25517
25517

Key Items for Site Inspection: 2018 IECC Residential

10.13.2020

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Providing effective energy strategies for buildings and communities

ICC Preferred Provider # 2396
ICC Course # 25592

SEDAC is a Preferred Education Provider with the International Code Council (ICC). Credits earned on completion of this program will be reported to ICC for ICC members. Certificates of Completion will be issued to all participants.

ICC PREFERRED EDUCATION PROVIDER

This workshop is approved for 1.5 LU/HSW CES credits from the American Institute of Architects (AIA). Credits earned on completion will be reported for AIA members.

AIA Continuing Education Provider

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Learning Objectives

1. Understand energy code site inspection practices for residential buildings.
2. Learn which measures generally are not meeting energy code requirements during the construction phase.
3. Demonstrate how to comply with energy code requirements at the site inspection stage.

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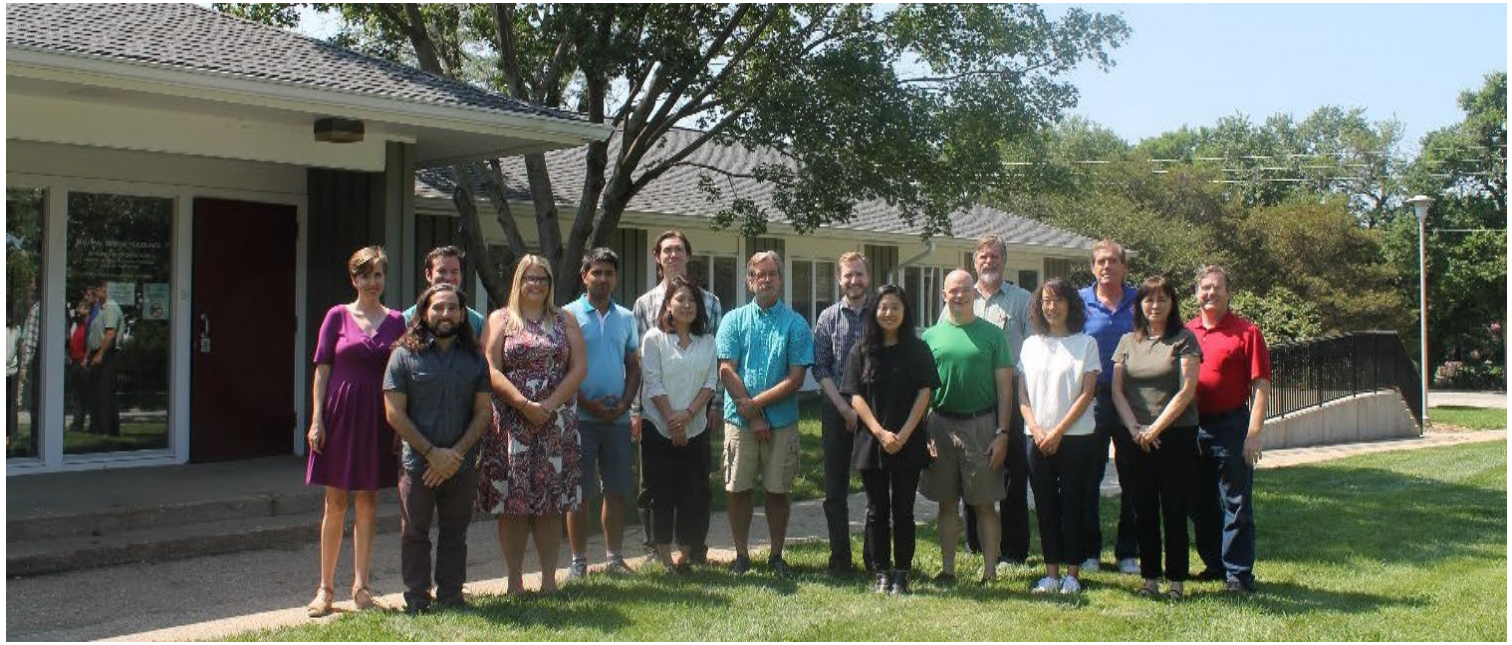
Who We Are

The Smart Energy Design Assistance Center (SEDAC) is an applied research program at University of Illinois.

Our mission: Reduce the energy footprint of Illinois and beyond.



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SEDAC is the Illinois Energy Conservation Code Training Provider

This training program is sponsored by
Illinois State Energy Office

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Energy Code Training Program

- Technical support
  energycode@sedac.org
  800.214.7954
- Online resources at
  sedac.org/energy-code
- Workshops
- Webinars
- Online on-demand training modules

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www.smartenergy.Illinois.edu/energy-code/

TRAINING AND SUPPORT SERVICES

Workshops

Webinars

Online courses

Technical support

ENERGY CODE RESOURCES

What is the Illinois Energy Conservation Code?

Frequently asked questions

Useful websites

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Access to 2018 IECC, Illinois Amendments & Chicago Energy Conservation Code

https://codes.iccsafe.org/content/IECC2018P4

https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Documents/2018%20Illinois%20Specific%20Amendments%20with%20Modifications%20Shown.pdf

CHAPTER 1 [CE]
SCOPE AND ADMINSTRATION

SECTION C101
SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the ~~*International Energy Conservation Code* of [NAME OF JURISDICTION] and shall be cited as such.~~ *Illinois Energy Conservation Code* or "this Code" and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600.Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2018 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective July 1, 2019.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600.Subpart C:

This Part, all additional requirements incorporated within Subpart C (including the 2018 International Energy Conservation Code, including all published errata and excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB, are effective July 1, 2019.

C101.1.2 Adoption. The Board shall adopt

C101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population, distribution, geography and climate of the Sate and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. ~~*Residential buildings* shall meet the provisions of IECC—Residential Provisions.~~ *Commercial buildings* shall meet the provisions of ~~IECC-Commercial Provisions~~ the *Illinois Energy Conservation Code* covered by 71 Ill. Adm. Code 600.Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

1. Compliance forms published in the ASHRAE 90.1 User's Manual; or
2. Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
3. Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or
4. The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325].

https://codes.iccsafe.org/content/document/1491

ARTICLE XIII.
CHICAGO ENERGY CONSERVATION CODE

SECTION 1. The Municipal Code of Chicago is hereby amended by inserting a new Title 14N, as follows:

TITLE 14N ENERGY CONSERVATION CODE

PART I – COMMERCIAL PROVISIONS

CHAPTER 14N-C1 SCOPE AND PURPOSE

14N-C1-C001 Adoption of the commercial provisions of the International Energy Conservation Code by reference.

The commercial provisions of the *International Energy Conservation Code*, 2018 edition, second printing, and all erratum thereto identified by the publisher (hereinafter referred to as "IECC-CE"), except Appendix CA, are adopted by reference and shall be considered part of the requirements of this title except as modified by the specific provisions of this title.

If a conflict exists between a provision modified by this title and a provision adopted without modification, the modified provision shall control.

14N-C1-C002 Citations.

Provisions of IECC-CE which are incorporated into this title by reference may be cited as follows:

14N-C[IECC-CE chapter number]-[IECC-CE section number]

14N-C1-C003 Global modifications.

The following modifications shall apply to each provision of IECC-CE incorporated into this title:

1. Replace each occurrence of "*International Codes*" with "*Chicago Construction Codes*."
2. Replace each occurrence of "*International Building Code*" with "*Chicago Building Code*."
3. Replace each occurrence of "ASME A17.1" or "ASME A17.1/CSA B44" with "the *Chicago Conveyance Device Code*."
4. Replace each occurrence of "NFPA 70" with "the *Chicago Electrical Code*."

SEDAC 2020/2021 Series Workshops

Key items for plan review & Inspection: 2018 IECC

- Residential Site inspection: Today & March 9th
- Commercial Plan Review: November 10th & April 13th
- Commercial Site inspection: December 8th & May 11th
- Code Panel Discussion: January 12th & June 15th
- Residential Plan Review: February 9th

Registration: https://smartenergy.illinois.edu/energy-code-training/webinars

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SEDAC 2020/2021 Series Webinars

Key items for plan review & Inspection: 2018 IECC

- Commercial Envelope: October 28th
- Case Study/Lessons Learned: January 27th
- Commercial Lighting: March 24th
- Commercial HVAC: May 26th

Registration: https://smartenergy.illinois.edu/energy-code-training/webinars

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When Does the Code Apply?

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Building Permit Application Triggers Energy Code

2015 International Residential Code, Chapter 1, Section 105, 105.2 Work *Exempt* from Permit – subject to local codes but generally, the following list applies:

- Building:
  - 1 story detached accessory structures <200sf; finish work; window awnings <54" extension and without supplemental support; moveable fixtures (cases, racks, counters, etc…)
  - Pools less than 24" deep
- Electrical:
  - Cord-and-plug temporary decorative lighting, Replacement of lamps.
- Gas/Mechanical:
  - Portable equipment; piping within a permitted piece of equipment; replacement of parts that don't alter or make unsafe existing equipment; self-contained refrigeration ≤10lb of refrigeration
- Plumbing:
  - Minor leak repair (no replacement of materials); clearing of blockages.

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Am I in a Residential Building?

- A detached one-family or two-family dwelling or any building that is 3 stories or less above grade (4 or less in Chicago) that contains multiple dwelling units, in which the occupants reside on a primarily permanent basis.
- Examples: Townhouse, row house, apartment house, convent, monastery, rectory, fraternity or sorority house, dormitory, rooming house

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#1. R105.2.1 Footing and foundation

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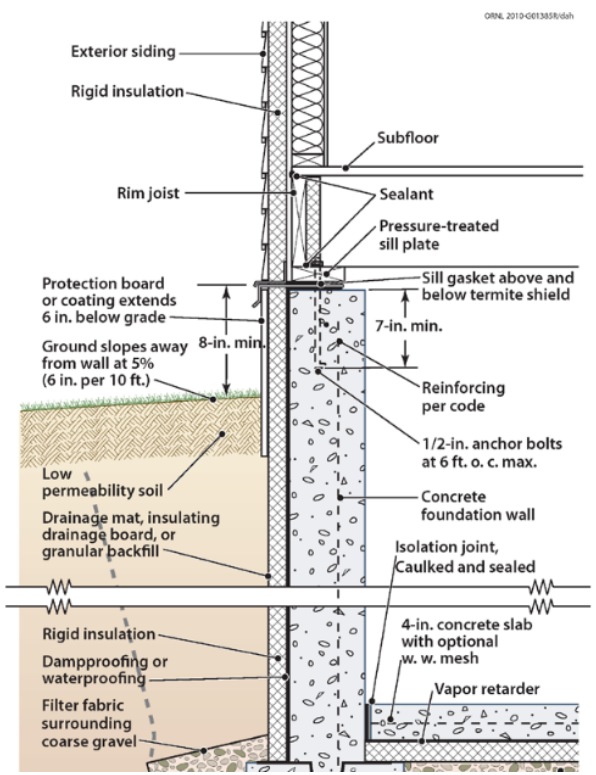
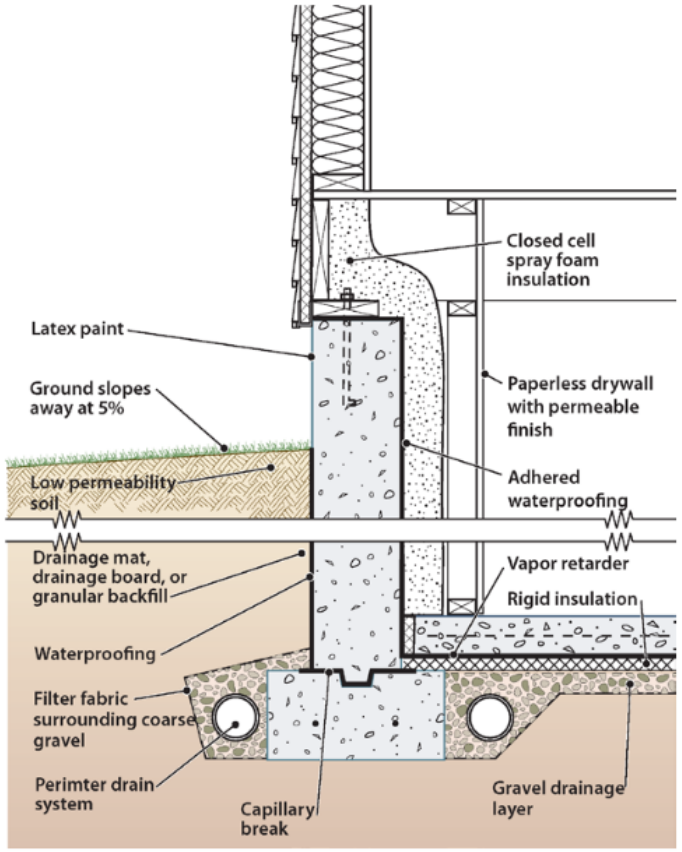
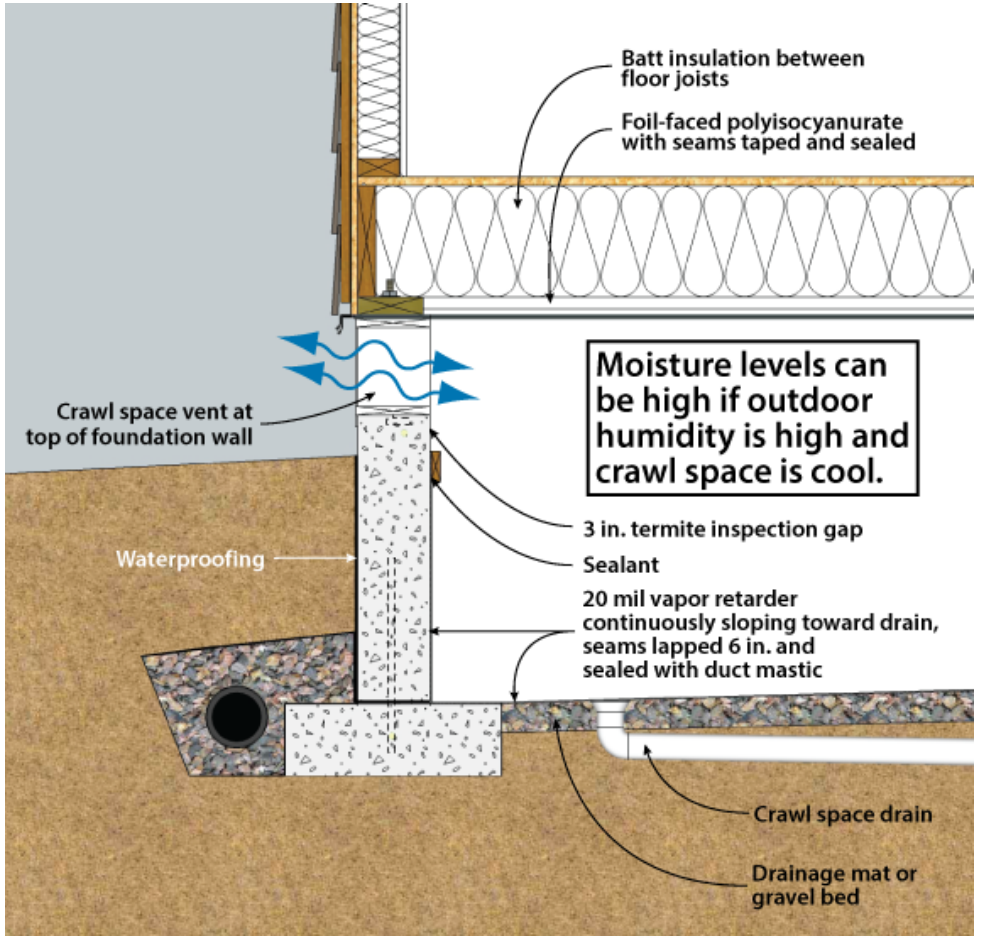
R105.2.1 Footing and foundation

- Checking R-value, location, thickness, depth of burial and protection of insulation







https://foundationhandbook.ornl.gov/handbook/

R105.2.1 Footing and foundation

Code Sections	Prescriptive Value	Design Value or N/A	Plan Review	Inspection
c. **Insulation and Fenestration Criteria** (R402.1.2) – Requirements based of (TableR402.1.2) for Climate Zone	Wood Frame Wall R-Value: ≧20 or 13+5[h] OR U-Factor: ≦0.060 **Zone 4 or 5**		☐	
	Mass Frame Wall R-Value: ≧8/13 ≧13/17 U-factor ≦0.098 ≦0.082 **Zone 4** **Zone 5**		☐	
	Floor R-Value: ≧ 19 ≧ 30[g2] U-factor ≦ 0.047 ≦ 0.033 **Zone 4** **Zone 5**		☐	
	Basement Wall R-Value: ≧ 10/13 OR U-Factor: ≦ 0.059 **Zone 4 or 5**		☐	
	Slab R-Value & Depth: ≧10, 2 ft Heated slab: R-5 under full slab **Zone 4 or 5**		☐	
	Crawl Space Wall R-Value R-Value ≧ 10/13 ≧ 15/19 U-factor ≦ 0.065 ≦ 0.055 **Zone 4** **Zone 5**		☐	

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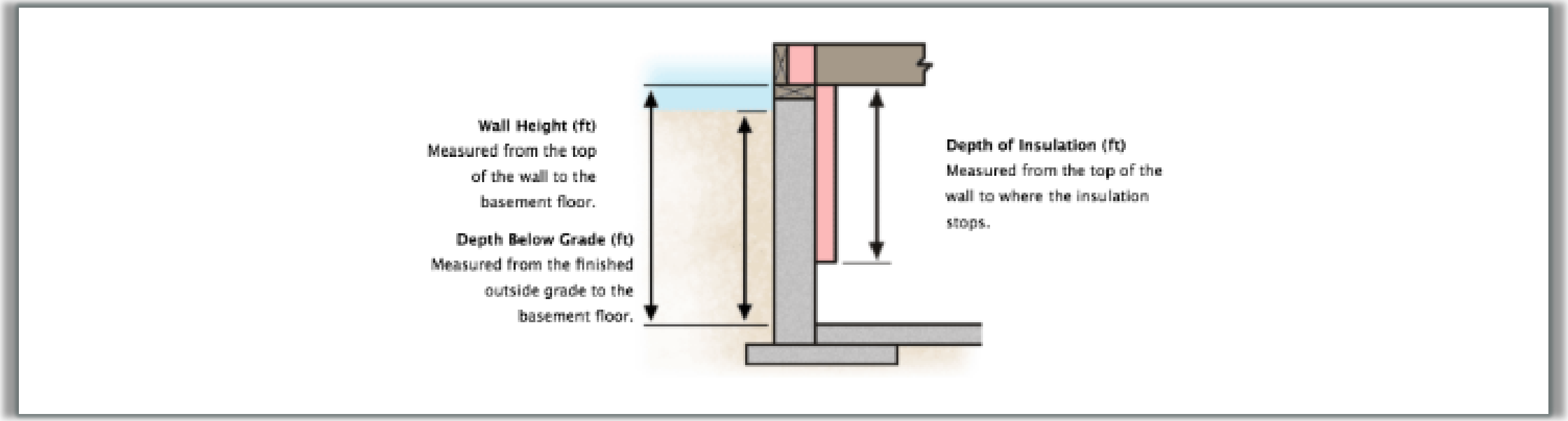
Insulation Depth



- Foundation wall height is from top of sill plate to top of finished floor (does not include rim board!)
- Depth below grade is from grade to top of finished floor.
- Insulation depth is from top of sill plate to bottom edge of insulation (does not include rim board)
- Rim board is included in above grade wall area.

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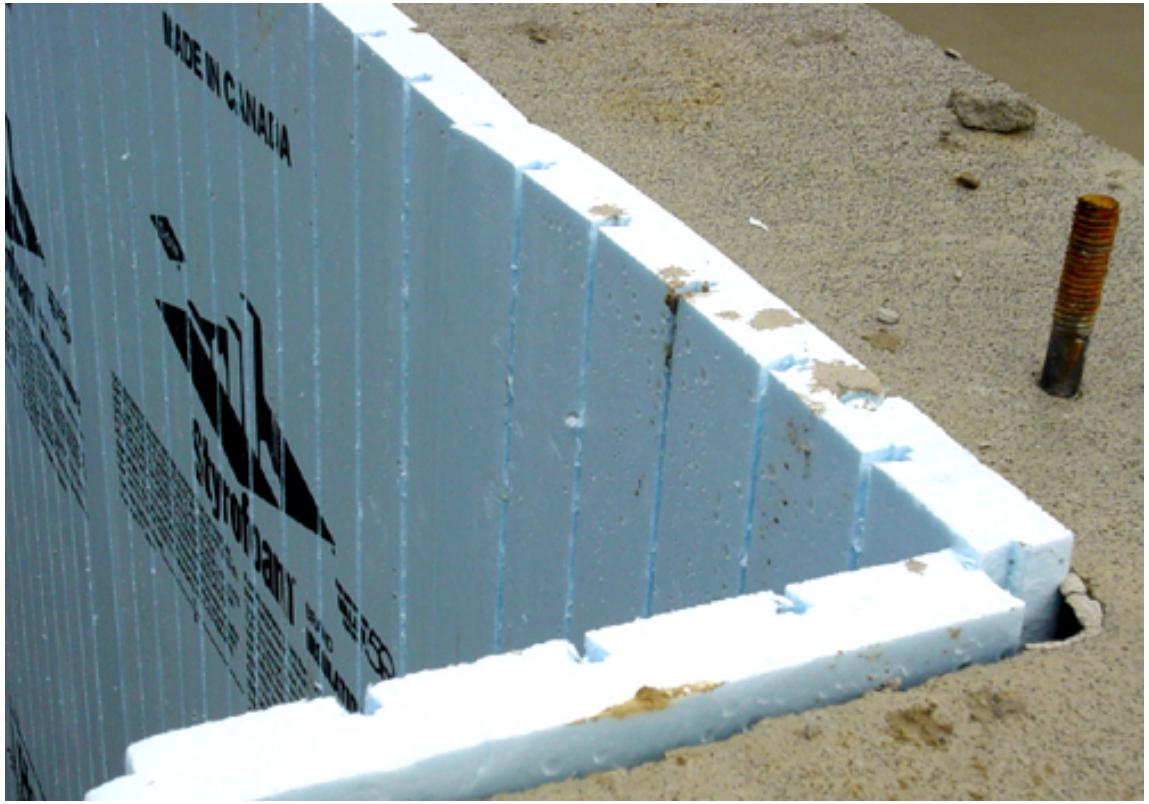
R105.2.1 Footing and foundation

- Checking location
  - Interior vs. exterior
  - Cavity vs. continuous



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R105.2.1 Footing and foundation

- Checking R-value
  - Quantity
  - Does it match the design?

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R105.2.1 Footing and foundation

- Checking thickness
  - Is the insulation compressed?
  - Does it fill the cavity

* Delivers R-18 value when in 5.5” cavity per spec sheet

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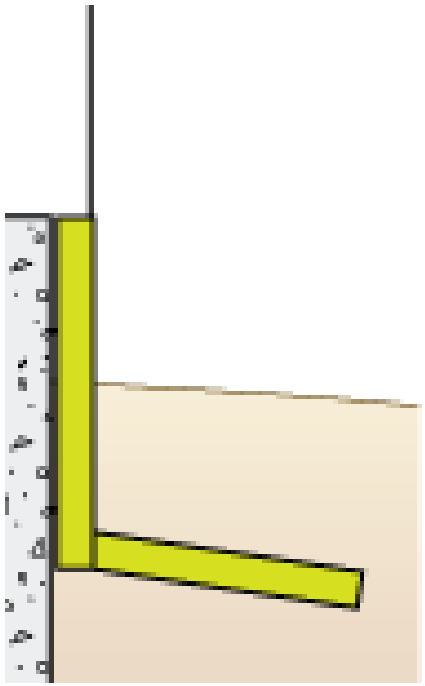
R105.2.1 Footing and foundation

- Checking depth of burial
  - Does it go down far enough? (2’, 4’, 10’, within 6” of basement slab, etc.)
  - Part may be horizontal



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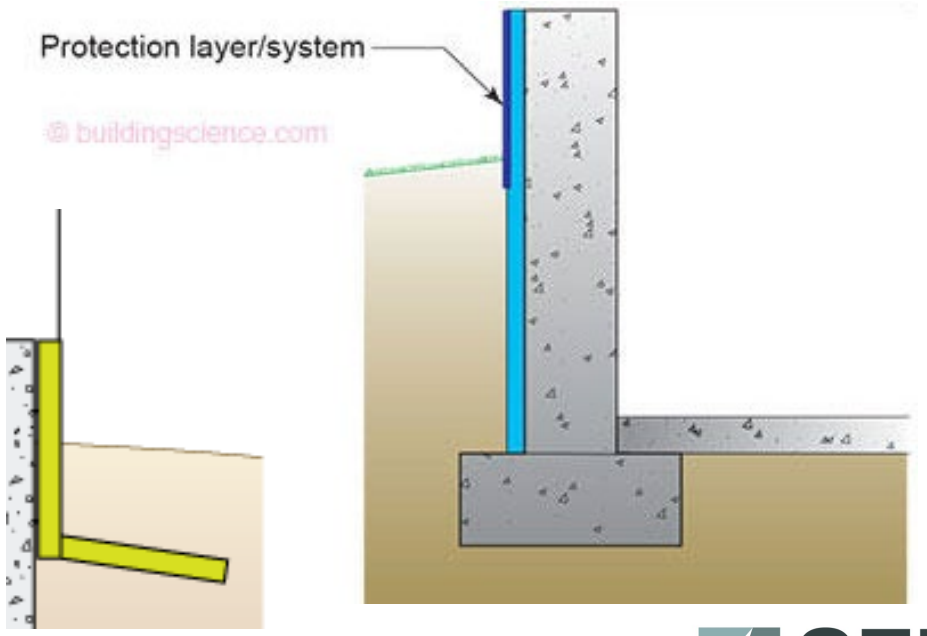
R105.2.1 Footing and foundation

- Checking protection of insulation
  - Insulation must be protected against compression, damage, UV, or fire.
  - Horizontal insulation must be at least 10” below ground



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#2. R105.2.2 Framing and rough-in

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R105.2.5 Framing and rough-in

- Can be two parts – Framing structural & air sealing, followed by insulation inspection
- Can also be single inspection, depending on building department

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R105.2.5 Framing and rough-in

- Checking types of insulation and corresponding R-value and location and proper installation, fenestration properties such as U-factor and SHGC and proper installation, and air leakage controls

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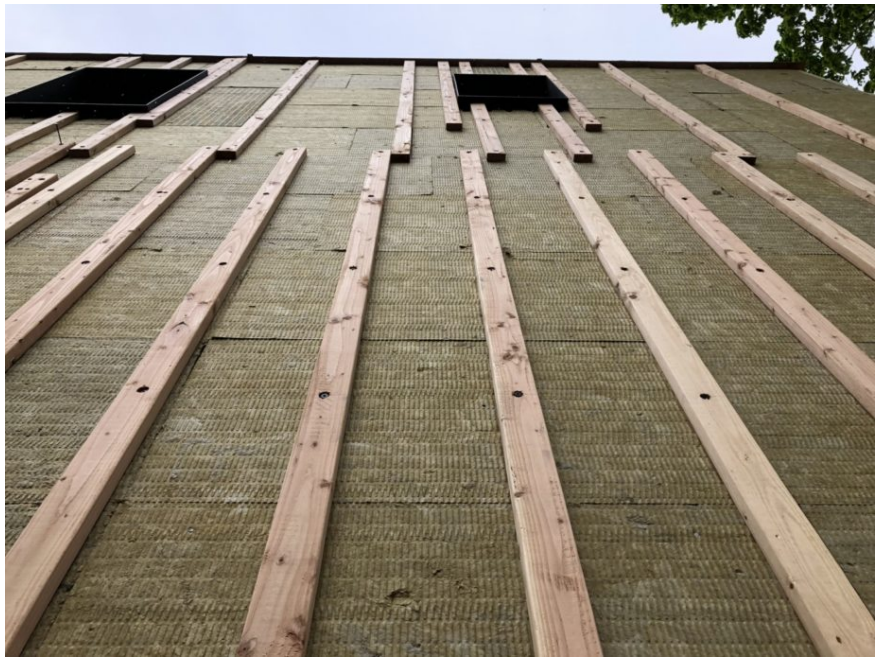
R105.2.5 Framing and rough-in

- Checking types of insulation
  - May be different for different locations
  - Does it match design?
  - If not, is the insulation supposed to be the vapor barrier?



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R105.2.5 Framing and rough-in

- Checking corresponding R-value
  - Does it match the design (higher R-value is okay)
  - Proper depth of insulation?
  - Required depth gauges? (every 300 SF minimum and affixed to trusses or joists)
  - Required certificate signed and posted for SPF or blown in insulation

Insulation Certificate

Spray foam type: Closed Cell

Thickness: 3.5”

R-value total: R-21

Signature: *Signed Signature*

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R105.2.5 Framing and rough-in

- Checking location
  - Attic floor vs. roof
  - Continuous vs. cavity

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R105.2.5 Framing and rough-in

- Checking proper installation
  - Fills the cavity
  - Uncompressed

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R105.2.5 Framing and rough-in

- Checking fenestration properties such as U-factor and SHGC and proper installation, and air leakage controls

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R105.2.5 Framing and rough-in

- Checking fenestration U-factor
  - Does it match the design (lower U-factor is okay)

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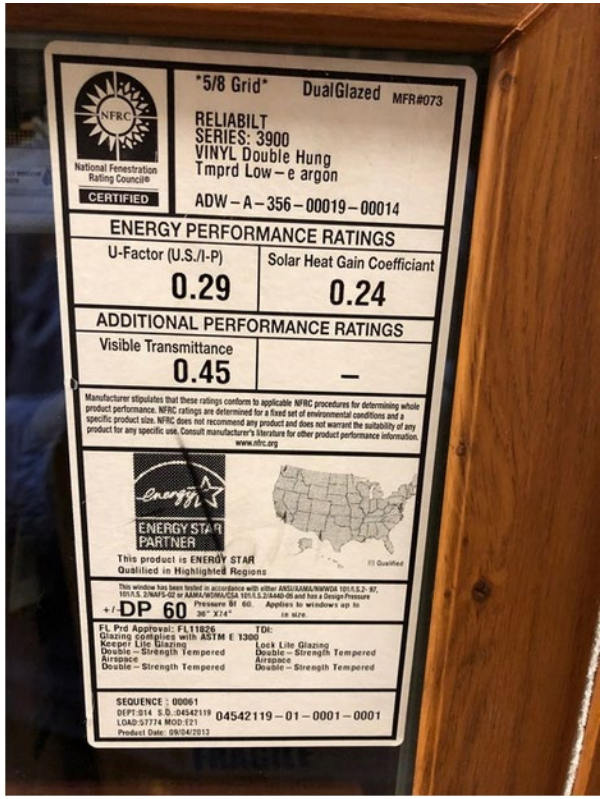
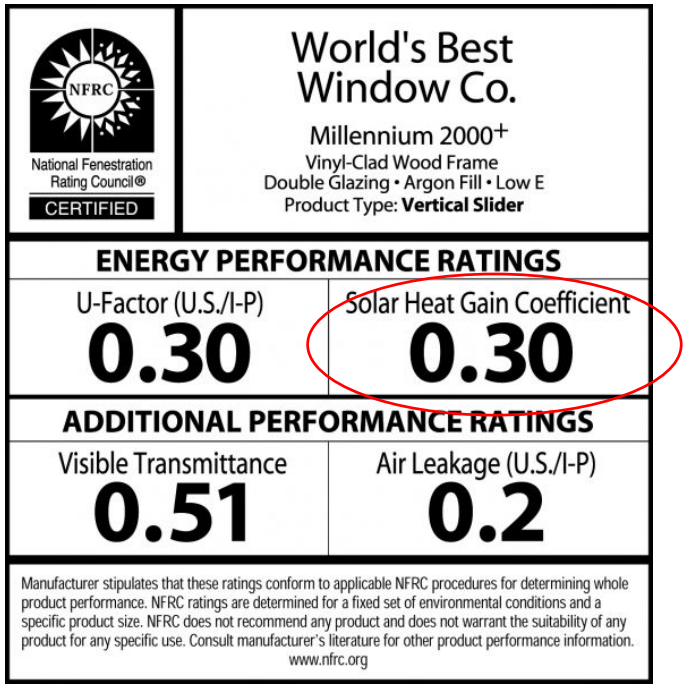
R105.2.5 Framing and rough-in

- Checking fenestration SHGC
  - Does it match the design?





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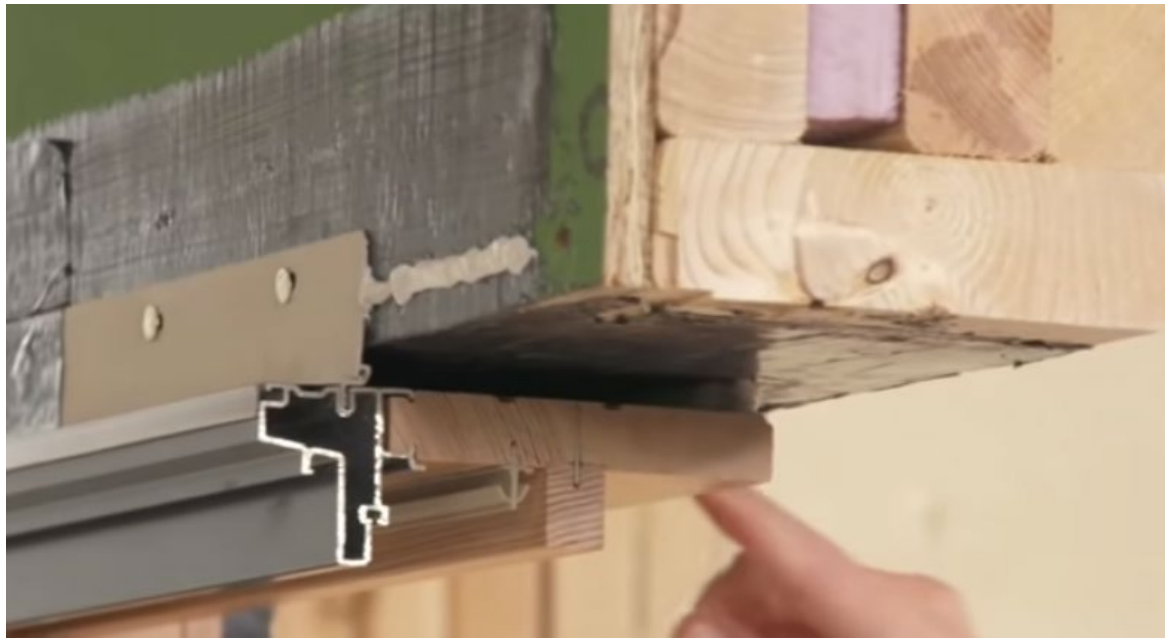
R105.2.5 Framing and rough-in

- Checking fenestration for proper installation
  - Adequate space for air sealing around window
  - Bottom flange not caulked to allow water out



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R105.2.5 Framing and rough-in

- Checking fenestration air leakage controls
    - Are the seals/brushes damaged?
    - Do the locks engage properly?

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#3. R105.2.3
Plumbing rough-in

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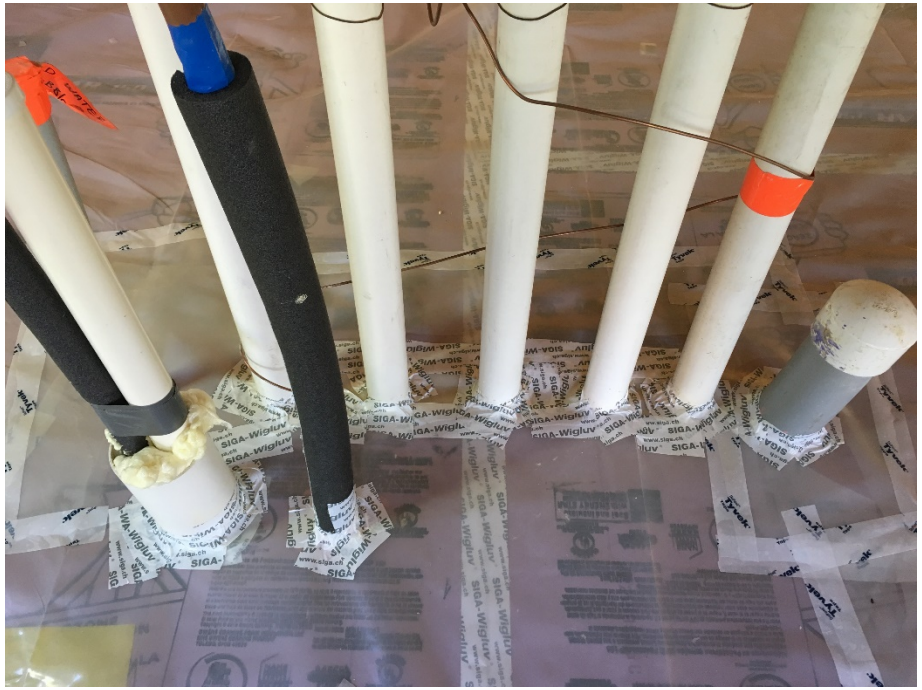
R105.2.3 Plumbing rough-in

- Types of insulation, corresponding R-value, protection, and required controls



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R105.2.3 Plumbing rough-in

- Types of insulation

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R105.2.3 Plumbing rough-in

- corresponding R-value

PIPE "R" VALUES PER SQUARE FOOT (ALL SIZES ARE NOMINAL)						
NOMINAL INSULATION I.D.	3/8" WALL*	1/2" WALL	3/4" WALL	1" WALL	1-1/2" WALL	2" WALL
3/8"	2.7	3.6	5.6	8.5	14.6	20.4
1/2"	2.5	3.4	5.4	7.9	13.5	18.9
5/8"	2.5	3.3	5.4	7.5	12.8	17.8

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R105.2.3 Plumbing rough-in

- protection

WireCare

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R105.2.3 Plumbing rough-in

- required controls

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R403.8 Systems serving multiple units

- Service Water Heating or HVAC
- Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the IECC – Commercial Provisions instead of R403

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#4. R105.2.4
Mechanical rough-in

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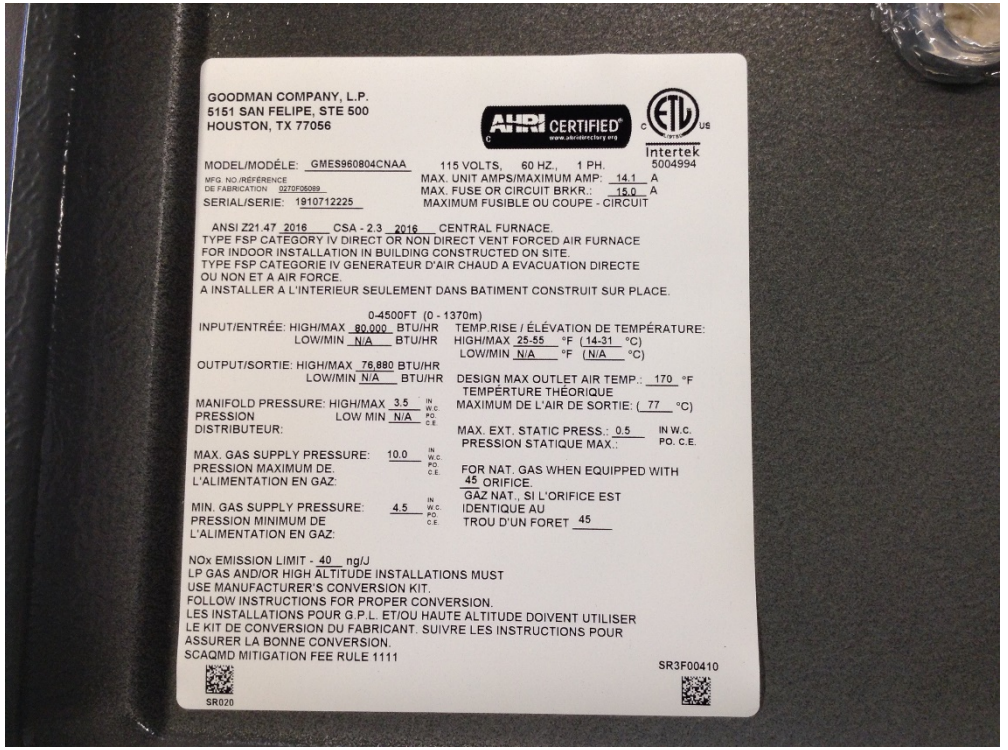
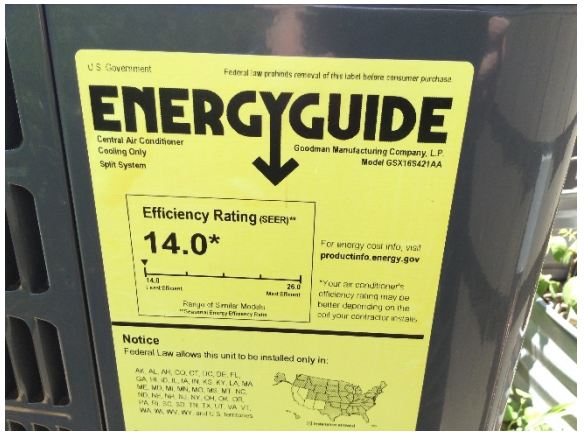
R105.2.4 Mechanical rough-in

- HVAC equipment type, size, efficiency, required controls, system insulation, and corresponding R-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation, and minimum fan efficiency





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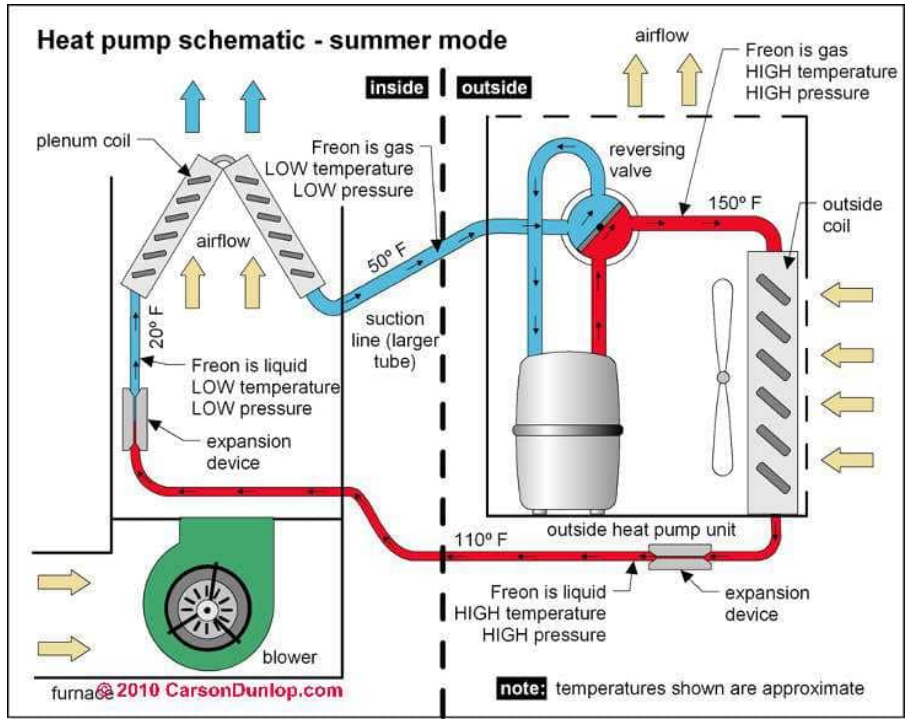
R105.2.4 Mechanical rough-in

- HVAC equipment type
  - Air conditioner vs. heat pump
  - Electric heat vs. Gas backup



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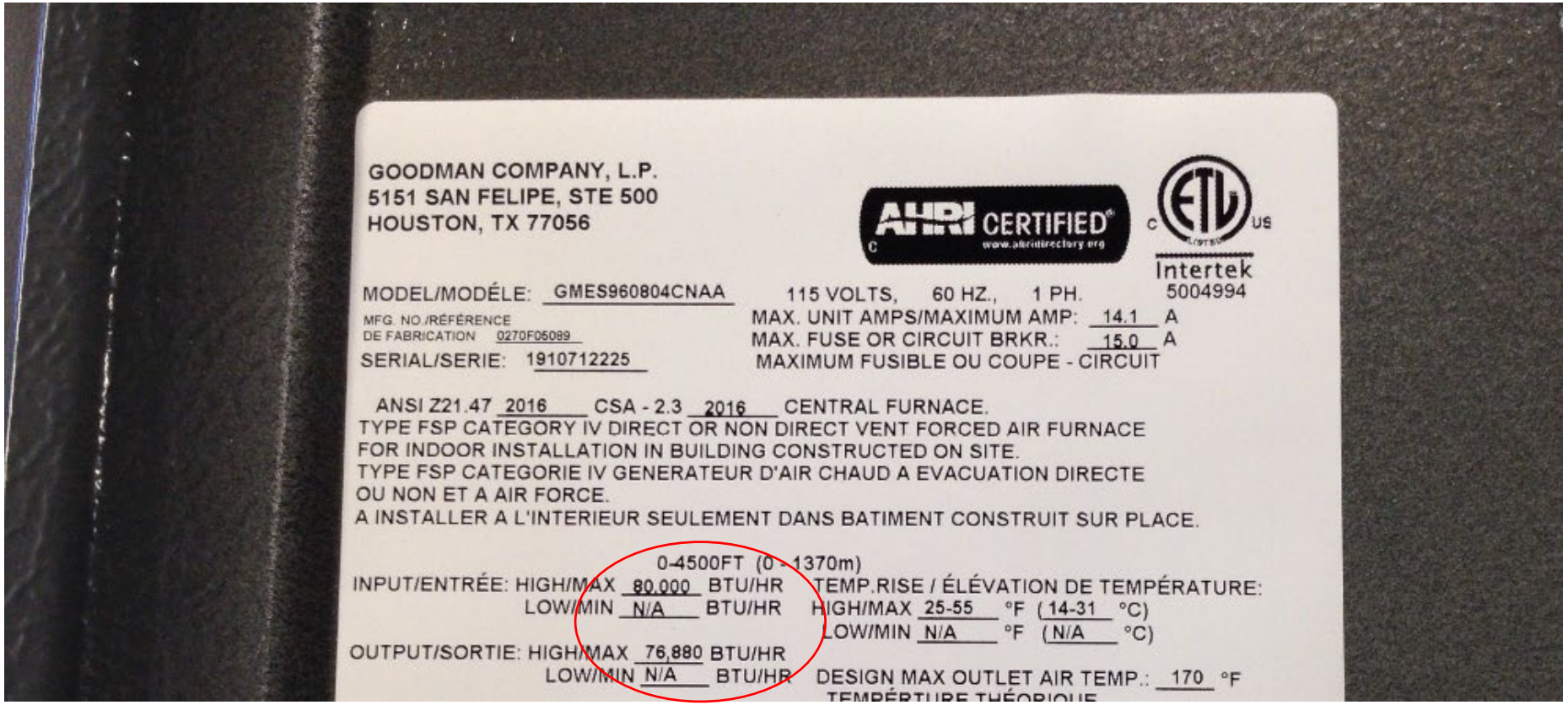
R105.2.4 Mechanical rough-in

- HVAC equipment size
  - Does it match the design?
  - Larger or smaller is a problem



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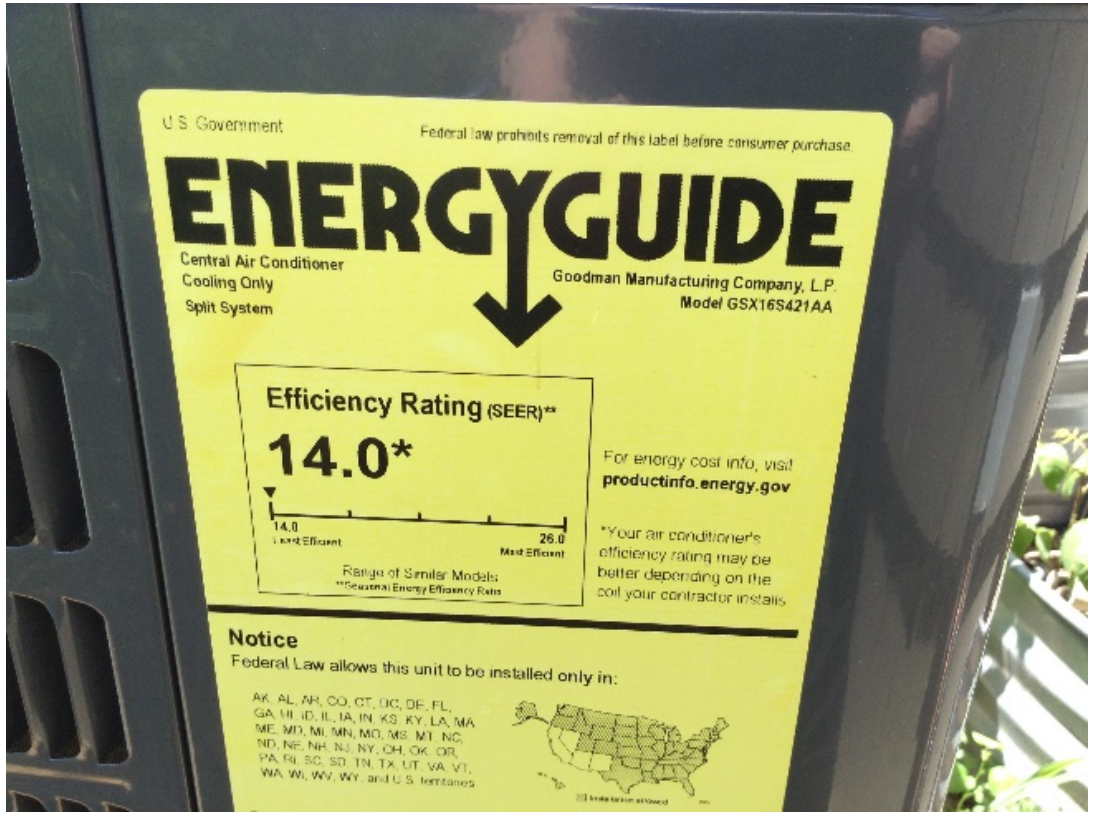
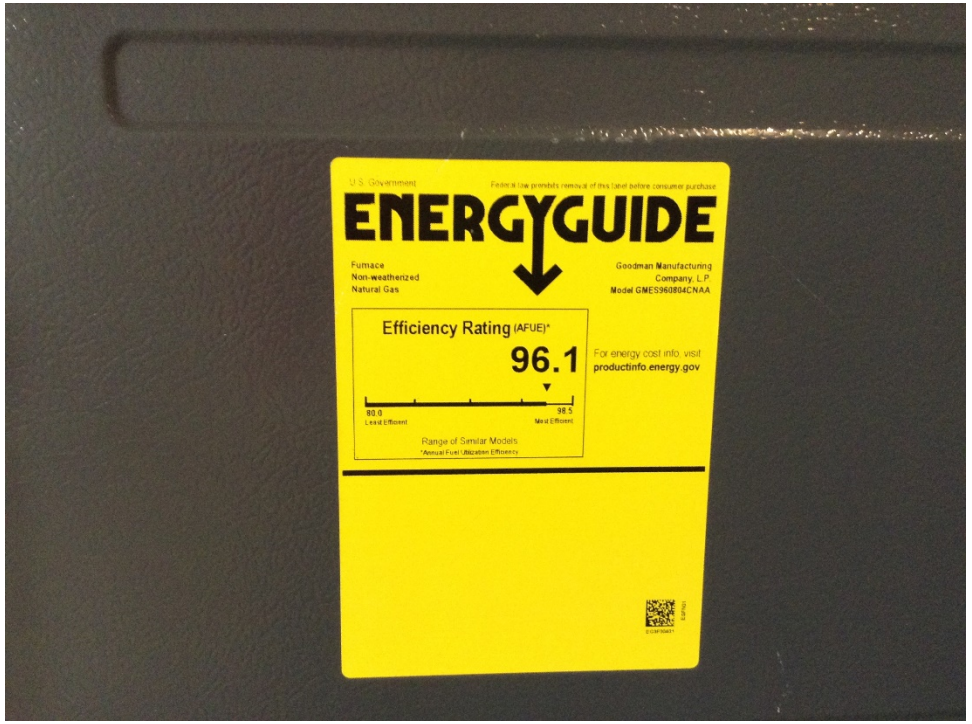
R105.2.4 Mechanical rough-in

- HVAC equipment efficiency
  - Should match design (higher is fine)





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R105.2.4 Mechanical rough-in

- HVAC equipment required controls
  - Damper controls?
  - Temperature controls?
  - Run time controls (for ventilation if used)?

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R105.2.4 Mechanical rough-in

- HVAC system insulation
    - Duct insulation where outside thermal envelope?

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R105.2.4 Mechanical rough-in

- HVAC system insulation R-value
  - Does it meet design values?

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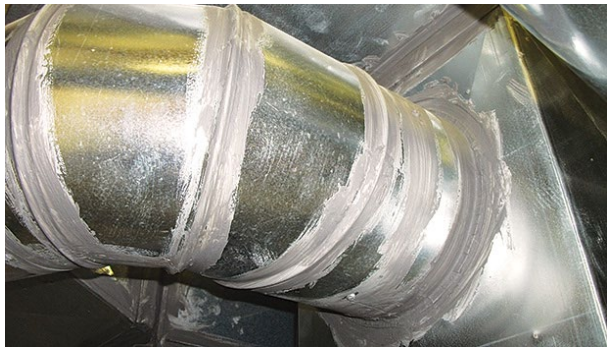
R105.2.4 Mechanical rough-in

- HVAC system air leakage control
  - Duct sealing completed (UL tape, mastic, etc)?
  - Duct testing completed?



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R105.2.4 Mechanical rough-in

- HVAC system programmable thermostats
    - Programmable thermostat installed?

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R105.2.4 Mechanical rough-in

- HVAC system dampers
    - System dampers installed and adjustable?

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R105.2.4 Mechanical rough-in

- whole-house ventilation system/controls
  - System present?
  - Designed controls installed?

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R105.2.4 Mechanical rough-in

- Whole house ventilation fan minimum fan efficiency (cfm/watt)
  - Often not verified

Blower Performance

Model	Motor HP	Blower Size	Temp. Rise	Blower Speed	CFM @ ext. Static Pressure - in. W.C. w/Filter(s)*							
					.20	.30	.40	.50	.60	.70	.80	.90
FURNACE MODEL "A"	1/3	10 x 8	35-65	High	1518	1446	1366	1297	1219	1122	1003	834
				Med/Hi	1340	1298	1234	1182	1101	1018	903	752
				Med	1099	1084	1060	1019	952	883	783	709
				Low	942	935	896	868	829	760	651	553
FURNACE MODEL "B"	1/3	10 x 8	45-75	High	1390	1337	1270	1207	1138	1063	949	858
				Med/Hi	1230	1176	1137	1082	1012	931	838	718
				Med	1008	984	956	912	872	806	722	587
				Low	872	847	834	800	758	690	600	495
FURNACE MODEL "C"	3/4	12 x 10	35-65	High	1921	1888	1831	1759	1668	1624	1549	1445
				Med/Hi	1750	1720	1682	1661	1625	1494	1397	1327
				Med	1515	1491	1462	1421	1397	1330	1258	1185
				Med/Low	1315	1300	1255	1213	1188	1159	1103	1017
				Low	1033	982	962	652	906	851	804	721

Table R403.6.1

Fan Location	Min CFM	CFM/Watt Min.	Max. CFM
HRV/ERV	Any	1.2	Any
Range Hood	Any	2.8	Any
In-Line Fan	Any	2.8	Any
Bath/Utility Room	10	1.4	<90
Bath/Utility Room	90	2.8	Any

- Check for ECM motor if HVAC unit used for ventilation

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#5. R105.2.5 Final

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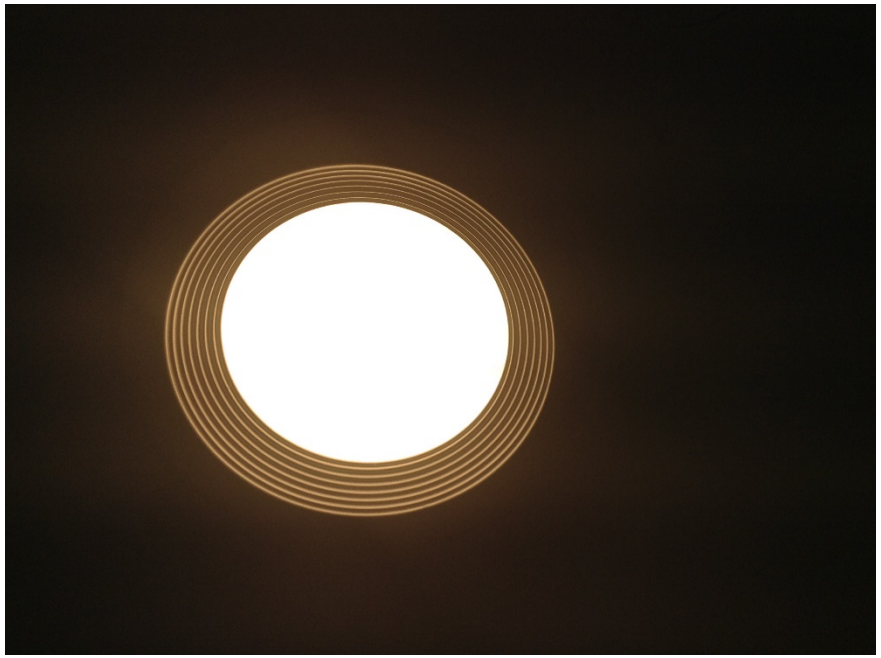
- Any required remaining building systems, equipment, and controls and their operation and the required number of high efficacy fixtures



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R402.4.1.2 Blower Door Testing

- **Mandatory** for residential construction
- Residential air leakage rate not to exceed 4 air changes per hour @ 50 pascals
- Where required by code official, testing shall be conducted by an approved third party.
- Testing performed after creation of all penetrations of the building thermal envelope

Date of Test: 11/1/2019

Customer: SEDAC
1 St Marys Ave
Champaign, IL 61920
Phone: 2173006495
Website: sedac.org

Test Results

1. Airflow at 50 Pascals: (50 Pa = 0.2 w.c.)
   2234 CFM50 (+/- 0.6 %)
   2.73 ACH50
   0.4519 CFM50/ft2 floor area
   0.3369 CFM50/ft2 surface area

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Bloor Door Testing for Multifamily Housing

Low-rise multifamily

- Air leakage not exceeding 0.25 cubic feet per minute of enclosure area (all six sides) at 50 Pascal.
- Sampling methodology available for buildings >7 units

https://www.mncee.org/blog/may-2019/research-sidesteps-obstacles-measuring-air-tightne/

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- Any required remaining building systems

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- Any required remaining equipment controls
- Any required remaining functional testing of controls and their operation

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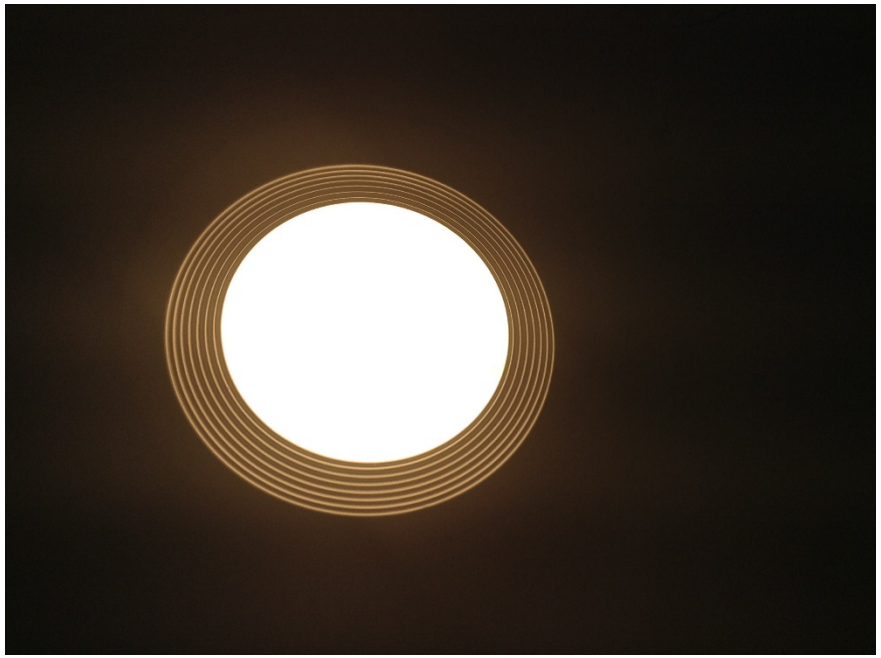
- Required number of high efficacy fixtures



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Questions?

energycode@sedac.org
800-214-7954