Overview of Wood Products

Michelle Kam-Biron, S.E.
WoodWorks

LEARNING OBJECTIVES

1. Increase understanding of the benefits of wood.
2. Learn about typical wood products.
3. Highlights of wood use.
4. Provide valuable resources to find more in-depth information.

Copyright Materials

This presentation is protected by US and International Copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.

© The Wood Products Council 2010
WHY CHOOSE WOOD?

- Cost
- Less Lead Times
- Aesthetics
- Sustainability

Construction Materials Price Index

Change in producer prices.
December 2003 = 100; Through October 2009

Lead Times

- For commonly available wood products many are in stock and ready for delivery.
- For special orders often lead times will be 3-5 weeks.
- Steel building components may have lead times at 12 weeks.

Wood and the Environment:
Building Occupant Environment

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

- Wood products offer a unique aesthetic appeal.

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

Ina-Higashi Elementary School, Japan

Point Architects

Yamakoya Library
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 the positive patient response due to humanism incorporated in the architecture of the facilities

Credit Valley Hospital

Tye Farrow, Farrow Partnership

Climate Change

Environmental benefits of using wood:

1. Wood products provide a means for long term carbon storage
2. Wood industry generates biomass energy which is carbon neutral
3. Wood is recyclable, renewable and reusable.
4. Wood is the only GREEN building material.
Green Benefits of Wood

Comparing CO2 emissions of different materials

- Sawn lumber products have a negative net CO2 contribution.
- Wood industry often contributes biomass energy to the grid.

LCA: How does wood measure up?

ATHENA OFFICE BUILDING CASE STUDY

- 50,000 sq. ft. Office Building
- Full LCA software used to compare steel, concrete and wood

Wood Framing Members

Palette of wood framing members available.

Wood Framing Members

CHECK LOCAL AVAILABILITY

Structural Panels | Repetitive Framing | Beams/Girders | Wall Studs

APA Form E30U

www.sfpa.org
#200

Model #A

www.wwpa.org

www.apawood.org

APA Form E30U
Wood Framing Members

Structural Panels  Repetitive Framing  Beams/Girders  Studs

Wood Structural Panels

Wood Parallel to Grain

Parallel  Perpendicular

Parallel: Stronger  Perpendicular: Less strong

Plywood Layup

FACE  CORE  CENTER  CORE  BACK
OSB layers are engineered for strength.

Manufacturing Standards

H860

S350
Veneer Grade of Sheathing

A Smooth, paintable. Not more than 18 neatly made repairs.

B Solid surface. Repairs, and tight knots to 1 inch.

C-Plugged Improved C veneer. Knotholes or other open defects limited to 1/4 x 1/2 inch.

C Tight knots to 1-1/2 inch. Knotholes to 1 inch across grain. Occasional 1-1/2-inch knothole.

D Knots and knotholes to 2-1/2 inch. Occasional 3-inch knothole.

Bond Classifications

APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING 32/16 15/32 INCH SIZED FOR SPACING EXTERIOR 000 PS 1-95 C-C PRP-108

APA THE ENGINEERED WOOD ASSOCIATION
RATED SHEATHING 32/16 15/32 INCH SIZED FOR SPACING EXPOSURE 1 000 PS 1-95 C-D PRP-108
**Exposure Durability Levels**

**Exposure 1**
Waterproof glue
Permit D-grade veneer (plywood)

**Exterior**
Waterproof glue
Minimum C-grade veneer (plywood)

---

**Moisture Exposure Recommendations**

<table>
<thead>
<tr>
<th>In-Service Moisture Content</th>
<th>End-Use Moisture Conditions</th>
<th>Recommended Bond Classification</th>
<th>Design Moisture Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 16%</td>
<td>Dry use</td>
<td>Exterior</td>
<td>Dry</td>
</tr>
<tr>
<td>16% to 19%</td>
<td>Humid interior or protected use</td>
<td>Exterior</td>
<td>Wet</td>
</tr>
<tr>
<td>Greater than 19%</td>
<td>Long-term exposure to weather</td>
<td>Exterior</td>
<td>Wet</td>
</tr>
<tr>
<td></td>
<td>Other very humid or wet uses</td>
<td>Exterior</td>
<td>Wet</td>
</tr>
<tr>
<td></td>
<td>Ground contact</td>
<td>Exterior</td>
<td>Wet</td>
</tr>
</tbody>
</table>

*(a) Contact APA for specific design provisions.*

---

**Roof Sheathing Application - HUGE Warehouses**

- 40% of US Imports flow through California ports
- Ports are Bottlenecks
- Consolidated warehousing gaining favor
- 1 Million square foot warehouses are becoming common place

*Slide provided by John Lawson, S.E., Kramer and Lawson*
Panelized Roof:
approx. $3.5 - $4.00/ sq.ft.

Pre-assemble large sections on the ground

2-3 people
4-5 minutes to assembly

Lift into position with high lift capacity forklifts
Structural Insulated Panels (SIPS)

- Often available in 8’x4’ to 8’x24’ dimensions.
- Benefits include:
  - Energy efficiency
  - Ease of Construction
- Limited use in high seismic areas (335plf max).

APA Publication: H650
www.sips.org
**Wood Framing Members**

- **Structural Panels**
- **Repetitive Framing**
- **Beams**
- **Girders**

Rafters, Joist, I-Joist, Trusses

**Solid Sawn Lumber - Rafters**

- Roof Rafters
  - Readily available
  - 2x4 to 2x12
  - Spans approx. 8'-20' 2ft. increments
  - In CA 32' spans are available
  - ≤ 16' spans are the most cost effective solution

**Sawn Lumber - Joist**

- Floor Joist
  - Readily available
  - 2x8 to 2x12
  - Spans approx. 16'
  - In CA 32' spans available
  - ≤ 16' spans are the most cost effective solution

**Species Groups**

**WEST**
- Douglas Fir-Larch
- Hem-Fir (White Fir)
- Spruce-Pine-Fir (South)
- Western Cedars
- White Woods

**NORTH EAST**
- Spruce-Pine-Fir (South)

**SOUTH**
- Southern Pine

**CANADA**
- Spruce Pine Fir
Products Association

- Rules writing/Quality Services
- Economic Services
- Lumber Grading
- Technical Support
- Information Services
- Product Support Services

Visual Stress-Graded Lumber

- Dimension Lumber evaluated by certified lumber graders
  - Visually examine each piece
  - Assigned grade based on visual characteristics
  - Each grade denotes design strength and stiffness value
  - Inspected in accordance with ALSC Grading Rules PS 20 for Lumber www.alsc.org
  - Based on ASTM D1990
  - +90% of lumber is visually graded.

Grade Stamps

GRADE MARKS:
- a) Certification mark
- b) Mill Identification
- c) Grade designation
- d) Species identification
- e) Condition of seasoning
  - MC-15 – 15% max. MC
  - KD-15 – 19% max. MC
  - S-DRY - KD
  - S-GRN - over 19% MC (unseasoned)

BASIC INFORMATION FROM STAMP:
1. Who made it
2. How strong is it

Machine Grade Lumber - MSR and MEL

- Machine Stress Lumber
- Grading machinery induces slight stresses to measure stiffness.
Machine Graded Lumber

Machine Stress-Rated Lumber (MSR)
- Machine Non-destructively evaluates stiffness

Machine Evaluated Lumber (MEL)
- Machine Non-destructively evaluates density

- Both MSR & MEL
  - Strength - Bending Stiffness
  - Stiffness - Sorts by Modulus of Elasticity

- Both have visual requirements and lower variability in strength
- Lumber properties are species independent
- Not widely used (limited availability)
- Mostly used for engineered wood or wood trusses

Machine Stress-Rated Lumber (MSR)

GRADE STAMP
- Product Designation – MSR, MACHINED RATED
- Registered Trademark of Grading Agency
- Mill Number or Name
- Moisture Content
- Species Fb and E rating
- When additional control process are implemented Ft, SG, Fc, F_{v} and F_{v}

Machine Evaluated Lumber (MEL)

GRADE STAMP
- Product Designation – MEL, MACHINE RATED
- Registered Trademark of Grading Agency
- Mill Number or Name
- Moisture Content
- Species Fb and E rating
- When additional control process are implemented Ft, SG, Fc, F_{v} and F_{v}

Governing Codes for Engineered Wood Design

- 2005 NDS (National Design Specification for Wood Construction)
Solid Sawn - Availability

- US and Canadian Wood Species
- In the Western United States Douglas Fir Larch, Hem Fir, and Spruce Pine-Fir are commonly available.
- In the Eastern United States Southern Pine and Spruce Pine-Fir are commonly available.

www.awc.org
www.wwpa.org
www.sfpa.org

Span Tables

OFFICE
50psf LL + 15psf LL (partition) = 65psf LL
10psf DL
Sawn Lumber Notching

Based on code requirements
- Outer third of span only
- Avoid tension edge

Fig. 1: Placement of Cuts in Floor Joists

WWPA Technical Note A-11 “Notching and Boring Guide

---

Solid Sawn Lumber Joist

- Lumber Design Suite available for sawn lumber.
- Free Download www.wwpa.org

---

I-Joist

- Commonly used for floor and roof framing
- Long lengths readily available

Flange:
- Lumber
- LVL

Web:
- OSB
- Plywood

Flange Widths:
- 1-1/2" to 3-1/2"

Common Depths:
- 11-7/8"
- 14"
- 16"
- 18"
- 20" - 32"

For 22" and greater depth could require a sprinkler at each bay!!!!
I-Joist

- Long floor spans approx. 60’
- Design flexibility
- Less material/fewer pieces

Adaptability to skewed, curved, radiuses plans

I-Joist

APA Form D710

APA Form Z725

Roof Truss Configurations
Pre-fabricated Roof Trusses

Roof Trusses
Max span approx. 75'
Max scissor truss span approx. 70'

Roof Trusses - Rules of Thumb

- 2x4 chords up to a 45’ span
- 2x6 chords up to 65’ span
- Max. top panel length
  - 8’ for 2x4
  - 12’ for 2x6
- Max. bottom chord panel length
  - 12’ for 2x4
  - 14’ for 2x6
- 2x3 min. web size
- 2x4 min. web size for all trusses spaced > 24” o.c.
- Max. cantilever is ¼ of the total span
- No girder heels less than 3.5”

Truss Connectors

Grade 40 Steel Characteristics:

- Yield Point 40,000psi
- Tensile Strength 55,000psi
- Allowable Tensile Stress 24,000psi
- Allowable Shear Stress 16,000psi

http://www.mii.com/unitedstates/
Parallel Chord Roof and Floor Trusses

**OPEN WEB PLATE CONNECTED TRUSSES**

---

Plated Floor Truss Spans

- Spans up to 30’ may be applicable for commercial construction.

---

Floor Trusses - Rules of Thumb

- Estimate of depth – 1” for every foot of span.
- Maximum span to depth ratio of 20
- Max. cantilever is ¼ of the total span
- Max. cantilever without a concentrated load at the end is 4 times the depth of the truss
- Max. cantilever with concentrated load at the end of the cantilever is 2 times the depth of the truss.
**Representative Floor Truss Tables**

**Wood Truss Council of America (WTCA)**

www.sbcindustry.com

**OPEN WEB PIN CONNECTED TRUSS**

- Spans 50’ floor and 120’ roof
- Spacing 24” floor, 32” or 48” roof
- Depths 16” to 76”

**RULES OF THUMB:**

- Deeper depths are more cost effective and allow for greater chase-way through trusses
- Requires 6-8 week lead times for complicated jobs and less for simple jobs
- More expensive than I-Joist but carries more load for longer spans.
- Does not work well with skewed or radius areas.
- Difficult to repair is field damaged.
- Available in custom shapes such as tapers, pitched, radiuses, etc.

**Wood Framing Members**

- Structural Panels
- Repetitive Framing
- Beams/Girders
- Studs
Solid Sawn Timber – Beams

Beams
Readily available West Coast
- 4x, 6x, or 8x and greater
- 24x24 up to 32’ long is available
  - Special order
  - 30-90 days lead time
- Spans approx. 16’ (check local supplier for longer)
- 2nd and 3rd generation trees
- East Coast 4x 4, 4x 6 possibly 4x8

Special order
- 30-90 days lead time
- Spans approx. 16’ (check local supplier for longer)
- 2nd and 3rd generation trees
- East Coast 4x 4, 4x 6 possibly 4x8

4x lumber
5x and greater are considered “Timbers”

Solid Sawn – Headers

- Wall Headers
- 2x8 wall allows for wider solid sawn beams

3-1/2” 5-1/2” 7”

Governing Codes for Engineered Wood Design

- 2005 NDS (National Design Specification for Wood Construction)

Solid Sawn Lumber Beams

- Lumber Design Suite available for sawn lumber.
- Free Download www.wwpa.org
**Standardization**

- Two classes by species groups
  - I – DF-L & SYP
  - II – HF & SPF
- SPF Canada
- SPF is not included in Timber sizes (5x5 and larger)

**Structural Composite Lumber**

- PSL
- LSL
- LVL
- OSL

**Features & Applications**

**Structural Composite Lumber (SCL):**
- The wood grain of veneers or strands is primarily oriented in the same direction.
- Strong when either face- or edge-loaded.
- Milled (sawn) to consistent sizes.
- Virtually free from warping and splitting.

**Strength Properties**
- APA publishes strength properties for its members on a proprietary basis.
Laminated Veneer Lumber (LVL):
- Produced by bonding thin veneers together
- Used for beams, headers, rafters & scaffold planking

Common Thicknesses:
- 3/4" to 3-1/2"

 Depths:
- 5-1/2" – 20"

The grain of all veneers is parallel to the long direction.

Parallel Strand Lumber (PSL):
- Manufactured from veneers clipped into long strands in a parallel formation and bonded together
- Strand length-to-thickness ratio is around 300
- Used for headers and beam as well as columns.
PSL BEAM

**Stock Widths**
- 3-1/2”
- 5-1/4”
- 7”

**Stock Depths:**
- 9-1/2”
- 11-7/8”
- 14”
- 16”
- 18”

- Camber for beams > 20’ as specified by engineer.
- Lengths up to 60’ (for up to 66’ check w/local manufacturer.

<table>
<thead>
<tr>
<th>Stock Widths</th>
<th>Standard Widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2”</td>
<td>3-1/2”</td>
</tr>
<tr>
<td>5-1/4”</td>
<td>5-1/4”</td>
</tr>
<tr>
<td>7”</td>
<td>7”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock Depths (in 2” increments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2” width: 20” through 28”</td>
</tr>
<tr>
<td>5-1/4” width: 20” through 42”</td>
</tr>
<tr>
<td>7” width: 20” through 54”</td>
</tr>
</tbody>
</table>

SCL Product Basics

**Laminated Strand Lumber (LSL):**
- Similar to PSL.
- Flaked strand length-to-thickness ratio is around 150
- Used for a variety of applications from studs to millwork components and Rim Board

Oriented Strand Lumber (OSL):
- Similar to LSL.
- Flaked strand length-to-thickness ratio is around 75
- Used for a variety of applications from studs to millwork components

LSL BEAM

**Stock Widths**
- 1-3/4”
- 3-1/2”

**Stock Depths:**
- 9-1/4”
- 9-1/2”
- 11-1/4”
- 11-7/8”
- 14”
- 16”

- Camber for beams > 20’ as specified by engineer.
- Lengths up to 60’ (for up to 66’ check w/local manufacturer.

<table>
<thead>
<tr>
<th>Stock Widths</th>
<th>Standard Widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2”</td>
<td>3-1/2”</td>
</tr>
<tr>
<td>5-1/4”</td>
<td>5-1/4”</td>
</tr>
<tr>
<td>7”</td>
<td>7”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stock Depths (in 2” increments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1/2” width: 20” through 28”</td>
</tr>
<tr>
<td>5-1/4” width: 20” through 42”</td>
</tr>
<tr>
<td>7” width: 20” through 54”</td>
</tr>
</tbody>
</table>

SCL Product Basics

Oriented Strand Lumber (OSL):
- Similar to LSL.
- Flaked strand length-to-thickness ratio is around 75
- Used for a variety of applications from studs to millwork components
Glulam: • Wood laminations bonded together • Wood grain runs parallel to the length

Typical Widths: • 2-1/2" to 10-3/4"
Laminations: 1-3/8" for Southern Pine 1-1/2" for Douglas Fir

Appearance Classifications:
- Framing (-L) (3-1/2", 5-1/2")
- Industrial (-L)
- Architectural
- Premium (verify local availability)

Note: Appearance classifications do not affect design values.
Stock Beam

Camber

3500 Ft. r Western
2000 Ft. r Southern

Zero Camber

Camber

L = Span (ft)

TOP

Δ = Camber (in)

Radius of Curvature (ft)

3500 Ft. Radius = Western
Camber = 1.5 Δ_{DL} Dry Use

2000 Ft. Radius = Southern
Camber = 2.0 Δ_{DL} Wet Use

Engineered Lay-ups

Compression zone
Inner zone
Tension zone

Critical Tension Zone

Glulam Manufacturing

Unbalanced Engineered Layups
Simple Spans
No. 2D No. 2
No. 2 No. 2
No. 3 TL

Balanced
Continuous Spans or Cantilevered
No. 1 No. 2
No. 3 TL

TL=Tension Lamination
Glulam Manufacturing

Engineered Layups

Simple Span – Unbalanced Layup

Cantilever or Continuous Span

Fire Resistant

Glulam Steel

Performance of Wood vs. Steel

Comparative Strength Loss of Wood versus Steel

Results from fire sponsored by National Forest Products Association at the Southeastern Institute
### Specification

#### Challenges

- **50** Glulam Bending Stress combinations tabulated in the 2005 NDS
- **51** Glulam Axial Load combinations in the 2005 NDS

#### Specification Solution

- Simplified Table of 7 stress class combinations in the 2005 NDS

### NDS Stress Classes

<table>
<thead>
<tr>
<th>Stress Class</th>
<th>Fb</th>
<th>MOE</th>
<th>Fv</th>
</tr>
</thead>
<tbody>
<tr>
<td>16F-1.3E</td>
<td>1600</td>
<td>1,300,000</td>
<td>195</td>
</tr>
<tr>
<td>20F-1.5E</td>
<td>2000</td>
<td>1,500,000</td>
<td>210</td>
</tr>
<tr>
<td>24F-1.7E</td>
<td>2400</td>
<td>1,700,000</td>
<td>210</td>
</tr>
<tr>
<td>24F-1.8E</td>
<td>2400</td>
<td>1,800,000</td>
<td>265</td>
</tr>
<tr>
<td>26F-1.9E</td>
<td>2600</td>
<td>1,900,000</td>
<td>265</td>
</tr>
<tr>
<td>28F-2.1E</td>
<td>2800</td>
<td>2,100,000</td>
<td>300</td>
</tr>
<tr>
<td>30F-2.1E</td>
<td>3000</td>
<td>2,100,000</td>
<td>300</td>
</tr>
</tbody>
</table>

### Use of a Glulam Stress Class

<table>
<thead>
<tr>
<th>Stress Class</th>
<th>Western Species</th>
<th>Southern Pine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unbalanced</td>
<td>Balanced</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### FiRP Glulams

#### Fiber Reinforced Glulam Beams

- **PFC – 5100** (formerly)
- **ESR - 1905**
**Innovation:**

**Glulam with LVL Tension Lamination**

- **LVL Tension Lam**
  - Full length - no finger joints
  - Greater tensile strength = 3000 psi

---

**Naturally Durable Wood**

**Alternative to Preservative Treatment:**

**Decay Resistant Wood:**
- Redwood
- Cedars
- Black locust

**Termite Resistant Wood:**
- Redwood
- Eastern cedar

**Natural Decay Resistant Glulam:**
- Alaska Yellow Cedar
- Western Red Cedar
- Port Orford Cedar

---

**Wood Framing Members**

| Structural Panels | Repetitive Framing | Beams/Girders | Studs |

- **For walls over 10’ prescriptive tables not applicable. Engineering is required.**
- **2x4, 3x4, 2x6 & 2x8**
- **When wall framing exceeds 20’ in height special orders may be required.**
- **Rule of thumb – NDS has slenderness requirement for studs (l/d<50).**
- **For a load bearing 2x4 L < 14’-7” ALWAYS**
Stud Walls

- Options for Tall Walls
  - Sawn can be planed and shimmed
  - Kiln dried framing lumber
  - Engineered wood – Laminated strand lumber (LSL), Oriented Strand Lumber (OSL), etc.
  - Finger Jointed Sawn Lumber

Finger Jointed Sawn Lumber

- 2303.1.1 Sawn lumber - Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade.
- Note HRA for 1 hr walls

Finger Jointed Sawn Lumber

- WWPA
- http://www2.wwpa.org/Portals/9/docs/PDF/F-F-HRA.pdf

LSL Tested Fire Assembly
Solid Sawn – Tall Walls

- For wind only loading using Table 3.20A of the 2001 Wood Frame Construction Manual
  - Often 2x6 are required
  - Table does not account for combined bending & axial loads

<table>
<thead>
<tr>
<th></th>
<th>2&quot;</th>
<th>3&quot;</th>
<th>4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas Fir-Larch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>#8</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>#12</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

2x6 DFL #2 @24” o.c. = 19'-9" for 90mph

Exp. B

Innovations: Cross Laminated Timber

Source: FPInnovations

Glulam versus CLT

Source: FPInnovations

Some Advantages of CLT Panels

- Cross lamination minimizes swelling and shrinkage in the board plane
- Good load-bearing capacity - In-plane & out-of-plane
- Two way action capability as concrete slab

Source: FPInnovations

Innovations: Cross Laminated Timber

Stradthaus-Murray Grove Tower, London
- Waugh Thistleton Architects
- 8 over 1 - 29 apartments
- Stores 186 tonnes of carbon
- 5 people on site, worked only 3 days/week
- Completed 49 weeks.
What’s a metric tonne?

- 1 metric tonne = 1.10231131 tons = 2205 lbs.
- One metric ton of CO₂ is released to the atmosphere for every 103 gallons of gasoline used. Using a car that gets 25 miles to the gallon, that’s just a bit more than 2,500 miles—about two months of driving for many Americans.
- About 12 metric tons of CO₂ are released to the atmosphere each year as a result of the energy consumed by the average American home for heating, cooling, cooking, electricity use, and other energy needs. Using up 40 barbeque propane canisters is the equivalent of releasing a ton of carbon dioxide into the atmosphere.

Bridport House, London Borough
- 41 Units
- 8 stories
Applications

- Offices
- Schools
- Assisted Living
- Retail
- Hospitality
- Recreation
- Ecclesiastic
- Multi-family

Wood Schools

- VanderMolen Elementary School
- Corona, CA

Wood Schools

- 28” Open Web Wood Joist
- Tall Walls in Assembly Area

Hospitality Moves to Wood

Hotel Construction - early 1990's
Traditionally Concrete and Masonry
5-Story Wood (Type III A)
Fire retardant wood exterior walls

Blue Ridge Destination Center

Glenwood Apt., Atlanta, GA
5 over 1
Davis & Church LLC, S.E.

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

1st Sustainable Animal Shelter, Canada
Winnipeg Humane Society
Number Ten Architectural Group
LEED Gold

Credit Valley Hospital and Carlo Fidani Peel Regional Cancer Centre, Mississauga ON
Farrow Partnership Architects, Toronto, ON
640,000 square feet
375 unit healthcare facility

Thunder Bay Regional Health Sciences Centre, Thunder Bay, ON
Salter Farrow Pilon Architects, Toronto, Ontario (Farrow Partnership Architects Inc., Salter Pilon Architects Inc., Successors
Disney Ice

Frank O. Gehry & Assoc., Architect
John A. Martin & Assoc. S.E.

Disney Ice Arena

Arched Glulams
- 24F-V5, 8-3/4” x 50-7/8” section
- 75-foot radius
- 22 feet on center, 116 foot spans
- Moment splices used to allow for transportation

Dining Hall & Admin. Bldg.

Moshe Safdie & Associates, Boston Architects
Safdie-Rapine Architects, S.D.
Nabih Youssef & Associates, Structural Engineers

Eleanor Roosevelt College, UCSD
- Steel round cantilever columns.

Approximately 3 stories high above grade 1 story below grade.

Plywood over tongue and groove decking.
Dormitories

Airport

Raleigh-Durham International Airport

- Fentress Architects
  - Denver, CO
  - Washington, DC
- Stewart Engineering, Inc.
  - Raleigh, NC
- Archer Western Contractors
  - Raleigh, NC
Raleigh-Durham International Airport

Ontario Art Gallery
- Art Gallery of Ontario (AGO), Toronto, Canada
- Architect: Gehry Partners, LLP
- Structural Engineer: Halcrow Yolles Engineering, Inc

Toronto Ontario Art Gallery
Richmond Olympic Oval

WoodWave Panel
2x4 pine spruce pine fir (SPF)
4’ w x 26”d
41 ft long

CANNON Design
Gerald Epp, Fast + Epp
Richmond (south of Vancouver)
The Cathedral of Christ the Light
Recap

**Featured:**
- Solid Sawn
- Wood Structural Panels
- SIPS
- I-Joists
- Trusses
- Engineered Beams
- Studs

**Why choose wood?**
- Project Cost
- Lead Times
- Aesthetics
- Sustainability
Recap - Applications

- Offices
- Schools
- Assisted Living
- Retail
- Hospitality
- Recreation
- Ecclesiastic

Free Downloadable Resources

- American Wood Council
  www.awc.org
- APA – The Engineered Wood
  www.apawood.org
- Western Wood Products Association
  www.wwpa.org
- Wood Truss Council of American
  www.sbcindustry.com
- The Wood Products Council - WoodWorks
  www.woodworks.org

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.

Project Assistance & Resources:

- Conceptual Design Phase Services:
  - Height & Area Code Study
  - Structural System Selection
  - Code Interpretation
- Working Design Phase Services:
  - New Products and Systems Update
  - Structural Analysis and Design
  - Green Building
  - Best Practices
- Construction Phase Services:
  - Wood Product Sourcing
  - Industry Feedback
  www.woodworks.org
Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

Michelle Kam-Biron, S.E.
805.498.4864
michelle@woodworks.org
www.woodworks.org