

2010 Code Change Training

The Oregon Energy Efficiency Specialty Code
Module 2 - Building Envelope

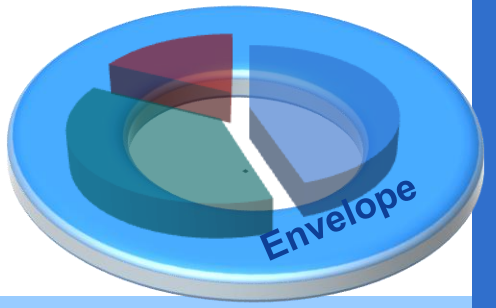
State of Oregon
Building Codes Division

State of Oregon
Building Codes Division

Agenda

- 1. Building Envelope-Commercial

2. Bldg Env-Commercial/Residential



State of Oregon
Building Codes Division

Building Envelope-Commercial

Three questions that you should have answers to at the end of this presentation:

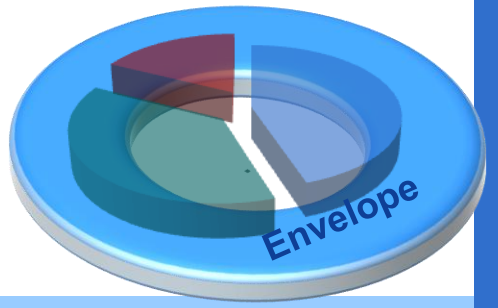
- Will alum. framed windows be required to have thermal-break frames, or what are options?
- What is the prescriptive, max window/wall ratio allowed?
- What changed for steel-framed walls?

Building Envelope-Commercial

General Building Envelope Requirements

While there are two different Climate Zones in Oregon, the building envelope requirements are identical in both zones:

- Climate Zone 4C (Marine)–Climate Zone 1 in previous codes
- Climate Zone 5B (Dry)–Climate Zone 2 in previous codes



State of Oregon
Building Codes Division

Building Envelope-Commercial

Methods of Compliance

Compliance with code can be simple by following Prescriptive

- Prescriptive……Simple
- Simplified Trade-off Approach (STA)..Analysis
- Whole Building Approach (WBA)…..Very Detailed Analysis

State of Oregon
Building Codes Division

Building Envelope-Commercial

One of the most critical compliance areas is the window-to-wall ratio allowed

- ***New Code***:
  30% ratio for entire state
- ***Previous Codes***:
  Many various window percentages – based on Climate Zone, and type of wall and window construction.

柔絲蜜市辦公室
OFFICE BUILDING ROSEMEAD

State of Oregon
Building Codes Division

Building Envelope-Commercial

How To Comply With Prescriptive?

either a component "insulation only" *R*-value or the "Assembly" *U*-factor:

- Table 502.2(1) contains the prescriptive "insulation only" R-value requirements
- Table 502.1.2 contains the prescriptive "Assembly" U-factor requirements

State of Oregon
Building Codes Division

Table 502.1.2

Component	Climate Zone 5 and Marine 4	
	Residential	Non-residential
ROOFS		
Insulation entirely above deck	U-0.048	U-0.048
Metal buildings	U-0.055	U-0.055
Attic and other	U-0.027	U-0.027
Walls, Above Grade		
Metal Building	U-0.069	U-0.069
Metal Framed	U-0.064	U-0.064
Wood framed and other	U-0.064	U-0.051

State of Oregon
Building Codes Division

Table 502.2(1)

Component	Climate Zone 5 and Marine 4	
	Residential	Non-residential
Roofs		
Insulation entirely above deck	R-20 ci	R-20 ci
Metal buildings (with R-5 thermal blocks[a,b])	R-19	R-13 + R-13
Attic and other	R-38	R-38
Walls, Above Grade		
Mass	R-13.3 ci	R-11.4 ci
Metal Building[b]	R-13 + R-5.6 ci	R-13 + R-5.6 ci
Metal Framed	R-13 + R-5.6 ci	R-13 + R-5.6 ci
Wood framed and other	R-13 + R-3.8 ci	R-13 + R-3.8 ci

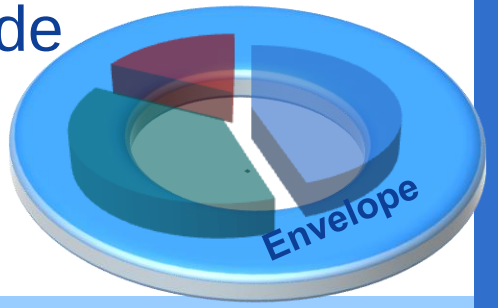
State of Oregon
Building Codes Division

Building Envelope-Commercial

Applicable Occupancies

All occupancy group R-1 buildings (regardless of # of stories) are classified as *Commercial Buildings*

- ***Commercial Buildings*** – Chapter 5
- ***Commercial Buildings - Residential, >3 stories in height*** – Chapter 5, some requirements are different than Commercial above
- ***Residential Buildings, 3 & less in height*** – Chapter 4, same as OR Residential Specialty Code requirements



Building Envelope-Commercial

Glazed Fenestration *U*-Factor (overall)

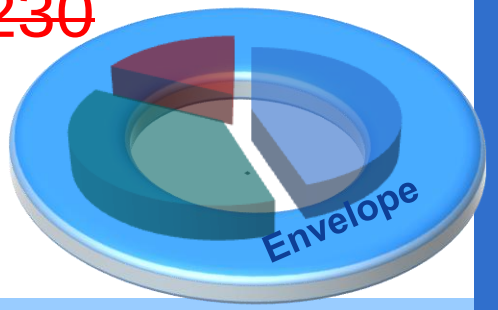
Requirements from Table 502.3

- Metal Frame-

Curtainwall & Storefront	U-0.45 ~~0.54~~
Fixed, Operable & Others	U-0.46
Glazed Entrance Door	U-0.80

- Wood/Vinyl Frame – All U-0.35
- Skylights – All U-0.60 ~~1.230~~

*Max area allowed (% of roof) 3% ~~6%~~

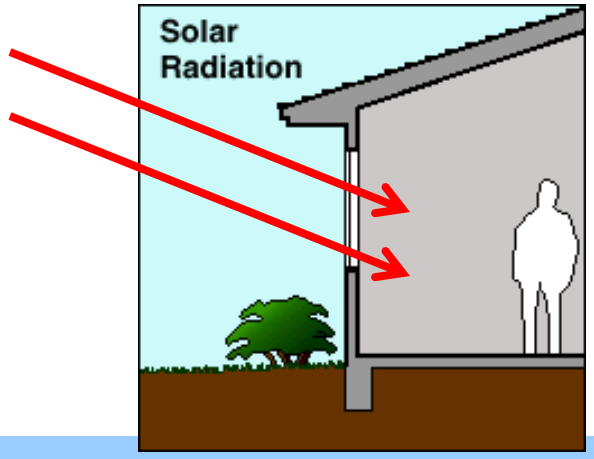


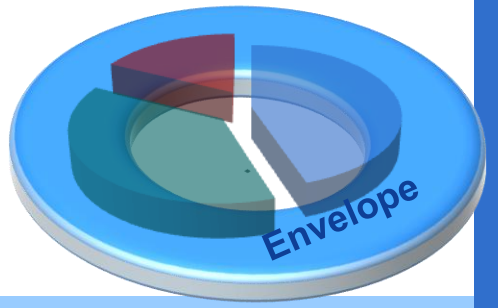
Building Envelope-Commercial

Glazed Fenestration SHGC (overall)

New code SHGC is an "*overall*" value (includes effects of framing and edge seal). Requirement for all windows & skylights are the same and are from Table 502.3.

- Windows – All SHGC 0.40 ~~.57 Shading Coefficient~~
- Skylights – All SHGC 0.40 ~~.47~~

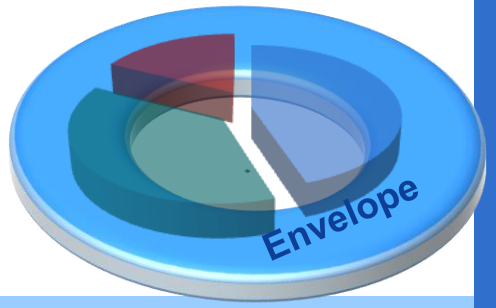




Examples of complying windows:

- Aluminum with thermally broken frame: Double glazing, ½ inch space, air filled, *e*=0.20 (.45)
- Aluminum w/o thermally broken frame: Double glazing, ½ inch spaced, argon filled, *e*=0.10 (.44)
- Wood/Vinyl: Double glazing, ½ inch spaced, air filled (.43) ¼ inch space, argon filled (.46), *e*=0.40

Examples from ASHRAE Handbook Chapter 15, Table 4



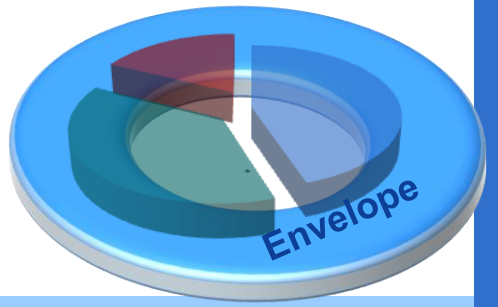
State of Oregon
Building Codes Division

Building Envelope-Commercial

Above-Grade Walls

- Requirements are from Table 502.2(1), assembly “insulation” R-value

- Metal Framing R-13+R-5.6 c.i.
- Wood Framing R-13+R-3.6 c.i.
- Metal Bldg (Butler) R-13+R-5.6 c.i.



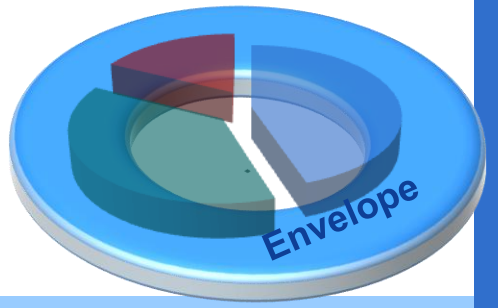
State of Oregon
Building Codes Division

Building Envelope-Commercial

Roof/Ceiling Assemblies

Requirements are from Table 502.2(1), assembly “insulation” R-value.

	New
Metal Bldg (Butler)	R-13+R-13+R-5 t.b.
Roof Deck-Underside	R-38 (batt)
Roof Deck-Exterior	R-20 c.i.
Attic or Ceiling Joist	R-38



State of Oregon
Building Codes Division

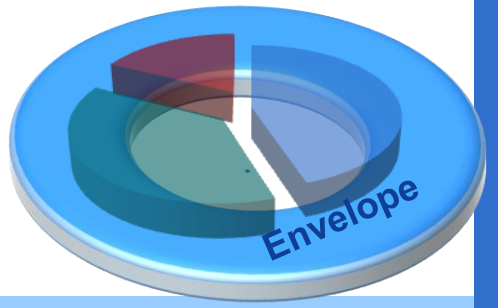
Building Envelope-Commercial

Floor Assemblies

(over unconditioned spaces)

- Floor assemblies include parking garages, crawlspaces, cantilevered floors, etc.

	New
Steel/Wood, Joist/Framing	R-30 (batt)
Mass (concrete)	R-10 c.i.

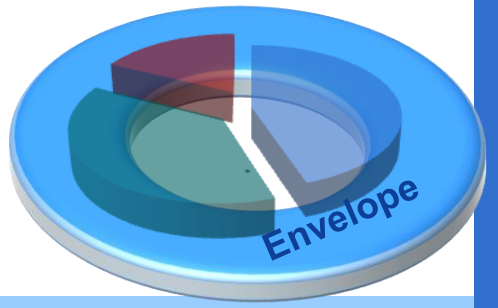


Building Envelope-Commercial

Slabs On-Grade Floors

Heated slabs contain hydronic or ducts.

	New
▪ Non-heated Slab	Not Required
▪ Heated Slab	R-15



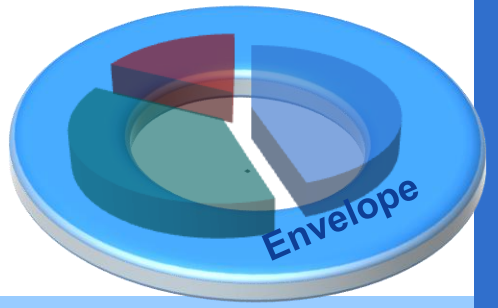
State of Oregon
Building Codes Division

Building Envelope-Commercial

Opaque Doors

	New
▪ Swinging (Hinged)	U-0.70[A]
▪ Overhead/Sliding	U-0.50 (overall U-)
▪ Coiling Roll-up	U-0.50 (overall U-)

[A] ASHRAE 90.1-07 states an uninsulated double-layer door = U-0.70

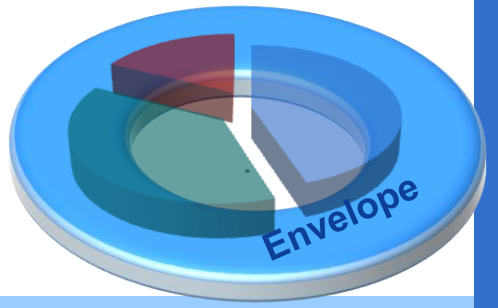


Building Envelope-Commercial

Below-Grade Walls

	New
▪ Interior	R-7.5 c.i.[A]
▪ Exterior	R-7.5 c.i.

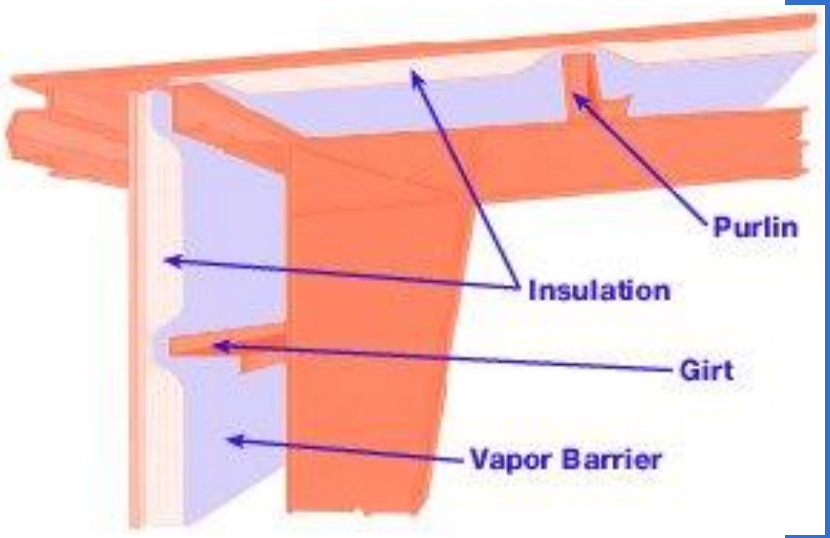
[A] Equivalent interior/furred-out assembly: metal 2x4framing w/R-13 batt + R-2 continuous rigid insulation; or wood 2x4 framing w/R-11 batt.



State of Oregon
Building Codes Division

What is continuous?

continuous insulation (c.i.): insulation that is continuous across all structural members without *thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building envelope.* *{ASHRAE Standard 90.1-2004}*



Building Envelope-Commercial

Vestibules

The interior & exterior doors in a vestibule must open on their own, not with a simultaneous device that opens both interior and exterior doors at the same time.

State of Oregon
Building Codes Division

Vestibules - Exceptions

Exceptions:

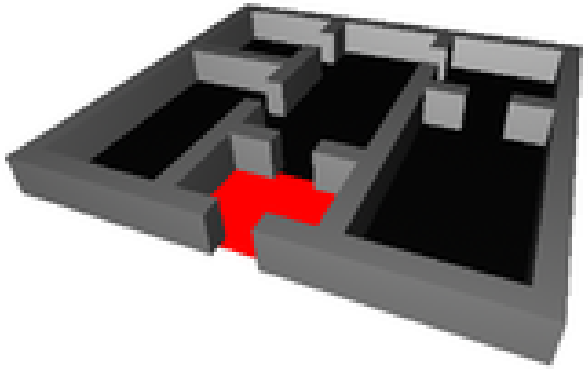
Doors that open directly from a space <3,000 sq ft in area.

Doors not intended to be used as a building "entrance door."

Doors for a dwelling unit or sleeping unit.

Revolving Doors

Doors used to facilitate vehicular movement or material handling and adjacent personnel doors.

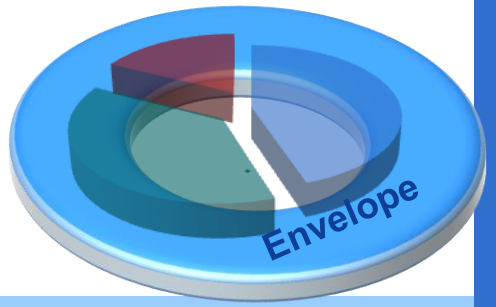


State of Oregon
Building Codes Division

Building Envelope-Commercial

Answers:

- **Most aluminum frame site-built windows will need a thermally broken frame to meet *U* 0.46 (NFRC Rated at o.46 is ok)**
- **Max window/wall ratio is 30%.**
- **Metal framed walls now require C.I.**



Building Envelope-Commercial/Residential

Commercial/Residential Buildings

Commercial/Residential Buildings include ***all*** occupancy group R-1 and all other group R occupancies that are **four or more stories** in height.

Insulation R-value requirements for previous code were identical to commercial buildings. The following slides only depict where there is a ***difference*** for commercial/residential over commercial. So – if requirement is not stated in following, it's same as commercial

See Residential Buildings for group R occupancies (except R-1) that are 3 stories and less in height.

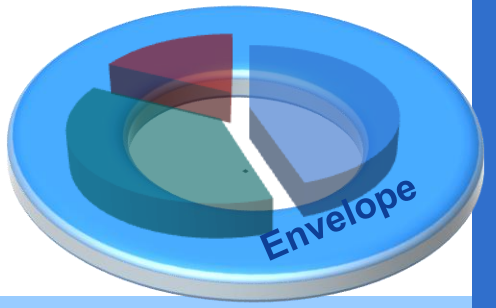
Building Envelope-Commercial/Residential

Roof/Ceiling Assemblies

Insulation R-value requirements for previous code were identical in all climate zones.

- Metal Bldg (Butler) R-19 (batt)[A]

[A] FYI – the commercial requirement is R-13+R-13+R-5 thermal block.

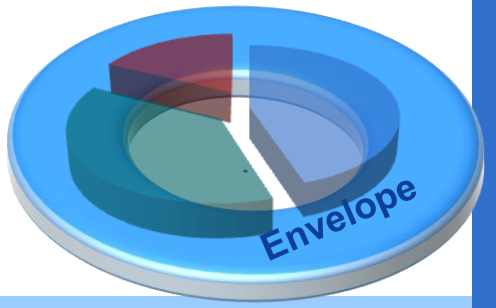


Building Envelope-Commercial/Residential

Floor Assemblies (over unconditioned spaces)

- Mass (concrete) R-12.5 c.i.[A]

[A] c.i. = continuous insulation. This could also be spray-applied insulation.

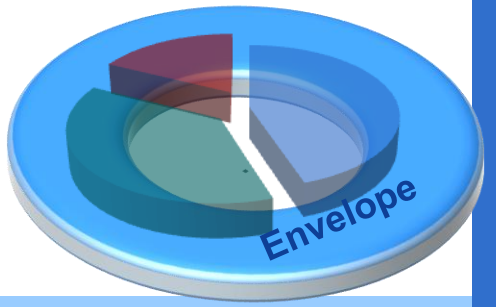


Building Envelope-Commercial/Residential

Slab On-Grade Floors

Heated slabs contain hydronic or ducts.

- Non-heated Slab R-10 (slab edge)



State of Oregon
Building Codes Division

QUESTIONS?