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Provider Number: 40119333

2015 Minnesota Commercial Energy Code

Course Number: KAUMNen2016

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Course Description:

The basic requirements of the newly adopted 2015 Minnesota Commercial Energy Code will be reviewed. The goal of this class is to provide a streamlined understanding of the requirements of the code compliance process for the new Energy Code. This class will also provide summary guidance to the designer on how to more effectively apply the Energy Code requirements to their projects.





Learning Objectives:

1. Review the code adoption background.
2. Demonstrate the code compliance paths available by outlining the major steps for each path.
3. Present a side by side comparison of the main requirements for the various code compliance paths available at each step in the code analysis to demonstrate the similarities and differences for each path.
4. Provide the designer with a summary outline on how to both quickly understand the code and access and use the published code materials.



2015 Minnesota State Energy Code

Highlighted Provisions of 2015 Minnesota Commercial Energy Code

February 2016



Introduction and Background

- **New 2015 Minnesota State Building Code.**

- Many of Minnesota's new codes went into effect Jan. 24, 2015.
- The Minnesota State Building Code and Energy Code went into effect June 2, 2015.



- **Based on the 2012 International Code Council (ICC) model codes**

- Contain Minnesota-specific construction provisions (i.e. Minnesota Rules).
- *ICC now publishes integrated code books for each state*
 - For Minnesota: the 2012 IBC Codes are integrated with the 2015 Minnesota Rules

- **Minnesota's State Building Code was last updated in 2007.**

2015 Minnesota State Building Codes that went into affect June 2, 2015

The 2012 IBC references other ICC Codes and is adopted by reference by the 2015 Minnesota State Code with the following clarifications:

- 2015 Minnesota Building Code: Minnesota Rules, Chapter 1305 (adopted pursuant to Minnesota Statutes, Section 326B.106) references compliance with the *2012 International Building Code*.
- 2015 Minnesota Commercial Energy Code: Minnesota Rules, Chapters 1323 (adopted pursuant to Minnesota Statutes, Section 326B.106) references compliance with the *2012 International Energy Conservation Code (IECC)*, which further allows the Design Team to select either the 2012 IECC or the ASHRAE Standard 90.1-2010 for compliance.



2015 Minnesota Commercial Energy Code

Administration For Commercial Energy Code (MN Rules)

- **Applies** to new commercial buildings
- **Applies** to additions, alterations, renovations or repairs
 - **Exceptions** (if energy use is not increased): adding storm windows, glass-only replacements, reroofing, exterior door replacement (existing vestibule to remain), replace less than 50% of light fixtures, replace bulb and ballast in existing light fixtures
- **Applies** to changes in occupancy whereby energy use increases
- **Applies** to changes in space conditioning (going from non conditioned to conditioned)
- **Does not apply** to Low-Energy Buildings (less than 3.4 Btu/h-ft² or 1.0 watt/ft²)



2015 Minnesota Commercial Energy Code

Mandatory Chapters:

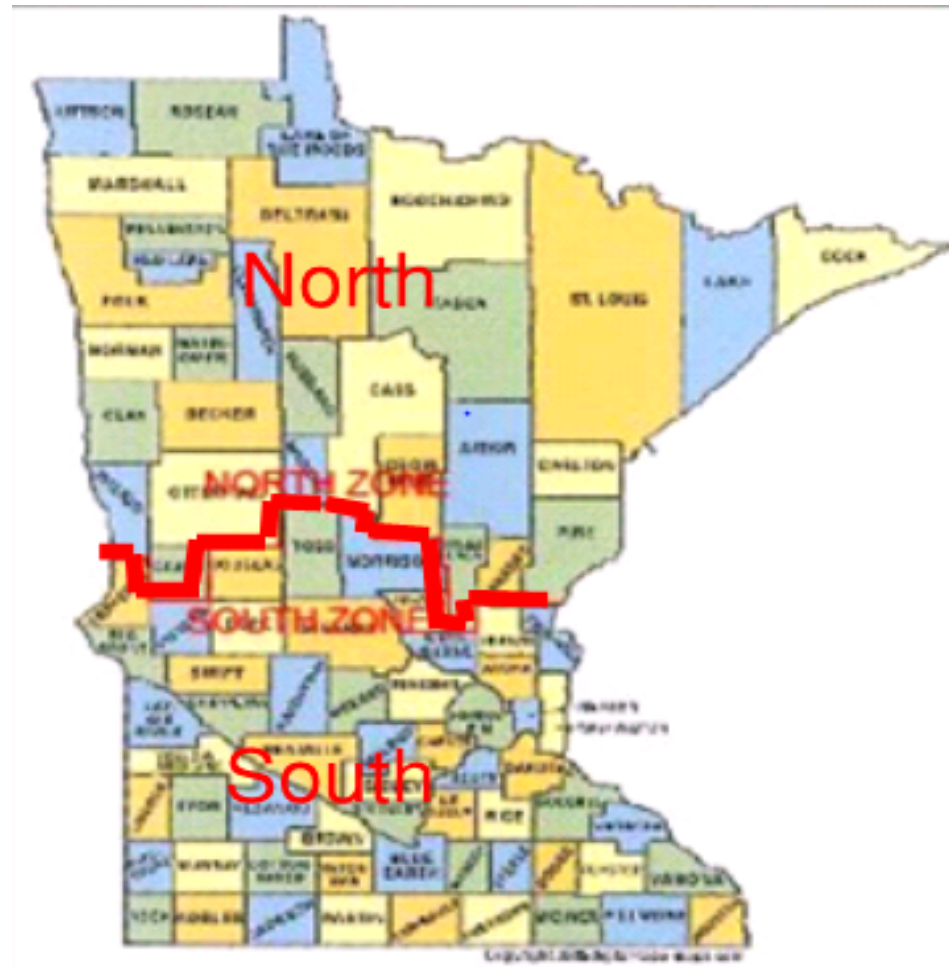
- Commercial Provisions of the *2012 International Energy Conservation Code (IECC)* – Chapters 2 (CE) to 5 (CE)
 - Chapter 1 (CE) Deleted (Replaced by Minnesota Rules: Minnesota Building Code Administration)
 - Chapter 2 (CE) Definitions
 - Chapter 3 (CE) General Requirements
 - Climate Zones: Minnesota (Zone 6A South; Zone 7 North)
 - Design Conditions: Max of 72°F for heating; Min of 75°F for Cooling
 - Previous Code: 68°F Heating; 78°F Cooling
 - Materials, Systems and Equipment (U-Value Labeling, Default U-Values If Not Labeled; Protection Of Exposed Foundation Insulation)
 - **Chapter 4 (CE) Commercial Energy Efficiency**
 - Chapter 5 Reference Standards



Minnesota Climate Zones

North Zone 7

South Zone 6A



2015 Minnesota Commercial Energy Code

{2012 International Energy Conservation Code (IECC)}

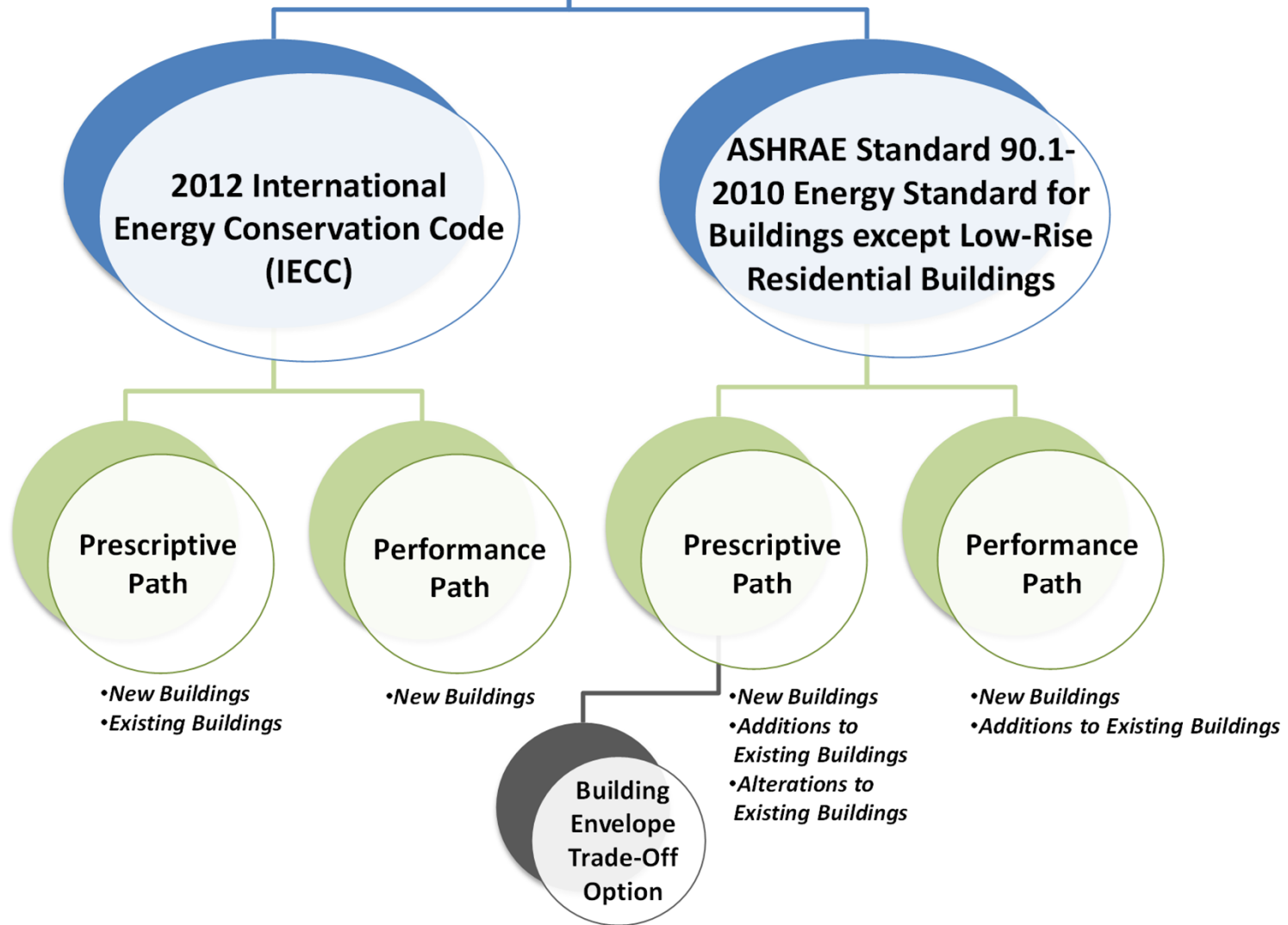
IECC Chapter 4 (CE) Commercial Energy Efficiency:

- New Buildings: Three available compliance paths (*design team to choose 1 path* and follow all requirements; cannot mix and match among paths):
 - **Path #1**: 2012 IECC Prescriptive Path
 - **Path #2**: 2012 IECC Performance Path
 - **Path #3**: Optional ASHRAE Standard 90.1-2010
 - **Path #3,a**: ASHRAE Standard 90.1-2010 prescriptive path option
 - **Path #3,b**: ASHRAE Standard 90.1-2010 performance path option

- Existing Buildings: Two available compliance paths (*design team choose 1*)
 - **Path #1**: 2012 IECC Prescriptive Path
 - **Path #2**: Optional ASHRAE Standard 90.1-2010



2015 Minnesota Commercial Energy Code



2015 Minnesota Commercial Energy Code

{2012 International Energy Conservation Code (IECC)}

IECC Chapter 4 (CE) Commercial Energy Efficiency:

New Buildings: **Path #1:** *2012 IECC Prescriptive Path*

- Section C402 Building Envelope Requirements (U-Values, Air Barrier, etc.)
 - **30% Fenestration Limit** (Increased to 40% with 50% Daylight Area)
- Section C403 Building Mechanical Systems (Equipment Efficiencies, etc.)
- Section C404 Service Water Heating (Domestic Hot Water, Pools/Spas)
- Section C405 Electrical Power & Lighting Systems (Loads, Controls, etc.)

- Also required to pick one of the three following sections:
 - Section C406.2 Efficient HVAC performance (Increased equipment efficiencies)
 - Or Section C406.3 Efficient lighting system (Reduced interior lighting power)
 - Or Section C406.4 On-site renewable energy (Solar, wind, waves, tides, landfill gas, biomass, or geothermal located on the project site)



2015 Minnesota Commercial Energy Code

{2012 International Energy Conservation Code (IECC)}

IECC Chapter 4 (CE) Commercial Energy Efficiency:

New Buildings: **Path #2:** *2012 IECC Performance Path*

- **Section C407 Total Building Performance** (Use when cannot meet prescriptive)
 - Compliance based on proposed building (*proposed design*) to have an annual energy cost that is equal to or less than 85% of the *standard reference design*.
- **Section C402.4 Air Leakage** (Continuous Air Barrier)
- **Section C403.2 Provisions Applicable To All Mechanical Systems** (Efficiencies/etc)
- **Section C404 Service Water Heating** (Domestic Hot Water); (Efficiencies/etc)
- **Section C405.2 Lighting Controls** (Automatic Controls/Occupancy Sensors)
- **Section C405.3 Tandem Wiring** (Ballast Wiring for Odd Numbered Bulbs)
- **Section C405.4 Exit Signs** (Max 5 Watts Per Side)
- **Section C405.6 Exterior Lighting** (Efficiencies)
- **Section C405.7 Electrical Energy Consumption** (Dwelling Unit Meters)



2015 Minnesota Commercial Energy Code

{optional ASHRAE Standard 90.1-2010}

ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings :

- New Buildings: Two available compliance paths (design team to choose 1)
 - **Path #1**: [*ASHRAE 90.1-2010 Prescriptive Path*](#)
 - **Path #2**: [*ASHRAE 90.1-2010 Performance Path*](#)
- Existing Buildings:
 - **Additions to Existing Buildings**: design team can choose either Path #1 or Path #2 above (performance trade-off exceptions)
 - **Alterations of Existing Buildings**: must follow Path #1 (historic exceptions, etc.)



2015 Minnesota Commercial Energy Code

{optional ASHRAE Standard 90.1-2010}

ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings :

New Buildings: **Path #1:** *ASHRAE 90.1-2010 Prescriptive Path*



- **Section 5 Building Envelope:** (U-Values, Air Barrier, etc.)
 - **40% Fenestration Limit**
 - **Prescriptive Building Envelope Option:** U-Value Tables for Opaque Elements and Fenestration
 - **Building Envelope Trade-Off Option:** Considers Only Building Envelope Components (Not MEP)
 - Section 5.1 General (Space-Conditioning Categories, Envelope Alterations, Climate)
 - Section 5.4 Mandatory Provisions (Insulation, Fenestration/Doors, Air Barrier, Vestibules)
 - Section 5.7 Submittals (Authority Having Jurisdiction)
 - Section 5.8 Product Information and Installation Requirements (Labeling, etc.)
 - Normative Appendix C: Methodology for Building Envelope Trade-Off Option
- **Section 6 Heating, Ventilating, and Air Conditioning** (Simplified or Prescriptive)
- **Section 7 Service Water Heating** (Domestic Hot Water, Pools)
- **Section 8 Power** (Transformer Efficiencies, 50% of outlets on auto control, etc.)
- **Section 9 Lighting** (Lighting Power Densities, Controls, etc.)
- **Section 10 Other Equipment** (Motor Efficiencies, Booster Pumps, Elevators, etc.)

2015 Minnesota Commercial Energy Code

{optional ASHRAE Standard 90.1-2010}

ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings :

New Buildings: **Path #2:** ASHRAE 90.1-2010 Performance Path



- **Section 11 Energy Cost Budget Method** (Use when cannot meet prescriptive)
 - Compliance based on proposed building (*proposed design*) to have an annual energy cost that is less than *standard reference design (a.k.a. energy cost budget)*.
- **Section 5.4 Mandatory Provisions** (Insulation, Fenestration/Doors, Air Leakage/Barrier, Vestibules)
- **Section 6.4 Mandatory Provisions** (HVAC Equipment Efficiencies, Controls, Insulation, etc.)
- **Section 7.4 Mandatory Provisions** (Service Water Heating Equipment Efficiencies, etc.)
- **Section 8.4 Mandatory Provisions** (Feeder Voltage Drops, 50% of Outlets on Auto Control, etc.)
- **Section 9.4 Mandatory Provisions** (Lighting Controls/Functional Testing, Exterior Lighting Power Densities, etc.)
- **Section 10.4 Mandatory Provisions** (Motor Efficiencies, Booster Pumps, Elevators, etc.)

2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Zone 6

U-Factor Alternative

2012 IECC

Assembly \leq U-Factor

(See values for typ. assemblies in Normative Appendix A in ASHRAE 90.1)

ASHRAE Standard 90.1-2010

Assembly \leq U-Factor

Roofs

All Other

Group R

Nonresidential

Residential

Semi-heated (AHJ)

Insulation above deck

R-30c.i.

R-30c.i.

R-20c.i.

R-20c.i.

R-10c.i.

Metal building

R-25+R-11LS

R-25+R-11LS

R-13+R-19, T.S.B.

R-13+R-19, T.S.B.

R-16

Attic and other

R-49

R-49

R-38

R-38

R-30

Walls Above Grade

Mass

R-13.3c.i.

R-15.2c.i.

R-13.3c.i.

R-15.2c.i.

R-5.7c.i.

Metal buildings

R-13+R-13c.i.

R-13+R-13c.i.

R-13+R-5.6c.i.

R-13+R-5.6c.i.

R-13

Metal framed

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13

Wood framed/other

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13+R-7.5c.i.

R-13

or R-20+R-3.8c.i.

R-20+R-3.8c.i.

Walls Below Grade

Below-grade wall

R-7.5c.i.

R-7.5c.i.

R-7.5c.i.

R-7.5c.i.

No insulation

Floors

Mass

R-12.5c.i.

R-12.5c.i.

R-12.5c.i.

R-14.6c.i.

R-4.2c.i.

Joist/framing

R-30

R-30 (R-38 steel)

R-30

R-38

R-19

Wood-Framed and Other

N/A

N/A

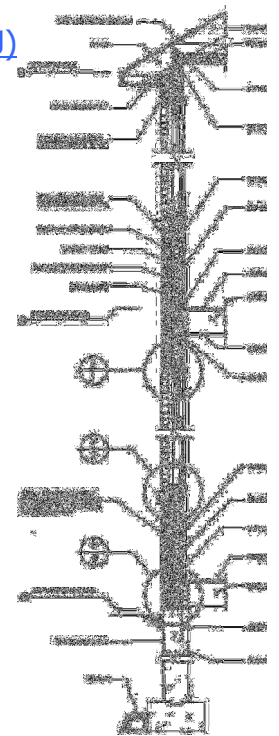
R-30

R-30

R-19

Note: LS = Linear System – A continuous uninterrupted membrane below the purlins with unfaced uncompressed insulation above between purlins

Note: T.S.B. = Thermal spacer block is required



2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Zone 6

2012 IECC

ASHRAE Standard 90.1-2010

Vertical Fenestration

All Buildings

Nonresidential

Residential

Semi-heated (AHJ)

U-factor (Area-Weighted)

Fixed fenestration

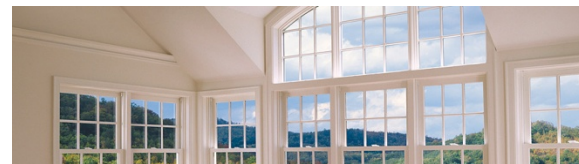
U-0.36

Operable fenestration

U-0.43

Entrance Doors

U-0.77



Nonmetal framing (all)

U-0.35

U-0.35

U-0.65

Metal framing (curtainwall/storefront)

U-0.45

U-0.45

U-0.60

Metal framing (entrance door)

U-0.80

U-0.80

U-0.90

Metal framing (all other)

U-0.55

U-0.55

U-0.65

Solar Heat Gain Coefficient

SHGC-0.40

SHGC-0.40

SHGC-0.40

SHGC-N/A

Note: see both energy codes for SHGC adjustment multipliers due to permanent building projections.

Max Vertical Fenestration:

30%

40%

40%

40%

(of gross wall area)

----- See Street Level Exceptions -----

Max Vertical Fenestration

With 50% Daylight Zones:

40%

N/A

N/A

N/A

2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

<u>Building Envelope</u>	<u>2012 IECC</u>	<u>ASHRAE Standard 90.1-2010</u>
<u>Trade-Off Option:</u>	N/A	Yes

- The *envelope performance factor* of the proposed building is less than or equal to the *envelope performance factor* of the budget building.
- Only considers *building envelope components* (mechanical/electrical system variations are not considered).
- Must also satisfy these Sections of ASHRAE Standard 90.1-2010:
 - [Section 5.1 General](#) (Space-Conditioning Categories, Envelope Alterations, Climate)
 - [Section 5.4 Mandatory Provisions](#) (Fenestration/Doors, Air Leakage/Barrier, Vestibules)
 - [Section 5.7 Submittals](#) (Authority Having Jurisdiction)
 - [Section 5.8 Product Information and Installation Requirements](#) (Labeling, etc.)
 - [Normative Appendix C: Methodology for Building Envelope Trade-Off Option](#)



2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Air Leakage

2012 IECC

ASHRAE Standard 90.1-2010

Continuous Air Barrier

Required

Required

Compliance Options:

- Air Barrier Materials Yes
- Air Barrier Assemblies Yes
- Building Test: ASTM E779 Yes

Yes

Yes

N/A

Vestibules

Required

Required

Distance between doors

Not specified

Must be 7 Ft. minimum

Self-closing devices

Required

Required

Simultaneous opening

Not allowed

Not allowed



2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Mechanical

Equipment Efficiencies

	<u>2012 IECC</u>	<u>ASHRAE Standard 90.1-2010</u>
2 Ton thru-wall A/C	12.0 SEER	12.0 SEER
2 Ton ductless A/C	13.0 SEER	13.0 SEER
2 Ton water source heat pump	12.0 EER	12.0 EER
20 Ton gas rooftop unit	9.9 IEER	9.9 IEER
100 Ton evaporative rooftop	11.7 IEER	11.7 IEER
250 MBH Gas hot water boiler	80% AFUE	80% AFUE
200 Ton air cooled chiller	9.562 EER (Full Load) 12.75 EER (IPLV)	9.562 EER (Full Load) 12.75 EER (IPLV)



EER: Energy efficiency ratio, (output cooling ÷ input electrical power), (higher number = more efficient)

SEER: Seasonal energy efficiency ratio (cooling season output ÷ season input elec.), (higher number = more efficient)

IEER: Integrated energy efficiency ratio (evaluates multiple part load conditions), (higher number = more efficient)

AFUE: Annual fuel utilization efficiency (represents actual season-long, average efficiency), (higher = more efficient)

IPLV: Integrated part load value (derived from equipment efficiency while operating at part load capacity conditions)

2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Mechanical

2012 IECC

ASHRAE Standard 90.1-2010

Duct Construction, Duct/Pipe Insulation

Similar for both codes

Control Systems (Air/hydraulic reduce energy)

VFD, time-clock, setback, optimal s/s

Similar for both codes

Ventilation Systems

- Demand control ventilation (Applies to spaces >500 SF)

~25 people/1,000 SF

>40 people/1,000 SF

- Energy recovery ventilation (Required when outdoor air >30%)

Similar for both codes

Cooling System Economizers

(Required on all cooling systems with fans)

Similar for both codes

Service Water Heating (Domestic hot water)

(Efficiencies, pools, pool covers)

Similar for both codes

Mechanical Commissioning

- Where required
 - Exceptions
- Commissioning plan

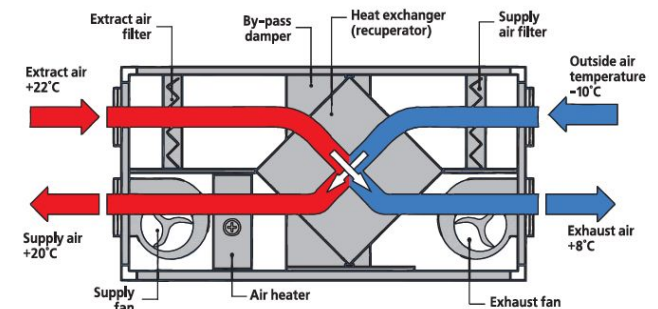
≥480 MBH cool/600 MBH heat
Dwelling units/Hotels/Motels

Yes

All Buildings

None

>50,000 SF conditioned area



2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Electrical

2012 IECC

ASHRAE Standard 90.1-2010

Feeder/Circuit Voltage Drop

2% / 3%

2% / 3%

Internally Illuminated Exit Signs

≤5 watts per side

≤5 watts per side

Automatic Receptacle Control

N/A

50% private/open offices & computer classes

Tandem Wiring (odd bulbs ballast wiring)

Yes

N/A

Separate Metering for Dwelling Units

Yes

N/A

Interior Lighting Power Compliance:

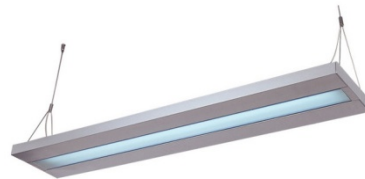
- Building area method (watts/SF) Similar for both codes with some variation in watts/SF
- Space-by-space method (watts/SF) Similar for both codes with some variation in watts/SF

(Exceptions exist if in addition to general lighting with separate control)

Lighting Controls

Similar for both codes with some variations and exceptions

- Automatic time switch
- Dual-level switching
- Occupancy sensors
- Daylight zone controls



Exterior Lighting Power & Control

Similar for both codes with exceptions

Functional Testing

Yes (see Commissioning)

Yes (see Lighting)

(Occupant sensors, daylighting/photo)

2015 Minnesota Commercial Energy Code

Comparison of Prescriptive Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Additional Items

2012 IECC

ASHRAE Standard 90.1-2010

Additional Efficiency Options

Choose one of the following:

- Efficient HVAC performance
(Increased equipment efficiencies)
- Efficient lighting systems
(Reduced lighting watts/SF)
- On-site renewable energy
(solar, wind, waves, tides,
landfill gas, biomass, geothermal)

Required

N/A



Other Equipment

- Service water booster pump controls
- Elevator lighting & ventilation

N/A

Required



2015 Minnesota Commercial Energy Code

Comparison of Performance Requirements

Between 2012 IECC and ASHRAE Standard 90.1-2010

Performance Path

Proposed Building Energy

2012 IECC

≤ 85% of Reference

ASHRAE Standard 90.1-2010

≤ 100% of Reference

- The performance path analysis allows the **design team to customize** all aspects of the proposed building including architectural, mechanical, and electrical.
- Compliance requires that the proposed building design be shown to have an annual energy cost that is **less than or equal to the annual energy cost of the standard reference design** (a.k.a. budget design).
- Both 2012 IECC and ASHRAE Standard 90.1-2010 provide **detailed definition for the standard reference design** (a.k.a. budget design) to be used in the calculations for comparison with the proposed building design.
- **Purchased energy rates** for electricity, gas, etc. shall be taken from a source approved by the code official.
- The **simulation program** used shall be a computer-based program for the analysis of energy consumption in buildings (a program such as but not limited to DOE-2 or BLAST).
- **Documentation** showing the energy usage of the proposed building design as compared with the reference building design, the energy-related features included, and the input and output from the simulation program shall be submitted to the code official.

2015 Minnesota Commercial Energy Code

Conclusion:



In most situations, the optional **ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings** will facilitate increased design flexibility as compared with the **2012 International Energy Conservation Code**

2015 Minnesota Commercial Energy Code



Questions?

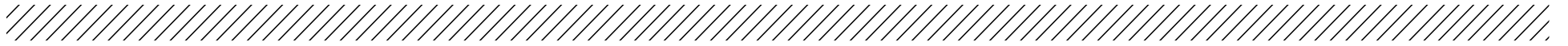
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This concludes The American Institute of Architects Continuing Education
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