Course Description

This presentation takes an in-depth look at fire-retardant treated wood (FRTW) focusing on: FRTW characteristics, properties and performance in a fire; preparation, treatment, inspection and labeling; fire tests, standards and building code requirements; how and where FRTW is used; and the impact of FRTW on construction and insurance costs.
Learning Objectives

At the end of this program, participants will be able to:

1. Why wood is the natural choice
2. Understanding what is fire-retardant treated wood (FRTW)
3. Uses in building construction
4. Benefits of constructing with FRTW
5. How to identify FRTW

FIRE RETARDANT TREATED WOOD

Jim Gogolski
• Hoover Treated Wood Products, Marketing Representative
• Member: International Codes Council and National Fire Protection Association
The sun provides energy to combine carbon dioxide gas (from the air) with water (from the soil.) 

\[ \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{glucose (sugar)} \]

Glucose units link in long chains to form cellulose – the primary component of wood fibers.

**INTRODUCTION**

**KEY WORDS**
- Fire Retardant Treated
- Pressure Treated
- Flame Spread
- Smoke Developed
- E84 Extended Test
- Sustainable Design
- Carbon Sequestration
- Renewable Resource

**PROGRAM**
- INTRODUCTION
- BUILDING CODE ACCEPTANCE
- RESEARCH
- INSURANCE RECOGNITION
- RECOMMENDATIONS

**HOW DO TREES PRODUCE WOOD?**
COMPARISON OF FORESTS

WHY USE WOOD?
- PROPERTIES
  - Physical
  - Mechanical
  - Chemical
  - Burns
  - Renewable
  - Carbon Storage
  - Easy to convert
  - Cultural and aesthetic
- COST
  - Of delivered raw material
  - To convert to end use
  - In dollars, energy, social acceptance, other
- AVAILABILITY
  - When and where needed
  - Quantity and quality

SUSTAINABLE FORESTRY CARBON CYCLE

Comparative Energy Consumed
Wood Vs. Steel-framed Interior Wall (GJ)

<table>
<thead>
<tr>
<th></th>
<th>WOOD STUD</th>
<th>STEEL STUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WALL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extraction</td>
<td>.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2.1</td>
<td>9.7</td>
</tr>
<tr>
<td>Construction</td>
<td>.6</td>
<td>.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3.4</td>
<td>11.5</td>
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</table>
## Wood Homes Have a Smaller Carbon Footprint

<table>
<thead>
<tr>
<th></th>
<th>Wood</th>
<th>Steel</th>
<th>Difference</th>
<th>% Change</th>
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</thead>
<tbody>
<tr>
<td><strong>Minneapolis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Embodied Energy (GJ)</td>
<td>651</td>
<td>764</td>
<td>113</td>
<td>17</td>
</tr>
<tr>
<td>Carbon Footprint (CO₂ kg)</td>
<td>37,047</td>
<td>46,826</td>
<td>9,779</td>
<td>26</td>
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<tr>
<td><strong>Atlanta</strong></td>
<td></td>
<td></td>
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<tr>
<td>Embodied Energy (GJ)</td>
<td>398</td>
<td>461</td>
<td>63</td>
<td>16</td>
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<tr>
<td>Carbon Footprint (CO₂ kg)</td>
<td>21,367</td>
<td>28,004</td>
<td>6,637</td>
<td>31</td>
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</table>

The energy difference would be many time more significant when comparing only those materials substituted.
THE TREATING PROCESS

Step 1: Dry wood is loaded into cylinder

Step 2: Initial vacuum pulls out air

Step 3: Liquid fire retardants fill cylinder

Step 4: Pressure forces liquid into wood

Step 5: Remaining liquid emptied for later use

Step 6: Final vacuum removes excess liquid

THE TREATING PLANT
AVAILABLE TREATMENTS

INTERIOR
HIGH TEMPERATURE

EXTERIOR
DEMONSTRATION OF FRTW CHARACTERISTICS

PROPERTIES OF FRTW

- oxygen
- combustion products
- heat
- inert gas source
- heat sink
- char stability
- low heat of combustion
- char blowing agent
- N/P synergy
- carbon layer
- combustible gas
- diesel fuel

PYRO-GUARD
HEAVY TIMBER vs. STEEL

TESTING
FLAME SPREAD

- E84
  - extended for 20 additional minutes
- UL 723
  - extended for 20 additional minutes
FLAMESPREAD CLASSIFICATION/TIME

Based on ASTM E-84 Tunnel

ASTM E84

There is more to FRTW

Pressure Impregnated

4 minutes
Fire Tube ASTM E69

3 minutes
Crib Test ASTM E160
withdrawn 1993
Coated Products

Paint

Cementitious

Coated Product

4 minutes
Fire Tube ASTM E69

3 minutes
Crib Test ASTM E160
withdrawn 1993

Crib Test Results

Fire Tube Test Results

Final Results

CHARACTERISTICS
- Flame spread 25 or less
- Self extinguishing

*Does not spread fire!*
BUILDING CODE ACCEPTANCE

- Choice of building material
- Uses of FRTW
- Testing
- Code Requirements
  - Third Party Inspection
  - Labeling
RECOGNIZED BY CODE

- Used in lieu of noncombustible materials
- Substituted for hourly ratings

(Section 704.2, combustible Projections; Section 1406.3, Balconies and similar projections)

TECH NOTE REFERENCE

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<thead>
<tr>
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<tr>
<td>Architectural trim, exterior.</td>
<td>1406.2.2</td>
<td>1406.2.2</td>
<td>37.2.1</td>
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<tr>
<td>Awnings &amp; canopies.</td>
<td>3105.3</td>
<td>3105.3</td>
<td>32.4.2.1#3</td>
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<td>Balconies and similar appendages.</td>
<td>1406.3</td>
<td>1406.3</td>
<td>37.2.2.2</td>
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<td>Bay and oriel windows.</td>
<td>1406.4</td>
<td>1406.4</td>
<td>37.2.2.1</td>
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<td>Children playground structures in malls</td>
<td>402.11.1</td>
<td>402.12.1</td>
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<td>Exterior bearing and nonbearing walls in Type III construction.</td>
<td>602.3</td>
<td>602.3</td>
<td>7.2.4.2.1</td>
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<td>Exterior bearing and nonbearing walls in heavy timber constr.</td>
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<td>7.2.5.6.7</td>
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<td>Exterior nonbearing walls in Type I and Type II construction.</td>
<td>603.1</td>
<td>603.1</td>
<td>7.2.3.212.1</td>
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<td>Fuel dispensing station (marine and motor vehicle).</td>
<td>406.5.3</td>
<td>406.5.3</td>
<td>32.4.5.2</td>
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<td>Kiosks in covered mall buildings.</td>
<td>402.10#1.1</td>
<td>402.11#1.1</td>
<td>27.4.4.12.1</td>
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<td>Interior finish with flame spread index ≤ 25 (Class A material).</td>
<td>803.1.1</td>
<td>803.1.1</td>
<td>10.3.2.1</td>
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<td>Townhouses: exterior and common wall when using FRTW roof sheathing within 4 ft. of such walls.</td>
<td>R310.2.2</td>
<td>R302.2.2</td>
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<td>Partitions (2hr. or less) in Type I and Type II construction.</td>
<td>603.1</td>
<td>603.1</td>
<td>7.2.3.211.2</td>
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<td>Roof construction in Type I and Type II building.</td>
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<td>603.1</td>
<td>7.2.3.2.5.2</td>
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<td>Shakes and shingles Class A, B, and C roofs.</td>
<td>71505.1</td>
<td>71505.1</td>
<td>38.3.2</td>
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<tr>
<td>Walls and ceilings turned and dropped more than 1 ½ inch.</td>
<td>803.4.2</td>
<td>803.11.2</td>
<td></td>
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</tbody>
</table>

USES OF FRTW
CONNECTED BUILDINGS

Pedestrian Walkways:
Roof Construction-FRTW

➢ At grade level
➢ Above grade level

ELIMINATE PARAPETS

➢ Townhouses
➢ Exterior Walls
➢ Fire Walls

EXTERIOR BEARING WALLS
Type IIA | Type IIIB | Type VA | Type VB
--- | --- | --- | ---
R-1 & R-2 | 4 | 4 | 3 | 2
No sprinklers | 24,000 | 16,000 | 12,000 | 7,000
Stories Area/floor | 100% increase | 128% increase | 128% increase | 128% increase
Sprinklers Stories Area/floor | 5 | 5 | 4 | 3
100% increase | 32,000 | 24,000 | 36% increase | 28% increase
Business No sprinklers Stories Area/floor | 5 | 4 | 3 | 2
57,000 | 19,000 | 18,000 | 9,000
58% increase | 28,000 | 111% increase | 111% increase | 111% increase
Sprinklers Stories Area/floor | 6 | 5 | 4 | 3
57,000 | 28,000 | 36,000 | 18,000
58% increase | 28% increase | 111% increase | 111% increase | 111% increase
RESIDENTIAL (R1 or R2)
With fire sprinklers

BUSINESS
No Sprinkler

BALCONIES

PLATFORMS
**END USE**

- Interior High Temperature
- Exterior

**TESTING - INTERIOR**

- ASTM D 5664 – Lumber = 150° F
- ASTM D 5516 – Plywood = 170° F
- Humidity = minimum of 50% (used 65%)
TESTING - EXTERIOR

- EXPOSED TO
  - The weather
  - Wet or damp locations
  - Meets ASTM D2898
- NOT A PRESERVATIVE TREATMENT

INTERIOR
LOW HYGROSCOPIC, HIGH TEMPERATURE

| PYRO-GUARD®  |
| HOOVER       |
| TREATED WOOD PRODUCTS INC. |
| (PLANT LOCATION) |

| TREATED PLYWOOD |
| 17PO R7003 |

| SPECIES |
| SURFACE BURNING CHARACTERISTICS |
| FLAMESpread |
| SMOKE Development |

| UNDERWRITERS LABORATORIES INC. |
| CLASSIFIED TREATED LUMBER |
| 15P9 R7002 |

| EXTERIOR FIRE-X® |
| HOOVER TREATED WOOD PRODUCTS INC. |
| PINE BLUFF, AR |
| PROCESS CONTROL STANDARD 2200 E |
| MONITORED BY TP KDAT |

| 30 MINUTE TEST |
| ++NO INCREASE IN THE LISTED |
| CLASSIFICATION WHEN SUBJECTED TO |
| THE STANDARD RAIN TEST |
THIRD PARTY INSPECTION

- CHEMICAL PURCHASES
- MIXING PROCESS
- TREATING PROCESS
- DRYING RECORDS
- APPLICATION OF LABELS

HOW IS A LABEL / LISTING MAINTAINED?

Witnesses mixing and accompanying paperwork
No Quality Control Agency (Underwriters Lab) 
Self Certified

No reference to testing for 30 minutes using the E84. E84 is a 10 minute test.

What is the species of wood?
RESEARCH
EFFECTS OF TREATMENT
EFFECTS OF TEMPERATURE

PYRO-GUARD TEST RESULTS

- LUMBER
- PLYWOOD

### DESIGN VALUE ADJUSTMENTS FOR PYRO-GUARD TREATED LUMBER

<table>
<thead>
<tr>
<th>Property</th>
<th>Service Temperature To 100°F/38°C</th>
<th>Pyro-Guard Roof Framing, Climate Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SP</td>
<td>DF</td>
</tr>
<tr>
<td>Extreme fiber in bending</td>
<td>0.91</td>
<td>0.97</td>
</tr>
<tr>
<td>Tension parallel to grain</td>
<td>0.88</td>
<td>0.95</td>
</tr>
<tr>
<td>Compression parallel to grain</td>
<td>0.94</td>
<td>1.00</td>
</tr>
<tr>
<td>Horizontal shear</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Compression perp. to grain</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td>Fasteners/ connectors</td>
<td>0.90</td>
<td>0.90</td>
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</table>

### MAXIMUM LOADS AND SPANS FOR PYRO-GUARD TREATED PLYWOOD

<table>
<thead>
<tr>
<th>Plywood thickness (inches)</th>
<th>Untreated roof/subfloor Span Rating</th>
<th>Roof Sheathing Maximum Live Load, (psf)</th>
<th>Wall &amp; Subfloor Span (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1A</td>
<td>1B</td>
<td>2</td>
</tr>
<tr>
<td>15/32, 1/2</td>
<td>32/16</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>19/32, 5/8</td>
<td>40/20</td>
<td>24</td>
<td>42</td>
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<td>23/32, 3/4</td>
<td>48/24</td>
<td>32</td>
<td>20</td>
</tr>
<tr>
<td>7/8</td>
<td>-</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>1-1/8</td>
<td>-</td>
<td>48</td>
<td>21</td>
</tr>
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</table>
The ISO gives buildings constructed with FRTW the same fire insurance rating as non-combustible buildings.
RECOMMENDATIONS

- VENTILATION
- USES
- SPECIFICATIONS

STORAGE

PROTECT FROM THE WEATHER AND STANDING WATER

VENTILATION
USES
- Where ever untreated wood can be used
- Uses contained in building codes as substitute for noncombustible material or fire resistance rating

SPECIFICATION

OTHER CODES RECOGNIZING FRTW

SUMMARY
- CHARACTERISTICS
  - Minimal flame spread
  - Minimal smoke developed
  - Reduced heat release rate
  - Self extinguishing
  - No progressive combustion
AVAILABLE TREATMENTS

ADVANTAGES

- PRESSURE IMPREGNATED
- THIRD PARTY QUALITY CONTROL
- SPECIES SPECIFIC TESTING
- REDUCED INSURANCE RATES
- READILY AVAILABLE

DISTANCE LEARNING

www.LearnAboutFRTW.com

1 Hour Credit

Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

Jim Gogolski
Hoover Treated Wood Products
jgogolski@frtw.com
www.frtw.com