COMcheck Fundamentals

Presented by :

Michael Shuell
Building Code & Regulations Committee

AIA Detroit

"AIA Detroit" is a Registered Provider with The American Institute of Architects Continuing Education Systems (AIA/CES). Credit(s) earned on completion of this program will be reported to AIA/CES for AIA members. Certificates of Completion for both AIA members and non-AIA members will be emailed to attendees after the presentation; please allow a couple weeks. This program is registered with AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Learning Objectives

Course Description

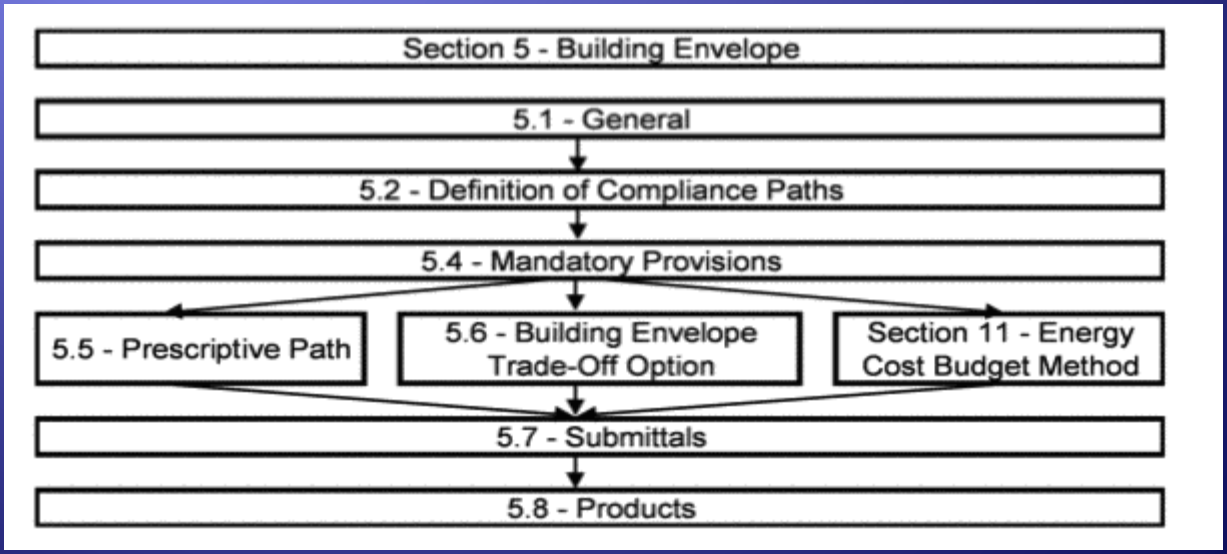
During the design and planning process Architects must make many decisions regarding elements of a building's exterior envelope. The quantity, location, and type of insulation, glazing, and other openings have a powerful effect on the thermal performance of buildings. This course will cover the "basics" of COMcheck software and how to use the program to make educated exterior envelope material selections to maximize building energy efficiency.

- Review the different compliance paths and methods that apply to the building thermal envelope of commercial buildings.
- Understand how to use COMcheck software to analyze the relative performance of various building elements and as how they affect the energy efficiency of the overall building.
- Understand how COMcheck reports are used by building officials to ensure that buildings are constructed as intended by the Architect.
- Discuss how to improve the performance of particularly difficult building designs.

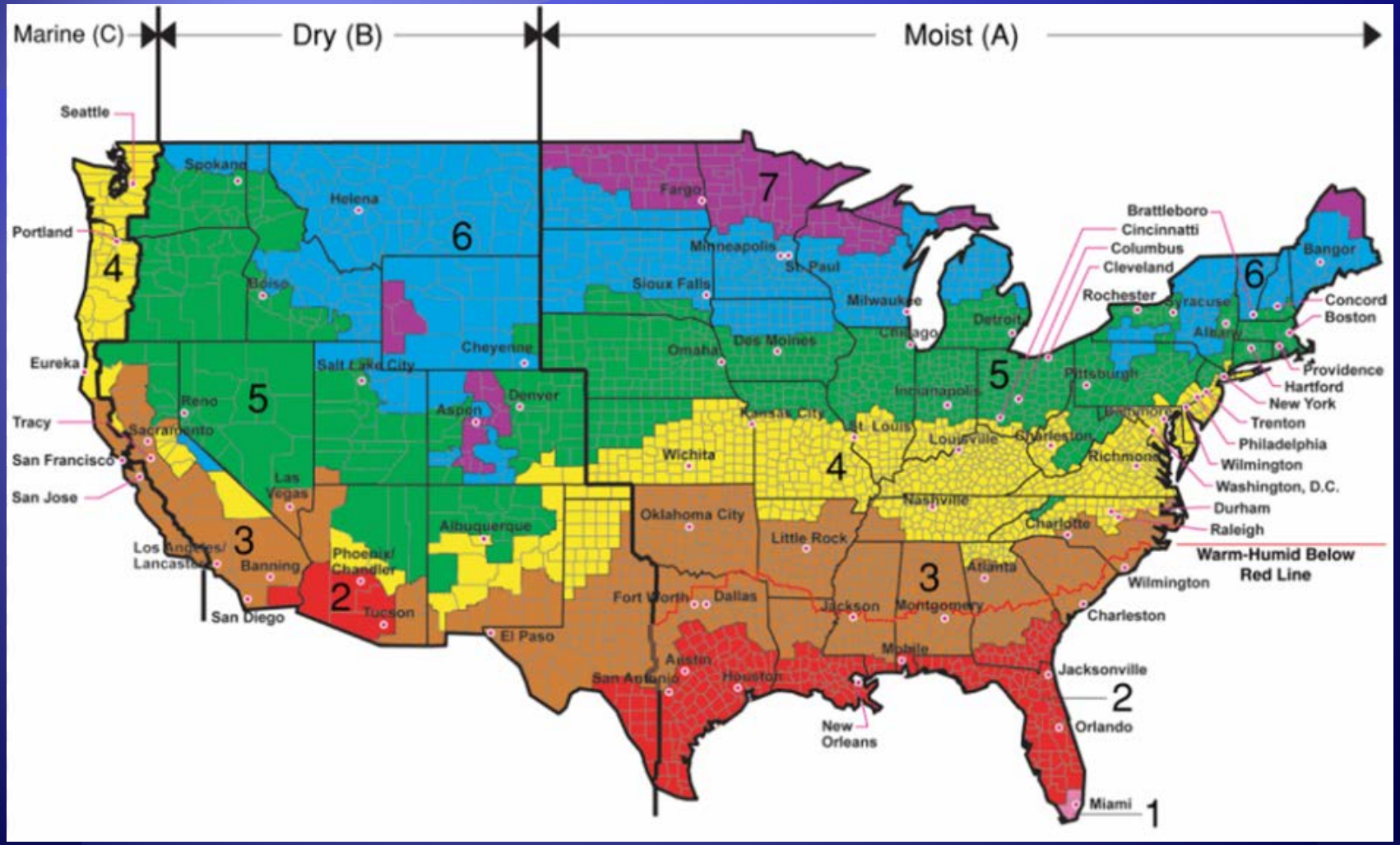
Why COMcheck?

- 2015 Michigan Energy Code Chapter 4 (Commercial Buildings) references ASHRAE 90.1 (2013)

- There are three methods to verify compliance with the energy code
  - Chapter 5.5 Prescriptive building envelope option.
  - Building Envelope Trade-off
  - Section 11 – Energy Cost Budget Method



ASHRAE 90.1 Climate Zone Map



Prescriptive Method

Table 5.5-5 Building Envelope Requirements for Climate Zone 5 (A,B,C)*

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
Roofs						
Insulation Entirely above Deck	U-0.032	R-30 c.i.	U-0.032	R-30 c.i.	U-0.063	R-15 c.i.
Metal Building[a]	U-0.037	R-19 + R-11 Ls or R-25 + R-8 Ls	U-0.037	R-19 + R-11 Ls or R-25 + R-8 Ls	U-0.082	R-19
Attic and Other	U-0.021	R-49	U-0.021	R-49	U-0.034	R-30
Walls, above Grade						
Mass	U-0.090	R-11.4 c.i.	U-0.080	R-13.3 c.i.	U-0.151[b]	R-5.7 c.i.[b]
Metal Building	U-0.050	R-0 + R-19 c.i.	U-0.050	R-0 + R-19 c.i.	U-0.094	R-0 + R-9.8 c.i.
Steel Framed	U-0.055	R-13 + R-10 c.i.	U-0.055	R-13 + R-10 c.i.	U-0.084	R-13+R-3.8 c.i.
Wood Framed and Other	U-0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.	U-0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.	U-0.089	R-13
Wall, below Grade						
Below Grade Wall	C-0.119	R-7.5 c.i.	C-0.092	R-10 c.i.	C-1.140	NR
Floors						
Mass	U-0.057	R-14.6 c.i.	U-0.051	R-16.7 c.i.	U-0.107	R-6.3 c.i.
Steel Joist	U-0.038	R-30	U-0.038	R-30	U-0.052	R-19
Wood Framed and Other	U-0.033	R-30	U-0.033	R-30	U-0.051	R-19

Prescriptive Method

Table 5.5-5 Building Envelope Requirements for Climate Zone 5 (A,B,C)*

Opaque Elements	Nonresidential Assembly Maximum	Nonresidential Insulation Min. R-Value	Residential Assembly Maximum	Residential Insulation Min. R-Value	Semiheated Assembly Maximum	Semiheated Insulation Min. R-Value
Opaque Doors						
Swinging	U-0.500		U-0.500		U-0.700	
Nonswinging	U-0.500		U-0.500		U-1.450	

Fenestration	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/SHGC
Vertical Fenestration, 0%–40% of Wall		(for all frame types)			(for all frame types)			(for all frame types)	
Nonmetal framing, all	U-0.32			U-0.32			U-0.45		
Metal framing, fixed	U-0.42			U-0.42			U-0.62		
Metal framing, operable	U-0.50	SHGC-0.40	1.10	U-0.50	SHGC-0.40	1.10	U-0.70	NR	NR
Metal framing, entrance door	U-0.77			U-0.68			U-0.77		
Skylight, 0%–3% of Roof									
All types	U-0.50	SHGC-0.40	NR	U-0.50	SHGC-0.40	NR	U-0.98	NR	NR

Section 11 – Energy Cost Budget Method (ECB)

- Similar to COMcheck but allows for more intense modelling of mechanical systems.
- Input includes purchased energy rates
  - electricity, gas, oil, propane, etc.
- Programs include:
  - ASHRAE-90.1 ECB
  - DOE-2
  - BLAST

Chapter 5.6 Building Envelope Trade-Off Method (COMcheck)

- 5.6.1 The building envelope complies with the standard if:
  - a. The proposed building satisfies the provisions of sections 5.1, 5.4, and 5.8 and
  - b. The envelope performance factor of the proposed building is less than or equal to the envelope performance factor of the budget building.

Section 5.1 Highlights

- Any alteration to an existing building element should comply with chapter 5 requirements. With exceptions for:
  - Storm Windows
  - Replacement glazing
  - Alterations to existing roof, wall, and floor cavities.
  - Re-roofing
  - Door replacement
  - Replacement of less than 25% of existing fenestration

Section 5.4 Mandatory Provisions

- A continuous air barrier is required and shall be clearly ***identified and detailed*** on the construction documents.
- Refer to 5.4.3.1.3 for a list of acceptable air barrier materials and assemblies (13 options)
- Refer to 5.4.3.2. for maximum air leakage requirements for doors and windows.
- Cargo doors and Loading dock doors required to have weather seals.

Section 5.4 Mandatory Provisions Continued

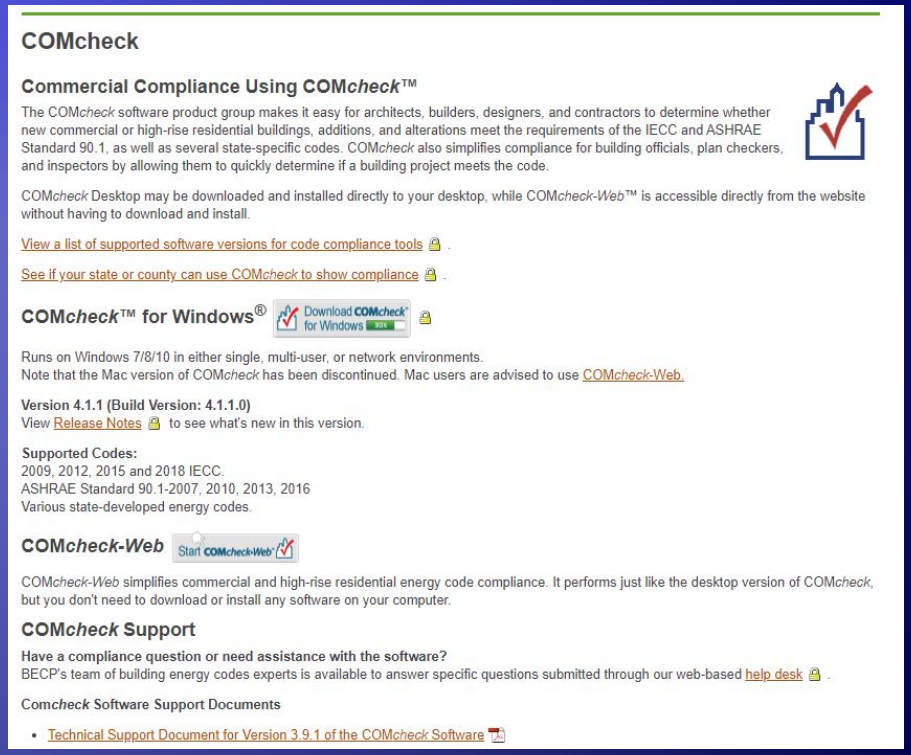
- 5.4.3.4 Vestibules are required ***unless***:
  - A revolving door is provided.
  - Doors not intended to be used a building entrance.
  - Doors opening directly into a dwelling unit.
  - Building entrances in zone 1 or 2.
  - Building entrances in zone 3, less than 4 stories above grade and less than 10,000 sq. ft. in gross conditioned area.
  - Buildings entrances in Zones 4, 5, 6, 7, or 8 and less than 1,000 sq. ft. in area.
  - Doors that open directly into a space that is less than 3,000 sq. ft.

Section 5.4 Mandatory Provisions Continued

- 5.4.3.5
  - When vestibules are required and
  - the gross conditioned floor area is 40,000 sq. ft. or greater and
  - automatic, electrically driven closing devices are provided,
  - the minimum distance between doors shall be 16 ft.

Where to get it?

- Search "comcheck" or go to energycodes.gov/comcheck
- Desktop and online versions are available.
- Software is updated frequently



COMcheck

Commercial Compliance Using COM*check*™

The COM*check* software product group makes it easy for architects, builders, designers, and contractors to determine whether new commercial or high-rise residential buildings, additions, and alterations meet the requirements of the IECC and ASHRAE Standard 90.1, as well as several state-specific codes. COM*check* also simplifies compliance for building officials, plan checkers, and inspectors by allowing them to quickly determine if a building project meets the code.

COM*check* Desktop may be downloaded and installed directly to your desktop, while COM*check-Web*™ is accessible directly from the website without having to download and install.

View a list of supported software versions for code compliance tools .

See if your state or county can use COM*check* to show compliance .

COM*check*™ for Windows® Download COMcheck for Windows

Runs on Windows 7/8/10 in either single, multi-user, or network environments.
Note that the Mac version of COM*check* has been discontinued. Mac users are advised to use COM*check*-Web.

Version 4.1.1 (Build Version: 4.1.1.0)
View Release Notes to see what's new in this version.

Supported Codes:
2009, 2012, 2015 and 2018 IECC.
ASHRAE Standard 90.1-2007, 2010, 2013, 2016
Various state-developed energy codes.

COM*check-Web* Start COMcheck-Web

COM*check-Web* simplifies commercial and high-rise residential energy code compliance. It performs just like the desktop version of COM*check*, but you don't need to download or install any software on your computer.

COM*check* Support

Have a compliance question or need assistance with the software?
BECP's team of building energy codes experts is available to answer specific questions submitted through our web-based help desk .

Com*check* Software Support Documents

- Technical Support Document for Version 3.9.1 of the COM*check* Software

Required Information

New Construction

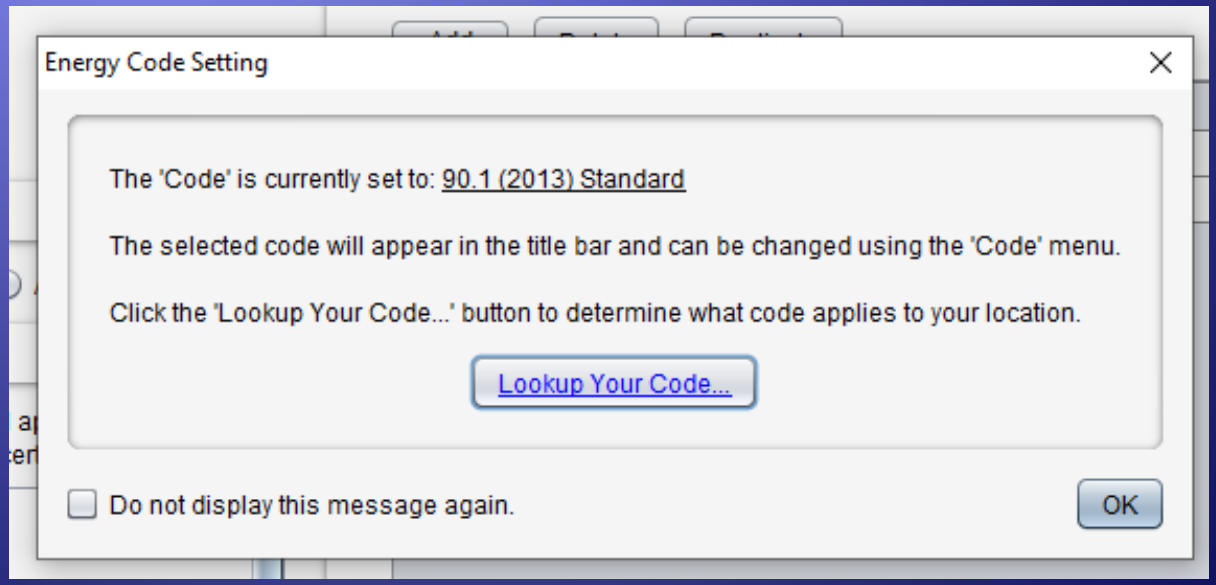
- Location/climate zone
- Area of building, walls, windows, roof , etc.
- R-Values for insulation or
- U-Factors for wall assemblies
- U-Factor and SHGC for windows

Additions/Alterations

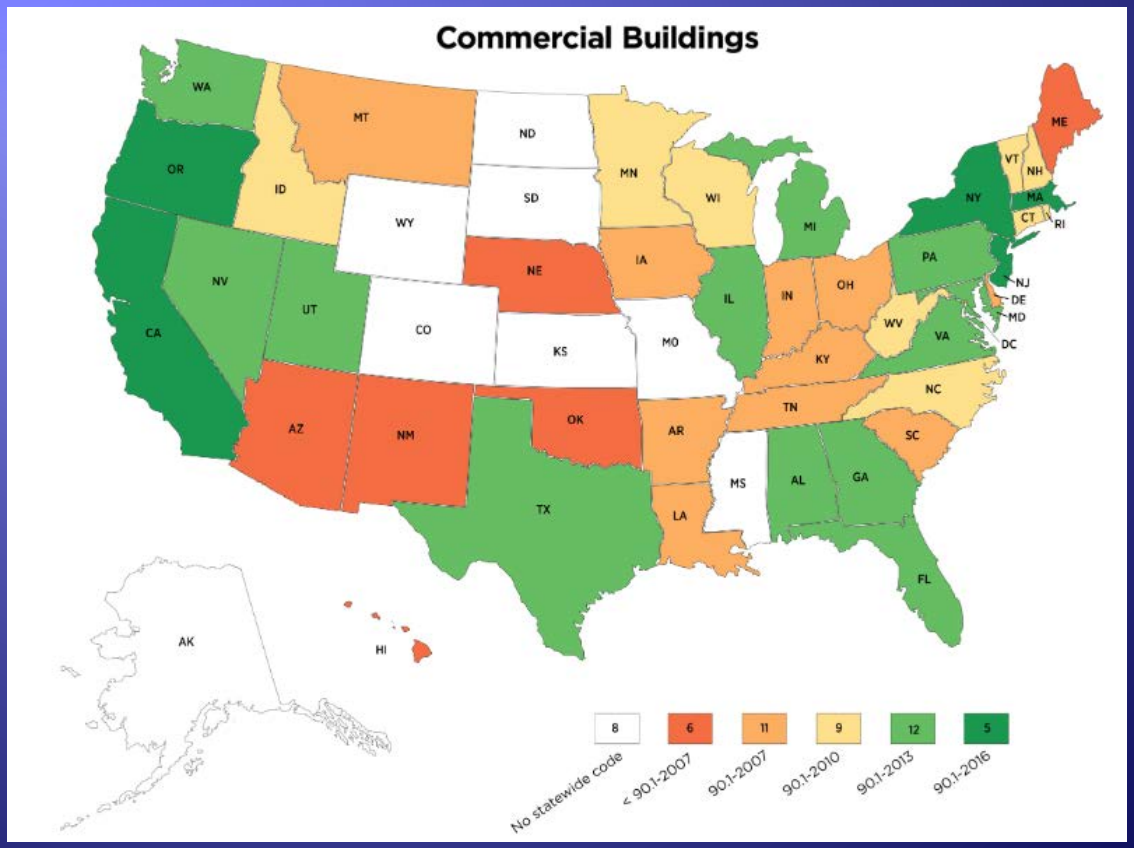
- Alterations
  - Refer to previous code sections.
- Additions
  - Shall conform to current codes.

What code should I use?

- Must make a selection immediately after opening COMcheck
- Software will help guide your selection.
- Current version is ASHRAE 90.1 (2013)

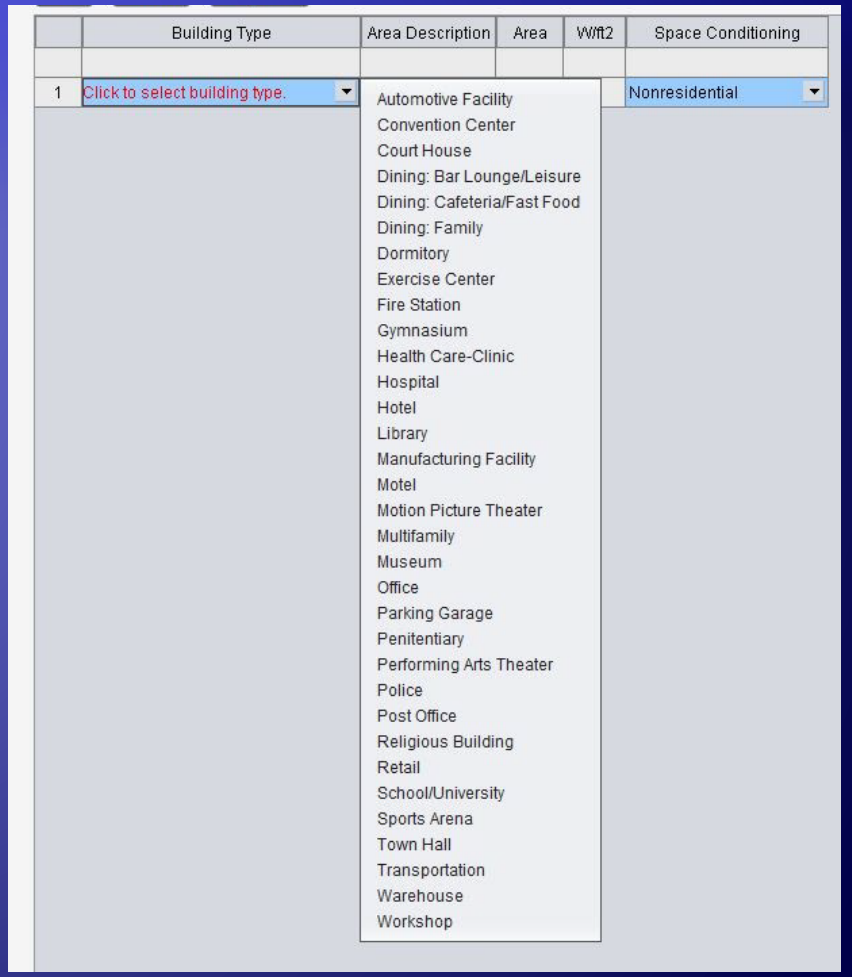


What code should I use?



Project - Building Use Type

- Choose the use which best fits the overall building use.
- Selection is used for lighting calculations.



Project - Building Area

- Input the area of the conditioned space.

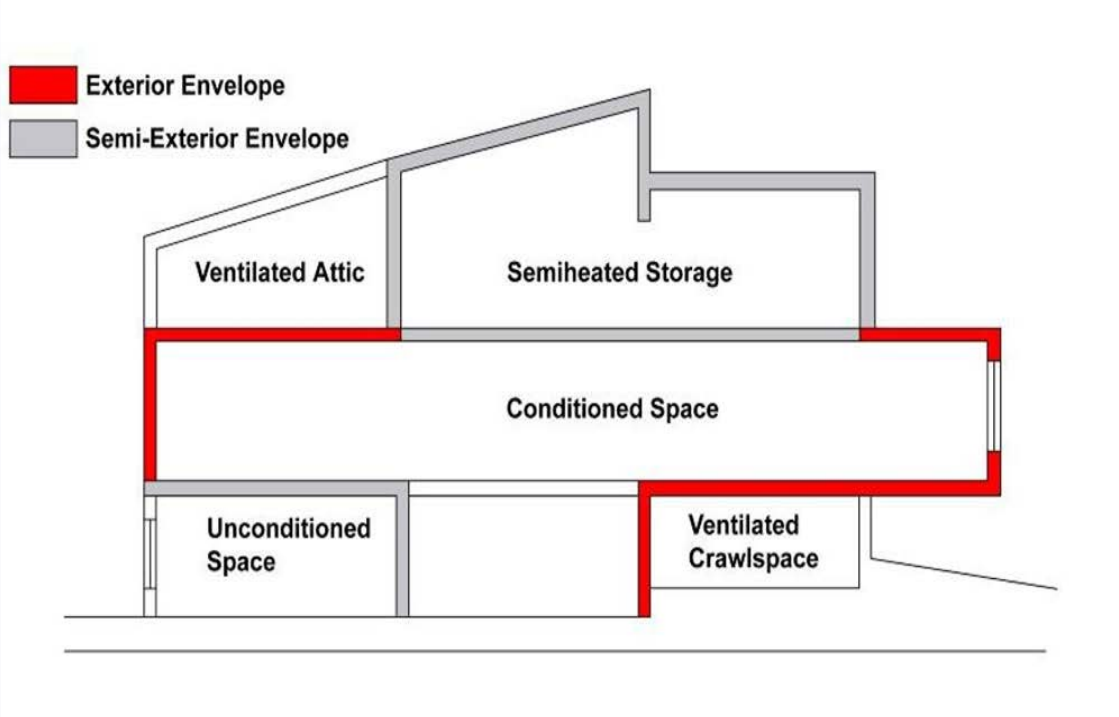
	Building Type	Area Description	Area	W/ft2	Space Conditioning
1	Dining: Family		10000	0.95	Nonresidential

Project – Space Conditioning

- Nonresidential
- Residential
  - High rise apartments, condos, etc.
- Semiheated
  - Less than 15 BTU per sq. ft.
  - No mechanical cooling
  - Approval from AHJ

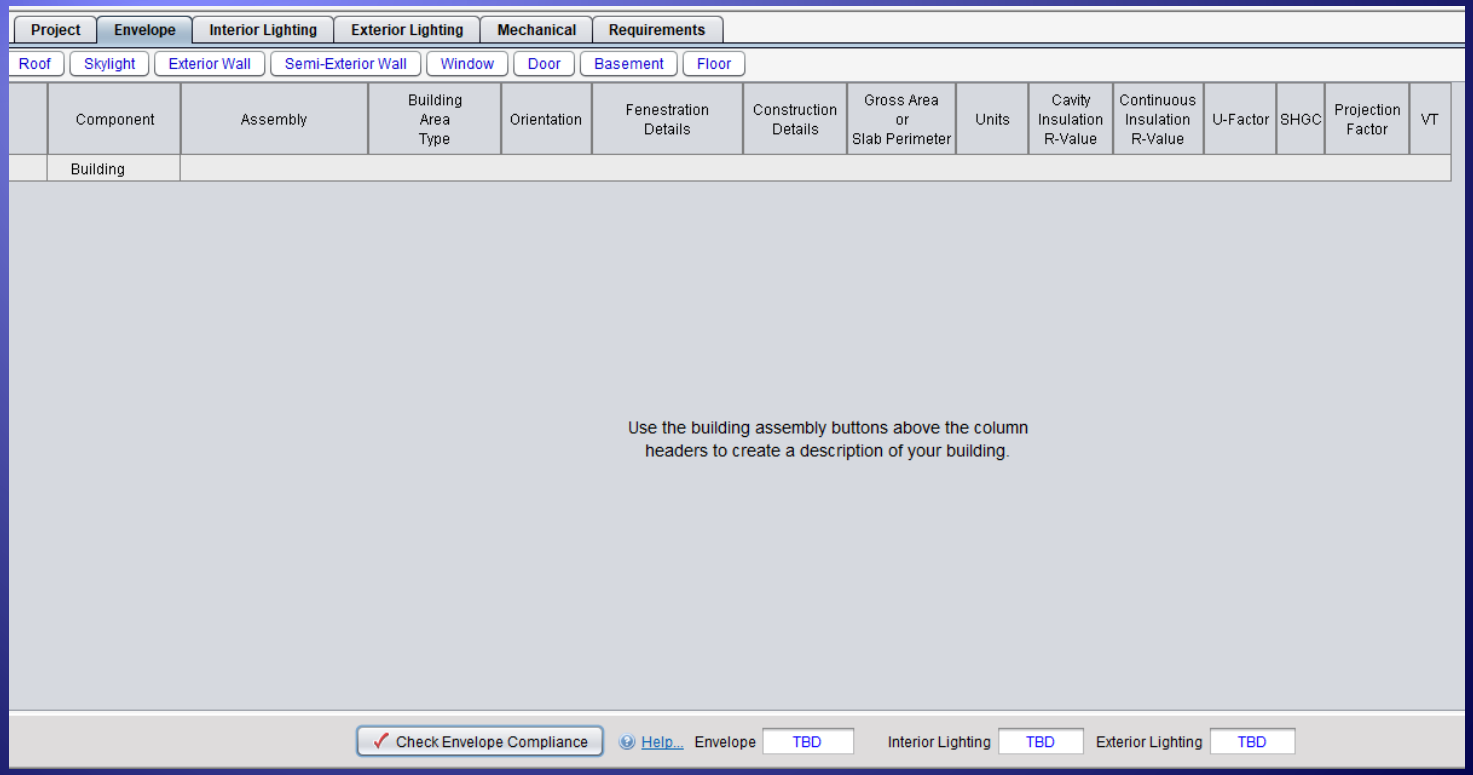
Envelope Types

- Input the area of each exterior surface.
- Software compares the performance of the building against a similar building meeting the prescriptive provisions.



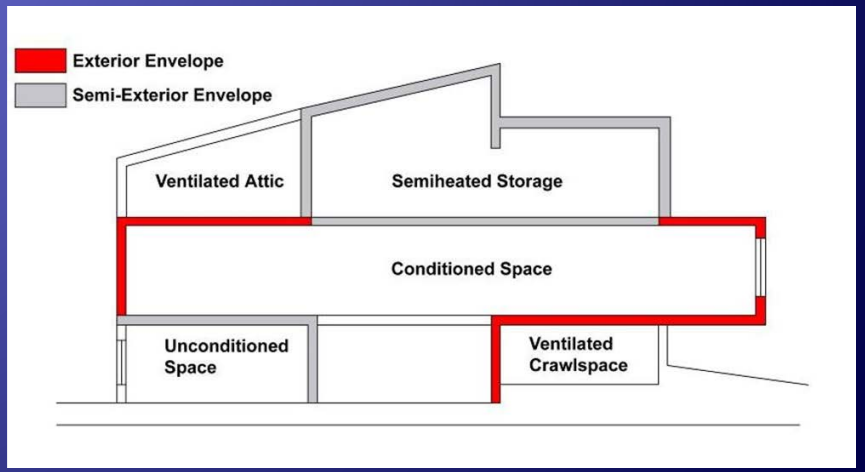
Envelope Types

- Input the area of each exterior surface.
- Software compares the performance of the building against a similar building meeting the prescriptive provisions.



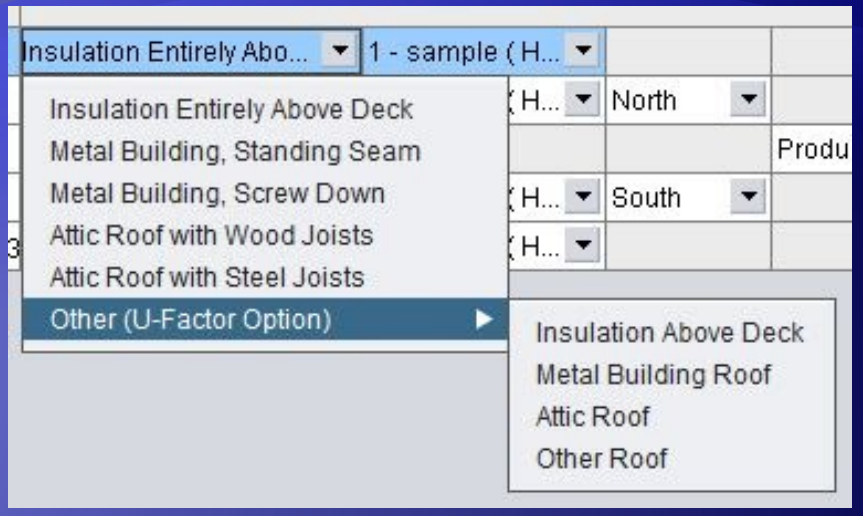
Envelope Types

- Get organized!
- Calculate areas for each wall type.
  - Wall Type 1, 2, etc.
  - Window 1, 2, etc.
  - Roof 1, 2, etc.
  - Door 1, 2, etc.
- Organize by facade direction.
  - North, South, East, West
- ***Windows and doors are included in wall areas!***



Roof Types

- Insulation Above Deck
- Metal Building, Standing Seam
  - Roof panels are attached with clips
- Metal Building, Screw Down
  - Roof panels are mech. fastened to the sub-structure
- Attic Roof w/ Wood Joists
  - Wood trusses
- Attic Roof w/ Steel Joists
  - trusses
- Other - Calculated U-Factor
  - Save work for later reference.
- Prescriptive requirement is R-30 continuous or R-49 in attic spaces.

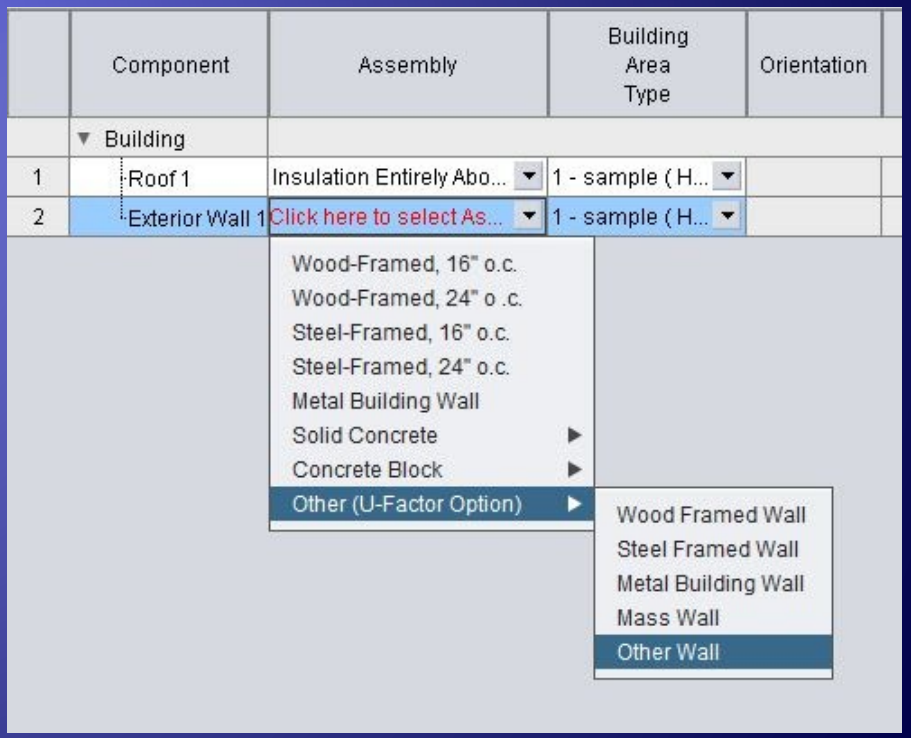


THERMAL PROPERTIES				
NOMINAL THICKNESS in	NOMINAL THICKNESS mm	LTTR*	MAXIMUM FLUTE SPAN in	MAXIMUM FLUTE SPAN mm
1.00	25.4	5.7	2.625	66.70
1.30	31.7	7.4	3.675	93.35
1.50	38.1	8.6	4.375	111.10
1.80	44.5	10.3	4.375	111.10
2.00	50.8	11.4	4.375	111.10
2.30	58.4	13.2	4.375	111.10
2.50	63.5	14.4	4.375	111.10
2.80	71.1	16.2	4.375	111.10
3.00	76.2	17.4	4.375	111.10
3.20	82.6	18.6	4.375	111.10
3.50	88.9	20.5	4.375	111.10
3.80	95.3	22.3	4.375	111.10
4.00	101.6	23.6	4.500	114.30

*Note: Long Term Thermal Resistance (LTTR) values have been determined in accordance with CAN/ULC S770.

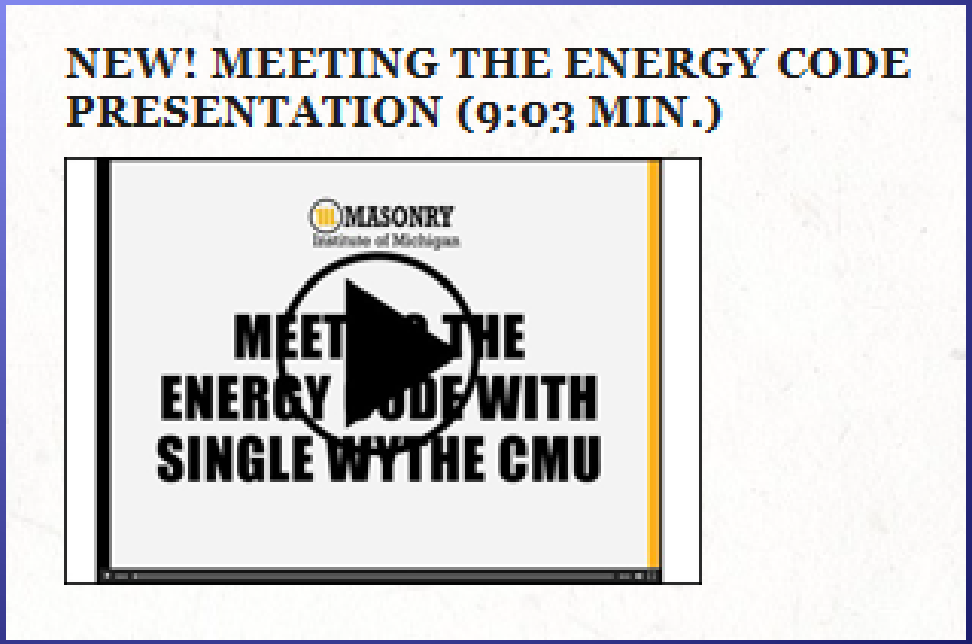
Wall Types

- First 4 types are for cavity wall construction.
- Metal Framed Building = Pre-engineered metal building
- Solid Concrete = Precast or poured conc. walls
- Conc. Block
- Other = Calculated U-factor.
  - Save work for later reference.
-



Wall Types

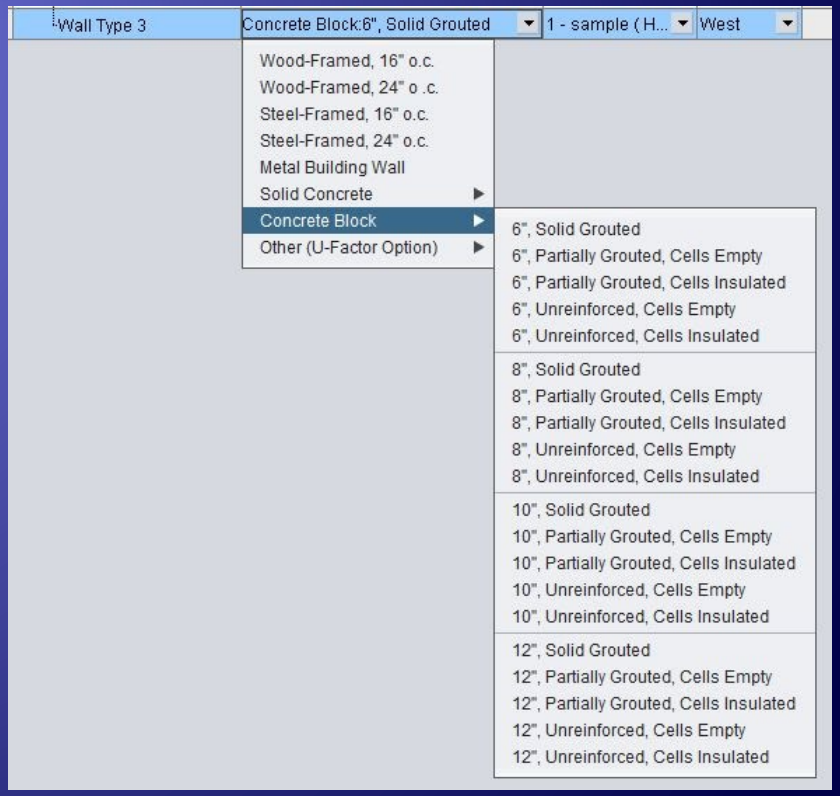
- Concrete block
  - The Masonry Institute of Michigan (MIM) has excellent resources for comcheck and masonry construction.
  - www.masonryinfo.org



Wall Types

Concrete block

- Select thickness, block type, reinforcement, etc.
- Selections are code minimums.
- Good for preliminary analysis
- Use "Mass Wall" option if having difficulty.



Wall Types

Metal Buildings

- Many PEMBs will provide U-Factors Use these if possible.

Construction Details:

- Single Layer = A single layer of batt insulation compressed between metal wall panels and the girt.
- Double Layer = A double layer of batt insulation compressed between metal wall panels and the girt.

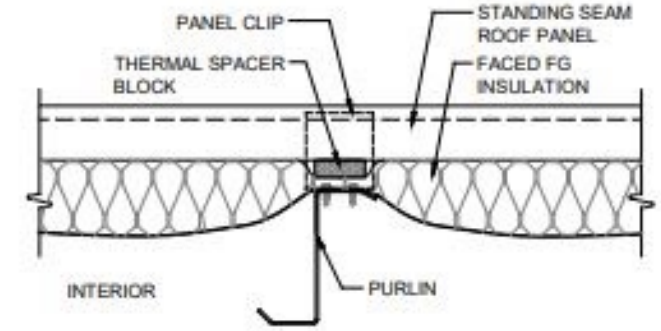


Figure 5.2-1: Standing Seam Roof with Single-Layer Fiberglass Insulation (Prescriptive Solution)

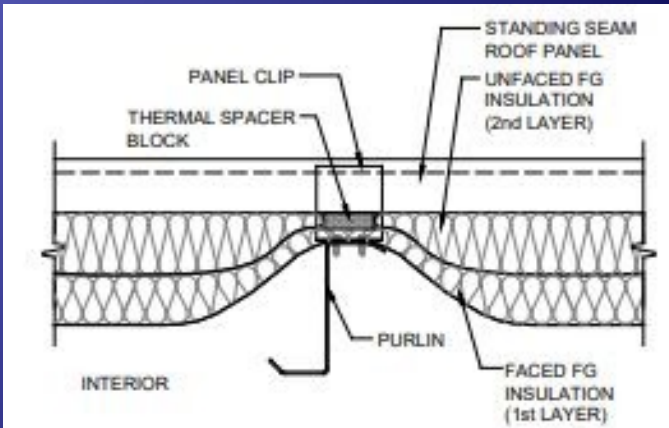
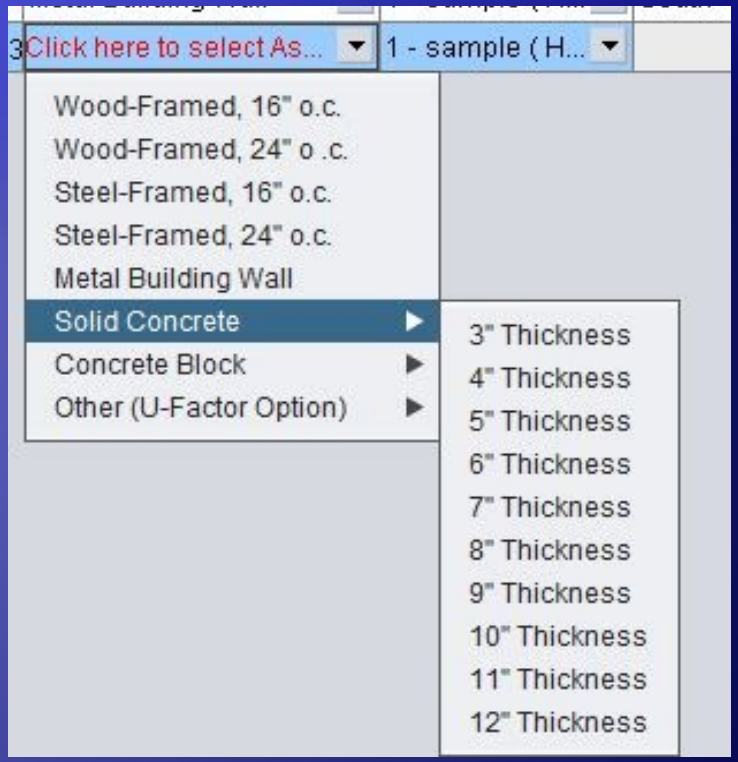


Figure 5.2-4: Standing Seam Roof with Double-Layer Fiberglass Insulation (Prescriptive Solution)

Wall Types

Solid Concrete

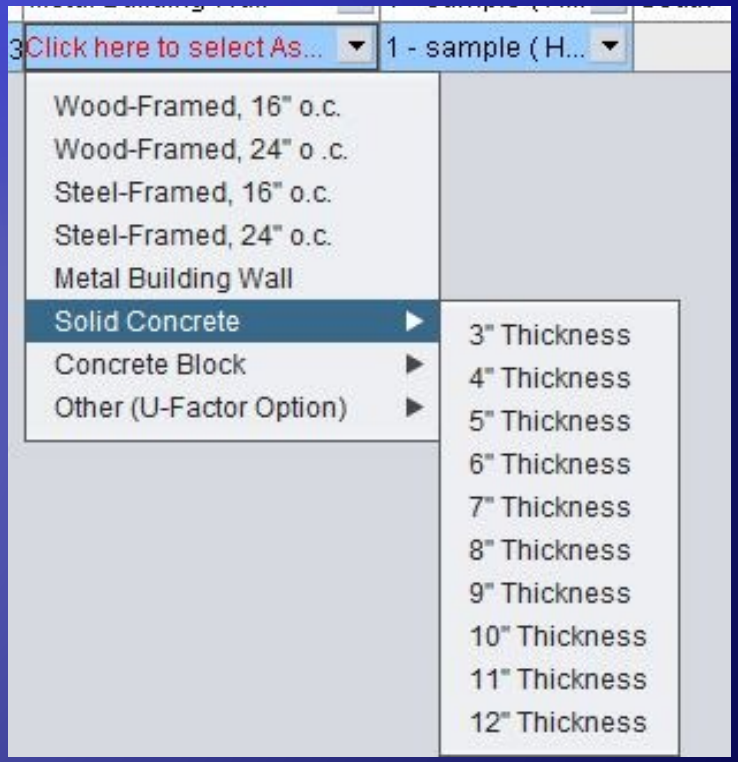
- Select wall thickness, concrete density, and furring type.
- Wall will be default values, which are very conservative.
- U-Factor option will give a better result.



Wall Types

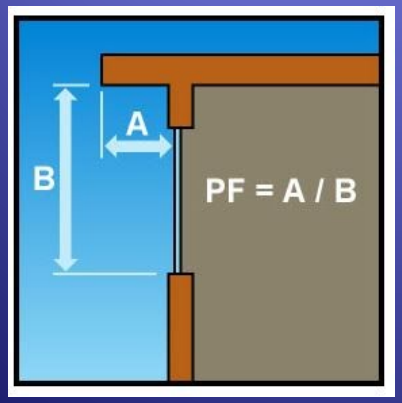
Solid Concrete

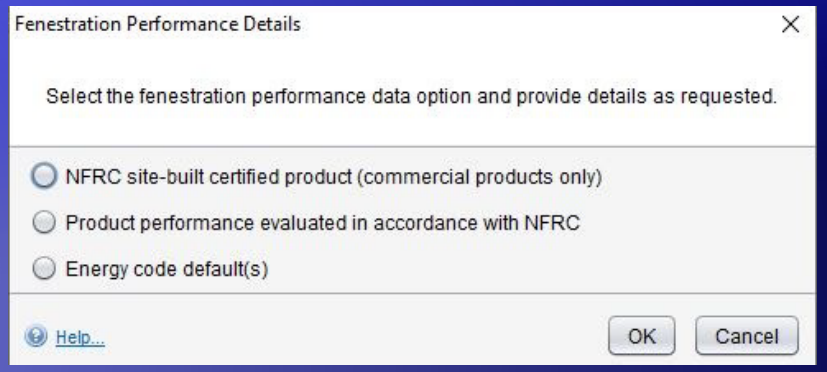
- Select wall thickness, concrete density, and furring type.
- Wall will be default values, which are very conservative.
- U-Factor option will give a better result.

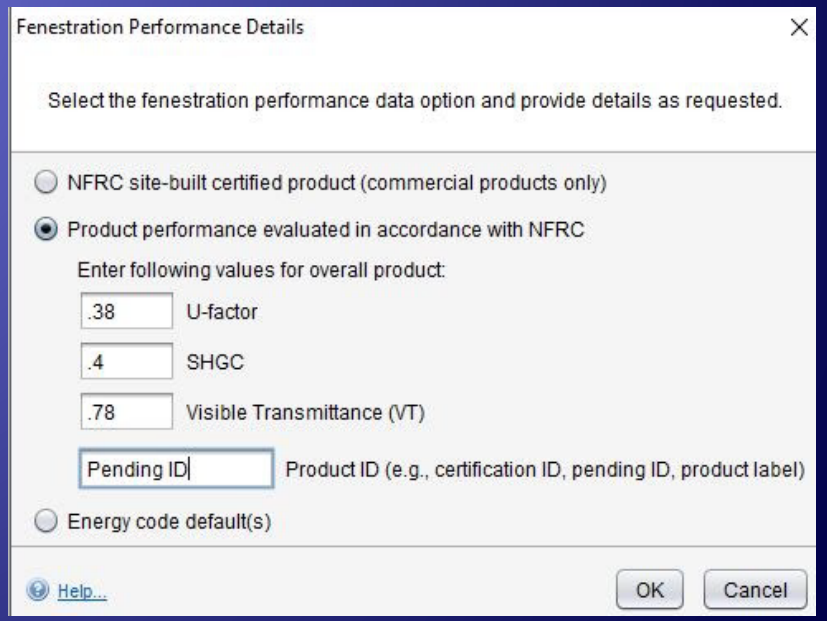


Window Types

- Energy code defaults are terrible!
- Refer to glazing manufacturer product data to select better glass performance.
- Storefront frames don't make much of a difference.
- Projection Factor

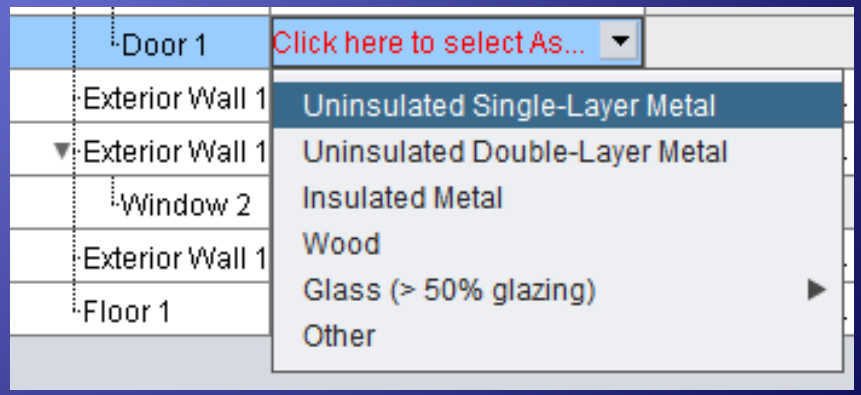






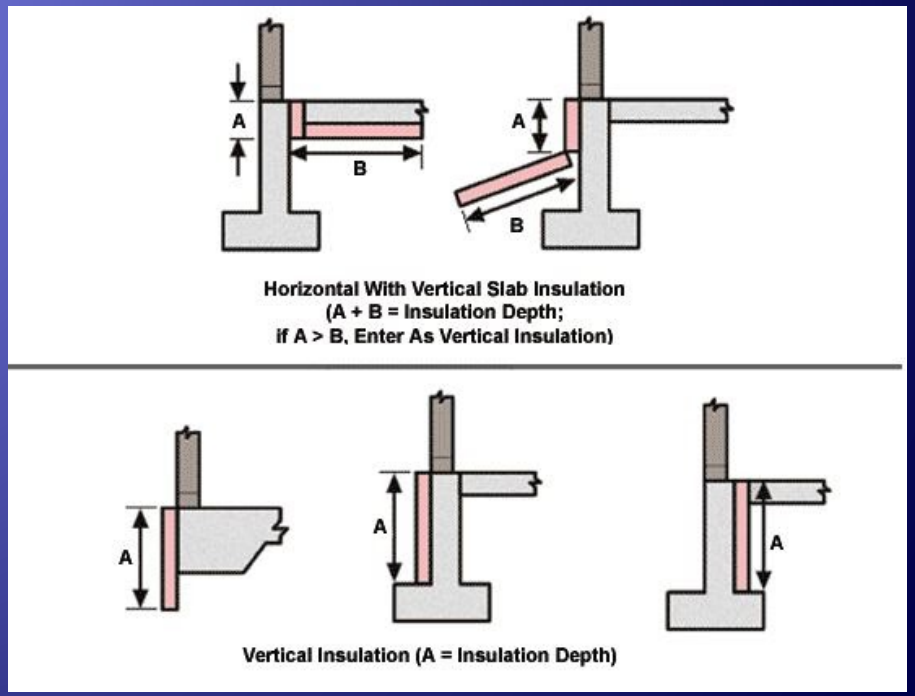
Door Types

- Use published manufacturer data for insulation.
- Overhead doors are "non-swinging"
- Storefront entrance doors are "Glass (>50% glazing)"



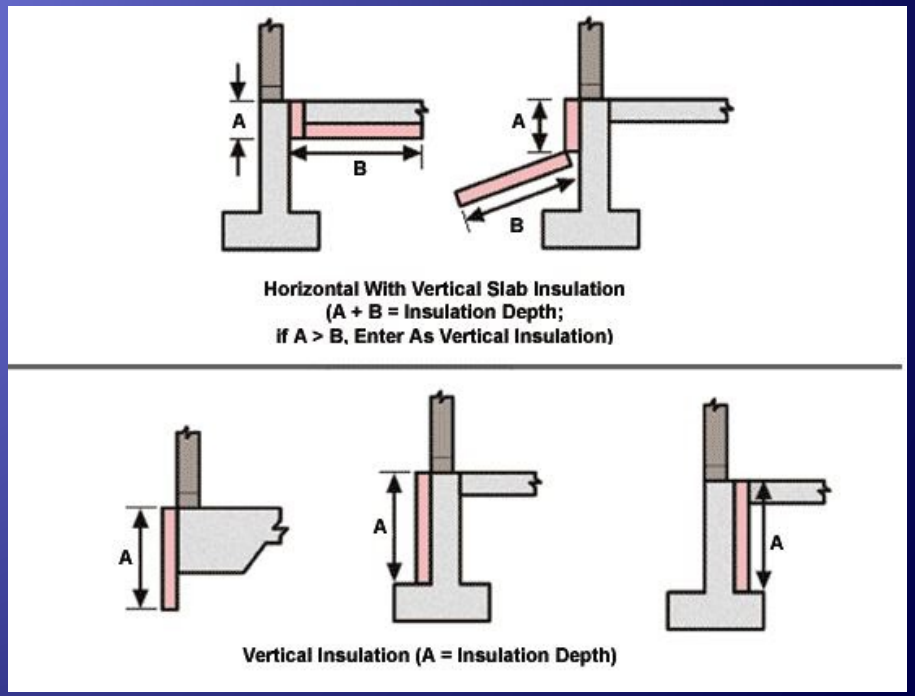
Floor Types

- Slab-On-Grade Unheated is the most common selection.
- Slab insulation value is perimeter, not area!
- Various slab insulation configurations.



Floor Types

- Slab-On-Grade Unheated is the most common selection.
- Slab insulation value is perimeter, not area!
- Various slab insulation configurations.



Sample Project

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

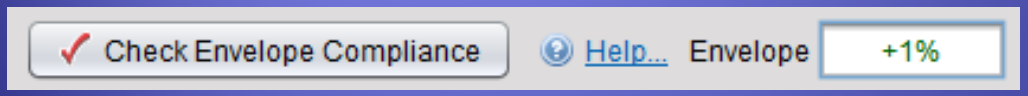
Roof | Skylight | Exterior Wall | Semi-Exterior Wall | Window | Door | Basement | Floor

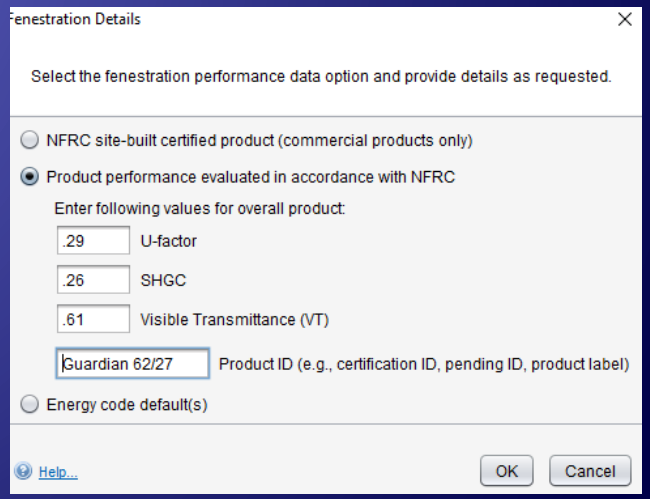
	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area or Slab Perimeter	Units	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
	▼ Building													
1	Roof 1	Insulation Entirely Abo...	1 - Dining: Fa...				10000	ft2		30.0	0.032			
2	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	North			1000	ft2	19.0	5.0	0.047			
3	Window 1	Metal Frame:Fixed			Code default ...	Glazing: Tripl...	900	ft2			0.700	0.42	0.00	0.22
4	Door 1	Glass (> 50% glazing):...			Code default ...	Glazing: Tinted	100	ft2			0.700	0.42	0.00	0.22
5	Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	East			1000	ft2	19.0	5.0	0.047			
6	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	South			1000	ft2	19.0	5.0	0.047			
7	Window 2	Metal Frame:Fixed			Code default ...	Glazing: Tripl...	800	ft2			0.700	0.42	0.00	0.22
8	Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	West			1000	ft2	19.0	5.0	0.047			
9	Floor 1	Slab-On-Grade:Unhea...	1 - Dining: Fa...			Insulation...	400	linear ft.		10.0				

Check Envelope Compliance | Help... | Envelope -3%

Sample Project

	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area or Slab Perimeter	Units	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	VT
	▼ Building													
1	Roof 1	Insulation Entirely Abo...	1 - Dining: Fa...				10000	ft2		30.0	0.032			
2	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	North			1000	ft2	19.0	5.0	0.047			
3	Window 1	Metal Frame:Fixed			Product ID: Guar...		900	ft2			0.290	0.26	0.00	0.61
4	Door 1	Glass (> 50% glazing):...			Product ID: Guar...		100	ft2			0.290	0.26	0.00	0.61
5	Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	East			1000	ft2	19.0	5.0	0.047			
6	▼ Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	South			1000	ft2	19.0	5.0	0.047			
7	Window 2	Metal Frame:Fixed			Product ID: Guar...		800	ft2			0.290	0.26	0.00	0.61
8	Exterior Wall 1	Wood-Framed, 24" o.c.	1 - Dining: Fa...	West			1000	ft2	19.0	5.0	0.047			
9	Floor 1	Slab-On-Grade:Unhea...	1 - Dining: Fa...			Insulation...	400	linear ft.		10.0				





Sample Report

COMcheck Software Version 4.1.4.0

Envelope Compliance Certificate

Project Information

Energy Code:	90.1 (2013) Standard
Project Title:	
Location:	Addison, Michigan
Climate Zone:	5a
Project Type:	New Construction
Vertical Glazing / Wall Area:	45%
Performance Sim. Specs:	EnergyPlus 8.1.0.009 (EPW: USA_OH_Toledo.Express.AP.725360_TMY3.epw)

Construction Site: Owner/Agent: Designer/Contractor:

Building Area	Floor Area
1-Dining: Family : Nonresidential	10000

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor(a)
Roof 1: Insulation Entirely Above Deck, [Bldg. Use 1 - Dining: Family]	10000	—	30.0	0.032	0.032
Floor 1: Slab-On-Grade:Unheated, Horizontal with vertical 2 ft., [Bldg. Use 1 - Dining: Family] (c)	400	—	10.0	0.700	0.520
NORTH					
Exterior Wall 1: Wood-Framed, 24" o.c., [Bldg. Use 1 - Dining: Family]	1000	19.0	5.0	0.047	0.051
Window 1: Metal Frame:Fixed, Perf. Specs.: Product ID Guardian, SHGC 0.26, VT 0.61, [Bldg. Use 1 - Dining: Family] (b)	900	—	—	0.290	0.420
Door 1: Glass (> 50% glazing) Metal Frame, Entrance Door, Perf. Specs.: Product ID Guardian 62027, SHGC 0.26, VT 0.61, [Bldg. Use 1 - Dining: Family] (b)	100	—	—	0.290	0.770
EAST					
Exterior Wall 1 copy 1: Wood-Framed, 24" o.c., [Bldg. Use 1 - Dining: Family]	1000	19.0	5.0	0.047	0.051
SOUTH					
Exterior Wall 1 copy 2: Wood-Framed, 24" o.c., [Bldg. Use 1 - Dining: Family]	1000	19.0	5.0	0.047	0.051
Window 2: Metal Frame:Fixed, Perf. Specs.: Product ID Guardian, SHGC 0.26, VT 0.61, [Bldg. Use 1 - Dining: Family] (b)	800	—	—	0.290	0.420
WEST					
Exterior Wall 1 copy 3: Wood-Framed, 24" o.c., [Bldg. Use 1 - Dining: Family]	1000	19.0	5.0	0.047	0.051

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.
(c) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

COMcheck Software Version 4.1.4.0

Inspection Checklist

Energy Code: 90.1 (2013) Standard

Requirements: 91.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 5.4.3.1.1, 5.7 [PR1][1]	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. **Location on plans/specs:** A-123
4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
5.5.4.2.3 [PR7][2]	In buildings > 2,500 ft2, any enclosed spaces directly under a roof with ceiling heights > 15 ft. and used as an office, lobby, atrium, concourse, corridor, storage (including nonrefrigerated warehouse), gymnasium, fitness/exercise area, playing area, gymnasium seating area, convention exhibit/event space, courtroom, automotive service, fire station engine room, manufacturing corridor/transition and bay areas, retail, library reading and stack areas, distribution/sorting area, transportation baggage and seating areas, or workshop, the following requirements apply: The daylight zone under skylights is >= half the floor area and (a) the skylight area to daylight zone is >= 3 percent with a skylight VT >= 0.40 or (b) the minimum skylight effective aperture >= 1 percent. The skylights have a measured haze value > 90 percent.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Requirement does not apply.

Sample Report

Section # & Req.ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
4.2.4 [FO1][2]	Installed below-grade wall insulation type and R-value consistent with insulation specifications reported in plans and COMcheck reports.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
4.2.4 [FO3][2]	Installed slab-on-grade insulation type and R-value consistent with insulation specifications reported in plans and COMcheck reports.	R-____ ☐ Unheated ☐ Heated	R-____ ☐ Unheated ☐ Heated	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.2 [FO4][2]	Slab edge insulation installed per manufacturer's instructions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
5.5.3.5 [FO5][2]	Slab edge insulation depth/length.	____ ft	____ ft	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.1.7 [FO6][1]	Exterior insulation protected against damage, sunlight, moisture, wind, landscaping and equipment maintenance activities.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
5.8.1.7.3 [FO7][1]	Insulation in contact with the ground has <=0.3% water absorption rate per ASTM C272.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
6.4.4.1.5 [FO11][3]	Bottom surface of floor structures incorporating radiant heating insulated to >=R-3.5.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met. *See the Envelope Assemblies table for values.*

Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
5.4.3.2 [FR1][3]	Factory-built and site-assembled fenestration and doors are labeled or certified as meeting air leakage requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
5.4.3.4 [FR4][3]	Vestibules are installed where building entrances separate conditioned space from the exterior, and meet exterior envelope requirements. Doors have self-closing devices, and are >=7 ft apart (>= 16 ft apart for adjoining floor area >= 40000 sq.ft.). Vestibule floor area <=7 50 sq.ft. or 2 percent of the adjoining conditioned floor area.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	**Exception:** Doors that open directly from a space <=3000 ft2 and separated from the building entrance.
5.5.4.3a [FR8][1]	Vertical fenestration U-Factor.	U-____	U-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.3b [FR9][1]	Skylight fenestration U-Factor.	U-____	U-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.4.1 [FR10][1]	Vertical fenestration SHGC value.	SHGC:____	SHGC:____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.5.4.4.2 [FR11][1]	Skylight SHGC value.	SHGC:____	SHGC:____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.8.2.1, 5.8.2.3, 5.8.2.4, 5.8.2.5 [FR12][3]	Fenestration products rated (U-factor, SHGC, and VT) in accordance with NFRC or energy code defaults are used.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
5.8.2.2 [FR13][1]	Fenestration and door products are labeled, or a signed and dated certificate listing the U-factor, SHGC, VT, and air leakage rate has been provided by the manufacturer.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.
5.5.3.6 [FR14][3]	U-factor of opaque doors associated with the building thermal envelope meets requirements.	U-____ ☐ Swinging ☐ Nonswinging	U-____ ☐ Swinging ☐ Nonswinging	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
5.4.3.1 [FR15][1]	Continuous air barrier is wrapped, sealed, caulked, gasketed, and/or taped in an approved manner, except in semiheated spaces in climate zones 1-6.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	Requirement will be met.

Questions??

Thank you!!