

The “CheckTools” Perspective

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Building Energy Codes Program
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Why do we do this?

42 USC 6833 (in part): ... **Technical assistance:** The Secretary shall provide technical assistance to States to implement the requirements of this section, and to improve and implement State residential and commercial building energy efficiency codes or to otherwise promote the design and construction of energy efficient buildings. ...

How do we do this?

- ▶ Provide technical assistance to states to implement national energy codes
- ▶ Provide software support to states to implement state energy codes
- ▶ Provide assistance increasing and verifying compliance
- ▶ Develop software to support a streamlined compliance process
- ▶ Provide objective information resources and technical guidance to states and localities to increase code compliance.

Early desktop software supported:

REScheck:

- MECcheck 1994: Model Energy Codes 1992+, IECC 1998+

COMcheck:

- COMcheck-EZ (1997) - True Windows version released 1998

Web presence:

- ▶ Energy Codes website started late 90's – platform for information and desktop tools
- ▶ REScheckWeb 2001
- ▶ COMcheckWeb 2002

Past and Present “Support Tools” :

- ▶ Package Generator
- ▶ “Score ‘N Store”
- ▶ U-factor calculator
- ▶ CodeCheck
- ▶ Energy code Tax credit app (<https://energycode.pnl.gov/EnergyCodeReqs/>)
- ▶ Lighting fixture library (COMcheck only)
- ▶ “AreaCalc” (REScheck only)
- ▶ Fan system compliance “wizard” (commercial only)
- ▶ Data exchange of project files between desktop and web
- ▶ Inspection checklists (UI interactive format and PDF)

Currently Supported Energy Codes

National Codes: 3 code cycle support

- ▶ RES: IECC 2009/2012/2015/2018 (Sept 2018)
- ▶ COM: IECC 2009/2012/2015/2018, ASHRAE 90.1-2007/2010/2013/2016

State codes software assistance policy:

Adoption Criteria

- ▶ Based on latest national code in the software
- ▶ More stringent than the base national code
- ▶ Advances code coverage/adoption that can be leveraged by other state codes

State Code Challenges:

- ▶ Alignment of state code adoption and CheckTools development or 3 code-cycle
- ▶ Grace periods allowed by state codes don't play well with web apps
- ▶ State energy code requirements can be contradictory and/or poorly defined

Currently Supported State Energy Codes

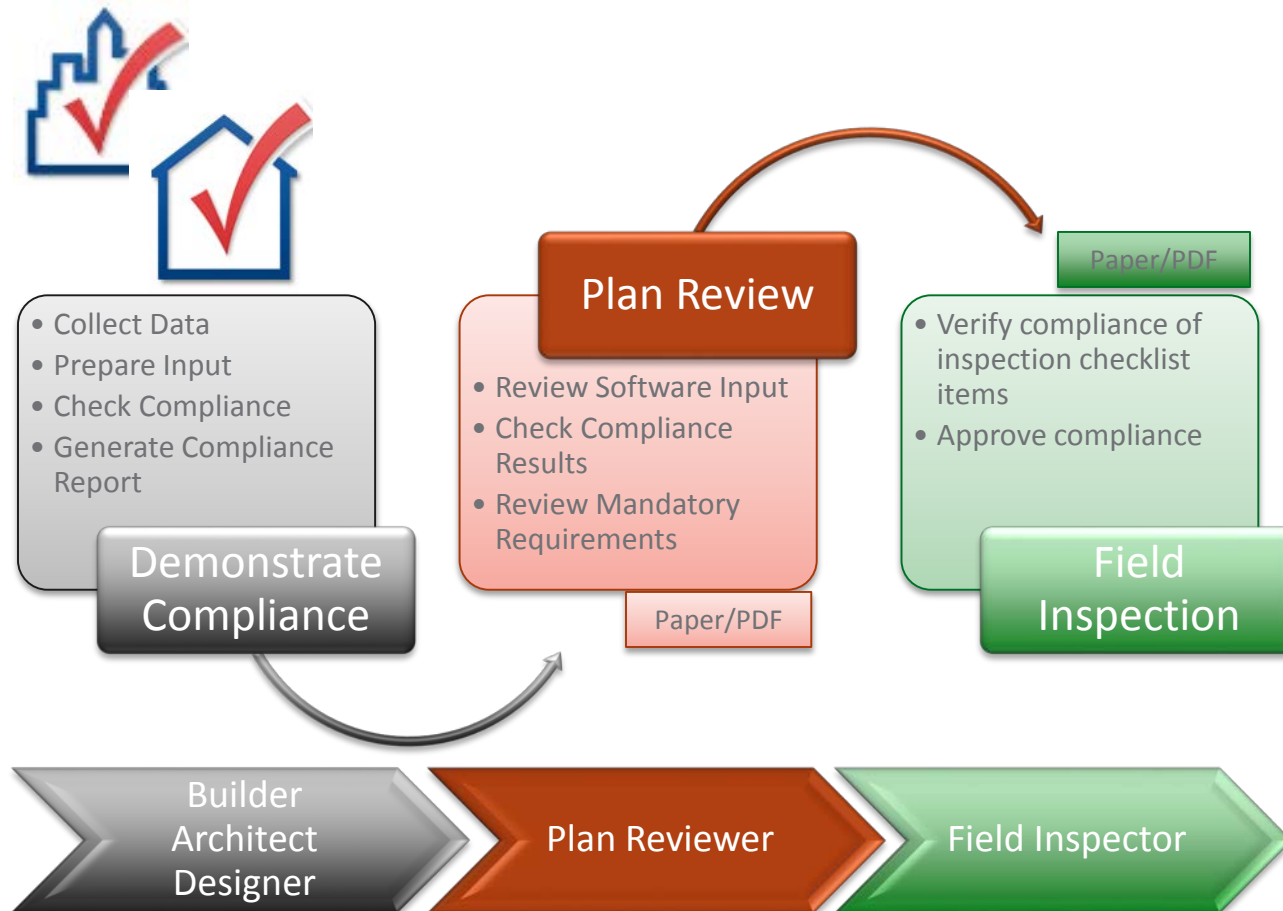
COMcheck:

Florida
Massachusetts
New York City
North Carolina
Ontario (CA)
Oregon
Puerto Rico
Vermont

REScheck:

Florida
Georgia
New York City
North Carolina
Puerto Rico
Utah
Vermont

CheckTools Current Use Scenario



BECP Tools used only during “Demonstrate Compliance” Stage

Building System

Compliance Options

Envelope

Lighting

HVAC

SWH

Power

Other

Mandatory Provisions
(required for most compliance options)

Prescriptive Option

Trade Off Option

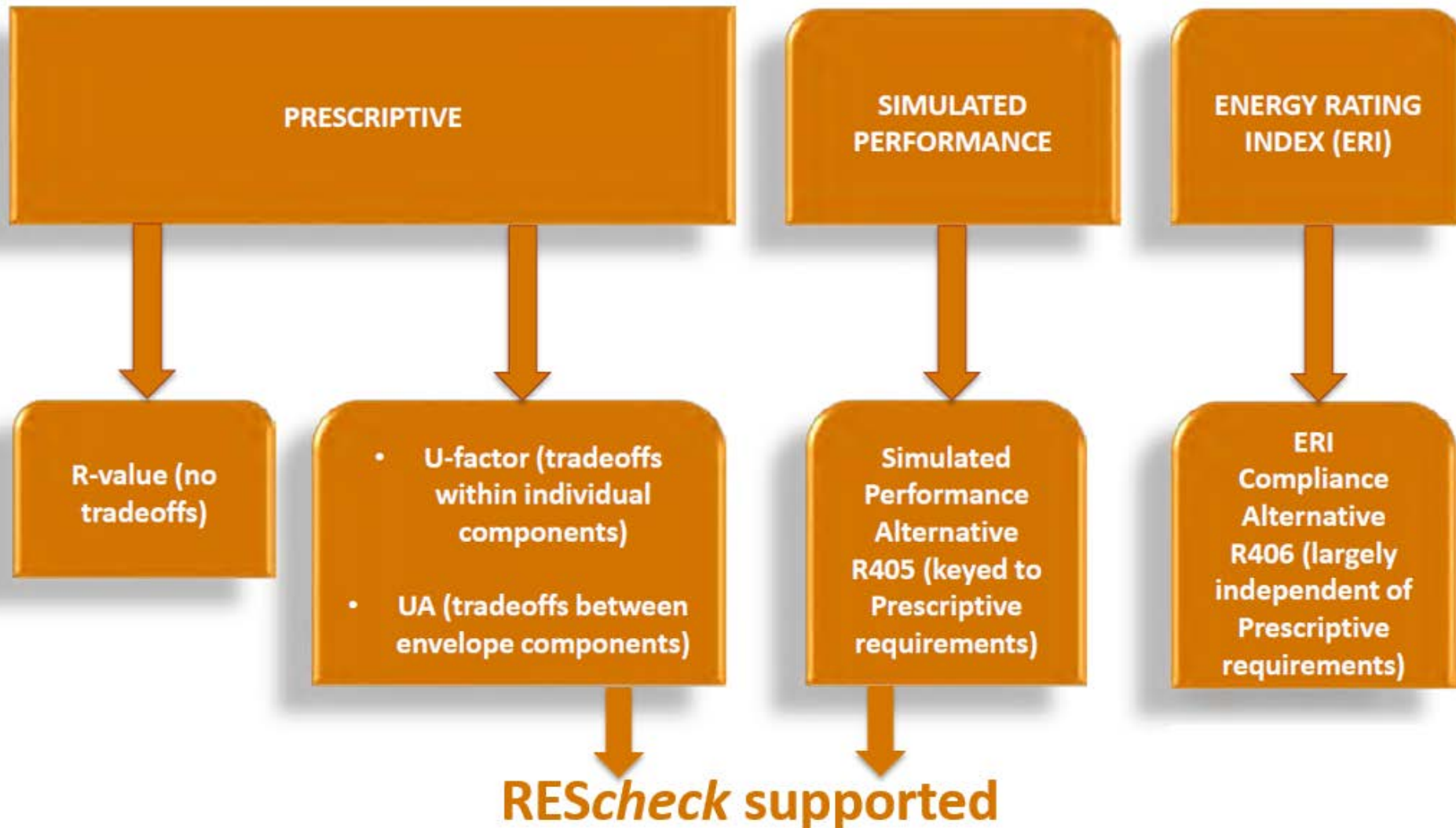
Energy Cost Budget

Simplified



Energy Code Compliance

Residential Compliance



Commercial Energy Code Envelope Trade-Off Methods

Pre-2013 ASHRAE 90.1 Appendix C Methodology for Building Envelope Trade-Off Option

- EPF based on heating, cooling, and lighting loads for building assemblies using regression coefficients and procedures specified by Appendix C.

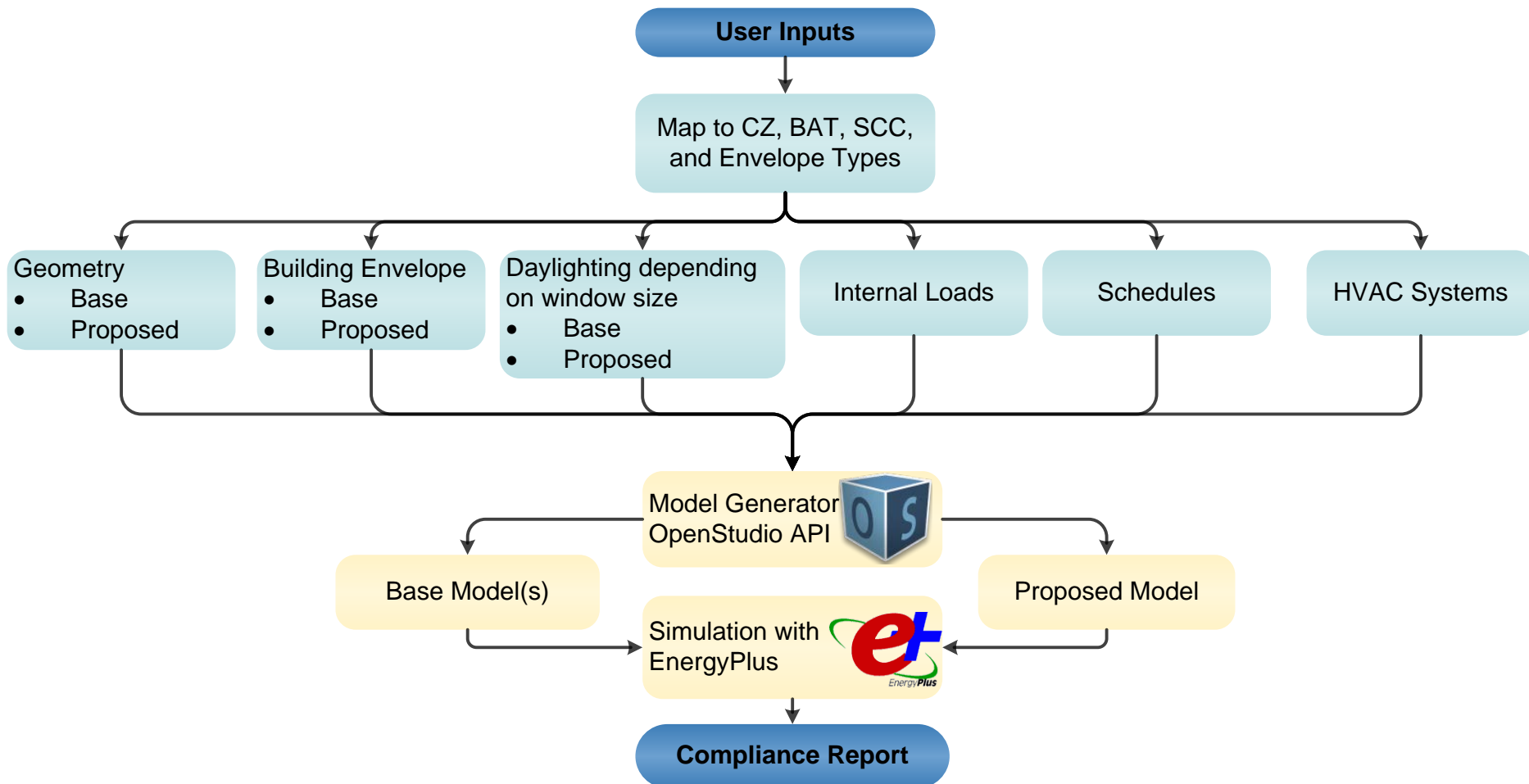
90.1-2013/2016 Methodology for Building Envelope Trade-Off Option

- EPF based on building energy performance simulations using EnergyPlus
- Envelope components are assigned to isolated thermal zones based on
 - Building area types (BAT)
 - Space conditioning categories (SCC)
 - Orientation, type, and property etc.
 - One packaged single-zone AC per zone
- Non-envelope model inputs are held constant (lighting, HVAC, schedules etc.) between Proposed and Base models.

2015/2018 IECC Component Performance Method Criteria

- Envelope assemblies must pass on 'hybrid' Total UA based criteria
- Area-weighted fenestration U-factor
- SHGC prescriptive requirement

90.1-2013/2016 Envelope Trade-Off Workflow



COMcheck Interior / Exterior Lighting

- ▶ Mandatory requirements
- ▶ Lighting power requirements
 - Complies if total connected power is less than lighting power allowance (entire building or partial)



≤



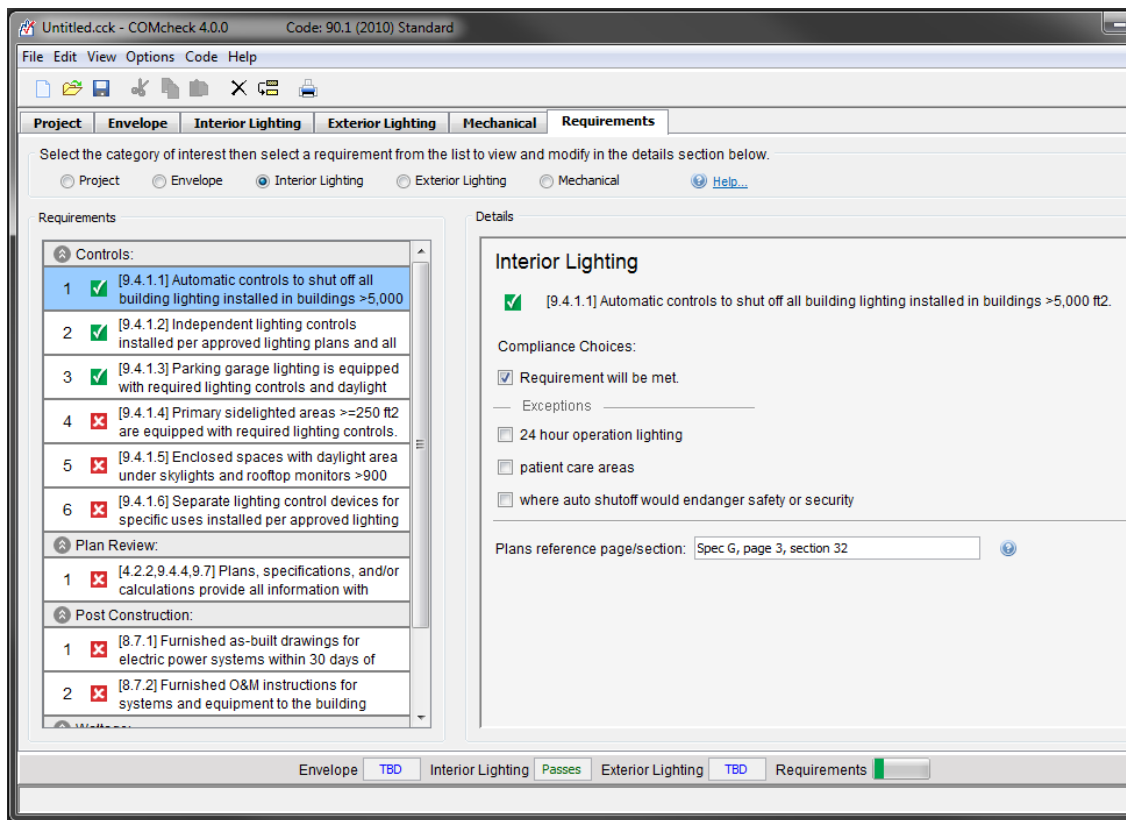
COMcheck Mechanical Equipment

- ▶ Different than Envelope and Lighting
- ▶ System types:
 - HVAC system
 - Plant
 - Water heating
- ▶ System inputs determine which requirements apply (“Customized” list of requirements)



Requirements Tab – Goals

- ▶ Ensure user is aware of applicable mandatory requirements and addresses each in the software
- ▶ Provide better documentation for code officials



Reports – Inspection Checklist



Requirements: 25.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

90.1 (2010) Standard	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10] ²	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	
9.4.1.1 [EL1] ²	Automatic controls to shut off all building lighting.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. Location on plans/spec: Spec G, page 3, section 32
9.4.1.2 [EL2] ²	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. Location on plans/spec: Spec G, page 3, section 32
9.4.1.3 [EL11] ²	Parking garage lighting is equipped with required lighting controls and daylight transition zone lighting.	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable	Requirement will be met. Location on plans/spec: Spec G, page 3, section 32
9.4.1.4 [EL12] ¹¹	Primary sidelighted areas ≥ 250 ft ² are equipped with required lighting	<input type="checkbox"/> Complies <input type="checkbox"/> Does Not	

CheckTools Limitations

- ▶ “Deemed-to-comply” – Deemed to meet the intent of the code
- ▶ Prescriptive compliance capability limited
- ▶ Not all exceptions/allowances can be supported
- ▶ Nonstandard assembly types – U-factor calculations/documentation required
- ▶ Geometry/envelope design details limited
- ▶ Mechanical system configurations complex
- ▶ Energy code copyright constraints

Untitled.xml - COMcheck 4.0.0 Code: 90.1 (2013) Standard

File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Location
State: Tennessee
City: Nashville
Climate zone: 4a

Project Type
☒ New Construction ☐ Addition ☐ Alterations

Project Details (optional)
Edit Project Details... This information will appear on the compliance certificate.

Title/Site/Permit
Owner/Agent
Designer/Contractor
Notes

Check Envelope Compliance Help Envelope TBC

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Add Delete Duplicate

	Building Type	Area Description	Area	W/ft2	Space Conditioni
1	Click to select building type.				Nonresidential

“DESKTOP”

WEB

COMcheck-Web - 2015 IECC - Google Chrome

Secure | https://energycode.pnl.gov/COMcheckWeb/index.html

COMcheck-Web™

Project title
2015 IECC

Email Address [redacted] Log In
Register | Forgotten Password?

New Project PROJECT ENVELOPE INT. LIGHTING EXT. LIGHTING MECHANICAL REQUIREMENTS Reports

Code/Location
Code: 2015 IECC
State: Alabama
City: Abbeville
If your location is not included here, choose a nearby location with similar weather conditions.

Project Type
☒ New Construction ☐ Addition ☐ Alterations

Compliance Options
Efficiency: Unspecified

Project Details (optional)
This information will appear on the compliance report. Edit Project Details...
Notes:

Building Envelope Area Types Interior Lighting Method and Areas Exterior Lighting Areas

Add Building Area Duplicate Delete

	Building Area	Area Description	Space Conditioning	Area
1	Select Area Type...			

✓ CHECK COMPLIANCE To display compliance results, click the Check Compliance button.

“DESKTOP”

Untitled.nd - REScheck 4.6.0 Code: 2012 IECC

File Edit View Options Code Tools Help

Front Faces: Unspecified

Project Envelope Mechanical Requirements

Location
State: Tennessee
City: Nolensville

Project Type
☒ New Construction ☐ Addition ☐ Alteration

Building Characteristics
☒ 1- and 2-Family, Detached ☐ Multifamily
Conditioned Floor Area: 0 ft²
☐ All ducts and air handlers located within conditioned spaces
[Explanation of duct testing requirements...](#)
☐ Project includes a thermally isolated sunroom
☐ Project includes a pool or inground permanent spa
☐ Project includes an interior wood-burning fireplace


Project Details (optional)
This information will appear on the compliance certificate.
[Edit Project Details...](#)

Title/Site/Permit

Owner/Agent

Designer/Contractor



Notes

 Invalid conditioned floor area (see project screen)

Compliance Method: Performance Alternative [Explanation of results...](#)

If you can't find the building's city, choose a nearby city that has similar weather conditions.

WEB

 Robert Schultz | Help | Sign off | 

Home > A Sample Project - Energy Code: 2015 IECC Draft

If left unsaved, this project session will end in 59 minutes.

Cancel Save Report Compliance Check

Project Envelope Compliance (15.2%) ✓

Project Info:

Project Title: A Sample Project

Energy Code: 2015 IECC [What's my code?](#)

Location: Richland, Washington

Project Type
☒ New Construction
☐ Addition
☐ Alteration

Compliance Method
☒ UA Trade-Off
☐ Performance Alternative

Building Characteristics

Construction Type
☒ 1- and 2-Family, Detached
☐ Multifamily

Conditioned Floor Area: 3000 ft²

Orientation - Front Faces
Enable: ☒
South 180°

Features

All ducts and air handlers are located within conditioned spaces: ☒ Yes ☐ No
Thermally isolated sunroom: ☐ Yes ☒ No
Pool or inground spa: ☐ Yes ☒ No
Interior wood-burning fireplace: ☒ Yes ☐ No

<https://www.energycodes.gov/rescheck:>

[View a list of supported software versions for code compliance tools](#)  .


[See if your state or county can use REScheck to show compliance](#)  .

REScheck™ for Windows® 

Runs on Windows 7/8/10 in either single, multi-user, or network environments.

Note that the Mac version of REScheck has been discontinued. Mac users are advised to use [REScheck-Web](#)

Version 4.6.5 (build version 4.6.5.0)

View [Release Notes](#)  to see what's new in this version.

Supported Codes:

2009, 2012 and 2015 IECC

Various state and county energy codes.

REScheck-Web 




REScheck-Web simplifies residential energy code compliance by automating trade-off calculations for the IECC and a number of state-specific codes. It performs just like the REScheck desktop version, but you don't need to download or install any software on your computer. REScheck-Web has been updated with several modern functions, including a new interface, a dashboard of your projects, the ability to share projects with colleagues, the ability to create individual user profiles, and more.

REScheck Support

Have a compliance question or need assistance with the software?

BECP's team of building energy codes experts is available to answer specific questions submitted through our web-based [help desk](#)  .

REScheck Software Support Documents

- [REScheck Software User's Guide](#) 
- [REScheck Plan Review Quick Reference Guide](#) 
- [Methodology for Developing the REScheck Software through Version 4.4.3](#) 

REScheck-Web: Registration and Account Log-In

Login

Register

Email Address*

Confirm email Address*

Password*

Confirm Password*

Register

Login

Register

Email Address

☒ Remember me

Password

[Forgot Password?](#)

Log In

Home: My Projects (aka Project Dashboard)



 Robert Schultz | [Help](#) | [Sign off](#) | 

Home

My Projects










Shared Project Requests

New Project

Create Sample Project

Import

Search

<input type="checkbox"/>	Project	Last Updated ^	Energy Code	Status	Sharing
<input type="checkbox"/>	North Meadows Development 	Sep 20, 2017 4:04:16 PM	2015 IECC	Final ▾	
<input type="checkbox"/>	Imported avg fen u factor fails 	Sep 15, 2017 8:48:31 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	Example2015IECC 	Sep 13, 2017 3:09:11 PM	2009 IECC	Final ▾	
<input type="checkbox"/>	North Meadows Development 	Jun 6, 2017 3:18:23 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	Performance method test 	Jan 31, 2017 7:33:39 AM	2015 IECC	Draft ▾	

« < 1 ... 5 ... 8 > »

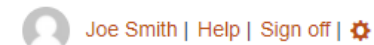
Help

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Joe Smith


Login email address: robert.schultz@pnnl.gov

Your information: Joe Smith
robert.schultz@pnnl.gov
[Edit](#)

Address Book:

Name	Email	Default Permissions	
Pam Cole	pam.cole@pnnl.gov	View Only	 
Bozeman Building Dept.	BZNBbuildDept@mt.gov	View Only	 
<input type="text" value="Name"/>	<input type="text" value="Email"/>	<input type="text" value="View Only"/>	<input type="button" value="Add"/>









REScheckWeb Project Sharing



Home

My Projects Shared Project Requests All Users

New Project Create Sample Project Import

<input type="checkbox"/>	Project	Last Updated ^	Energy Code	Status	Sharing
<input type="checkbox"/>	2012 Alteration project 	Feb 6, 2018 10:24:28 AM	2012 IECC	Draft ▾	
<input type="checkbox"/>	Slab test  Shared with Others	Feb 6, 2018 10:15:47 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	North Meadows Development 	Feb 6, 2018 9:52:52 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	Imported avg fen u factor fails 	Feb 5, 2018			
<input type="checkbox"/>	Florida 2014 test 	Feb 1, 2018			

Share Slab test with others

Name	Email	Permissions	
Pam	pam.cole@pnnl.gov	Can Edit	Un-share
Rose	rosemarie.bartlett@pnnl.gov	Read Only ▾	Share

Done

Sharing Projects: Shared Project Invitation



[Home](#)

[My Projects](#)

[Shared Project Requests](#)

These are projects other users have asked to share with you.

<input type="checkbox"/>	Project ^	Location	Permission	Sender	Action
--------------------------	-----------	----------	------------	--------	--------

You don't currently have any unconfirmed sharing requests.



[Home](#)

[My Projects](#)


[Shared Project Requests 1](#)

These are projects other users have asked to share with you.

<input type="checkbox"/>	Project ^	Location	Permission	Sender	Action
<input type="checkbox"/>	A Sample Project	Dogtown, WA	Can Edit		Accept Ignore

Sharing Projects: Email Invitation

Shared project recipient will receive email with invitation to accept the “share”


 Reply  Reply All  Forward  IM



Fri 7/13/2018 9:08 AM

CheckWeb@energycodes.gov

Rescheck Project Shared

To  Schultz, Robert W

membobmt@gmail.com has offered to share a project with you via REScheck. To accept, click on the project link below.

Project: [A Sample Project](#)

Location: Richland, Washington

Sharing Projects: Shared Projects



Home

My Projects











Shared Project Requests

New Project

Create Sample Project

Import

Search

<input type="checkbox"/>	Project	Last Updated ^	Energy Code	Status	Sharing
<input type="checkbox"/>	A Sample Project  Shared with Me	Feb 6, 2018 2:14:19 PM	2015 IECC	Draft ▾	
<input type="checkbox"/>	2012 Alteration project 	Feb 6, 2018 10:24:28 AM	2012 IECC	Draft ▾	
<input type="checkbox"/>	Slab test  Shared with Others	Feb 6, 2018 10:15:47 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	North Meadows Development 	Feb 6, 2018 9:52:52 AM	2015 IECC	Draft ▾	
<input type="checkbox"/>	Imported avg fen u factor fails 	Feb 5, 2018 5:06:29 PM	2015 IECC	Draft ▾	

Future Development Opportunities

- ▶ More comprehensive and dynamic coverage of compliance alternatives: trade-off and prescriptive options
- ▶ Move towards more benefits to code officials
 - Enforce prescriptive/mandatory requirements documentation
 - Customize inspection checklists
 - Include tools for selecting requirement to verify based on accredited statistical sampling process and energy sensitivity analysis
 - Facilitated mobile app checklist access
- ▶ Educational content on individual code requirements:
 - Add hyperlinks to educational content in software interface and reports
 - Specific and detailed explanations
 - Include graphics showing examples of correct and incorrect installation
 - Video links to installation and inspection techniques

Future Development Opportunities (cont)

- ▶ More product library support: e.g. NFRC, lighting fixtures/products, etc
- ▶ Build out the web application sharing feature
- ▶ Upgrade COMcheckWeb to modern platform compatible with REScheckWeb
- ▶ Commercial mechanical input design upgrade
- ▶ ePermitting

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Renewable Energy

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2018 National Energy Codes Conference on Building Energy Codes
Save the Date! Join us July 15-17, 2018, in Austin, Texas, for the **2018 National Energy Codes Conference**, hosted by the U.S. Department of Energy, to promote energy improvements in existing and new residential buildings. [Learn more...](#)

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www.energycodes.gov

BECP help desk

<http://www.energycodes.gov/resource-center/help-desk>