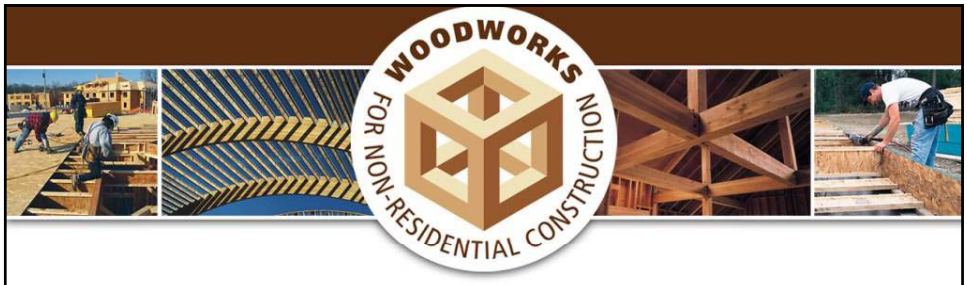


WoodWorks

Why Use Wood Framing in Commercial Buildings?

AIA Program Number 09S003
Provider Number G516

www.woodworks.org

"***The Wood Products Council***" is a Registered Provider with ***The American Institute of Architects Continuing Education Systems (AIA/CES)***. Credit(s) earned on completion of this program will be reported to ***AIA/CES*** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This program is registered with ***AIA/CES*** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

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

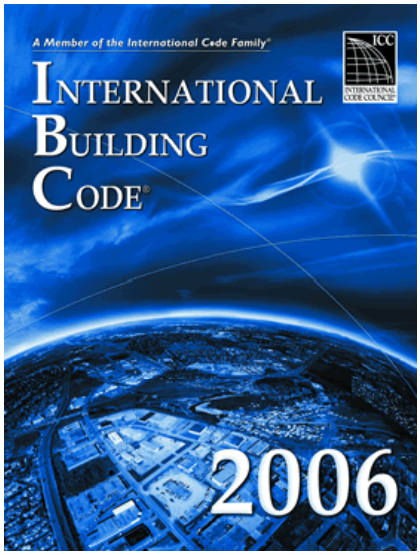
Copyright Materials

What are you looking for in a building?

- Code Compliant? 
  - Code +
- Durability? 
  - Should it last forever?
- Cost? 
- Desirable 

Code Compliance?

- Code Compliant?
  - Life Safety
  - Height & Areas



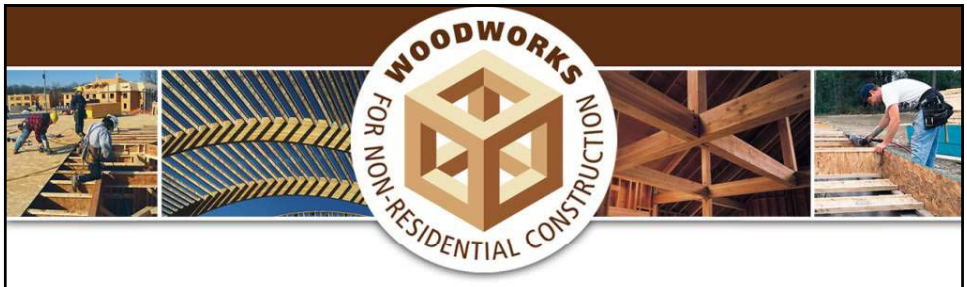
Combustibility ≠ Fire Endurance

- 1982 NIST study of unprotected floors
  - Steel floor endurance is ½ of a comparable wood floor

Fire Protection & Heights/Areas

- What is better? VA or IIB constrction
- Allowable area for VA in many instances is bigger than IIB!

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	HGT (S)	UL	160	65	55	65	55	65	50	40
M	S	UL	11	4	4	4	4	4	3	1
	A	UL	UL	21,500	12,500	18,500	12,500	20,500	14,000	9,000
A-2	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000



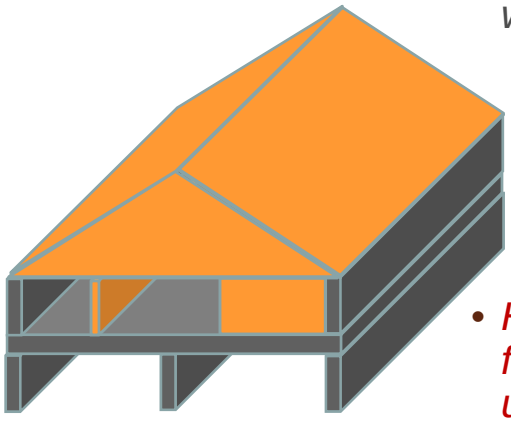
Building Type/ Heights and Areas

www.woodworks.org

Building Types

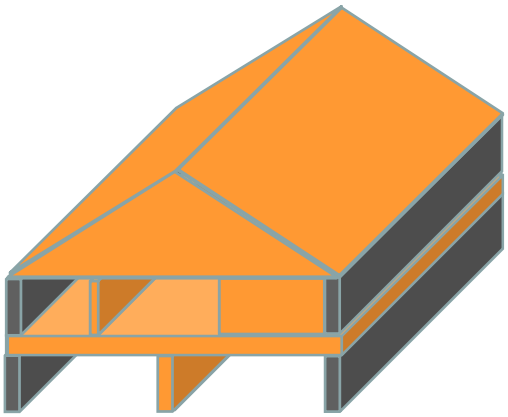
- *The 2006 IBC allows for five types of construction.*
- ***A given use and occupancy can be built using any type of construction.***
- *Types I and II are generally non-combustible materials such as concrete.*
- *Types III-V are generally combustible such as wood.*

Type I and II construction



- *So where can the FRT wood go?*
  - Non-bearing exterior walls where no fire rating is req'd.
  - Non-bearing partitions where the fire rating is 2 hours or less.
  - In some cases roof construction including girders, trusses, framing, and decking.
- *Heavy Timber roof framing may be utilized for rating requirements one hour or less in Type II and Type IB*

Type III



- *So where can wood go?*
  - Almost anywhere!.
- *Exterior Walls need to be non-combustible or FRT Wood*
- *Be careful with wall/floor interface*

Type IV - Rated Interior Assemblies

- In a variety of ways the building code does recognize the ability for Heavy Timber to resist fires through charring.

Layton Petro Mart

Type IV - Rated Interior Assemblies

- Walls are to be non-combustible.
- The IBC has published minimum sizes for a structure to be Heavy Timber.
- Detailed provisions available from AWC and APA.

TABLE 4

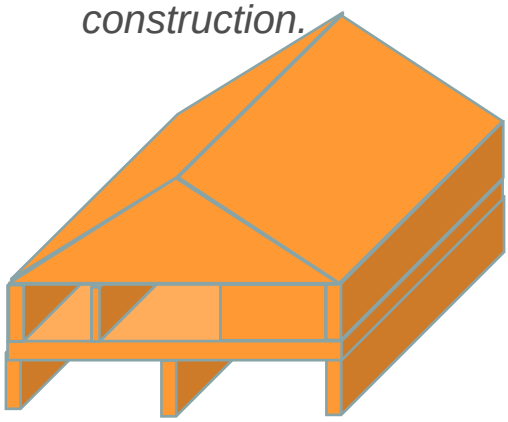
DIMENSIONS OF COMPONENTS FOR HEAVY TIMBER CONSTRU

Heavy timber construction is generally defined in building codes and st portions of a building:

	Inches, nominal
Columns	
Supporting floor loads	8x8
Supporting roof and ceiling loads only	6x8
Floor framing	
Beams and girders	6 wide x 10 deep
Arches and trusses	8 in any dimension
Roof framing – not supporting floor loads	
Arches springing from grade	6x8 lower half 6x6 upper half
Arches, trusses, other framing springing from top of walls, etc.	4x6

Type V

- *All structural elements can be combustible construction.*



BUILDING ELEMENT	TYPE V	
	A[e]	B
Bearing walls		
Exterior[g]	1	0
Interior	1	0
Nonbearing walls and partitions Exterior		
Nonbearing walls and partitions Interior[f]	0	0
Floor construction Including supporting beams	1	0
Roof construction Including supporting beams	1[c, d]	0

Allowable Areas – Running the #'s

- Tabulated Areas
- Protected vs. Unprotected
- Effect of Sprinklers – Area
- Open Frontage

Building Size

- Assume an office building is desired – Group B

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	HGT (S) HGT (feet)	UL	160	65	55	65	55	65	50	40
B	S A	UL UL	11 UL	5 37,500	4 23,000	5 28,500	4 19,000	5 36,000	3 18,000	2 9,000

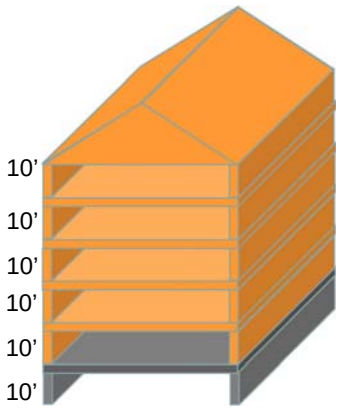
- For Type I 11 stories/UL sf is allowed.
- For Type II 4 stories/23,000sf is allowed.
- For Type III 4 stories/19,000sf is allowed.
- For Type IV 5 stories/36,000sf is allowed.
- For Type V 2 stories/9000sf is allowed.

Total Frontage & Sprinkler Increase

- *For a multi-story unprotected office building; type IIIB construction:*
  - *Tabulated area A_t is 19,000sf*
  - *$A_a = \{A_t + [A_t \times I_f] + [A_t \times I_s] \}$ (Equation 5-1)*
  - *$A_a = \{19{,}000 + [19{,}000 \times 0.75] + [19{,}000 \times 2] \}$*
  - *$A_a = 71{,}250$sf/story*
- *For type IIIA the same building would be:*
  - *$A_a = \{28{,}500 + [28{,}500 \times 0.75] + [28{,}500 \times 2] \}$*
  - *$A_a = 106{,}000$sf/story*

Podium Structures – IBC Section 509

- *A basement and/or the first story above grade plane of a building shall be considered as a separate and distinct building*
- *Additional Concrete Story Allowed*
- *Overall height requirements must be maintained*
- *60’ + 20’ = 80’*

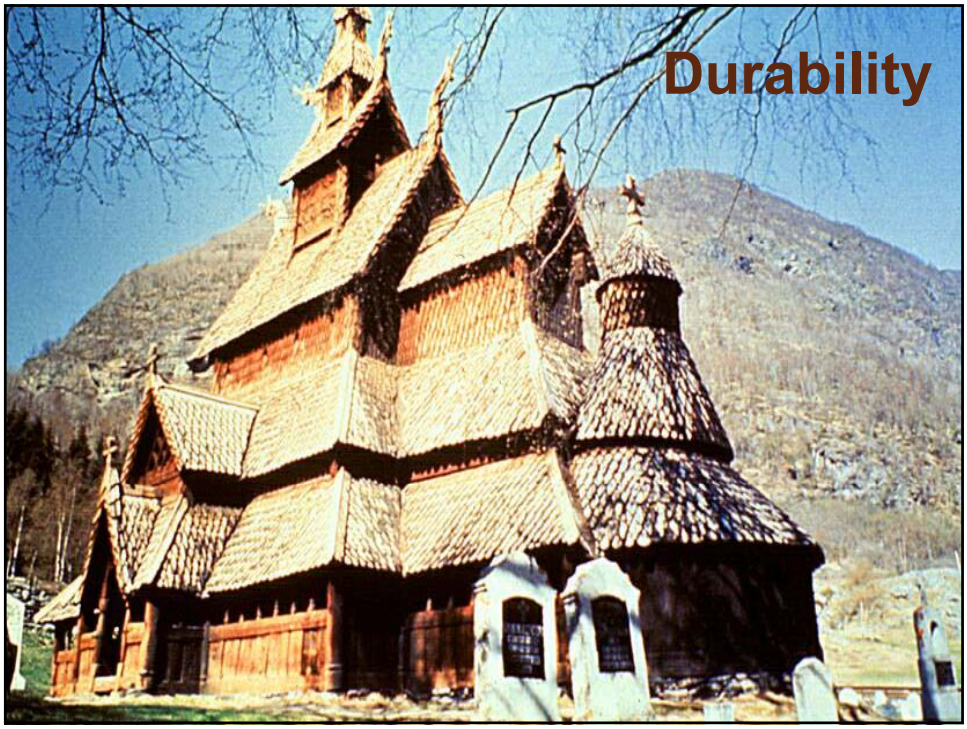


Common Examples Building Height

- *For a 5 story sprinklered building;*
  - *Using type IIIA; B, F-2, H-3, I-1, M, R, S-2.*
  - *Offices, Assisted Living, Mercantile, and Residential*

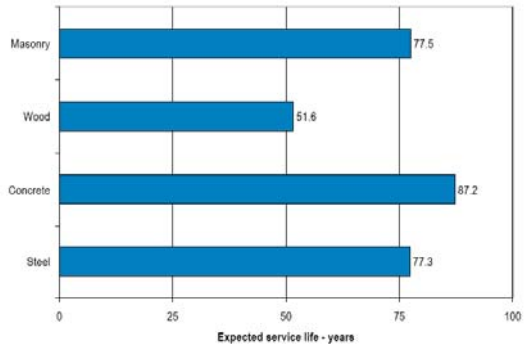
Common Examples Building Height

- *For a 4 story sprinklered building;*
  - *Using type IIIA; A, E, F-1, H-5, I-4.*
  - *Examples include assembly areas, and schools.*



Which building mat'l is the most durable

- Survey indicates architects think wood is the least durable.

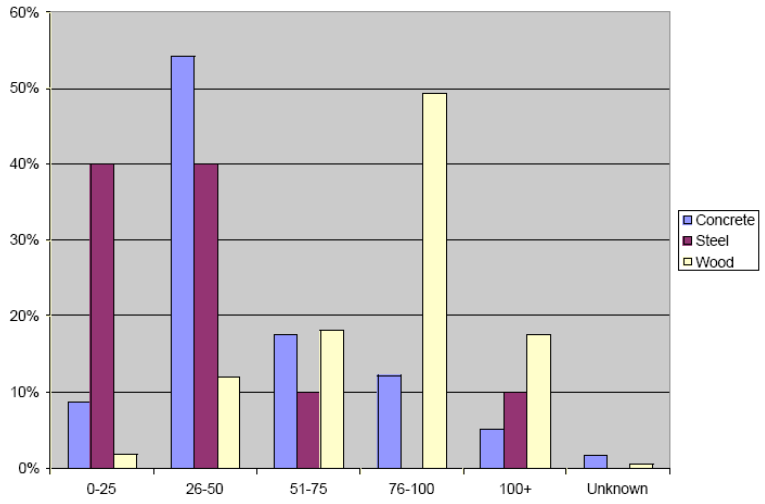


What does research tell us?

- Durability study conducted by the Athena Institute to evaluate the relative life span of demolished buildings.
  - Review of demolished buildings in the Minneapolis area.
  - 227 buildings reviewed
  - Focus on building material impact of durability

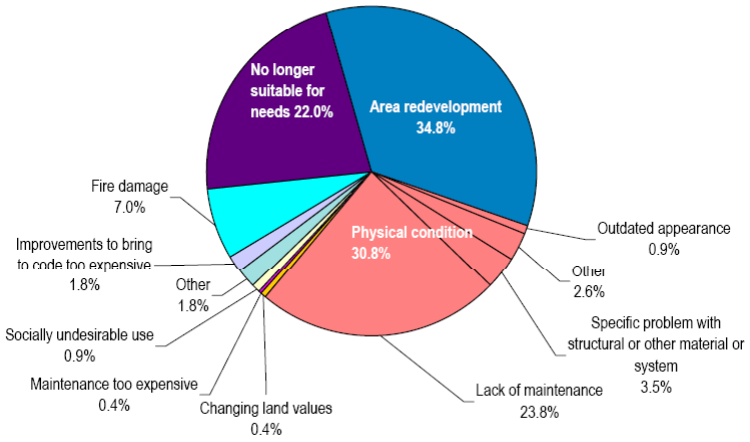
Durability

Figure 7: *Comparison of percentage of demolished buildings in each age group by structural material*



Durability cont'd

– Most buildings were demolished for reasons OTHER than structural inadequacy



Durability

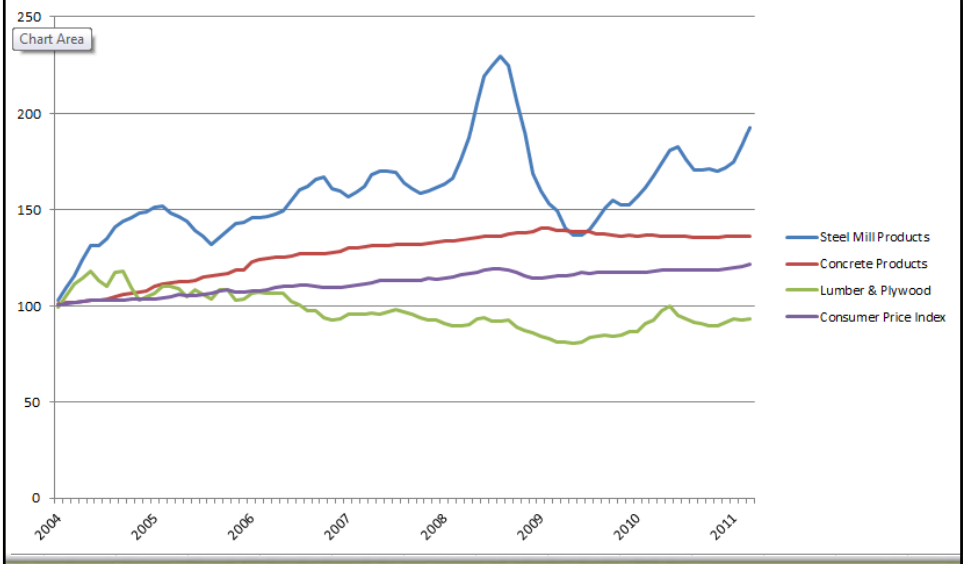
- **Real:** Wood rots, steel rusts, concrete cracks if not taken care of properly
- **Real:** The durability of a material is not the primary driver for demolition of buildings.

According to Paul Vermani of the Federal Highway Administration concrete spalling is a 276 billion dollar issue

COST BENEFITS

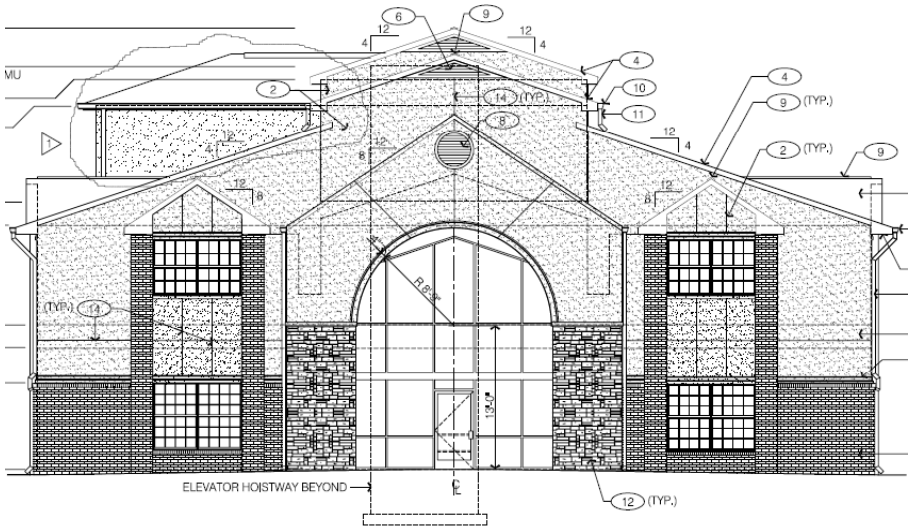
Construction Materials Price Index

Change in producer prices. Dec. 2003 = 100; Through Feb. 2011



Source: U.S. Dept of Labor, Bureau of Labor Statistics

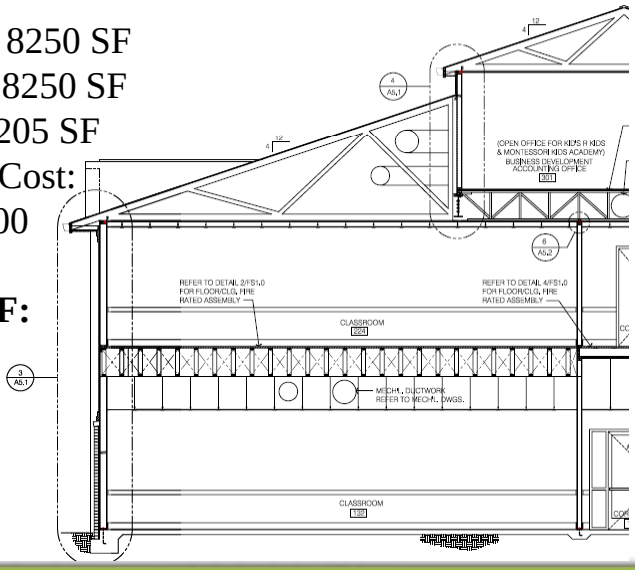
Montessori School – Cumming GA



INFORMATION PROVIDED BY ARCHITECT DENNIS DUBEY

Montessori School

Ground Floor area: 8250 SF
Second Floor area: 8250 SF
Third Floor area: 1205 SF
Total Construction Cost:
Building: $1,234,500
Site: $115,500
TOTAL COST / SF: $76/SF



INFORMATION PROVIDED BY ARCHITECT DENNIS DUBEY

Hilton Garden Inn

Hilton Garden Inn

- Design/Build 74,983 sf
- 4 Story, 120 Guestroom
- Opens Fall 2008.

Developer: Briad Group

Only a year ago, the building's wood frame construction would not have been permitted for a commercial building. The revised building code could save developers 10 percent on the overall cost of project, Coughlan added.

Cost Benefits?

Size	Length	Price	Other	% Increase
2x4	10'	$ 2.44	Spruce Pine-Fir	-
2x4	10'	$ 2.77	Spruce Pine-Fir End Jointed	14%
3-5/8"	10'	$ 3.50	20ga Non-Structural Drywall	43%
3-5/8"	10'	$ 8.00	18ga Structural	228%
2x6 #2	20'	$ 9.20	Spruce Pine-Fir	
3-5/8"	20'	$ 16.00	18ga Structural	74%
2x6 #2	32'	$ 18.98	Spruce Pine-Fir End Jointed	

WHAT ABOUT INSTALLED COSTS?
Data obtained 8/14/09

Are Aesthetics most Important?

- **Retail**
- **Education**
- **Hospitality**
- **Industrial**
- **Business**
- **Multi-Family**

Blue Ridge Destination Center
Lord, Aeck & Sargent Architects,NC
http://www.aia.org/aiarchitect/thisweek08/0328/0328d_blue.cfm

Wood and the Environment:
Building Occupant Environment

Wood makes people feel good.

- People are attracted to wood because of its:
  - Biophilia = “love of living systems”
  - Visual variety, natural irregularity and expressiveness
  - Warmth, softness and a calming effect
- Principles of “Evidence-based Design” show that occupants respond positively to wood
  - Schools in Japan are built with wood because students respond positively
  - Healthcare facilities in Canada have experienced positive patient response due the humanism incorporated in the architecture of the facilities

Japan Schools

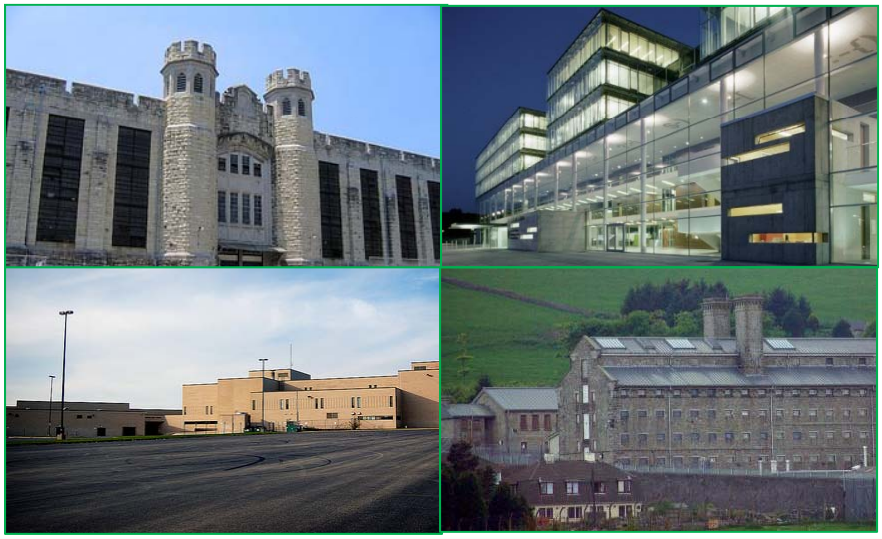
Wood and the Environment:
Building Occupant Environment

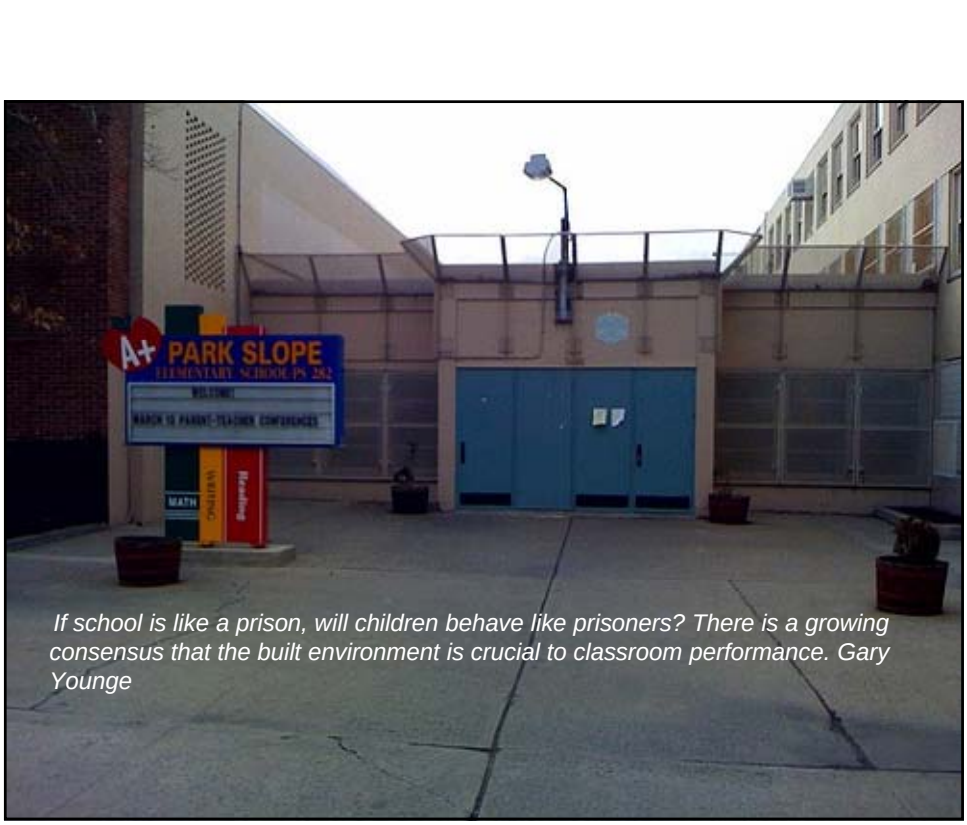
Thunder Bay Regional Health Sciences Center

Credit Valley Hospital

How does wood contribute to the interior environment of a building?

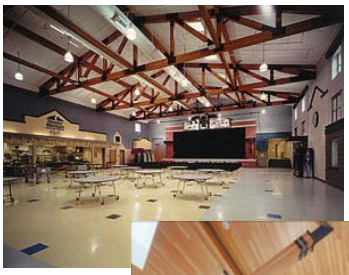
3 prisons, 1 school

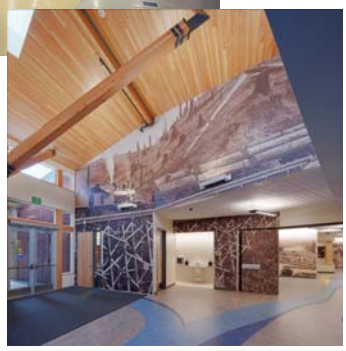




If school is like a prison, will children behave like prisoners? There is a growing consensus that the built environment is crucial to classroom performance. Gary Younge

What about aesthetics?





Example Projects

Example Project

- Dental Clinic
- 6,000sf
- Wood brought the building back into budget

Dr. Gluck's – Orthodontist's Office

- 7,200sf in Mixed Use Development
- Traditional prairie school themed interior
- Building Layout
  - 2 story open treatment room for 8
  - 2 records rooms
  - 2 consult rooms
  - lab, sterilization, & offices

Project information by: ZANARDO ARCHITECTS, P.C.

Architectural Features

ZANARDO ARCHITECTS, P.C.

Structural Features

- Timber Trusses
  - Steel Tension Ties
- 2x Wood Framed Walls
  - Reduced Thermal Bridging

ZANARDO ARCHITECTS, P.C.

Murchison Performing Arts Center

- Seating 1,100
- 98’ Span
- SWS AL supplied glulam

- "glulam structural members were structurally, aesthetically, and economically the material of choice."

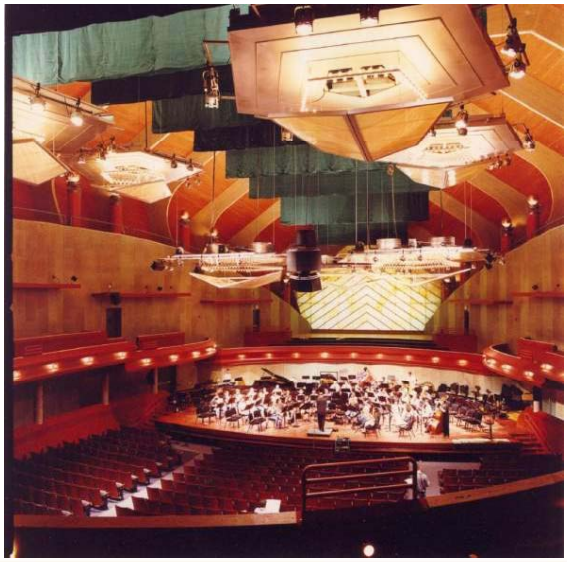
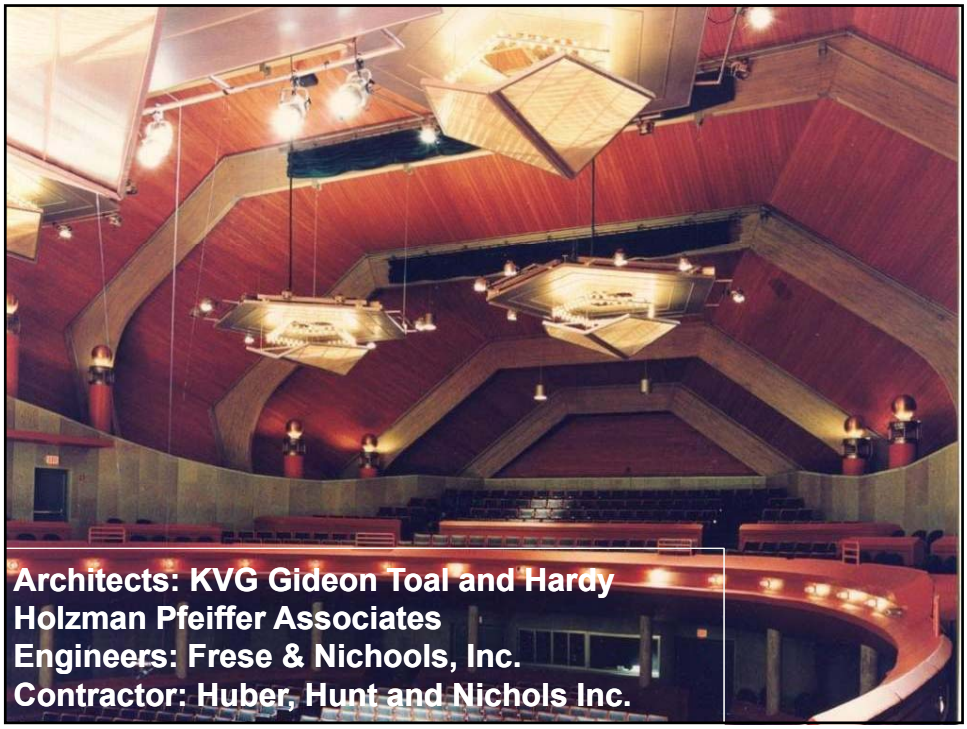


Image provided by SWS



6,000 sf Building Expansion

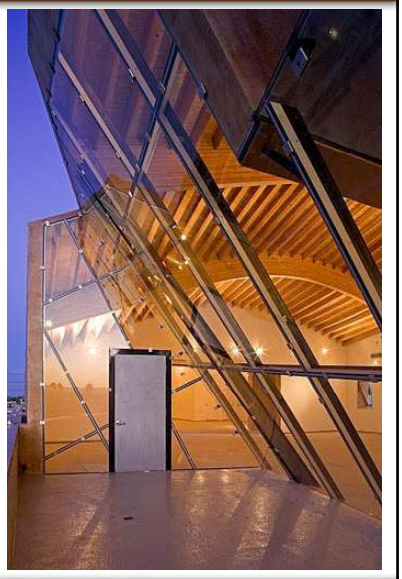
Hayden Warehouse

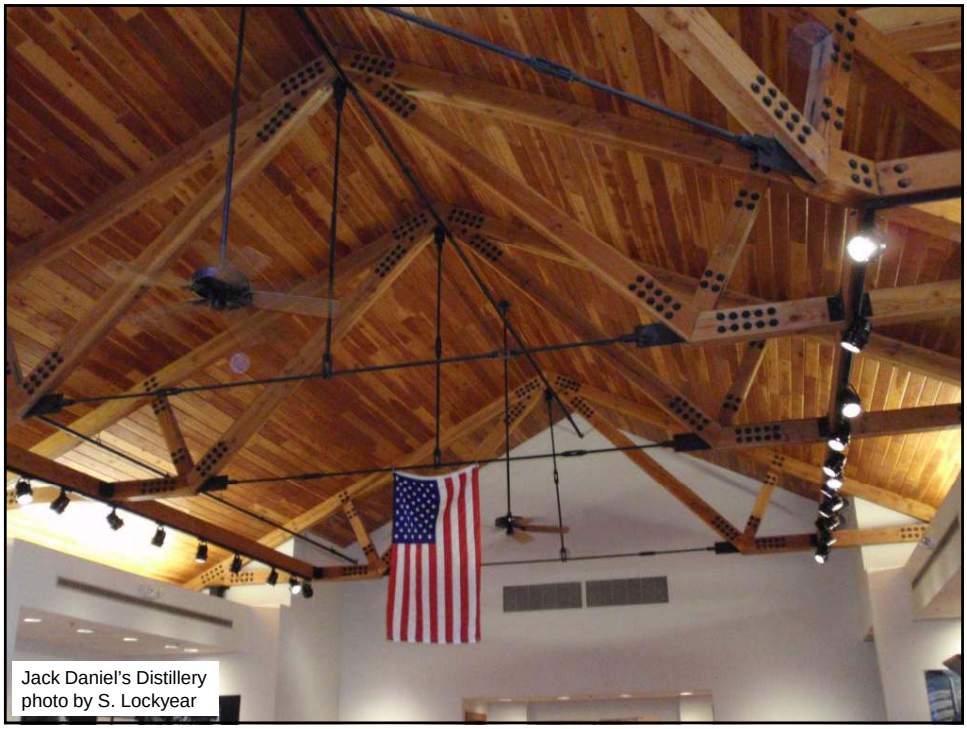
Glulam span – 16 -52’

5-1/8 to 6-3/4” wide
9 to 30” deep

12’ o.c.

2x rafters 16” o.c.





Jack Daniel's Distillery
photo by S. Lockyear

Great Wolf Lodge Resort, located in Concord, NC, is a $70 million, 470,000 square foot complex. It will contain 402 hotel guest units, a 90,000 square foot indoor water park, and a 20,000 square foot convention center.

Kraemer Brothers, LLC of Plain, WI has contracted with Universal Forest Products to provide and install all rough carpentry, wood trusses, and fiber cement siding. *David Boyce* (E285 – Dallas, NC) is the account manager for the $6.7 million turn-key project. *Dan Chaney* is coordinating all efforts with David Boyce as General Manager of Operations in Dallas.

The project started in November 2007 and is expected to be complete in March 2009. Image above is a partial view of west wing of building.

Heavy Timber Roof

Focal point is heavy timber framework at entry core area and water park.

Photo by Universal Forest Products

Large Roof With Structural Panels

Photo by Universal Forest Products

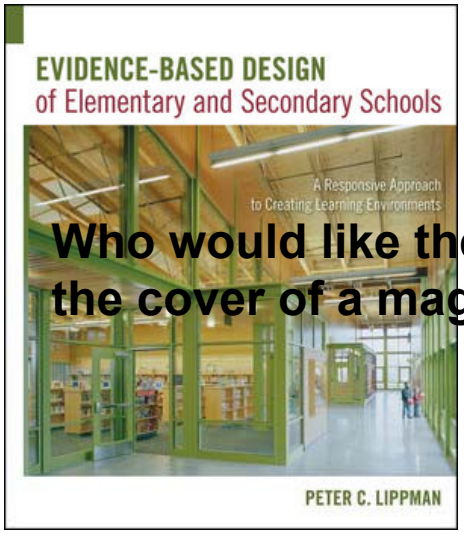
Glued Laminated Beams with T&G

Photo by Universal Forest Products

Anaheim Ice Arena

116’ Span Anaheim Ice Arena

Wiley & Son Publications



Who would like their building on the cover of a magazine?

Course Evaluations

In order to maintain high-quality learning experiences, please access the evaluation for this course by logging into CES Discovery and clicking on the Course Evaluation link on the left side of the page.

Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

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The Wood Products Council