This webinar, which is part of DOE's Building Energy Codes Program *Energy Codes Commentator* webinar-based training series, will provide an introduction into metal building types and systems and how they are defined in the national energy codes and standards. The presentation will focus on metal building envelope assemblies and applications (e.g., roofs, exterior walls, fenestration, air barriers, and air leakage). Learn about how the energy code affects various aspects of metal building envelopes and various code compliance options. A demo of DOE's energy code compliance software will be shown focusing on how the different metal building assemblies are defined and calculated for code compliance.
Learning Objectives

1. Learn how the building energy code defines a metal building.
2. Understand the differences between unconditioned, conditioned, and semi-heated spaces.
3. Be able to look up assembly U-Factors for metal building assemblies.
4. Lean how to show compliance using COMcheck.
Energy Code Compliance for Metal Building Systems
Part 1 – Introduction & Metal Building System Primer
Part 2 – Prescriptive Compliance - Insulation
Part 3 – COMcheck
Who is MBMA?

- Founded in 1956 – Cleveland Based
- 13 Charter Member Companies
- Today – 43 Member Companies & 71 Suppliers
- Metal building systems ~45% of new low rise non-residential construction (MBMA stats)
- Roughly 9,000 contractors affiliated with member companies and ~ 28,000 projects / YR
Metal Building System (MBS) - Defined

- **Not** Pre-Fabricated Modular Buildings, nor are they Pre-Engineered.
- Metal Building Systems are designed using the systems approach, in which standard components are used to fit customized applications. Each building system is **custom engineered** to meet customer needs and for the particular application.
Metal Building Envelope

- Primary Framing
  - Often Tapered Columns & Beams
- Secondary Framing
  - Purlins & Girts
  - Open Joists
- Metal Cladding
  - Roof & Wall Sheeting
- Bracing
  - Lateral & Stability
- Connections
  - Screws & Bolts
- Additional Items
  - Insulation
  - Windows, Doors, Skylights
Energy Codes

- Differentiate by
  - Building type
  - Climate zone
  - Building construction
Metal Buildings by Building Type

- Commercial (41%)
  - Retail
  - Offices
  - Warehouses
  - More...
- Community (18%)
- Agricultural (14%)
- Manufacturing (20%)
- Other (7%)
Building Types

Manufacturing / Distribution

Agricultural

Recreational Facilities

K-12 Schools

Fire Stations

Aircraft Hangars
Building Types

- Community Centers
- Office / Warehouse
- Retail
- Religious
Energy Code defines a Metal Building

- Metal Roof & Metal Wall Panels
- Purlins (roof) spaced nominally 5 feet
- Girts (wall) average 52 inch spacing
- Metal building insulation further defined
Primary Focus Areas

Building Envelope

Mechanical Systems

IECC & ASHRAE 90.1

Service Water Heating

Power & Lighting Systems
Building Envelope – Focus Areas

- Insulation
  - Roof
  - Walls, above/below grade
  - Walls, below grade
  - Floors, Slab-on-grade
- Cool Roofs
- Windows, Doors, Skylights
- Air Barrier, Air Leakage
- Loading Dock Weatherseals
- Vestibules
IECC and 90.1

- IECC points to ASHRAE 90.1 to define all building envelope construction types
- IECC references 90.1 on a number of occasions
- In fact, 90.1 is the first choice offered
IECC vs 90.1 – One of the Differences

- Fully Insulated despite level of heating or cooling
- Separate requirements for semi-heated space definition
Space Conditioning Needs

Agriculture
Health Care
Religious

Aircraft Hangar
Restaurant
Office/Warehouse
Space Conditioning Types

- **International Energy Conservation Code (IECC)**
  - **Low Energy Buildings** – Exempt from building thermal envelope provisions if peak design rate of energy usage < 3.4 Btu/hr/ft²
  - **Conditioned Space** – Area or room within a building being heated or cooled...or ≥ 3.4 Btu/hr/ft²
Space Conditioning Types

- **ASHRAE 90.1**
  - **Semi-Heated Space** – Space that is heated, but not to comfort levels, and is not cooled
  - **Conditioned Space** – a cooled space, a heated space, or an indirectly conditioned space
    - 90.1 has a table for heating output by climate zone
  - **Unconditioned Buildings** – Exempt from envelope provisions if peak design rate of energy usage $< 3.4$ Btu/hr/ft$^2$
## Compliance Methods

<table>
<thead>
<tr>
<th>Prescriptive</th>
<th>Trade-Off</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Specific requirements for insulation, fenestration, air leakage</em></td>
<td><em>UA Trade-off</em></td>
<td><em>Whole building energy modeling</em></td>
</tr>
<tr>
<td><em>R-value method U-factor method</em></td>
<td><em>COMcheck software</em></td>
<td><em>Envelope, Mechanical, Lighting, …</em></td>
</tr>
<tr>
<td><em>Easiest, but limiting</em></td>
<td><em>U-factor substitution</em></td>
<td><em>More complicated</em></td>
</tr>
<tr>
<td></td>
<td><em>Building envelope</em></td>
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<td></td>
<td><em>Easy to comply</em></td>
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</tr>
</tbody>
</table>
Air Leakage Provisions

2015 IECC
- Whole building testing at <0.40 cfm/ft\(^2\) or the following:
- Air barrier sealing & placement and comply w/
  - Materials with air permeance ≤ 0.004 cfm/ft\(^2\) or
  - Assemblies with air permeance 0.04 cfm/ft\(^2\)

ASHRAE 90.1-2013
- Air barrier sealing & placement and comply w/
  - Materials with air permeance ≤ 0.004 cfm/ft\(^2\) or
  - Assemblies with air permeance 0.04 cfm/ft\(^2\)
Air Barrier - Requirements

- All seams, penetrations, and transitions between materials to be sealed
- Continuous and resist positive & negative pressures
- Can be placed inside or outside of building envelope

- 2015 IECC exempts CZ 2B
- 90.1-2013 exempts
  - Single wythe concrete masonry buildings in CZ 2B
  - Semiheated Spaces in CZ 1 through CZ 6
Application to MBS

Rips or Tears

Penetrations Sealed

Insulation Seams

Interface of:
Wall to Floor
Wall to Wall
Wall to Roof
Materials – Compliance Option

- ≤ 0.004 cfm/ft² under 75 Pa tested per ASTM E 2178 or use the deemed to comply list

<table>
<thead>
<tr>
<th>Material</th>
<th>Insulation Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood ≥ 3/8”</td>
<td>Built-up roofing membrane</td>
</tr>
<tr>
<td>OSB ≥ 3/8”</td>
<td>Modified bituminous roof membrane</td>
</tr>
<tr>
<td>Extruded polystyrene insulation board ≥ ½”</td>
<td>Fully adhered single-ply roof membrane</td>
</tr>
<tr>
<td>Foil-faced urethane insulation board ≥ ½”</td>
<td>Portland cement/sand parge, stucco, or gypsum plaster</td>
</tr>
<tr>
<td>Closed cell spray foam min. density 1.5 pcf ≥ 1-½”</td>
<td>Cast-in-place and precast concrete</td>
</tr>
<tr>
<td>Open cell spray foam density btwn 0.4 &amp; 1.5 pcf ≥ 4-½”</td>
<td>Fully grouted concrete block masonry</td>
</tr>
<tr>
<td>Gypsum board ≥ ½”</td>
<td>Sheet steel or aluminum</td>
</tr>
<tr>
<td>Cement board ≥ ½”</td>
<td>Solid or hollow masonry of clay or shale</td>
</tr>
</tbody>
</table>

Similar list in ASHRAE 90.1-2013
Sheet Steel meets 0.004 cfm/ft² air permeability, per the deemed to comply list.
**Assemblies – Compliance Options**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM E 2357</td>
<td>Air Leakage of Air Barrier Assemblies</td>
</tr>
<tr>
<td>ASTM E 1677</td>
<td>Air Barrier Material or System for Low-Rise Framed Building Walls</td>
</tr>
<tr>
<td>ASTM E 1680</td>
<td>Air Leakage through Exterior Metal Roof Panel Systems</td>
</tr>
<tr>
<td>ASTM E 283</td>
<td>Air Leakage through exterior windows, curtain walls, and doors</td>
</tr>
</tbody>
</table>

≤ 0.04 cfm/ft\(^2\) under 75 Pa tested per

Or use the deemed to comply list for concrete masonry wall systems
Assemblies – MBS Application

- 2011 NAHB Research Center
- Typical MB walls tested to meet ASTM E 283 – 8 Tests
  - Fiberglass, vapor retarder sealed
    - R-13 (0.0164 cfm/sf)
    - R-13 + R-30 Cavity Filled (0.0162 cfm/sf)
    - w/ flange brace hole (0.0198 cfm/sf)
Assemblies – MBS Application

- Typical MB roofs tested to meet ASTM E 1680
  - Standing Seam or Through Fastened Roof
  - Purlins
  - Insulation (may or may not be included)
Whole Building – MBS Application

- Can exceed U.S. Army Corps of Engineers limits of 0.25 cfm/sf
- ORNL full scale study
  - Pre-Retrofit = 0.26 cfm/sf
  - Post-Retrofit = 0.12 cfm/sf
Part 2
Prescriptive Compliance - Insulation
• C402.1.3 Insulation component R-value-based method - C402.2 and C402.4
• C402.2.2.2 Roof assembly – Table C402.1.3
• C402.2.3 Above-grade walls - Table C402.1.3
• C402.4 Fenestration – C402.4 through C402.4.4 and Table C402.4
• Daylight controls – Fenestration sections above and C405.2.3.1

• C402.1.4 Assembly U-factor, C-factor, or F-factor-based method – Table C402.1.4
<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 EXCEPT MARINE</th>
<th>5 AND MARINE 4</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All other</td>
<td>Group R</td>
<td>All other</td>
<td>Group R</td>
<td>All other</td>
<td>Group R</td>
<td>All other</td>
<td>Group R</td>
</tr>
<tr>
<td><strong>Metal building</strong></td>
<td>R-13+ R-6.5ci</td>
<td>R-13+ R-6.5ci</td>
<td>R-13+ R-6.5ci</td>
<td>R-13+ R-6.5ci</td>
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<td>R-13+ R-6.5ci</td>
</tr>
</tbody>
</table>

**R-value Method**
Group R = Commercial Residential Application. Living/Sleeping areas (i.e. dorms, nursing homes, prisons, …)
All other = Enclosing occupancies other than Group R

**TABLE C402.1.3**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
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</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 4.88 kg/m², 1 pound per cubic foot = 16 kg/m³.

a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
b. When using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4.
### 2015 IECC Table - Roofs

**TABLE C402.1.3**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
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</table>

**Note a** - Assembly Descriptions can be found in ASHRAE 90.1 Appendix A under:
- A2.3 Metal Building Roofs
- A2.3.2.4 Liner System (Ls)

**Note b** summarized: R-value method requires thermal spacer block.

Thermal spacer blocks are used with Standing Seam Roofs, not Through Fastened Roofs

CZ 1-5 = R-19 + R-11 LS
CZ 6 = R-25 + R-11 LS
CZ 7-8 = R-30 + R-11 LS
ci = Continuous Insulation. Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

Note a - Assembly Descriptions can found in ASHRAE 90.1 Appendix A
A3.2.2 Rated R-Value of Insulation for Metal Building Walls

CZ 1-3 = R-13 + R-6.5 ci
CZ 4-8 = R-13 + R-13 ci
ci shown as rigid foam board, other materials may apply.
### 2015 IECC Table - Roofs

**TABLE C402.1.4**

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<th>CLIMATE ZONE</th>
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<tbody>
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</tr>
</tbody>
</table>

#### Notes:

**Note a – Allows 90.1 Assemblies**

**Note b – Also allows U-factors by suppliers if validated by testing means**

Consider contacting MBMA Building Systems Members and MBMA Associate Members for product specific options.
- Fiberglass
- Continuous Insulation
- Insulated Metal Panels

**U-factor Method**

**CZ 1-5:** U-0.035  
**CZ 6:** U-0.031  
**CZ 7-8:** U-0.029

Note: Doesn’t tell you what type of insulation system to use.
# 2015 IECC Table – Above-Grade Walls

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
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<td>U-0.123</td>
<td>U-0.104</td>
<td>U-0.090</td>
<td>U-0.080</td>
<td>U-0.080</td>
<td>U-0.071</td>
</tr>
<tr>
<td>CZ 1-3</td>
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<td>U-0.079</td>
<td>U-0.052</td>
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<tr>
<td>CZ 4-8</td>
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</table>

- **Note a** – Allows 90.1 Assemblies
- **Note b** – Also allows U-factors by suppliers if validated by testing means

Consider contacting MBMA Building Systems Members and MBMA Associate Members for product specific options.
- Fiberglass
- Continuous Insulation
- Insulated Metal Panels
2015 IECC refers to 90.1-2013 as a compliance option
Requirements based on:

Two methods:

Space Conditioning Type
Climate Zone

R-value Method

U-factor Method
### Table 5.5-6 Building Envelope Requirements for Climate Zone 6 (A,B)*

<table>
<thead>
<tr>
<th>Opaque Elements</th>
<th>Nonresidential</th>
<th>Residential</th>
<th>Semihicated</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Assembly Max.</td>
<td>Insulation Min. R-Value</td>
<td>Assembly Max.</td>
</tr>
<tr>
<td><strong>Roofs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation Entirely above Deck</td>
<td>U-0.032</td>
<td>R-30 c.i.</td>
<td>U-0.032</td>
</tr>
<tr>
<td>Metal Buildinga</td>
<td>U-0.031</td>
<td>R-25 + R-11 Ls</td>
<td>U-0.029</td>
</tr>
<tr>
<td>Attic and Other</td>
<td>U-0.021</td>
<td>R-49</td>
<td>U-0.021</td>
</tr>
<tr>
<td><strong>Walls, above Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>U-0.080</td>
<td>R-13.3 c.i.</td>
<td>U-0.071</td>
</tr>
<tr>
<td>Metal Building</td>
<td>U-0.050</td>
<td>R-0 + R-19 c.i.</td>
<td>U-0.050</td>
</tr>
<tr>
<td>Steel Framed</td>
<td>U-0.049</td>
<td>R-13 + R-12.5 c.i.</td>
<td>U-0.049</td>
</tr>
<tr>
<td>Wood Framed and Other</td>
<td>U-0.051</td>
<td>R-13 + R-7.5 c.i. or R-19 + R-5 c.i.</td>
<td>U-0.051</td>
</tr>
</tbody>
</table>

*The following definitions apply: c.i. = continuous insulation (see Section 3.2), FC = filled cavity (see Section A2.3.2.5), Ls = liner system (see Section A2.3.2.4), NR = no (insulation) requirement.

a. When using the R-value compliance method for metal building roofs, a thermal spacer block is required (see Section A2.3.2).
### TABLE A2.3.3 Assembly U-Factors for Metal Building Roofs

<table>
<thead>
<tr>
<th>Insulation System</th>
<th>Rated R-Value of Insulation</th>
<th>Overall U-Factor for Entire Base Roof Assembly</th>
<th>Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (Uninterrupted by Framing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>R-6.5</td>
<td>R-9.8</td>
</tr>
<tr>
<td>Standing Seam Roofs with Thermal Spacer Blocks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Layer</td>
<td>Note</td>
<td>1.280</td>
<td>0.137</td>
</tr>
<tr>
<td></td>
<td>R-10</td>
<td>0.115</td>
<td>0.066</td>
</tr>
<tr>
<td></td>
<td>R-11</td>
<td>0.107</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>R-13</td>
<td>0.101</td>
<td>0.061</td>
</tr>
<tr>
<td></td>
<td>R-15</td>
<td>0.096</td>
<td>0.059</td>
</tr>
<tr>
<td></td>
<td>R-16</td>
<td>0.082</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>R-19</td>
<td>0.082</td>
<td>0.053</td>
</tr>
<tr>
<td>Double Layer</td>
<td>R-10 + R-10</td>
<td>0.088</td>
<td>0.056</td>
</tr>
<tr>
<td></td>
<td>R-10 + R-11</td>
<td>0.086</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>R-11 + R-11</td>
<td>0.085</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>R-10 + R-13</td>
<td>0.084</td>
<td>0.054</td>
</tr>
<tr>
<td></td>
<td>R-11 + R-13</td>
<td>0.082</td>
<td>0.053</td>
</tr>
<tr>
<td></td>
<td>R-13 + R-13</td>
<td>0.075</td>
<td>0.050</td>
</tr>
<tr>
<td></td>
<td>R-10 + R-19</td>
<td>0.074</td>
<td>0.050</td>
</tr>
<tr>
<td></td>
<td>R-11 + R-19</td>
<td>0.072</td>
<td>0.049</td>
</tr>
<tr>
<td></td>
<td>R-13 + R-19</td>
<td>0.068</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>R-16 + R-19</td>
<td>0.065</td>
<td>0.046</td>
</tr>
<tr>
<td></td>
<td>R-19 + R-19</td>
<td>0.060</td>
<td>0.043</td>
</tr>
<tr>
<td>Liner System</td>
<td>R-19 + R-11</td>
<td>0.037</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>R-25 + R-8</td>
<td>0.037</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>R-25 + R-11</td>
<td>0.031</td>
<td>0.031</td>
</tr>
<tr>
<td></td>
<td>R-30 + R-11</td>
<td>0.029</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td>R-25 + R-11 + R-11</td>
<td>0.026</td>
<td>0.026</td>
</tr>
</tbody>
</table>

**Options to meet U-factors in CZ 6:**
- Conditioned: U-0.031
- Semi-Heated: U-0.060

1 – Cont. Insulation Only
2 – Fiberglass Systems + Continuous Insulation
3 – Fiberglass Only (Conditioned case)
4 – Or…simply use the R-value method for the Roof only
Use the Contact Us Form at
http://www.mbma.com
Follow us on Twitter: @LearnAboutMBMA
YouTube: www.youtube.com/MBMAmmedia
2015 IECC Component Performance Alternative

DOE COMcheck Software Program
COMcheck and Metal Buildings Demo

Prepared by Pacific Northwest National Laboratory for the U.S. Department of Energy
Section C402.1.5 (New)

Proposed U-, F- and C-factors COMPARED to Prescriptive U-, F- and C-factors

A + B + C + D + E ≤ Zero
- A = Roof & Above Grade Walls, & Fenestration = UA Dif +/-
- B = Slab-On-Grade = FL Dif +/-
- C = Below Grade Walls = CA Dif +/-
- D = Windows above 30% Area = UA Dif + only
- E = Skylights above 3% Area = UA Dif + only
COMCheck Overview

TODAY’S PRESENTATION

- High Level Overview
  - Input Screens
  - Building Envelope Only
  - Overview of Checklists
- Metal Building Application
  - Primary Focus
  - Case Studies

TOPICS NOT COVERED

- Listen to PNNL Webinar
- COMCheck Basics (2016)
- www.energycodes.gov/training
- Detailed Review of
  - Building Envelope, Lighting, & Mechanical Inputs/Outputs
  - Understand Compliance Reports
  - Includes a Metal Building Case Study
- COMcheck Basics - 120 Minute Webinar
  - Recorded June 2016, Listen on Demand
- Alterations using COMcheck – 90 Minute Webinar
  - Recorded in February 2017, Listen on Demand

https://www.energycodes.gov/resource-center/training
COMcheck

Commercial Compliance Using COMcheck™

The COMcheck software product group makes it easy for architects, builders, designers, and contractors to determine whether new commercial or high-rise residential buildings, additions, and alterations meet the requirements of the IECC and ASHRAE Standard 90.1, as well as several state-specific codes. COMcheck also simplifies compliance for building officials, plan checkers, and inspectors by allowing them to quickly determine if a building project meets the code.

COMcheck Desktop may be downloaded and installed directly to your desktop, while COMcheck-Web™ is accessible directly from the website without having to download and install.

View a list of supported software versions for code compliance tools.
See if your state or county can use COMcheck to show compliance.

COMcheck™ for Windows®

Runs on Windows 7/8/10 in either single, multi-user, or network environments. Note that the Mac version of COMcheck has been discontinued. Mac users are advised to use COMcheck-Web.

Version 4.0.7 (Build Version: 4.0.7.2)
Version 4.0.7 includes support for ASHRAE 90.1-2016. View Release Notes for additional details.

Supported Codes:
2009, 2012 and 2015 IECC.
Various state-developed energy codes.

COMcheck-Web

COMcheck-Web simplifies commercial and high-rise residential energy code compliance. It performs just like the desktop version of COMcheck, but you don't need to download or install any software on your computer.
COMcheck – Allows all different roof and wall types...including hybrid construction

Agriculture

Health Care

Religious

Restaurant

Office/Warehouse
COMcheck

“DESKTOP”

WEB
Resources

200+ Pages

Ch. 1 – Introduction
Ch. 2 – MBS & Applications
Ch. 3 – Energy Code Fundamentals
Ch. 4 – Energy Codes & Standards
Ch. 5 – Compliance Tools
Ch. 6 – Insulating MBS
Ch. 7 – Cool Roofs
Ch. 8 – Daylighting
Ch. 9 – Green Building
Ch. 10 – Advanced Energy Codes
Appendix A – PV Roof Panels
Appendix B – Daylighting Design
Energycodes.gov Resource Center

- Compliance software
- Compliance checklists
- Technical support
- Code notes
- Publications
- Resource guides
- Training materials
Training

The Building Energy Codes Program (BECP) offers a variety of training resources related to the world of energy codes, ranging from overviews to a variety of special topics and tutorials. A list of the most commonly requested materials is included below. Additional resources are also available in the full Training Catalog.

Topics

- Codes 101: An Overview of Building Energy Codes
- Adoption, Compliance & Enforcement (ACE) Learning Series
- Energy Code Compliance Paths: Which is best for you?
- Achieving and Evaluating Residential Compliance of Tight Envelopes
- REScheck Basics
- Lighting Requirements and compliance with the 2015 IECC and ASHRAE 90.1-2013
- COMcheck Basics
- 2015 IECC – Energy Rating Index (ERI) Compliance Alternative
- Intro to Commercial Building HVAC Systems and Energy Code Requirements
- Daylighting Controls
- Achieving a More Meaningful Assessment of Commercial Building Code Compliance
- Showing Compliance for Additions & Alterations Using REScheck & COMcheck
- Do Code Controls Requirements Save Energy in Real Buildings?
- REScheck-Web: New Features and Functions
- Buried Ducts: Advantages, Challenges, and New Options in the 2018 IECC
- Energy Code Compliance for Metal Buildings – New
THANK YOU!

Building Energy Codes Program
www.energycodes.gov/training

BECP help desk
https://www.energycodes.gov/HelpDesk