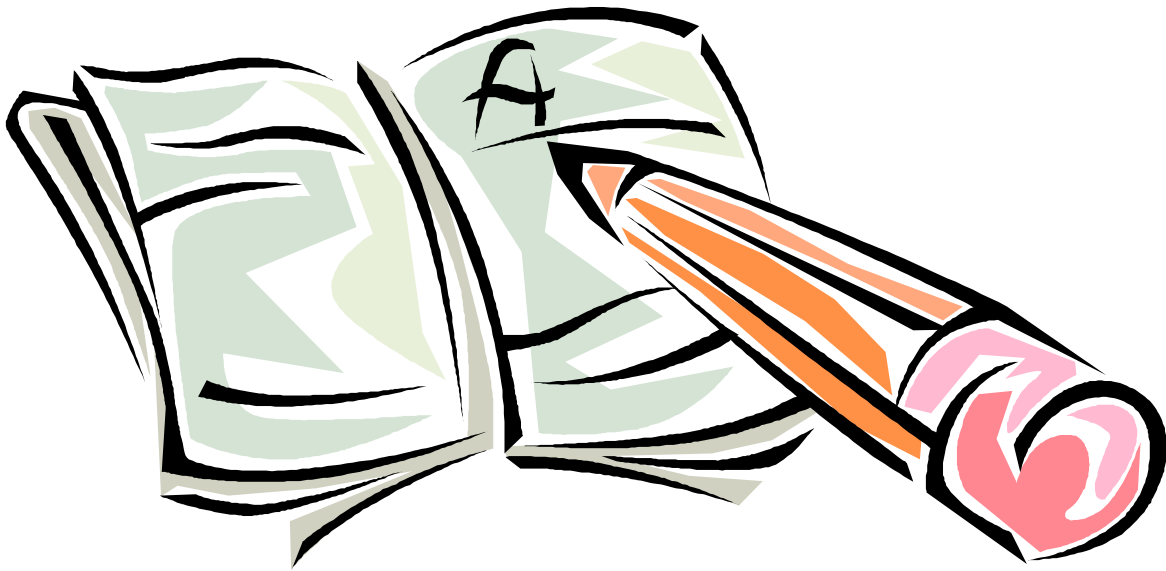
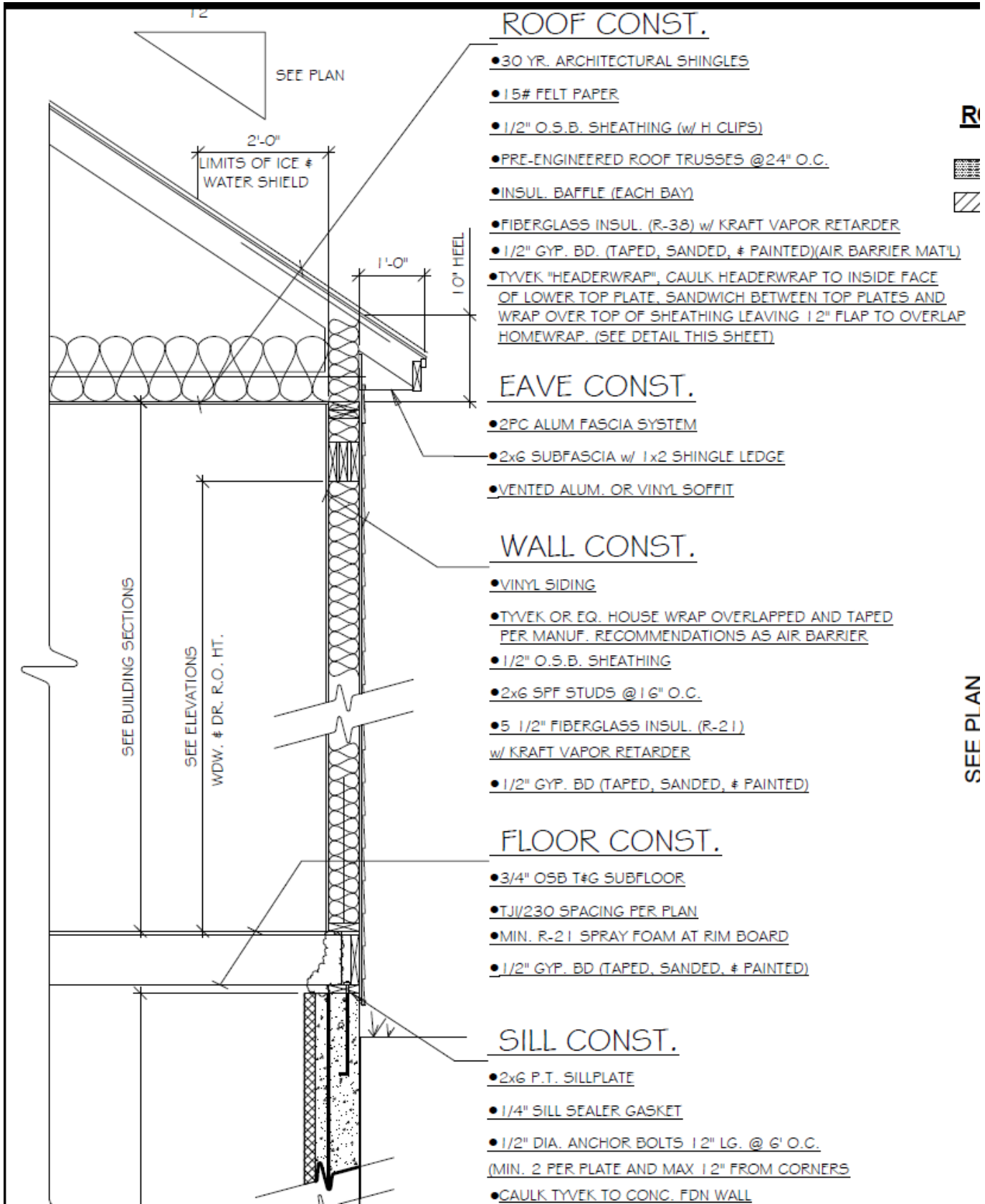


# The 2015 ECCCNY for Residential Buildings



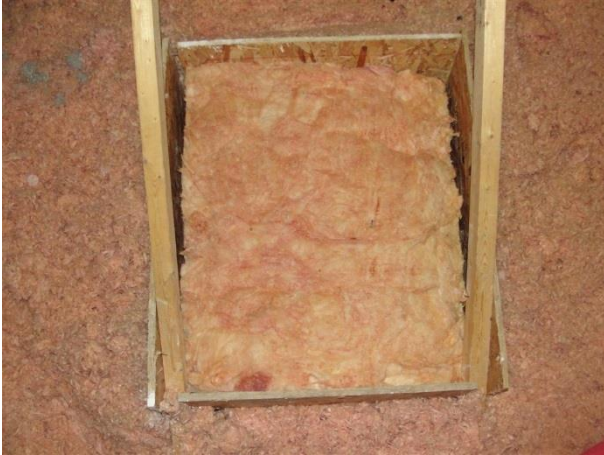
## EXERCISES Course 1

# Exercise 1: Details on Plans



## Exercise 2: Insulation Installation Details

The three images below show examples of common problem areas with regards to insulation installation details. From what we just learned about insulation installation details, what is the reason each of these examples would be considered non-compliant?



### ***Attic Hatch***

***Reason for non-compliance:***



### ***Slab Edge***

***Reason for non-compliance:***



### ***Walls***

***Reason for non-compliance:***

## Exercises 3 & 4: Alternative Approaches: U-Factor and Total UA

**TABLE R402.1.2 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b, e</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 <sup>h</sup>	8/13	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 <sup>h</sup>	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 <sup>h</sup>	13/17	30 <sup>g</sup>	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 <sup>h</sup>	15/20	30 <sup>g</sup>	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 <sup>h</sup>	19/21	38 <sup>g</sup>	15/19	10, 4 ft	15/19

**TABLE R402.1.4 EQUIVALENT U-FACTORS<sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR <sup>b</sup>	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
1	0.50	0.75	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.030	0.084	0.165	0.064	0.360	0.477
3	0.35	0.55	0.030	0.060	0.098	0.047	0.091 <sup>c</sup>	0.136
4 except Marine	0.35	0.55	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.32	0.55	0.026	0.045	0.057	0.028	0.050	0.055

A new, 2,000 ft<sup>2</sup>, single-family home is under construction in Albany, NY (Climate Zone 5). The builder is using Structural Insulated Panels (SIPs) for both the walls and the ceiling components.

The 8" SIP walls have a U-Factor of .032 and 12" ceiling assemblies have a U-Factor of .022. The floor insulation is R-19, an equivalent U-Factor of .047. The plans also call for two types of windows, all of which are the same size, but have different U-Factors. Half of the windows have a U-Factor of .32 while the other half has a U-Factor of .48.

### Exercise 3: U-Factor Alternative

The U-Factor Alternative allows for alternate design approaches for building components. Assemblies with a U-Factor equal to or less than that specified in Table R402.1.14 shall comply. Which of the components from the proposed plan described above would comply using this method?

Component	Assembly	Proposed U-Factor	Required U-Factor	Compliant?
Ceiling	12" SIP	.022		
Wall	8" SIP	.032		
Fenestration	Windows	.32		
Fenestration	Windows	.48		
Floor	R-19 Blown	.047		

### Exercise 4: Total UA

The Total UA method allows trade-offs across all envelope components. If the total building thermal envelope UA is less than or equal to the total UA from the U-factors specified in Table R402.1.14, the building shall be considered in compliance. Using this method, determine whether the proposed plan would comply with the Energy Code.

$$UA = (U\text{-Factor}) \times (\text{Area})$$

Component	Assembly	Gross Area (ft <sup>2</sup> )	Proposed U-Factor	Required U-Factor	Proposed UA	Required UA
Ceiling	12" SIP	2,000	.022	.026	44	52
Wall	8" SIP	1,500	.032	.060	48	90
Fenestration	Windows	150	.32	.32	48	48
Fenestration	Windows	150	.48	.32	72	48
Floor	R-19 Blown	2,000	.047	.033	94	66
<b>Total UA</b>					<b>306</b>	<b>304</b>

Does the proposed plan comply with code using the Total UA method? If not, what could the builder do to make comply with the Total UA method?

## Exercise 5: Air Sealing/ Ventilation

Please indicate whether the following statements about Air Barrier requirements are True or False.

- |   |   |   |
|---|---|---|
| 1. The air barrier <i>must</i> be continuous.                     | T | F |
| 2. All breaks, joints, and penetrations <i>must</i> be sealed.    | T | F |
| 3. Air-permeable insulation <i>may</i> be used as an air barrier. | T | F |
| 4. Recessed light fixtures <i>do not</i> need to be sealed.       | T | F |
| 5. Rim joists <i>must</i> include the air barrier.                | T | F |

**The 2015 IECC requires tested envelope leakage in residential buildings to be < 3 ACH at 50 pascals.**

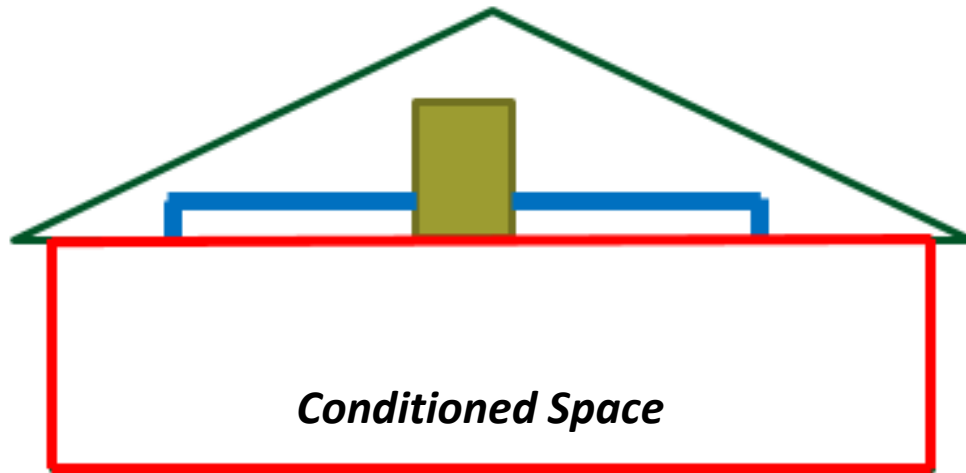
$$ACH_{50} = CFM_{50} \times 60 / \text{Volume}$$

A one-story, three bedroom, 1,500 ft<sup>2</sup> home with a flat ceiling and unconditioned attic has 8' tall ceilings. Blower door testing results in a reading of 600 CFM<sub>50</sub>.

1. What is the ACH<sub>50</sub> for this home?
2. Does this meet the code requirements for air leakage testing?
3. Is WHMV required for this home?
4. What is the total required continuous WHMV airflow rate for this size home? (Use the table below)

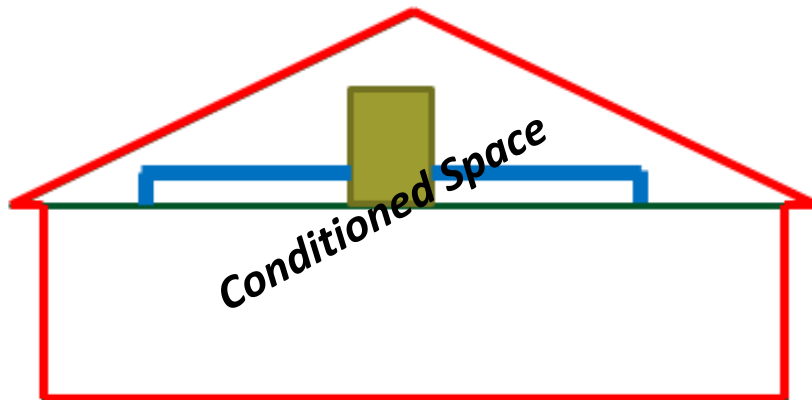
Table M1507.3.3(1) Continuous Whole-House Mechanical Ventilation Airflow Rate Requirements (cfm)					
Floor Area (sq ft)	Number of Bedrooms				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
	Airflow in CFM				
< 1500	30	45	60	75	90
1501 - 3000	45	60	75	90	105
3001 - 4500	60	75	90	105	120
4501 - 6000	75	90	105	120	135
6001 - 7500	90	105	120	135	150
> 7500	105	120	135	150	165

## Exercise 6: Duct System Requirements



What are the requirements for the following components for the duct system depicted above?

Insulation:	Not- Required	Required	Prescriptive R-Value:
Sealing:	Not-Required	Required	
Testing:	Not-Required	Required	Prescriptive Tightness Target:



What are the requirements for the following components for the duct system depicted above?

Insulation:	Not- Required	Required	Prescriptive R-Value:
Sealing:	Not-Required	Required	
Testing:	Not-Required	Required	Prescriptive Tightness Target:

## Exercise 7: Manual J/S

Rhvac - Residential & Light Commercial HVAC Loads

Elite Software Development, Inc.

Schenectady, NY 12306



1 Mallard

Page 2

### Project Report

#### General Project Information

Project Title: [REDACTED]  
 Designed By: [REDACTED]  
 Project Date: Saturday, December 19, 2015  
 Client Name: [REDACTED]  
 Company Name: Appolo Heating  
 Company Representative: [REDACTED]  
 Company Address: [REDACTED]  
 Company City: Schnectady Ny 12306  
 Company Phone: [REDACTED]

#### Design Data

Reference City: Schenectady, New York  
 Building Orientation: Front door faces North  
 Daily Temperature Range: Medium  
 Latitude: 42 Degrees  
 Elevation: 378 ft.  
 Altitude Factor: 0.986

	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	1	0.31	n/a	n/a	70	n/a
Summer:	87	72	49%	50%	75	30

#### Check Figures

Total Building Supply CFM:	1,260	CFM Per Square ft.:	0.360
Square ft. of Room Area:	3,502	Square ft. Per Ton:	1,349
Volume (ft³) of Cond. Space:	29,855		

#### Building Loads

Total Heating Required Including Ventilation Air:	61,950 Btuh	61.950 MBH
Total Sensible Gain:	27,350 Btuh	88 %
Total Latent Gain:	3,801 Btuh	12 %
Total Cooling Required Including Ventilation Air:	31,151 Btuh	2.60 Tons (Based On Sensible + Latent)

#### Notes

Rhvac is an ACCA approved Manual J and Manual D computer program.  
 Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.  
 All computed results are estimates as building use and weather may vary.  
 Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.



## Exercise 8: Lighting Requirements

1. True or False: The three primary types of High Efficacy lighting are LED, CFL, and Incandescent?
2. A home's lighting system includes:
  - 50 surface mount LED ceiling lights
  - 5 integrated LED wall sconces
  - 3 incandescent bulbs in each of 5 bathroom vanity fixtures
  - 6 linear fluorescent fixtures

Does the home's lighting system meet the lighting requirements?

3. If a home has only 50% "high efficacy" fixtures, but includes high performance windows, and wall and ceiling insulation that exceed the prescriptive requirements, can it comply with the Energy Code?

### Important Lighting Terminology

<b>Lumens</b>	<ul style="list-style-type: none"><li>• Lumens measure how much light you are getting from a bulb</li><li>• More Lumens = brighter</li><li>• 60W ~ 800 Lumens</li></ul>
<b>Efficacy</b>	<ul style="list-style-type: none"><li>• Measures how efficient a bulb/fixture is.</li><li>• Lumens (output)/ Watts (input)</li><li>• Higher efficacy numbers means better efficiency<ul style="list-style-type: none"><li>○ 60W Incandescent ~ 13 Lumens/Watt</li><li>○ 15 W CFL ~ 53 Lumens/Watt</li><li>○ 10 W LED ~ 80 Lumens/Watt</li></ul></li></ul>
<b>Kelvin</b>	<ul style="list-style-type: none"><li>• Measures the color of light</li><li>• Cool colors (white to blue) have higher Kelvin temperatures</li><li>• Warm colors (yellow to orange) have lower Kelvin temperatures</li></ul>
<b>CRI</b>	<ul style="list-style-type: none"><li>• Measures color accuracy compared to natural light (100 CRI)</li><li>• LEDs range from 70-95 CRI</li><li>• CFLs range from 60-85 CRI</li></ul>

## Exercise 9: Section 405 Performance Path

# 2015 IECC Energy Cost Compliance

<b>Property</b> ,	<b>Organization</b> Newport Ventures 518-377-9410 Matt Evans	<b>HERS</b> Projected Rating 2/22/2016 Rating No:0001 Rater ID:
Weather:Albany, NY Sample Residence Sample Building Per Plans.blg	<b>Builder</b>	

### Annual Energy Cost

	<b>\$/yr</b>	
	2015 IECC	As Designed
Heating	1032	1062
Cooling	348	274
Water Heating	213	213
<b>SubTotal - Used to Determine Compliance</b>	<b>1593</b>	<b>1549</b>
Lights & Appliances	1637	1594
Photovoltaics	-0	-0
Service Charge	0	0
<b>Total</b>	<b>3230</b>	<b>3143</b>

### Mandatory Requirements

The following Mandatory Requirements Fail:

Home Infiltration Check (Section 402.4.1.2)

Infiltration (Design must be equal or lower).

H:3.00 C:3.00 ACH50

H:4.50 C:4.50 ACH50

This home DOES NOT meet the annual energy cost requirements of Section 405 of the 2015 International Energy Conservation Code based on a climate zone of 5A.

Name | Matt Evans  
Organization | Newport Ventures

Signature |  
Date | 3 May 2016

In accordance with IECC, building inputs, such as setpoints, infiltration rates, and window shading may have been changed prior to calculating annual energy cost. Furthermore, the standard reference design HVAC system efficiencies are set equal to those in the code book as specified in the 2015 IECC. These standards are subject to change and the latest code should be obtained.

## Exercise 10: ERI Trade-Offs

Indicate whether the following scenarios would be compliant with the Energy Rating Index compliance path (R406) for Climate Zone 6. Climate Zone 6 requires an ERI of 54.

*Hint: Remember, all mandatory items are mandatory regardless of compliance path!*

1. Meet a ERI of 54 with only R13 wall insulation
2. Meet an ERI of 50 and skip the code certificate
3. Meet an ERI of 75 with all prescriptive insulation requirements
4. Meet an ERI of 54 with 100% efficient lighting and a 1ACH50, but only R38 attic insulation
5. Meet an ERI of 30 with photovoltaics and ducts in the attic insulated to R6
6. Meet an ERI of 50 with attic insulation of only R-19
7. Meet an ERI of 50 with a high efficiency water heater, but ducts tested at 8CFM25
8. Meet an ERI of 45 with a blower door test of 6ACH50
9. Meet an ERI of 45 with high efficiency HVAC and window SHGC of 0.55
10. Meet an ERI of 45 with high efficiency HVAC and an uninsulated rim joist

## Exercise 11: Review

Use the notes excerpts from plans below to fill out the sample compliance certificate on the following page.

<b>INTERNATIONAL ENERGY CONSERVATION CODE</b>	
1.	All work to comply with 2015 IECC.
2.	Compliance path for this single family residence is the <b><u>PRESCRIPTIVE PATH.</u></b>
3.	Trusses shall be designed/fabricated with a minimum of 10" heels to allow for full insulation.
4.	Heating system is to be direct venting 92% Efficiency unit.
5.	Windows shall be insulated glazing with Low E enhancement. Seal to framing with low expanding spray foam for air barrier compliance.
6.	Heating Degree Days 4634 (Maryland County)+/-
7.	Seal all penetrations including building envelope, floors, walls, ceilings and roof.
8.	Continuous thermal envelope depicted in building sections.
9.	Provide residential building energy standards certificate or equal posted in or near the electric distribution panel
10.	Air barrier, weather resistive barrier and thermal barrier shall be continuous. All transitions, penetrations and breaches shall be gasketed, taped or sealed as required to maintain barrier's continuity.
11.	All lighting shall be high efficacy LED lighting, minimum efficacy requirements per Section R202.
12.	All recessed luminaires in the building thermal envelope shall be IC-rated, have an air leakage rate >2cfm and shall be gasketed at the cgl.
13.	Residence shall be air leakage tested per R402.4.1.2.
14.	Provide mechanical ventilation per R403.6 and the IRC and IMC.
15.	All ducts shall be completely air sealed.
16.	All ducts and air handlers shall be located within the building thermal envelope.
17.	Provide programmable thermostat per R403.1.1.

### **INSULATION & FENESTRATION REQUIREMENTS BY COMPONENT PER TABLE 402.1.2 OF THE 2015 IECC**

CLIMATE ZONE 4	REQUIRED	PROVIDED
FENESTRATION U-FACTOR	.35	.30
SKYLIGHT U-FACTOR	.55	N/A
SHGC	.40	.40
CEILING R-VALUE	49	38**
WALL R-VALUE (cavity)	20	21
BASEMENT WALL R-VALUE, CONTINUOUS	10	11
FLOOR R-VALUE	19	30
MASS WALL VALUE, CONTINUOUS	13	N/A
SLAB R-VALUE, DEPTH	10,2	N/A
CRAWL SPACE WALL R-VALUE	10/13	N/A

\*\* RAISED HEEL TRUSS USED (10") PER R402.2.1. INSULATION SHALL EXTEND FULL DEPTH UNCOMPRESSED AND EXTEND OVER THE TOP WALL PLATE TO THE OUTSIDE FACE OF THE STUD/PLATE.

## ENERGY EFFICIENCY CERTIFICATE

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

### RESIDENTIAL COMPLIANCE PATH

*(Only one shall apply)*

Prescriptive R  Prescriptive U   
Prescriptive UA  Performance   
ERI  Index: \_\_\_\_\_

### COMPONENT VALUES

Ceiling *R* or *U*-value: \_\_\_\_\_

Wood Frame Wall *R* or *U*-value: \_\_\_\_\_

Mass Wall *R* or *U*-value: \_\_\_\_\_

Floor *R* or *U*-value: \_\_\_\_\_

Basement Wall *R*-value: \_\_\_\_\_

Slab *R*-value: \_\_\_\_\_ Depth: \_\_\_\_\_

Crawl Space *R*-value: \_\_\_\_\_

Fenestration *U*-Factor: \_\_\_\_\_ SHGC: \_\_\_\_\_

Skylight *U*-Factor: \_\_\_\_\_

Ducts Outside of

Thermal Envelope *R*-value: Supply R-8  Other R-6

Building Envelope Air Leakage: \_\_\_\_\_ Air Changes per Hour

Duct System Air Leakage: \_\_\_\_\_ CFM per 100ft<sup>2</sup>

Rough In Testing:  Post Construction Testing:

Heating System Efficiency: \_\_\_\_\_

Cooling System Efficiency: \_\_\_\_\_

Water Heating Efficiency: \_\_\_\_\_

Gas Fired Unvented

Room Heater:

Electric Furnace:

Baseboard Electric Heat:

*This Certificate is based upon 2015 International Energy Conservation Code and the 2015 International Residential Code. This Certificate shall be posted on or in the electrical distribution panel.*

I certify that the information contained on this certificate is true and complete:

Contractor: \_\_\_\_\_ Signature: \_\_\_\_\_

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

HB/MHIC License #: \_\_\_\_\_



**Resources:**

[www.newportventures.net](http://www.newportventures.net)

[www.homeenergyheroes.com](http://www.homeenergyheroes.com)

**22 Jay Street, Schenectady, NY 12305**

**518-377-9410**

**Energy Code Hotline**

**Call (518) 377-9410**

**e-mail: [energyservices@newportventures.net](mailto:energyservices@newportventures.net)**

**Free Plan Review and Inspection Services**

**Call 518-377-9410 or e-mail [energyservices@newportventures.net](mailto:energyservices@newportventures.net)**

**Department of State, Division of Code Enforcement & Administration**

**[https://www.dos.ny.gov/DCEA/tech\\_bull2016.html](https://www.dos.ny.gov/DCEA/tech_bull2016.html)**

**Due Process Issues - Unsafe Structures**

**Appendix " S " - Agency Regulations**

**RESCheck/COMCheck**

**Air Infiltration**

**Mechanical Ventilation**

**Legal citations to code provisions**

**Website: Building America Solution Center**