Meeting Fire Codes with OSB

Learning Objectives

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

1. Identify the components and list the physical attributes of fire-rated cementitious coated OSB (FRCC OSB) sheathing
2. Explain how FRCC OSB sheathing can be used to meet code requirements
3. Discuss building design and code requirements, and approval and testing standards, relevant to FRCC OSB sheathing
4. Demonstrate common construction applications relevant to FRCC OSB sheathing
Fire Facts

The National Fire Protection Association (NFPA, www.nfpa.org) Fire Analysis and Research Division reports that in 2008:

- 78% of all structure fires occurred in residential properties
- A fire occurs in a structure every 61 seconds
- $12.4 billion damage occurred in structure fires

What Is Oriented Strand Board (OSB) Sheathing?

- Made by blending rectangular wood strands with thermosetting, water-resistant adhesives and wax
- Engineered panel is strong, uniform, dense and workable
- Used for sub-floor, wall and roof applications
- Exposure 1 Classification

What Is FRCC OSB Sheathing?

- Panels consist of a proprietary, non-combustible, fiberglass-reinforced, cementitious coating that is bonded to one or both sides of a sheet of OSB
- Coating is a layer of non-combustible magnesium oxide cement and chemically bound water
Installation Considerations

- Installs with standard fasteners
- Gapping between panels is the same as that used for OSB and plywood
- Joints do not require fire caulk
- Handling and safety requirements are the same as those for other structural panels

FRCC OSB: Panel Dimensions & Panel Weight

- 7/16", 15/32", 19/32", and 23/32" OSB performance categories in 4' x 8', 4' x 9' and 4' x 10' lengths
- Struct-1 grade is available
- Coating adds approximately 0.6 lbs per square foot to a board
  - panel treated on one side = 66lbs
  - panel treated on both sides = 85lbs
  - 4' x 8' x 5/8" gypsum board (80 lbs) plus a 4' x 8', 15/32 wood sheathing panel = over 120lbs

Structural Performance

- Fiberglass reinforcement increases strength, bending stiffness, shear capacity, and impact resistance of the panels
- Coating causes no initial or long-term loss of structural performance, nor does it increase water absorption
- Structural design values are the same as those for wood structural panels in the same thickness category
Code Compliance

- Requirements for fire-resistant construction are specified in IBC, IRC, and state and local building and safety codes
- ICC-ES considers the performance requirements of products in construction applications and establishes test criteria
- ICC-ES publishes ESRs
- Test procedures are regulated by ASTM, UL etc.
- Code compliance of FRCC OSB is described in an ESR that may be found on the ICC-ES web site.

Fire Ratings - Referenced & Required by IBC

Fire resistance
- Ability of a material or an assembly of materials to resist burn-through and, in load-bearing assemblies, to support a given load for a specified time period under standardized fire conditions

Flame spread
- A measure of the speed of travel of flame on the surface of a given product or material under a standard set of conditions

Flame Spread Testing

- “Tunnel Test”
- ASTM E84, or UL 723
- Flame Spread Ratings (Standard 10-Minute Test)
  - Class A, or 1
  - Class B or 2
  - Class C or 3
- Burn-through resistance is not measured
- Smoke development is measured

FRCC OSB Flame Spread Rating

- Flame spread index of 0 to 10 in the 10-minute test
- Flame progression of well under 10.5 feet when the test is extended for 30 minutes
- Satisfies the requirements for smoke development
- Panels carry a stamp indicating that it satisfies the performance requirements of Section 2303.2 of the IBC
- ESR reports specify the code-compliant applications and code officials who have the authority to permit FRCC OSB in various applications
Burn-Through Resistance

- ASTM E119 test (Standard Test Methods for Fire Tests of Building Construction and Material) is used to determine a fire resistance rating for wall and floor/ceiling assemblies.

ASTM E119 Time-Temperature Curve

<table>
<thead>
<tr>
<th>TIME (HOURS)</th>
<th>TEMPERATURE, °F</th>
<th>TEMPERATURE, °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
<td>93</td>
</tr>
<tr>
<td>1</td>
<td>300</td>
<td>149</td>
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<td>7</td>
<td>900</td>
<td>482</td>
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<tr>
<td>8</td>
<td>1200</td>
<td>649</td>
</tr>
</tbody>
</table>

Construction Types (per IBC Table 503)

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>FRTW or FRCC OSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I (fire-resistive)</td>
<td>Mainly non-structural*</td>
</tr>
<tr>
<td>Type II (non-combustible)</td>
<td>Roof deck, non-structural*</td>
</tr>
<tr>
<td>Type III (ordinary)</td>
<td>Throughout*</td>
</tr>
<tr>
<td>Type IV (heavy timber)</td>
<td>Throughout</td>
</tr>
<tr>
<td>Type V (wood frame)</td>
<td></td>
</tr>
</tbody>
</table>

*FRCC OSB must be treated on both faces of panel
Vertical Continuity of Fire Walls

- Most common application for FRCC OSB is in roof decking on either side of a fire wall in Type V construction
- Used to satisfy IBC requirements for vertical continuity of fire walls (IBC Section 706.6.)

Multi-Family Roof Deck Construction

Fire wall with the adjacent trusses and Class A-rated roof deck

- Gypsum underlayment or FRT panels

Vertical Continuity of Fire Walls in Roof Decks

- FRCC OSB, treated on one side, is code-compliant and meets vertical continuity requirements with a single panel solution, with full load and span ratings and an Exposure 1 Classification

Summary: FRCC OSB in Roof Decks

Why consider FRCC OSB in roof decks?
- Superior weather resistance
- Less labor required than gypsum option
- Panels lie flat, with no delaminations
- 7/16 thickness category available

Condominium project, Southern California
Exterior Rated Walls in the IBC

What Is the Fire Separation Distance (FSD)?

- FSD is the distance measured from the building face to one of the following:
  1. The closest interior lot line
  2. The centerline of a street, an alley or public way
  3. An imaginary line between two buildings on the property

- Distance shall be measured at right angles from the face of the wall

Exterior Rated Assemblies

Example: Common 1-Hour Exterior Wall

- Load-bearing assembly with 5/8" Type X GWB on each side
- Rated for 1-hour from both sides
Example: 1-Hour Wall Assembly with FRCC OSB

- 5/8" Type X GWB on interior side
- 2"x6" framing
- 5.5" mineral wool insulation
- FRCC OSB against studs with cementitious side facing exterior
- Weather-resistant building wrap
- Wood, fiber cement, steel, or stucco as exterior wall covering
- 2145 pounds per stud
- Intertek listing

Advantages: 1-Hour Exterior Walls with FRCC OSB

- Labor savings
- Reduced dead load
- Reduced wall thickness
- Better substrate for fastening of exterior cladding

2-Hour Party Wall Assembly with FRCC OSB

Two configurations:
- A – FRCC OSB and Type X GWB on living space side of wall
- B – FRCC OSB on the air gap side of the studs, and resilient channel behind Type X GWB on one of the living space sides

Exterior Walls Type III A: 2-Hour

- 2 layers of Type X GWB on the interior, wood framing, a shear panel layer if needed, then 1 or 2 layers of exterior GWB and a non-combustible exterior wall covering

<table>
<thead>
<tr>
<th>TABLE 601</th>
<th>FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING ELEMENT</td>
<td>TYPE I</td>
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<tr>
<td>Bearing walls</td>
<td>A</td>
</tr>
<tr>
<td>Exterior</td>
<td>3</td>
</tr>
</tbody>
</table>
ASTM E119 2-Hour Wall Assembly Test

- Two layers of 5/8" Type X GWB, FRT wood studs, fiberglass insulation, and FRT plywood exterior sheathing

2-Hour Exterior Wall Assemblies with FRCC OSB

UL Listings
- BXUV.U349
- BXUV.W408

- 2 layers of Type X GWB on interior side
- 1 layer of FRCC OSB on exterior side of studs
- FRCC OSB must be treated on both sides

Code-Compliance in Type III Exterior Walls

- Code Compliance of FRCC OSB in bearing and non-bearing exterior walls of Type III buildings, in accordance with IBC Section 602.3, is described in Section 4.2c of ESR-1365

Advantages of Using FRCC OSB in Type III Construction

- Labor savings
- Reduced dead load
- Reduced wall thickness
- Better substrate for fastening of exterior cladding
FRCC OSB in Type I and Type II Buildings

- IBC Section 603.1. describes areas where combustible materials are allowed in Type I and Type II buildings

FRT wood is permitted in:
- 25.1: Non-bearing partition walls rated 2-hours or less
- 25.2: Non-bearing exterior walls where no fire rating is required
- 25.3: Roof construction, including girders, trusses, framing, and decking (Except in most IA buildings above 2 stories)

Wildfire Zones

- California Building Code (CBC) requires that building materials and products used in the Wildland Urban Interface (WUI) zones meet certain ignition resistance and fire standards
- Recognizes FRCC OSB sheathing as an approved component of certain wall assemblies meeting the requirements of the California 12-7A-1 fire test for exterior walls

Additional Applications

- Return ducts and plenums
- Commercial roof decks
- SIPs

California 12-7A-1 Wall Test
WUI Zones

- Senior housing
- Under-eave construction
- Closed soffit construction

FRCC OSB sheathing consists of a sheet of OSB with a non-combustible, fiberglass-reinforced magnesium oxide coating.

- Designed to resist ignition, inhibit the spread of flames and slow the rate of heat transfer through the panel
- Applications: a component of fire-resistance-rated wall assemblies, roof decking (to satisfy vertical continuity of fire wall requirements), a component of assemblies meeting California WUI fire hazard zone requirements, roof decks in Type II construction, SIP panels, and applications requiring a 15-minute thermal barrier

Code-compliant or fire-rated materials must pass tests which measure strength and stiffness, bond durability and water resistance, flame spread, and fire resistance.

Questions?

This concludes The American Institute of Architects Continuing Education Systems Course.

Robert Palardy
LP Building Products
Bob.palardy@lpcorp.com