



# NYCECC RESIDENTIAL OVERVIEW: 2016 NYC Energy Conservation Code

Effective October 3, 2016

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**NYC**  
Buildings

*presented by*  
**Bill de Blasio, Mayor**  
**Melanie La Rocca, Commissioner**

# ACKNOWLEDGEMENTS

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## One City: Built to Last

We wish to acknowledge Mayor Bill de Blasio for his commitment to 80% reduction of Greenhouse Gas Emissions by 2050, over 2005 levels.

- A sweeping plan to retrofit public and private buildings to reduce the City's contributions to climate change.
- This makes New York the largest city to commit to the 80% reduction by 2050.
- It charts a long-term path for investment in renewable sources of energy and a total transition from fossil fuels.





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# INTRODUCTION

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Welcome to the New York City Department of Buildings Energy Code Training Modules!

**This Residential Module addresses:**

- General Code requirements and applicability for residential projects
- Technical requirements and strategies related to all aspects of residential energy efficiency, including the thermal envelope, electrical and mechanical provisions of the [2016 NYCECC](#)
- NYC DOB Energy Code Submission and Progress Inspection Requirements for residential buildings



# INTRODUCTION

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*(continued)*

**This Residential Module addresses:**

**This module addresses Energy Code requirements related to all low-rise single family and multifamily residential buildings, when 3 or less stories. Residential Energy Code also covers Group R Buildings that are 3 stories and lower.**

**Energy criteria related to R-2 and R-3 occupancies four stories and higher are covered under the NYC DOB Commercial Building Training Modules.**



# OVERVIEW: SLIDE NAVIGATION GUIDE

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Look for the following icons:



The **NYC Buildings** logo takes you to the [2016 NYCECC Training Modules](#) home page.



The **Menu** icon takes you to the main menu page within each module.



The **Attention** icon brings up Callouts with key points and additional information.



The **Links** icon takes you to related DOB web pages or other resources.



# OVERVIEW: SLIDE NAVIGATION GUIDE

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Look for the following icons:



The **Documentation** icon addresses DOB documentation issues and requirements.



The **Inspection** icon addresses DOB Progress Inspection issues and requirements.



The **Code Reference** icon refers to relevant Code sections.

The slides are enhanced with special icons that will help to focus on key points, or serve as links to external resources. The Attention icon brings up Callouts (like this one) with key points and additional information.



# ADMINISTRATIVE OVERVIEW: MODULE MENU

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| <b>1. WHAT'S NEW IN 2016 NYCECC</b> | Key Updates To Residential Sections • Current Local Laws, Rules and Buildings Bulletins   | <b>12</b> |
| <b>2. CODE APPLICABILITY</b>        | DOB Terminology • Applicability by Building Types   | <b>15</b> |
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# ADMINISTRATIVE OVERVIEW: MODULE MENU

*(continued)*

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| <b>5. AIR &amp; MOISTURE CONTROL</b>    | Air Barriers & Vapor Retarder • Air Sealing<br>• Testing • Recommended Practices                         | <b>80</b>  |
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# RESIDENTIAL CHAPTER LAYOUT

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For 2016 NYCECC

## CHAPTER R2 DEFINITIONS

- ECC R201 General
- ECC R202 General Definitions

## CHAPTER R3 GENERAL REQUIREMENTS

- ECC R301 Climate Zones
- ECC R302 Design Conditions
- ECC R303 Materials, Systems and Equipment

## CHAPTER R4 RESIDENTIAL ENERGY EFFICIENCY

- ECC R401 General
- ECC R402 Building Thermal Envelope
- ECC R403 Systems
- ECC R404 Electrical Power and Lighting Systems
- ECC R405 Simulated Performance Alternative (Performance)
- ECC R406 Energy Rating Index Compliance Alternative

## CHAPTER R5 EXISTING BUILDINGS

- ECC R501 General
- ECC R502 Additions
- ECC R503 Alterations
- ECC R504 Repairs
- ECC R505 Change of Occupancy or Use

## CHAPTER R6 REFERENCED STANDARDS APPENDIX RA

RECOMMENDED PROCEDURE FOR WORST-CASE TESTING OF ATMOSPHERIC VENTING SYSTEMS UNDER R402.4 OR R405 CONDITIONED  $\leq 5ACH_{50}$

- ECC RA 101 Scope
- ECC RA 201 General Definitions
- ECC RA 301 Testing Procedure

## APPENDIX RB

SOLAR-READY PROVISIONS - DETACHED ONE- AND TWO FAMILY DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS (TOWNHOUSES)

- ECC RB 101 Scope
- ECC RB 102 General Definitions
- ECC RB 103 Solar-Ready Zone



# CLASSIFICATIONS

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- **Air Sealing**

- Testing
- Exceptions: Buildings with more than 7 dwelling units, Visual Inspection options
- Recessed Lighting
- Fireplaces
- Rooms containing fuel-burning appliances
- Skylight definition (Definitions)

- **Envelope**

- Default Glazed Fenestration on SHGC and VT
- Insulated Siding
- Compliance
- Solar Ready Requirements
- Insulation and Fenestration Requirements by Components
- Equivalent U-Factor
- Total UA Alternatives
- Access Hatched and Doors
- Steel-Frame Ceilings, Walls, and Floors
- Walls with Partial Structural Sheathing
- Glazed Fenestration SHGC
- Thermally Isolated Sunroom U-Factor (Prescriptive)
- Installation
- Air Barrier & Insulation Installation
- Maximum Fenestration U-Factor (Mandatory)

- **Power**

- Electrical Energy Conservation
- Solar Ready (Appendix RB)

- **HVAC (continued)**

- Service Hot Water Systems
- Heated Water Circulation and Temperature Maintenance Systems (Mandatory)
- Circulation Systems
- Heat Trace Systems
- Demand Recirculation Systems
- Hot Water Pipe Insulation (Prescriptive)
- Drain Water Heat Recovery Unit
- Whole-House Mechanical Ventilation System Fan Efficacy
- Systems Serving Multiple Dwelling Units
- Heaters

- **Lighting**

- Lighting Equipment (Mandatory)
- Lighting

- **Modeling**

- Energy Rating Index Compliance Alternative
- Mandatory Requirements
- Energy Rating Index
- ERI Reference Design
- ERI-Based Compliance
- Maximum Energy Rating Index
- Verification by Approved Agency
- Documentation
- Compliance Software Tools
- Compliance Report
- Additional Documentation
- Calculation Software Tool
- Minimum Capabilities
- Specific Approval
- Input Value
- Existing Plus Addition Compliance (Simulated Performance Alternative)

# 1. WHAT'S NEW IN THE 2016 NYCECC: OVERVIEW

Slides 12 to 14

**LOCAL LAWS OF NYC Buildings**

**TR8: Technical Report Statement of Responsibility for Energy Code Provisions**

**NYC Buildings**  
NYC Buildings Department  
200 Broadway, New York, NY 10007  
Rick D. Chandler, P.E., Commissioner

**BUILDINGS BULLETIN**

**NEW YORK CITY ENERGY CONSERVATION CODE**  
with ANSI/ASHRAE/IES STANDARD 90.1 -2013 with AMENDMENTS

**1 RCNY §5000-01 CHAPTER 5000**  
New York City Energy Conservation Code

**§ 5000-01 Construction document approval requirements for compliance with the New York City Energy Conservation Code.**

**Purpose.** This section sets forth the requirements for filing and approval of construction documents and the reverse of progress inspections during construction, in accordance with the New York City Energy Conservation Code.

**References.** See New York City Energy Conservation Code (Administrative Code Sections 25-1001.1 et seq.); New York State Energy Conservation Construction Code (19 NYCRR part 1240); Administrative Code Section 24.04.7.9, Sections BC107.13 and BC110.3.5; 1 RCNY §101-07 ("Approved Agencies").

**Definitions.** For the purposes of this chapter, the following terms shall have the following meanings:

**APPROVED PROGRESS INSPECTION AGENCY.** An approved progress inspection agency as described in paragraph (a) of section 101-07 of the rules of the Department.

**ASHRAE 90.1.** American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., Standard 90.1 as defined in the New York State Energy Conservation Construction Code and amended by Part 25 of the Energy Code.

**COMMERCIAL BUILDING.** A commercial building as defined in the Energy Code.

**REGISTERED DESIGN PROFESSIONAL.** An applicant of record who develops, signs and seals the construction drawings. The applicant may be someone other than the registered design professional who prepares, signs and seals the drawings.

**CODE.** The New York City Energy Conservation Code and amended by the Energy Code.

**ADMINISTRATIVE CODE BUILDING.** A historic building as described in the Energy Code.

**DESIGN PROFESSIONAL.** A registered design professional who prepares, signs and seals the drawings.

**RESIDENTIAL BUILDING.** A residential building as defined in the Energy Code.

**Version and edition of Energy Code.** Applications must comply with the Energy Code in effect when the application is filed, continuing through construction and sign-off of the project.

**Building projects.** All applications related to a single commercial building project must comply with the Energy Code in its entirety and as modified by ECC provisions to a maximum fenestration compliance path.

**Commercial buildings with vertical fenestration exceeding 30% of the above-grade wall area.** Vertical fenestration is allowed up to 30% of the gross wall area, if the vertical fenestration exceeds 40% of the gross wall area, the design team must comply in accordance with Section 11 of ASHRAE 90.1 ("Energy Cost Budget Method") or ASHRAE 90.1 ("Performance Rating Method") and as provided in subparagraph (1) of subdivision (d) of this section or Section 5.6 of ASHRAE 90.1 ("Building Options").

**Applications.** Applicants must indicate in the application form all applications; if an application has not yet been filed, the name of the applicant or the applicant's anticipated related applications.



# **1. WHAT'S NEW IN THE 2016 NYCECC: OVERVIEW**

In this section you will learn about:

- Key changes and additions in the [2016 NYCECC](#) related to residential buildings, including the building envelope, HVAC, service hot water and electrical;
- Current NYC Local Laws affecting Energy Code compliance; and
- Current Rules and Bulletins affecting Energy Code compliance.





# 1. WHAT'S NEW IN THE 2016 NYCECC: OVERVIEW



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## What NYCECC-Related Local Laws, Rules, or Bulletins Affect Residential Buildings?


### Local Laws

- [LL 91-2016](#) – Established the current [2016 NYCECC](#) 
- [LL 125-2016](#) – Clean up Bill

### Rules

- [1 RCNY §5000-01](#) 
  - Energy Code submission procedures, including progress inspections on drawings
- [1 RCNY §101-07](#) 
  - Qualification requirements for individuals performing progress inspections

### Bulletins

- **Buildings Bulletins** [2017-004](#), [2017-005](#), [2017-006](#) 
  - Provide interpretations of Energy Code applicability to HVAC, service water, lighting, electrical power, and envelope systems in additions, alterations, renovations, or repairs



# 2. CODE APPLICABILITY

Slides 15 to 31



Photo: iStock / Jupiter Images



## **2. CODE APPLICABILITY: LEARNING OBJECTIVES**

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**In this section you will learn about:**

- **DOB terminology related to NYCECC applicability;**
- **Differences in applicability for New Construction, Additions, Alterations, Renovations, and Repairs;**
- **Allowable Exemptions and Exceptions;**
- **Factory Manufactured Homes and Mobile Homes;**
- **Mixed occupancy; and**
- **Historic buildings.**



# **2. CODE APPLICABILITY: GENERAL TERMINOLOGY 1**

## **What's the Terminology used by DOB related to Code Applicability?**

### **The Code**

- The NYCECC is law
- It applies to all buildings, new and existing, unless explicitly stated otherwise

### **Rules**

- Rules are prepared by the DOB to implement the Code
- Rules must go through a formal administrative public comment process
- Rules have the force of law

The DOB website is always updated to reflect all changes to laws, rules and bulletins. Check the website frequently.

### **Bulletins**

- Bulletins are issued by the DOB, in part to clarify interpretations of the codes
- They may change more frequently than laws or rules



## 2. CODE APPLICABILITY: GENERAL TERMINOLOGY-2

### What's the Terminology used by DOB related to Code Applicability?

#### Exemptions

- Exemptions define specific building types, applications, or building elements that are not required to meet the Code, and are addressed in the PW1 form when they constitute the entire application (1 through 4 below, as listed on the PW1)
  
- The following are the **ONLY** allowed exemptions to the NYCECC:
  1. Historic buildings (per NYCECC [Section C501.6](#), [LL 91 of 2016](#), [LL 125 of 2016](#), [1 RCNY § 5000-01](#))
    - National or State designated historic buildings
    - Buildings certified as contributing buildings within a National or State historic district
    - Buildings certified as eligible for the designations above
    - City level certification **does not qualify** for exemptions





## 2. CODE APPLICABILITY: GENERAL TERMINOLOGY-2

What's the Terminology used by DOB related to Code Applicability?

### Exemptions (continued)

2. The envelopes of unconditioned or **low-energy** buildings or spaces (low energy is <3.4 BTU/H or 1 Watt/SF peak design rate for space conditioning) and the scope of work is limited to the envelope.
3. Temporary structures under [BC § 3103](#) and [28-111.1](#)
  - The following work types, categorized as not affecting energy use:
    - Buildings certified as eligible for the designations above
    - City level FA (fire alarm), FP (fire suppression in a range hood), SD (standpipe), FS (fuel storage), EQ (construction equipment), CC (curb cut), OT/BPP (builder's pavement plan), OT/FPP (fire protection plan)
4. A post-approval amendment of an application that is exempt under a [prior edition](#) of the Energy Code

(\*Numbers correspond to the exemptions listed on the [PW1, Section 10](#))



# 2. CODE APPLICABILITY: GENERAL TERMINOLOGY-3

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## What are Exceptions?

### Exceptions

- Exceptions are conditions under which specific provisions of the Code may not be required
- Exceptions exist within the specific provisions of the NYCECC, Chapters [R4](#) and [R5](#)



## 2. CODE APPLICABILITY: GENERAL TERMINOLOGY-3

### What are Exceptions? (*continued*)

- Additional exceptions described in Section [R503](#), Alterations, apply only if they do not result in increased energy use of the building
  - Envelope Exceptions:
    1. Storm window installed over existing fenestration
    2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation
    3. Construction where the existing roof, wall or floor cavity is not exposed
    4. Roof recover
    5. 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. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided the codes does not require the glazing or fenestration assembly to be replaced
  - Heating and cooling exception:

Duct leakage testing, R403.3.3, is not required when ducts from existing heating or cooling systems are extended no more than 40 feet in unconditioned spaces
  - Lighting exception:

Alterations that replace less than 20 percent of the luminaries in a space



# **2. CODE APPLICABILITY: DIFFERENT SCOPES OF WORK**

## **New Buildings**

- All must comply via Prescriptive or Performance-Based Approaches (see topic 3 of this module)
- Only exemption is for envelope in low-energy/unconditioned buildings when the scope of work is limited to the envelope. If the scope entails more than the envelope, then the application is not exempt.

## **Additions**

- Must comply either:
  - As a stand-alone addition, or
  - Along with the existing building as a single entity, or
  - Where the building with the addition uses no more energy than the existing building



# **2. CODE APPLICABILITY: DIFFERENT SCOPES OF WORK**

*(continued)*

## **Alterations/Renovations**

- Only applies to scope of alteration work; unaltered portions are not required to comply
- Some exceptions may apply (per Bulletins)
- Shall be such that the existing building or structure uses no more energy than the existing building or structure prior to the alteration.

## **Repairs**

- Technically applies even if a permit is not required (e.g., window or roof replacements or repairs)
- These are considered repairs:
  1. Glass-only replacements in an existing sash and frame
  2. Roof repairs
  3. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior power





## 2. CODE APPLICABILITY: BY BUILDING TYPE

Which chapters of the Code apply to different building types?

### RESIDENTIAL

R-3 (detached one- and two-family dwellings, and multiple single-family dwellings)

**AND**

R-2 (Multifamily > 2-family) ≤ 3-stories  
Factory-manufactured Homes and Mobile Homes



Residential  
NYCECC [Chapter R4](#)

### GROUP R BUILDINGS

R-1 (Hotels/motels) any height

**AND**

R-2 (Multifamily > 2-family) > 3 stories

**AND**

R-3 (One & Two Family) > 3 stories



### ALL OTHER BUILDINGS

*Building Type includes Group I, H*



Commercial (Update)  
NYCECC [Chapter C4](#) OR  
[Appendix CA](#) as modified by NYC



## 2. CODE APPLICABILITY: BY BUILDING TYPE

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### Factory Manufactured Homes and Mobile Homes

- Individual modular homes are certified by NYS not the total home assembly
- Total home assembly needs to be submitted to the Department
- What is needed on drawings to show compliance?
  - Statement that the home is certified by NY State, and meets the energy code
  - Documentation will need to be provided showing that the home was certified by NY State
- Ensuring modular construction is up to the NYCECC standards:
  - **Inspections:** Per [1 RCNY § 5000-01](#) minimum inspections include:
    1. Air sealing and insulation - visual - IA6
    2. Air sealing and insulation - testing - IA7
    3. Electrical energy consumption - IC1
    4. Maintenance information - ID1
    5. Permanent certificate - ID2
    6. Solar-ready requirements - ID3



## 2. CODE APPLICABILITY: MIXED OCCUPANCY

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- A mixed-occupancy building is one that contains both residential and commercial uses
- Each occupancy shall be separately considered
  - Chapters R2, R3, R4, and R5 for residential
  - Residential portions/occupancies are classified as Group R when determining the insulation requirements
  - Chapters C2, C3, C4, and C5 or ASHRAE 90.1-2013 (Appendix CA) for commercial
    - Cannot mix and match codes for commercial portion – same code version must be followed and applied in its entirety
  - Do not include the floors or walls that separate commercial from residential. Include only the exterior thermal envelope.



# 2. CODE APPLICABILITY: MIXED OCCUPANCY

## Scenarios

- Buildings greater than 3 stories are categorized as commercial even if residential occupancies exist
- Use accessory area requirements (Major occupancy > 90% of floor area)\*

| 100% APARTMENTS |             | 100% APARTMENTS |             | 100% APARTMENTS |             | 100% APARTMENTS              |   | 100% APARTMENTS |            |
|-----------------|-------------|-----------------|-------------|-----------------|-------------|------------------------------|---|-----------------|------------|
| 100% APARTMENTS |             | 100% APARTMENTS |             | 100% APARTMENTS |             | 60% RETAIL<br>40% APARTMENTS |   | 100% APARTMENTS |            |
| 100% RETAIL     |             | ≤ 10% RETAIL    |             | > 90% RETAIL    |             |                              |   | 100% RETAIL     |            |
| FLOOR           | PROVISION   | FLOOR           | PROVISION   | FLOOR           | PROVISION   | FLOOR                        | PROVISION                               | FLOOR           | PROVISION  |
| 3               | Residential | 3               | Residential | 3               | Residential | 3                            | Residential                             | 4               | Commercial |
| 2               | Residential | 2               | Residential | 2               | Residential | 2                            | Residential                             | 3               | Commercial |
| 1               | Commercial  | 1               | Residential | 1               | Commercial  | 1                            | 60%<br>Commercial<br>40%<br>Residential | 2               | Commercial |
|                 |             |                 |             |                 |             |                              |   | 1               | Commercial |

\* Requires code official approval

## **2. CODE APPLICABILITY: KEY RESIDENTIAL TERMINOLOGY**

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### **Residential Building**

- Detached 1- and 2-family dwellings, multiple single family dwellings (town houses) not more than 3 stories in height above grade
- Manufactured homes
- R-2 and R-3 that are 3 stories or less

### **Dwelling Unit**

- Single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking & sanitation

### **Building Thermal Envelope (also called Thermal Boundary)**

- The planes or surfaces of the building or structure that physically separate conditioned space from the unconditioned exterior or unconditioned space.
- The thermal boundary must be continuous and closed, and insulated per NYCECC requirements. Air and moisture barriers must be maintained to protect the integrity of the thermal boundary.



# 2. CODE APPLICABILITY: HISTORIC BUILDINGS

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## Alterations vs. Additions on 'Historic building'

- Repair, restoration and alterations work, and change of occupancy to 'Historic Building' are exempt from the ECC compliance requirements
- The basis for exemption must be stated in the Professional Statement
- **Limitations:**
  - The ECC exemption for 'Historical Building' is *limited to the National or New York State Historic Buildings*,
    - i.e., buildings that are registered or eligible for registration as a National or New York State Historic Building, or designated as a contributing building in a National or State Historic District
  - New York City-designated historic buildings are NOT exempt from the NYCECC
  - The NYCECC also does not recognize buildings that have Landmark designated status
- For the complete definition of 'Historic Buildings,' refer to Section [R202](#), [C202](#), or ASHRAE 90.1 2013 ([Appendix CA](#))





# 2. CODE APPLICABILITY: HISTORIC BUILDINGS

## Alterations vs. Additions on ‘Historic building’

- Job applications declaring exemptions of ECC compliance for the reason of ‘Historic Buildings’ must present evidence of such eligibility by submitting:
  - 1). A letter from the NYC Landmarks Preservation Commission accompanied by a visual representation of the Cultural Resource Information System (CRIS) map indicating the eligible designation, or
  - 2). A letter from the State Historic Preservation Office verifying the eligibility in response to a Request for Evaluation of Eligibility

## Exception

- Additions to ‘Historic Buildings’ are NOT exempt from the ECC, and thus the ‘Added’ portion to the Historic Building *must* demonstrate compliance with the ECC according to Provisions under Section [R502](#), [C502](#) or ASHRAE 90.1 2013 ([Appendix CA](#))
- Any vertical or horizontal enlargement to an eligible historic building is considered “new construction” and must meet all the requirements of the NYCECC



# 2. CODE APPLICABILITY: HISTORIC BUILDINGS

USN Details

**06101.001774: Building - Listed**  
**A.T. Steward Store (The Sun Building)**  
 280 Broadway, Manhattan NY

Overview | Inventory Form | NR Status (3) | MCDs (1) | Children (0) | Determinations (0) | Photos (1) | Atts. (1) | Agmts. (0) | Projects (0) | Surveys (0) | Submitted (0)

Type: Building  
 Classification: Building  
 Eligibility: Listed  
 Parent USN:  
 Is Contributing:   
 Is a Complex:   
 Is Demolished:   
 Is in a Certified District:   
 Is a National Historic Landmark:   
 Is State Board Approved:   
 Is State Register Listed:

Eligibility Notes:

|          |                         |
|----------|-------------------------|
| County   | MCD                     |
| New York | MANHATTAN (NYC Borough) |

NEW YORK STATE

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**CRIS**  
 Cultural Resource Information System

SIGN IN  
 Forgot your username or password?  
 NY.gov ID - Terms of Service

PROCEED AS GUEST

SIGN UP NOW

To have the full functionality and data of CRIS available, sign up for an NY.gov ID.

**NYC Commission** | New York, NY 10007 | Scan Code 12-669-7700 | http://nyc.gov/landmarks

Project number: NYC ENERGY CONSERV CONST CODE / NYC ENERGY CONS  
 Project:  
 Address:  
 Date Received: 10/15/2013 BBL:

The Commission notes, for purposes of the New York City Energy Conservation Code, NYCECC 101.4.2, the property is a contributing building in the \_\_\_\_\_ Historic District, which has been determined to be eligible for listing, on the State and/or National Registers(s) of Historic Places

10/16/2013

SIGNATURE: Environmental Review DATE

File Name: .doc

**CRIS** | HOME | SUBMIT | SEARCH | COMMUNICATE | Welcome Guest User | Contact Us | FAQ | Help | Sign Out

Welcome to the Cultural Resource Information System (CRIS)

Find My Project

I know my Project Number  
 I know my Submission Token

Project Number: ex: 14PR0001  
 Email: ex: john.doe@gmail.com

Search

To search New York State's database of historic buildings, structures, sites, and surveys, click "Search" in the navigation bar above.  
 To continue or edit an initial submission, click "Submit" in the navigation bar above and select "Continue/Edit an Existing Submission."  
 To learn more about the NYS Historic Preservation Office and Register programs, please visit our website at [nysparks.com/ship](http://nysparks.com/ship)

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# 3. THERMAL PROPERTIES: RESIDENTIAL REQUIREMENTS

Slides 32 to 51



# 3. THERMAL PROPERTIES: OVERVIEW

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In this section you will learn about:

- Key terminology used in describing the thermal properties of materials and assemblies, including R-Value & U-Factor;
- The R-Values of typical insulation materials, and how to verify R-values in the field;
- The differences between continuous and cavity insulation, concept of thermal boundary & how thermal bridging impacts the effectiveness of insulations and assemblies.



# 3. THERMAL PROPERTIES: OPAQUE ENVELOPE

## What are the Common Thermal Properties Regulated by Code?

### R-Value

- Thermal Resistance to heat flow through conduction
- The reciprocal of the thermal transmittance ( $R=1/U$ )
- Typically used for insulation layers
- Unit:  $\text{hr} \cdot \text{ft}^2 \cdot ^\circ\text{F} / \text{Btu}$

### U-Factor

- Typically used for all assemblies except slabs on grade
- The Reciprocal of the R-value where  $U= 1/R$  for single materials and  $U=1/(R1 + R2 + \dots)$  for assemblies
- Includes effect of exterior and interior air films
- Unit:  $\text{Btu} / \text{hr} \cdot \text{ft}^2 \cdot ^\circ\text{F}$

### Example: Heat Transfer through Conduction

- 100 sf. Envelope Surface
- Outside  $0^\circ\text{F}$ , Inside  $70^\circ\text{F}$ , Delta T =  $70^\circ\text{F}$
- Window: Typical U-0.32: lets in  $100\text{ sf} \times 70 \times 0.32 = 2240\text{ Btu} / \text{Hr}$ .
- Wall: Typical R-20 or U-0.05: lets in  $100\text{ sf} \times 70\text{F} \times 0.05 = 350\text{ Btu} / \text{Hr}$ .





# 3. THERMAL PROPERTIES: OPAQUE ENVELOPE

## What are the Common Thermal Properties Regulated by Code?

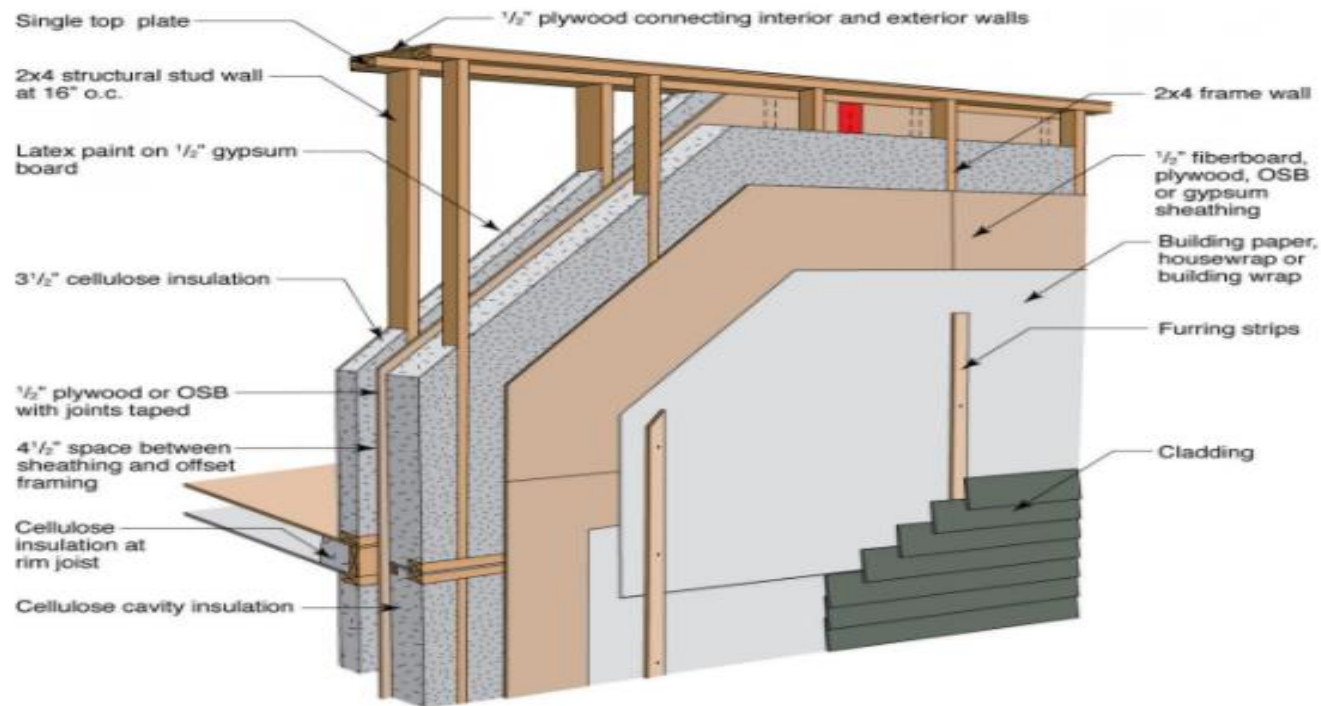


Image: Courtesy of [basc.pnnl.gov](http://basc.pnnl.gov)






# 3. THERMAL PROPERTIES: R-VALUE

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What is the Most Common Thermal Property Referred to in the Code?

## R-Value (Thermal Resistance)

- Measures an individual material's thermal resistance to heat flow (through conduction process)
  -  Higher R-Value is Better
- R-Values can be added, but:
  - Only if materials are in series, and assuming there are no thermal bridging effects due to metal or concrete
- R-Values of insulation materials are used to demonstrate compliance using the Prescriptive Method



# 3. THERMAL PROPERTIES: MATERIALS 1

What are the Most Common Types of Insulation materials used?

## Batt Insulation

|                  |                       |
|------------------|-----------------------|
| Fiberglass Batts | R-3.1 to R-4.3 / inch |
| Rock Wool Batts  | R-3.2 to R-3.9 / inch |
| Cotton Batts     | R-3.7 / inch          |



Photo: Courtesy of DOE/NREL

## Rigid Foam Boards

|                      |                       |
|----------------------|-----------------------|
| Expanded Polystyrene | R-3.9 to R-4.2 / inch |
| Extruded Polystyrene | R-5.0 / inch          |
| Polyisocyanurate     | R-5.6 to R-7.0 / inch |
| Polyurethane         | R-5.6 to R-7.0 / inch |



Photo: Courtesy of DOE/NREL



# 3. THERMAL PROPERTIES: MATERIALS 2

What is the Most Common Thermal Property Referred to in the Code?

| Loose-Fill (Blown In)   |                       |
|-------------------------|-----------------------|
| Cellulose               | R-3.1 to R-3.7 / inch |
| Fiberglass              | R-2.2 to R-2.9 / inch |
| Fiberglass (Dense-Pack) | R-3.4 to R-4.2 / inch |
| Mineral Wool            | R-2.2 to R-2.9 / inch |



Photo: Courtesy of DOE/NREL

| Spray-In Place            |                       |
|---------------------------|-----------------------|
| Polyurethane Foam         | R-5.6 to R-6.2 / inch |
| Low Density Urethane Foam | R-3.6 to R-4.3 / inch |
| Magnesium Silicate Foam:  | R-3.9 / inch          |
| Wet-Spray Cellulose       | R-2.9 to R-3.4 / inch |
| Spray-in Fiberglass       | R-3.7 to R-3.8 / inch |



Photo: Courtesy of DOE/NREL



# 3. THERMAL PROPERTIES: MATERIALS 3

## What are the Requirements for Insulation Protection?

### Protection of Exposed Foundation Insulation

- Weather resistant permanent & protective cover required for rigid insulation applied to exterior basement walls, crawl space walls and slab on grade construction. Protective covering shall cover the portions above grade and shall extend not less than 6” below grade.

### Additional Good Practices

(not specifically required in the NYCECC)

- Before Installation
  - Sunlight, moisture, wind, physical compression or damage can significantly degrade insulation performance - on site protection during construction should be checked by Progress Inspectors
- Once Installed
  - Protection with permanent material covers (finishes, air and moisture barriers)
  - Compression to be avoided when installed in assembly



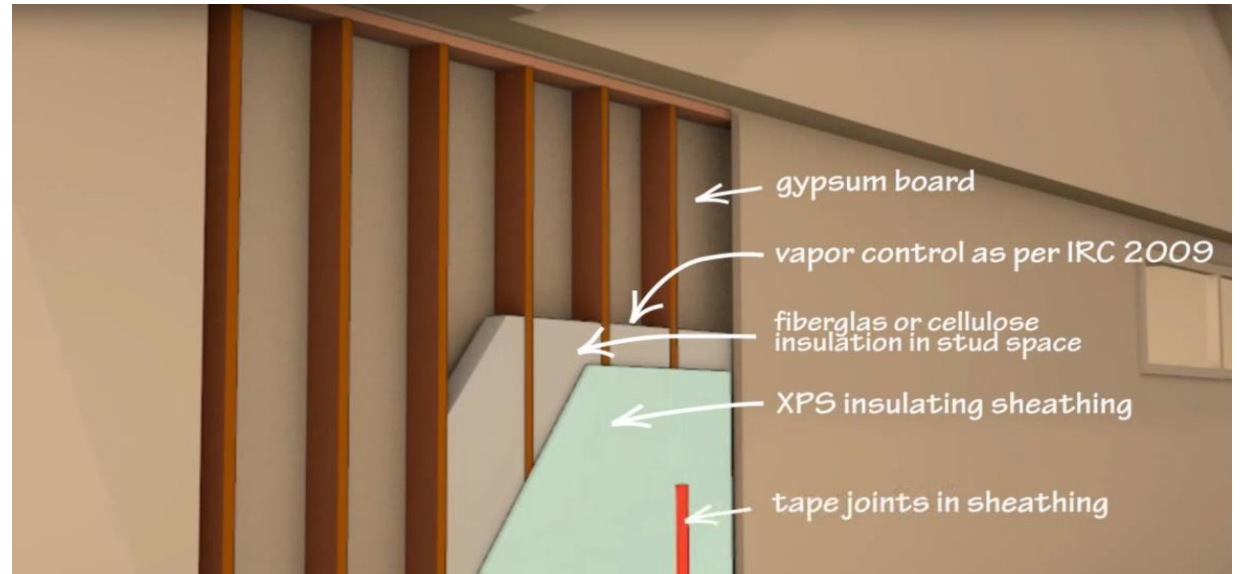


# 3. THERMAL PROPERTIES: INSULATION PROTECTION

## What are the Requirements for Insulation Protection?



[https://basc.pnnl.gov/images?f%5B0%5D=field\\_basc\\_keywords%3A178810](https://basc.pnnl.gov/images?f%5B0%5D=field_basc_keywords%3A178810)



screenshot from video

<https://energy.gov/eere/buildings/building-america-bringing-building-innovations-market>



# 3. THERMAL PROPERTIES: NAMING CONVENTION

## What is the Difference Between R and Rci?

### R

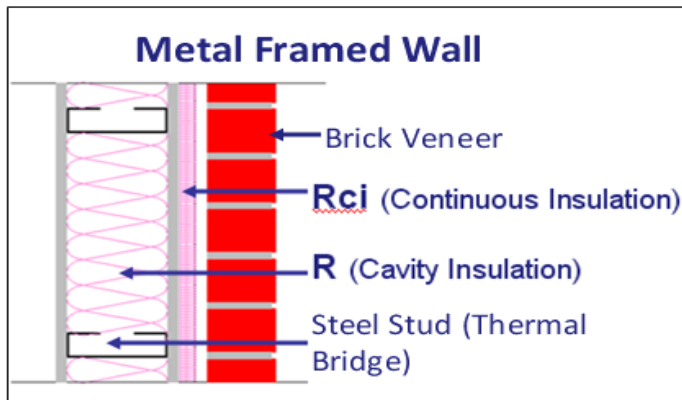
- R-Value of Insulation installed within the cavity between framing members

### Rci

- R-Value of continuous insulation uninterrupted by framing, most commonly installed exterior to framing
- Typically required in assemblies where thermal bridging is significant
- In Residential Chapter, continuous insulation is referenced via footnotes in tables

### Examples

- Roof (attic) - R-49: cavity only requirement
- Walls (mass) – R-15/20: The second R-value applies when more than half the insulation is on the interior of the mass wall and wood framing is used
- Walls (metal framed) – R-13cavity+R-12.7c.i.  
or R-15+12.3c.i. or R-19+11.6c.i. or R-21+11.3c.i.  
or R-25+10.9c.i.



Insulation must be clearly & consistently indicated in drawings and all supporting documents.

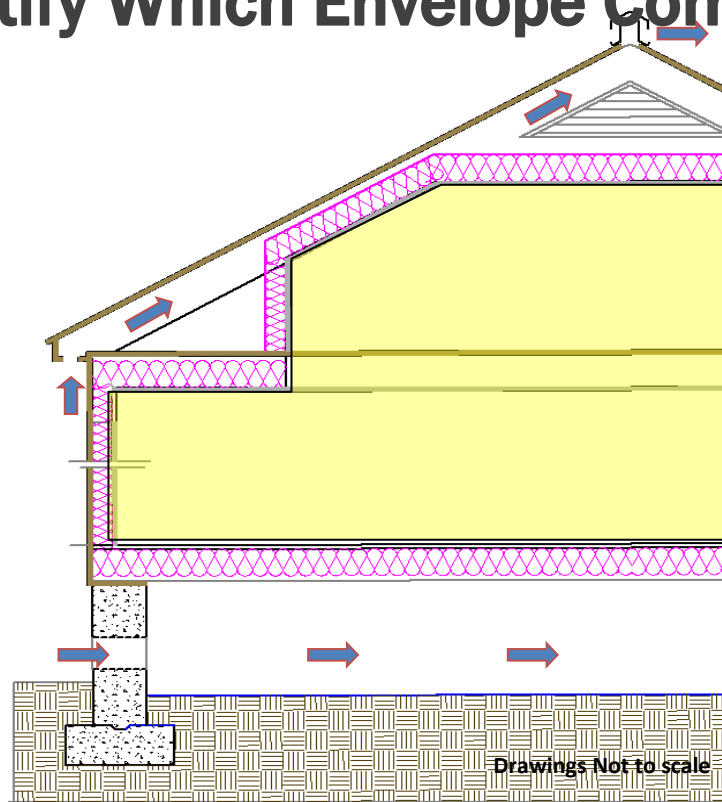
All “R” will be assumed to be cavity type unless “Rci” is used to denote continuous type.





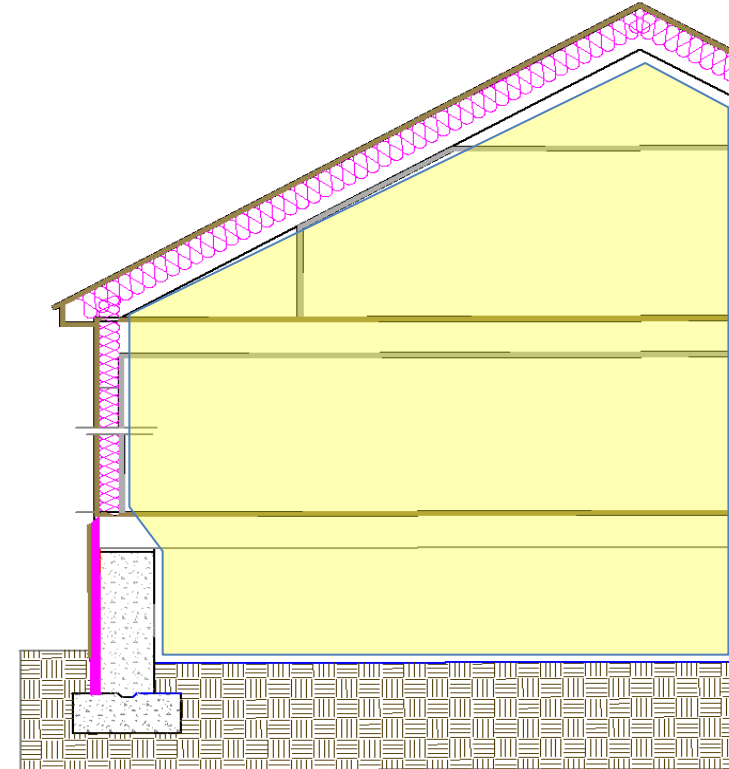
# 3. THERMAL PROPERTIES: THERMAL ENVELOPE/BOUNDARY

Identify Which Envelope Components Behave as Thermal Boundary.



**Figure 1. Vented Attic & Crawl Space**

1. Attic & Crawl Space are outside building thermal envelope
2. Attic ceiling & Floor are insulated
3. Foundation wall need not be insulated



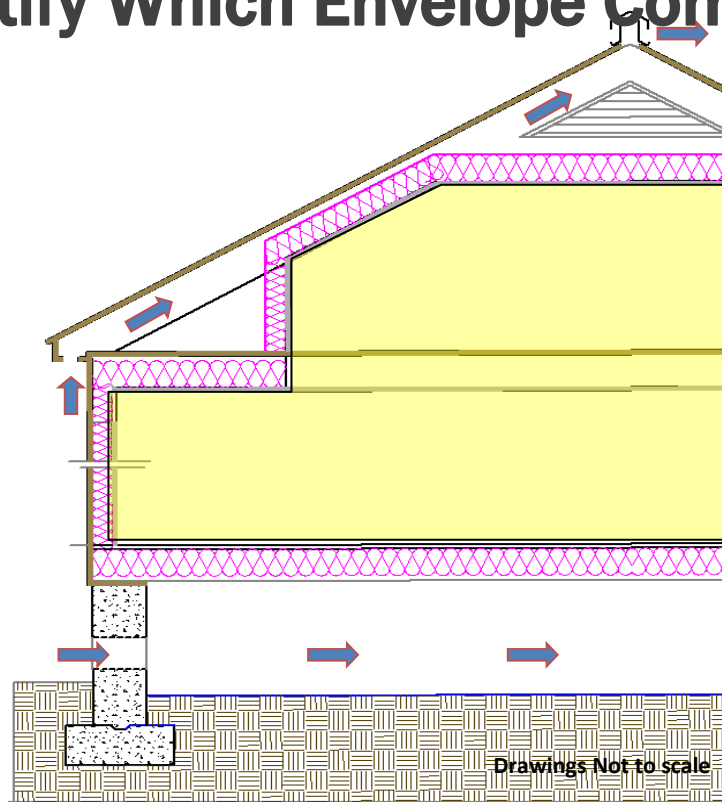
**Figure 2. Unvented Attic & Crawl Space**

1. Attic & Crawl Space are within building thermal envelope
2. Roof deck & Foundation Wall are insulated
3. Floor need not be insulated



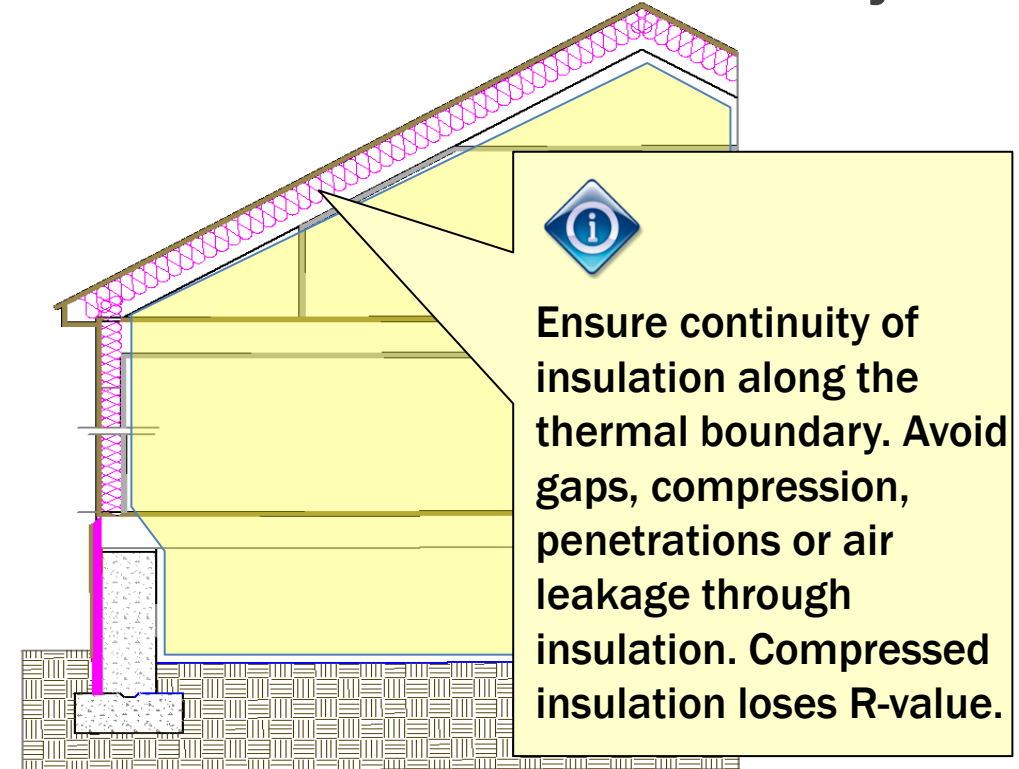
# 3. THERMAL PROPERTIES: THERMAL ENVELOPE/BOUNDARY

Identify Which Envelope Components Behave as Thermal Boundary.



**Figure 1. Vented Attic & Crawl Space**

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**Figure 2. Unvented Attic & Crawl Space**

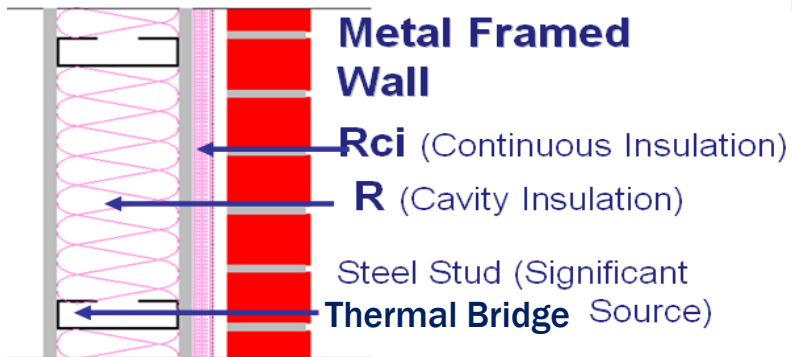
1. Attic & Crawl Space are within building thermal envelope
2. Roof deck & Foundation Wall are insulated
3. Floor need not be insulated



# 3. THERMAL PROPERTIES: THERMAL BRIDGING

## How Does Thermal Bridging Impact R-Value?

Figure 1. Metal Framed Wall



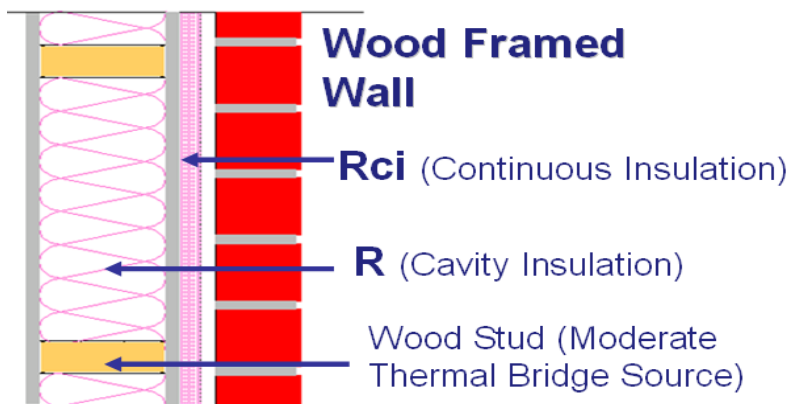
**Thermal bridging is caused by heat transfer through highly-conductive materials**

- Typically steel or aluminum framing members are of most concern, but other materials such as wood and concrete can also create thermal short circuits

### Examples @ cavity wall assembly

- Actual value of insulation
  - Figure 1: In a Metal Framed wall, the effective value of R-13 in cavity depreciates to R-7
  - Figure 2: In a Wood Framed wall, the effective value of R-13 in cavity depreciates to R-10

Figure 2. Wood Framed Wall



# 3. THERMAL PROPERTIES: THERMAL BRIDGING

## What are Progress Inspection Requirements for Insulation?

### Progress inspection for documenting Insulation placement & R-Values

- Visual inspection required for installed insulation for each component of the conditioned space envelope & junctions between components.

Confirm that:

- R-Values are marked
- R-Values conform to those identified in the construction documents
- The insulation is properly installed
- Certifications for unmarked insulation shall be similarly visually inspected
- Certificate for blown or spray applied insulation required from insulation contractor
- Insulation markers to be installed for blown or spray applied roof / ceiling insulation



# 3. THERMAL PROPERTIES: THERMAL BRIDGING IDENTIFYING R-VALUES IN THE FIELD

## What are Progress Inspection Requirements for Insulation?

### Progress inspection for documenting Insulation placement & R-Values

- Visual inspection required for installed insulation for each component of the conditioned space envelope & junctions between components.

Confirm that:

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- R-Values conform to those identified in the construction documents
- The insulation is properly installed
- Certifications for unmarked insulation shall be similarly visually inspected
- Certificate for blown or spray applied insulation required from insulation contractor
- Insulation markers to be installed for blown or spray applied roof / ceiling insulation



Registered design professional or builder must provide a permanent certificate on a wall in the space where the furnace is located, a utility room or an approved location inside the building. It can also be in, on or near the electrical panel at eye level and in plain sight. R-Values for insulation materials & U-Factors for windows, doors and skylights must be furnished in the certificate.

The permanent certificate must also include information about HVAC systems, blower door testing and solar ready requirements.



# 3. EXAMPLE OF PERMANENT CERTIFICATE

| Permanent Energy Efficiency Certificate   |                                   |                                  |                     |            |                        |
|---|-----------------------------------|----------------------------------|---------------------|------------|------------------------|
| <b>Insulation Rating</b>  |                                   |                                  |                     |            |                        |
| <b>Ceiling/Roof</b>   | Attic                             | R-49 cavity                      |                     |            |                        |
|   | Vaulted                           | R-49 cavity                      |                     |            |                        |
| <b>Walls</b>  | Framed wall                       | R-5 continuous +                 | R-21 cavity         | Wood frame |                        |
|   | Mass wall                         | n/a                              |                     |            |                        |
|   | Basement                          | R-10 continuous +                | R-19 cavity         |            |                        |
| <b>Floors</b>   | Crawl Space                       | n/a                              |                     |            |                        |
|   | Over unconditioned space          | R-30 cavity                      |                     |            |                        |
| <b>Ducts outside</b>  | Slab Edge                         | R-10 continuous                  | 4ft deep            |            |                        |
| <b>Conditioned space</b>  | Attic                             | R-8                              |                     |            |                        |
|   | Other                             | R-6                              |                     |            |                        |
| <b>Fenestration Rating</b>  |                                   |                                  |                     |            |                        |
| <b>Window</b>   | NFRC U-Factor                     | U-0.27                           |                     | NFRC SHGC  | 0.36                   |
| <b>Opaque door</b>  |                                   | U-0.32                           |                     |            | 0.35                   |
| <b>Skylight</b>   |                                   | U-0.5                            |                     |            | 0.36                   |
| <b>Air Leakage Test Results</b>   |                                   |                                  |                     |            |                        |
| <b>Blower door</b>  | 2.7                               | ACH/50Pascals                    | <b>Duct testing</b> | 4.0        | cfm/100ft <sup>2</sup> |
| <b>Equipment Performance</b>  |                                   |                                  |                     |            |                        |
| <b>Heating System</b>   | Gas-fueled Hot Water Boiler       | 140,000 Btu/h                    | <b>Efficiency</b>   | 91.4%      | AFUE                   |
| <b>Cooling System</b>   | Split System Air Conditioner      | 54,000 Btu/h                     |                     | 16         | SEER                   |
| <b>Water Heater</b>   | Gas-fueled Water Heater           | 75,100 Btu/h – 98 gallon storage |                     | 0.49       | EF                     |
| Indicate if the following have been installed (an efficiency shall not be listed)   |                                   |                                  |                     |            |                        |
| <input type="checkbox"/> electric furnace <input type="checkbox"/> gas-fire unvented room heater <input type="checkbox"/> baseboard electric heater <input type="checkbox"/> Other:   |                                   |                                  |                     |            |                        |
| Notes:  |                                   |                                  |                     |            |                        |
| <b>Solar Ready Zone</b>   |                                   |                                  |                     |            |                        |
| <p>DESIGNATED ZONE: 213 sf<br/>ORIENTATION: 210° OF TRUE NORTH</p> <p>NYCECC RB103.7: LOCATION OF MAIN ELECTRICAL SERVICE PANEL WITH RESERVED SPACE LABELED "FOR FUTURE SOLAR ELECTRIC" IN CELLAR</p> <p><b>ROOF PLAN</b></p> |                                   |                                  |                     |            |                        |
| <b>Premises (address)</b>   | 123 West 789 Street, New York, NY |                                  |                     |            |                        |
| <b>Designer/Builder</b>   | XYZ Home Builders                 |                                  |                     |            |                        |
| <b>Energy Code edition</b>  | 2016 NYCECC                       | <b>Posting/ Update Date</b>      | 09/01/2017          |            |                        |





# 3. THERMAL PROPERTIES: U-FACTOR

## What is U-Factor and How is it Used for Trade-Offs?

Weighted Average Method for U

$$U = \frac{(U_1 \times A_1) + (U_2 \times A_2) + \dots}{A_1 + A_2 + \dots}$$

$U_1$  &  $U_2$ : U-Factor of each individual construction assembly. The assembly value must be computed using approved methods in ASHRAE (next slide).

$A_1$  &  $A_2$ : Corresponding surface area of the assembly as designed in the building.

## U-Factor (Thermal Transmittance)

- Total Assembly's Conductance (Btu/H.ft<sup>2</sup>.F)
- Inverse of assembly's R-Value
  - ✓ Lower U-Factor is Better
- Offers Flexibility for Trade-Offs
  - Trade-Offs are required if any of the prescriptive R-Values cannot be met
- Accounts for thermal bridging – Effective R- Value for assembly
  - heat transfer occurring through framing members bypassing insulation
- UA Alternative, Trade-off calculation must be used to demonstrate compliance based on Weighted Average Method

✗ Cannot add: (U1+U2+...)



# 3. THERMAL PROPERTIES: U-FACTOR

---

## What are the Approved Methods to Calculate U-Factors?

### Software Programs

- RESCheck or COMcheck
  - Also does an overall weighted average calculation among envelope elements
- DOE approved energy analysis programs
  - EnergyPlus
  - eQUEST, DOE 2.1 E, Visual DOE, Trane Trace, IESVE

### ASHRAE 90.1, Look Up Tables

- Appendix A (Applicable to both Residential and Commercial Provisions)

### Manual Calculations

- Refer to ASHRAE Fundamentals textbook
  - Series Method
  - Parallel Path Method
  - Other methods are not approved for residential buildings



# 3. THERMAL PROPERTIES: U-FACTOR

## What are the Approved Methods to Calculate U-Factors?

### Software Programs

- REScheck or COMcheck
  - Also does an overall weighted average calculation among envelope elements
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### ASHRAE 90.1, Look Up Tables

- Appendix A (Applicable to both Residential and Commercial Buildings)

### Manual Calculations


- Refer to ASHRAE Fundamentals textbook
  - Series Method
  - Parallel Path Method
  - Other methods are not approved for residential buildings

[REScheck](#) is a free software program developed & distributed by the U.S. Department of Energy (DOE). (routinely check website for most up-to-date version)



# 3. THERMAL PROPERTIES: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Building Envelope?

|  <b>Inspection / Test</b> (As indicated on the <a href="#">TR8</a> )  | <b>Frequency</b>   |
|--|--|
| <b>Protection of exposed foundation insulation (IA1)</b><br>Insulation shall be visually inspected to verify proper protection where applied to the exterior of basement or cellar walls, crawl-space walls and/or the perimeter of slab-on-grade floors.  | Prior to backfill  |
| <b>Insulation placement and R-values (IA2)</b><br>Installed insulation for each component of the conditioned space envelope and at junctions between components shall be visually inspected to ensure that the R-values are marked, that such R-values conform to the R-values identified in the construction documents and that the insulation is properly installed. Certifications for unmarked insulation shall be similarly visually inspected. | As required to verify continuous enclosure while walls, ceilings and floors are open |
| <b>Fenestration U-factor and product ratings (IA3)</b><br>U-factors, SHGC and VT values of installed fenestration shall be verified by visual inspection for conformance with the U-factors, SHGC and VT values identified in the construction drawings, either by verifying the manufacturers NFRC labels or, where not labeled, using the ratings in ECC Tables R303.1.3(1) and (2).   | As required during installation  |



# 4. INSULATION REQUIREMENTS

---

Slides 52 to 79



# **4. INSULATION REQUIREMENTS: OVERVIEW**

**In this section you will learn about:**

- **How to determine insulation requirements using Prescriptive & U-Factor Alternative methods;**
- **Determining insulation requirements for different types of construction – wood frame, metal frame and mass walls; and**
- **Details for insulation placement and application for different envelope assemblies, including walls, floors, attics, basements, crawl spaces, windows & doors.**





# **4. INSULATION REQUIREMENTS: PRESCRIPTIVE APPROACH**

## **How do you Typically Approach the Insulation Requirements for Envelope?**

### **Method 1: Prescriptive R-Value**

- Determine Min. R-Values for each component type using Table R402.1.2 or [Table R402.2.6](#) (Steel Framed Assembly) for Climate Zone-4
  - Each component must individually comply with the R-Value requirements (must be equal or higher)
  - The R-Values represented in Table R402.1.2 refer only to the labeled R-value of the insulation and no other building materials

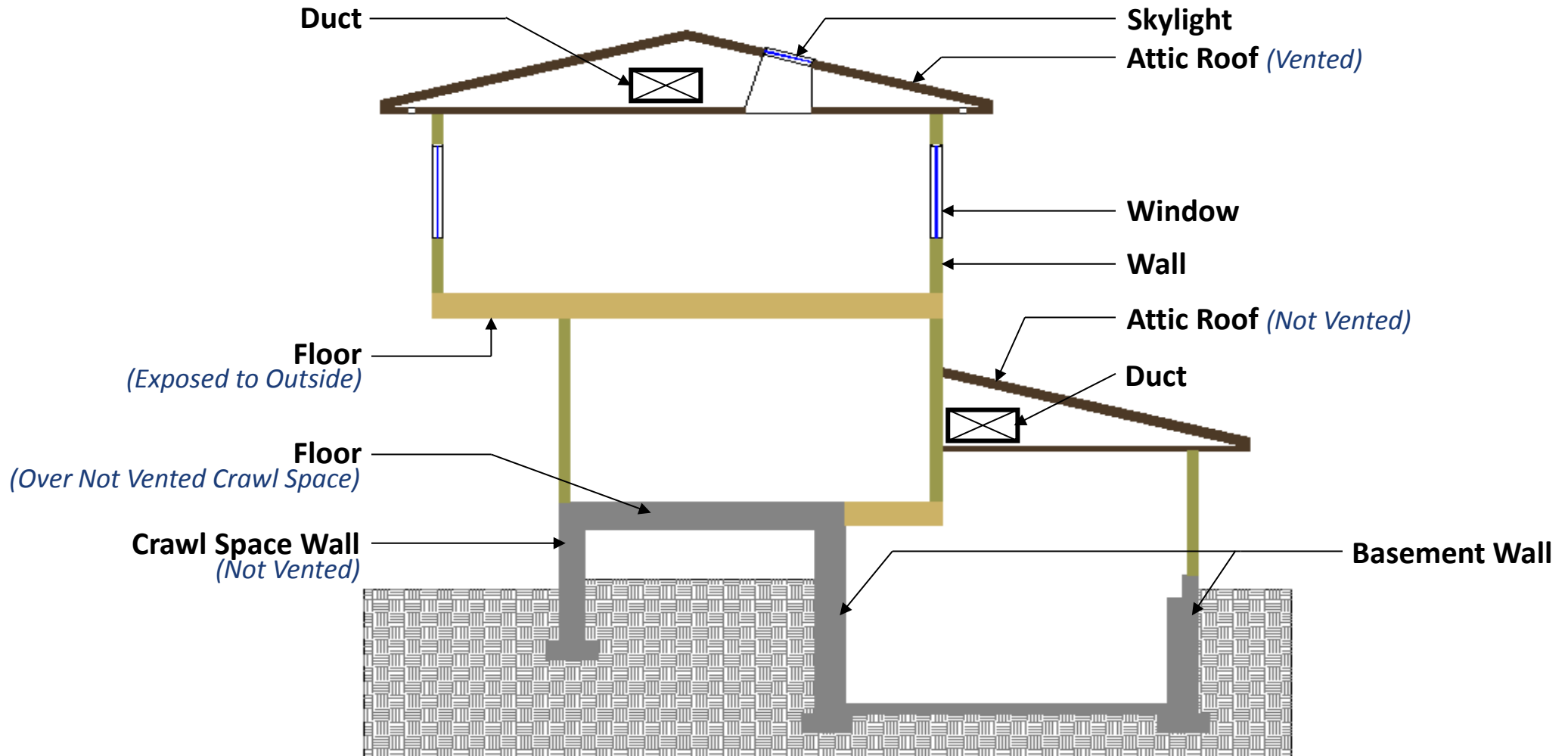
### **Method 2: U-Factor Alternative**

- Determine Max. allowable equivalent U-Factors for each assembly type using [Table R402.1.4](#) for Climate Zone-4
  - Each assembly must individually comply with the U-Factor requirements (must be equal or lower)
  - The U-Factors represented in Table R402.1.4 take into account all of the building materials in the assembly and shall include the thermal bridging effects of framing materials



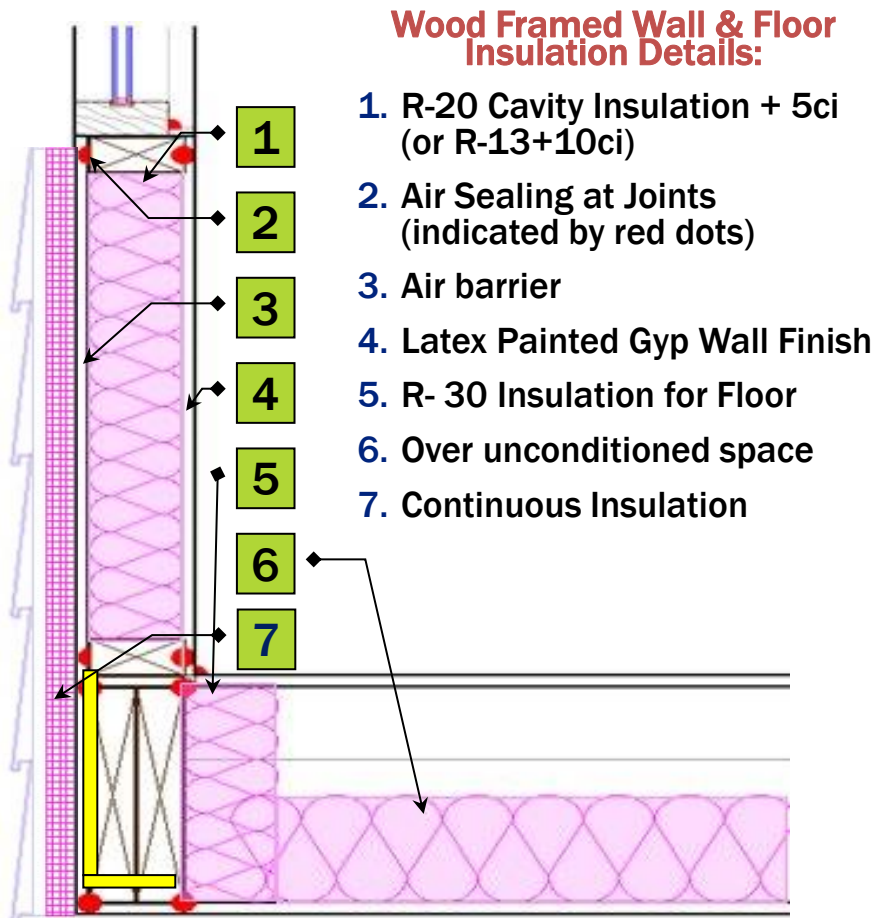
# 4. INSULATION REQUIREMENTS: CASE STUDY DIAGRAM

Identify Envelope Elements That are Required to be Insulated by Code.



# 4. INSULATION REQUIREMENTS: WOOD FRAMED CONSTRUCTION

## What are the Insulation Requirements for Wood Framed Assemblies?



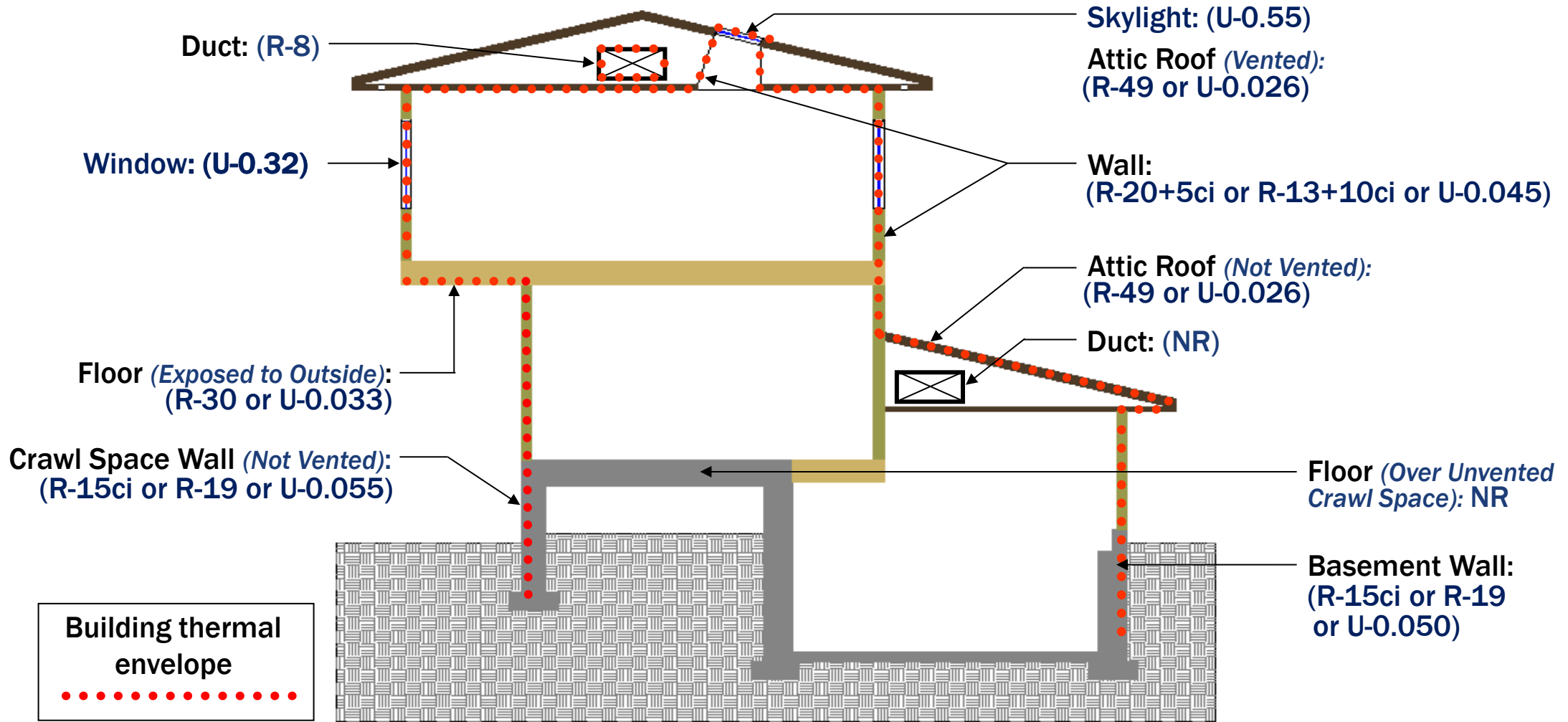
### Compliance Requirements

- **Prescriptive R-Values**
  - R-20+5ci or R-13+10ci for walls (Refer to Table [R402.1.2](#))
  - For ceiling and floors, only cavity insulation is required
  - Insulation for basement and crawl space walls (unvented) can either be installed on the interior cavity or on exterior using continuous rigid type insulation
- **U-Factor alternative**
  - U-0.045 is the maximum allowed for frame wall (Refer to [Table R402.1.4](#))
  - Can be used for individual assemblies that differ from prescriptive requirements
  - Follow the instructions in [ASHRAE 90.1-2013 Appendix CA](#)



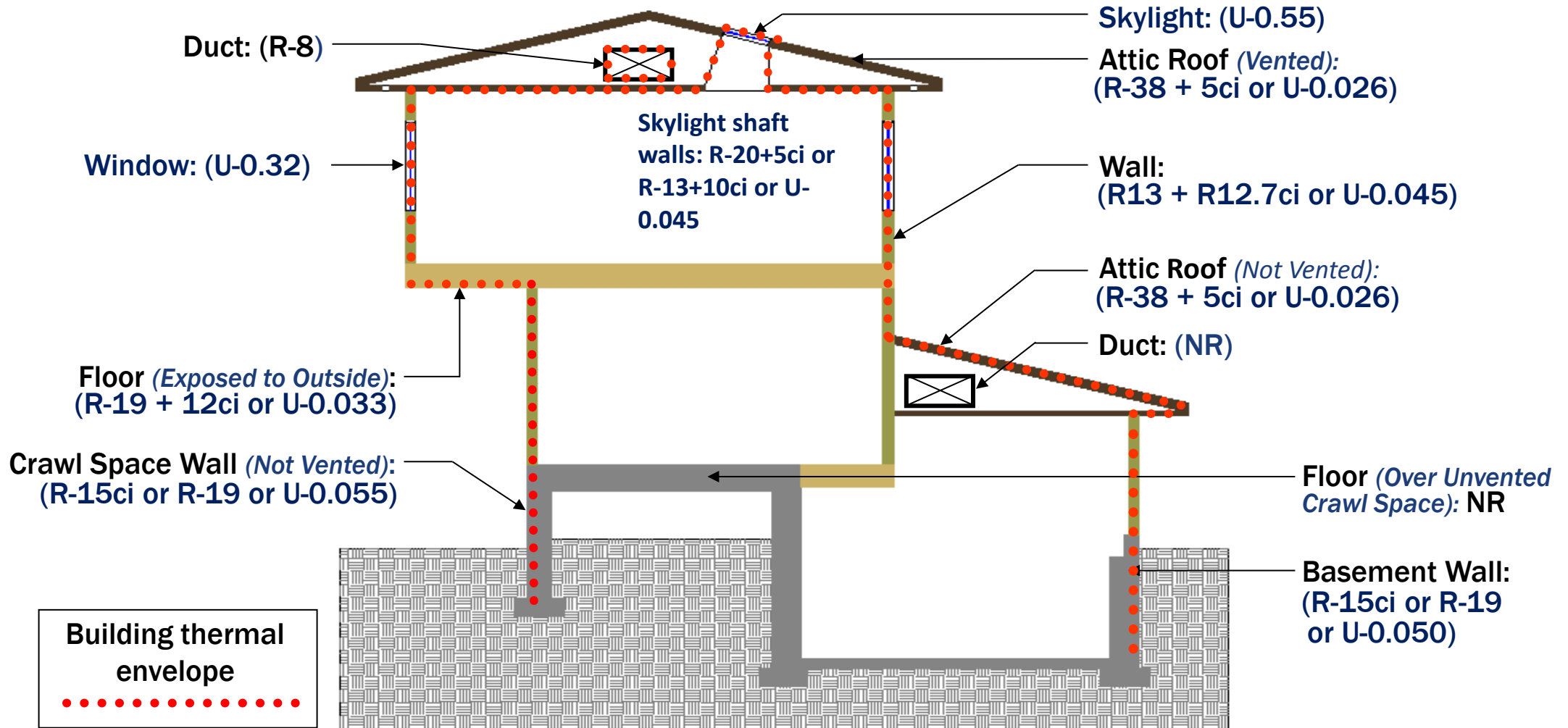
# 4. INSULATION REQUIREMENTS: WOOD FRAMED CONSTRUCTION

## Identify Building Thermal Envelope & Minimum Insulation Requirements.



# 4. INSULATION REQUIREMENTS: STEEL FRAMED CONSTRUCTION

## Determine Thermal Envelope & Minimum Insulation Requirements.



# 4. INSULATION REQUIREMENTS: MASS WALLS

## What are the Requirements for Wall Types Other Than Steel/Wood Framed?



Photo: Courtesy of DOE/NREL

### Applicable Wall Constructions

- Concrete Masonry Block (CMU)
- Concrete
- Insulated Concrete Forms (ICF)
- Masonry cavity
- Brick (excludes brick veneer)
- Earth (Adobe, Compressed Earth Block, Rammed Earth)
- Solid Timber/Logs

### Insulation Requirements

- Insulation can be placed on outside or inside the thermal mass or split between the two
- Outside Placement:
  - More than 50% of insulation must be placed exterior to the mass
  - Minimum required is R-15\* total
  - Maximum allowed U-0.060
- Inside Placement:
  - More than 50% of insulation must be placed interior to the mass
  - Minimum required is R-20\* total
  - Maximum allowed U-0.057

*\*U-factor approach should be used for steel frame cavity insulation*





# 4. INSULATION REQUIREMENTS: STRUCTURAL SHEATHING

## What are the Requirements for Walls with Partial Structural Sheathing?

### Walls with Partial Structural Sheathing

- Where [Section R402.1.2](#) would require continuous insulation on exterior walls and structural sheathing covers 40 percent or less of the gross area of all exterior walls
- Rci may be reduced by up to R-3 in order to result in a consistent total sheathing thickness, on areas of the walls covered by structural sheathing
- Reduction does not apply to U-factor alternative approach or total UA alternative

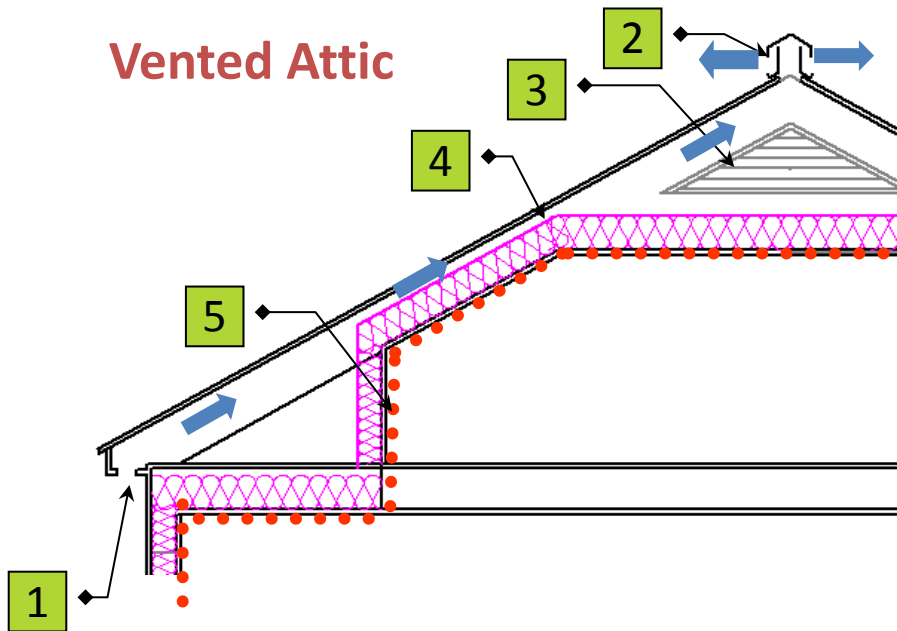


Photo: Courtesy of DOE/NREL



# 4. INSULATION REQUIREMENTS: VENTED ATTICS

## What is a Vented Attic and What are Its Code Requirements?



### Insulation Details

1. Soffit Vent
2. Ridge Vent
3. Gable Vent at End Walls
4. Protective Membrane to keep air space clear
5. Insulated Thermal envelope

## Construction Features

- Vents are present at soffits & ridge to allow for air flow within attic
  - Soffit & ridge vents must be clear, adequate and evenly distributed for free & uniform flow of air
- Building thermal envelope occurs above the ceiling
  - Attic space is considered unconditioned
  - Roof deck is cold in winter
- Insulation must be installed over air tight ceiling
  - Access hatches must be weatherstripped and insulated to equivalent of surrounding surfaces
  - All ceiling penetrations must be air sealed
  - Recessed ceiling fixtures must be enclosed in air tight boxes and insulated



# 4. INSULATION REQUIREMENTS: VENTED ATTICS

## What are the Required Insulation Practices for Attics?

### Vented Attic – Insulation Details

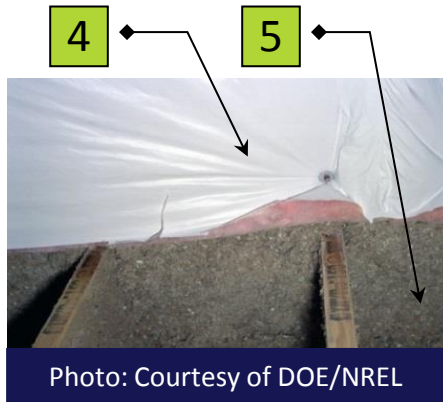
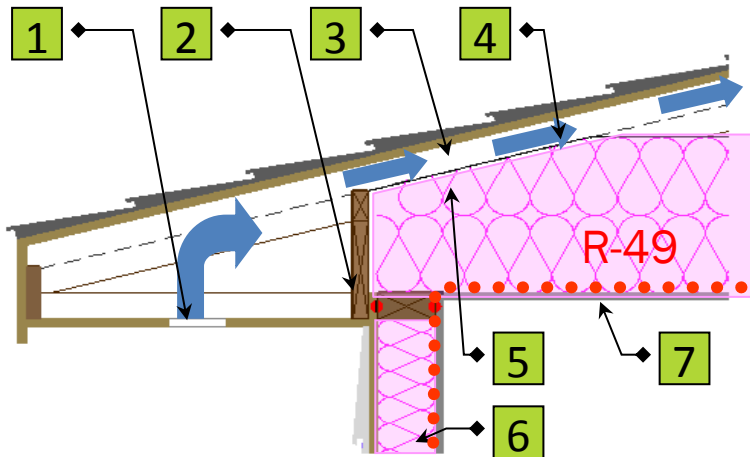


Photo: Courtesy of DOE/NREL

### Insulation Details

1. Soffit Vent
2. Vertical support for insulation
3. Clear air space for air flow
4. Protective Membrane to keep air space clear
5. R-49 Insulation required (if Compression occurs at top plate & eaves)
6. Building Thermal envelope
7. Air tight ceiling

## Insulation Requirements

- Minimum R-49 is required over attic
  - If compression of insulation occurs at wall top plate & eaves
  - R-38 allowed if no compression occurs
- Insulation (air permeable type) must be installed with protective cover or baffle along air flow path & at vertical edges
  - To prevent retardation of insulation performance
  - To eliminate the risk of insulation displacement or disturbance due to air flow
- Clear space required between insulation baffle and deck to allow for free flow of air



# 4. INSULATION REQUIREMENTS: VENTED ATTICS

What are the Required Insulation Practices for Attics?

## Baffles

- Baffles provide an air space over the insulation to guide ventilation air from the soffit vents up along the underside of the roof deck

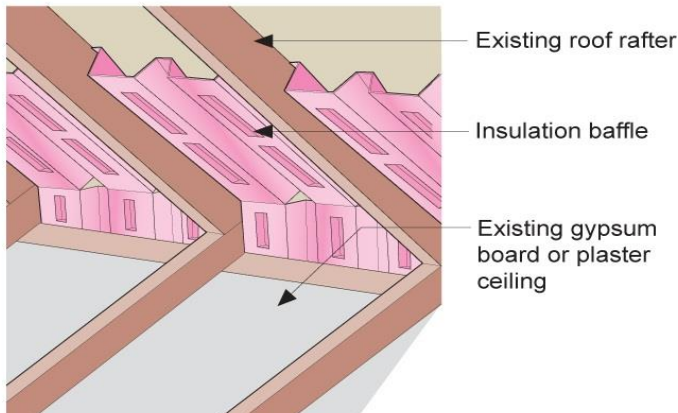


Image: Courtesy of [basc.pnnl.gov](http://basc.pnnl.gov)

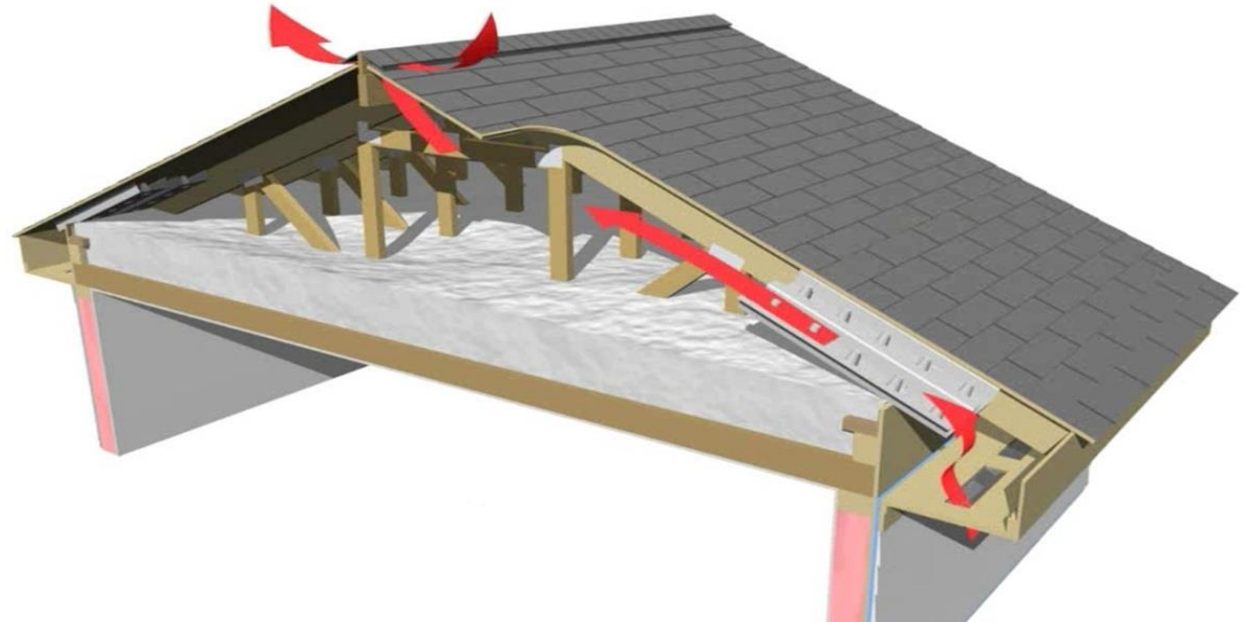


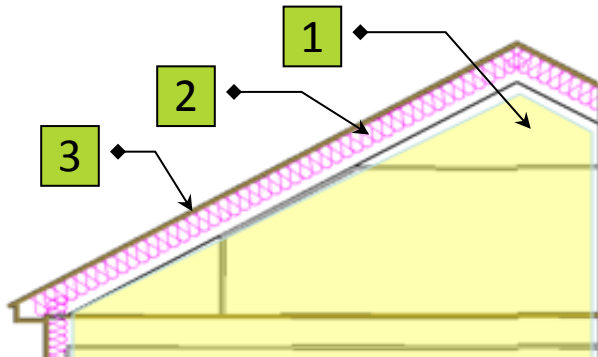
Image: Courtesy of [basc.pnnl.gov](http://basc.pnnl.gov)



# 4. INSULATION REQUIREMENTS: UNVENTED ATTICS

## What are Best Practices for Unvented Attics?

### Unvented Attic – Insulation Details



#### Insulation Details

1. Unvented Attic – Conditioned space
2. Building Thermal envelope along roof deck
3. Insulation (Air Impermeable Type) in contact with roof deck

### Best Practices

- Attic is not vented to outside
- Building thermal envelope occurs along roof deck
  - Attic space is considered conditioned
  - Hot Deck Design
- Insulation must be installed along roof deck
  - Vapor retarder type 1 & 2 cannot be installed on ceilings
- Wood shingles or shakes require 1/4" vented air space between shingles and roofing underlayment

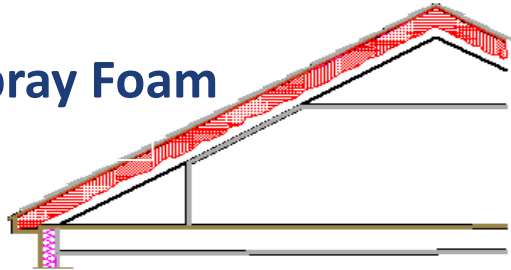




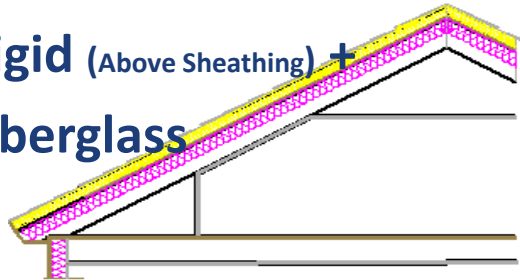
# 4. INSULATION REQUIREMENTS: UNVENTED ATTICS

## What are Best Practices for Unvented Attics? (continued)

R-49 Spray Foam



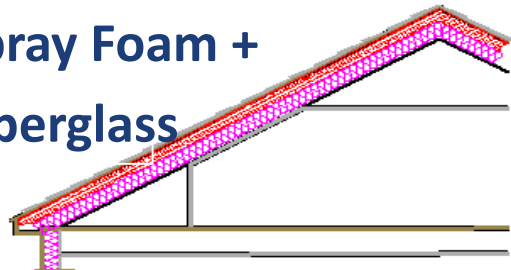
R-15 Rigid (Above Sheathing) +



R-23 Fiberglass

R-15 Spray Foam +

R-23 Fiberglass



## Insulation Requirements

- Total value of insulation must be R-49 or higher
- Insulation placement depends on Air Permeability of Insulation
  - Air Impermeable (Spray Foam)
    - R-49 Insulation installed in direct contact with underside of structural roof sheathing
  - Air Permeable (Fiberglass / Cellulose)
    - R-15 Rigid Board insulation required to be installed above roof sheathing in addition to R-23 or higher air permeable insulation below roof sheathing
  - Air Impermeable + Air Permeable
    - Air impermeable (Spray Foam) layer (R-15 or higher) installed in direct contact with underside of structural roof sheathing
    - Additional air permeable layer (Fiberglass or Cellulose) with R-23 or higher installed below the spray foam insulation

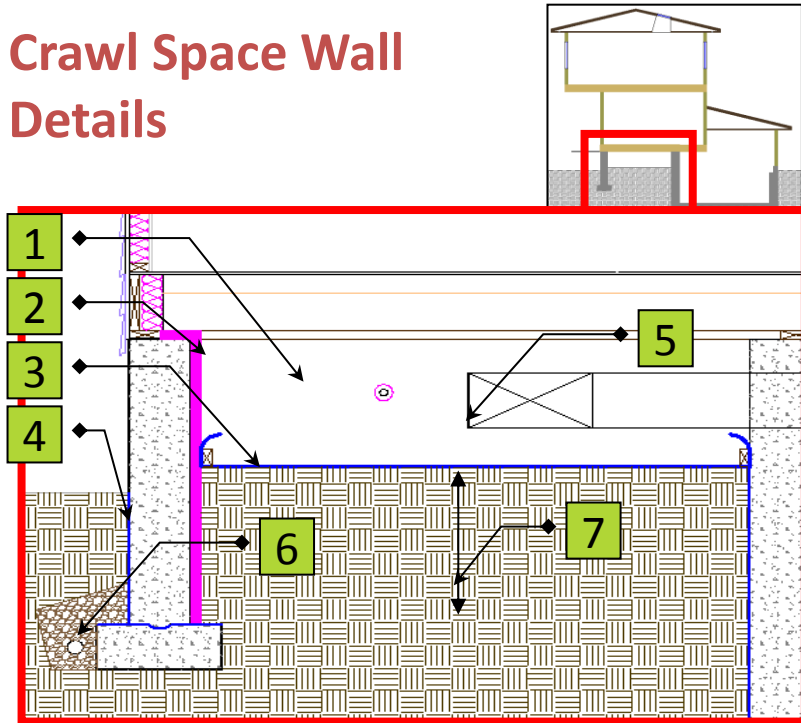




# 4. INSULATION REQUIREMENTS: CRAWL SPACES

## What are Differences Between Vented and Unvented Crawl Space Walls?

### Crawl Space Wall Details



1. Unvented Crawl Space
2. R-15 Rigid Insulation
3. Class I Vapor Retarder min. 6" up stem wall sealed or taped (Best Practices)
4. Damp Proofing
5. Duct (inside conditioned space)
6. Foundation Drain
7. 48" Minimum Depth for insulation

### Unvented Crawl Spaces

- Insulation required in crawl space wall if it is part of the continuous building thermal envelope
- Insulation value must follow tables R402.1.2 & R402.1.4
  - Maximum allowed assembly U-0.055
  - Minimum required R-15 continuous or
  - Minimum required R-19 within cavity for non metal framed walls
  - Insulation must be permanently fastened to wall and extend downward from floor to finish grade then vertically or horizontally for at least an additional 24"
  - Duct insulation is optional as it is located within thermal boundary
- Damp proofing and vapor barrier required to prevent moisture migration from soil into conditioned crawl spaces

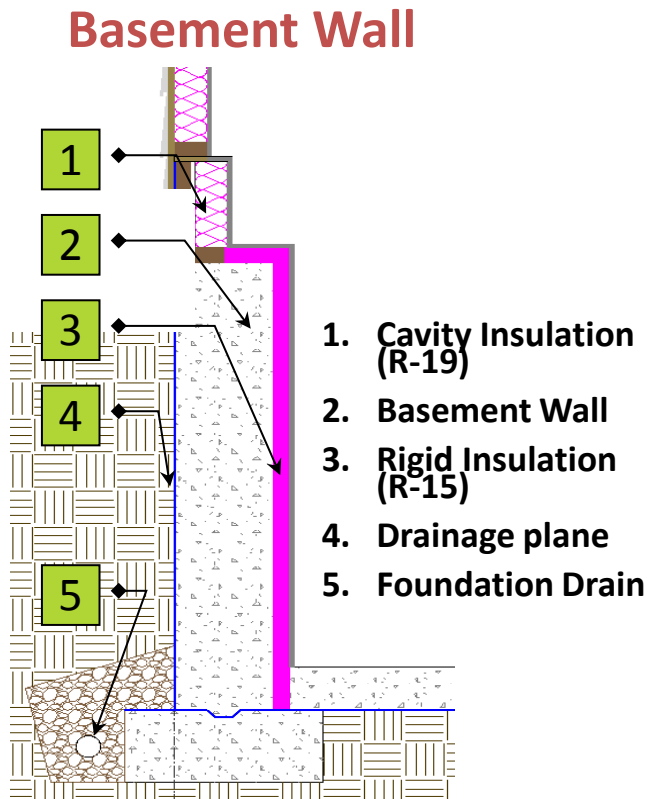
### Vented Crawl Spaces

- Need insulation installed in the floor separating conditioned and unconditioned spaces
  - Crawl space wall is no longer part of thermal boundary



# 4. INSULATION REQUIREMENTS: BASEMENT WALLS

## How Should Basement Walls be Insulated?



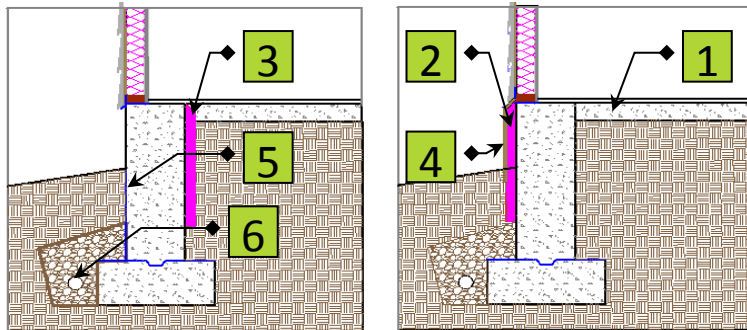
## Insulation & Placement

- R-15 continuous rigid type insulation installed on the inside or outside  
OR
- R-19 cavity type insulation installed on inside for non metal framed walls  
OR
- U-Factor is 0.050 or lower for assembly
  - This value must be used for metal framed walls
- Insulation must extend from top of wall down to 10' below grade, or to top of floor, whichever comes first
  - Not required if the basement is unheated and the floor above is insulated

# 4. INSULATION REQUIREMENTS: SLAB ON GRADE FLOORS

## What Level of Insulation is Required for Slab-on-Grade Conditions?

### Options for Insulation Placement



1. R-10 Insulation
2. Floor Slab
3. Thermal Break between Slab & Foundation
4. Exterior Insulation Protection
5. Water Proofing
6. Foundation Drain

### Insulation

- R-10 for unheated slabs
- R-15 for heated slabs

### Placement

- Insulation must start on top of slab edge and extend 48", vertically or horizontally and outside or inside of foundation walls below exterior finished grade
- Thermal break must be provided between slab & foundation wall if insulation is placed on the inner face of foundation wall
  - Use rigid type insulation and protect the weather exposed sections with permanent weather resistant cover material

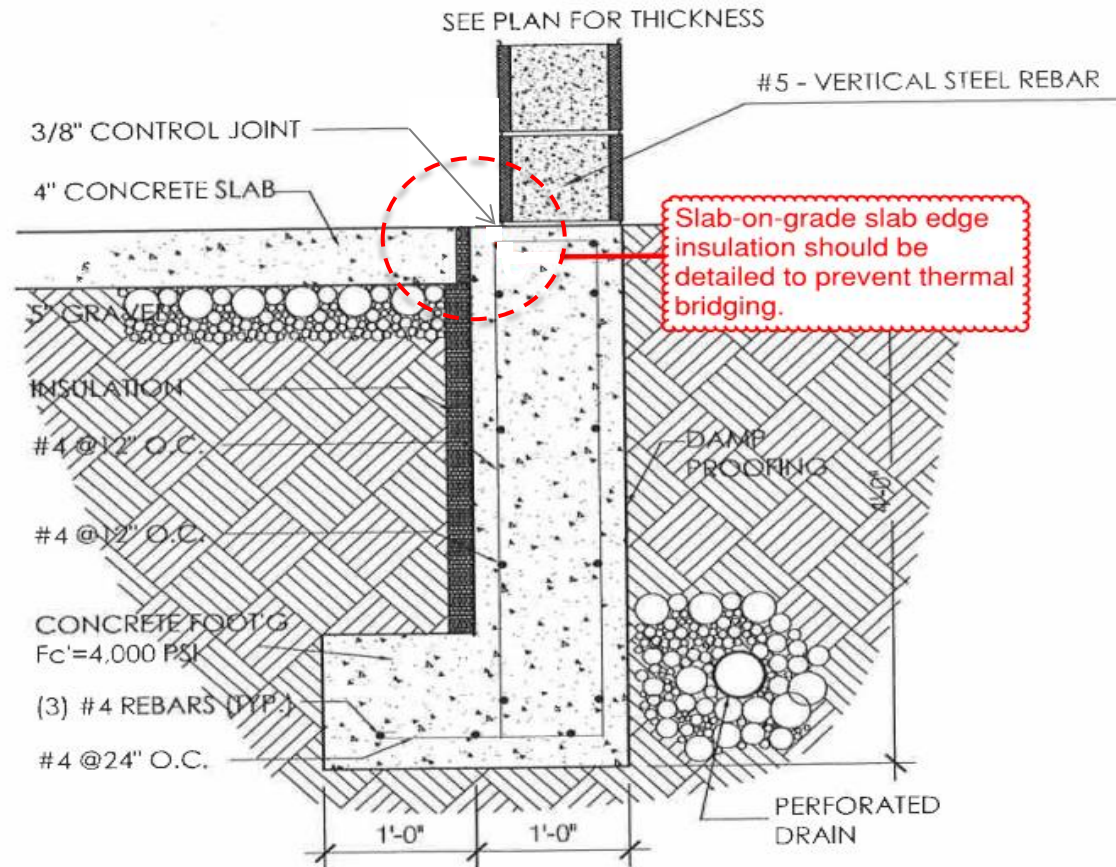


Insulation must be installed & protected at time of foundation inspection.



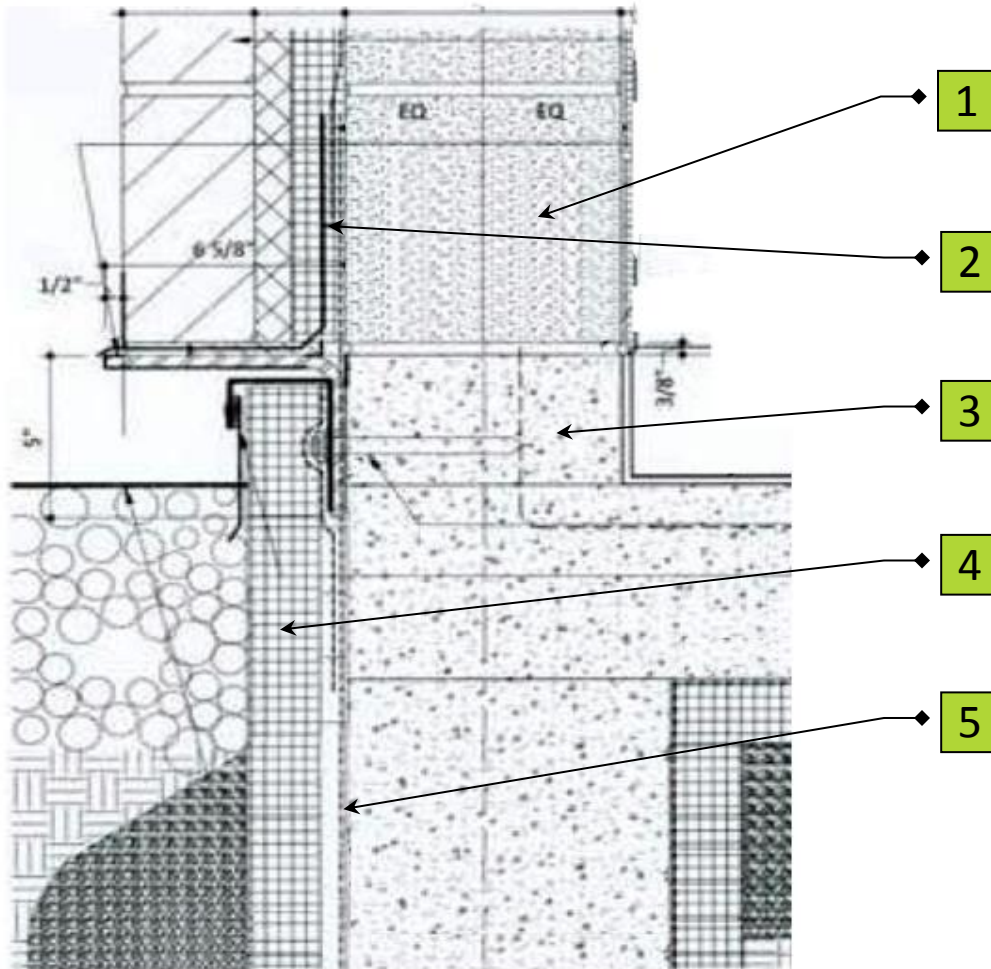
# 4. INSULATION REQUIREMENTS: SLAB ON GRADE FLOORS

## Thermal Bridging at Slab-on-Grade.



# 4. INSULATION REQUIREMENTS: SLAB ON GRADE FLOORS

## Example of Thermal Bridging at Slab-on-Grade.



1. Aerated structural concrete block wall with reinforcing
2. Flexible flashing
3. Structural concrete slab
4. Rigid insulation
5. Water proofing membrane

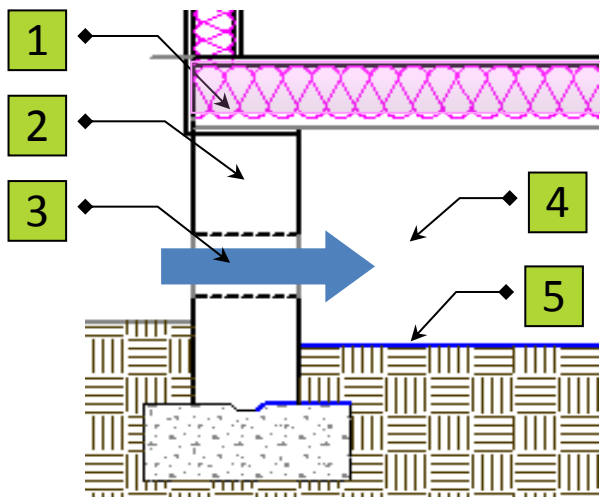




# 4. INSULATION REQUIREMENTS: FLOORS OVER UNCONDITIONED SPACE

## What are the Floor Insulation Requirements?

### Insulated Floor



1. Insulation placed in contact with subfloor
2. Foundation wall
3. Venting
4. Unconditioned Crawl Space
5. Moisture barrier

### Insulation

- Required if floor separates conditioned & unconditioned spaces
- Wood Joist Floor: R-30, or insulation sufficient to fill the framing cavity, R-19 minimum
- Steel Joist Floor (2x6 construction): R-19 cavity + R-6 continuous
- Steel Joist Floor (2x8 or 2x10): R-19 cavity + R-12 continuous
- Assembly U-Factor: 0.033
- Use impermeable, vapor retardant type of insulation if moisture risk exists

### Placement


- Insulation must maintain permanent contact with sub-floor
- Insulation must be protected from exposure to elements, moisture





# 4. INSULATION REQUIREMENTS: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Building Envelope?

|  <b>Inspection / Test (As indicated on the <a href="#">TR8</a>)</b>  | <b>Frequency</b>  |
|---|---|
| <p><b>Insulation placement and R-values (IA2)</b></p> <p>Installed insulation for each component of the conditioned space envelope and at junctions between components shall be <b>visually inspected to ensure that the R-values are marked</b>, that such R-values conform to the R-values identified in the construction documents and that the <b>insulation is properly installed</b>. Certifications for unmarked insulation shall be similarly visually inspected.</p> | <p>As required to verify continuous enclosure while walls, ceilings and floors are open</p> |
| <p><b>Permanent certificate (ID2)</b></p> <p>The installed permanent certificate shall be <b>visually inspected for location, completeness and accuracy</b>.</p>  | <p>Prior to final plumbing, electrical and/or construction inspection as applicable</p>     |
| <p><b>Air sealing and insulation – visual (IA6)</b></p> <p>Openings and penetrations in the building envelope, including site-built fenestration and doors, shall be visually inspected to verify that they are properly sealed, in accordance with Table R402.4.1.1. <b>See Air &amp; Moisture Control section of this Module.</b></p>   | <p>As required during envelope construction</p>   |
| <p><b>Air sealing and insulation – testing (IA7)</b></p> <p>Testing shall be performed in accordance with section ECC R402.4.1.2 and shall be accepted if the building meets the requirements detailed in such section. Test results shall be retained in accordance with the provision of Title 28. Testing must be performed by a third-party independent of the contractor and acceptable to the department.</p>   | <p>Prior to final construction inspection</p>   |



# 4. INSULATION REQUIREMENTS: FENESTRATION

## How to determine Compliance for Windows or Doors?

### Coverage

- Applies to Doors & Windows
- Includes replacement units if sash & frame are replaced

### U-Factor Requirement: 0.32 or lower

- Prescriptive path:
  - Area-Weighted average U-Factor of all fenestration products (excluding skylights) should be 0.32 or lower
  - Exemption per dwelling unit
    - Up to 15 ft<sup>2</sup> of glazing (single or multiple units)
    - 1 single side-hinged door of up to 24 ft<sup>2</sup>
- Trade-Off path (Total UA Alternative):
  - Area-weighted average (UA Method) accounting for all thermal envelope components is allowed
    - 15 ft<sup>2</sup> exemptions cannot be taken under Trade-Off path
    - 24 ft<sup>2</sup> opaque door exemption cannot be taken under Trade-Off path
    - Maximum allowed average U-Factor for fenestration is 0.40



U-Factor values can be found on NFRC labels that are typically affixed on each window by manufacturer.

Retain these labels on windows for progress inspections.



# 4. INSULATION REQUIREMENTS: FENESTRATION

## What Properties Define Window Compliance?



## Fenestration requirement

- U-Factor of 0.32 (of the unit, not center of glass) or lower required on an average for all fenestration products or as part of total general building's weighted average UA Calculation
- Special Exemption for 15 ft<sup>2</sup> of glazed area per dwelling unit under prescriptive method

## Recommended Window Types

- High-performance double-glazed, low-E wood- or vinyl-framed windows will typically meet U-0.32 requirement
- Double-glazed metal-framed windows will have difficulty meeting U-0.32 requirement
  - Complete thermal break, very high-performance glass, triple-pane assembly may be required for metal-framed windows to meet this standard

|  |  |  |
|--|--|--|
|  <p>National Fenestration Rating Council®<br/>CERTIFIED</p>  | <p>World's Best Window Co.</p> <p>Millennium 2000+<br/>Vinyl-Clad Wood Frame<br/>Double Glazing • Argon Fill • Low E<br/>Product Type: Vertical Slider</p>       |  |
|  | <p><b>ENERGY PERFORMANCE RATINGS</b></p> <p>U-Factor (U.S./I-P)      Solar Heat Gain Coefficient</p> <p><b>0.30</b>                              <b>0.30</b></p> |  |
| <p><b>ADDITIONAL PERFORMANCE RATINGS</b></p> <p>Visible Transmittance      Air Leakage (U.S./I-P)</p> <p><b>0.51</b>                              <b>0.2</b></p>   |  |  |
| <p><small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.<br/>www.nfrc.org</small></p> |  |  |



# 4. INSULATION REQUIREMENTS: FENESTRATION

## What Properties Define Window Compliance?



**NFRC Labels must be retained on windows for inspections. U-Factor to be verified on labels.**

## Fenestration requirement

- U-Factor of 0.32 (of the unit, not center of glass) or lower required on an average for all fenestration products or as part of total general building's weighted average UA Calculation
- Special Exemption for 15 ft<sup>2</sup> of glazed area per dwelling unit under prescriptive method

## Recommended Window Types

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  - Complete thermal break, very high-performance glass, triple-pane assembly may be required for metal-framed windows to meet this standard

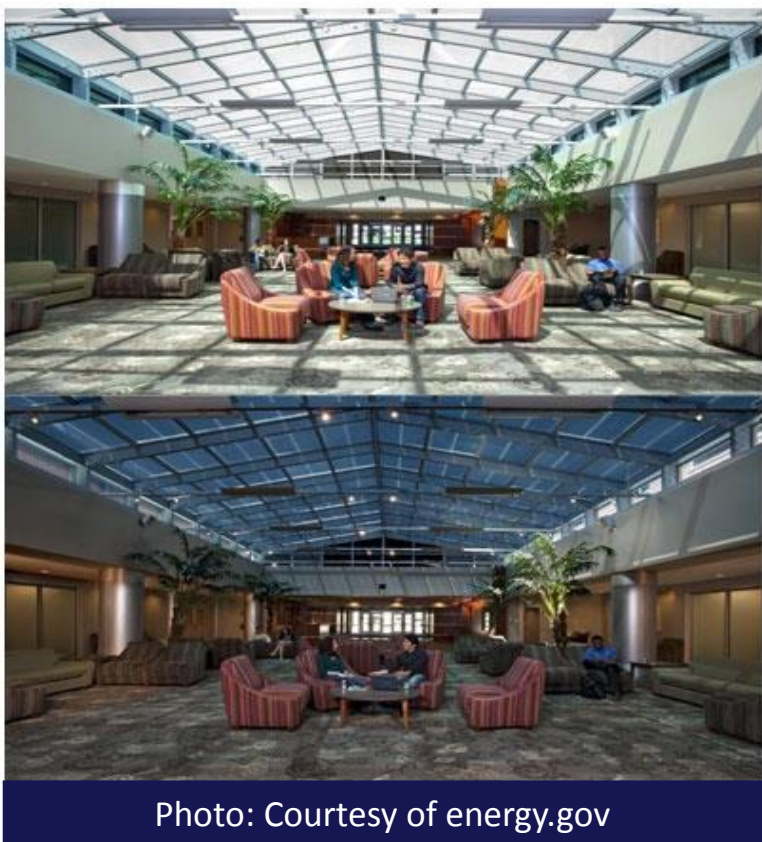
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|---|--|
| <br>National Fenestration Rating Council®<br>CERTIFIED  | <b>World's Best Window Co.</b><br>Millennium 2000+<br>Vinyl-Clad Wood Frame<br>Double Glazing • Argon Fill • Low E<br>Product Type: <b>Vertical Slider</b> |
| <b>ENERGY PERFORMANCE RATINGS</b>   |  |
| U-Factor (U.S./I-P)<br><b>0.30</b>  | Solar Heat Gain Coefficient<br><b>0.30</b>   |
| <b>ADDITIONAL PERFORMANCE RATINGS</b>   |  |
| Visible Transmittance<br><b>0.51</b>  | Air Leakage (U.S./I-P)<br><b>0.2</b>   |
| <small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.<br/>www.nfrc.org</small> |  |





# 4. INSULATION REQUIREMENTS: WINDOWS

## What Properties Define Window Compliance?



### Dynamic Glazing

- If part of scope of work, must satisfy Table R402.1.2 when
  - Ratio of higher SHGC/lower SHGC  $\geq 2.4$ , and
  - It is automatically controlled to modulate amount of solar gain in multiple steps
- Is not required to comply with this section when both the lower and higher labeled SHGC already comply with the requirements of Table R402.1.2

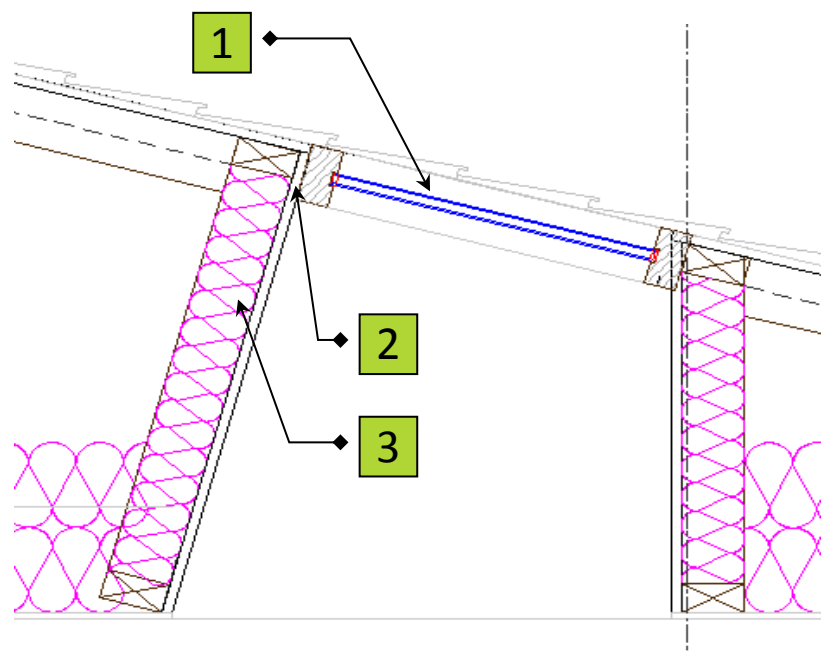
### Considered separately from other fenestration

- Area-weighted averaging with other fenestration that is not dynamic glazing is not permitted



# 4. INSULATION REQUIREMENTS: SKYLIGHTS

What are the Requirements for Skylights?



1. Skylight
2. Air Sealing & Flashing
3. Insulated Curb / Knee Walls

**U-Factor Requirement 0.55 or lower required for each skylight unit**

- Fiberglass-insulated panel types and triple- or quadruple-paned glass skylights will typically meet this spec

**Skylight Curb or Knee Wall must be insulated if it becomes part of building thermal boundary**

**Area-Weighted Average allowed to meet the compliance requirements**





# 4. INSULATION REQUIREMENTS: SUNROOMS

## What are the Requirements for Thermally-Isolated Sun Rooms?



Photo: Courtesy of DOE/NREL

### Thermal Isolation

- **Thermally-isolated from main building**
  - Walls, doors & windows separating the Sun Room from the main residence must meet building thermal envelope criteria (as if the Sun Room were unconditioned)



The thermal performance values for Sun Rooms are less stringent than typical construction, but only if they are thermally isolated from the main residence.


### Thermal Requirements for Sun Room

- **Ceilings: Minimum R-19**
- **Walls: Minimum R-13**
- **Fenestration: Maximum U-0.45**
- **Skylights: Maximum U-0.70**



# 4. INSULATION REQUIREMENTS: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Building Fenestration?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> )   | Frequency                              |
|--|--|
| <p><b>Fenestration U-factor and product ratings (IA3)</b></p> <p>U-Factors, SHGC and VT values of installed fenestration shall be <b>verified by visual inspection</b> for conformance with the U-Factors, SHGC and VT values identified in the construction drawings, either by <b>verifying the manufacturer’s NFRC labels</b> or, where not labeled, using the ratings in ECC Tables R303.1.3(1) and (2).</p> | As required during installation        |
| <p><b>Fenestration air leakage (IA4)</b></p> <p>Windows, skylights and sliding glass doors, except site-built windows, skylights and doors, shall be <b>visually inspected to verify that installed assemblies are listed</b> and labeled to the referenced standard.</p>  | As required during installation        |
| <p><b>Fenestration areas (IA5)</b></p> <p>Dimensions of windows, doors and skylights shall be verified by visual inspection</p>  | Prior to final construction inspection |



# 5. AIR LEAKAGE CONTROL

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Slides 80 to 91



# 5. AIR LEAKAGE CONTROL: OVERVIEW

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In this section you will learn about:

- Concepts and requirements for air leakage control, testing and inspection requirements;
- Fireplaces; and
- Rooms containing fuel-burning appliances.





# 5. AIR LEAKAGE CONTROL: ENVELOPE

## What is Air Leakage?



Photo: Courtesy of DOE/NREL



Photo: Courtesy of DOE/NREL

## Air Leakage

- Uncontrolled leakage of air from conditioned spaces to unconditioned spaces (exfiltration) or vice versa (infiltration), usually at building thermal envelope boundary
- Air leakage usually occurs through cracks in building envelopes
- Leads to energy waste & comfort issues
- May lead to moisture issues within assemblies

## Code Requirement

- Air leakage must be controlled by attention to details in air-sealing activity during construction
- Air leakage must be kept below threshold and proven via testing and detailed visual inspections.



# 5. AIR LEAKAGE CONTROL

## Which are the Key Areas that Need Attention to Air Sealing?

- |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|
| 1 Sill Plate & Rim Joist | 9 Fireplace              | 15 Crawlspace Access     |
| 2 Stairs                 | 10 Plumbing Penetrations | 16 Registers             |
| 3 Wall & Ceiling Drywall | 11 Attic Access          | 17 Exhaust Fan           |
| 4 Kneewalls              | 12 Doors                 | 18 Garage Common Wall    |
| 5 Windows                | 13 Cantilever            | 19 Wall Adjoining Cavity |
| 6 ICAT Can Light         | 14 Skylight              | 20 Tub                   |
| 7 Electric Circuit Box   |                          | 21 Interior Soffit       |
| 8 Outlets & Switches     |                          | 22 Plywood Floor Panels  |

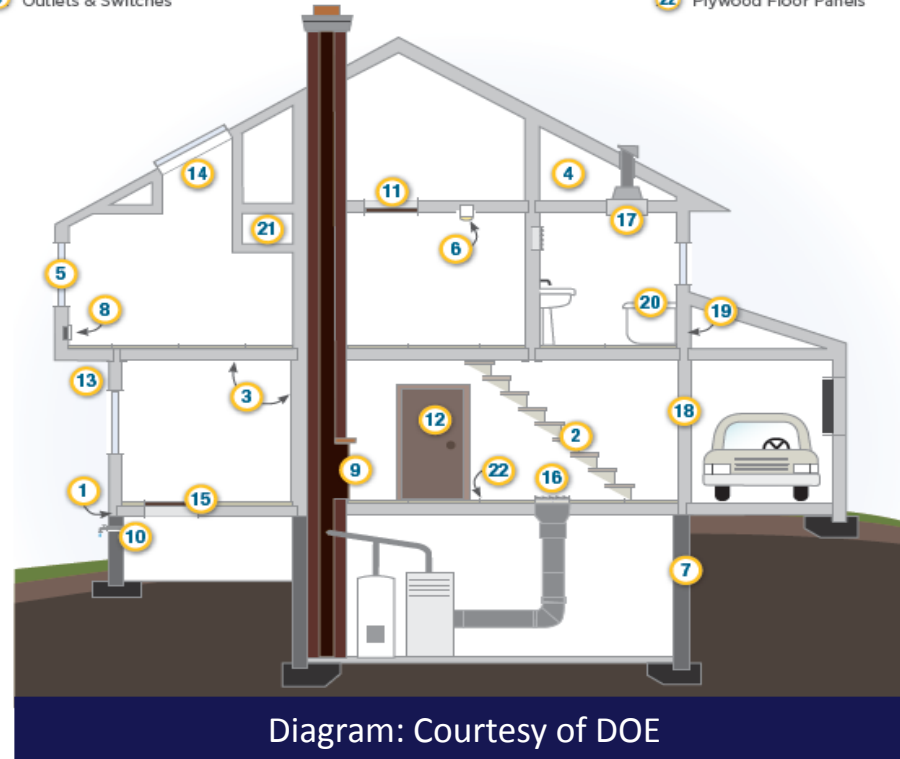


Diagram: Courtesy of DOE





# 5. AIR LEAKAGE CONTROL: TESTING

## How is Air Sealing Performance Tested & Demonstrated for Compliance?



Photo: Courtesy of energycodes.gov

### Mandatory Blower Door Test

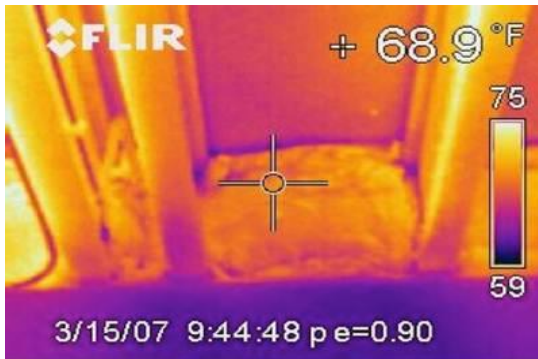
- A whole building “house” pressurization test to measure air leakage
  - Passes when air leakage rate  $\leq 3$  ACH\* at 50 Pascals
  - If test fails, leaks to be sealed until test passes
  - Performed by an approved third party without conflict of interest
- Required for new residential buildings
- Documented test results to be provided to Progress Inspectors; code official may request documentation
- Refer to [R402.4.1.2](#) for report requirements

\*ACH = Air Changes per Hour

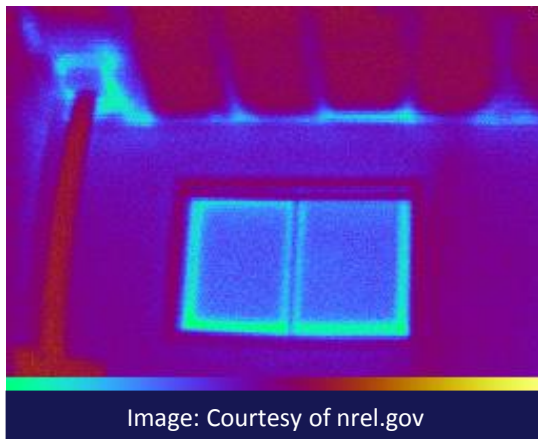


# 5. AIR LEAKAGE CONTROL: TESTING

## How is Air Sealing Performance Tested & Demonstrated for Compliance?



Display Image: [thermograph of rim joist.jpg](#)  
Courtesy of: [energy.gov](#)



## Mandatory Blower Door Test

- In accordance with ASTM E779 or ASTM E1827
- Testing to be carried out after creation of all envelope penetrations
- Rules during Testing (as per code)
  - Refer to [R402.4.1.2](#) (6 conditions)
- If blower door test fails, leaky spots may be identified by using
  - Your hand
  - A hand-held chemical smoke puffer
  - An infrared camera
  - Any other technique recommended by the equipment manufacturer
- Other considerations (not required by code)
  - Consider mechanical ventilation as option for adequate ventilation



# 5. AIR LEAKAGE CONTROL: TESTING

How is Air Sealing Performance Tested & Demonstrated for Compliance?


## Optional (alternative) Testing Procedure

- 2 or more dwelling units within building envelope
  - Each testing unit to be tested
  - Air leakage rate must be  $\leq 0.3$  cubic feet/minute/square foot of enclosure surface area within testing area to pass
  - Testing shall be conducted with a blower door at 50 Pascals
  - Testing to be carried out after creation of all envelope penetrations
  - In accordance with ASTM E 779
- More than 7 dwelling units within building envelope
  - When whole building “house” test done, testing each unit is not required
  - Testing of sample testing units as per [R402.4.1.3.1](#) permitted



# 5. AIR LEAKAGE CONTROL: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Air Sealing?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> )   | Frequency                                |
|--|--|
| <b>Air sealing and insulation – visual (IA6)</b><br>Openings and penetrations in the building envelope, including site-built fenestration and doors, shall <b>be visually inspected to verify that they are properly sealed</b> , in accordance with <a href="#">Table R402.4.1.1</a> .  | As required during envelope construction |
| <b>Air sealing and insulation – Testing (IA7)</b><br><b>Testing shall be performed</b> in accordance with section ECC <a href="#">R402.4.1.2</a> and shall be accepted if the building meets the requirements detailed in such section. Test results shall be retained in accordance with the provisions of Title 28. Testing must be performed by a third-party independent of the contractor and acceptable to the department. | Prior to final construction inspection   |



# 5. AIR LEAKAGE CONTROL: FIREPLACES

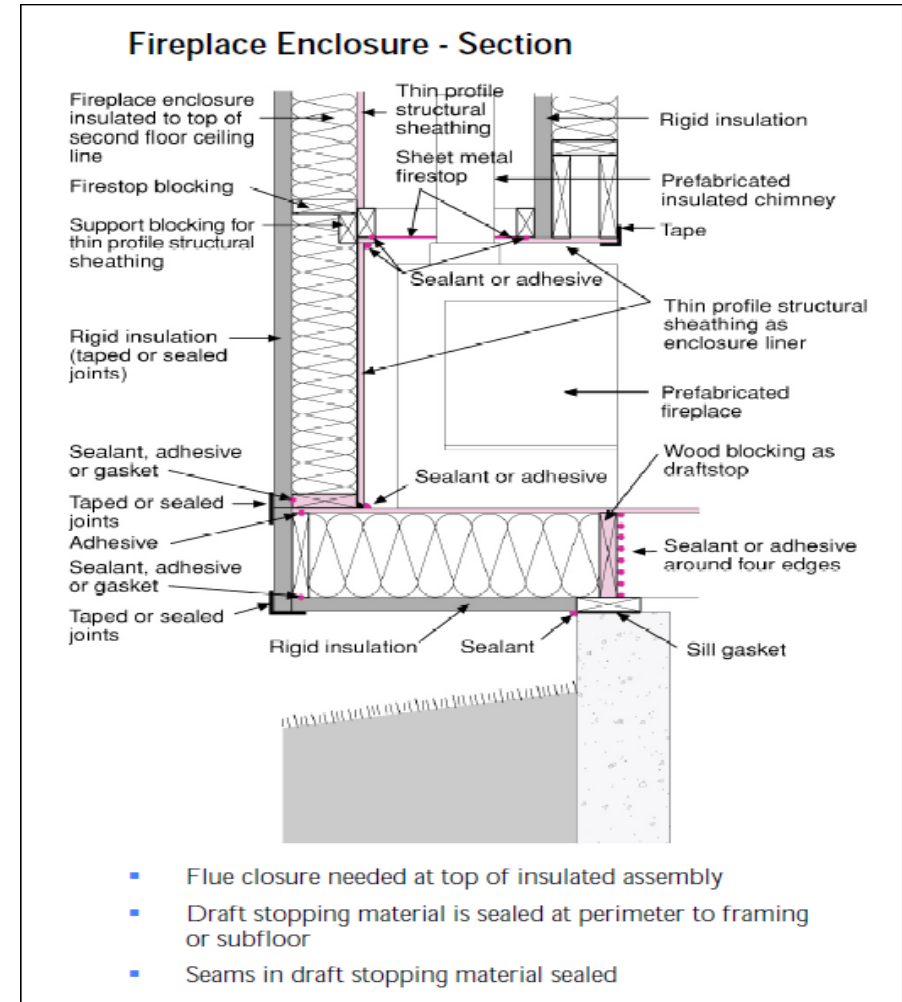
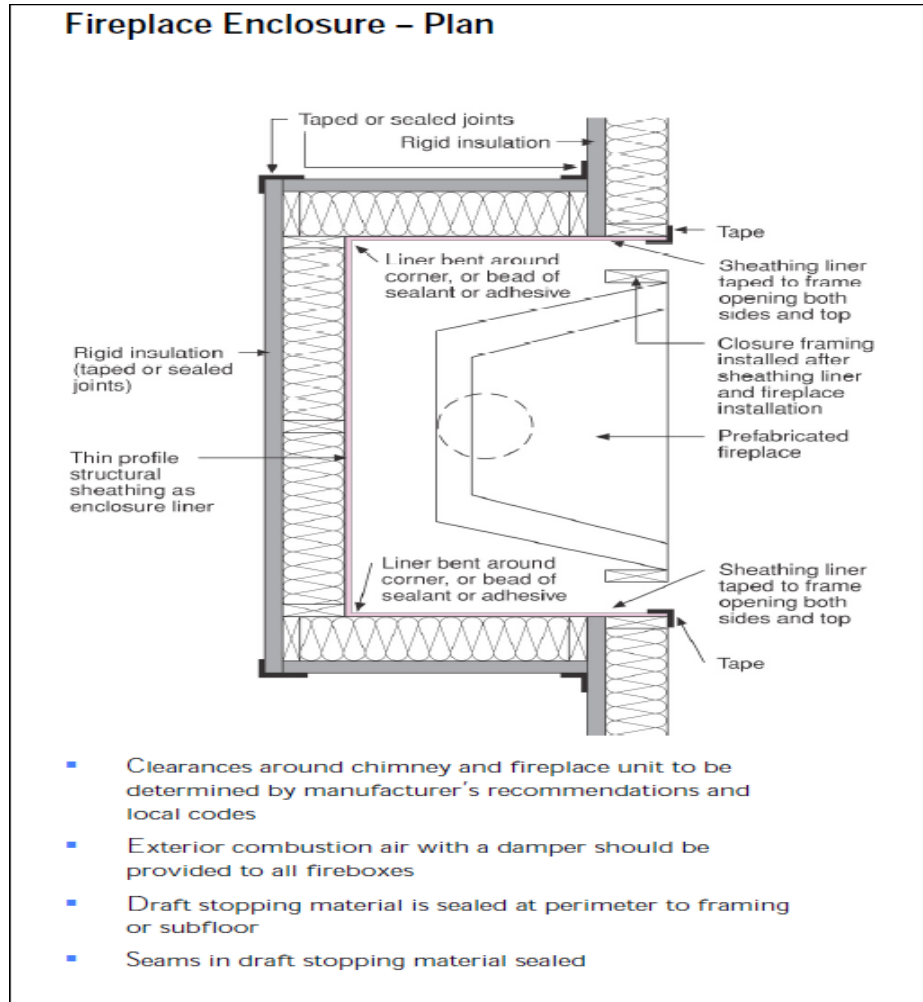
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## Fireplaces (R402.4.2)

- New wood-burning fireplaces designed to allow an open burn & new wood-burning fireplaces units designed to allow an open burn
- Tight-fitting flue dampers, or tight-fitting doors are required
- Tight-fitting doors
  - Factory built fireplace → UL 127
  - Masonry fireplace → UL 907
- Must be provided with a source of outdoor combustion air as required by the fireplace construction provisions of the NYC Building Code



# 5. AIR LEAKAGE CONTROL: FIREPLACES



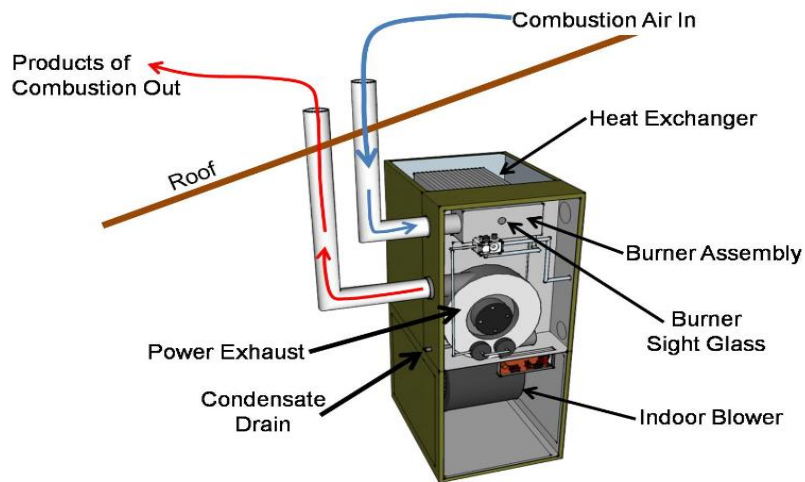
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# 5. AIR LEAKAGE CONTROL: FUEL-BURNING APPLIANCES

## Rooms containing fuel-burning appliances ([R402.4.4](#))



<https://basc.pnnl.gov/resource-guides/direct-vent-equipment#quicktabs-guides=1>

- Open combustion fuel burning appliances and combustion air opening: to be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope
- Reference Appendix RA
- Such rooms shall be sealed and insulated per Table [R402.1.2](#)
  - Walls, floors and ceilings: Not less than the basement wall R-Value requirement
  - Door into the room: Fully gasketed
  - Water lines and ducts in room: insulated per Section R403
  - Combustion air duct insulated to R8


## Exceptions to [R402.4.4](#)

- Direct vent appliances with both intake and exhaust continuous to the outside (See Figure)
- Fireplaces and stoves complying with Section [R402.4.2](#) and Chapter 9 of the NYC Mechanical code



# 5. AIR & MOISTURE CONTROL: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Mechanical & Plumbing Systems?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> )   | Frequency   |
|--|---|
| <b>Fireplaces (IB1)</b><br>Provision of combustion air and tight-fitting fireplace doors shall be <b>verified by visual inspection</b> .   | Prior to final construction inspection                |
| <b>Shutoff dampers (IB2)</b><br>Not less than 20% of installed automatic or gravity dampers, and a minimum of one of each type, shall be <b>visually inspected and physically tested for proper operation</b> .  | Prior to final construction inspection                |
| <b>HVAC and service water heating equipment (IB3)</b><br>Heating and cooling equipment shall be <b>verified by visual inspection for proper sizing</b> . Pool heaters and covers shall be verified by visual inspection.   | Prior to final plumbing and construction inspection   |
| <b>HVAC and service water heating system controls (IB4)</b><br>System controls shall be inspected to verify that each dwelling is provided with at least one individual programmable thermostat with capabilities as described in <b>ECC R40-3.1.1</b> , and that such controls are set and operate as specified in <b>ECC R403.1.1</b> .<br>Controls for supplementary electric-resistance heat pumps shall be inspected to verify that such controls prevent supplemental heat operation when the heat pump compressor can meet the heating load. Controls for snow- and ice-melting systems and pools shall be inspected for proper operation. <b>Not less than 20% or one of each control type</b> , whichever is more, shall be inspected. Controls for turning off circulating hot water pumps when not in use shall be inspected for an automatic or manual switch. | Prior to final electrical and construction inspection |



# 6. MECHANICAL/ELECTRICAL/PLUMBING SYSTEMS

Slides 92 to 113



Photo: Courtesy of energy.gov



# 6. M/E/P SYSTEMS: OVERVIEW

---

In this section you will learn about:

- Requirements for equipment sizing, HVAC controls including programmable thermostats and heat pumps;
- Insulation and air-sealing requirements for ducts and pipes;
- Requirements for swimming pools and snow melt systems;
- Lamp-efficiency requirements;
- Electrical metering requirements; and
- Solar-ready requirements.



# 6. M/E/P SYSTEMS: SIZING

## How Should HVAC Equipment Size be Determined?



Photo: Courtesy of DOE/NREL

### Equipment Sizing

- Building loads calculation must be performed for each project based on ACCA Manual J and sized in accordance with ACCA Manual S or other approved methodology
  - Applicable to systems serving 1 or 2 dwelling units
  - Systems serving multiple dwelling units shall follow requirements for commercial systems and follow ACCA/ASHRAE Standard 183 for load calculations and comply with [Section C403](#) and [Section C404](#) in lieu of [Section R403](#)



# 6. M/E/P SYSTEMS: CONTROLS

## What Controls are Required for Regulating Heating and Cooling?

### Thermostat

- At least one thermostat per heating & cooling system
- At least one programmable thermostat per dwelling unit
  - Automatic adjustment in response to thermostat for heating or cooling zone

### Heat Pump Supplementary Heat

- Controls to limit the use of electric heat for supplemental heat and defrost cycles

### Hot Water Boiler Outdoor Temperature Setback


- Lowers boiler water temperature based on the outdoor temperature





# 6. M/E/P SYSTEMS: PROGRESS INSPECTIONS


## What are the Applicable Inspections for Residential Mechanical & Plumbing Systems?

|  <b>Inspection / Test (As indicated on the <a href="#">TR8</a>)</b>   | <b>Frequency</b>                                      |
|--|---|
| <b>Fireplaces (IB1)</b><br>Provision of combustion air and tight-fitting fireplace doors shall be <b>verified by visual inspection</b> .   | Prior to final construction inspection                |
| <b>Shutoff dampers (IB2)</b><br>Not less than 20% of installed automatic or gravity dampers, and a minimum of one of each type, shall be <b>visually inspected and physically tested for proper operation</b> .  | Prior to final construction inspection                |
| <b>HVAC and service water heating equipment (IB3)</b><br>Heating and cooling equipment shall be <b>verified by visual inspection for proper sizing</b> . Pool heaters and covers shall be verified by visual inspection.   | Prior to final plumbing and construction inspection   |
| <b>HVAC and service water heating system controls (IB4)</b><br>System controls shall be inspected to verify that each dwelling is provided with at least one individual programmable thermostat with capabilities as described in <b>ECC R403.1.1</b> , and that such controls are set and operate as specified in <b>ECC R403.1.1</b> .<br>Controls for supplementary electric-resistance heat pumps shall be inspected to verify that such controls prevent supplemental heat operation when the heat pump compressor can meet the heating load. Controls for snow- and ice-melting systems and pools shall be inspected for proper operation.<br><b>Not less than 20% or one of each control type</b> , whichever is more, shall be inspected. Controls for turning off circulating hot water pumps when not in use shall be inspected for an automatic or manual switch. | Prior to final electrical and construction inspection |



# 6. M/E/P SYSTEMS: PROGRESS INSPECTIONS

What are the Applicable Inspections for Residential Mechanical & Plumbing Systems?

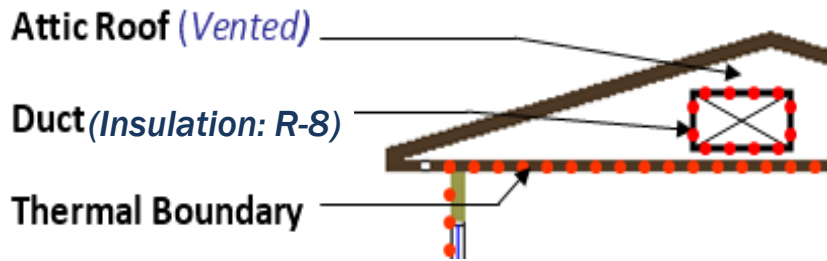
|  <b>Inspection / Test (As indicated on the <a href="#">TR8</a>)</b>   | <b>Frequency</b>  |
|--|---|
| <p><b>Maintenance information (ID1)</b><br/>           Maintenance manuals for equipment and systems requiring preventive maintenance shall be <b>reviewed for applicability to installed equipment and systems</b> before such manuals are provided to the owner. Labels required for such equipment or systems shall be inspected for accuracy and completeness.</p> | <p>Prior to sign-off or issuance of Certificate of Occupancy</p>                        |
| <p><b><a href="#">Permanent certificate (ID2)</a></b><br/>           The installed permanent certificate shall be <b>visually inspected for location, completeness and accuracy</b>.</p>   | <p>Prior to final plumbing, electrical and/or construction inspection as applicable</p> |



# 6. M/E/P SYSTEMS: DUCTS - 1

## What are the Minimum Insulation Requirements for Air Ducts?

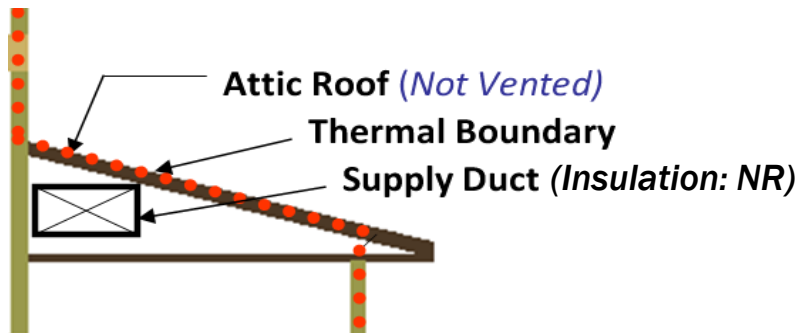
### Duct Placed in Vented Attic



### Insulation Requirements

- R-8 minimum insulation required for:
  - Supply ducts  $\geq 3$ " diameter, located in attics
  - Combustion air ducts passing through conditioned space
- R-6 minimum insulation required for:
  - All Ducts  $< 3$ " in diameter, located in attics
  - All ducts  $\geq 3$ " diameter, located in other portions of the building
- R-4.2 minimum insulation required for:
  - All ducts  $< 3$ " diameter, located in other portions of the building
- No insulation required for:
  - Ducts located completely within thermal envelope
    - Heat loss / gain are expected to be minimal if the ducts are located within thermal envelopes

### Duct Placed in Unvented Attic



### Prohibited Framing cavities

- Framing cavities cannot be used as supply ducts or plenums
  - To avoid heat loss/gain at exterior walls
  - To avoid supply air leakage



# 6. M/E/P SYSTEMS: DUCTS - 2

## How is Duct Air Leakage Regulated Within the Code?

### Air Sealing Requirements

- Required for ducts, air handlers, filter boxes
- Joints & seams must comply with the New York City Mechanical Code

### Duct Leakage Testing

- Duct air-tightness must be tested and verified at 25 Pascals with all registers taped or sealed
  - Method 1 – Rough-In Test:
    - Total leakage shall be less than or equal to 4 cubic feet per minute per 100 square feet of conditioned floor area where the air handler is installed at the time of the test or 3 cubic feet per minute without the air handler
  - Method 2 – Postconstruction Test:
    - Total leakage shall be less than or equal to 4 cubic feet per minute per 100 square feet of conditioned floor area
- A duct leakage test is not required where the ducts and air handlers are located entirely within the building thermal envelope
  - If the duct passes through unconditioned space then it will need to be insulated



# 6. M/E/P SYSTEMS: INSULATION & VENTILATION

## What other Requirements are Applicable to HVAC Systems?

### Piping Insulation for space conditioning systems

- Minimum required is R-3 if the pipe carries fluids greater than 105 °F or below 55 °F


### Mechanical Ventilation

- Outdoor air intakes and exhausts should have automatic or gravity dampers that close when the system is not in use
- Must meet the ventilation requirements of the NYC MC
- Whole house fan efficacy requirements
  - Mechanical ventilation systems fans shall meet the efficacy requirements of [Table R403.6.1](#)
    - Electronically commuted motors shall be used where mechanical ventilation fans are integral to tested and listed HVAC equipment.



# 6. M/E/P SYSTEMS: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Ducts & Piping?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> )   | Frequency   |
|--|---|
| <p><b>HVAC insulation and sealing (IB5)</b></p> <p>Installed duct and piping insulation shall be <b>visually inspected to verify correct insulation placement and values.</b></p> <p>Ducts, air handlers, filter boxes and building cavities used as ducts shall be visually inspected for proper sealing.</p>           | <p>Prior to closing ceilings and walls and prior to final construction inspection</p> |
| <p><b>Duct leakage testing (IB6)</b></p> <p>Where the air handler and/or some ductwork is in unconditioned space, duct-leakage <b>testing shall be performed either after rough-in or post-construction to ensure compliance with ECC R403.3.3 and R403.3.4.</b> Not less than 20% of such ductwork shall be tested.</p> | <p>Prior to closing ceilings and walls and prior to final construction inspection</p> |





# **6. M/E/P SYSTEMS: SNOW & ICE-MELT SYSTEMS**

## **How Does the Code Address Snow and Ice-Melt Systems?**

### **Controls Requirement**

- **Compliance required if snow-melt system's energy (hot water or electricity or fuel) is supplied from the building**
  - **Automatic shut-off when pavement temperature is above 50 ° F and no precipitation**
    - Use Pavement Temperature Sensor & Snow/Precipitation Detector
  - **Auto or Manual shut-off above 40 ° F**
    - Outdoor air temperature sensor tie-in
  - **No requirements for Freeze Protection systems (Heat Trace)**
    - Recommended shut off at 40 ° F



# 6. M/E/P SYSTEMS: POOLS & PERMANENT SPAS

## What are the Code Requirements for Residential Swimming Pools?

### On-Off Switch for Pool Heaters

- Must be readily accessible
- Shut-off should not alter thermostat setting
- Gas- or LPG-fired pool heaters should not have continuously burning pilots

### Time Switches

- Automatic on-off switching capability based on schedule for controlling heaters & pumps
  - Exceptions
    - If public health standards require 24-hour pump operation
    - Pumps are integrated with solar or waste heat recovery pool heating systems

### Pool Covers

- Vapor-retardant covers for outdoor heated pools and outdoor permanent spas
- Minimum R-12 insulation if pool is maintained at 90 °F or higher
  - Exception: Where more than 60% of the energy is from site-recovered energy or solar



Photo: Courtesy of DOE/NREL



# **6. M/E/P SYSTEMS: SERVICE HOT WATER SYSTEMS**

**How Does the Code Address Service Water Heating?**

**Circulating Service Hot Water Systems**

**Drain water heat recovery unit**

**Pipe insulation**



# 6. M/E/P SYSTEMS: SERVICE WATER HEATING

## How Does the Code Address Service Water Heating?

### Circulating Service Hot Water Systems

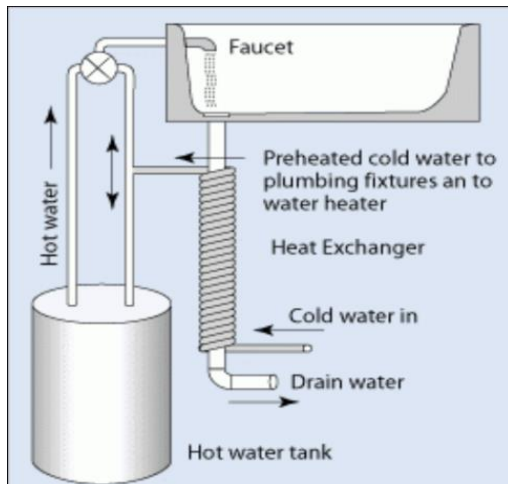


Diagram: Courtesy of energy.gov

- If the design includes circulation systems or heat trace
  - The controls shall automatically turn off the pump or heat trace when the water is at the desired temperature and when there is no demand for hot water
  - Must be provided with a circulation pump
- If the design includes drain water heat recovery
  - Potable water-side pressure loss limits are required
  - Drain water heat recovery unit to comply with CSA B55.2 and CSA B55.1



# 6. M/E/P SYSTEMS: SERVICE WATER HEATING

## How Does the Code Address Service Water Heating?

### Service Hot Water Pipe Insulation

- R-3 is required on most installations, if the design includes
  - Piping with diameters  $\geq \frac{3}{4}$  inch.
  - Piping serving more than 1 dwelling unit
  - Piping outside conditioned space, under a floor slab or buried
  - Piping from a water heater to a distribution manifold
  - Piping in a recirculation system that is not demand controlled



# 6. M/E/P SYSTEMS: LIGHTING EQUIPMENT

## What are the Efficiency Requirements Applicable to Lighting in Dwelling Units?

### Efficiency Requirements

- At least 75% of lamps in permanently installed fixtures or at least 75% of fixtures must be of high-efficacy type
  - Efficacy is measure of lamp efficiency to produce light, measured in lumens / Watt
- High-efficacy lamp requirements
  - Compact Fluorescent Lamps (CFL)
  - Linear Fluorescent Lamps: T8 or T5
  - Lamps  $\leq$  15 Watts: Minimum 40 Lumens / Watt
  - Lamps 15 to 40 watts: Minimum 50 Lumens / Watt
  - Lamps  $>$  40 Watts: Minimum 60 Lumens / Watt
- T12 type Linear Fluorescent, Incandescent & Halogen lamps will not qualify as high-efficacy lamps
- Fuel gas lighting systems shall not have continuously burning pilot lights ([R404.1.1](#))



High-efficacy lamps

Source: [energycodes.gov](http://energycodes.gov)



Source: [basc.pnnl.gov](http://basc.pnnl.gov)

### Documentation Requirements

- Must include fixture schedule or project-specific provisions indicating the type of fixtures, the number of fixtures & the number of lamps per fixture

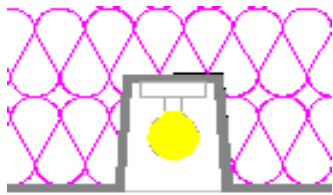




# 6. M/E/P SYSTEMS: LIGHTING FIXTURES – AIR SEALING

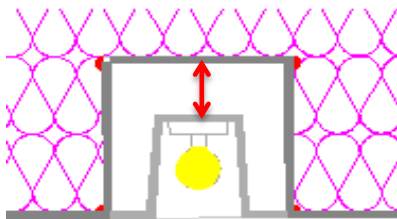
## What are the Requirements if Recessed Luminaires are Installed in Ceilings?

### “IC” Rated Luminaire



Luminaire can be installed in insulated ceiling. The ceiling penetration must be air sealed.

### Non-IC Rated Luminaire



Air-tight enclosure must be built around fixture. Insulation must not come in contact with fixture housing.

## Installation Requirements

- Recessed ceiling luminaires or light fixtures installed in building thermal envelope (ceiling with insulation) should be rated for “IC” (Insulation Contact)
- Meet ASTM E 283 standard
  - Verify for air leakage rate < 2.0 CFM at 1.57 psf
- The ceiling junction must be sealed with gasket or caulk to avoid air leakage
- Non-IC rated fixtures need air-tight enclosure box to be constructed around the fixtures to avoid insulation contact and air leakage



# 6. M/E/P SYSTEMS: ELECTRICAL METERING

What are the Requirements for dwelling Unit Metering?




## Metering Requirement

- Each dwelling unit must have capability to determine actual electrical usage
  - Separate individual meter for each unit



# 6. M/E/P SYSTEMS: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Electrical and Lighting Systems?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> )                                    | Frequency   |
|---|---|
| <b>Electrical energy consumption (IC1)</b><br>The presence and operation of individual meters shall be <b>verified by visual inspection</b> for all dwelling units.               | Prior to final electrical and construction inspection |
| <b>Interior lighting power (IC2)</b><br>Lamps in permanently installed lighting fixtures shall be <b>visually inspected</b> to verify compliance with high-efficacy requirements. | Prior to final electrical and construction inspection |



# **6. M/E/P SYSTEMS: SOLAR-READY REQUIREMENTS**

What are the Solar-Ready Requirements?

## **Solar-ready Provisions are Mandatory\***

### **Solar-ready zone**

- A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system

### **\*Required for applications with following conditions**

- New detached one- and two-family dwellings, and multiple single-family dwellings (townhouses), *and*
- Area of the roof oriented between 110° and 270° of true north ≥ 600sf, *and*
- The building is shaded ≤ 50% of daylight hours/yr., *and*
- No permanently installed on-site renewable energy system exists



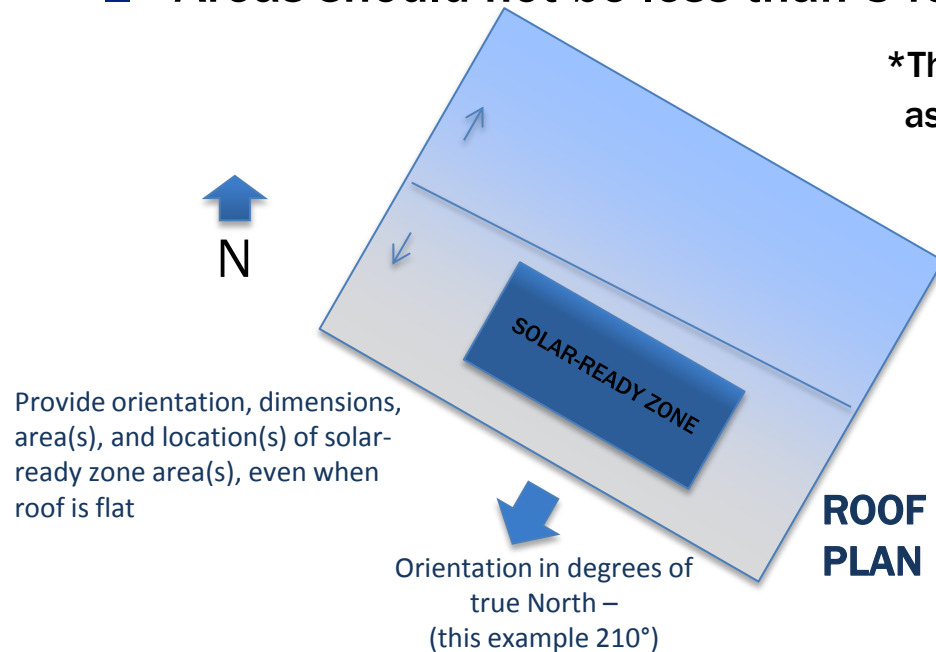
# 6. M/E/P SYSTEMS: SOLAR-READY REQUIREMENTS

## What are the Solar-Ready Requirements?

### Minimum solar-ready area requirements\*

- Min. 200 sq. ft. for new detached 1- and 2-family dwellings
- Min. 100 sq. ft. for multiple single-family dwellings (townhouses)  $\leq$  2,000 sq. ft. per dwelling
- Areas should not be less than 5 feet in width and 80 sq. ft.

\*These areas are exclusive of mandatory access or set back areas as required by the New York City Fire Code




### Construction documents

- To indicate the solar-ready zone area(s)
- Zones must be free of obstructions
- To show a reserved space on main electrical service panel for a dual pole circuit breaker labeled “For Future Solar Electric”



# 6. M/E/P SYSTEMS: PROGRESS INSPECTIONS

## What are the Applicable Inspections for Residential Installation of Equipment?

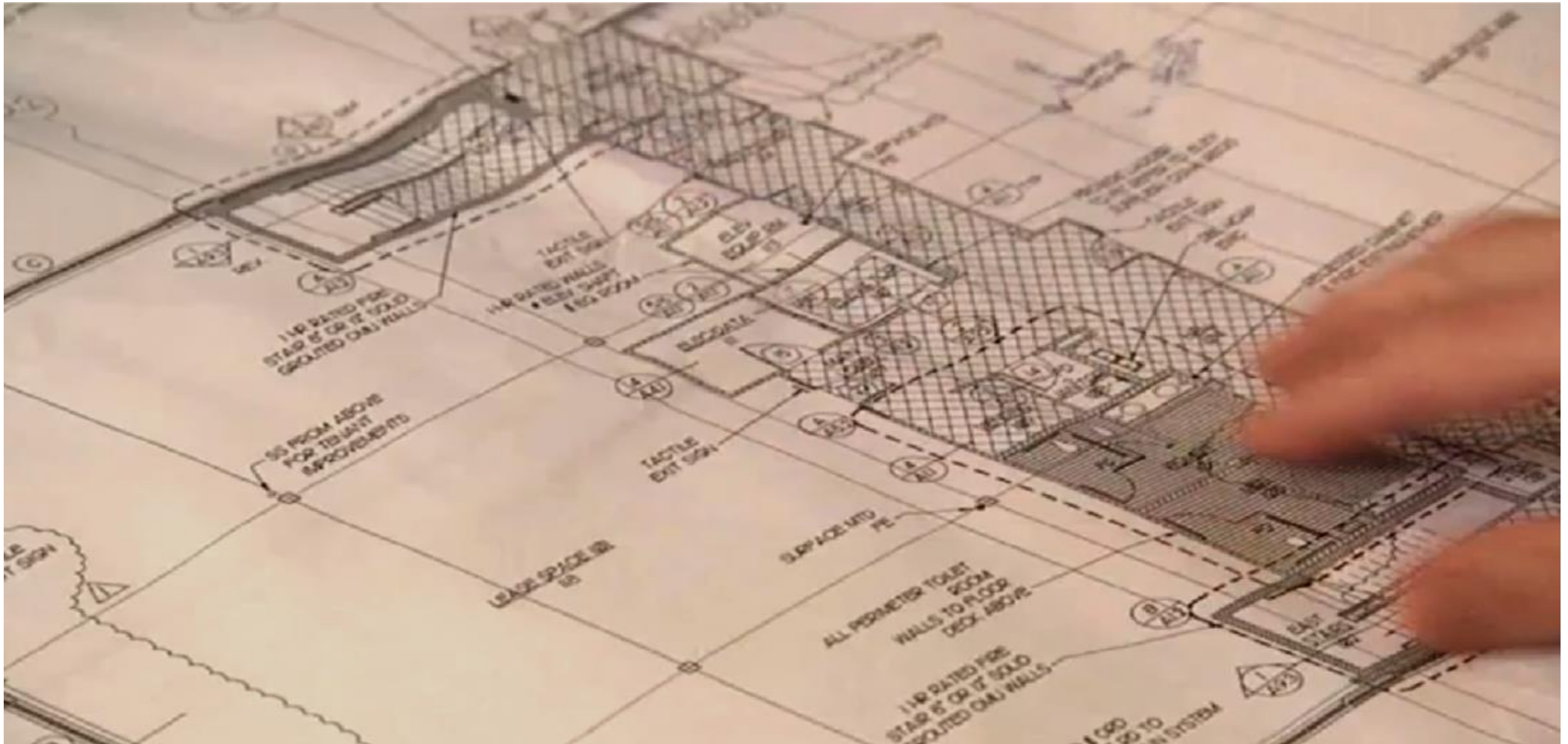
|  Inspection / Test (As indicated on the <a href="#">TR8</a> )  | Frequency  |
|---|--|
| <b>Maintenance information (ID1)</b><br>Maintenance manuals for equipment and systems requiring preventive maintenance shall be <b>reviewed for applicability to installed equipment and systems</b> before such manuals are provided to the owner. Labels required for such equipment or systems shall be inspected for accuracy and completeness. | Prior to sign-off or issuance of Certificate of Occupancy                        |
| <b><a href="#">Permanent Certificate (ID2)</a></b><br>The installed permanent certificate shall be <b>visually inspected for location, completeness and accuracy</b> .  | Prior to final plumbing, electrical and/or construction inspection as applicable |
| <b>Solar-ready requirements (ID3)</b><br>Solar-ready zone area and electrical service reserved space must be visually inspected to verify compliance. Location shall be noted on the permanent certificate.   | Prior to final construction inspection   |





# 7. SUBMISSIONS & INSPECTIONS

Slides 114 to 156



# 7. SUBMISSIONS & INSPECTIONS: OVERVIEW

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In this section you will learn about:

- Residential requirements for NYCECC Submissions, including:
  - Energy Analysis, and
  - Supporting Documentation
- Applicable Progress Inspections associated with residential buildings.



# 7. SUBMISSIONS & INSPECTIONS: NYCECC & APPLICATIONS

## What are the Application Requirements Related to the NYCECC?

### Per 1 RCNY § 5000-01

- A Professional Statement
- An Energy Analysis
- Supporting Documentation, including required Progress Inspections

### Approved Energy Analysis Methods

- Tabular Analysis: For prescriptive approach
- REScheck Software: For prescriptive and envelope trade-off approaches
- Simulated Performance Alternative: For whole-building approach
- ERI



This Residential Module addresses only Energy Analysis, Supporting Documentation, and Progress Inspection issues. A full overview of the required submission documents, including Professional Statement, is included under the NYCECC Administrative Overview module in this series.



# 7. SUBMISSIONS & INSPECTIONS: NYCECC & APPLICATIONS

## How Should the Envelope be Addressed in the Energy Analysis?

### Option 1: Tabular Analysis

- The Tabular Analysis compares proposed values of each NYCECC-regulated item in the scope of work with the respective prescriptive values required by the Code
  - Applicable to New Buildings, Additions, or Alterations
  - Demonstrates Prescriptive Compliance



Residential documentation should be sure to include:

- **ALL** assemblies related to the scope of work (roofs, above grade walls, fenestration, below grade walls, etc.)
- **ALL** significant variations of envelope assemblies (different wall assemblies, glazing types, roof assemblies, door types, etc.)



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE TABULAR ANALYSIS – 1

## Examples of Notes for Residential Alterations/Renovations


| ITEM DESCRIPTION   | PROPOSED DESIGN VALUE  | CODE PRESCRIPTIVE VALUE AND CITATION   | SUPPORTING DOCUMENTATION   |
|--|--|--|--|
| <b>BUILDING ENVELOPE</b>   |  |  |  |
| Replace roof shingles and sheathing, add insulation to attic                             | Roof Type 1:<br>R -49 fiberglass insulation in wood ceiling joists below vented attic space            | Minimum R-49 ceiling insulation<br>NYCECC <a href="#">Table R402.1.2</a>   | Roof Type 1:<br>A-100 (Roof Plan)<br>A-402 (Wall Sections)<br>7/A-603 (Roof Eave Detail) |
| Replace existing windows w/new wood framed windows, Floors 1-2                           | Window Type 1 +2 +3:<br>U = 0.31<br>Air leakage 0.30 cfm/SF<br>SHGC = .37                              | Window Types A-D:<br>Maximum U-Factor = 0.32<br>NYCECC Table R402.1.2<br>SHGC = .40<br>Maximum Air Leakage = 0.3 cfm/SF<br>NYCECC <a href="#">Section R402.4.3</a> | Window Types A-D:<br>A-301-302 (Elevations)<br>A-501 (Schedules)                         |
| Renovate interior side of exterior walls around new window openings – repair/replace gwb | No change proposed to existing 3 ½” wood stud walls which are completely filled with fiberglass batts. | NYCECC R503.1.1 Exception 2 – Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.        | A-102-104 (Floor Plans)<br>1-2/A-305 (Interior Elevations)                               |



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE TABULAR ANALYSIS – 1

## Examples of Notes for Residential Alterations/Renovations

| ITEM DESCRIPTION   | PROPOSED DESIGN VALUE  | CODE PRESCRIPTIVE VALUE AND CITATION  | SUPPORTING DOCUMENTATION   |
|--|--|---|--|
| <b>BUILDING ENVELOPE</b>   |  |   |  |
| Replace roof shingles and sheathing, add insulation to attic                             | Roof Type 1:<br>R -49 fiberglass insulation in wood ceiling joists below space                         | Minimum R-49 ceiling insulation<br>NYCECC Table R402.4.1  | Roof Type 1:<br>A-100 (Roof Plan)<br>A-402 (Wall Sections)<br>7/A-603 (Roof Eave Detail) |
| Replace existing windows w/new wood framed windows, Floors 1-2                           | Window Type 1<br>U = 0.31<br>Air leakage 0.30<br>SHGC = .37  | 0.3 cfm/SF<br>NYCECC <a href="#">Section R402.4.3</a>   | Window Types A-D:<br>A-301-302 (Elevations)<br>A-501 (Schedules)                         |
| Renovate interior side of exterior walls around new window openings – repair/replace gwb | No change proposed to existing 3 ½” wood stud walls which are completely filled with fiberglass batts. | NYCECC R503.1.1 Exception 2 – Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation. | A-102-104 (Floor Plans)<br>1-2/A-305 (Interior Elevations)                               |

 **Applicants must include reference to the applicable Supporting Documentation for EACH item within the Tabular Analysis.**






# 7. SUBMISSIONS & INSPECTIONS: RESCHECK

## How Should Residential Buildings be Addressed in the Energy Analysis?

### Option 2: REScheck submissions

- REScheck software, available for free from the US Department of Energy, can be used to prepare Energy Code compliance calculations
  - Demonstrates Prescriptive Compliance, with Trade-Offs allowed among different envelope assemblies (roofs, walls, glazings, etc.)
  - Only New York City NYCECC REScheck forms are permitted (not IECC)
  - Downloads: <https://www.energycodes.gov> 



Envelope input in REScheck should be sure to include:

- **ALL** assemblies related to the scope of work (roofs, above grade walls, fenestration, below grade walls, etc.)
- **ALL** significant variations of envelope assemblies (different wall assemblies, glazing types, roof assemblies, door types, etc.)



# 7. SUBMISSIONS & INSPECTIONS: RESCHECK

Pres 1.rck - REScheck 4.6.4 Code: 2016 New York City Energy Conservation Code

File Edit View Options Code Tools Help

Project Envelope Mechanical Requirements

Ceiling Skylight Wall Window Door Basement Floor Crawl Wall

|            | Component              | Assembly                                   | Gross Area |     | Cavity Insulation R-Value | Continuous Insulation R-Value | U-Factor | UA  | SHGC |
|------------|------------------------|--|------------|-----|---------------------------|-------------------------------|----------|-----|------|
| ▼ Building |                        |  |            |     |                           |                               |          |     |      |
| 1          | ▼ Exterior Wall Type A | Steel Frame, 16" o.c.                      | 1260       | ft2 | 15.0                      | 14.0                          | 0.045    | 51  |      |
| 2          | Window 1               | Wood Frame:Double Pane with Low-E          | 75         | ft2 |                           |                               | 0.3      | 23  | 0.30 |
| 3          | Door 1                 | Solid                                      | 41         | ft2 |                           |                               | 0.2      | 8   |      |
| 4          | ▼ Exterior Wall Type B | Steel Frame, 16" o.c.                      | 2513       | ft2 | 15.0                      | 14.0                          | 0.045    | 101 |      |
| 5          | Window 2               | Wood Frame:Double Pane with Low-E          | 210        | ft2 |                           |                               | 0.3      | 63  | 0.30 |
| 6          | Window 3               | Wood Frame:Double Pane with Low-E          | 30         | ft2 |                           |                               | 0.3      | 9   | 0.30 |
| 7          | Window 4               | Wood Frame:Double Pane with Low-E          | 5          | ft2 |                           |                               | 0.3      | 2   | 0.30 |
| 8          | Door 2                 | Glass                                      | 24         | ft2 |                           |                               | 0.2      | 5   | 0.21 |
| 9          | ▼ Roof Type 1          | Steel Joist/Rafter, 16" o.c.:2x10          | 823        | ft2 | 0.0                       | 35.0                          | 0.027    | 21  |      |
| 10         | Skylight 1             | Metal Frame with Thermal Break:Triple Pane | 32         | ft2 |                           |                               | 0.55     | 18  | 0.30 |
| 11         | Skylight 2             | Other                                      | 9          | ft2 |                           |                               | 0.55     | 5   | 0.24 |

Passes 4.1 % Better Than Code

Compliance Method: UA Trade-Off Max. UA  Your UA



# 7. SUBMISSIONS & INSPECTIONS: RESCHECK

Pres 1.rck - REScheck 4.6.4 Code: 2016 New York City Energy Conservation Code

File Edit View Options Code Tools Help

Project Envelope Mechanical Requirements

Ceiling Skylight Wall Window Door Basement Floor Crawl Wall

|    | Component              | Assembly                                   | Gross Area |     | Cavity Insulation R-Value | Continuous Insulation R-Value | U-Factor | UA  | SHGC |
|----|------------------------|--|------------|-----|---------------------------|-------------------------------|----------|-----|------|
|    | ▼ Building             |  |            |     |                           |                               |          |     |      |
| 1  | ▼ Exterior Wall Type A | Steel Frame, 16" o.c.                      | 1260       | ft2 | 15.0                      | 14.0                          | 0.045    | 51  |      |
| 2  | Window 1               | Wood Frame:Double Pane with Low-E          | 75         | ft2 |                           |                               | 0.3      | 23  | 0.30 |
| 3  | Door 1                 | Solid                                      | 41         | ft2 |                           |                               | 0.2      | 8   |      |
| 4  | ▼ Exterior Wall Type B | Steel Frame, 16" o.c.                      | 2513       | ft2 | 15.0                      | 14.0                          | 0.045    | 101 |      |
| 5  | Window 2               | Wood Frame:Double Pane with Low-E          | 210        | ft2 |                           |                               | 0.3      | 63  | 0.30 |
| 6  | Window 3               | Wood Frame:Double Pane with Low-E          | 30         | ft2 |                           |                               | 0.3      | 9   | 0.30 |
| 7  | Window 4               | Wood Frame:Double Pane with Low-E          | 5          | ft2 |                           |                               | 0.3      | 2   | 0.30 |
| 8  | Door 2                 | Glass                                      | 24         | ft2 |                           |                               | 0.2      | 5   | 0.21 |
| 9  | ▼ Roof Type 1          | Steel Joist/Rafter, 16" o.c.:2x10          | 823        | ft2 | 0.0                       | 35.0                          | 0.027    | 21  |      |
| 10 | Skylight 1             | Metal Frame with Thermal Break:Triple Pane | 32         | ft2 |                           |                               | 0.55     | 18  | 0.30 |
| 11 | Skylight 2             | Other                                      | 9          | ft2 |                           |                               | 0.55     | 5   | 0.24 |

Compliance Method: UA Trade-Off Max. UA 319 Your UA 306



Use consistent assembly labels in both REScheck and the Supporting Documentation – see sample documents at the end of this Section.

There are some limitations to the trade-off approach in residential construction. An applicant cannot exceed maximum allowed U-Factors for vertical fenestration (0.40) or skylights (0.75) in New York City.



# 7. SUBMISSIONS & INSPECTIONS: SIMULATED PERFORMANCE ALTERNATIVE - 1

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## What is the Simulated Performance Alternative; When Would it be Used?

### Intent

- Allows use of advanced techniques to credit energy-efficiency measures (e.g. Energy Recovery Ventilation) not accounted for in other paths, or
- Used for Trade-Offs among disciplines when all prescriptive requirements cannot be met

### Process

- Addresses energy costs of heating, cooling, and service water heating
  - Excluded: Energy use of Lighting & Appliances
  - Allows credit for onsite renewables, such as solar HW or PV
- Compliance demonstrated if energy cost of Proposed Design is equal to or lower than Standard Reference Design
  - Proposed Design: User defined
  - Reference Design: Generated by software program (users cannot change it)
- All mandatory requirements of building envelope must be met



# 7. SUBMISSIONS & INSPECTIONS: SIMULATED PERFORMANCE ALTERNATIVE - 2



## Software Tools

- Must be approved by the NYS Secretary of State and the DOB Commissioner
- Approved software programs:
  - DOE2 or updates of DOE2, VisualDOE, EnergyPlus, Trane Trace, IESVE and eQuest



# 7. SUBMISSIONS & INSPECTIONS: ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

## ECC R406 Criteria for using an Energy Rating Index (ERI) analysis

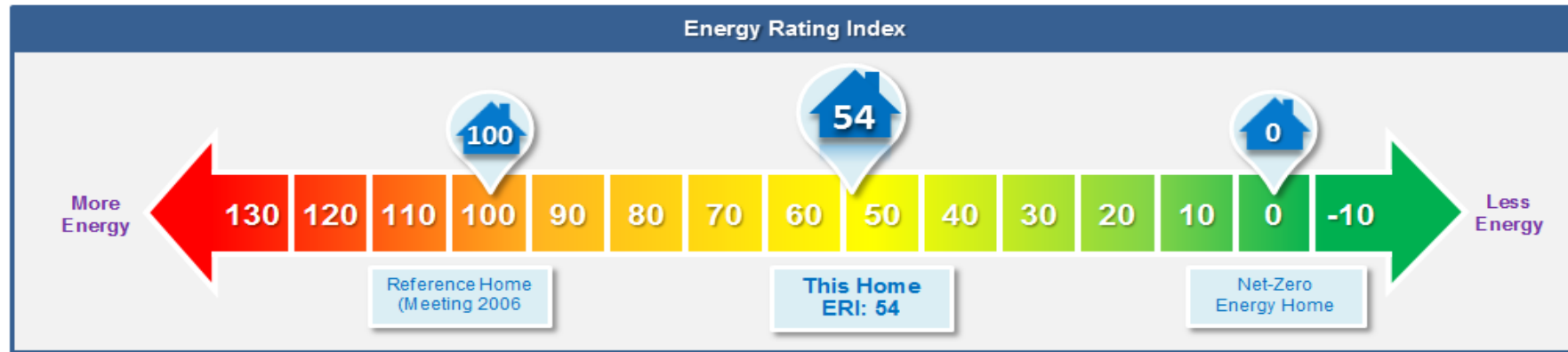
### R406.2 Mandatory Requirements

- Requires
  - mandatory provisions identified in Sections [R401](#) through [R404](#), and
  - provisions of Section [R403.5.3](#), be met.
- The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in [Table 402.1.1](#) or [402.1.3](#) of the 2011 NYCECC.
- The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the ERI reference design has an Index value of 100 and a residential building that uses no net purchased energy has an index value of 0. Each integer value on the scale shall represent a 1-percent change in the total energy use of the rated design relative to the total energy use of the ERI reference design. The ERI shall consider all energy used in the residential building.
- The ERI reference design shall be configured such that it meets the minimum requirements of the [2006 IECC](#) prescriptive requirements.
- Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to the appropriate value listed in [Table R406.4](#) when compared to the ERI reference design. For climate Zone 4, the maximum ERI is 54.
- Verification of compliance with [Section R406](#) shall be completed by an approved third party.





# 7. SUBMISSIONS & INSPECTIONS: ENERGY RATING INDEX COMPLIANCE ALTERNATIVE



# 7. SUBMISSIONS & INSPECTIONS: SUPPORTING DOCUMENTATION

## What Type of Supporting Documentation Should be Provided?

### Supporting Documentation should

- Support the values submitted in the Energy Analysis
- Verify mandatory requirements of the NYCECC are met
- Supporting documentation should be in the format of the Supporting Documentation Index

| <u>SUPPORTING DOCUMENTATION INDEX</u>                           |  |  |
|---|--|--|
| Code chapter and/or standard used for design<br>Climate Zone 4A |  |  |
| <u>Code Section</u>   | <u>Item Description</u>  | <u>Supporting Documentation Location</u>             |
| (List specific code section)                                    | (List all elements of the scope of work in the detail that they are addressed by the energy code.) | (List the drawing page number and/or section title.) |

- List and describe each applicable progress inspection as required based on the scope of work, per Table I of [1 RCNY §5000-01](#)



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



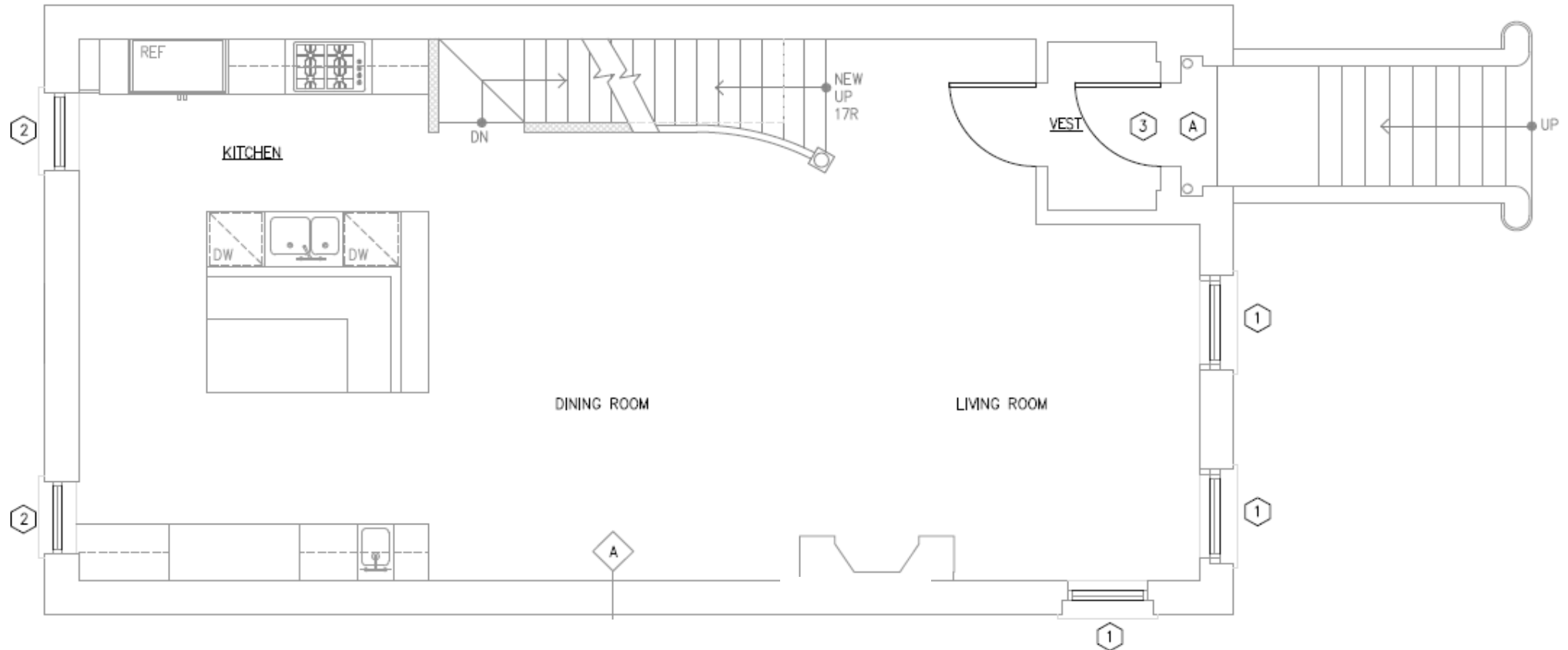
The following **Sample Supporting Documentation** has been developed to illustrate compliance procedures related to the **NYCECC** only.

Additional information required by the DOB related to zoning and other Code provisions is intentionally omitted.



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence

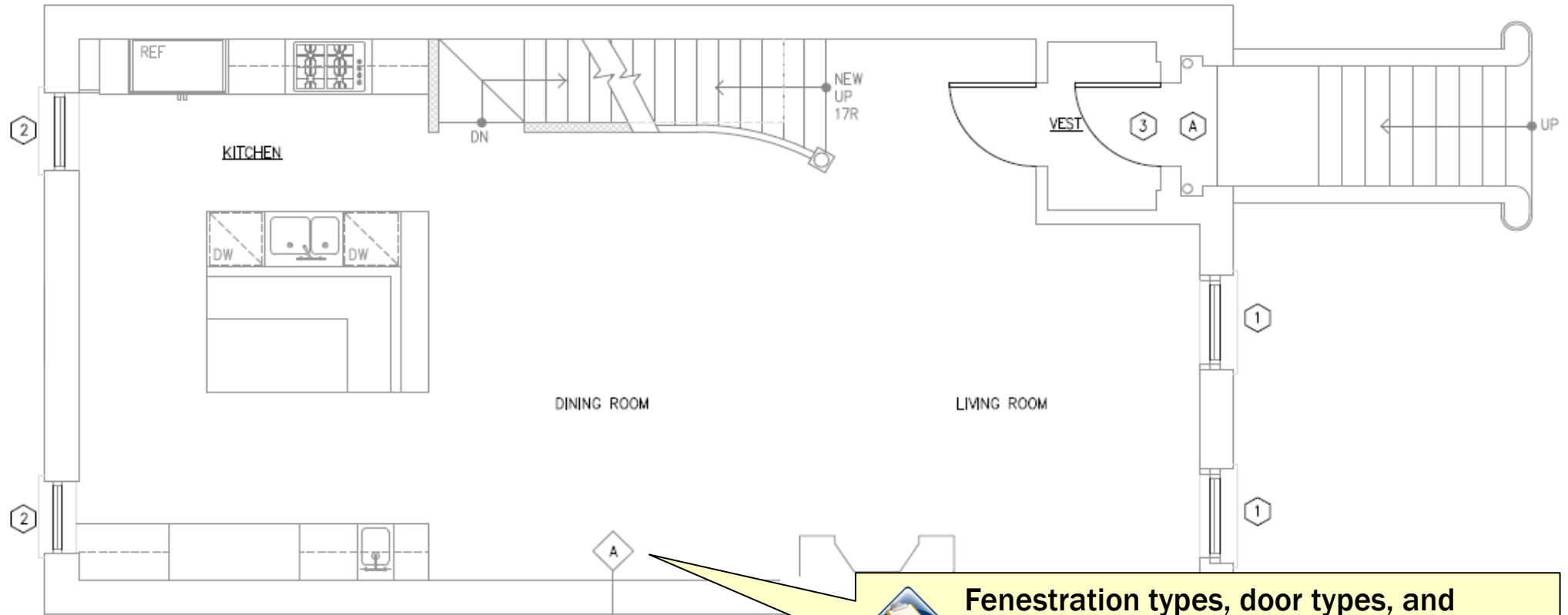


1<sup>st</sup> FLOOR PLAN



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



1<sup>st</sup> FLOOR PLAN



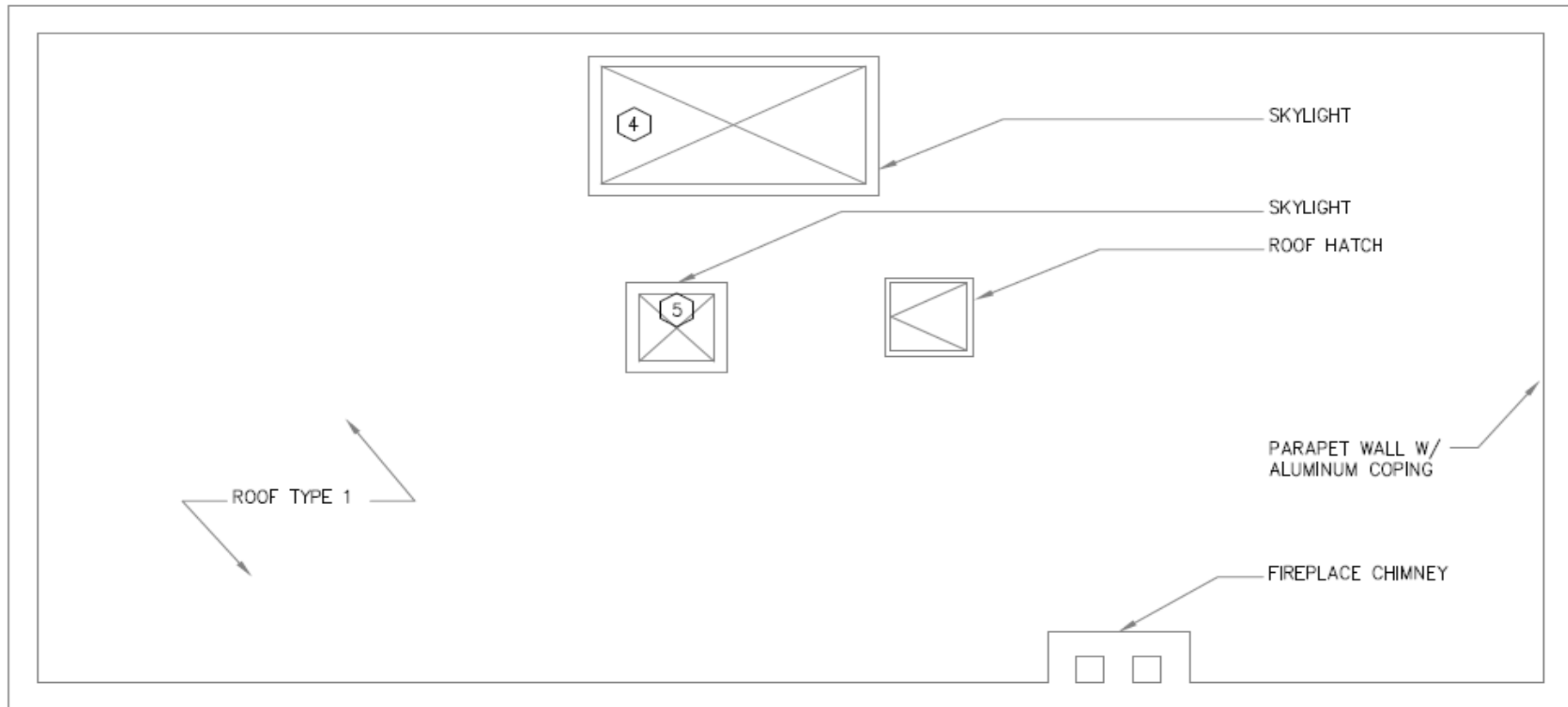
Fenestration types, door types, and exterior wall types should be clearly marked in the plans of the Supporting Documentation.





# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence

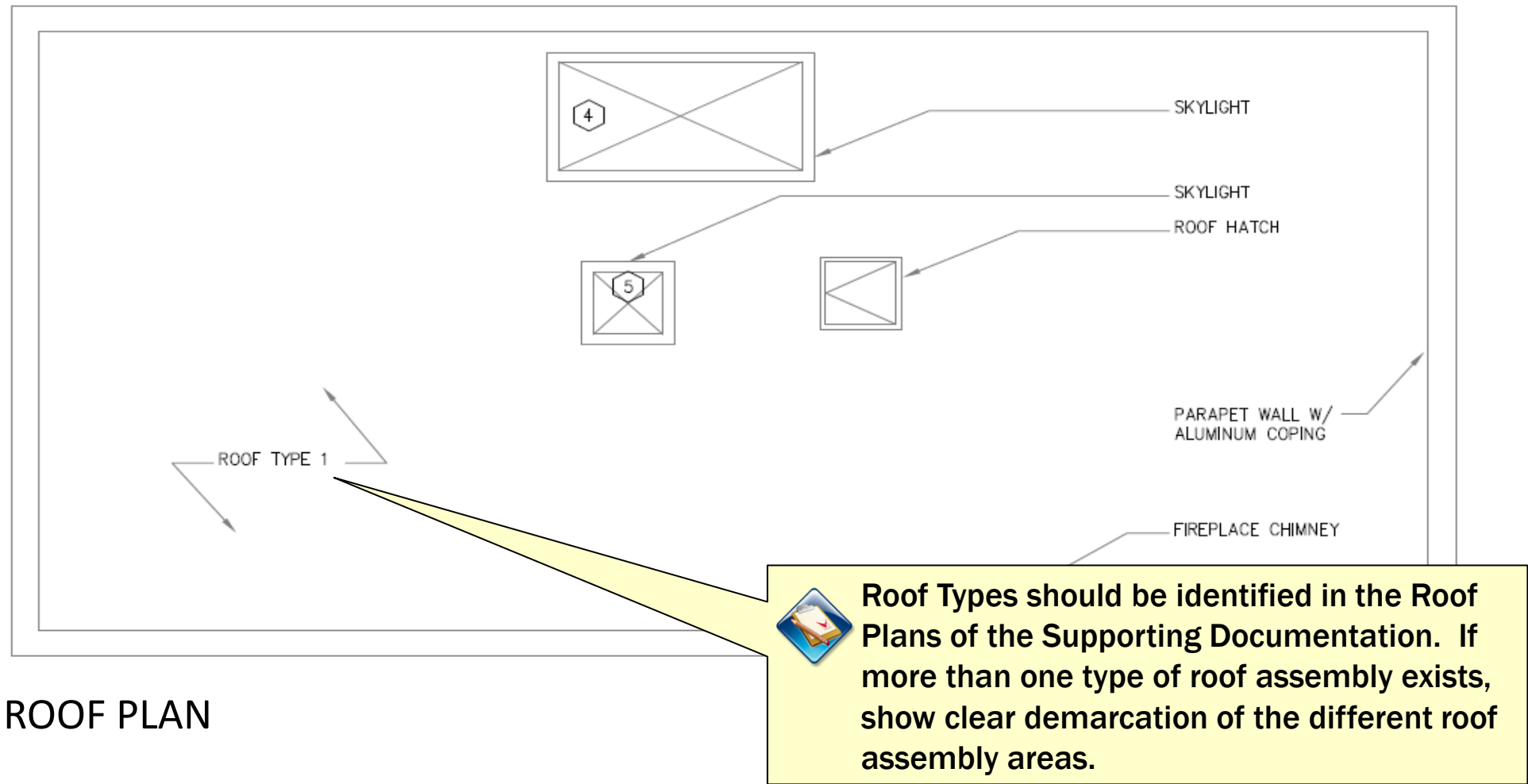


ROOF PLAN



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



Fenestration types and door types should be clearly called out on the project elevations in the Supporting Documentation. These should be keyed into the submitted Window/ Fenestration and Door Schedules, and from the corresponding Energy Analysis.

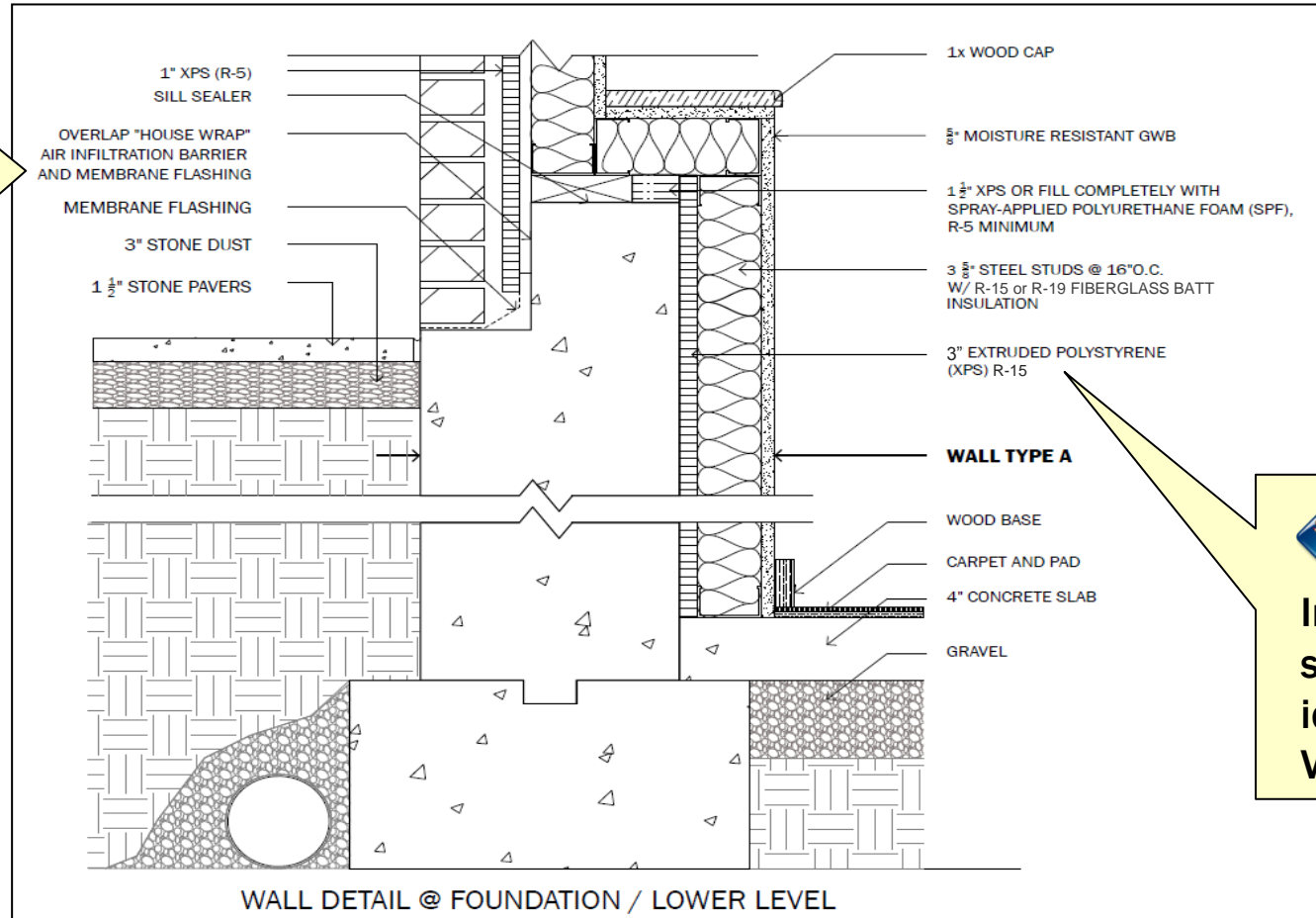


# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



Wall sections and details in the Supporting Documentation should note materials/techniques to meet mandatory NYCECC Air Leakage requirements.



Insulation types should be identified and R-Values stated.



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

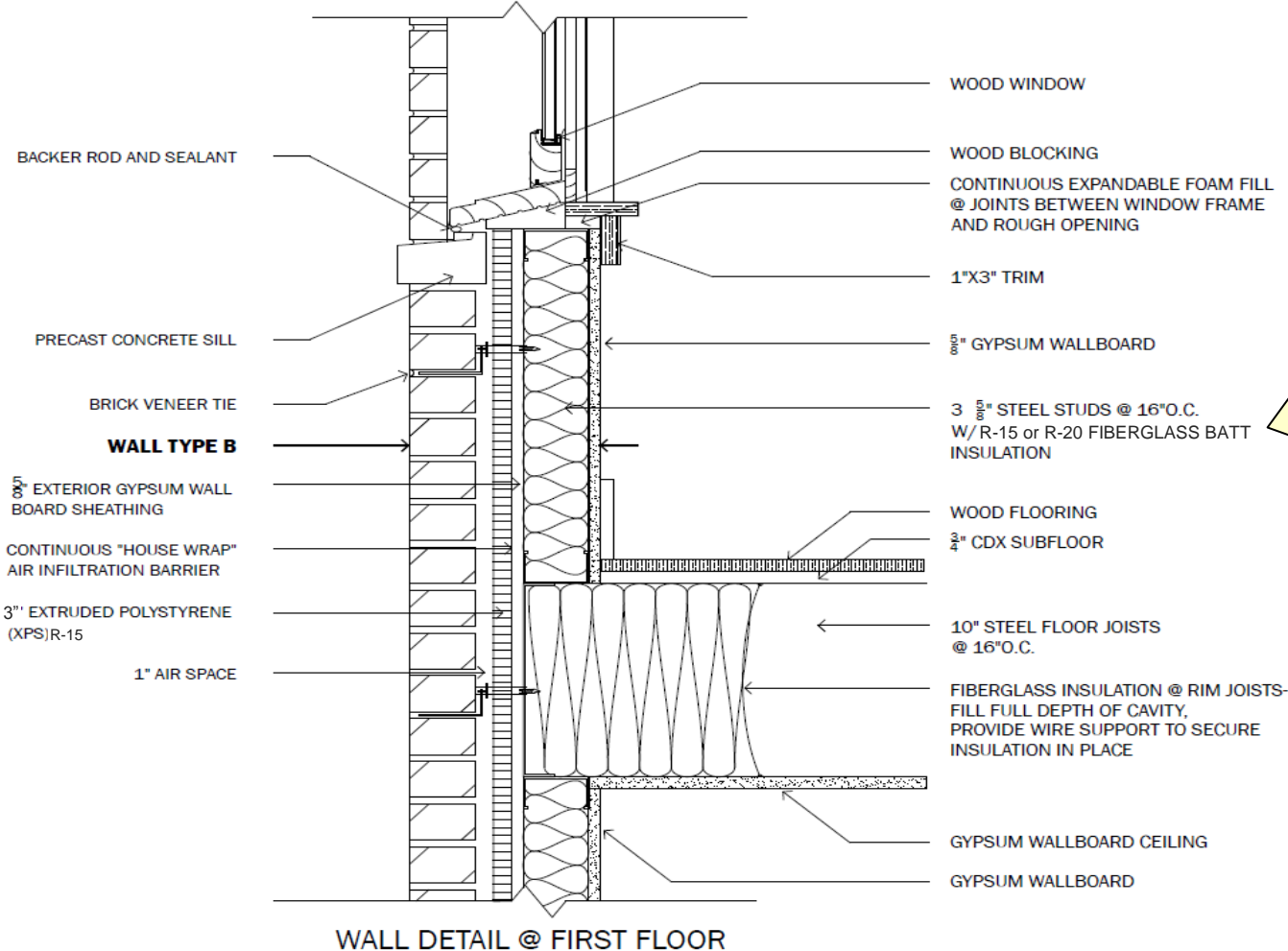
## Sample Building: New Infill Residence



Wall sections and details in the Supporting Documentation should note materials/ techniques to meet mandatory NYCECC Air Leakage requirements.



All Wall Assembly Types should be identified, corresponding to those noted in the Plans and in the Energy Analysis.



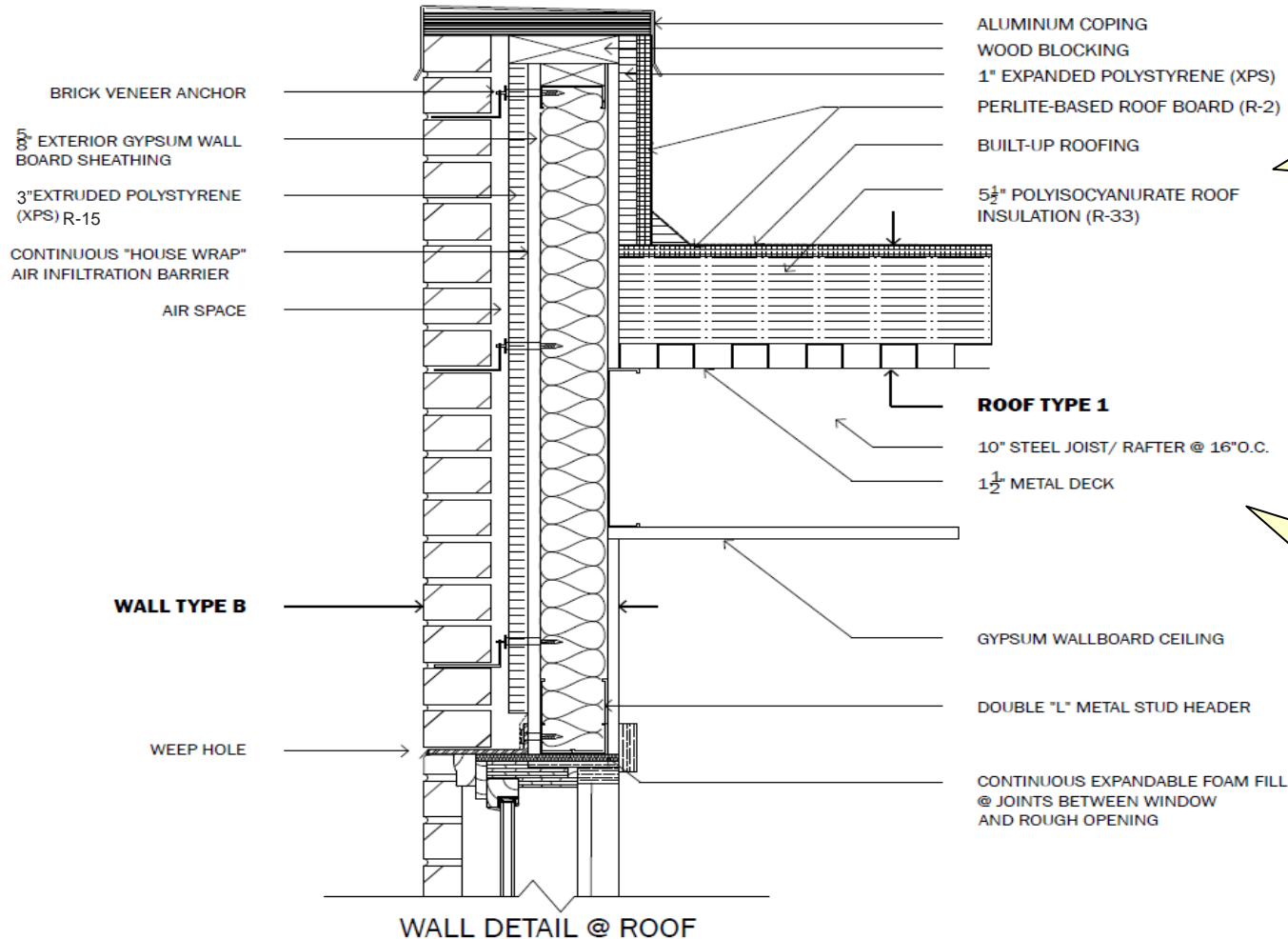
Insulation types should be identified and R-Values stated.





# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



Wall sections and roof details in the Supporting Documentation should note the insulation type and state the R-Value.



Roof Assembly Types should be identified, corresponding to those noted in the Plans and Energy Analysis.



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence

| Window / Skylight Schedule |                                |                       |                             |          |               |              |           |       |
|----------------------------|--------------------------------|-----------------------|-----------------------------|----------|---------------|--------------|-----------|-------|
| Type                       | Description                    | R.O. / M.O.           | Glass Type                  | U-Factor | Air Leakage   | Manufacturer | Catalog # | Notes |
| 1                          | Wood-Framed Dbl. Hung          | 3' - 0" x 7' - 0"     | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3696 | 1     |
| 2                          | Wood-Framed Dbl. Hung          | 3' - 0" x 5' - 0"     | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3660 | 1     |
| 3                          | Wood-Framed Fixed Transom      | 3' - 0" x 1' - 8"     | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3620 | 1     |
| 4                          | Alum-Framed Fixed Skylight     | 4' - 0" W x 8' - 0" L | Triple Glazed, low-e, clear | 0.55     | ≤ 0.10 cfm/SF | HLS Inc.     | FS-4896   | 2, 3  |
| 5                          | Alum/ABS Framed Fixed Skylight | 3' - 0" W x 3' - 0" L | IGU, low-e, tinted          | 0.55     | ≤ 0.10 cfm/SF | HLS Inc.     | FS-3636   | 2, 3  |

**Notes:**

1. Air leakage: Provide flashing, window dams, expandable foam sealant, and caulking at rough opening/window frame joints to create a continuous air barrier with surrounding wall system.
2. Air leakage: Provide flashing, expandable foam sealant, and caulking at rough opening/skylight frame joints to create a continuous air barrier with surrounding roof system.
3. Manufacturer's air infiltration rates based on 6.24 psf (300 Pa) static pressure differential, tested per ASTM E 283.

| Exterior Door Schedule |                              |                   |                   |           |                             |              |                            |       |
|------------------------|------------------------------|-------------------|-------------------|-----------|-----------------------------|--------------|----------------------------|-------|
| Type                   | Description                  | R.O. / M.O.       | Glass Type        | U-Factor  | Infiltration Value (cfm/SF) | Manufacturer | Catalog #                  | Notes |
| A                      | Wood/Glass French Door       | 3' - 0" x 8' - 0" | IGU, low-e, clear | 0.50/0.35 | 0.30 cfm/SF                 | EJA Inc.     | FR-2000 Series Custom Size | 1     |
| B                      | Solid Wood Raised Panel Door | 3' - 0" x 6' - 8" | N/A               | 0.50      | N/A*                        | CJA Inc.     | WRP3680                    | 1     |

**Notes:**

1. Air leakage: Provide flashing, expandable foam sealant, and caulking at rough opening/door frame joints to create a continuous air barrier with surrounding wall system.
- \* Doors will be field-fitted with weatherstripping per ECC Section 502.4.1



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence



Schedules must include U-Factor and Air Leakage information.

| Window / Skylight Schedule |                                |                       |                             |          |               |              |           |       |
|----------------------------|--------------------------------|-----------------------|-----------------------------|----------|---------------|--------------|-----------|-------|
| Type                       | Description                    | R.O. / M.O.           | Glass Type                  | U-Factor | Air Leakage   | Manufacturer | Catalog # | Notes |
| 1                          | Wood-Frame                     |                       | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3696 | 1     |
| 2                          | Wood-Frame                     |                       | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3660 | 1     |
| 3                          | Wood-Framed Fixed Transom      | 3' - 0" x 1' - 8"     | IGU, low-e, clear           | 0.32     | 0.30 cfm/SF   | FSC Inc.     | P100-3620 | 1     |
| 4                          | Alum-Framed Fixed Skylight     | 4' - 0" W x 8' - 0" L | Triple Glazed, low-e, clear | 0.55     | ≤ 0.10 cfm/SF | HLS Inc.     | FS-4896   | 2, 3  |
| 5                          | Alum/ABS Framed Fixed Skylight | 3' - 0" W x 3' - 0" L | IGU, low-e, tinted          | 0.55     | ≤ 0.10 cfm/SF | HLS Inc.     | FS-3636   | 2, 3  |

### Notes:

1. Air leakage: Provide flashing, window dams, expandable foam sealant, and caulking at rough opening/window frame joints to create a continuous air barrier with surrounding wall system.
2. Air leakage: Provide flashing, expandable foam sealant, and caulking at rough opening/skylight frame joints to create a continuous air barrier with surrounding wall system.
3. Manufacturer's air infiltration rates based on 6.24 psf (300 Pa) static pressure differential, tested per ASTM E 283.

Manufacturers and Catalog Numbers are optional for the NYCECC submission.

| Exterior Door Schedule |                              |                   |                   |           |             |              |                               |       |
|------------------------|------------------------------|-------------------|-------------------|-----------|-------------|--------------|-------------------------------|-------|
| Type                   | Description                  | R.O. / M.O.       | Glass Type        | U-Factor  | (cfm/SF)    | Manufacturer | Catalog #                     | Notes |
| A                      | Wood/Glass French Door       | 3' - 0" x 8' - 0" | IGU, low-e, clear | 0.50/0.35 | 0.30 cfm/SF | EJA Inc.     | FR-2000 Series<br>Custom Size | 1     |
| B                      | Solid Wood Raised Panel Door | 3' - 0" x 6' - 8" | N/A               | 0.50      | N/A*        | CJA Inc.     | WRP3680                       | 1     |

### Notes:

1. Air leakage: Provide flashing, expandable foam sealant, and caulking at rough opening/door frame joints to create a continuous air barrier with surrounding wall system.
- \* Doors will be field-fitted with weatherstripping per ECC Section 502.4.1



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence

| Section # & Req. ID                             | Framing /   |
|---|---|
| 402.1.1, 402.3.4 [FR1]                          | Door U-factors  |
| 402.1.1, 402.3.1, 402.3.3, 402.3.6, 402.5 [FR2] | Glazing U-factor average  |
| 302.1.3 [FR4]                                   | U-factors of are determined with the NF taken from                                      |
| 402.1.1, 402.3.3, 402.3.6, 402.5 [FR5]          | Skylight U-factors  |
| 402.4.6 [FR20]                                  | Fire separate dwelling unit family dwellings are insulated and the wall accordance      |
| 402.4.1.1 [FR23]                                | Air barrier is installed per instructions   |
| 402.4.3 [FR20]                                  | Fenestration is listed and AAMA /WDM or has initial 400 that do limits                  |
| 402.4.5 [FR16]                                  | IC-rated rec sealed at hd and labeled leakage at 3                                      |
| 402.2.1 [FR12]                                  | Supply and insulated >= 3 inches R-6 where return ducts the building diameter >= 3 inch |
| 402.3.2.5 [FR15]                                | Building cav ducts or ple   |
| 402.4 [FR17]                                    | HVAC piping above 105 below 55 FF 3   |

Project Title:  
Data filename: C:\User

**Additional Comment**

302.2.1 [FO11] A protective protect expd and extends grade.

402.3 [FO12] Snow and id installed.

**Requirements: 0.0%**  
Text in the "Comments requirement, the user is being claimed. When

Compliance Statement calculations submitted Conservation Code req Inspection Checklist.

Name - Title

**REScheck Software Version 4.6.4 Compliance Certificate**

Project  
Energy Code: **2016 New York City Energy Conservation Code**  
Location: **New York, New York**  
Construction Type: **Single-family**  
Project Type: **New Construction**  
Conditioned Floor Area: **0 ft2**  
Glazing Area: **9%**  
Climate Zone: **4 (5362 HDD)**  
Permit Date:  
Permit Number:

Construction Site:                      Owner/Agent:                      Designer/Contractor:

**Compliance: Passes using UA trade-off**  
Compliance: **4.1% Better Than Code**    Maximum UA: **319**    Your UA: **306**    Maximum SHGC: **0.40**    Your SHGC: **0.29**  
The % Better or Worse Than Code index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

**Envelope Assemblies**

| Assembly  | Gross Area or Perimeter | Cavity R-Value | Cont. R-Value | U-Factor | UA  |
|---|-------------------------|----------------|---------------|----------|-----|
| Exterior Wall Type A: Steel Frame, 16" o.c.                       | 1,260                   | 15.0           | 14.0          | 0.045    | 51  |
| Window 1: Wood Frame:Double Pane with Low-E SHGC: 0.30            | 75                      |                |               | 0.300    | 23  |
| Door 1: Solid   | 41                      |                |               | 0.200    | 8   |
| Exterior Wall Type B: Steel Frame, 16" o.c.                       | 2,513                   | 15.0           | 14.0          | 0.045    | 101 |
| Window 2: Wood Frame:Double Pane with Low-E SHGC: 0.30            | 210                     |                |               | 0.300    | 63  |
| Window 3: Wood Frame:Double Pane with Low-E SHGC: 0.30            | 30                      |                |               | 0.300    | 9   |
| Window 4: Wood Frame:Double Pane with Low-E SHGC: 0.30            | 5                       |                |               | 0.300    | 2   |
| Door 2: Glass SHGC: 0.21  | 24                      |                |               | 0.200    | 5   |
| Roof Type 1: Steel Joist/Rafter, 16" o.c.:2x10                    | 823                     | 0.0            | 35.0          | 0.027    | 21  |
| Skylight 1: Metal Frame with Thermal Break:Triple Pane SHGC: 0.30 | 32                      |                |               | 0.550    | 18  |
| Skylight 2: Other SHGC: 0.24                                      | 9                       |                |               | 0.550    | 5   |

Project Title:  
Data filename: C:\User\staharris\Documents\REScheck\Pres 1.rck

Report date: 11/27/17  
Page 1 of 10

**2016 New York City Energy Conservation Code Energy Efficiency Certificate**

| Insulation Rating                | R-Value |
|----------------------------------|---------|
| Above-Grade Wall                 | 29.00   |
| Below-Grade Wall                 | 0.00    |
| Floor                            | 0.00    |
| Ceiling / Roof                   | 35.00   |
| Ductwork (unconditioned spaces): | _____   |

| Glass & Door Rating | U-Factor | SHGC |
|---------------------|----------|------|
| Window              | 0.30     | 0.30 |
| Door                | 0.20     | 0.21 |
| Skylight            | 0.55     | 0.30 |

| Heating & Cooling Equipment | Efficiency |
|-----------------------------|------------|
| Heating System: _____       | _____      |
| Cooling System: _____       | _____      |
| Water Heater: _____         | _____      |

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Comments



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Sample Building: New Infill Residence

**Table of Requirements (Left Document):**

| Section # & Req. ID                             | Requirement  |
|---|--|
| 402.1.1, 402.3.4 [FR1]                          | Door U-factors   |
| 402.1.1, 402.3.1, 402.3.3, 402.3.6, 402.5 [FR2] | Glazing U-factors (average)  |
| 302.1.3 [FR4]                                   | U-factors of are determined with the NFPA taken from   |
| 402.1.1, 402.3.3, 402.3.6, 402.5 [FR5]          | Skylight U-factors   |
| 402.4.6 [FR20]                                  | Fire separate dwelling units are insulated and the wall accordance                             |
| 402.4.1.1 [FR23]                                | Air barrier is installed per instructions  |
| 402.4.3 [FR20]                                  | Fenestration is listed and AAMA / WDM or has an initial 400 that do limits                     |
| 402.4.5 [FR16]                                  | IC-rated rec sealed at hd and labeled leakage at 3   |
| 402.2.1 [FR12]                                  | Supply and insulated - >= 3 inches R-6 where return ducts the building diameter > for < 3 inch |
| 402.3.3.5 [FR15]                                | Building cav ducts or ple  |
| 402.4 [FR17]                                    | HVAC piping above 105 below 55 FF 3  |

**Project Information Form (Middle Document):**

**Project**

Energy Code: \_\_\_\_\_ Location: \_\_\_\_\_ Construction Ty: \_\_\_\_\_ Project Type: \_\_\_\_\_ Conditioned Floor Area: \_\_\_\_\_ Glazing Area: \_\_\_\_\_ Climate Zone: \_\_\_\_\_ Permit Date: \_\_\_\_\_ Permit Number: \_\_\_\_\_ Construction S: \_\_\_\_\_

**Envelope**

Exterior Wall T: \_\_\_\_\_ Window 1: Wood SHGC: 0.30 Door 1: Solid Exterior Wall T: \_\_\_\_\_ Window 2: Wood SHGC: 0.30 Window 3: Wood SHGC: 0.30 Window 4: Wood SHGC: 0.30 Door 2: Glass SHGC: 0.21 Roof Type 1: 56 Skylight 1: Met SHGC: 0.30 Skylight 2: Ob SHGC: 0.24

**2016 New York City Energy Conservation Code Energy Efficiency Certificate (Right Document):**

| Insulation Rating                | R-Value |
|----------------------------------|---------|
| Above-Grade Wall                 | 29.00   |
| Below-Grade Wall                 | 0.00    |
| Floor                            | 0.00    |
| Ceiling / Roof                   | 35.00   |
| Ductwork (unconditioned spaces): |         |
| Glass & C                        | U-GC    |
| Window                           | 0.30    |
| Door                             | 0.21    |
| Water                            | 0.30    |
| Name: _____                      |         |
| Comment: _____                   |         |

**Callout Box:** Place clear image of REScheck Compliance Certificate on drawing and sign and seal at the title block of the sheet.



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE SUPPORTING DOCUMENTATION

## Detail from REScheck Report



All Wall Types, Roof Types, Fenestration Types, and Door Types in the COMcheck analysis should use the same nomenclature as those shown in the Supporting Documentation.

### Compliance: Passes using UA trade-off

Compliance: **4.1% Better Than Code**      Maximum UA: **319**      Your UA: **306**      Maximum SHGC: **0.40**      Your SHGC: **0.29**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

### Envelope Assemblies

| Assembly   | Gross Area or Perimeter | Cavity R-Value | Cont. R-Value | U-Factor | UA  |
|--|-------------------------|----------------|---------------|----------|-----|
| Exterior Wall Type A: Steel Frame, 16" o.c.                          | 1,260                   | 15.0           | 14.0          | 0.045    | 51  |
| Window 1: Wood Frame:Double Pane with Low-E<br>SHGC: 0.30            | 75                      |                |               | 0.300    | 23  |
| Door 1: Solid  | 41                      |                |               | 0.200    | 8   |
| Exterior Wall Type B: Steel Frame, 16" o.c.                          | 2,513                   | 15.0           | 14.0          | 0.045    | 101 |
| Window 2: Wood Frame:Double Pane with Low-E<br>SHGC: 0.30            | 210                     |                |               | 0.300    | 63  |
| Window 3: Wood Frame:Double Pane with Low-E<br>SHGC: 0.30            | 30                      |                |               | 0.300    | 9   |
| Window 4: Wood Frame:Double Pane with Low-E<br>SHGC: 0.30            | 5                       |                |               | 0.300    | 2   |
| Door 2: Glass<br>SHGC: 0.21  | 24                      |                |               | 0.200    | 5   |
| Roof Type 1: Steel Joist/Rafter, 16" o.c.:2x10                       | 823                     | 0.0            | 35.0          | 0.027    | 21  |
| Skylight 1: Metal Frame with Thermal Break:Triple Pane<br>SHGC: 0.30 | 32                      |                |               | 0.550    | 18  |
| Skylight 2: Other<br>SHGC: 0.24                                      | 9                       |                |               | 0.550    | 5   |





# 7. SUBMISSIONS & INSPECTIONS: SAMPLE ENERGY ANALYSIS

|           | Inspection/Test   | Frequency (minimum)  | Reference Standard (See ECC Chapter R6) or Other Criteria                                   | ECC or Other Citation                                 |
|-----------|---|--|---|---|
| <b>IB</b> | <b>Mechanical and Plumbing Inspections</b>  |  |   |   |
| IB1       | <b>Fireplaces:</b> Provision of combustion air and tight-fitting fireplace doors shall be verified by visual inspection.  | Prior to final construction inspection   | Approved construction documents; UL 127, UL 907, ANSI Z21.60 (see also MC 904), ANSI Z21.50 | R402.4.2; BC 2111; MC Chapters 7, 8, 9; FGC Chapter 6 |
| IB2       | <b>Shutoff dampers:</b> Not less than 20% of installed automatic or gravity dampers, and a minimum of one of each type, shall be visually inspected and physically tested for proper operation.   | Prior to final construction inspection   | Approved construction documents   | R403.6, R403.8, C403, C404                            |
| IB3       | <b>HVAC and service water heating system equipment:</b> Heating and cooling equipment shall be verified by visual inspection for proper sizing. Pool heaters and covers shall be verified by visual inspection.   | Prior to final plumbing and construction inspection                            | ACCA Manual J and S; Approved construction documents, including energy analysis             | R403, C403, C404                                      |
| IB4       | <b>HVAC and service water heating system controls:</b> System controls shall be inspected to verify that each dwelling is provided with at least one individual programmable thermostat with capabilities as described in ECC R403.1.1, and that such controls are set and operate as specified in ECC R403.1.1.<br>Controls for supplementary electric-resistance heat pumps shall be inspected to verify that such controls prevent supplemental heat operation when the heat pump compressor can meet the heating load.<br>Controls for snow- and ice-melting systems and pools shall be inspected for proper operation. Not less than 20% or one of each control type, whichever is more, shall be inspected.<br>Controls for turning off circulating hot water pumps when not in use shall be inspected for an automatic or manual switch. | Prior to final electrical and construction inspection                          | Approved construction documents, including control system narratives                        | R403, C403, C404                                      |
| IB5       | <b>HVAC insulation and sealing:</b> Installed duct and piping insulation shall be visually inspected to verify correct insulation placement and values. Ducts, air handlers, filter boxes and building cavities used as ducts shall be visually inspected for proper sealing.   | Prior to closing ceilings and walls and prior to final construction inspection | Approved construction documents; NYC Mechanical Code  | R403.3, R403.4, R403.5, R403.8, C403, C404; MC 603.9  |
| IB6       | <b>Duct Leakage Testing:</b> Where the air handler and/or some ductwork is in unconditioned space, duct-leakage testing shall be performed either after rough-in or post-construction to ensure compliance with ECC R403.3.3 and R403.3.4. Not less than 20% of such ductwork shall be tested.  | Prior to closing ceilings and walls and prior to final construction inspection | Approved construction documents   | R403.3.3, R403.3.4, R403.8, C403                      |



# 7. SUBMISSIONS & INSPECTIONS: SAMPLE ENERGY ANALYSIS

|           | Inspection/Test  | Frequency (minimum)                                   | Reference Standard (See ECC Chapter R6) or Other Criteria                                   | ECC or Other Citation                                 |
|-----------|--|---|---|---|
| <b>IB</b> | <b>Mechanical and Plumbing Inspections</b>   |   |   |   |
| IB1       | <b>Fireplaces:</b> Provision of combustion air and tight-fitting fireplace doors shall be verified by visual inspection.   | Prior to final construction inspection                | Approved construction documents; UL 127, UL 907, ANSI Z21.60 (see also MC 904), ANSI Z21.50 | R402.4.2; BC 2111; MC Chapters 7, 8, 9; FGC Chapter 6 |
| IB2       | <b>Shutoff dampers:</b> Not less than 20% of installed automatic or gravity dampers, and a minimum of one of each type, shall be visually inspected and physically tested for proper operation.  | Prior to final construction inspection                | Approved construction documents   | R403.6, R403.8, C403, C404                            |
| IB3       | <b>HVAC and service water heating system equipment:</b> Heating and cooling equipment shall be verified by visual inspection for proper sizing. Pool heaters and covers shall be verified by visual inspection.  | Prior to final plumbing and construction inspection   | ACCA Manual J and S; Approved construction documents, including energy analysis             | R403, C403, C404                                      |
| IB4       | <b>HVAC and service water heating system controls:</b> System controls shall be inspected to verify that each dwelling is provided with at least one individual programmable thermostat with capabilities as described in ECC R403.1.1, and that such controls are set and operate as specified in ECC R403.1.1.<br>Controls for supplementary electric-resistance heat pumps shall be inspected to verify that such controls prevent supplemental heat operation when the heat pump compressor can meet the heating load.<br>Controls for snow- and ice-melting systems and pools shall be inspected for proper operation. Not less than 20% or one of each control type, whichever is more, shall be inspected.<br>Controls for turning off circulating hot water pumps shall be inspected to verify that such controls prevent supplemental heat operation when the heat pump compressor can meet the heating load. | Prior to final electrical and construction inspection | Approved construction documents, including control system narratives                        | R403, C403, C404                                      |
| IB5       | <b>HVAC insulation and sealing:</b> Installed duct and pipe placement and values. Ducts, air handlers, filter boxes shall be inspected for proper placement and values. Ducts, air handlers, filter boxes shall be inspected for proper placement and values. Ducts, air handlers, filter boxes shall be inspected for proper placement and values. Ducts, air handlers, filter boxes shall be inspected for proper placement and values.  |   | Approved construction documents; NYC Mechanical Code  | R403.3, R403.4, R403.5, R403.8, C403, C404; MC 603.9  |
| IB6       | <b>Duct Leakage Testing:</b> Where the air handler and ductwork are installed, duct leakage testing shall be performed either after rough-in or post-construction. Such ductwork shall be tested.  | construction inspection                               | Approved construction documents   | R403.3.3, R403.3.4, R403.8, C403                      |




**A Progress Inspections Table must be included in the Supporting Documentation, noting all applicable inspections to be performed based on the scope of work, plus Reference Standards and NYCECC citations.**



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS


## What are the Applicable Progress Inspections for Residential Buildings?

|  Inspection / Test (as indicated on the <a href="#">TR8</a> ) | Frequency  |
|--|--|
| Protection of exposed foundation insulation (IA1)  | Prior to backfill  |
| Insulation placement and R-Values (IA2)  | As required to verify continuous enclosure while walls, ceilings and floors are open |
| Fenestration u-factor and product ratings (IA3)  | As required during installation  |
| Fenestration air leakage (IA4)   | As required during installation  |
| Fenestration areas (IA5)   | Prior to final construction inspection   |
| Air sealing and insulation – visual (IA6)  | As required during envelope construction   |
| Air sealing and insulation – testing (IA7)   | Prior to final construction inspection   |
| Fireplaces (IB1)   | Prior to final construction inspection   |
| Shutoff Dampers (IB2)  | Prior to final construction inspection   |
| HVAC and service water heating equipment (IB3)   | Prior to final plumbing and construction inspection                                  |



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS

## What are the Applicable Progress Inspections for Residential Buildings?

|  Inspection / Test (As indicated on the <a href="#">TR8</a> ) | Frequency  |
|--|--|
| HVAC and service water heating system controls (IB4)   | Prior to final electrical and construction inspection                            |
| HVAC insulation and sealing (IB5)  | Prior to closing ceilings and walls and prior to final construction inspection   |
| Duct leakage testing (IB6)   | Prior to closing ceilings and walls and prior to final construction inspection   |
| Electrical energy consumption (IC1)  | Prior to final electrical and construction inspection                            |
| Interior lighting power (IC2)  | Prior to final electrical and construction inspection                            |
| Maintenance information (ID1)  | Prior to sign-off or issuance of Certificate of Occupancy                        |
| Permanent certificate (ID2)  | Prior to final plumbing, electrical and/or construction inspection as applicable |
| Solar Ready Requirements (ID3)   | Prior to final construction inspection   |



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC Buildings**

**TR8: Technical Report  
Statement of Responsibility for  
Energy Code Progress Inspections**

This form must be typewritten

Orient and affix BIS job number label here

**1 Location Information** *Required for all applications.*

House No(s) \_\_\_\_\_ Street Name \_\_\_\_\_

Work on Floor(s) \_\_\_\_\_

**3 Energy Code Progress Inspection** *Required for applications where Energy Code Compliance Progress Inspection is marked Yes on TR1*

| 3A ← Identification of Requirement |                          | 3B Identification of Responsibilities                     | 3C Certificate of Complete Inspections / Tests | 3D Withdraw Responsibilities |
|------------------------------------|--------------------------|---|--|------------------------------|
| Y                                  | N                        | Initial & Date  | Initial & Date                                 | Initial & Date               |
| <input type="checkbox"/>           | <input type="checkbox"/> | Protection of exposed foundation insulation (IA1), (IIA1) |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Insulation placement and R values (IA2), (IIA2)           |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration u-factor and product rating (IA3), (IIA3)    |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration air leakage (IA4), (IIA4)                    |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration areas (IA5), (IIA5)                          |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Air sealing and insulation — visual (IA6), (IIA6)         |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Air sealing and insulation — testing (IA7), (IIA7)        |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Loading deck weather seals (IIA8)                         |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Vestibules (IIA9)   |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fireplaces (IB1), (IIB1)                                  |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Shutoff dampers (IB2), (IIB2)                             |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | HVAC insulation and sealing (IB5), (IIB5)                 |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Duct leakage testing (IB6), (IIB6)                        |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Electrical energy consumption (IC1), (IIC1)               |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Lighting in dwelling units (IC2), (IIC2)                  |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Interior lighting power (IC2), (IIC3)                     |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Exterior lighting power (IC4)                             |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Lighting controls (IC5)                                   |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Electrical motors (IC6)                                   |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Maintenance information (ID1), (IID1)                     |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Permanent certificate (ID2)                               |  |                              |
| <input type="checkbox"/>           | <input type="checkbox"/> | Solar Ready Requirements (ID3)                            |  |                              |

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC Buildings**

**TR8: Technical Report**  
**Statement of Responsibility for**  
**Energy Code Progress Inspections**  
*This form must be typewritten*

**1 Location Information** *Required for all applications.*

House No(s) \_\_\_\_\_ Street Name \_\_\_\_\_

Work on Floor(s) \_\_\_\_\_

The applicant (R.A. or P.E.) defines the required progress inspections by checking “Y” or “N” in the left-hand column under section 3 of the TR8 form.

| 3 Energy Code Progress Inspections |                          | Required for applications where Energy Code Compliance Progress Inspection is marked Yes on TR1 |  |                              |                |                |
|------------------------------------|--------------------------|---|--|------------------------------|----------------|----------------|
| 3A Identification of Requirement   |                          | 3B Identification of Responsibilities   | 3C Certificate of Complete Inspections / Tests   | 3D Withdraw Responsibilities |                |                |
| Y                                  | N                        | Progress Inspections  | Table Reference in 1RCNY §5000-01(h) (1) and (2) | Initial & Date               | Initial & Date | Initial & Date |
| <input type="checkbox"/>           | <input type="checkbox"/> | Protection of exposed foundation insulation   | (IA1), (IIA1)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Insulation placement and R values   | (IA2), (IIA2)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration u-factor and product rating  | (IA3), (IIA3)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration air leakage  | (IA4), (IIA4)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fenestration areas  | (IA5), (IIA5)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Air sealing and insulation — visual   | (IA6), (IIA6)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Air sealing and insulation — testing  | (IA7), (IIA7)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Loading deck weather seals  | (IIA8)   |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Vestibules  | (IIA9)   |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Fireplaces  | (IB1), (IIB1)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Shutoff dampers   | (IB2), (IIB2)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | HVAC insulation and sealing   | (IB5), (IIB5)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Duct leakage testing  | (IB6), (IIB6)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Electrical energy consumption   | (IC1), (IC1)                                     |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Lighting in dwelling units  | (IC2), (IC2)                                     |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Interior lighting power   | (IC2), (IC3)                                     |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Exterior lighting power   | (IC4)  |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Lighting controls   | (IC5)  |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Electrical motors   | (IC6)  |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Maintenance information   | (ID1), (IID1)                                    |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Permanent certificate   | (ID2)  |                              |                |                |
| <input type="checkbox"/>           | <input type="checkbox"/> | Solar Ready Requirements  | (ID3)  |                              |                |                |

Prior to Permit, the designated Progress Inspector must initial and date each inspection they will be responsible for, and sign/seal under section 5 of the TR8 form. If multiple Progress Inspectors are involved in a project, each one must submit a signed/sealed TR8 for their scope of inspection services.

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016





# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC**  
Buildings

**TR8: Technical Report**  
**Statement of Responsibility for**  
**Energy Code Progress Inspections**

☑ Orient and affix BIS  
job number label here ☒

*This form must be typewritten*

**1** Location Information *Required for all applications.*

TR8

PAGE 2

**4 Design Applicant's Statements and Signatures** *P.E./R.A. responsible for plans must sign and seal.*

I have identified herein all of the progress inspections, and commissioning required for compliance and determined whether commissioning is required.

Commissioning is required for applications where C408 or ASHRAE 90.1 Section 6.7.2.4 requires commissioning. Check one:

- This project requires commissioning and a preliminary commissioning report certification will be provide prior to sign-off.
- This project does not require commissioning.

Name (please print)

Signature

Date

P.E. / R.A. Seal *(apply seal, then sign and date over seal)*

|   |              |  |  |  |
|---|--------------|--|--|--|
| <input type="checkbox"/> HVAC and service water heating equipment       | (IB3), (IB3) |  |  |  |
| <input type="checkbox"/> HVAC and service water heating system controls | (IB4), (IB4) |  |  |  |
| <input type="checkbox"/> HVAC insulation and sealing                    | (IB5), (IB5) |  |  |  |
| <input type="checkbox"/> Duct leakage testing                           | (IB6), (IB6) |  |  |  |
| <input type="checkbox"/> Electrical energy consumption                  | (IC1), (IC1) |  |  |  |
| <input type="checkbox"/> Lighting in dwelling units                     | (IC2)        |  |  |  |
| <input type="checkbox"/> Interior lighting power                        | (IC2), (IC3) |  |  |  |
| <input type="checkbox"/> Exterior lighting power                        | (IC4)        |  |  |  |
| <input type="checkbox"/> Lighting controls                              | (IC5)        |  |  |  |
| <input type="checkbox"/> Electrical motors                              | (IC6)        |  |  |  |
| <input type="checkbox"/> Maintenance information                        | (ID1), (ID1) |  |  |  |
| <input type="checkbox"/> Permanent certificate                          | (ID2)        |  |  |  |
| <input type="checkbox"/> Solar Ready Requirements                       | (ID3)        |  |  |  |

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC**  
Buildings

**TR8: Technical Report  
Statement of Responsibility for  
Energy Code Progress Inspections**

Orient and affix BIS  
job number label here

*This form must be typewritten*

1 Location Information Required for all applications.

TR8 PAGE 2

**4 Design Applicant's Statements and Signatures** *P.E./R.A. responsible for plans must sign and seal.*

I have identified herein all of the progress inspections, and commissioning required for compliance and determined whether commissioning is required.

Commissioning is required for applications where C408 or ASHRAE 90.1 Section 6.7.2.4 requires commissioning. Check one:

This project requires commissioning and a preliminary commissioning report certification will be provide prior to sign-off.

This project does not require commissioning.

Name (please print) \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

P.E. / R.A. Seal (apply seal, then sign and date over seal)

|                          |  |              |  |  |
|--------------------------|--|--------------|--|--|
| <input type="checkbox"/> | HVAC and service water heating equipment       |              |  |  |
| <input type="checkbox"/> | HVAC and service water heating system controls | (IB4), (IB5) |  |  |
| <input type="checkbox"/> | HVAC insulation and sealing                    | (IB5), (IB6) |  |  |
| <input type="checkbox"/> | Duct leakage testing                           | (IB6), (IB6) |  |  |
| <input type="checkbox"/> | Electrical energy consumption                  | (IC1), (IC1) |  |  |
| <input type="checkbox"/> | Lighting in dwelling units                     | (IC2)        |  |  |
| <input type="checkbox"/> | Interior lighting power                        | (IC2), (IC3) |  |  |
| <input type="checkbox"/> | Exterior lighting power                        | (IC4)        |  |  |
| <input type="checkbox"/> | Lighting controls                              | (IC5)        |  |  |
| <input type="checkbox"/> | Electrical motors                              | (IC6)        |  |  |
| <input type="checkbox"/> | Maintenance information                        | (ID1), (ID1) |  |  |
| <input type="checkbox"/> | Permanent certificate                          | (ID2)        |  |  |
| <input type="checkbox"/> | Solar Ready Requirements                       | (ID3)        |  |  |

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016

The design applicant must indicate whether commissioning is required or not.



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC**  
Buildings

TR8: Technical Report  
Statement of Responsibility for  
Energy Code Progress Inspections  
*This form must be typewritten*

Orient and affix BIS  
job number label here

## 6 Inspection Applicant's Certification of Completion

- I have completed the items specified herein and certify the following (check one only):
- All work performed substantially conforms to approved construction documents and has been performed in accordance with applicable provisions of the New York City Energy Conservation Code and other designated rules and regulations.
  - All work performed substantially conforms to approved construction documents and has been performed in accordance with applicable provisions of the New York City Energy Conservation Code and other designated rules and regulations, except as indicated in the attached report.

I am aware of the additional sanctions imposed on false filings by §28-211.1.2 of the Administrative Code.

- Withdrawal of Applicant:** I am withdrawing responsibility for the items of progress inspections and/or tests indicated herein and herewith submit the results or status of the work performed to date.

Name (please print)

\_\_\_\_\_

Signature

Date

\_\_\_\_\_

P.E. / R.A. Seal (apply seal, then sign and date over seal)

September 2016

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS TR8 REPORT

**NYC**  
Buildings

TR8: Technical Report  
Statement of Responsibility for  
Energy Code Progress Inspections  
*This form must be typewritten*

Orient and affix BIS  
job number label here

**6 Inspection Applicant's Certification of Completion**

I have completed the items specified herein and certify the following (check one only):

- All work performed substantially conforms to approved construction documents and has been performed in accordance with applicable provisions of the New York City Energy Conservation Code and other designated rules and regulations.
- All work performed substantially conforms to approved construction documents and has been performed in accordance with applicable provisions of the New York City Energy Conservation Code and other designated rules and regulations, and the applicant has submitted a report.

I am aware of the additional sanctions imposed on false filings by §28-211.1.2 of the Administrative Code.

**Withdrawal of Applicant:** I am withdrawing responsibility for the items of progress inspections and the results or status of the work performed to date.

Name (please print) \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

P.E. / R.A. Seal (apply seal, then sign and date over seal)

\* For column 3C, indicate date when the actual final inspection was performed.

September 2016

Upon completion of the applicable inspections, the Progress Inspector initials and dates each inspection performed (column 3C). Any inspections assigned to the Progress Inspector that are not performed are addressed through column 3D (withdraw responsibilities). Final signatures and seals are provided in section 6 of the TR8 form.



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS - REQUIREMENTS



While a specific format is not stated, inspection records can include:

- ▶ Logs, reports, meeting minutes
- ▶ Photographs
- ▶ Annotated Drawings

## NYC Administrative Code § 28-116.2.3

- A record of all inspections shall be kept by the person performing the inspection
  - The commissioner may require inspection reports to be filed with the department
  - Records of inspections shall be maintained for a period of six years after sign-off, or for such other period of time as the commissioner may require
  - Records of inspections shall be made available to the DOB upon request

## 1 RCNY § 101-07(c)(3)

- EN2 Form
  - This DOB form is signed by the progress inspector, certifying that the values in the last-approved Energy Analysis represent the respective values in the constructed building



# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS – EN2 FORM

**NYC Buildings**

**EN2: As Built Energy Analysis**  
*This form must be typewritten and submitted in person to the Certificate of Occupancy Division's Borough Office where energy analysis was reviewed.*

Orient and affix BIS job number label here

**1 Progress Inspector Information** *Required for all applications.*

|                  |                    |                |
|------------------|--------------------|----------------|
| Last Name        | First Name         | Middle Initial |
| Business Name    | Business Telephone |                |
| Business Address | Business Fax       |                |

**3 As Built Information** *P.E./R.A. responsible for progress inspections, choose one below and sign/seal.*

The as-built conditions of the completed building conform to the originally approved energy analysis and do not require a revised energy analysis.

The energy analysis has been revised according to one of the statements below:

Attached is a revised energy analysis, prepared, signed and sealed by the registered design professional who prepared the previously submitted and approved energy analysis. The as-built conditions of the completed building conform to this revised energy analysis.

The last revised energy analysis was submitted and approved as a post approval amendment on \_\_\_\_\_ (date). The as-built conditions of the completed building conform to this revised energy analysis.

**4 Progress Inspector's Statements and Signatures** *P.E./R.A. responsible for progress inspections, choose both below and sign/seal.*

I have reviewed the information provided herein and, to the best of my knowledge and belief, attest to its accuracy. Falsification of any statement is a misdemeanor and is punishable by a fine or imprisonment, or both. It is unlawful to give to a city employee, or for a city employee to accept, any benefit, monetary or otherwise, either as a gratuity for properly performing the job or in exchange for special consideration. Violation is punishable by a fine or imprisonment, or both. I understand that if I am found after hearing to have knowingly or negligently made a false statement or to have knowingly or negligently falsified or allowed to be falsified any certificate, form, signed statement, application, report or certification of the correction of a violation required under the provisions of this code or of a rule of any agency, I may be barred from filing further applications or documents with the Department.

I, \_\_\_\_\_, a registered design professional who performed or supervised the progress inspections for \_\_\_\_\_ (envelope, or HVAC/service water heating, or electrical/lighting work), certify that, to the best of my knowledge and professional judgment, the above checked statement(s) are true with respect to the progress inspections I completed as indicated on my signed, sealed and submitted TR8.

Name (please print) \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

P.E. / R.A. Seal (apply seal, then sign and date over seal)

01/11





# 7. SUBMISSIONS & INSPECTIONS: PROGRESS INSPECTIONS – EN2 FORM

**NYC**  
Buildings

EN2: As Built Energy Analysis  
*This form must be typewritten and submitted in person to the Certificate of Occupancy Division's Borough Office where energy analysis was reviewed.*

Orient and affix BIS job number label here

**1 Progress Inspector Information** *Required for all applications.*

|                  |                    |                |
|------------------|--------------------|----------------|
| Last Name        | First Name         | Middle Initial |
| Business Name    | Business Telephone |                |
| Business Address | Business Phone     |                |

**3 As Built Information** *P.E./R.A. responsible for progress inspections, choose one below and sign/seal.*

The as-built conditions of the completed building conform to the originally approved energy analysis and do not require a revised energy analysis.

The energy analysis has been revised according to one of the statements below:

- Attached is a revised energy analysis, prepared, signed and sealed by the registered design professional who prepared the previously submitted and approved energy analysis. The as-built conditions of the completed building conform to this revised energy analysis.
- The last revised energy analysis was submitted and approved as a post approval amendment on \_\_\_\_\_ (date). The as-built conditions of the completed building conform to this revised energy analysis.

**4 Progress Inspector's Statements and Signatures** *P.E./R.A. responsible for progress inspections, choose both below and sign/seal.*

I have reviewed the information provided herein and, to the best of my knowledge and belief, attest to its accuracy. Falsification of any statement is a misdemeanor and is punishable by a fine or imprisonment, or both. It is unlawful to give to a city employee, or for a city employee to accept, any benefit, monetary or otherwise, either as a gratuity for properly performing the job or in exchange for special consideration. Violation is punishable by a fine or imprisonment, or both. I understand that if I am found after hearing to have knowingly or negligently made a false statement or to have knowingly or negligently falsified or allowed to be falsified any certificate, form, signed statement, application, report or certification of the correction of a violation required under the provisions of this code or of a rule of any agency, I may be barred from filing further applications or documents with the Department.

I, \_\_\_\_\_, a registered design professional who performed or supervised the progress inspections for \_\_\_\_\_ (envelope, or HVAC/service water heating, or electrical/lighting work), certify that, to the best of my knowledge and professional judgment, the above checked statement(s) are true with respect to the progress inspections I completed as indicated on my signed, sealed and submitted TR8.

Name (please print) \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

P.E. / R.A. Seal (apply seal, then sign and date over seal)

01/11

The Progress Inspectors and design applicants will need to coordinate to ensure that the as-built conditions and approved Energy Analysis are consistent. An as-built Energy Analysis update may be required.



# 8. RESOURCES

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Slides 157 to 161



# 8. RESOURCES: OVERVIEW

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In this section you will learn about:

- Resources and links;
- DOB assistance; and
- Image/Photo Credits & Copyrights.



# 8. RESOURCES: RESOURCES & LINKS

The Resources below have been referenced in this module.

| Resource  | Link  |
|---|---|
| 2016 NYCECC   | <a href="http://www1.nyc.gov/site/buildings/codes/2016-energy-conservation-code.page">http://www1.nyc.gov/site/buildings/codes/2016-energy-conservation-code.page</a> |
| Local Law 91 of 2016                                      | <a href="http://www1.nyc.gov/assets/buildings/local_laws/ll91of2016.pdf">http://www1.nyc.gov/assets/buildings/local_laws/ll91of2016.pdf</a>                           |
| Local Law 125 of 2016                                     | <a href="http://www1.nyc.gov/assets/buildings/local_laws/ll125of2016.pdf">http://www1.nyc.gov/assets/buildings/local_laws/ll125of2016.pdf</a>                         |
| Code Notes  | <a href="http://www1.nyc.gov/site/buildings/codes/list-code-notes.page">http://www1.nyc.gov/site/buildings/codes/list-code-notes.page</a>                             |
| NYCECC FAQ  | <a href="http://www1.nyc.gov/site/buildings/codes/nycecc-faq.page">http://www1.nyc.gov/site/buildings/codes/nycecc-faq.page</a>                                       |
| UPDATED - Energy Code: Supporting Documents How to Guides | <a href="http://www1.nyc.gov/site/buildings/codes/energy-conservation-code.page">http://www1.nyc.gov/site/buildings/codes/energy-conservation-code.page</a>           |
| 1 RCNY § 5000-01  | <a href="http://www1.nyc.gov/assets/buildings/rules/1_RCNY_5000-01.pdf">http://www1.nyc.gov/assets/buildings/rules/1_RCNY_5000-01.pdf</a>                             |
| 1 RCNY § 101-07   | <a href="http://www1.nyc.gov/assets/buildings/rules/1_RCNY_101-07.pdf">http://www1.nyc.gov/assets/buildings/rules/1_RCNY_101-07.pdf</a>                               |
| Buildings Bulletins                                       | <a href="http://www1.nyc.gov/site/buildings/codes/building-bulletins/page">http://www1.nyc.gov/site/buildings/codes/building-bulletins/page</a>                       |
| EN1, EN2, and TR8 Forms                                   | <a href="http://www1.nyc.gov/site/buildings/codes/energy-code-forms.page">http://www1.nyc.gov/site/buildings/codes/energy-code-forms.page</a>                         |
| REScheck/COMcheck   | <a href="https://www.energycodes.gov/">https://www.energycodes.gov/</a>   |
| Blower Door Testing                                       | <a href="https://www.energy.gov/energysaver/blower-door-tests">https://www.energy.gov/energysaver/blower-door-tests</a>   |
| One City: Built to Last                                   | <a href="http://www1.nyc.gov/site/builttolast/index.page">http://www1.nyc.gov/site/builttolast/index.page</a>   |
| New York City Construction Codes                          | <a href="http://www2.iccsafe.org/states/newyorkcity/">http://www2.iccsafe.org/states/newyorkcity/</a>   |



# **8. RESOURCES: DOB ASSISTANCE**

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Questions on the NYCECC can be submitted to the DOB at:

[EnergyCode@buildings.nyc.gov](mailto:EnergyCode@buildings.nyc.gov)



## **8. RESOURCES: IMAGES/PHOTO CREDITS & COPYRIGHTS**

| <b>Company or Individual</b>     | <b>Slide Numbers</b>  |
|----------------------------------|---|
| <b>Basc.pnnl.gov</b>             | <b>35, 90, 99, 107b</b>                                     |
| <b>Comstock / Jupiter Images</b> | <b>15</b>   |
| <b>DOE/NREL</b>                  | <b>37, 38, 59, 60, 62, 63, 78, 82, 83, 85b, 86, 94, 103</b> |
| <b>Energy.gov</b>                | <b>76, 85a, 92, 105</b>                                     |
| <b>Energycodes.gov</b>           | <b>84, 107a</b>   |
| <b>Samantha Modell</b>           | <b>109, 157</b>   |







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