Energy Code Basics

Presentation Overview

- History of Minnesota’s Energy Code
- Code Comparison
  - Envelope
  - Lighting
  - HVAC
- New Construction
- Existing Buildings
- Recommendations
- Questions

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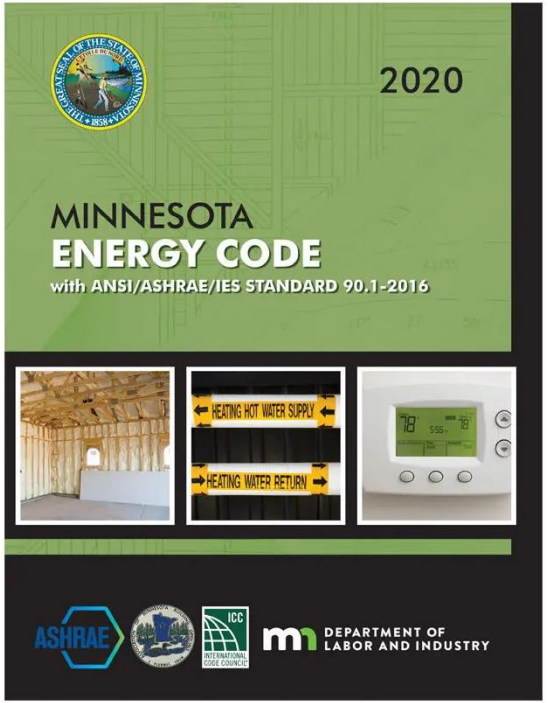
2020 Minnesota Commercial Energy Code

Minnesota Commercial Energy Code - Chapter 1323

Two paths to compliance

- *2018 IECC*
- *ASHRAE 90.1-2016*

The MN Energy Code is available online for free at this link: https://codes.iccsafe.org/content/MNEC2020P1



When does the Energy Code Apply?

- New Construction
- Additions to existing buildings

- Existing buildings with the exception of :
  - Historically significant buildings (designated by adopting authority)
  - Buildings on the National Register of Historic Places
  - Buildings eligible for listing by the US Secretary of the Interior
  - Buildings where the annual energy consumption of the comprehensive design shall not be greater than the annual energy consumption of a substantially identical design, using the same energy types, and where the code is met
- Existing buildings with a change in occupancy or use and that would result in increased demand for either fossil fuel or electrical energy
- Existing buildings with a change in space conditioning from non-conditioned space to conditioned space

History of Minnesota's Energy Code

- January 30, 1976 – Energy Conservation in Buildings
- January 1, 1984 – Adopted 1983 Model Energy Code
- May 13, 1991 – Adopted 1989 Model Energy Code
- June 16, 1994 – 1994 Minnesota Energy Code
- July 20, 1999 – ASHRAE 90.1-1989
- June 1, 2008 – 2006 IECC/ ASHRAE 90.1-2004
- June 2, 2015 – 2012 IECC/ ASHRAE 90.1-2010
- March 31, 2020 – 2018 IECC/ ASHRAE 90.1-2016
- Future (2023-2025?) – ASHRAE 90.1-2019
    - July 2021 DOE issued determination that ASHRAE 90.1-2019 is the new energy standard
    - States have 2 years to certify their energy code meets or exceeds the energy standard
    - DOE estimates 90.1-2019 will save 4.3% energy/cost compared to 90.1-2016

Visit **www.dli.mn.gov/business/codes-and-laws** to view the code.

NEW CONSTRUCTION

NEW CONSTRUCTION

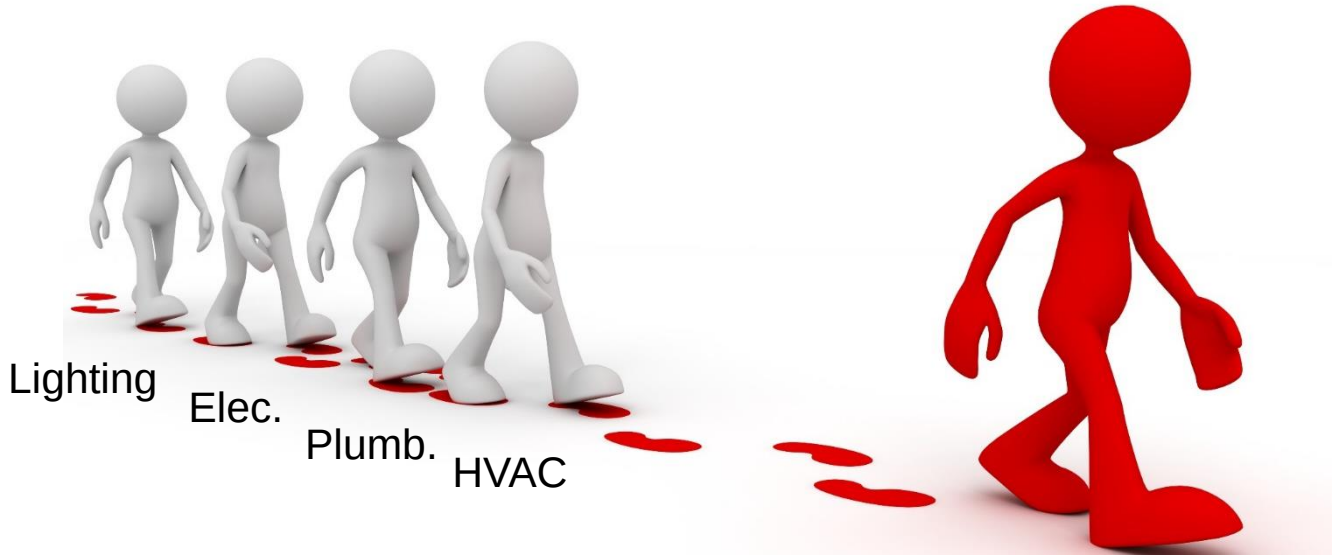
IECC 2018

- Lower insulation requirements
- No semi-heated space
- 30% windows maximum
- Requires additional enhanced energy savings option
- Domestic Hot Water Piping Run Out Limitations
- Domestic Hot Water Pump Controls
- More commissioning required

ASHRAE 90.1 - 2016

- Higher insulation requirements
- Allows for semi-heated space
- 40% windows maximum
- Heat Recovery Required ≤30% Outside Air
- Automatic Receptacle Control
- Energy Monitoring
- More commissioning required
- Energy Cost Budget Compliance

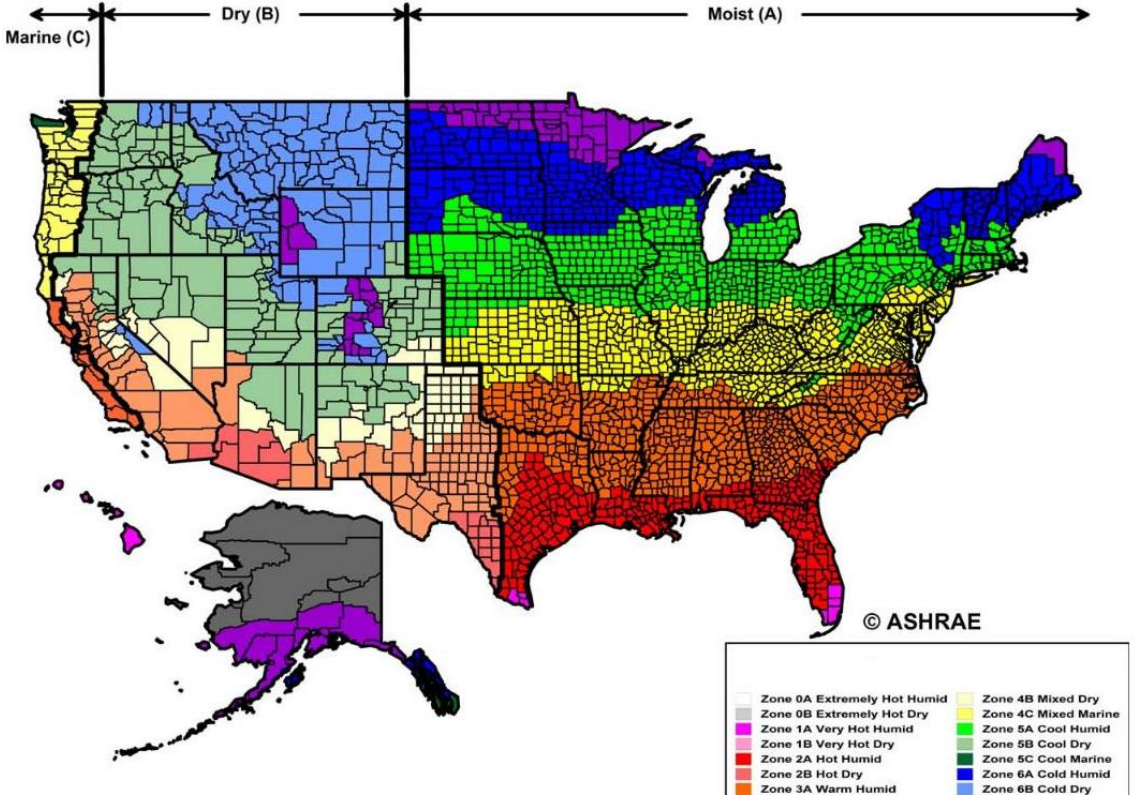
NEW CONSTRUCTION



The entire design team must follow the selected path.
This includes Architectural, Mechanical, Plumbing, and Electrical.

CLIMATE ZONES

Minnesota has two climate zones
- Climate zone 6 (southern half)
- Climate zone 7 (northern half)

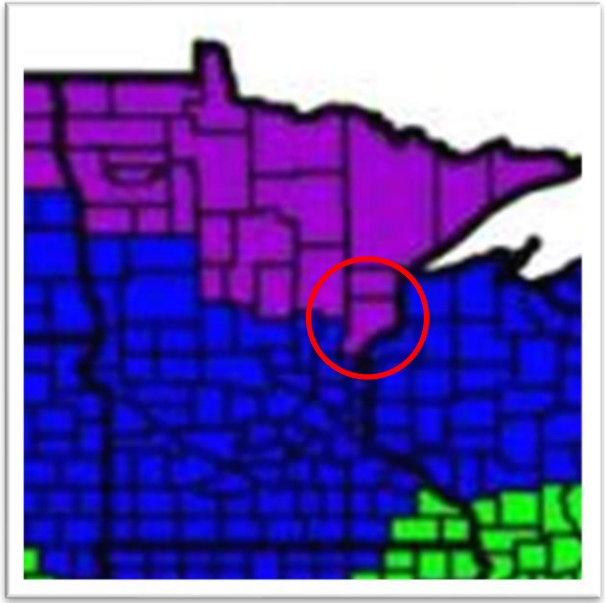


CLIMATE ZONES

The border between the two climate zones varies slightly between IECC and ASHRAE

IECC 2018

ASHRAE 90.1-2016



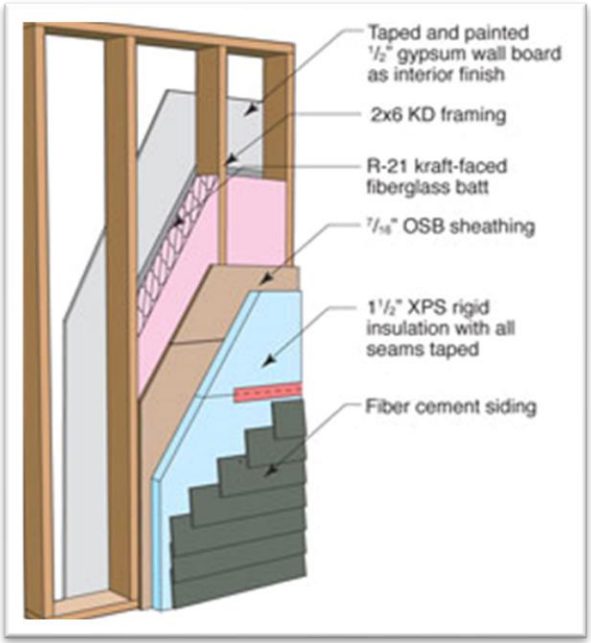
Zone 6A except...

Fillmore 5A
Houston 5A
Winona 5A
Aitkin 7
Beltrami 7
Carlton 7
Cass 7
Clearwater 7
Cook 7
Crow Wing 7
Hubbard 7
Itasca 7
Kittson 7
Koochiching 7
Lake 7
Lake of the Woods 7
Mahnomen 7
Marshall 7
Norman 7
Pennington 7
Pine 7
Polk 7
Red Lake 7
Roseau 7
St. Louis 7
Wadena 7

R-Value vs. U-Factor

R-Value is the capacity of a material to insulate

U-Factor is the value for the assembly to insulate (U=1/R).



BUILDING ENVELOPE REQUIREMENTS

Comparing the two paths: IECC 2018 and ASHRAE 90.1-2016

ITEM	IECC 2018	ASHRAE 90.1-2016
Roof – Above Deck	R-35 c.i.	R-35 c.i.
Steel Stud Wall	R-13 c.i.	R-18 c.i.
Mass Wall	R-15.2 c.i.	R-15.2 c.i.
Slab on Grade Floors – Unheated	R-15	R-20
Swinging Door	U-0.370	U-0.370
Curtainwall/Storefront	U-0.29	U-0.33

BUILDING ENVELOPE REQUIREMENTS

Example: Foundation Wall Insulation

- IECC: R-15 = 3” XPS insulation
- ASHRAE 90.1: R-20 = 4” XPS insulation

BUILDING ENVELOPE REQUIREMENTS

Maximum vertical fenestration allowed

IECC - 2018

ASHRAE 90.1-2016

BUILDING ENVELOPE REQUIREMENTS

Vestibules are generally required at buildings entrances that separate conditioned space from unconditioned space, except….

IECC 2018	ASHRAE 90.1-2016
Doors not intended to be used by the public	Doors not intended to be used as a building entrance
Doors that open into space 3,000 SF or less	Doors that open into space 3,000 SF or less and are separate from a building entrance
Revolving doors	Revolving doors
Doors for material handling adj. to personnel doors	
Doors w/ min. 6.56 f/s velocity air curtain	
	Doors that open into buildings 1,000 SF or less
	Semi-heated spaces

BUILDING ENVELOPE REQUIREMENTS

IECC: where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

1. The room or space containing the appliance shall be located outside of the building thermal envelope.
2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the building thermal envelope. Such rooms shall comply with all of the following:
    1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls
    2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed.
    3. The doors into the enclosed room or space shall be shall be fully gasketed.
    4. Water lines and ducts in the enclosed room or space shall be insulated.
    5. Where an air duct supplying combustion air to the enclosed room or space passes through conditioned space, the duct shall be insulated to an R-value of not less than R-8.

Mechanical Systems

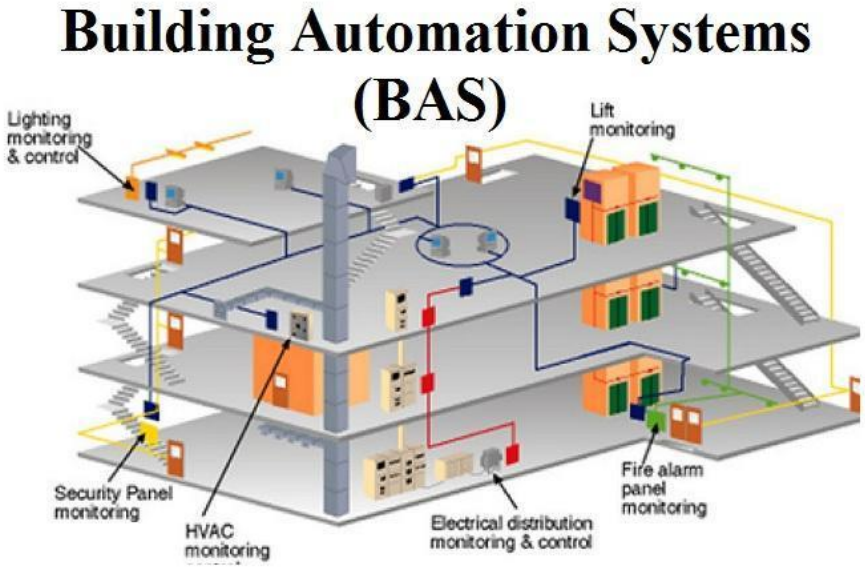
- Outside Air Design Conditions
- Equipment Efficiency
- Energy Recovery (Air Handling Unit and Condenser Water)
- Kitchen Ventilation Systems
- Air Handling Unit Fan Horsepower Limitation
- Duct and Piping Insulation
- Duct Leakage
- Damper Leakage
- Snow Melt Systems

Domestic Water Heating

- Equipment Efficiency
- Heat Traps
- Piping Insulation
- IECC: Recirculating Pump Control
- IECC: Maximum Run Out Pipe Length

Controls, Controls, Controls, Controls

- Heating and Cooling Pumps
- Air Handling Units
- Chiller Controls
- Boilers
- Interior Lighting
- Exterior Lighting



Electrical

- Interior Lighting Power Density
  - Building Area Method (Hospital 1.05 W/sqft)
  - Space by Space – Allows trade offs by space type
- Exterior Lighting Power Density
- Motor Efficiency
- Feeder and branch circuit voltage drop

Electrical ASHRAE 90.1

- Automatic Receptacle Control
  - 50% Offices, Conference, Copy, Break Room, Classrooms, and Workstations
- Electrical Energy Monitoring
  - Monitored and recorded every 15 minutes
- Transformer Efficiency
- Parking Garage Lighting Control

Project Completion

- As-Built Documentation
- Operations and Maintenance Manuals
- Systems Balancing
- System Commissioning
  - IECC: ≥ 480,000 BTUH (40 tons) and ≥ 600 MBH heating (≈ 16,000 square feet)
  - ASHRAE 90.1: ≥ 50,000 square feet

EXISTING CONSTRUCTION

Existing Buildings – What's Required?

2018 International Energy Conservation Code (IECC) BASIC Upgrade to Premium

CHAPTER 5 [CE] EXISTING BUILDINGS

Fourth Version: Mar 2020

CHAPTER 5 [CE]
EXISTING BUILDINGS

User note:

About this chapter: *Many buildings are renovated or altered in numerous ways that could affect the energy use of the building as a whole. Chapter 5 requires the application of certain parts of Chapter 4 in order to maintain, if not improve, the conservation of energy by the renovated or altered building.*

SECTION C501
GENERAL

C501.1 Scope.

The provisions of this chapter shall control the *alteration*, *repair*, *addition* and *change of occupancy* of existing buildings and structures.

C501.2 Existing buildings.

Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing *building* or *building* system lawfully in existence at the time of adoption of this code.

C501.3 Maintenance.

Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices and systems required by this code shall be maintained in conformance to the code edition under which they were installed. The owner or the owner's authorized agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

Existing Buildings – What's Required?

CHAPTER 5 [CE]
EXISTING BUILDINGS

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Existing Buildings – What's Required?

1323.0100
ADMINISTRATION
FOR COMMERCIAL ENERGY CODE

Subpart 1. Application.

In addition to the requirements in Minnesota Rules, part 1323.0030, the administrative provisions in this part apply.

Subp. 2. Scope.

This code applies to commercial buildings, building sites, and the associated systems and equipment.

Subp. 3. Additions, alterations, renovations, or repairs.

Additions, alterations, renovations, or repairs to an existing building, building system, or portion thereof shall conform to this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exceptions: The following conditions are not required to comply with this code if the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass-only replacements in an existing sash and frame.
3. Existing ceiling, wall, or floor cavities exposed during construction, provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall, or floor cavity is not exposed.
5. Reroofing for roofs not covered by Section C402.2.1.2, where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed.
7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaires in a space, provided that the alteration does not increase the installed interior lighting power.

Existing Buildings – What's Required?

Anything that is altered (regardless of level of alteration) shall comply with the new energy code.

There are exceptions if the **energy use of the building is not increased**:

1. Storm windows installed over existing fenestration.
2. Glass-only replacements in an existing sash and frame.
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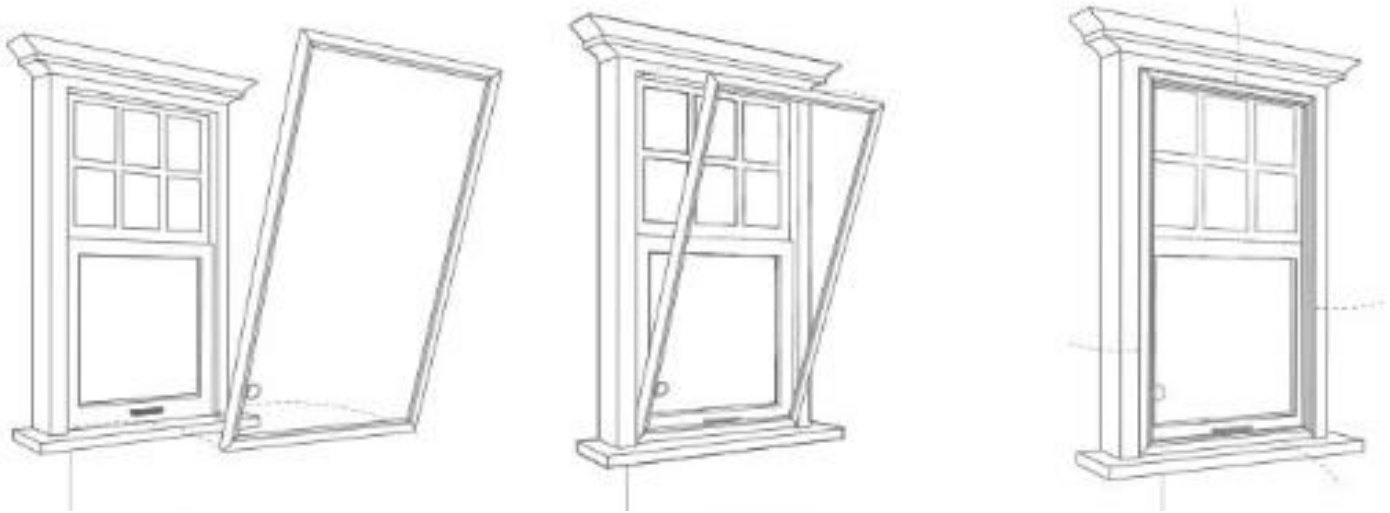
Existing Buildings – What's Required?

Not required to comply: Storm windows installed over existing fenestration.



Existing Buildings – What's Required?

Not required to comply:

Glass-only replacements in an existing sash and frame.

Required to comply:

Replacement of entire window unit.

Existing Buildings – What's Required?

Not required to comply:

Existing ceiling, wall, or floor cavities exposed during construction, provided that cavities are filled with insulation.

Required to comply:

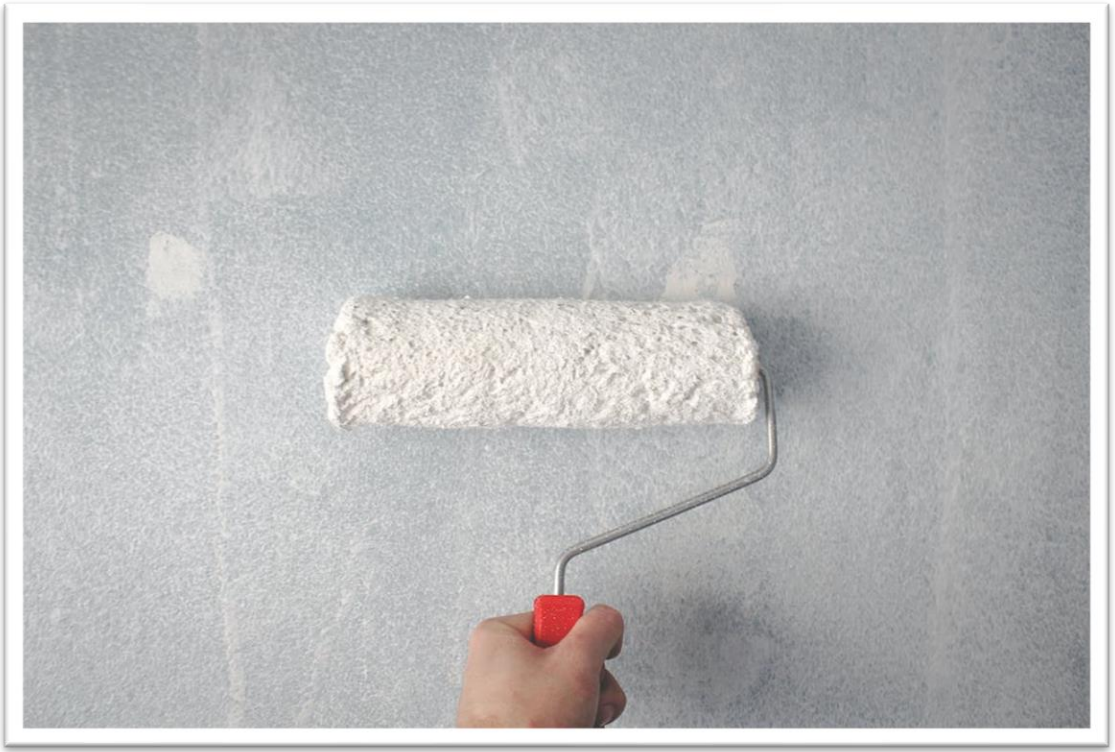
Walls that do not have insulation when the cavity is exposed.

Walls that are being furred out, thus creating a cavity.

Existing Buildings – What's Required?

Not required to comply:

Construction where the existing roof, wall, or floor cavity is not exposed.



Existing Buildings – What's Required?

Not required to comply:

Reroofing for roofs not covered by Section C402.2.1.2, where neither the sheathing nor the insulation is exposed.

Required to comply:

Reroofing where the insulation is exposed and is non-compliant.

Existing Buildings – What's Required?

Not required to comply:

Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed.

Remodeling with Existing Mechanical and Electrical Systems

- ASHRAE 90.1
- Lighting – Any alteration shall comply
- Power – Relocated equipment can be reused, new equipment shall comply
- HVAC
  - Existing systems serving a remodel or addition do not need to comply
  - New equipment shall comply
- Domestic Water Heating
  - Existing systems serving a remodel or addition do not need to comply
  - New equipment shall comply


Recommendations

Sealant Maintenance Plan

Develop a maintenance plan to main sealants

- Minimize air leakage
- Minimize water intrusion

C402.5 Max. building air leakage rate of 0.40 cfm/ft2

Maintain Window Gaskets

Review window gaskets for continuity.

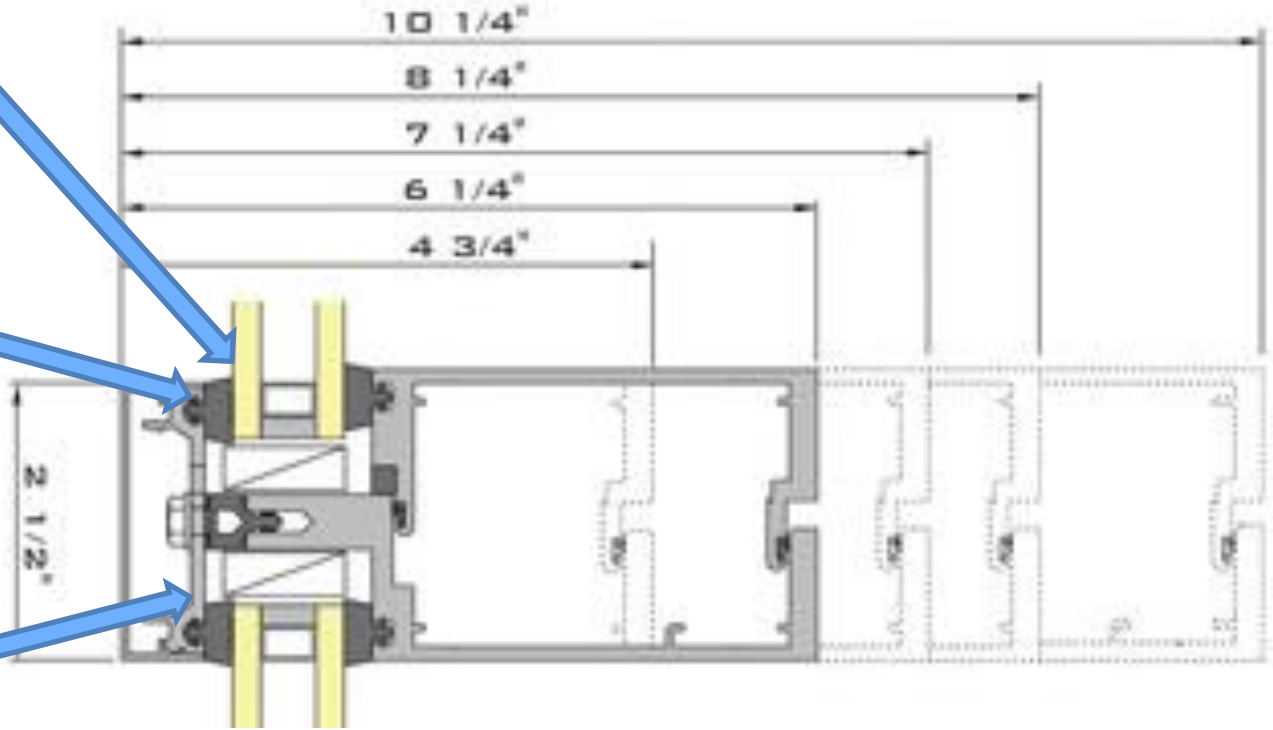
Replace as needed.

Insulated Glass – Dual Pane

Dual Paned Glass

Thermal Break

Pressure Plate

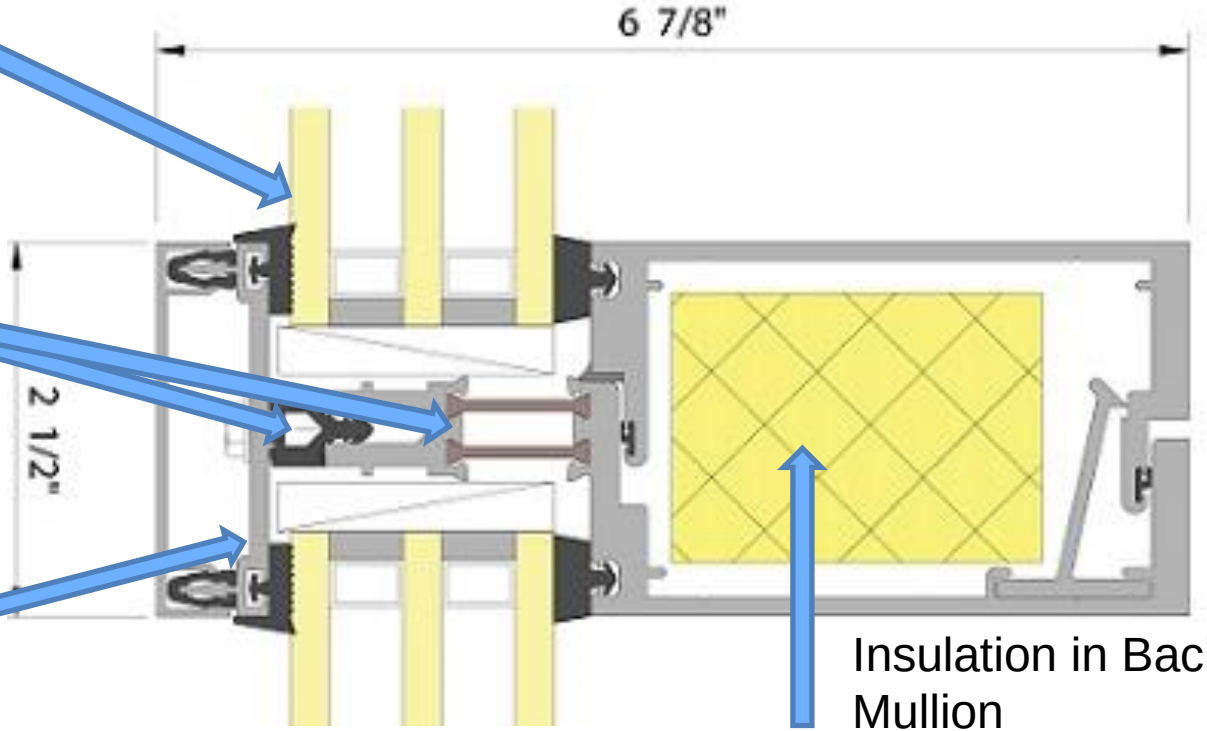


Insulated Glass – Triple Pane

Triple Paned Glass

Multi-Level
Thermal Break

Pressure Plate

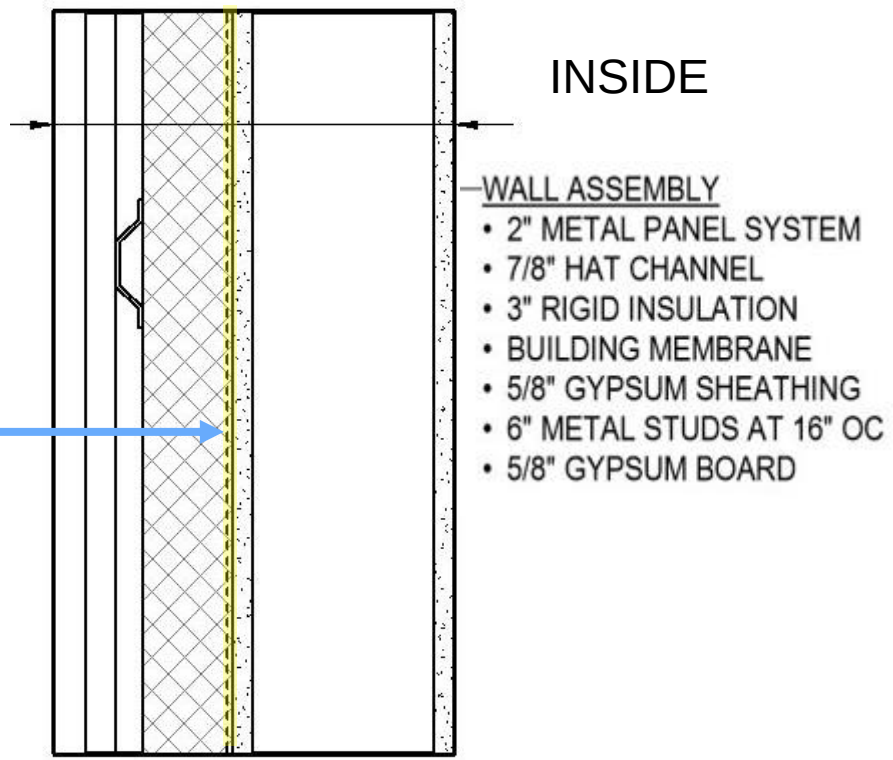


Insulation in Back
Mullion

The “Perfect Wall”

Four Control Layers:

- Rain/Water
- Air
- Vapor
- Thermal



The “Perfect Wall”

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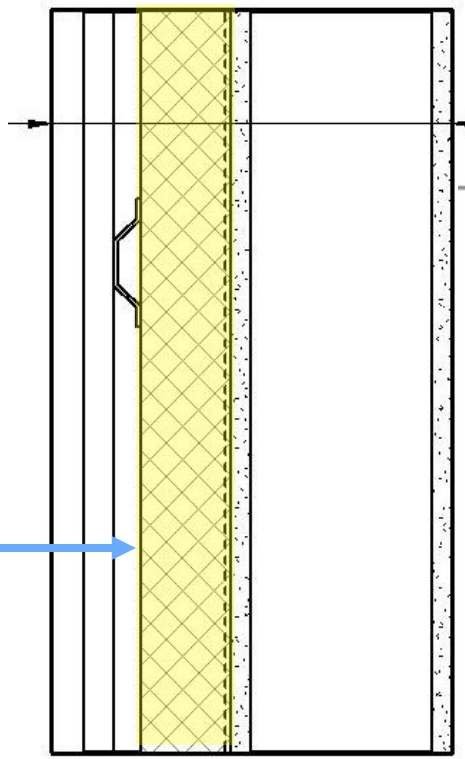


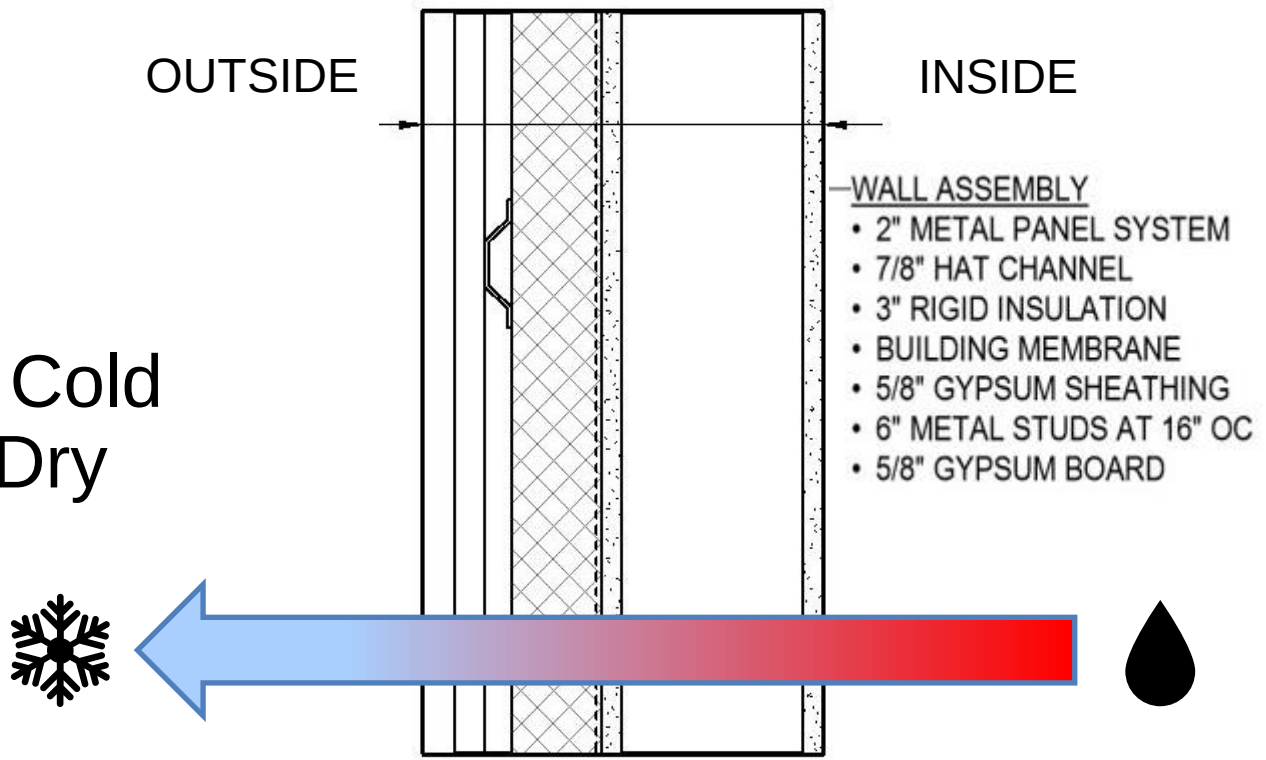
WALL ASSEMBLY

- 2" METAL PANEL SYSTEM
- 7/8" HAT CHANNEL
- 3" RIGID INSULATION
- BUILDING MEMBRANE
- 5/8" GYPSUM SHEATHING
- 6" METAL STUDS AT 16" OC
- 5/8" GYPSUM BOARD

NO Z-FURRING

The "Perfect Wall"

Vapor Drive
- Warm to Cold
- Moist to Dry



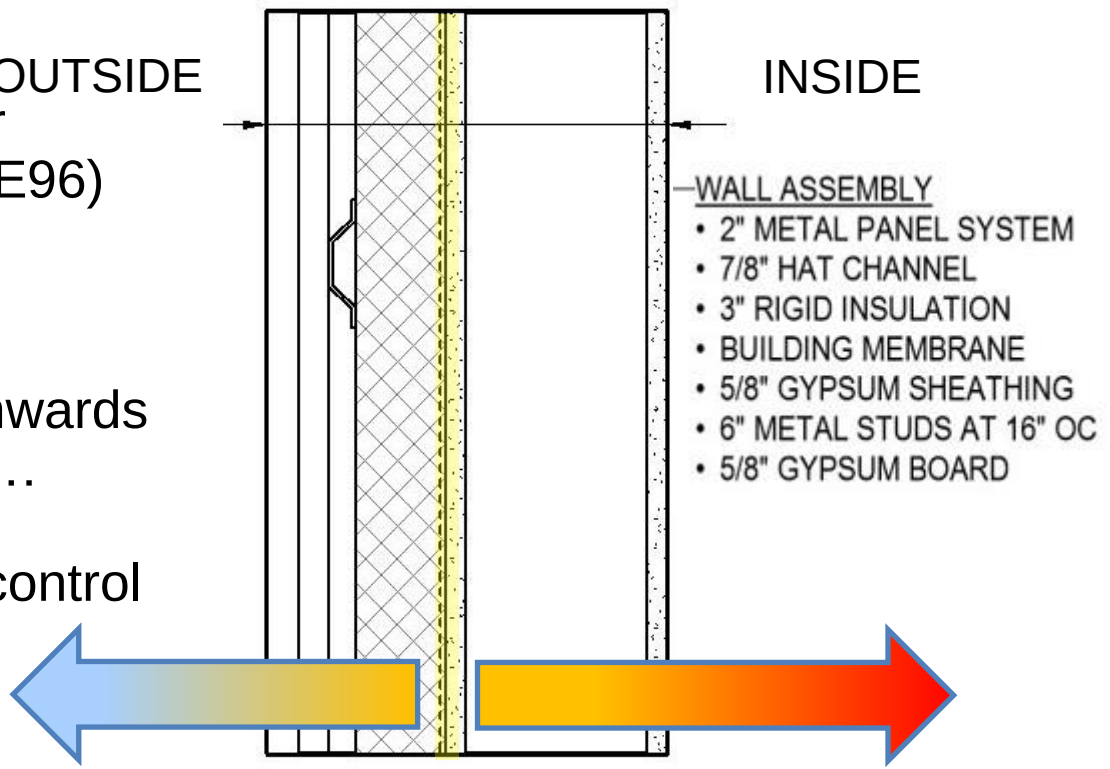
The "Perfect Wall"

Water/Air/Vapor Barrier

- 0.1 Perms (ASTM E96) *(nothing is getting through)*

Assembly should dry inwards from the control layers…

And outward from the control layers



Questions?

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