

## Meeting Fire Codes with OSB



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## > 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

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## Meeting Fire Codes with OSB

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Course Number: LPFRS11  
Learning Units: 1.0 LU/HSW Hour

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## Fire Facts

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The National Fire Protection Association (NFPA, [www.nfpa.org](http://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?

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- 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?

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- 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



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## 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



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## 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

**FIGURE 1. RECOMMENDED UNIFORM ROOF LIVE LOADS FOR LP FLAMEBLOCK FIRE-RATED SHEATHING<sup>(C)</sup> AND RATED SUBFLOOR WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS<sup>(D)</sup>**

Panel Span Rating	Performance Category <sup>(E)</sup>	Maximum Span (in.)		Allowable Live Loads (psf) <sup>(B)</sup>							
		With Edge Support (a)	Without Edge Support	Spacing of Supports Center-to-Center (in.)							
Rated Sheathing <sup>(C)</sup>				12	16	20	24	32	40	48	60
24/16	7/16	24	24	190	100	65	40				
32/16	15/32, 1/2	32	28	325	180	120	94	30			
40/20	19/32, 5/8	40	32	-	205	135	101	68	30		
48/24	23/32, 3/4	48	36	-	-	280	175	95	45	35	

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## Structural Performance

**FIGURE 2. ALLOWABLE SHEAR (POUNDS PER FOOT) FOR PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS-FIR, LARCH, OR SOUTHERN PINE<sup>(A)</sup> OR WIND OR SEISMIC LOADING<sup>(B)(C)(D)</sup> (See also 2006 IBC Table 2306.4.1)**

Panel Grade	Performance Category <sup>(E)</sup>	Minimum Nail Penetration in Framing (in.)	Nail Size (Common or Galvanized Box)	Panels Applied Direct to Framing			
				Nail Spacing at Panel Edge (in.)			
				6	4	3	2 <sup>(E)</sup>
Structural 1 Grades	7/16	1-3/8	8d	255	395	505	670 <sup>(C)</sup>
	15/32			280	430	550	730
	15/32			1-1/2	10d	340	510
Rated Sheathing	7/16	1-3/8	8d	240	350	450	585 <sup>(C)</sup>
	15/32			260	380	490	640
	15/32			1-1/2	10d	310	460
	5/8			340	510	665 <sup>(E)</sup>	870

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## Code Compliance

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- 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.

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## Fire Ratings - Referenced & Required by IBC

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### 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



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## Flame Spread Testing

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- “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



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## FRCC OSB Flame Spread Rating

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- 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

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## 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.



Wall Test Furnace

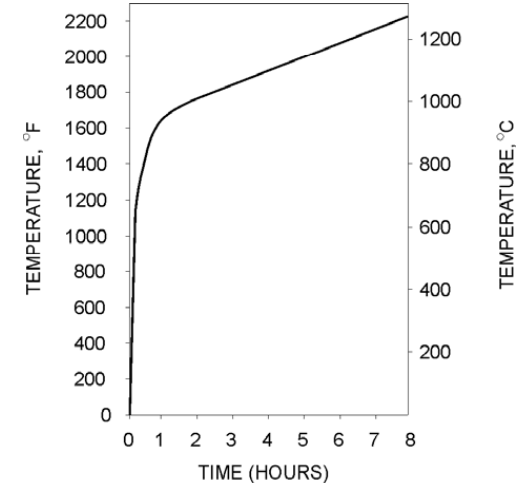


Wall Assembly Test

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## ASTM E119 Time-Temperature Curve



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## ASTM E119 Wall Assembly Test



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## Construction Types (per IBC Table 503)

### Type of Construction

- Type I (fire-resistive)
- Type II (non-combustible)
- Type III (ordinary)
- Type IV (heavy timber)
- Type V (wood frame)

### FRTW or FRCC OSB

- Mainly non-structural\*
- Roof deck, non-structural\*
- Throughout\*
- Throughout

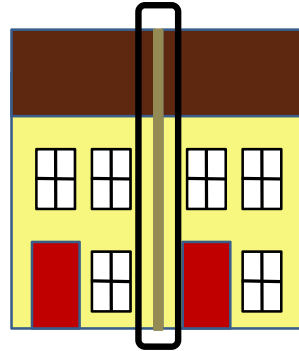
\*FRCC OSB must be treated on both faces of panel

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## 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.)

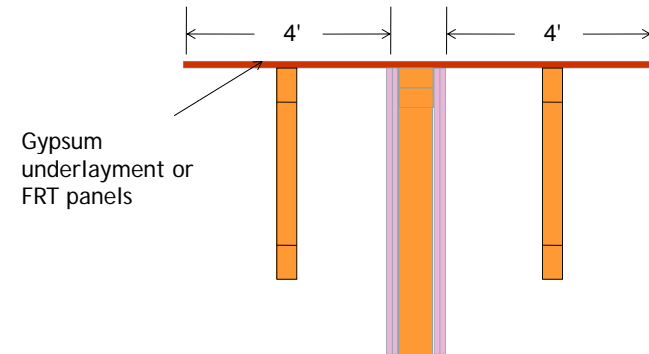


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## Multi-Family Roof Deck Construction

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



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## 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



Condominium project, Southern California

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## Summary: FRCC OSB in Roof Decks

Why consider FRCC OSB in roof decks?

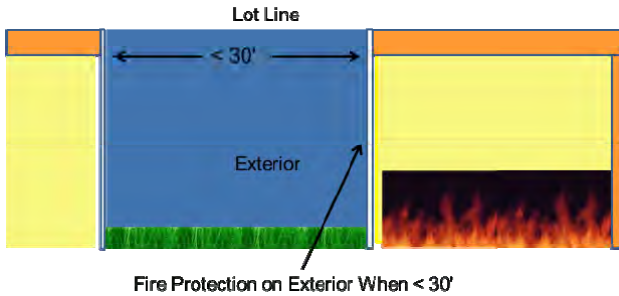
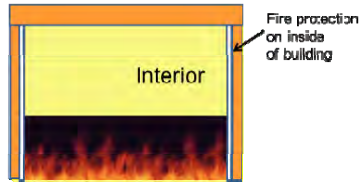
- Superior weather resistance
- Less labor required than gypsum option
- Panels lie flat, with no delaminations
- 7/16 thickness category available



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## Exterior Rated Walls in the IBC



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## What Is the Fire Separation Distance (FSD)?

- FSD is the distance measured from the building face to one of the following:
  - The closest interior lot line
  - The centerline of a street, an alley or public way
  - An imaginary line between two buildings on the property
- Distance shall be measured at right angles from the face of the wall

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## Exterior Rated Assemblies

**TABLE 602**  
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE, *a*

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H	OCCUPANCY GROUP F, I, M, S-1	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U <sup>b</sup>
$X < 5'$	All	3	2	1
$5 \leq X < 10$	IA	3	2	1
	Others	2	1	1
$10 \leq X \leq 30$	IA, IB	2	1	1 <sup>d</sup>
	IIA, IIB	1	0	0
	Others	1	1	1 <sup>d</sup>
$X > 30$	All	0	0	0

For 91:1 foot = 304.8 mm.

*a.* Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

*b.* For special repair permits for Group U occupancies see Section 406.1.2.

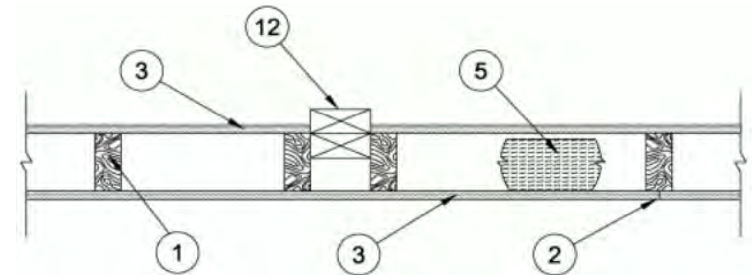
*c.* See Section 705.1.1 for party walls.

*d.* Open parking garages complying with Section 405 shall not be required to have a fire-resistance rating.

*e.* The fire-resistance rating of an exterior wall is determined based upon the fire-separation distance of the exterior wall and the story in which the wall is located.

## 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



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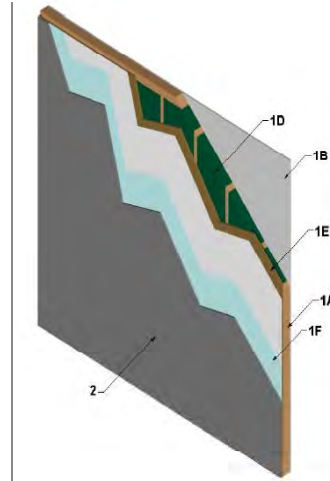
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## Example: 1-Hour Wall Assembly with FRCC OSB

- 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



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## Advantages: 1-Hour Exterior Walls with FRCC OSB

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



1-Hour Wall Along Property Line



1-Hour Walls – Multi-Family Project

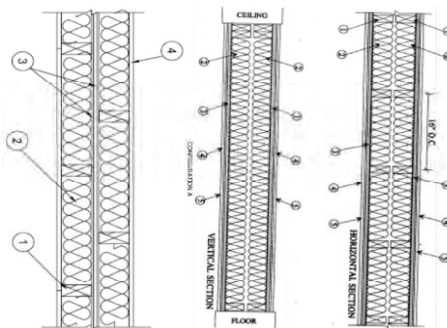
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## 2-Hour Party Wall Assembly with FRCC OSB

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



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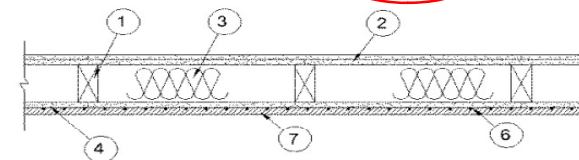
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## Exterior Walls Type III A: 2-Hour

- 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 601  
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A <sup>c</sup>	B	A <sup>c</sup>	B	HT	A <sup>c</sup>	B
Bearing walls									
Exterior <sup>d</sup>	3	2	1	0	2	2	2	1	0



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## 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



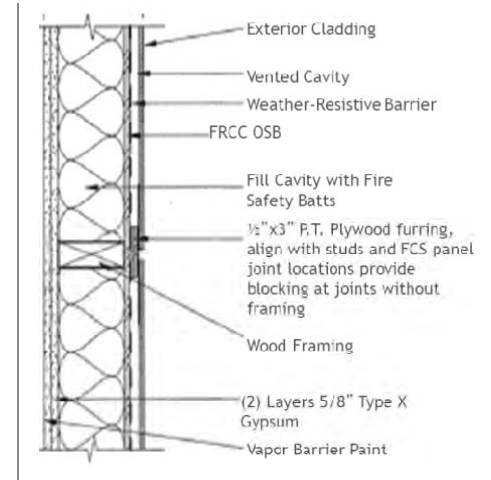
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## 2-Hour Exterior Wall Assemblies with FRCC OSB

### 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



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## 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



2-hour rated wall assembly with FRCC OSB in Type III construction  
(Student housing, College Park, MD)

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## Advantages of Using FRCC OSB in Type III Construction

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



Fairfax, VA

Issaquah, WA

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## FRCC OSB in Type I and Type II Buildings

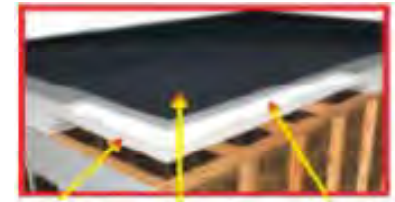
- IBC Section 603.1. describes areas where combustible materials are allowed in Type I and Type II buildings

FRT wood is permitted in:

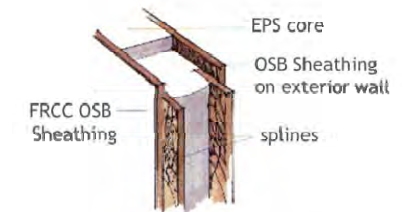
- 25.1: Non-bearing partition walls rated 2-hours or less
- 25.2: Non-bearing exterior walls where no fire rating is required
- 25.3: Roof construction, including girders, trusses, framing, and decking (Except in most IA buildings above 2 stories)

## Additional Applications

- Return ducts and plenums
- Commercial roof decks
- SIPs



FRCC OSB EPDM EPDM



## 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

## California 12-7A-1 Wall Test



## WUI Zones

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



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## Course Summary

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- 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

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## > Questions?

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