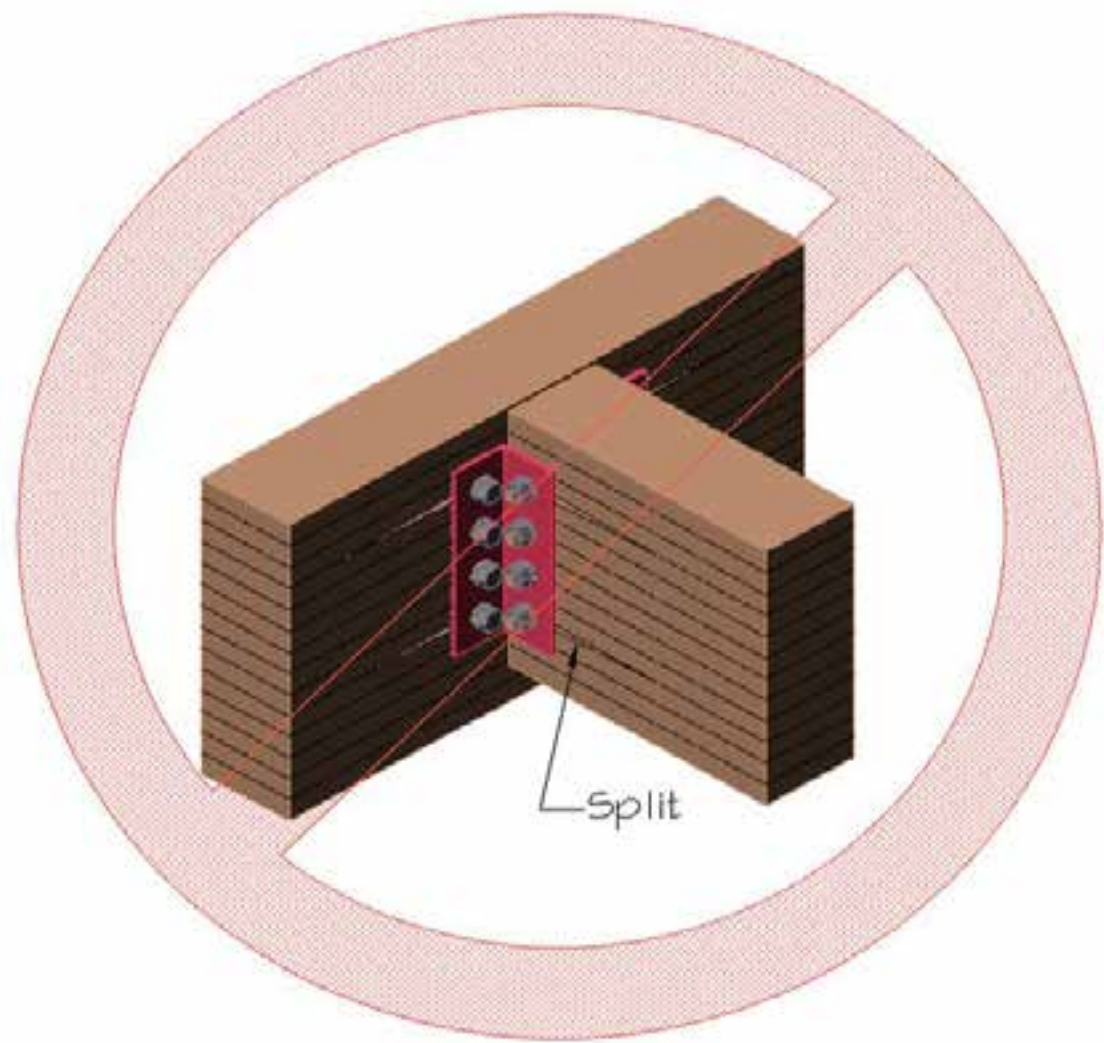


The Lodge at Crooked Lake

Siren, WI





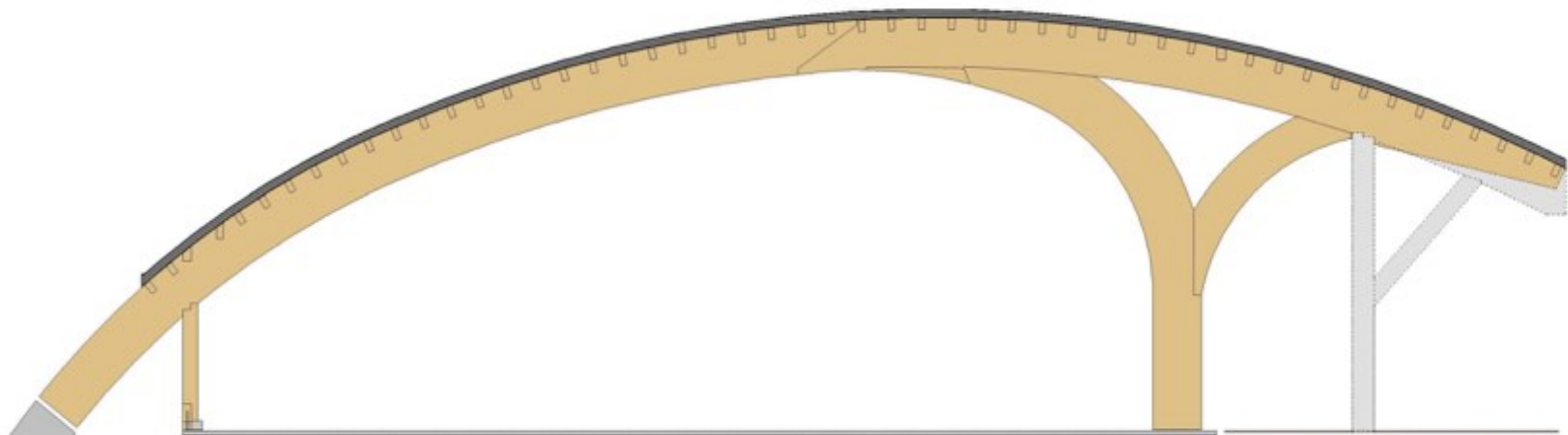


Timber Rivets



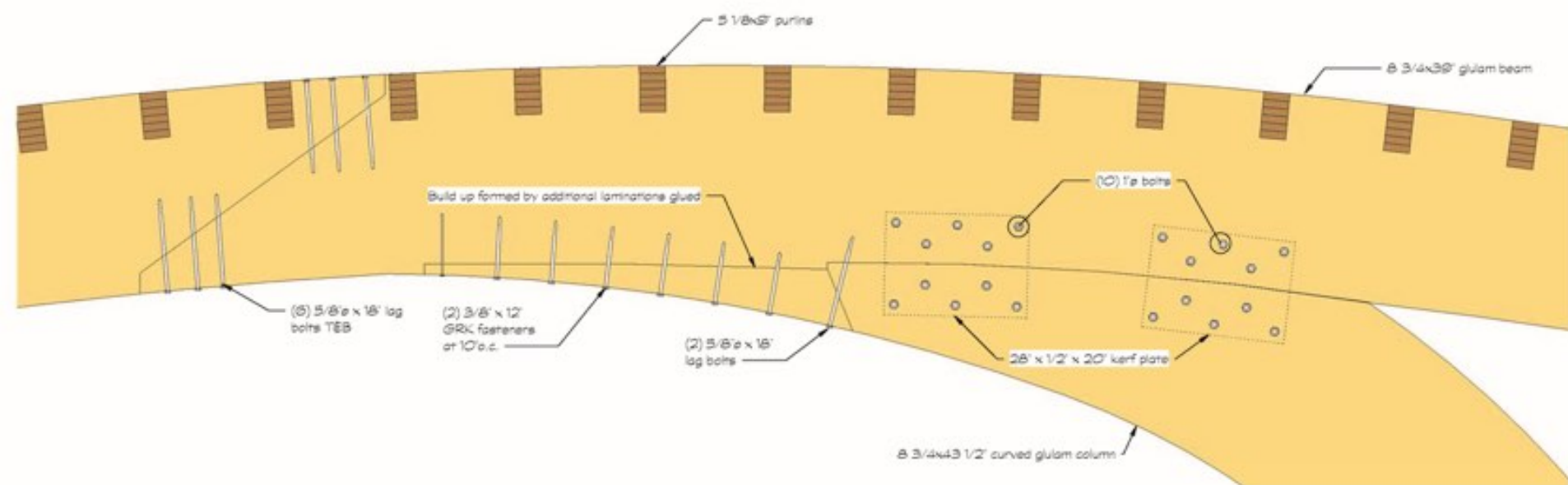
















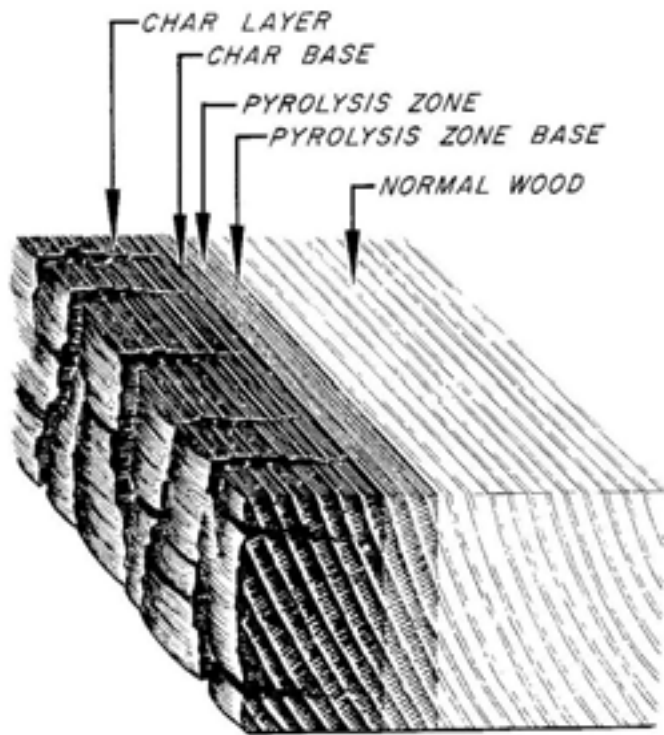
Design for Fire



Fire Performance

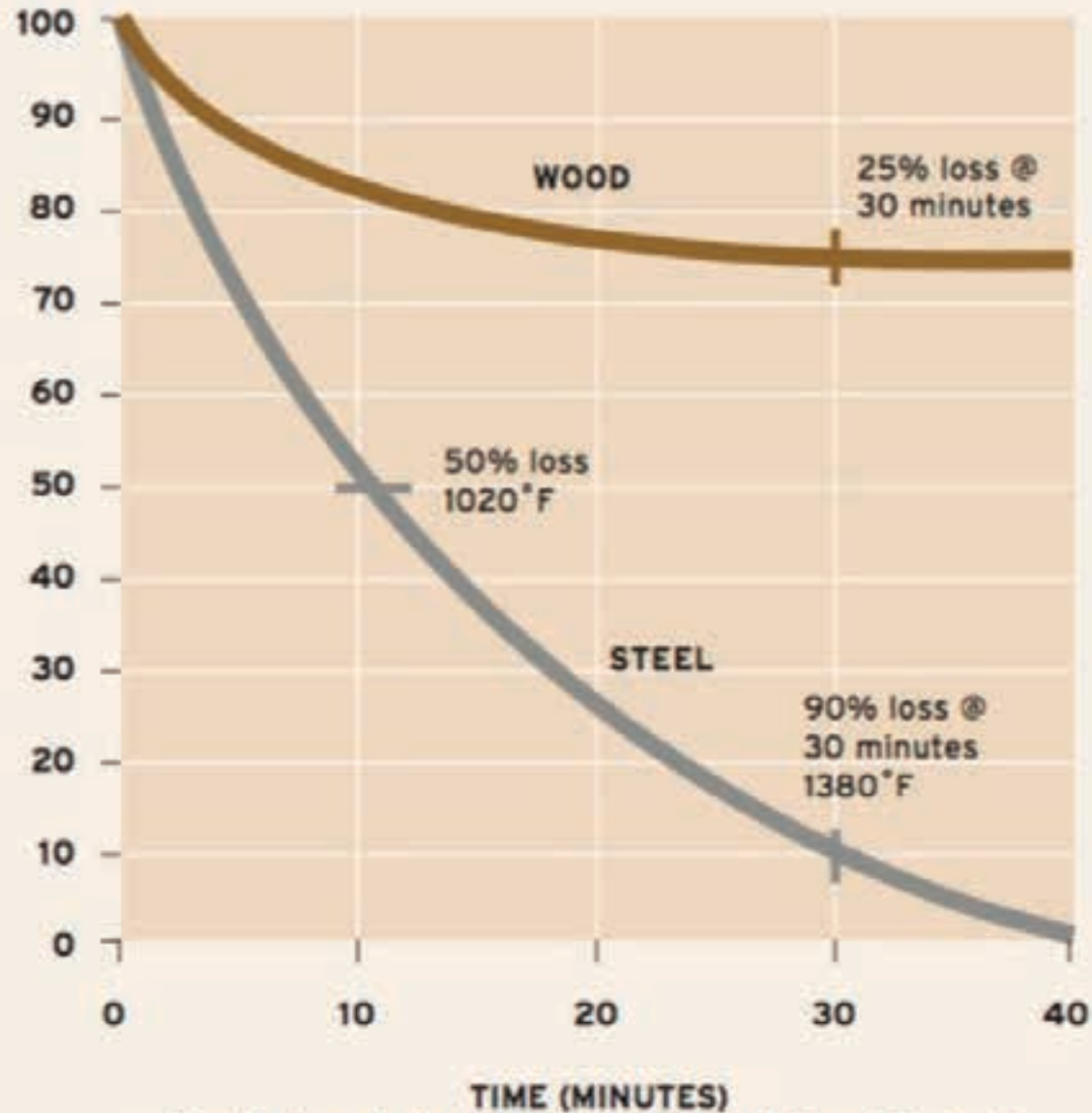


Fire Resistance of Mass Timber



Comparative Fire Test

COMPARATIVE STRENGTH LOSS OF WOOD VERSUS STEEL



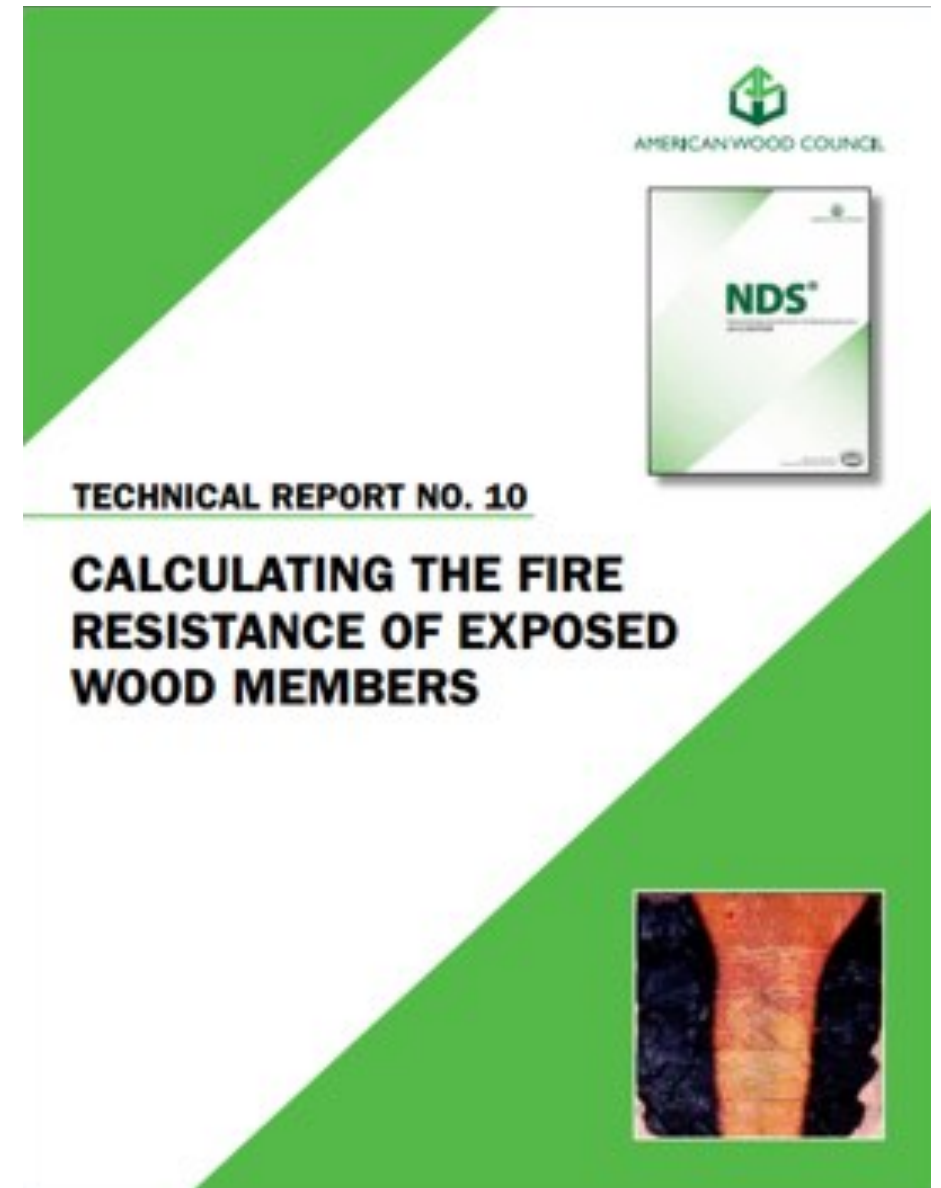
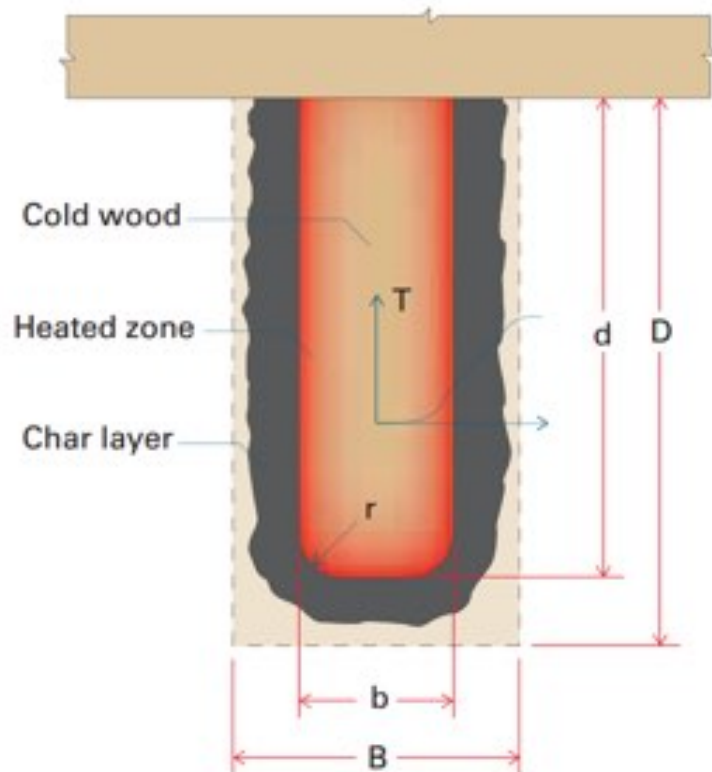
Results from test sponsored by National Forest Products Association at the Southwest Research Institute

SOURCE: AITC



AWC -Technical Report 10

www.awc.org



Protect Steel Hardware



Design for Durability



Design for Durability



Keep Your Feet Dry



Keep the rain off



Preservative Treatment



Before Laminating - Water based treatments – CCA, ACQ, Copper Azole

After Laminating – Solvent based treatments – Pentachlorophenol, Permethrin, copper naphthenate

Timber Decking



CLT Panels







> QUESTIONS?

This concludes The American Institute
of Architects Continuing Education
Systems Course



Jim DeStefano, P.E., AIA, F.SEI

jimd@dcstructural.com

