# Complying with The Energy Code
# 2018 IECC with Hawaii Amendments

**Webinar**
**December 9, 2021**

HAWAII STATE Energy Office

Presentation Collaborators

Hawai'i Energy · School of Architecture, University of Hawai'i at Mānoa · Honolulu Section BIA · ASHRAE Hawaii Chapter · AIA Honolulu · HAWAII · HNEI Hawai'i Natural Energy Institute, University of Hawai'i at Mānoa · Sea Grant · BOMA HAWAII

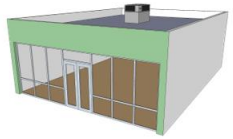
## Section 1
## Code Overview and Adoption Status


8

## Section 2
## Compliance Roadmap

13

## Section 3
## Compliance Examples



55

## Section 4
## Hawai`i Energy Incentives

Hawai'i Energy

90

## Section 5
## Wrap Up

100

# Complying with The Energy Code
# 2018 IECC with Hawaii Amendments

## Webinar

## December 9, 2021

HAWAII STATE Energy Office

Presentation Collaborators

Hawai'i Energy

SCHOOL OF ARCHITECTURE
UNIVERSITY OF HAWAI'I AT MĀNOA

IES Honolulu Section

BIA Building Industry Association Hawaii

ASHRAE Hawaii Chapter

Environmental Research & Design Lab

AIA Honolulu

U.S. Green Building Council USGBC HAWAII

HNEI Hawai'i Natural Energy Institute
University of Hawai'i at Mānoa

Sea Grant

BOMA HAWAII
Building Owners and Managers Association


This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

# COURSE DESCRIPTION

A new energy code takes effect for Hawai'i State building projects on December 14 and for other projects no later than December 2022 depending on adoption by the Counties.

This 90-minute webinar provides guidance on the compliance process and focus on "how to" energy code compliance questions such as: How do I figure out if the energy code applies to my project? How do I determine the compliance options and requirements? What information is required on the plans? Guidance will be provided for a range of project types, including both new construction and alteration projects and will include common State project types.

# LEARNING OBJECTIVES

At the end of this course, participants will be able to:

1. Determine whether a project falls within the scope of the energy code
2. Identify applicable requirements in the 2018 IECC, including Hawaii amendments
3. Use energy code checklists to review designs for compliance
4. Identify information that should be on the plans to show energy code compliance

# Introductions

Presenters

- Howard Wiig, State Energy Office
- Erik Kolderup, PE, Kolderup Consulting
- Ramsey Brown, Hawaii Energy
- Lacey Shimabukuro, Hawaii Energy

Acknowledgments

- Gail Suzuki-Jones, State Energy Office
- Kathy Yim, State Energy Office
- Sehun Nakama, Hawaii Energy
- Karen Shishido, Hawaii Energy

# Topics

Code introduction

Compliance roadmap

- Does my project have to comply?
- Which compliance options are available?
- What are the requirements?
- What information needs to be in the plans and specs?

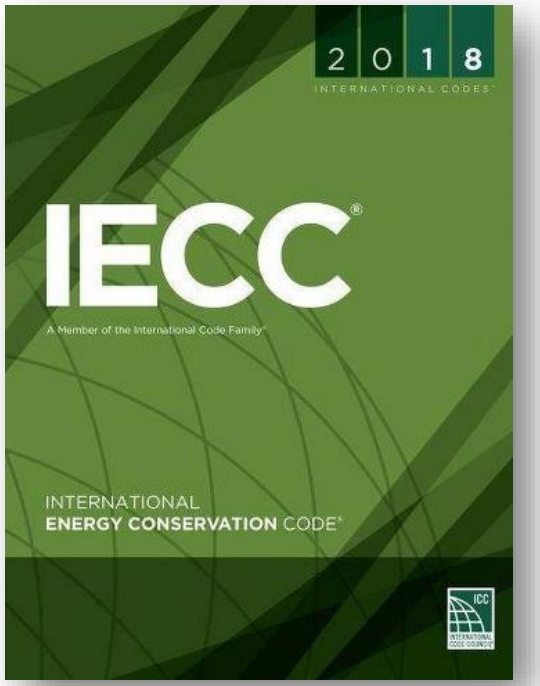
Compliance examples

Hawaii Energy incentives

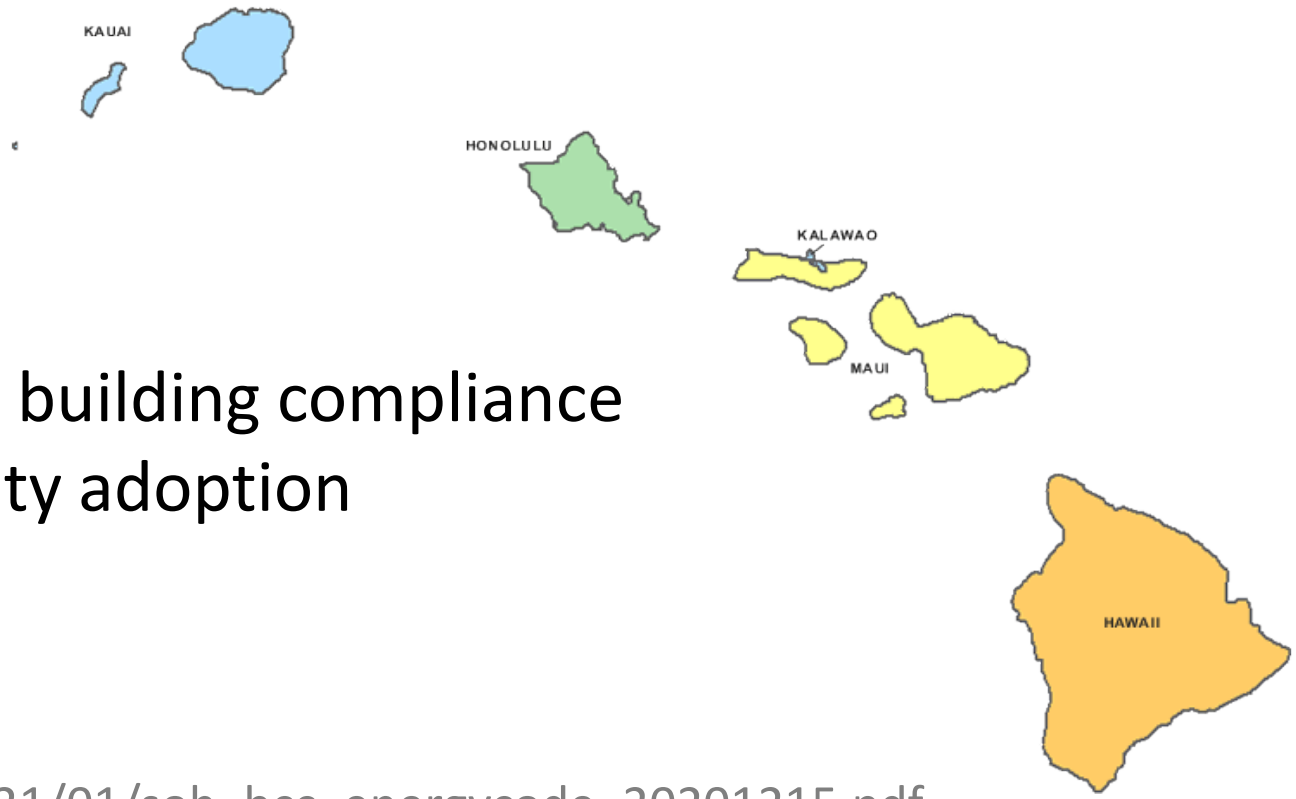
Q&A

# Section 1

# Code Overview and Adoption Status



# Adoption

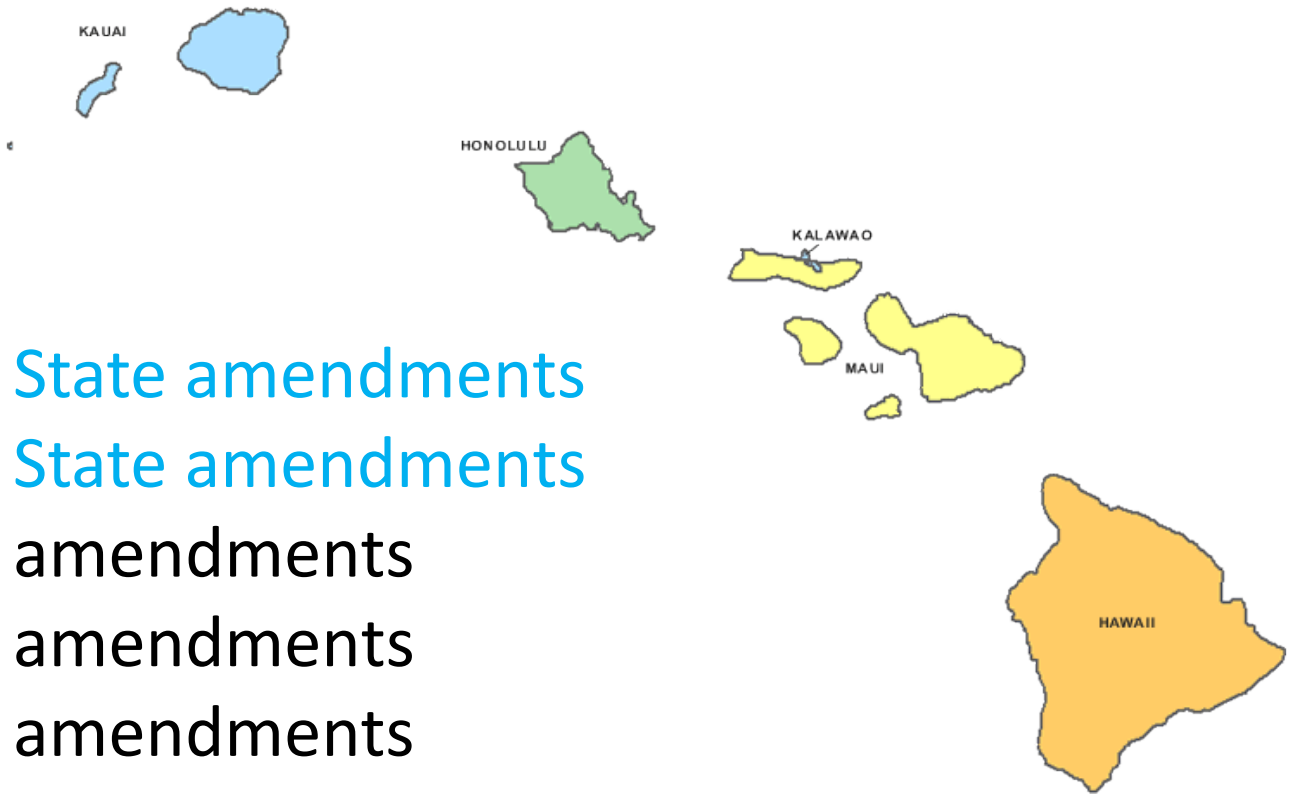



Dec. 15, 2020 – State adoption
Dec. 15, 2021 – Deadline for State building compliance
Dec. 15, 2022 – Deadline for County adoption

State amendments
https://ags.hawaii.gov/wp-content/uploads/2021/01/soh_bcc_energycode_20201215.pdf

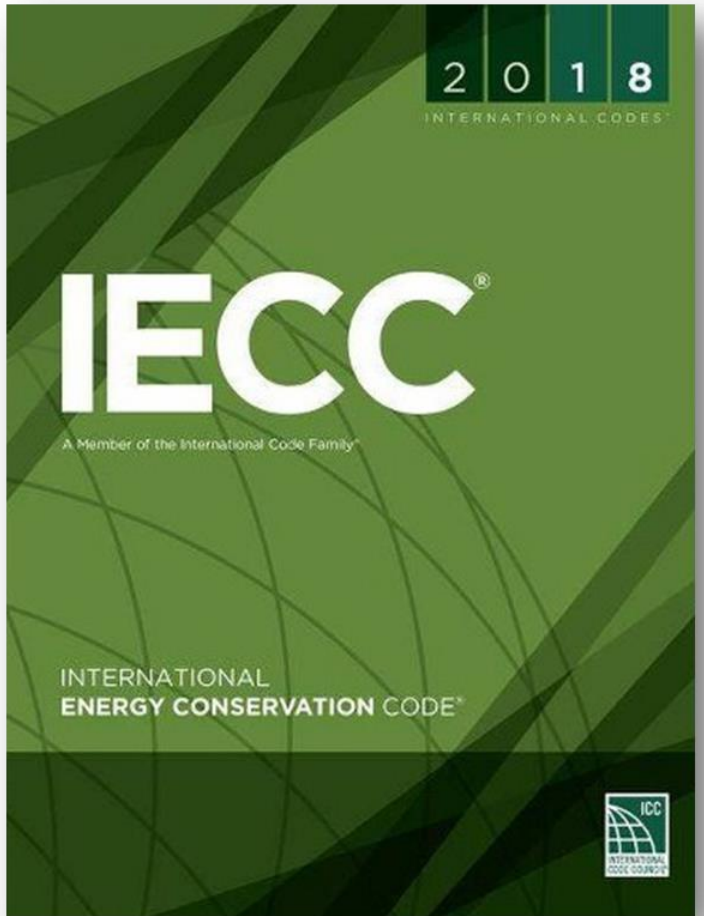
2018 IECC
https://codes.iccsafe.org/content/iecc2018

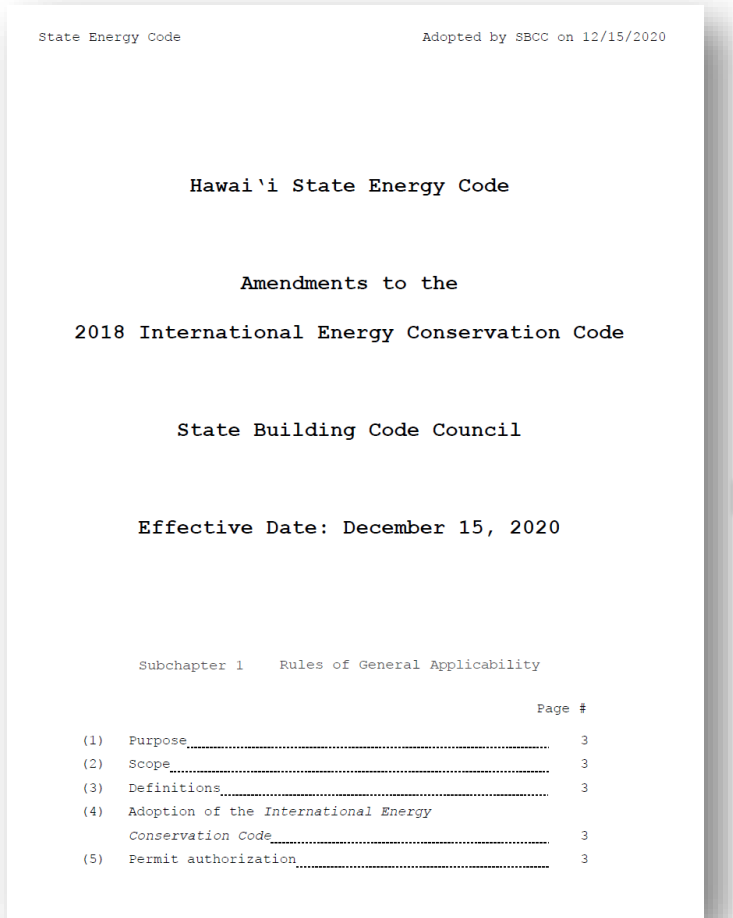
# Adoption




**Current Status**

| | |
|---|---|
| State Buildings | 2018 IECC with State amendments |
| Hawaii County | 2018 IECC with State amendments |
| Honolulu County | 2015 IECC with amendments |
| Kauai County | 2015 IECC with amendments |
| Maui County | 2015 IECC with amendments |



State Energy Code Adopted by SBCC on 12/15/2020

Hawai‘i State Energy Code

Amendments to the

2018 International Energy Conservation Code

State Building Code Council

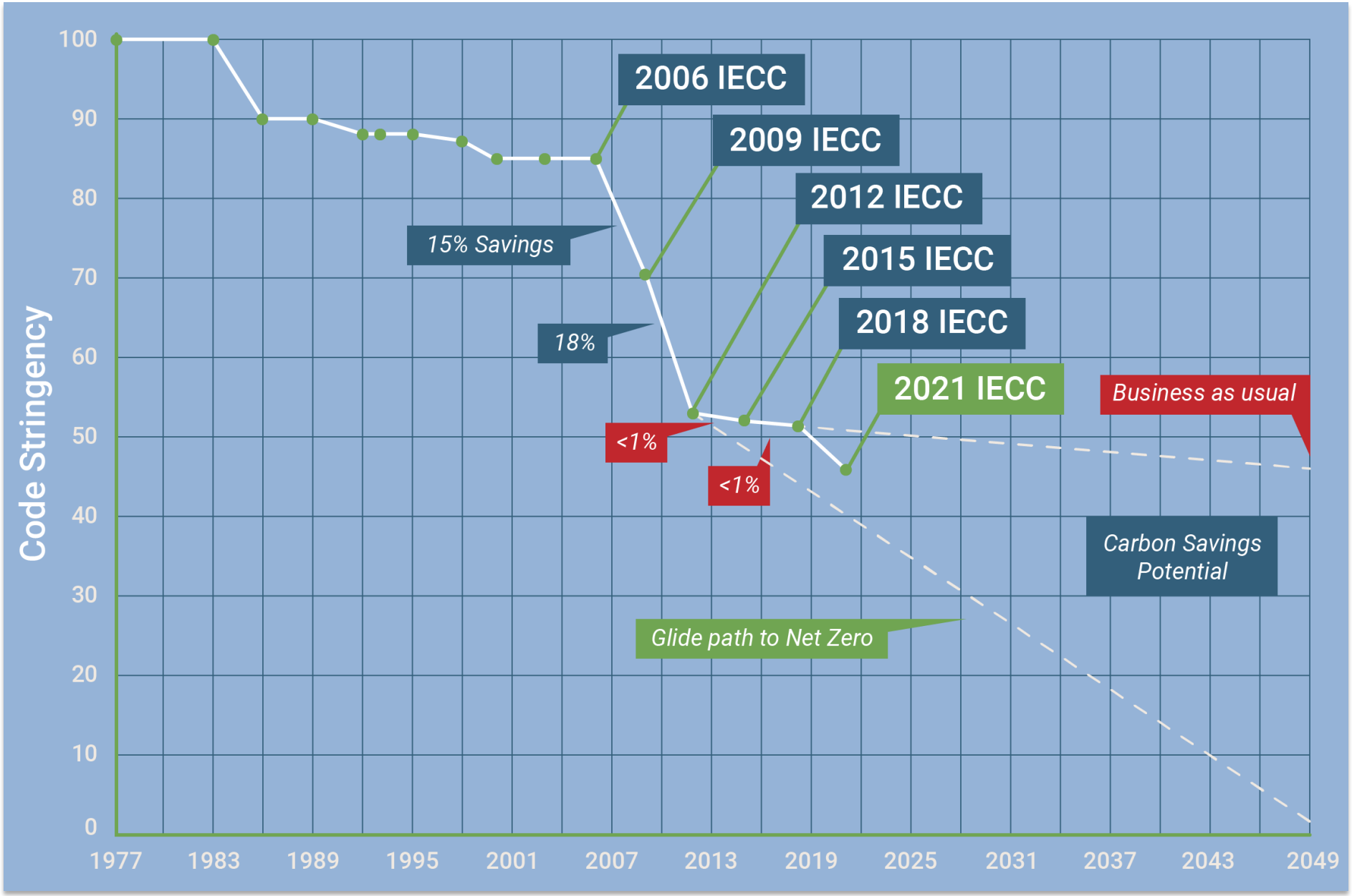
Effective Date: December 15, 2020

Subchapter 1 Rules of General Applicability



State amendments
12 pages

County amendments




Source: Energy Efficient Codes Coalition. https://energyefficientcodes.org/iecc/

# Section 2

# Compliance Roadmap

# Compliance roles

Owner/owner’s representative

Project manager

Architect/Designer

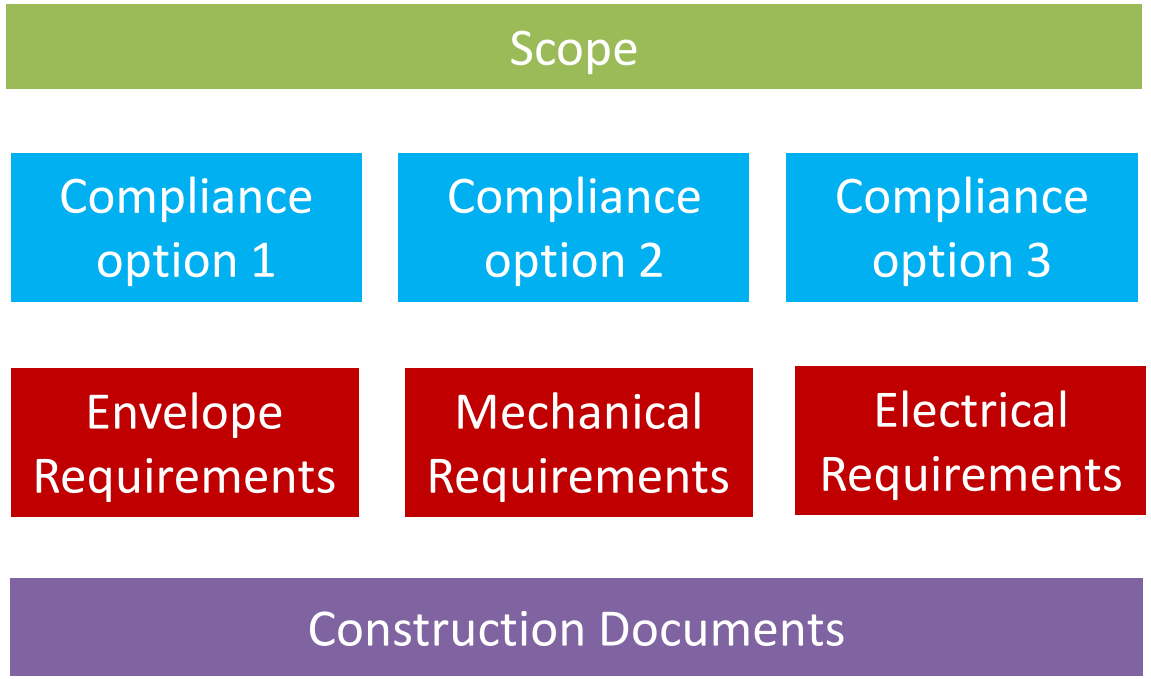
Contractor

Vendor

Plan reviewer

Inspector

# Compliance roadmap




Does my project need to comply?

Which compliance options are available?

What are the requirements?

What information needs to be in the plans and specs?

# References

2018 International Energy Conservation Code

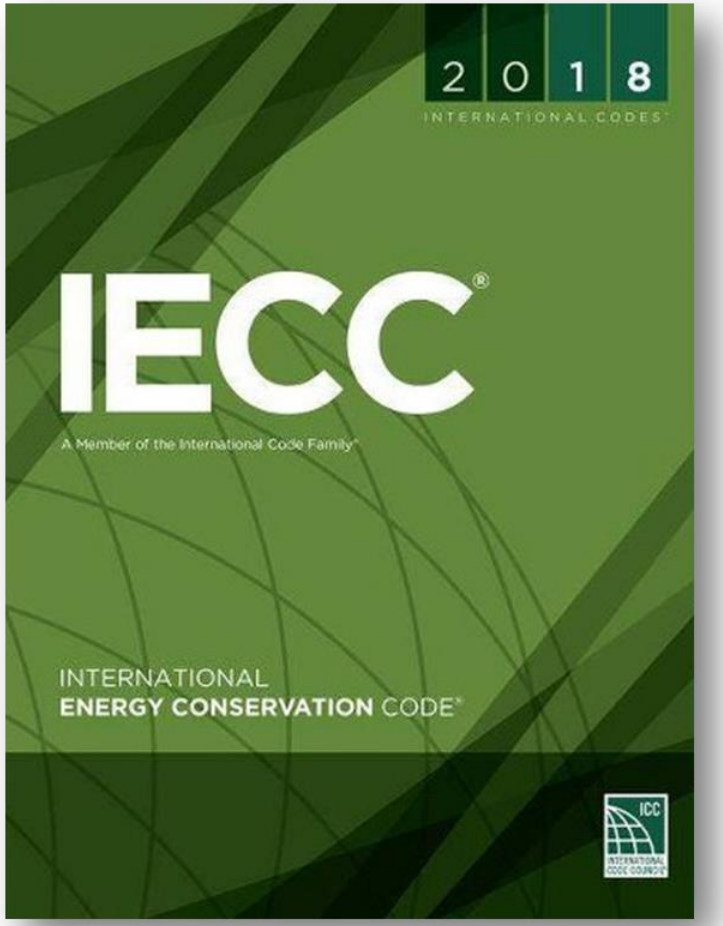
Hawai’i State amendments

County amendments (if applicable)

Energy code checklist

Recorded webinars, May 2021

ASHRAE Standard 90.1-2016 (if applicable)




https://codes.iccsafe.org/content/iecc2018

# References

2018 International Energy Conservation Code

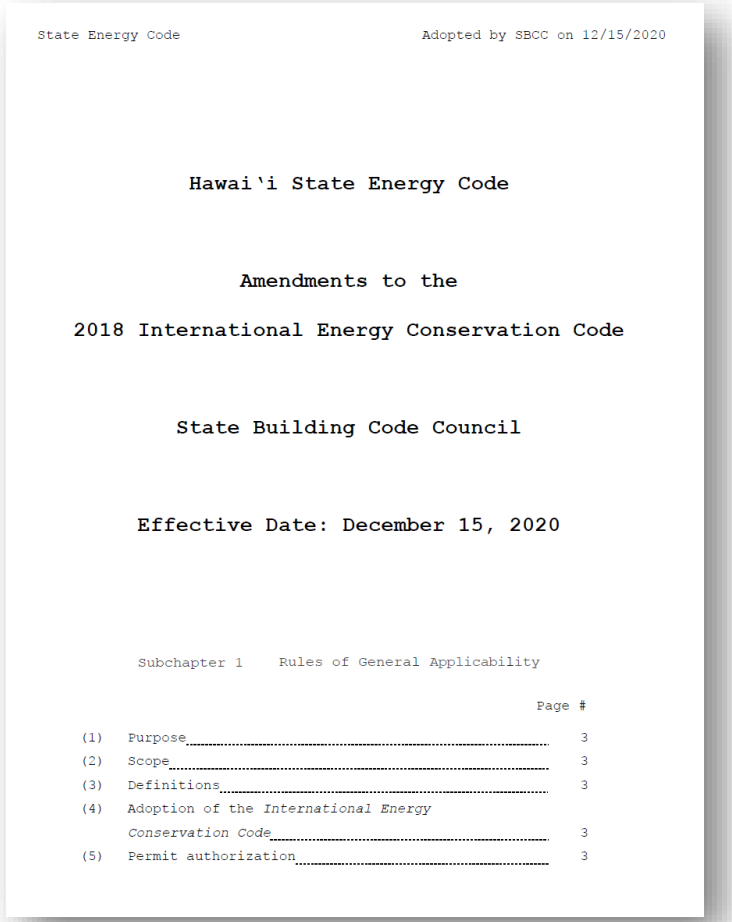
Hawai'i State amendments

County amendments (if applicable)

Energy code checklist

Recorded webinars, May 2021

ASHRAE Standard 90.1-2016 (if applicable)



State Energy Code — Adopted by SBCC on 12/15/2020

Hawai'i State Energy Code

Amendments to the

2018 International Energy Conservation Code

State Building Code Council

Effective Date: December 15, 2020

Subchapter 1 Rules of General Applicability



https://ags.hawaii.gov/wp-content/uploads/2021/01/soh_bcc_energycode_20201215.pdf

# References

2018 International Energy Conservation Code

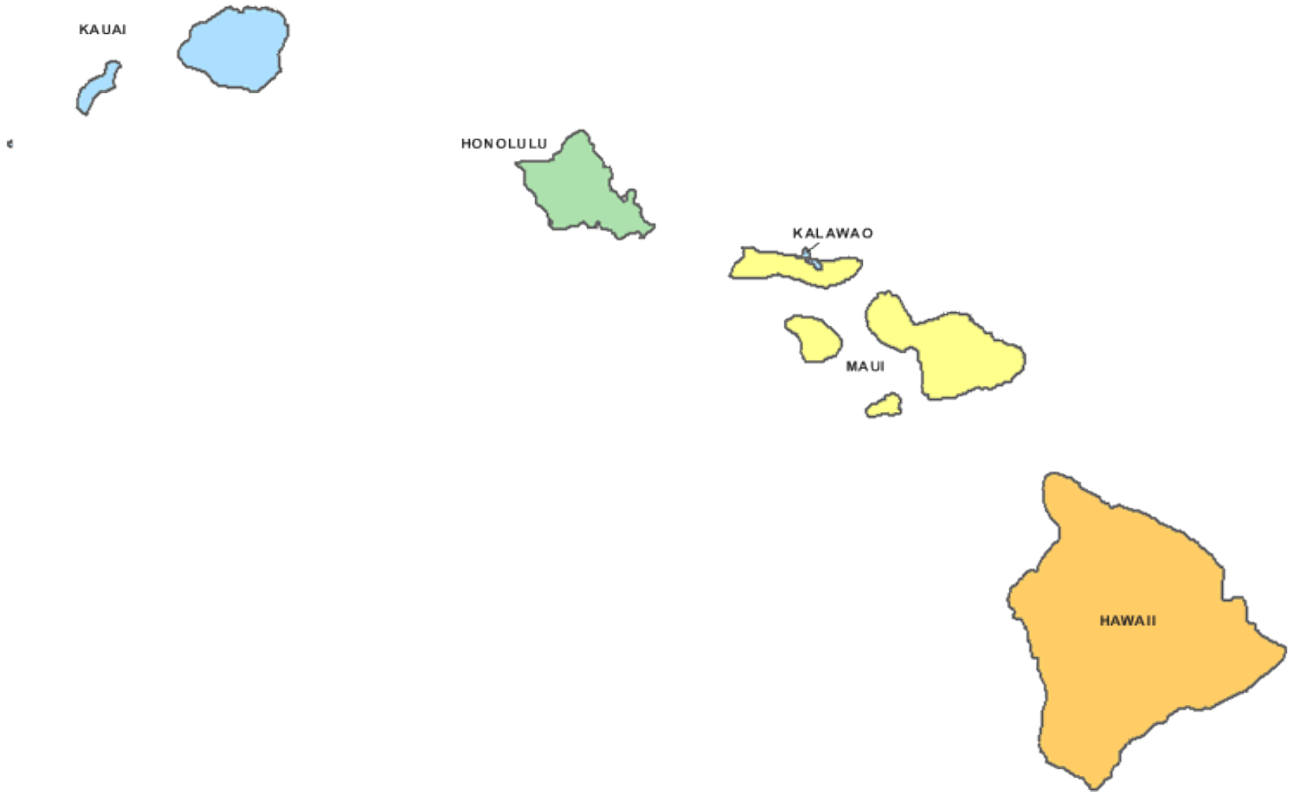
Hawai’i State amendments

County amendments (if applicable)

Energy code checklist

Recorded webinars, May 2021

ASHRAE Standard 90.1-2016 (if applicable)



# References

2018 International Energy Conservation Code

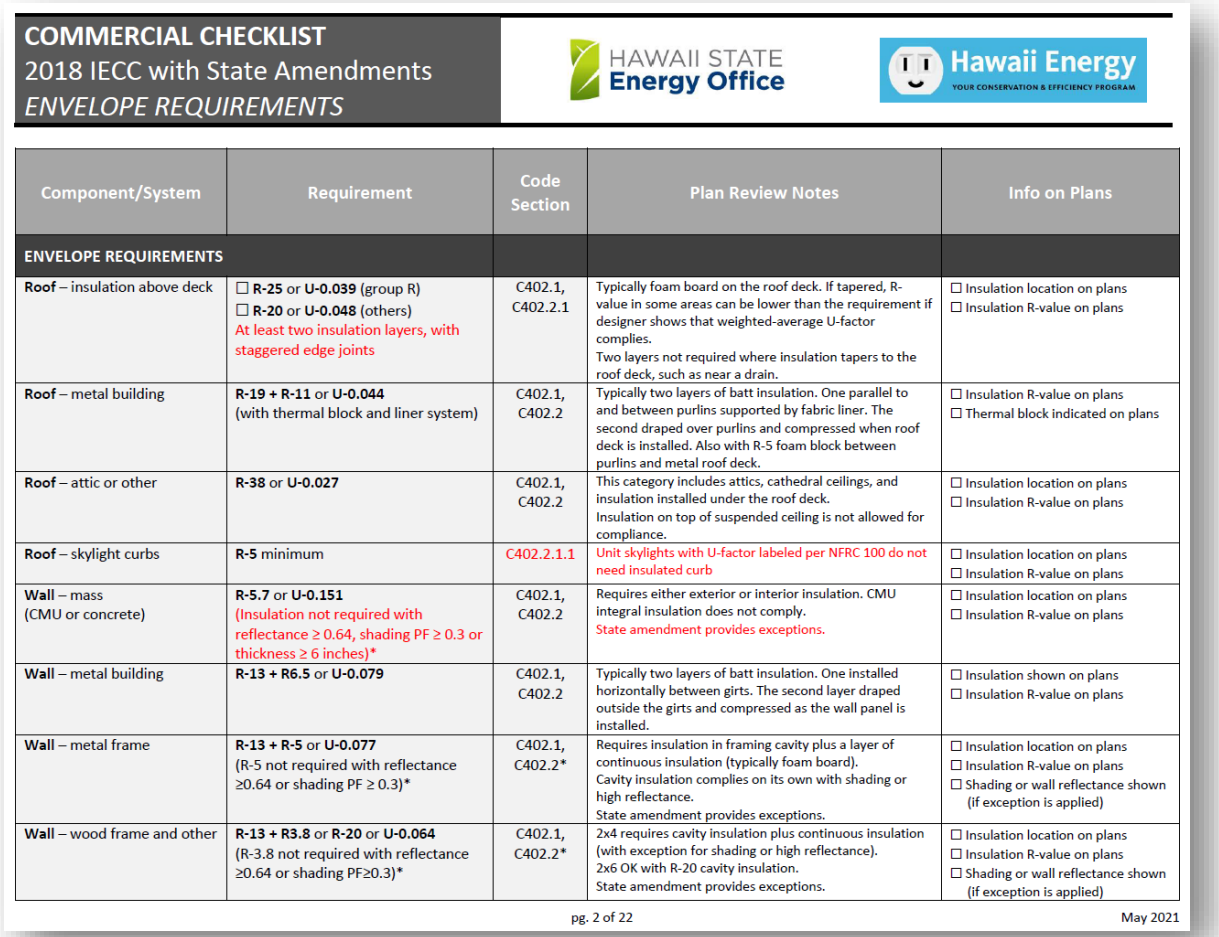
Hawai'i State amendments

County amendments (if applicable)

Energy code checklist ➡

Recorded webinars, May 2021

ASHRAE Standard 90.1-2016 (if applicable)



**COMMERCIAL CHECKLIST**
2018 IECC with State Amendments
*ENVELOPE REQUIREMENTS*

HAWAII STATE Energy Office

Hawaii Energy
YOUR CONSERVATION & EFFICIENCY PROGRAM

| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **ENVELOPE REQUIREMENTS** | | | | |
| **Roof** – insulation above deck | ☐ **R-25** or **U-0.039** (group R)<br>☐ **R-20** or **U-0.048** (others)<br>At least two insulation layers, with staggered edge joints | C402.1, C402.2.1 | Typically foam board on the roof deck. If tapered, R-value in some areas can be lower than the requirement if designer shows that weighted-average U-factor complies.<br>Two layers not required where insulation tapers to the roof deck, such as near a drain. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Roof** – metal building | **R-19 + R-11** or **U-0.044**<br>(with thermal block and liner system) | C402.1, C402.2 | Typically two layers of batt insulation. One parallel to and between purlins supported by fabric liner. The second draped over purlins and compressed when roof deck is installed. Also with R-5 foam block between purlins and metal roof deck. | ☐ Insulation R-value on plans<br>☐ Thermal block indicated on plans |
| **Roof** – attic or other | **R-38** or **U-0.027** | C402.1, C402.2 | This category includes attics, cathedral ceilings, and insulation installed under the roof deck.<br>Insulation on top of suspended ceiling is not allowed for compliance. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Roof** – skylight curbs | **R-5** minimum | C402.2.1.1 | Unit skylights with U-factor labeled per NFRC 100 do not need insulated curb | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Wall** – mass<br>(CMU or concrete) | **R-5.7** or **U-0.151**<br>(Insulation not required with reflectance ≥ 0.64, shading PF ≥ 0.3 or thickness ≥ 6 inches)* | C402.1, C402.2 | Requires either exterior or interior insulation. CMU integral insulation does not comply.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Wall** – metal building | **R-13 + R6.5** or **U-0.079** | C402.1, C402.2 | Typically two layers of batt insulation. One installed horizontally between girts. The second layer draped outside the girts and compressed as the wall panel is installed. | ☐ Insulation shown on plans<br>☐ Insulation R-value on plans |
| **Wall** – metal frame | **R-13 + R-5** or **U-0.077**<br>(R-5 not required with reflectance ≥0.64 or shading PF ≥ 0.3)* | C402.1, C402.2* | Requires insulation in framing cavity plus a layer of continuous insulation (typically foam board).<br>Cavity insulation complies on its own with shading or high reflectance.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans<br>☐ Shading or wall reflectance shown (if exception is applied) |
| **Wall** – wood frame and other | **R-13 + R3.8** or **R-20** or **U-0.064**<br>(R-3.8 not required with reflectance ≥0.64 or shading PF≥0.3)* | C402.1, C402.2* | 2x4 requires cavity insulation plus continuous insulation (with exception for shading or high reflectance).<br>2x6 OK with R-20 cavity insulation.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans<br>☐ Shading or wall reflectance shown (if exception is applied) |

pg. 2 of 22 May 2021

https://energy.hawaii.gov/hawaii-energy-building-code/building-code-resources

# References

2018 International Energy Conservation Code

Hawai’i State amendments

County amendments (if applicable)

Energy code checklist

Recorded webinars, May 2021 ➡

ASHRAE Standard 90.1-2016 (if applicable)


https://energy.hawaii.gov/2018-iecc-hawaii-amendments

# References

2018 International Energy Conservation Code

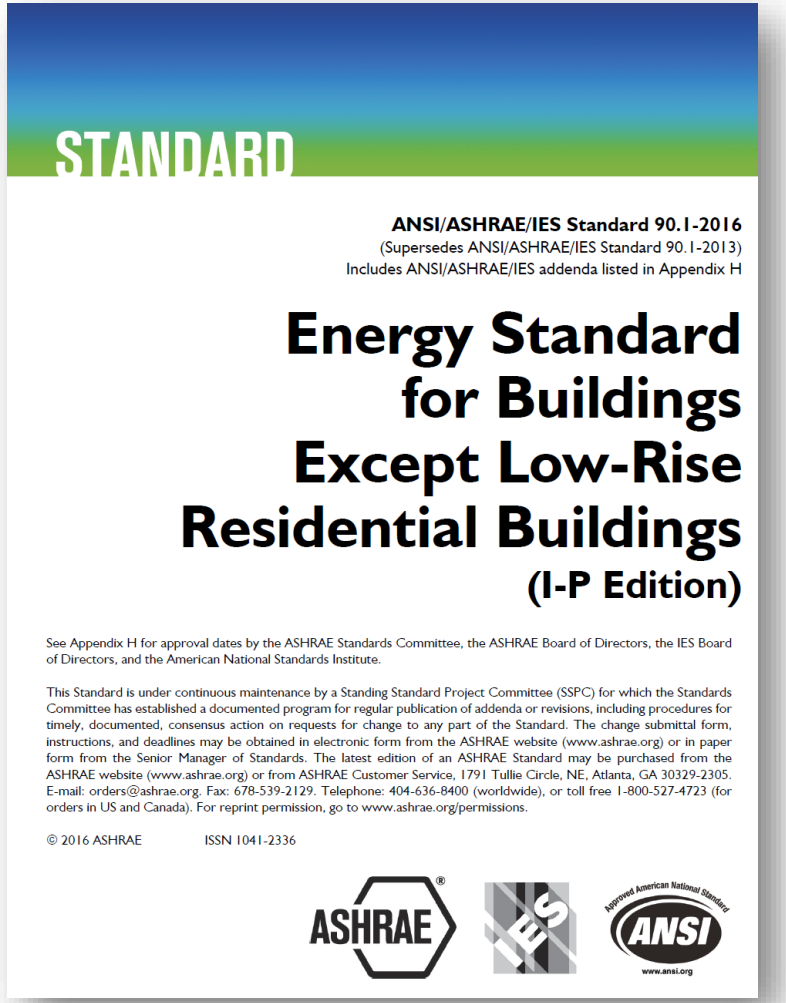
Hawai'i State amendments

County amendments (if applicable)

Energy code checklist

Recorded webinars, May 2021

ASHRAE Standard 90.1-2016 (if applicable)




Free online viewer https://ashrae.iwrapper.com/ASHRAE_PREVIEW_ONLY_STANDARDS/STD_90.1_2016_IP

# Compliance roadmap

Scope

Does my project need to comply?

Compliance option 1

Compliance option 2

Compliance option 3

Which compliance options are available?

Envelope Requirements

Mechanical Requirements

Electrical Requirements

What are the requirements?

Construction Documents

What information needs to be in the plans and specs?

# Scope

## Residential

- 1- and 2-family dwellings (R-3)
- Multi-family (R-2 ≤ 3 stories )
- Residential care/assisted living (R-4 ≤ 3 stories)


Courtesy Daniel Sandomire, Armstrong Builders

## Commercial

- All other buildings
  - Including R-1 (hotels) and R-2 ≥ 4 stories

# Scope

**Mixed use buildings**

- Commercial code for commercial portion
- Residential code for residential portion
  ≤ 3 stories

https://www.drhorton.com/hawaii/oahu/ewa-beach/kohina-at-hoopili

# Does my project need to comply?

New construction

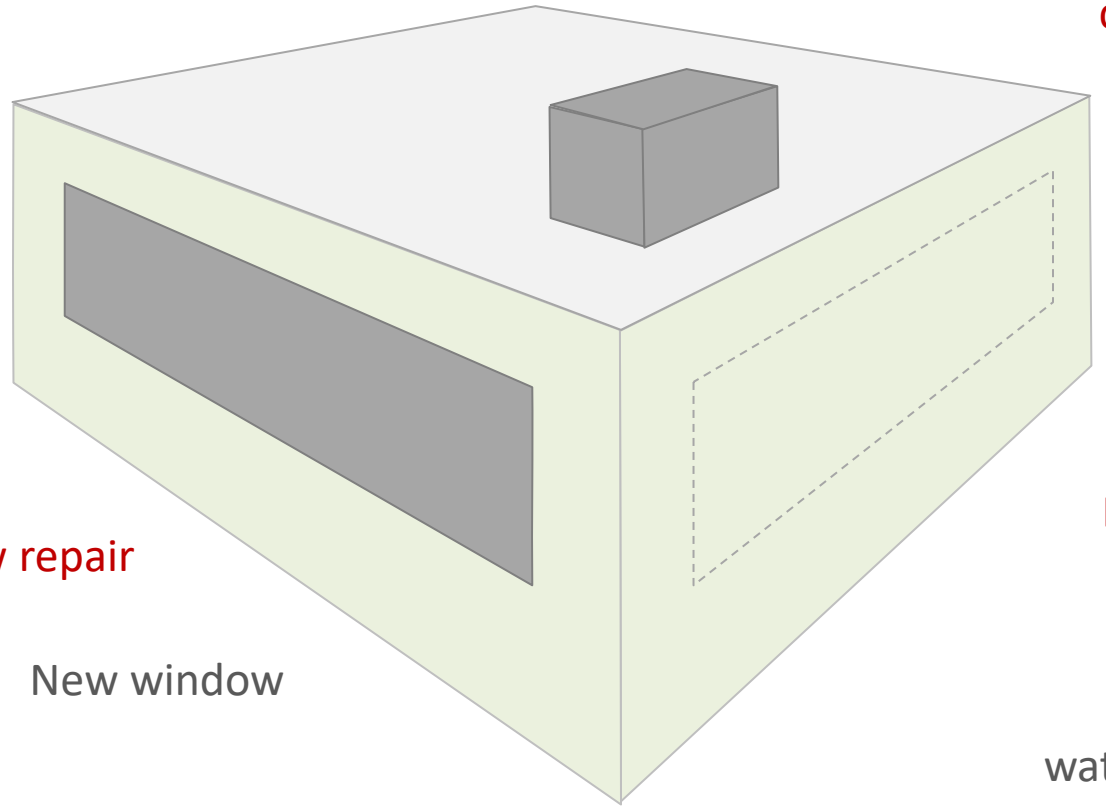
Roof replacement

AC replacement

Roof repair

Add PV system

Add AC to non-conditioned space



New interior lighting

Window replacement

Interior lighting retrofit

Exterior lighting retrofit

Window repair

New window

Replace hot water distribution

Repaint exterior walls

Replace water heater

# Scope

**New construction** ➡

Additions (C502)

Alterations (C503)

- Change in space conditioning (C503.2)

Repairs (C504)

Change of occupancy (C505)

*Applies to commercial buildings and the buildings' sites and associated systems and equipment.*

- Building envelope
- Mechanical systems
- Commercial freezers and coolers
- Commercial kitchen exhaust
- Parking garage ventilation
- Interior and exterior lighting
- Water heating systems
- Transformers and motors
- Elevators and escalators

Not in scope

- Plug loads, office equipment, appliances
- Cooking equipment
- Fire alarm systems

# Scope

New construction

**Additions (C502)** ➡

Alterations (C503)

Change in space conditioning (C503.2)

Repairs (C504)

Change of occupancy (C505)

Options

1. New construction requirements for addition
2. Performance method for existing + addition

Vertical fenestration area

Skylight area

Building mechanical systems

Service water heating systems

Pools and inground permanently installed spas

Lighting power and systems

# Scope

New construction

Additions (C502)

**Alterations (C503)** ➡

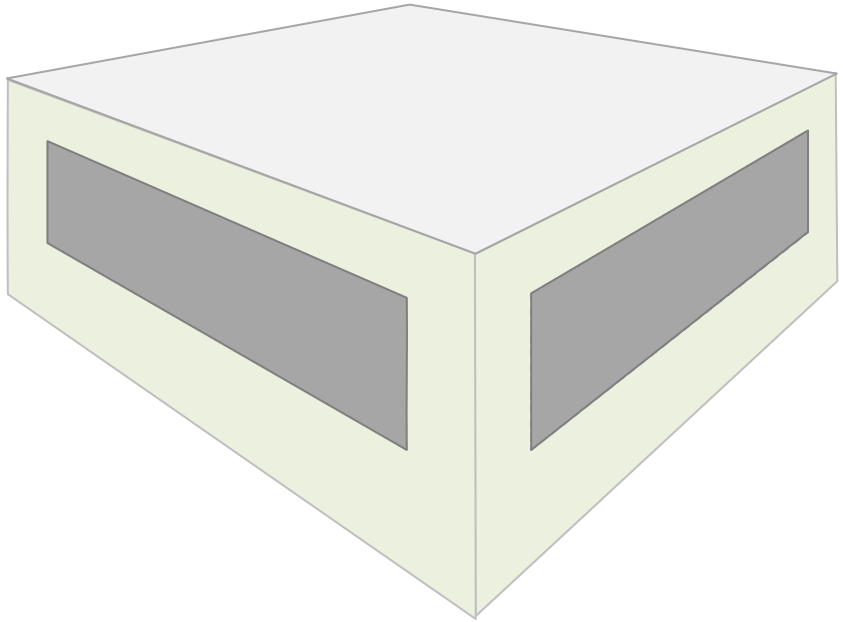
- Change in space conditioning (C503.2)

Repairs (C504)

Change of occupancy (C505)

New construction requirements for altered portions

Several exceptions (discussed later)



# Scope

New construction

Additions (C502)

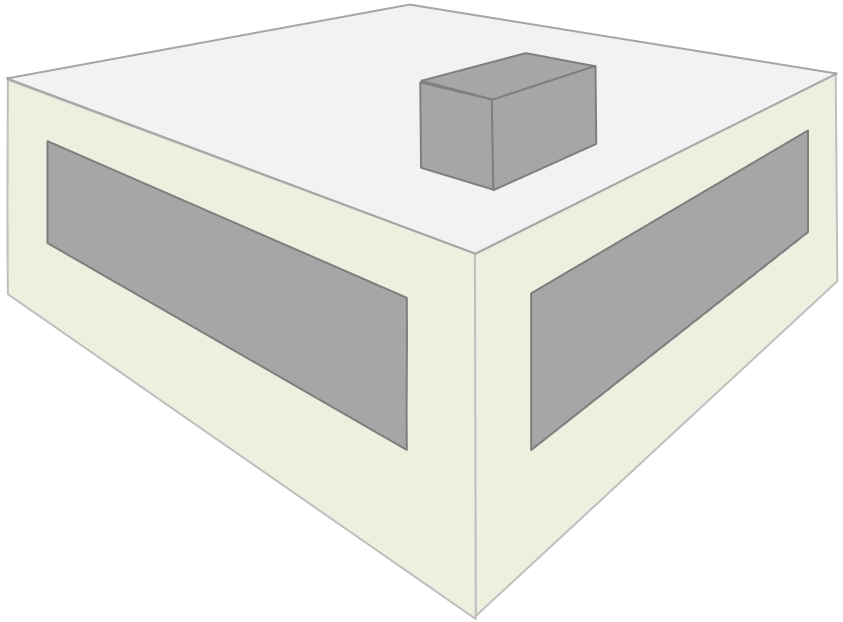
Alterations (C503)

**Change in space conditioning (C503.2)**

Repairs (C504)

Change of occupancy (C505)

Non-conditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance.



# Scope

New construction

Additions (C502)

Alterations (C503)

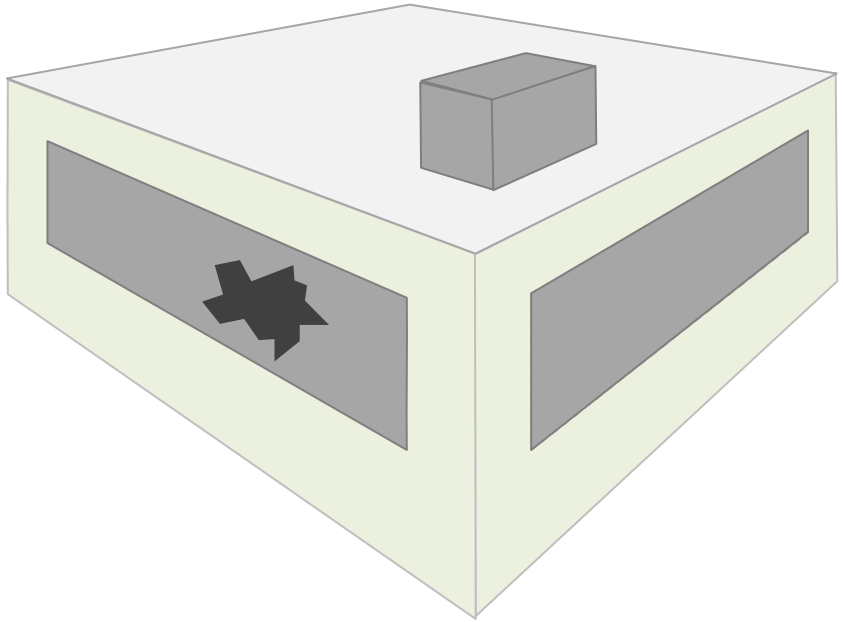
Change in space conditioning (C503.2)

**Repairs (C504)** ➡

Change of occupancy (C505)

Compliance <u>not</u> required

- Routine maintenance
- Repairs exempt from permit
- Glass-only replacement
- Roof repairs
- Bulb and ballast replacement, if energy does not increase



# Scope

New construction

Additions (C502)

Alterations (C503)

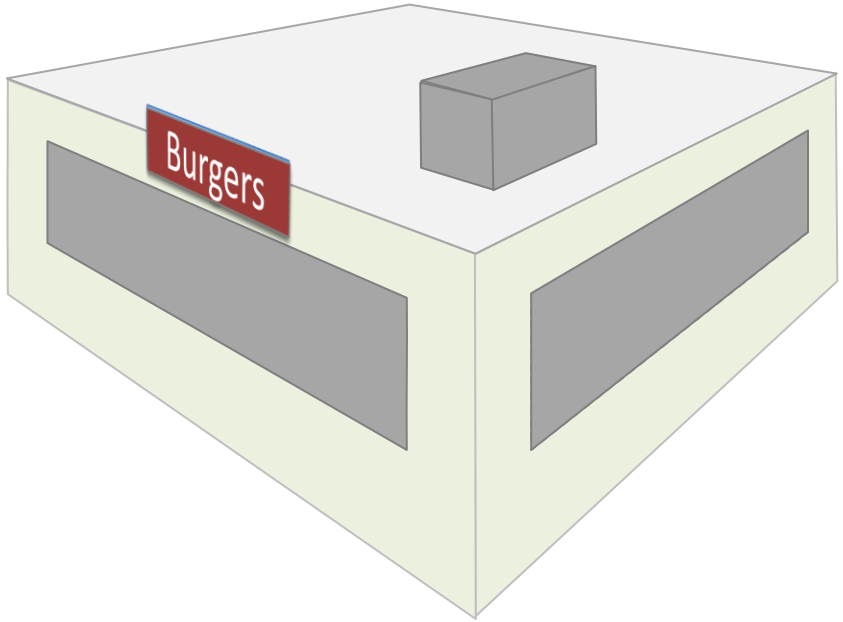
Change in space conditioning (C503.2)

Repairs (C504)

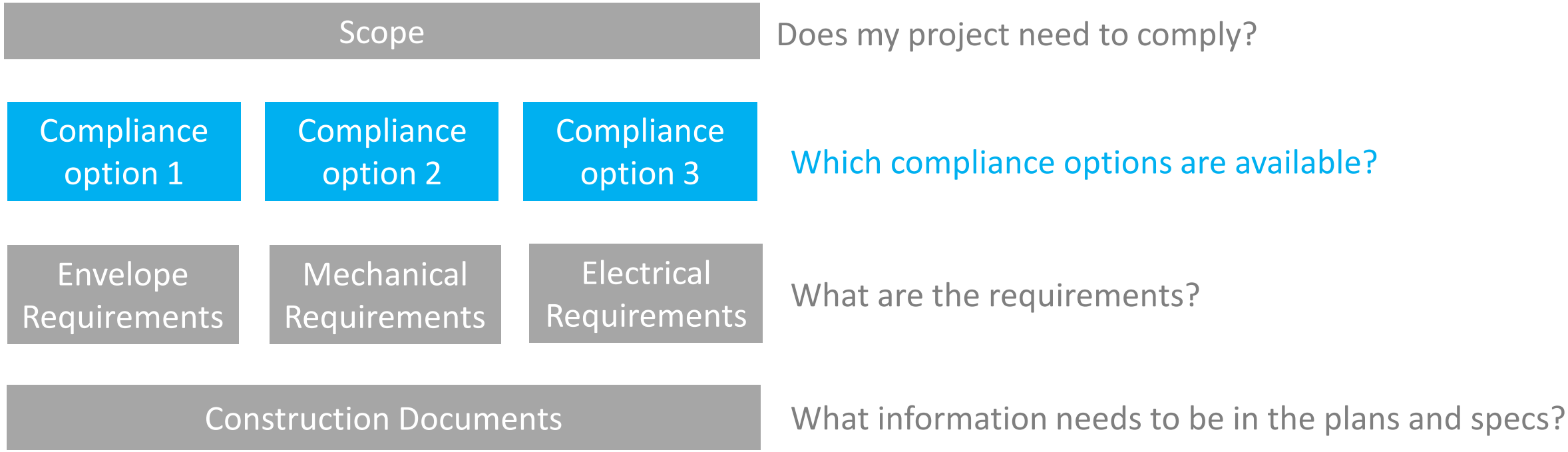
**Change of occupancy (C505)** ➡

Compliance required

- When change in occupancy would result in an increase in demand for either fossil fuel or electrical energy



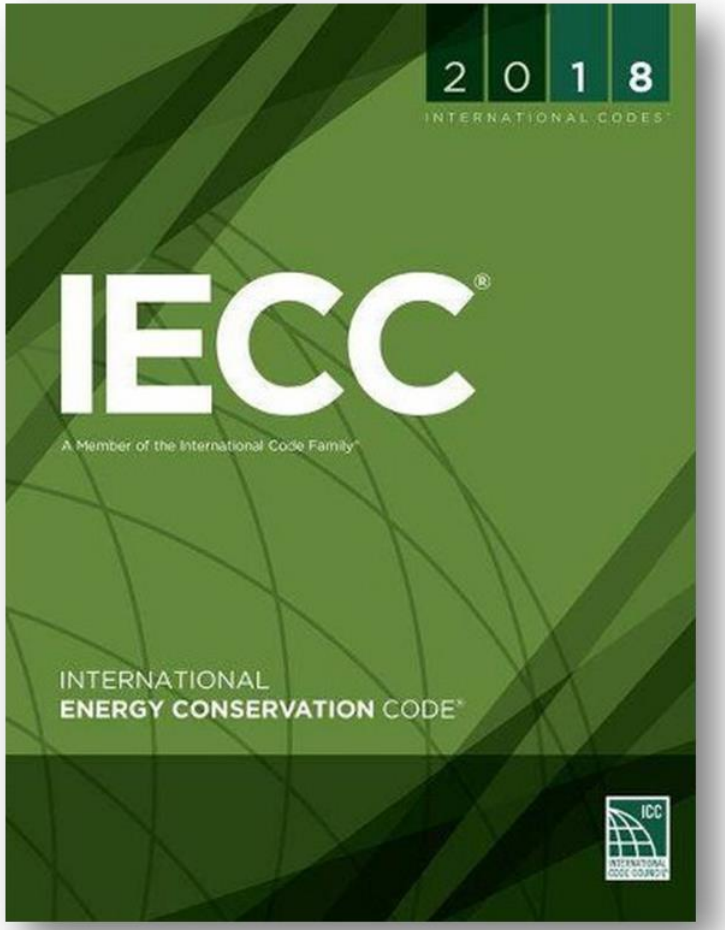
# Compliance roadmap



# Compliance options

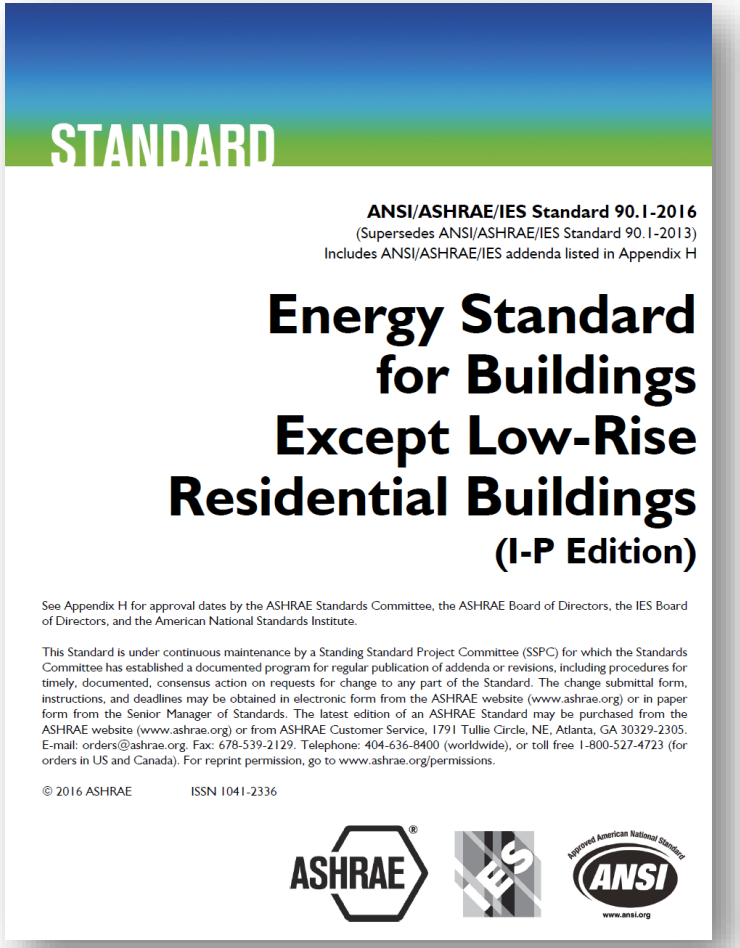
**For commercial buildings**

2018 IECC + amendments




or

ASHRAE Standard 90.1-2016



# Compliance options

Mandatory requirements

Prescriptive requirements

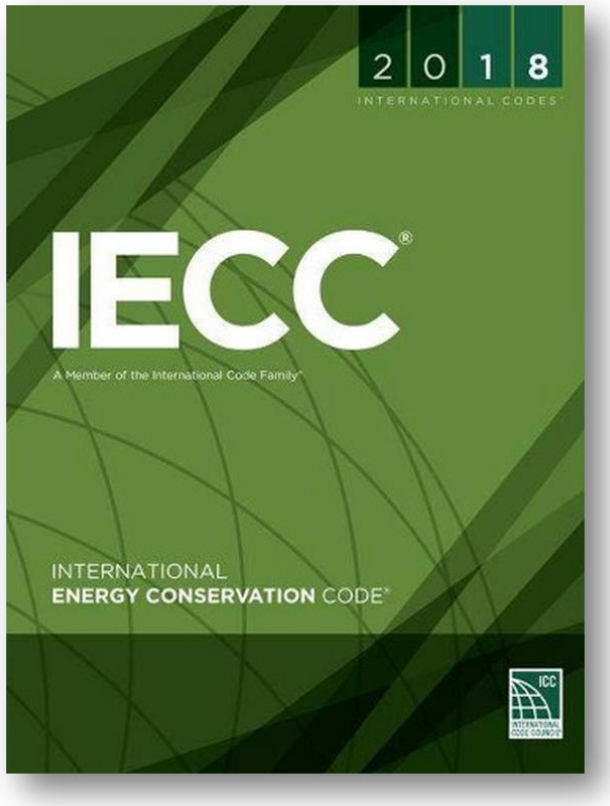
or

Total Building Performance

Insulation
Windows & skylights
HVAC
Interior lighting power
**Additional efficiency**

Computer simulation

This path necessary if window area >40% or skylight area >3%



# Compliance options

**Additional Efficiency Package Options** (C406.1)

Buildings must comply with at least one additional efficiency feature:

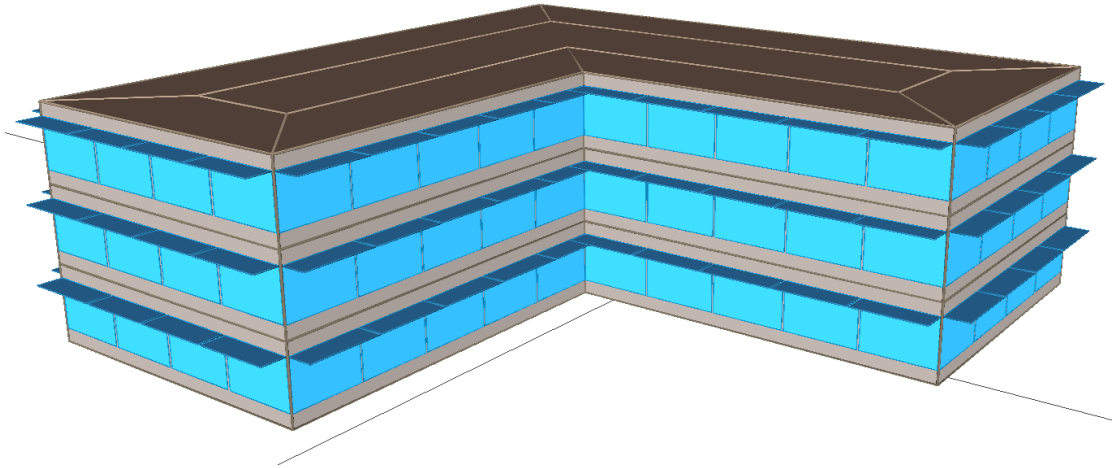
1. More efficient HVAC
2. Reduced lighting power density
3. Enhanced lighting controls
4. On-site renewable energy
5. Dedicated outdoor air system
6. High-efficiency SWH
7. Enhanced envelope performance
8. Reduced air infiltration

New in 2018

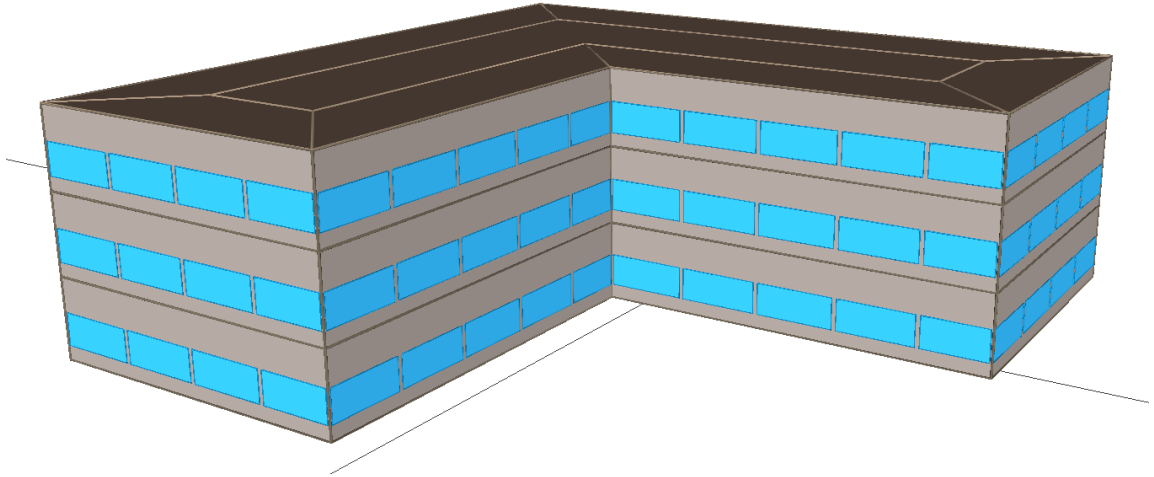

# Compliance options

**C407 Total Building Performance**

Proposed design model

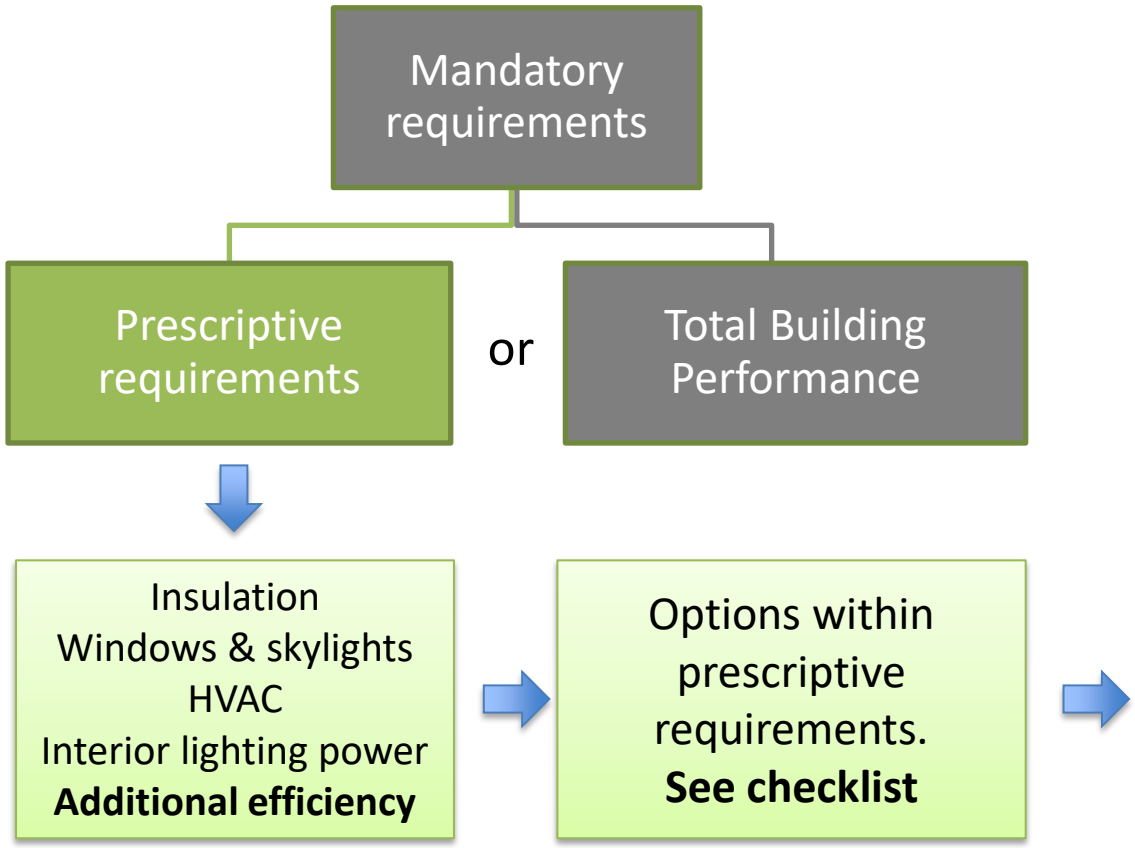


Standard reference design model



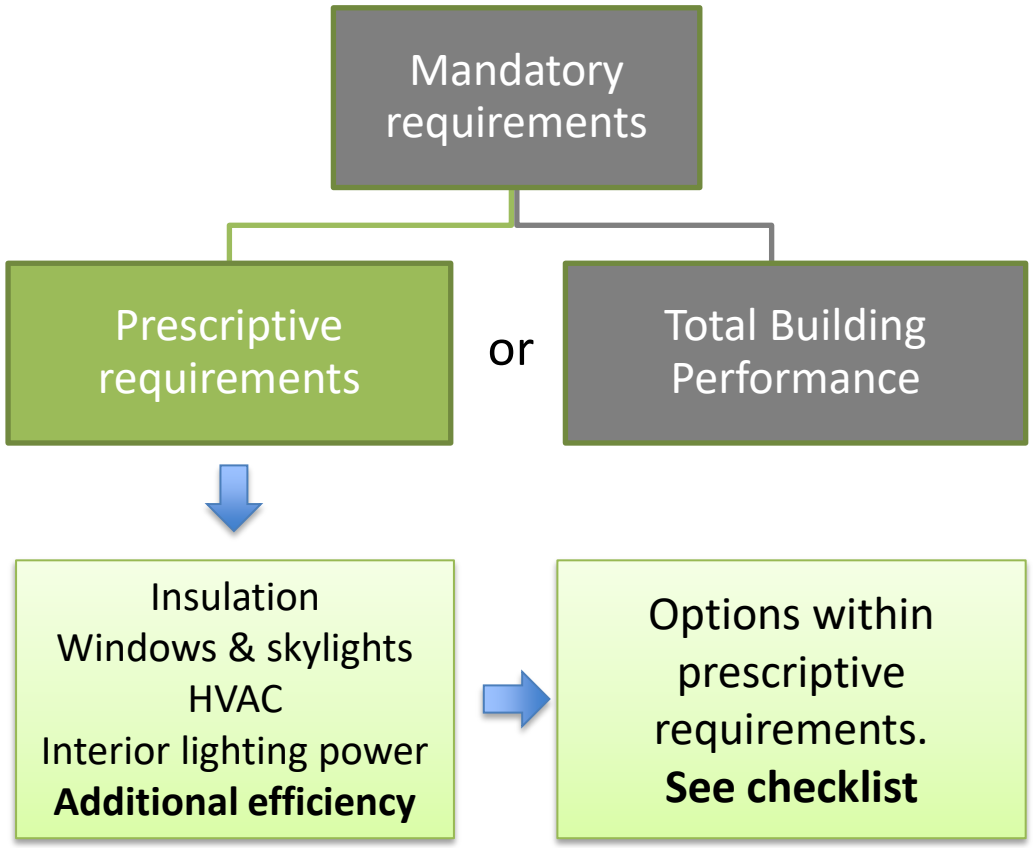
Proposed design $/year ≤ Standard reference design $/year x 0.85

# Compliance options



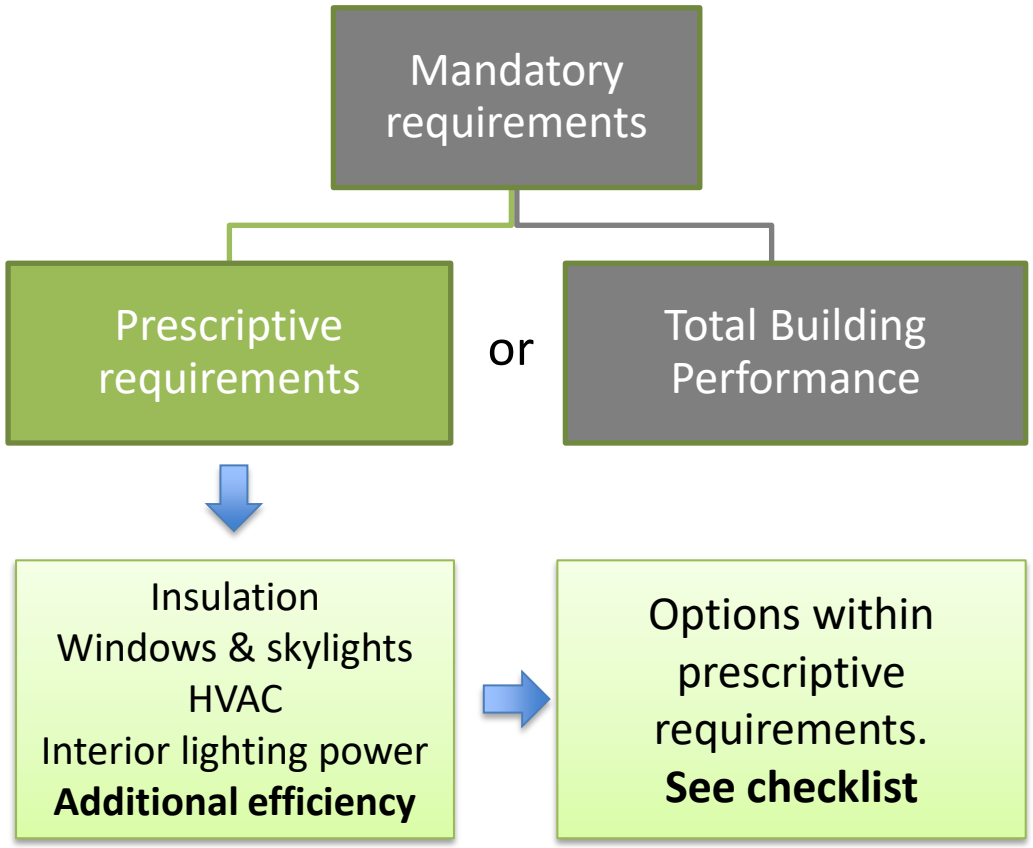

| Component/System | Requirement | Code Section |
|---|---|---|
| **ENVELOPE REQUIREMENTS** | | |
| **Roof** – insulation above deck | ☐ **R-25** or **U-0.039** (group R)<br>☐ **R-20** or **U-0.048** (others)<br>At least two insulation layers, with staggered edge joints | C402.1, C402.2.1 |
| **Roof** – metal building | **R-19 + R-11** or **U-0.044**<br>(with thermal block and liner system) | C402.1, C402.2 |
| **Roof** – attic or other | **R-38** or **U-0.027** | C402.1, C402.2 |
| **Roof** – skylight curbs | **R-5** minimum | C402.2.1.1 |
| **Wall** – mass<br>(CMU or concrete) | **R-5.7** or **U-0.151**<br>(Insulation not required with reflectance ≥ 0.64, shading PF ≥ 0.3 or thickness ≥ 6 inches)* | C402.1, C402.2 |
| **Wall** – metal building | **R-13 + R6.5** or **U-0.079** | C402.1, C402.2 |
| **Wall** – metal frame | **R-13 + R-5** or **U-0.077**<br>(R-5 not required with reflectance ≥0.64 or shading PF ≥ 0.3)* | C402.1, C402.2* |
| **Wall** – wood frame and other | **R-13 + R3.8** or **R-20** or **U-0.064**<br>(R-3.8 not required with reflectance ≥0.64 or shading PF≥0.3)* | C402.1, C402.2* |

# Compliance options



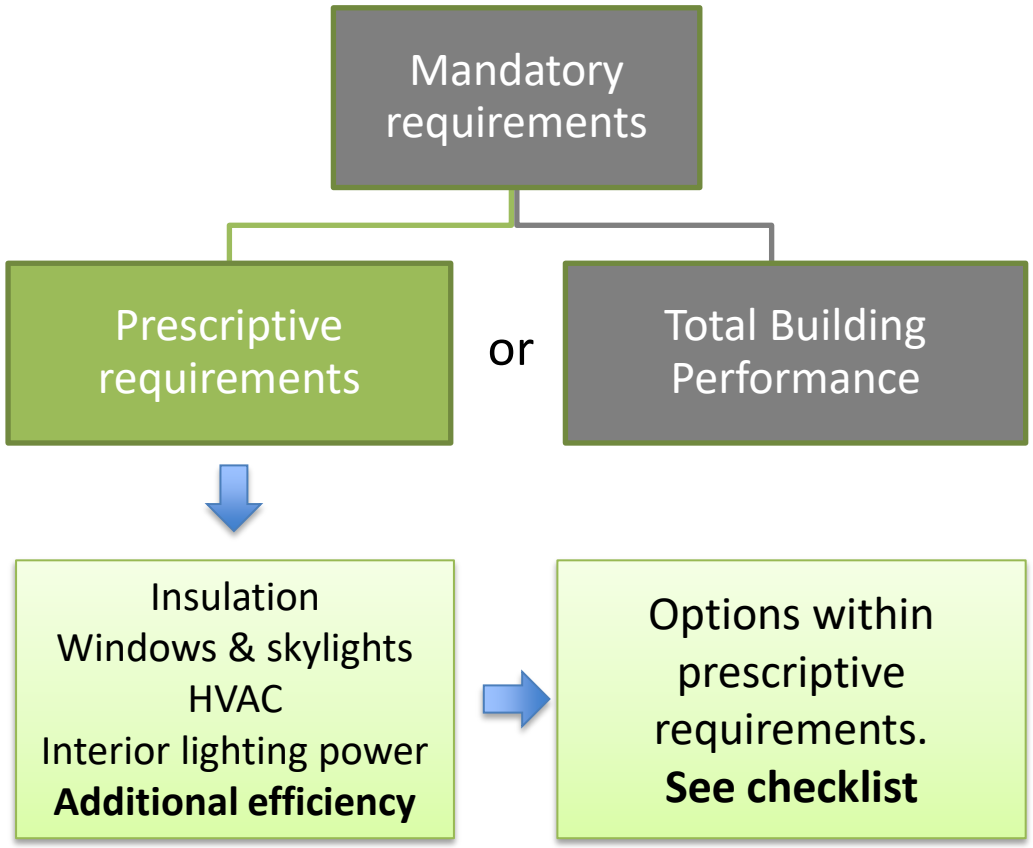

| | |
|---|---|
| **Windows** – maximum area | **≤ 30%** of gross wall area<br>(≤ 40% when meeting daylighting requirements) |
| **Windows**– solar heat gain coefficient (SHGC) – east, south, west | ≤ **0.25** if projection factor < 0.2.<br>≤ **0.30** if projection factor 0.2-0.5.<br>≤ **0.40** if projection factor ≥ 0.5.<br>(Area-weighted average permitted)<br>Jalousie windows exempt* |

# Compliance options

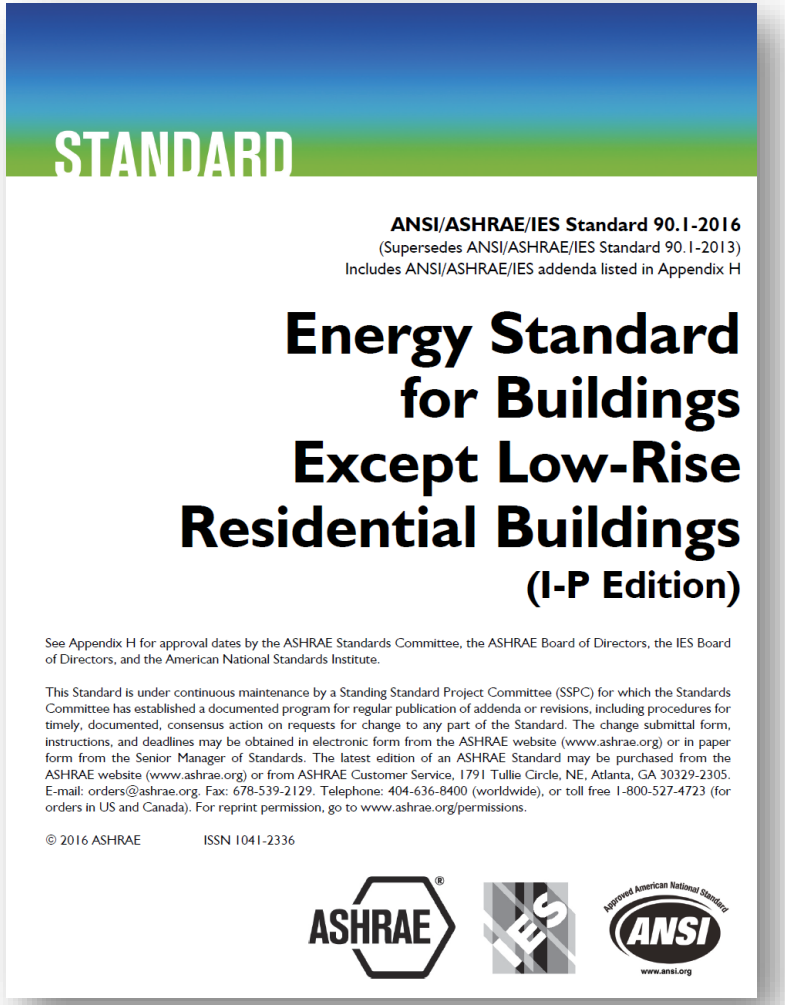



| | |
|---|---|
| **Interior lighting power allowance** | Total connected power shall be no greater than allowance.<br>Two calculation methods for allowance:<br>▪ Building area method<br>▪ Space-by-space method (includes extra allowance for retail and decorative lighting) |

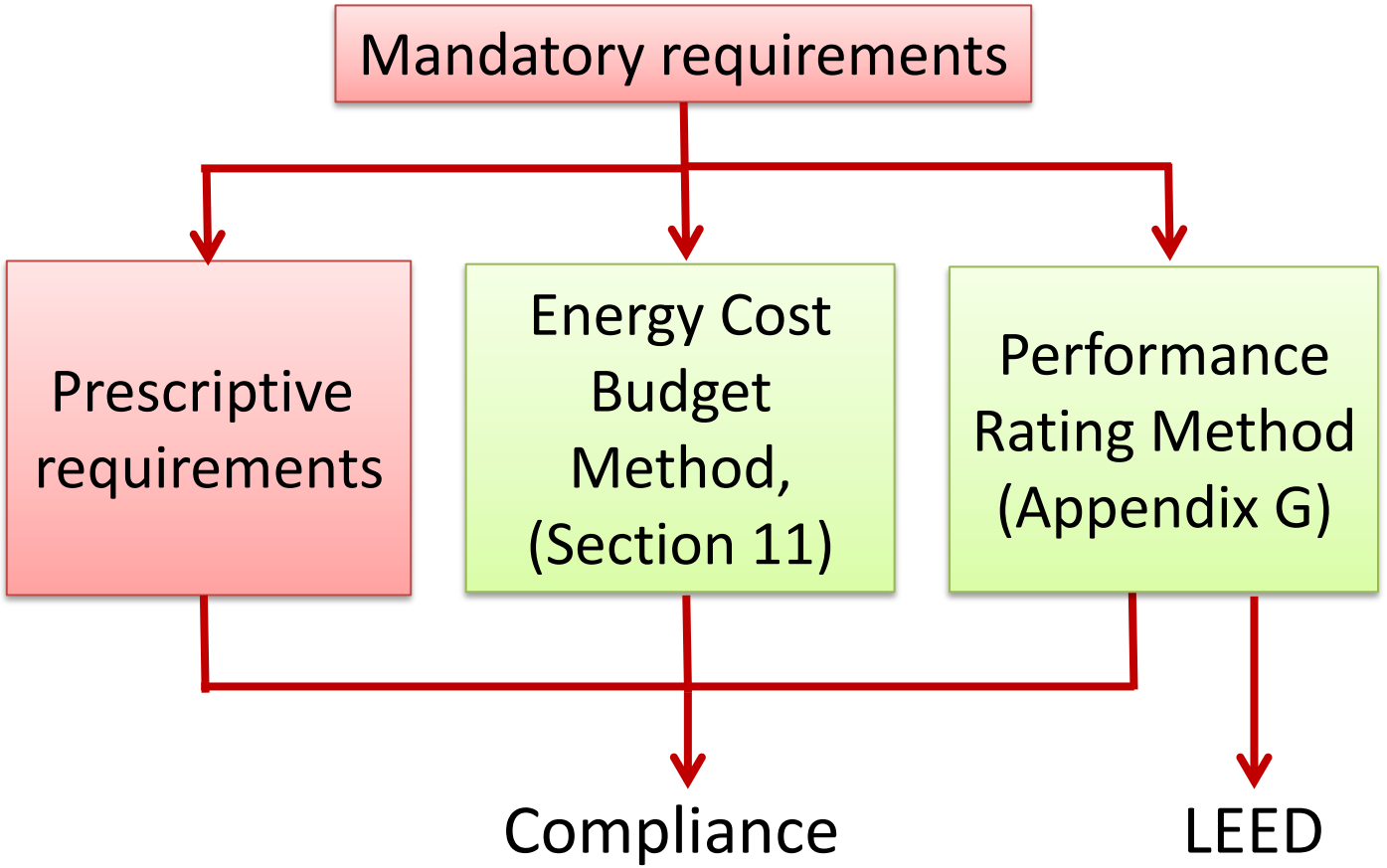
# Compliance options




| | |
|---|---|
| **Roof - replacement** | Options (Hawaii amendment)<br>▪ New construction requirements<br>▪ Initial solar reflectance ≥85% and aged reflectance ≥63%<br>▪ At least one of:<br>1. EnergyStar compliant covering<br>2. Radiant barrier<br>3. Attic ventilation via solar fan(s), ridge ventilation or gable vents<br>4. One or more exceptions in Section C402.3 |

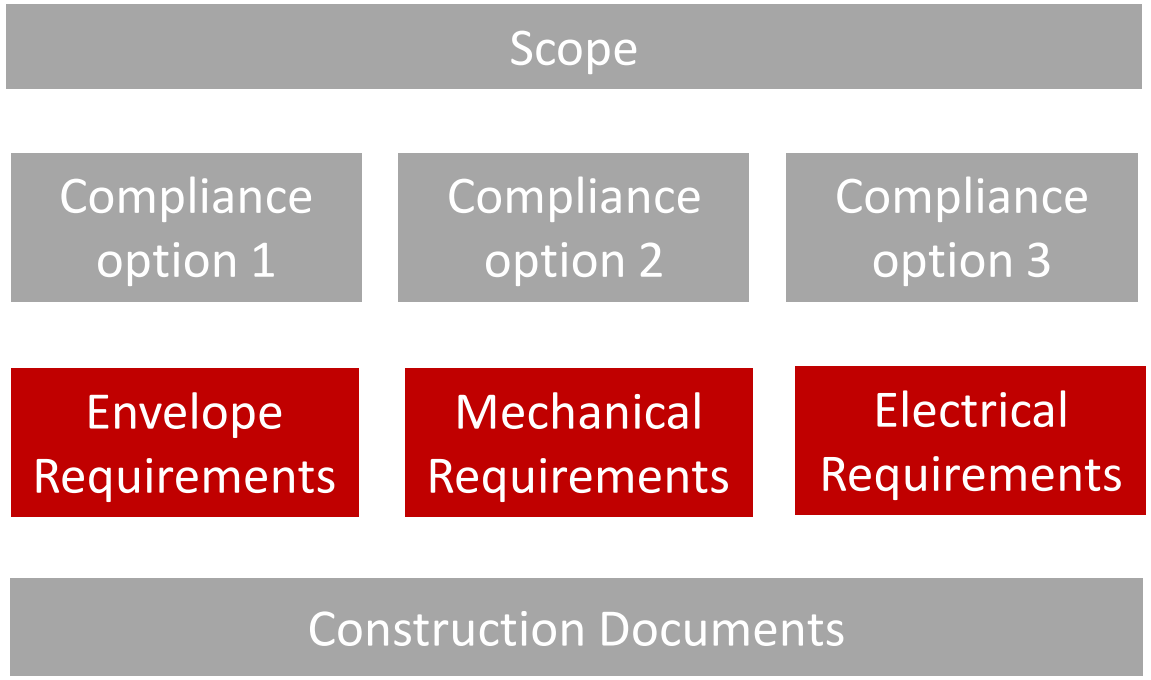



# ASHRAE Standard 90.1-2016 Compliance




Free online viewer
https://ashrae.iwrapper.com/ASHRAE_PREVIEW_ONLY_STANDARDS/STD_90.1_2016_IP

# Compliance roadmap



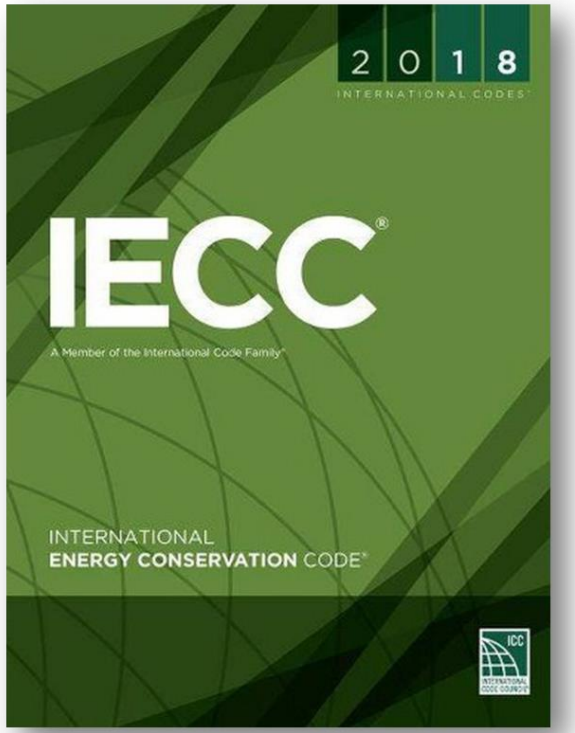

Does my project need to comply?

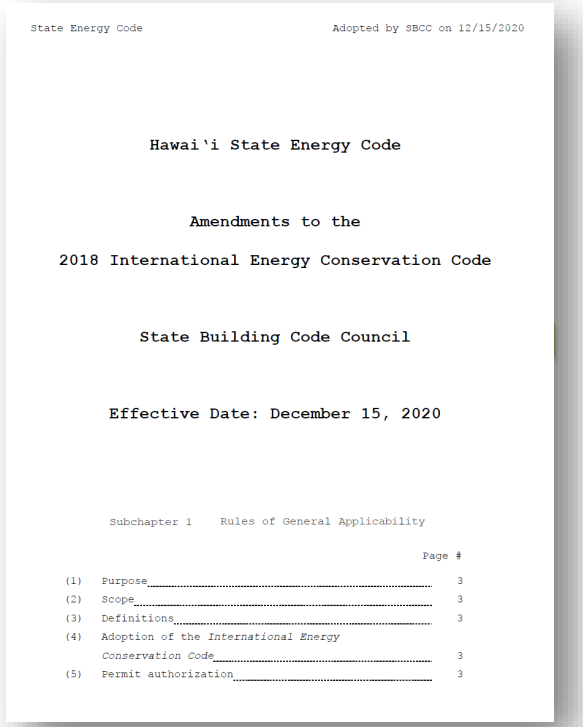
Which compliance options are available?

What are the requirements?

What information needs to be in the plans and specs?

# What are the requirements?



State Energy Code — Adopted by SBCC on 12/15/2020

Hawai'i State Energy Code

Amendments to the

2018 International Energy Conservation Code

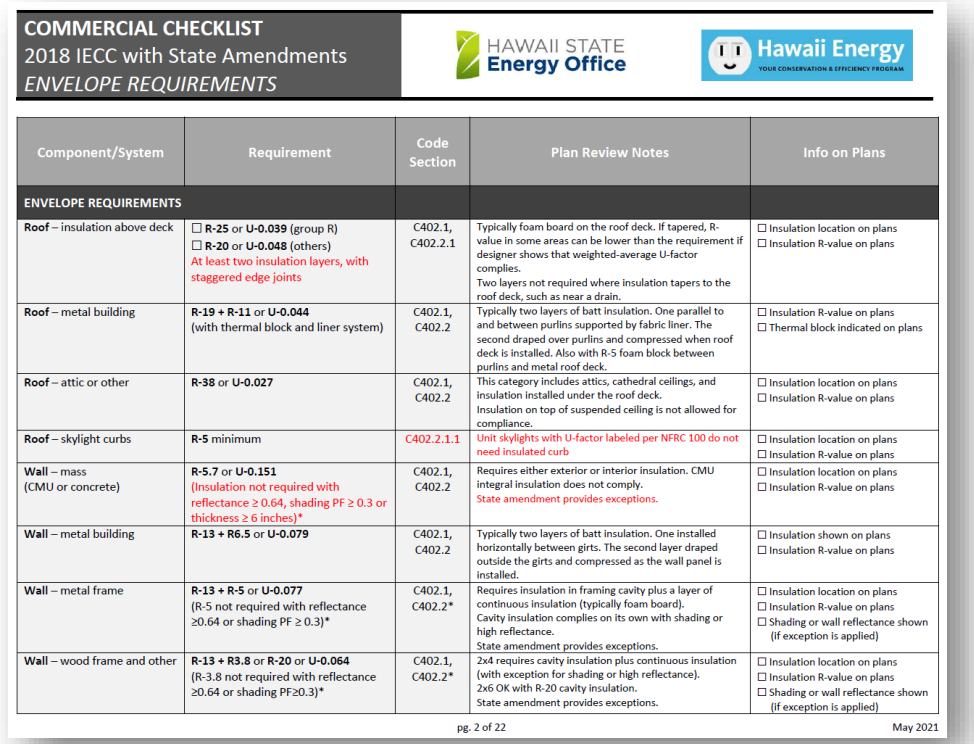
State Building Code Council

Effective Date: December 15, 2020

Subchapter 1 Rules of General Applicability

Page #





**COMMERCIAL CHECKLIST**
2018 IECC with State Amendments
*ENVELOPE REQUIREMENTS*

HAWAII STATE Energy Office — Hawaii Energy

| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **ENVELOPE REQUIREMENTS** | | | | |
| **Roof** – insulation above deck | ☐ **R-25** or **U-0.039** (group R)<br>☐ **R-20** or **U-0.048** (others)<br>At least two insulation layers, with staggered edge joints | C402.1, C402.2.1 | Typically foam board on the roof deck. If tapered, R-value in some areas can be lower than the requirement if designer shows that weighted-average U-factor complies.<br>Two layers not required where insulation tapers to the roof deck, such as near a drain. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Roof** – metal building | **R-19 + R-11** or **U-0.044**<br>(with thermal block and liner system) | C402.1, C402.2 | Typically two layers of batt insulation. One parallel to and between purlins supported by fabric liner. The second draped over purlins and compressed when roof deck is installed. Also with R-5 foam block between purlins and metal roof deck. | ☐ Insulation R-value on plans<br>☐ Thermal block indicated on plans |
| **Roof** – attic or other | **R-38** or **U-0.027** | C402.1, C402.2 | This category includes attics, cathedral ceilings, and insulation installed under the roof deck.<br>Insulation on top of suspended ceiling is not allowed for compliance. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Roof** – skylight curbs | **R-5** minimum | C402.2.1.1 | Unit skylights with U-factor labeled per NFRC 100 do not need insulated curb | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Wall** – mass<br>(CMU or concrete) | **R-5.7** or **U-0.151**<br>(Insulation not required with reflectance ≥ 0.64, shading PF ≥ 0.3 or thickness ≥ 6 inches)* | C402.1, C402.2 | Requires either exterior or interior insulation. CMU integral insulation does not comply.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| **Wall** – metal building | **R-13 + R6.5** or **U-0.079** | C402.1, C402.2 | Typically two layers of batt insulation. One installed horizontally between girts. The second layer draped outside the girts and compressed as the wall panel is installed. | ☐ Insulation shown on plans<br>☐ Insulation R-value on plans |
| **Wall** – metal frame | **R-13 + R-5** or **U-0.077**<br>(R-5 not required with reflectance ≥0.64 or shading PF ≥ 0.3)* | C402.1, C402.2* | Requires insulation in framing cavity plus a layer of continuous insulation (typically foam board).<br>Cavity insulation complies on its own with shading or high reflectance.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans<br>☐ Shading or wall reflectance shown (if exception is applied) |
| **Wall** – wood frame and other | **R-13 + R3.8** or **R-20** or **U-0.064**<br>(R-3.8 not required with reflectance ≥0.64 or shading PF≥0.3)* | C402.1, C402.2* | 2x4 requires cavity insulation plus continuous insulation (with exception for shading or high reflectance).<br>2x6 OK with R-20 cavity insulation.<br>State amendment provides exceptions. | ☐ Insulation location on plans<br>☐ Insulation R-value on plans<br>☐ Shading or wall reflectance shown (if exception is applied) |

pg. 2 of 22 — May 2021

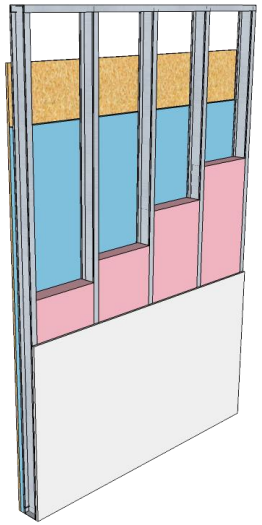
State amendments
12 pages

County amendments not included in May 2021 checklist

# What are the requirements?

Envelope

- Roof
- Walls
- Doors
- Low-slope roof membrane
- Window area and performance
- Skylight area and performance
- Air leakage



# What are the requirements?

Mechanical systems

- Commissioning
- Zone isolation
- Ventilation
- Equipment efficiency
- Hot gas bypass
- Thermostatic controls
- Hydronic part load controls
- Pump isolation
- Variable air volume system controls
- Demand control ventilation
- Parking garage ventilation
- Energy recovery
- Kitchen exhaust
- Guest room AC and ventilation controls
- Shutoff dampers
- Fan power
- Fan control
- Cooling tower fan control
- Heat recovery for water heating
- Refrigeration
- Duct and plenum insulation and sealing
- Piping insulation

# What are the requirements?

Service water heating

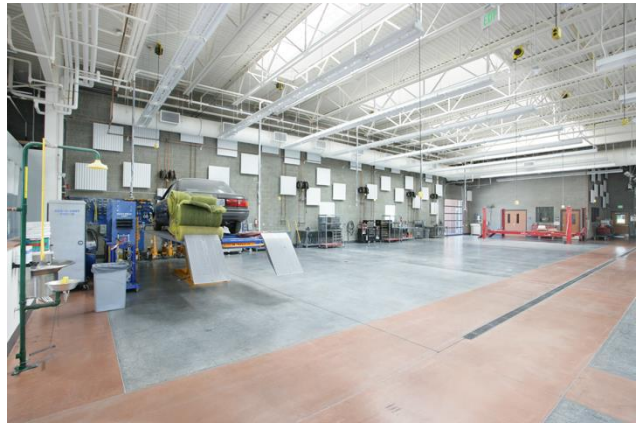
- Commissioning
- Equipment efficiency
- Heat traps for storage tanks
- Pipe insulation
- Maximum pipe length
- Circulation system controls
- Demand recirculation system controls
- Pools and spas

Courtesy Daniel Sandomire, Armstrong Builders

# What are the requirements?

Lighting

- Functional testing
- Dwelling unit lighting
- Interior lighting controls
  - Occupant sensor
  - Time switch
  - Light reduction
  - Daylight responsive
  - Display and accent
  - Sleeping and dwelling units
- Interior lighting power
- Exterior lighting control
- Exterior lighting power
- Gas lighting



# What are the requirements?

Other electrical

- Electricity meters
- Electrical transformers
- Electrical motors
- Elevators and escalators
- Voltage drop in feeders and branch circuits
- Electrical sub-metering

# What are the requirements?

Electric vehicle infrastructure

- May be required by counties


Courtesy Rocky Mould

# What are the requirements?

## Additional Efficiency Package Options (C406.1)

Buildings must comply with at least one additional efficiency feature:

1. More efficient HVAC
2. Reduced lighting power density
3. Enhanced lighting controls
4. On-site renewable energy
5. Dedicated outdoor air system
6. High-efficiency SWH
7. Enhanced envelope performance
8. Reduced air infiltration

New in 2018


# Compliance roadmap

Scope — Does my project need to comply?

Compliance option 1 | Compliance option 2 | Compliance option 3 — Which compliance options are available?

Envelope Requirements | Mechanical Requirements | Electrical Requirements — What are the requirements?

Construction Documents — What information needs to be in the plans and specs?

# Construction documents

Requirements are set by the Counties

May require designer compliance certification →

Example

COUNTY OF KAUA'I
CHAPTER 12, KAUA'I COUNTY BUILDING CODE
KAUA'I COUNTY CODE 1987, AS AMENDED

ARTICLE 6 – ENERGY CONSERVATION CODE

To the best of my knowledge, this project's design substantially conforms to:

Section 12-6.3 Adoption of the International Energy Conservation Code (IECC)
Section 12-6.4 Local Amendments to the IECC
For **electrical and lighting systems** (Section C405 and C408).

**COMPLIANCE METHOD**

- ☐ 2015 IECC as amended. Mandatory & Prescriptive
- ☐ 2015 IECC as amended. Mandatory & Total Building Performance
- ☐ ASHRAE Standard 90.1-2013. Mandatory & Prescriptive
- ☐ ASHRAE Standard 90.1-2013. Mandatory & Energy Cost Budget

| **INFORMATION IN CONSTRUCTION DOCUMENTS** | **YES** | **N/A** |
|---|---|---|
| Interior Lighting | | |
| Occupant sensor controls. C405.2.1 | ☐ | ☐ |
| Time switch controls. C405.2.2 | ☐ | ☐ |
| Daylight responsive controls. C405.2.3 | ☐ | ☐ |
| Daylight zones on plans. C405.2.3.2 & C405.2.3.3 | ☐ | ☐ |
| Guest room controls. C405.2.4 | ☐ | ☐ |
| Interior lighting fixture schedule | | |
| Input power for interior lighting fixtures. C405.4.1 | ☐ | ☐ |
| Interior lighting fixture locations | ☐ | ☐ |
| Lighting control functional performance testing requirement. C408.3 | ☐ | ☐ |
| Exterior lighting | | |
| Exterior lighting controls. C405.2.5 | ☐ | ☐ |
| Exterior lighting fixture schedule | ☐ | ☐ |
| Input power for exterior lighting fixtures | ☐ | ☐ |
| Exterior lighting fixture locations | ☐ | ☐ |
| Electrical | | |
| Electrical transformer efficiency. C405.7 | ☐ | ☐ |
| Tenant submetering. C405.10 | ☐ | ☐ |

**FUNCTIONAL TESTING**

**C408.3.1 Functional testing.** Prior to passing final inspection, the *registered design professional* shall provide evidence that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the *construction documents* and manufacturer's instructions. Functional testing shall be in accordance with Sections C408.3.1.1 and C408.3.1.2 for the applicable control type.

**NOTES**

SIGNATURE:

DATE:

NAME:

TITLE:

LICENSE NO.:

# Construction documents

Requirements are set by the Counties

May require designer compliance certification

2018 IECC Section C103.2

Information required on plans →

2018 IECC Section C103.2

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and solar heat gain coefficients (SHGCs).
3. Area-weighted *U*-factor and solar heat gain coefficient (SHGC) calculations.
4. Mechanical system design criteria.
5. Mechanical and service water heating systems and equipment types, sizes and efficiencies.
6. Economizer description.
7. Equipment and system controls.
8. Fan motor horsepower (hp) and controls.
9. Duct sealing, duct and pipe insulation and location.
10. Lighting fixture schedule with wattage and control narrative.
11. Location of *daylight* zones on floor plans.
12. Air sealing details.

# Construction documents

Requirements are set by the Counties

- May require designer compliance certification

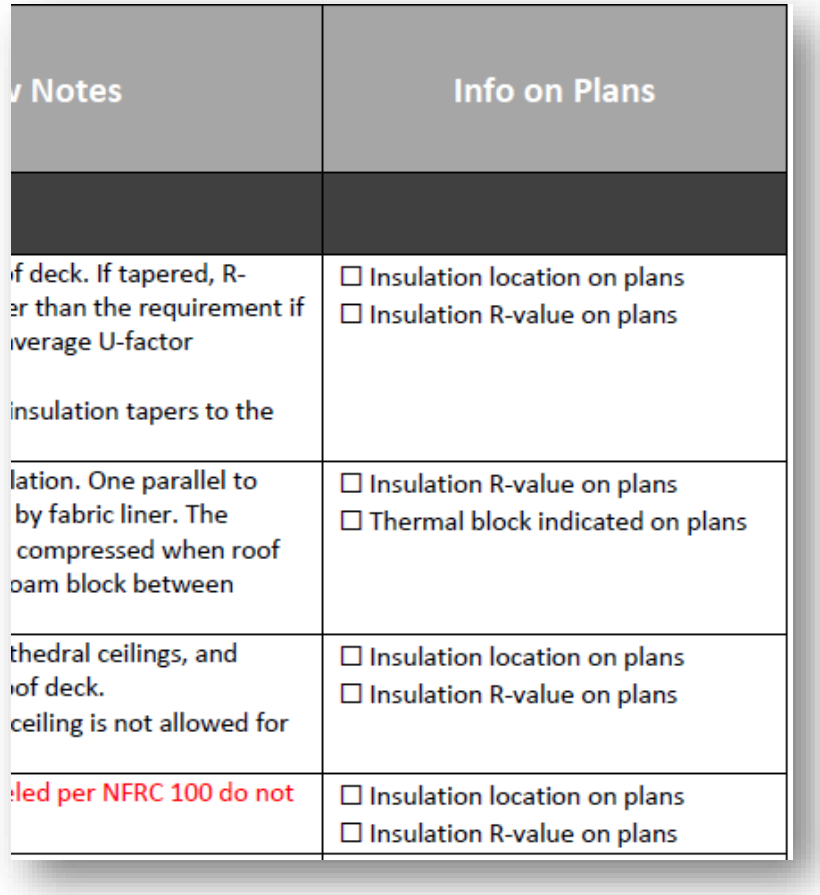
2018 IECC Section C103.2

- Information required on plans

Recommendations in energy code checklists →

Items often missing from plans

- Insulation R-value
- Window SHGC
- Lighting fixture input power
- AC equipment efficiency and fan power

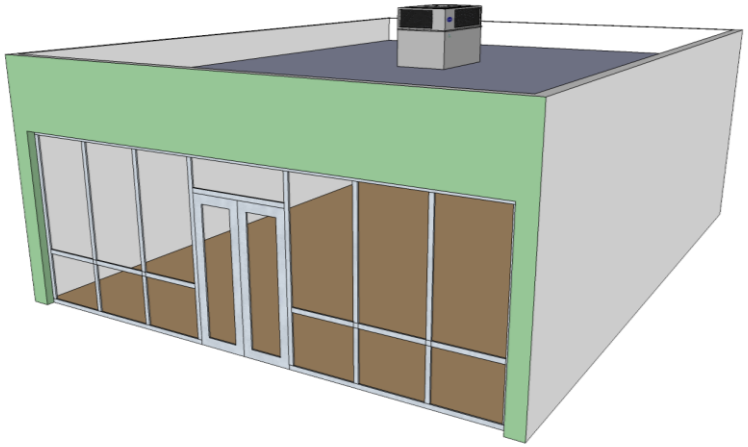


| Notes | Info on Plans |
|---|---|
| f deck. If tapered, R-<br>er than the requirement if<br>verage U-factor<br><br>insulation tapers to the | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| lation. One parallel to<br>by fabric liner. The<br>compressed when roof<br>oam block between | ☐ Insulation R-value on plans<br>☐ Thermal block indicated on plans |
| thedral ceilings, and<br>of deck.<br>ceiling is not allowed for | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |
| led per NFRC 100 do not | ☐ Insulation location on plans<br>☐ Insulation R-value on plans |

https://energy.hawaii.gov/hawaii-energy-building-code/building-code-resources

# Section 3

## Compliance Examples



# Compliance examples

Non-conditioned building

Roof replacement

Roof repair or recover

Window replacement

New interior lighting system

Interior lighting retrofit

New exterior lighting

AC system replacement

AC added to non-conditioned space

Kitchen exhaust replacement

Does it have to comply?

Which compliance options are available?

What are the requirements?

What information needs to be in the plans and specs?

# Examples - New non-conditioned building

New non-conditioned building
- Park restroom building
- Storage building


https://www.staradvertiser.com/

Does it have to comply? → Yes!

Which compliance options are available?
- Interior lighting
- Exterior lighting (if applicable)
- Water heating (if applicable)
- Envelope?

What are the requirements?

What information needs to be in the plans and specs?

# Examples - New non-conditioned building

New non-conditioned building
- Park restroom building
- Storage building

https://www.staradvertiser.com/

Envelope requirements

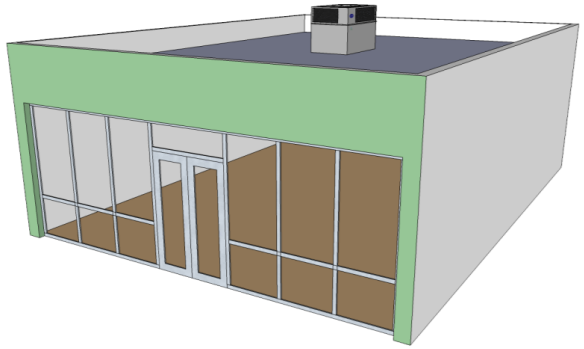
2018 IECC

Section C402.1.1
Buildings exempt from the envelope requirements
1. Peak design cooling energy <1.0 watt per square foot
2. Those that do not contain conditioned space.
3. Greenhouses.

County amendments may require envelope compliance for habitable non-conditioned spaces

# Examples - Roof repair or recover

Repair or re-cover the roof on an existing building

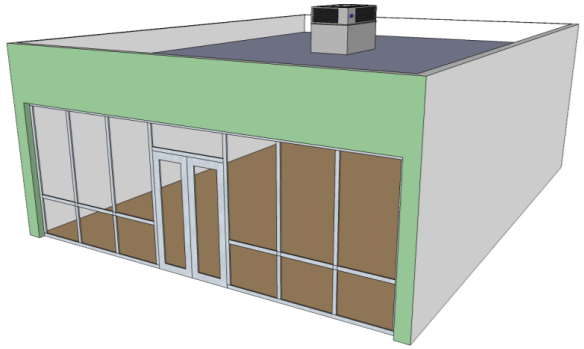


Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Roof - repair** | No requirement | C504 | "Roof repair" is reconstruction or renewal of any part of an existing roof for the purpose of its maintenance. |
| **Roof – recover** | No requirement | C503.1 | "Roof recover" is the process of installing an additional roof covering over an existing roof covering without removing the existing roof covering. |

# Examples - Roof replacement

Replace the roof on an existing building



Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Roof - replacement** | Options (Hawaii amendment)<br>▪ New construction requirements<br>▪ Initial solar reflectance ≥85% and aged reflectance ≥63%<br>▪ At least one of:<br>1. EnergyStar compliant covering<br>2. Radiant barrier<br>3. Attic ventilation via solar fan(s), ridge ventilation or gable vents<br>4. One or more exceptions in Section C402.3 | C503.3.1* | "Roof replacement" is the process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.<br><br>Exceptions listed in section C402.3 include:<br>1. Portions covered by the following:<br>▪ Photovoltaic systems or components.<br>▪ Solar air or water-heating systems or components.<br>▪ Roof gardens or landscaped roofs.<br>▪ Above-roof decks or walkways.<br>▪ Skylights.<br>▪ HVAC systems and components, and other opaque objects mounted above the roof.<br>2. Portions shaded during summer solstice<br>3. Portions ballasted with stone 17 lb/sf |

# New construction roof insulation requirements

## Roof insulation (Table C402.1.3)

| | Type | Min. Insulation | |
|---|---|---|---|
| | | Group R | Other |
| Roof | Insulation entirely above deck | R-25ci | R-20ci |
| | Metal building | R-19 + R-11 LS | R-19 + R-11 LS |
| | Attic and other | R-38 | R-38 |

ci = continuous insulation
LS = layer system

## Roof U-factor (Table C402.1.4)

| | Type | Min. Insulation | |
|---|---|---|---|
| | | Group R | Other |
| Roof | Insulation entirely above deck | U-0.039 | U-0.048 |
| | Metal building | U-0.035 | U-0.035 |
| | Attic and other | U-0.027 | U-0.027 |

# Examples - Window replacement

Replace windows in an existing building, including glazing and frame

goldenstatewindows.com

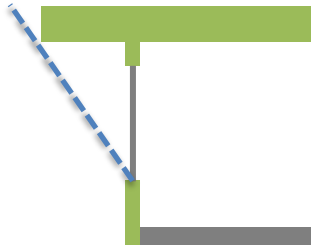
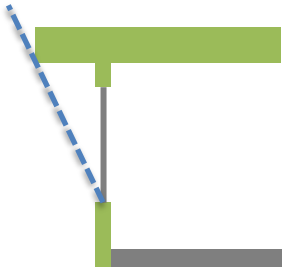
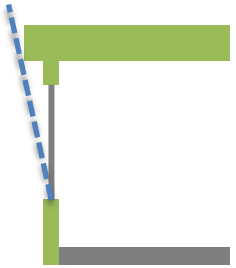
Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Windows** – maximum area | ▪ Total building window area after added windows ≤ 30% of gross wall area<br>▪ Or, window area in space with added windows alone ≤ 30% of gross wall area (≤ 40% when meeting daylighting requirements) | C503.3.2 | If the project cannot comply with the prescriptive limit on window area when new windows are added, then it must comply with either Section C402.1.5 Component Performance Alternative or Section C407 Total Building Performance.<br><br>If the existing building already exceeds the prescriptive window limit, then the alteration is exempt from the window area limit as long as window area is not increased. |
| **Window** – U-factor and SHGC | Same as new construction. See the envelope checklist | C503.3.2 C401.2.1 | Requirements do not apply when glass is replaced in an existing sash (C504.2). |

Repair does not need to comply

# Envelope prescriptive requirements

Window maximum solar heat gain coefficient (SHGC) (C402.4)

| | Large overhang<br>  <br>PF ≥ 0.5 | Medium overhang<br>  <br>0.20 ≤ PF < 0.50 | Small overhang<br>  <br>PF < 0.20 |
|---|---|---|---|
| E/S/W | 0.40 | 0.30 | 0.25 |
| North | 0.40 | 0.37 | 0.33 |

Area-weighted average SHGC allowed by Hawaii amendment

State amendment

Jalousie windows exempt

https://breezway.com/

# Envelope prescriptive requirements

Window maximum U-factor (C402.4)

Maximum U-factor

- U-0.50 fixed windows
- U-0.65 operable windows

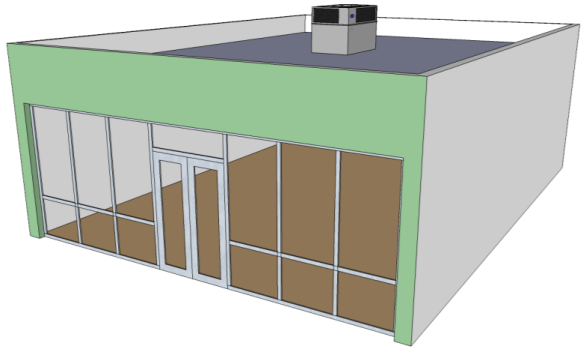
→ Dual-pane, low-e typical

- U-1.10 doors → Single-pane complies

Area-weighted average U-factor allowed

# Examples - New interior lighting system

New lighting system in small office

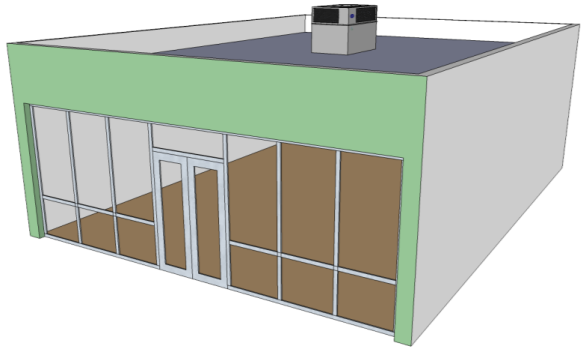


Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Lighting system functional testing** | Prior to final inspection the registered design professional provides evidence of testing.<br>▪ Occupant sensor controls<br>▪ Time-switch controls<br>▪ Daylight responsive controls<br>Construction documents specify that drawings, manuals and test report be provided to the owner within 90 days of certificate of occupancy. | C408.3 | Intent is that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions | ☐ Plans indicate that functional test certification documents will be provided to owner<br>☐ Registered design professional provides evidence of testing |

# Examples - New interior lighting system

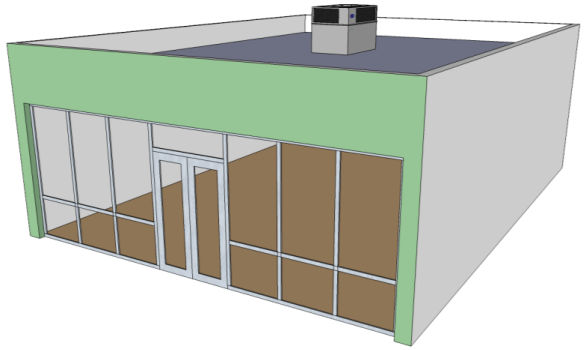
New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Controls - occupant sensor** | Required in many specific spaces. Manual-on type required in most cases. | C405.2.1 | Required in these space types:<br>1. Classrooms/lecture/training rooms.<br>2. Conference/meeting/multipurpose rooms.<br>3. Copy/print rooms.<br>4. Lounges/breakrooms<br>5. Enclosed offices.<br>6. Open plan office areas.<br>7. Restrooms.<br>8. Storage rooms.<br>9. Locker rooms.<br>10. Other spaces 300 sf or less that are enclosed by floor-to-ceiling height partitions.<br>11. Warehouse storage areas | ☐ Occupant sensor controls on plans, where applicable |

# Examples - New interior lighting system

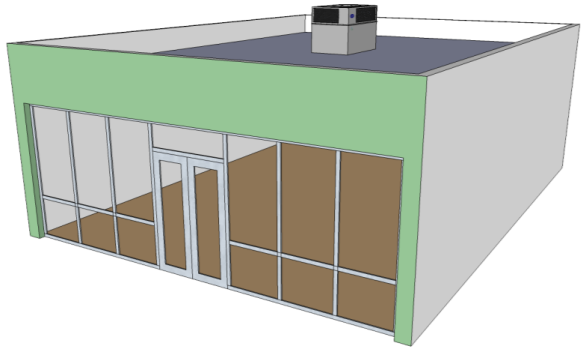
New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Controls - time-switch** | Required where occupant sensors are not used.<br>Specific spaces exempt but must use light-reduction controls. | C405.2.2 | Time switch controls not required in the following spaces if manual light-reduction controls are used:<br>1. Spaces where patient care is directly provided.<br>2. Spaces where an automatic shutoff would endanger occupant safety or security.<br>3. Lighting intended for continuous operation.<br>4. Shop and laboratory classrooms. | ☐ Time switch controls on plans, where applicable |

# Examples - New interior lighting system

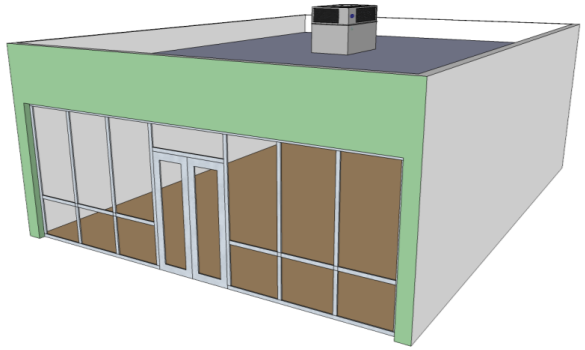
New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Controls – light reduction** | Required where occupant sensors are not used.<br>Requires manual control to allow occupant to reduce lighting power by at least 50% | C405.2.2.2 | Requires reasonably uniform illumination at the reduced light level.<br>Not required for daylighted zones that meet the control requirements in C405.2.3 | ☐ Circuiting or controls on plans indicate multi-level control |

# Examples - New interior lighting system

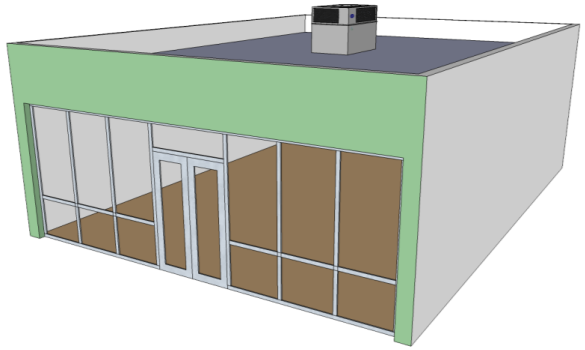
New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Controls - daylight-responsive** | Required in spaces with ≥150W of lighting within daylit zones.<br><br>Some exceptions, such as patient care areas and ground-floor retail.<br>Exception for new buildings where the project's total lighting power is below a limit defined by an equation.<br><br>Definitions provided for sidelit and toplit daylight zones. | C405.2.3 | **Sidelit daylight zone** is the floor area adjacent to windows with a depth equal to the window head height and width equal to two feet to either side of the window.<br>**Toplit daylight zone** is the floor area under a skylight extending to 0.7 times the ceiling height on all sides of the skylight.<br>(See the code for further details and exceptions)<br>The exception for new buildings set a limit based on the fraction of floor area in daylight zones, and ranges from 100% to 60% of the normal lighting power allowance. | ☐ Automatic daylight responsive lighting controls indicated, where applicable |

# Examples - New interior lighting system

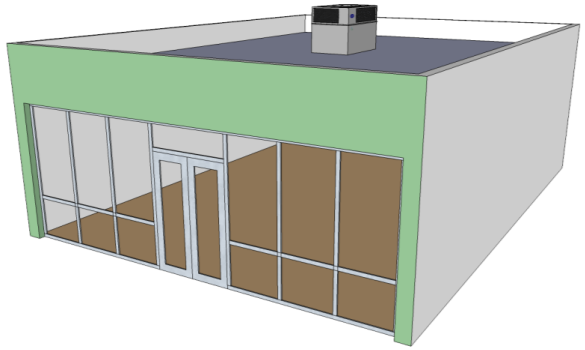
New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Controls – display & accent lighting** | Display lighting, accent lighting and display-case lighting controlled separately from general lighting and include either occupancy sensor control or time-switch control | C405.2.4 | | ☐ Controls indicated on plans |

# Examples - New interior lighting system

New lighting system in small office



| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Total connected interior lighting power** | Includes input power for all proposed luminaires, with exceptions for some lighting applications. Specifies how power is to be determined for different types of luminaires | C405.3.1 | In general, use the rated input power for the luminaire. Track lighting is a special case, where the input power shall be one of the following<br>▪ Wattage of luminaires, but not less than 8 watts per linear foot<br>▪ The wattage limit of a permanent current-limiting device<br>▪ The wattage limit of the transformer | ☐ All fixtures located and identified on plans<br>☐ Fixture schedule includes input power for each fixture |
| **Interior lighting power allowance** | Total connected power shall be no greater than allowance.<br>Two calculation methods for allowance:<br>▪ Building area method<br>▪ Space-by-space method (includes extra allowance for retail and decorative lighting) | C405.3.2 | Power limits and some space types change between 2015 and 2018 IECC.<br>Though not required by code, ideally the designer includes a table on the plans showing the allowed lighting power calculation (listing space types and floor areas) along with a total of the connected lighting power. | |

# Examples - New interior lighting system

**TABLE C405.3.2(1)**
**INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD**

| BUILDING AREA TYPE | LPD (w/ft$^2$) |
|---|---|
| Automotive facility | 0.71 |
| Convention center | 0.76 |
| Courthouse | 0.90 |
| Dining: bar lounge/leisure | 0.90 |
| Dining: cafeteria/fast food | 0.79 |
| Dining: family | 0.78 |
| Dormitory[a, b] | 0.61 |
| Exercise center | 0.65 |
| Fire station[a] | 0.53 |
| Gymnasium | 0.68 |
| Health care clinic | 0.82 |
| Hospital[a] | 1.05 |
| Hotel/Motel[a, b] | 0.75 |
| Library | 0.78 |
| Manufacturing facility | 0.90 |
| Motion picture theater | 0.83 |
| Multifamily[c] | 0.68 |
| Museum | 1.06 |
| Office | 0.79 |
| Parking garage | 0.15 |
| Penitentiary | 0.75 |
| Performing arts theater | 1.18 |
| Police station | 0.80 |
| Post office | 0.67 |
| Religious building | 0.94 |
| Retail | 1.06 |
| School/university | 0.81 |
| Sports arena | 0.87 |
| Town hall | 0.80 |
| Transportation | 0.61 |
| Warehouse | 0.48 |
| Workshop | 0.90 |

0.82

1.26

0.66

For comparison, 2015 IECC allowance examples

# Examples - New interior lighting system

## Partial table

**TABLE C405.3.2(2)**
**INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD**

| COMMON SPACE TYPES[a] | LPD (watts/sq.ft) |
|---|---|
| Atrium | |
| Less than 40 feet in height | 0.03 per foot in total height |
| Greater than 40 feet in height | 0.40 + 0.02 per foot in total height |
| Audience seating area | |
| In an auditorium | 0.63 |
| In a convention center | 0.82 |
| In a gymnasium | 0.65 |
| In a motion picture theater | 1.14 |
| In a penitentiary | 0.28 |
| In a performing arts theater | 2.03 |
| In a religious building | 1.53 |
| In a sports arena | 0.43 |
| Locker room | 0.48 |
| Lounge/breakroom | |
| In a healthcare facility | 0.78 |
| Otherwise | 0.62 |
| Office | |
| Enclosed | 0.93 |
| Open plan | 0.81 |
| Parking area, interior | 0.14 |
| Pharmacy area | 1.34 |
| Restroom | |
| In a facility for the visually impaired (and not used primarily by the staff[b] | 0.96 |
| Otherwise | 0.85 |
| Sales area | 1.22 |
| Seating area, general | 0.42 |
| Stairway (see Space containing stairway) | |
| Stairwell | 0.58 |
| Storage room | 0.46 |
| Vehicular maintenance area | 0.56 |
| Workshop | 1.14 |

1.11

0.98

For comparison, 2015 IECC allowance examples

Extra allowances for

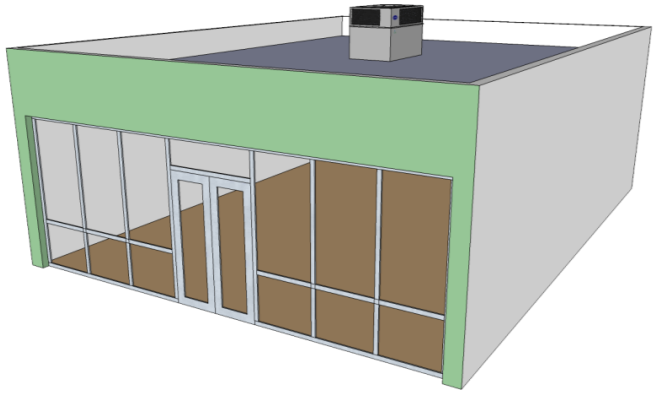
1. Sales areas
2. Decorative lighting or highlight art or exhibits

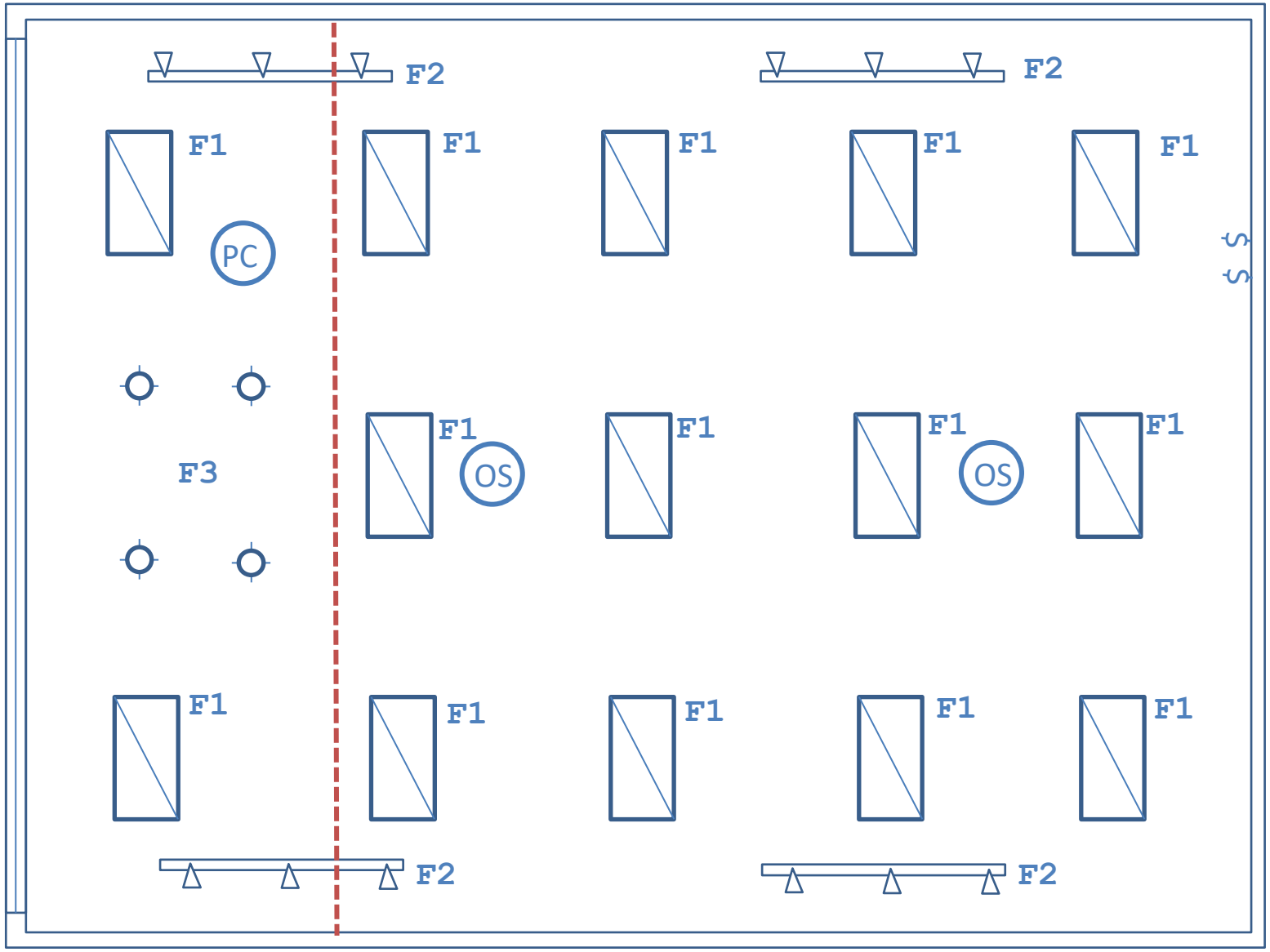
# Examples - New interior lighting system

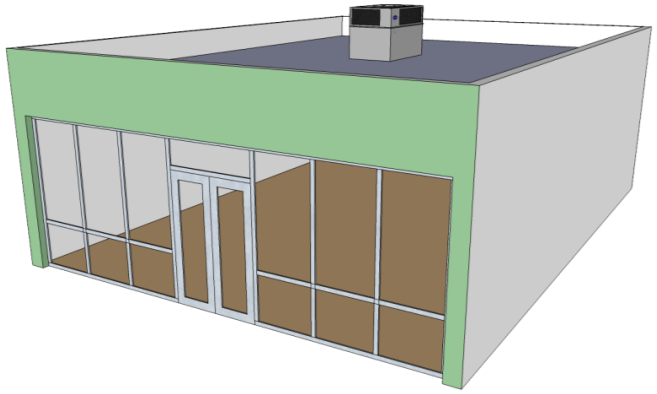
What information needs to be in the plans and specs?

- Notes indicate that functional test certification documents will be provided to owner
- Occupant sensor controls on plans, where applicable
- Time switch controls on plans, where applicable
- Circuiting or controls on plans indicate multi-level control, where applicable
- Automatic daylight responsive lighting controls indicated, where applicable
- Display and accent lighting controls indicated on plans
- Luminaires identified on plans
- Luminaire schedule with input power (ideally also quantity and total connected power)

New lighting system in small office





**Info on lighting plans**

Luminaire IDs

Occupant sensors

Photocell for daylit zone

Separate display switching

## LUMINAIRE SCHEDULE

| ID | Symbol | Description | Input Power | Qty | Total Power |
|---|---|---|---|---|---|
| F1 |  | 2’x4’, recessed LED troffer, 120V | 45W | 14 | 630W |
| F2 |  | 8-ft track, three 15W LED lamps, 120V | 64W | 4 | 256W |
| F3 |  | LED downlight, 120V | 26W | 4 | 104W |
| | | | | **Total** | **914W** |

Recommended

**NOTES**

Functional test certification documents for occupant sensors, time-switch controls and automatic daylighting controls shall be provided to the owner within 90 days of receipt of the certificate of occupancy, per 2018 IECC section C408.3.

# Examples - Interior lighting system alteration

T8 fluorescent to LED conversion - lamp and driver retrofit in classrooms

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?


Not required to comply.

*Repairs* where only the bulb, the ballast or both within the existing luminaires in a space are replaced, provided that the replacement does not increase the installed interior lighting power (C504)

# Examples - Interior lighting system alteration

Replacement of existing fluorescent luminaires with LED luminaires in a classroom

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Lighting systems** | New lighting systems that are part of an alteration are required to meet new construction requirements.<br>▪ Exception if less than 10% of luminaires in a space are replaced and installed lighting power does not increase | | Requirements do not apply when bulbs and/or ballasts are replaced within existing luminaires (C504.2) |

# Examples - New exterior lighting

Add wall-mounted exterior lighting to an existing building

https://cltc.ucdavis.edu/project/adaptive-led-wall-packs

Does it have to comply?

Which compliance options are available?

What are the requirements?

What information needs to be in the plans and specs?

# Examples - New exterior lighting

Add wall-mounted exterior lighting to an existing building

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Exterior lighting controls** | Photo cell and time-based control required.<br>▪ For façade and landscape lighting, automatic on/off off-hour required.<br>▪ Otherwise, automatic reduction ≥30% required during off-hours.<br>▪ Some exceptions apply. | C405.2.6 | Automatically turn off lights as a function of daylight.<br><br>In addition:<br>▪ Façade and landscape lighting off no later than 1 hour after closing and on no earlier than 1 hour before opening.<br>▪ For all others controls automatically reduce lighting power by ≥30% from midnight to 6am (or other options). | ☐ Controls indicated on plans |
| **Exterior building lighting power** | Maximum allowed power listed in Table C405.4.2(2) includes base allowance plus allowances for lighted areas. Additional individual lighting power allowances in Table C405.4.3(3) may be applied only to luminaires serving those applications, such as drive-up windows. Allowances vary by lighting zone per Table C405.5.2(1) | C405.4.2 | Power limits change between 2015 and 2018.<br><br>Though not required by code, ideally the designer includes a table on the plans showing the allowed lighting power calculation separately for the standard exterior lighting allowance and for the individual lighting power allowances along with a total of the connected exterior lighting power. | ☐ All fixtures located and identified on plans<br>☐ Fixture schedule includes input power for each fixture |

# Examples - New exterior lighting

Add wall-mounted exterior lighting to an existing building

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

**Exceptions (C405.4.1)**

1. Lighting *approved* because of safety considerations.
2. Emergency lighting automatically off during normal business operation.
3. Exit signs.
4. Specialized signal, directional and marker lighting associated with transportation.
5. Advertising signage or directional signage.
6. Integral to equipment or instrumentation and installed by its manufacturer.
7. Theatrical purposes, including performance, stage, film production and video production.
8. Athletic playing areas.
9. Temporary lighting.
10. Industrial production, material handling, transportation sites and associated storage areas.
11. Theme elements in theme/amusement parks.
12. Used to highlight features of art, public monuments, and the national flag.
13. Lighting for water features and swimming pools.
14. Lighting controlled from within dwelling units, where the lighting complies with Section R404.1.

# Exterior Lighting Allowances

Table C405.4.2(2)

https://cltc.ucdavis.edu/project/adaptive-led-wall-packs

| | LIGHTING ZONES | | | |
|---|---|---|---|---|
| | Zone 1 | Zone 2 | Zone 3 | Zone 4 |
| Base Site Allowance | 350 W | 400 W | 500 W | 900 W |
| **Uncovered Parking Areas** | | | | |
| Parking areas and drives | 0.03W/ft$^2$ | 0.04 W/ft$^2$ | 0.06 W/ft$^2$ | 0.08 W/ft$^2$ |
| **Building Grounds** | | | | |
| Walkways and ramps less than 10 feet wide | 0.5 W/linear foot | 0.5 W/linear foot | 0.6 W/linear foot | 0.7 W/linear foot |
| Walkways and ramps 10 feet wide or greater, plaza areas, special feature areas | 0.10 W/ft$^2$ | 0.10 W/ft$^2$ | 0.11 W/ft$^2$ | 0.14 W/ft$^2$ |
| Dining areas | 0.65 W/ft$^2$ | 0.65 W/ft$^2$ | 0.75 W/ft$^2$ | 0.95 W/ft$^2$ |
| Stairways | 0.6 W/ft$^2$ | 0.7 W/ft$^2$ | 0.7 W/ft$^2$ | 0.7 W/ft$^2$ |
| Pedestrian tunnels | 0.12 W/ft$^2$ | 0.12 W/ft$^2$ | 0.14 W/ft$^2$ | 0.21 W/ft$^2$ |
| Landscaping | 0.03 W/ft$^2$ | 0.04 W/ft$^2$ | 0.04 W/ft$^2$ | 0.04 W/ft$^2$ |
| **Building Entrances and Exits** | | | | |
| Pedestrian and vehicular entrances and exits | 14 W/linear foot of opening | 14 W/linear foot of opening | 21 W/linear foot of opening | 21 W/linear foot of opening |
| Entry canopies | 0.20 W/ft$^2$ | 0.25 W/ft$^2$ | 0.4 W/ft$^2$ | 0.4 W/ft$^2$ |
| Loading docks | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ | 0.35 W/ft$^2$ |
| **Sales Canopies** | | | | |
| Free-standing and attached | 0.40 W/ft$^2$ | 0.40 W/ft$^2$ | 0.6 W/ft$^2$ | 0.7 W/ft$^2$ |
| **Outdoor Sales** | | | | |
| Open areas (including vehicle sales lots) | 0.20 W/ft$^2$ | 0.20 W/ft$^2$ | 0.35 W/ft$^2$ | 0.50 W/ft$^2$ |
| Street frontage for vehicle sales lots in addition to “open area” allowance | No allowance | 7 W/linear foot | 7 W/linear foot | 21 W/linear foot |

# Exterior Lighting Allowances

Additional exterior lighting power

**TABLE C405.4.2(3) INDIVIDUAL LIGHTING POWER ALLOWANCES FOR BUILDING EXTERIORS**

| LIGHTING ZONES | | | | |
|---|---|---|---|---|
| | **Zone 1** | **Zone 2** | **Zone 3** | **Zone 4** |
| Building facades | No allowance | 0.075 W/ft$^2$ of gross above-grade wall area | 0.113 W/ft$^2$ of gross above-grade wall area | 0.15 W/ft$^2$ of gross above-grade wall area |
| Automated teller machines (ATM) and night depositories | 135 W per location plus 45 W per additional ATM per location | | | |
| Uncovered entrances and gatehouse inspection stations at guarded facilities | 0.5 W/ft$^2$ of area | | | |
| Uncovered loading areas for law enforcement, fire, ambulance and other emergency service vehicles | 0.35 W/ft$^2$ of area | | | |
| Drive-up windows and doors | 200 W per drive through | | | |
| Parking near 24-hour retail entrances. | 400 W per main entry | | | |

The additional power shall be used only for the luminaires that are serving these applications and shall not be used for any other purpose

# Examples - AC system replacement

Replace packaged rooftop AC unit

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Mechanical systems** | New heating, cooling and duct systems are required to meet new construction requirements. | C503.4 | For example, replacement air conditioners must meet the efficiency requirements, and new ducts must meet the insulation requirements. Unaltered portions of the system are not required to comply. |

# Examples - AC system replacement

## What are the requirements?

| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Ventilation** | Outdoor air ventilation per IMC (International Mechanical Code) | C403.2.2 | Natural or mechanical ventilation required for all spaces. | ☐ Outdoor air ventilation rates listed on plans |
| **HVAC equipment performance** | Tables C403.3.2(1) - C403.3.2(9) | C403.3.2 | Cooling efficiency rated by SEER, EER, or kW/ton. Requirement varies by equipment type and cooling capacity.<br>Efficiency changes from 2015:<br>▪ Room air conditioners<br>▪ Gas-fired furnaces<br>▪ Axial-fan closed-circuit cooling towers | ☐ Cooling efficiency listed on plans<br>☐ Cooling capacity listed on plans |
| **Shutoff dampers** | Dampers required on outdoor air intake and exhaust openings and stairway and shaft vents | C403.7.7 | Gravity dampers allowed in Hawaii's climate zone. Max. leakage at 1.0 in w.g.:<br>▪ ≤20 cfm/ft$^2$ for dampers ≥ 24 in.<br>▪ ≤40 cfm/ft$^2$ for dampers < 24 in. | |
| **HVAC fans** | When fan motors' total hp ≥ 5hp<br>▪ Allowable fan horsepower<br>▪ Motor nameplate horsepower<br>▪ Fan efficiency<br>▪ Fraction hp fan motors | C403.8 | ▪ Allowed fan hp = function of airflow.<br>▪ Nameplate hp limited to smallest that meets bhp requirement<br>▪ Fan efficiency grade ≥67; some exceptions<br>▪ Fractional hp motors (1/12 ≤ hp < 1hp) must be electronically commutated motors (ECMs); some exceptions | ☐ Hp or bhp for all supply, return, exhaust, and terminal-unit fans on plans.<br>☐ Airflow for all fans on plans. |
| **Fan airflow control** | Two-stage or variable airflow control | C403.8.5 | At least 2-stage fan control required:<br>▪ DX cooling ≥ 65kBtu/hr<br>▪ Chilled water systems ≥0.25 hp fan | ☐ Fan control on plans (if applicable) |

# Examples - AC system replacement

What information needs to be in the plans and specs?

| ID | Supply air flow | Outdoor air flow | Total cooling capacity | Fan brake horse-power | Fan motor horse-power | Cooling Efficiency | | Notes |
|---|---|---|---|---|---|---|---|---|
| | (cfm) | (cfm) | (Btu/hr) | (hp) | (hp) | (EER) | (IEER) | |
| AC-1 | 3,000 | 600 | 90,000 | 2.4 | 3 | 11.5 | 14.0 | 1,2 |

Notes

1. 2-stage fan speed control
2. OA and EA damper leakage < 20 cfm/ft2 at 1.0” w.c.

# Examples - AC added to non-conditioned space

Add AC to an existing space that is non-conditioned

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

| Component/System | Requirement | Code Section | Plan Review Notes |
|---|---|---|---|
| **Change in space conditioning** | Full compliance is required for previously unconditioned spaces that are altered to become conditioned | C503.2 | Exceptions<br>▪ Envelope compliance if UA is no greater than 110% of target UA per C402.1.5.<br>▪ Total building performance compliance if proposed design energy cost is no greater than 110% of otherwise permitted energy cost. |

# Examples – Kitchen exhaust replacement

Kitchen exhaust system replacement in a school cafeteria

Does it have to comply?
Which compliance options are available?
What are the requirements?
What information needs to be in the plans and specs?

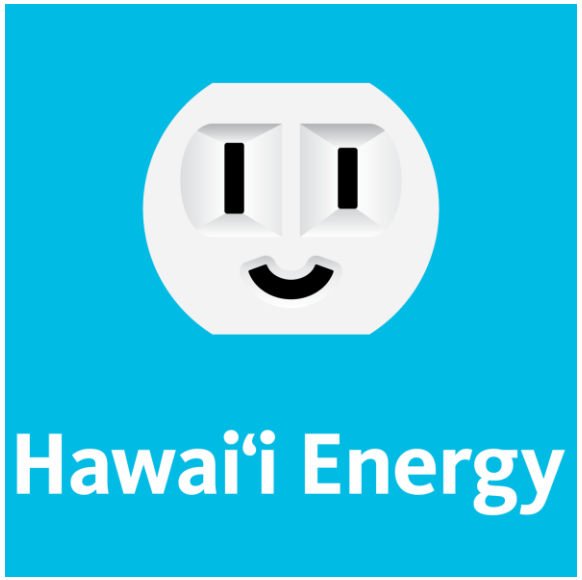
| Component/System | Requirement | Code Section | Plan Review Notes | Info on Plans |
|---|---|---|---|---|
| **Kitchen exhaust** | ▪ Limit on direct makeup air in hood.<br>▪ For flow > 5,000 cfm<br>○ UL listed hoods required<br>○ Limit on cfm/ft<br>○ Additional requirements | C403.7.5 | ▪ Kitchen exhaust systems allowed ≤10% replacement air directly into hood.<br>▪ For kitchens > 5,000 cfm exhaust, UL listed hoods are required plus one of the following is required: 1) transfer air ≥50%, 2) demand-control ventilation, or 3) energy recovery | ☐ Kitchen hood and exhaust fan specs on plans |

# Examples that don’t need to comply

- Envelope for non-conditioned spaces
- Window glazing replacement in existing frame
- Wall when cavity is not exposed during alteration
- Roof repair or re-cover
- Lighting alteration replacing fewer than 10% of fixtures, if power doesn’t increase
- Lighting bulb and ballast replacement
- Portions of AC system not replaced during an alteration

# Section 4

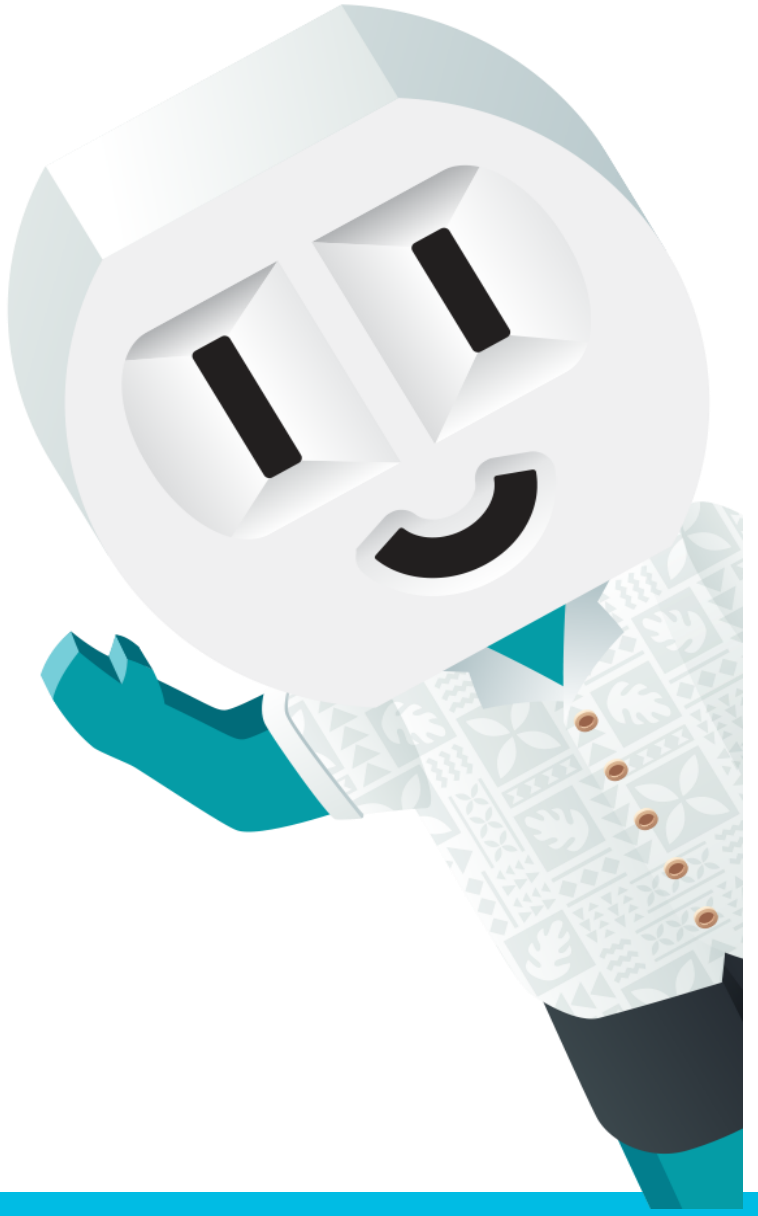
## Hawai`i Energy Incentives



# New Construction

# &

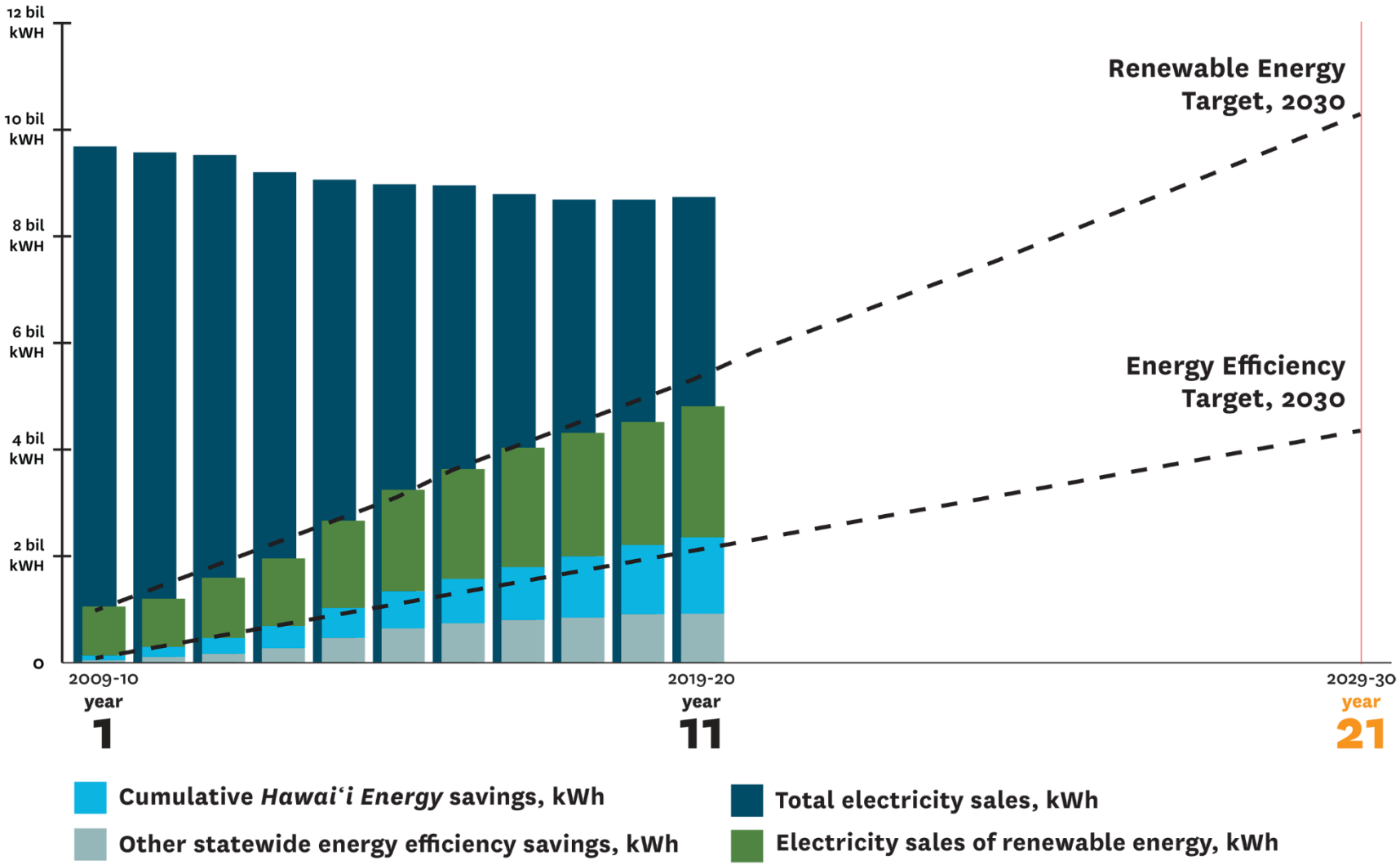
# Major Renovation



# HAWAIʻI CLEAN ENERGY INITIATIVE (HCEI)

**Achieve 70% Clean Energy by 2030:** 30% from Energy Efficiency, 40% from Renewable Energy

This 2030 goal is a milestone to achieving the 2045 HCEI target of 100% clean energy



# New Construction & Major Renovation

https://hawaiienergy.com/for-business/business-solutions/new-construction-major-renovation

## New Construction & Major Renovation

Commercial and multifamily new construction & major renovation projects can receive rebates for incorporating energy-efficient features into building designs and exceeding building code requirements.

Whether you're using energy modeling systems to plan energy-saving features during the conceptual stage or seeking support on specific products/equipment, Hawaii Energy is here to help guide you through creating a more sustainable and energy-efficient building.

### For Questions

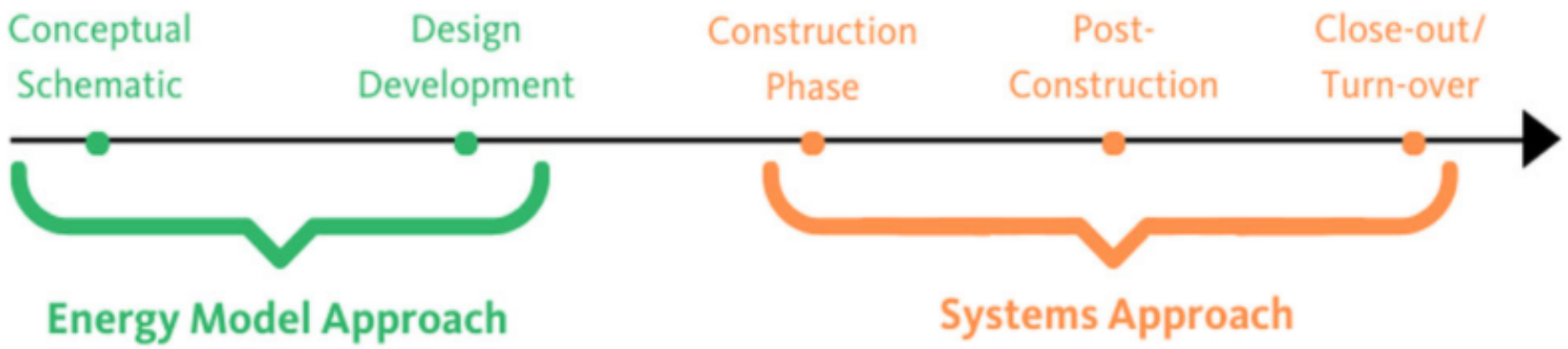
Contact our Energy Advisors:

**Lacey Shimabukuro**
Honolulu County
lacey.k.shimabukuro@leidos.com
(808) 848-8542

**Walter Enomoto**
Maui County
enomotow@leidos.com
(808) 298-4269

**Graceson Ghen**
Hawaii County
graceson.ghen@leidos.cor
(808) 895-6713

# New Construction & Major Renovation




**Energy Model Approach (EMA)** *is an analysis during* ***the conceptual or schematic development stage*** *of the design.*

Using this approach, our incentive is calculated and paid across three milestone stages: energy model, energy model report presentation, and post-construction.

**Systems Approach (SA)** *is a method to identify and incorporate energy efficiency options during the* ***construction phase****.*

Using this approach, Hawaii Energy will apply standard prescriptive and custom rebates. Custom rebates are calculated at $0.12/kWh based off energy savings and $125/kW for demand reduction.

# Incentives & Rebates

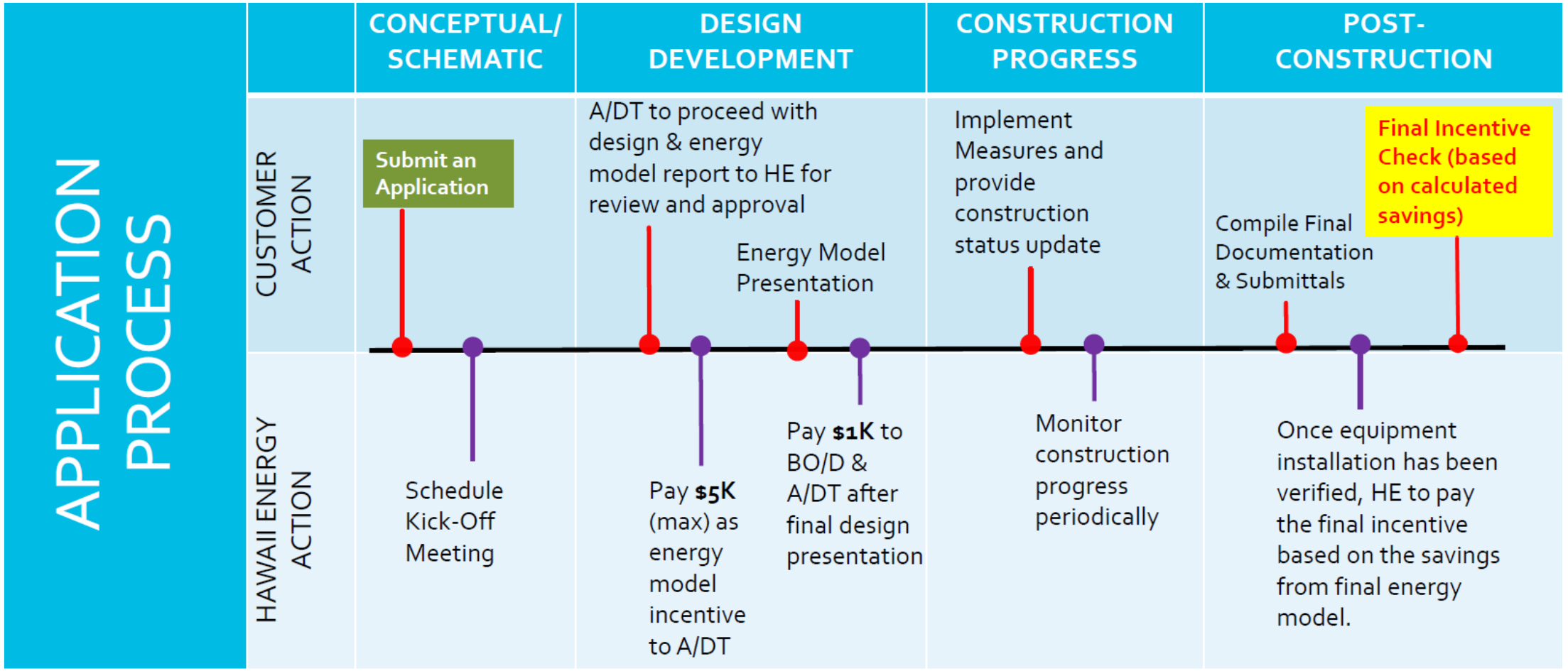
## Energy Model Approach

- Up to **$5,000** paid for energy model and report
- **$1,000** paid to owner/developer AND **$1,000** paid to architect/design team for energy model presentation
- **Energy saving rebates** calculated at $0.12/kWh (based on savings predicted by energy model and capped at $150,000)
- **Demand saving rebate** calculated at $125/kW

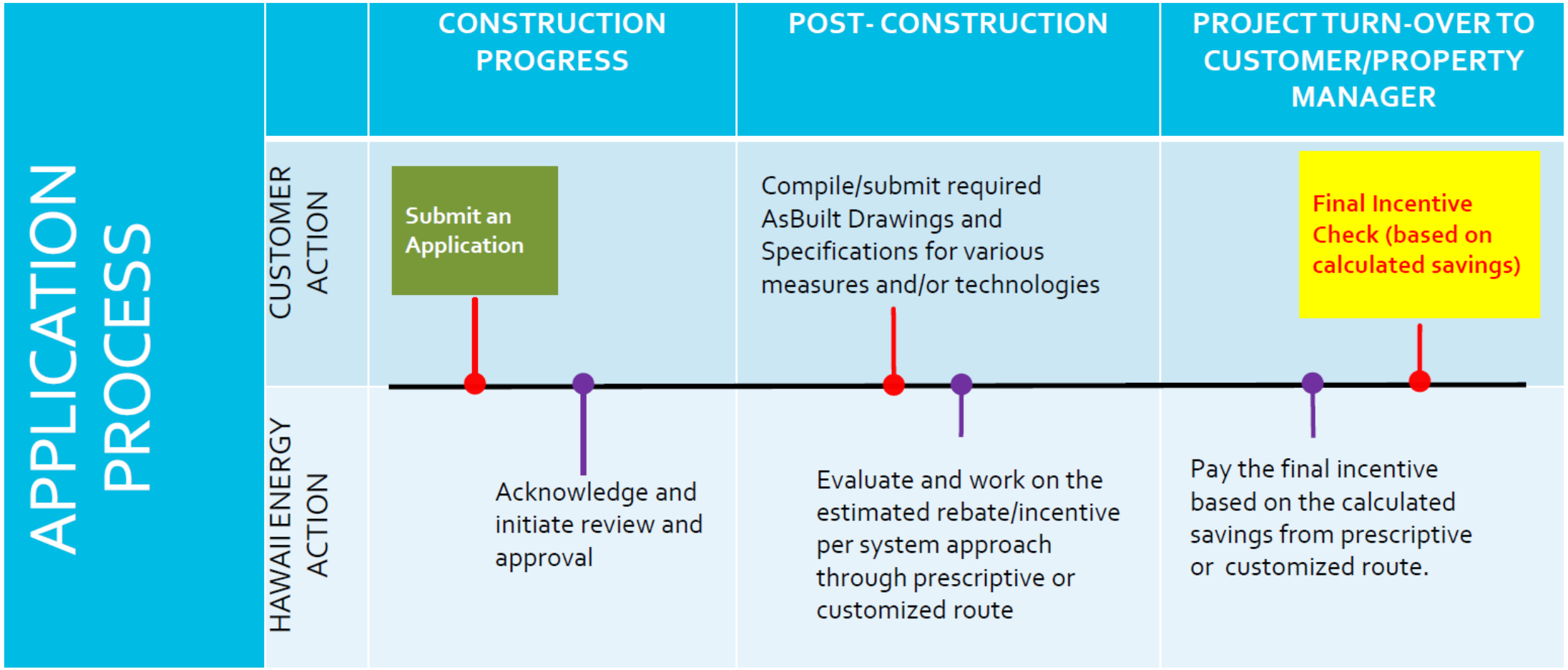
## Systems Approach

- **Lighting rebates** calculated at $0.12/kWh (based on energy savings)
- **Other Equipment** qualified through prescriptive or custom requirements at $0.12/kWh for **energy savings** and $125/kW for **demand savings**

# Energy Model Approach



# Systems Approach



# Rebate Summary Sheet

## Rebates

Hawai'i Energy

Hawai'i Energy makes it easy to implement your projects quick. We help you identify energy-saving opportunities and provide attractive financial incentives that significantly offset costs, reduce payback periods and positively impact your bottom line. To get started, call us at **839-8880** (Oahu) or **1-877-231-8222** (toll-free neighbor islands), or visit our website at HawaiiEnergy.com/for-businesses.

**PLEASE NOTE:** All incentives require a completed and signed application, relevant worksheets, product specifications and project invoices. All documents can be submitted via email to HawaiiEnergy@leidos.com or faxed to (808) 441-6068.

### HVAC

**Important:** AC system size is taken as the AHRI rated system capacity, not the nominal system capacity which is rounded to the nearest whole number.
*Please see corresponding worksheet for eligibility requirements*

| Chillers | |
|---|---|
| Positive Displacement | $45/ton |
| Centrifugal | $45/ton |
| Air-cooled with condenser | $45/ton |

| Air-Cooled Package/Split | |
|---|---|
| Package/Split | Tier 1: $100/ton |
| Package/Split | Tier 2: $175/ton |
| ***Note:*** Refer to custom program for units with capacities greater than 600 tons. | |

| Water-Cooled Package/Split | |
|---|---|
| Package/Split | $100/ton |

| Water-source Heat Pumps | |
|---|---|
| Water-source heat pump | $100/ton |

| VRF Multisplit AC and Heat Pumps | |
|---|---|
| Multisplit AC | $250/ton |

| Variable Frequency Drives | |
|---|---|
| VFD controls for HVAC fans; new construction > 7.5 hp not eligible | $50 per HP |
| VFD controls for Chiller and Condenser Water pumps | $80 per HP |

### Refrigeration & Kitchen Equipment

*Refrigerators: New unit must be > 16 cu. ft.; trade-in must be > 14 cu. ft.*
*Night covers: On existing open refrigerated display cases*
*Anti-Sweat Heater Controls: Replacement of existing controls. New refrigerators/ freezers and walk-in units manufactured after 1/1/09 not eligible.*

| Specialty Kitchen Equipment | |
|---|---|
| **Equipment Category** | **Incentive** |
| ENERGY STAR® Refrigerators (Trade-In) | $150 per unit |
| Refrigerated Night Covers | $10 per lin. ft. |
| Anti-Sweat Heater Controls (for refrigerator/freezer) | $40 per lin. ft. |
| Kitchen Exhaust Hood Demand Ventilation | $700 per HP |
| ENERGY STAR® Commercial Kitchen Equipment | Various- see separate worksheet |

### Advanced Metering & Controls

*Advanced metering: Retrofit only; new construction not eligible. Condos and small businesses must be master-metered. Projects are subject to pre-approval and meet other Program requirements.*

| Advanced Metering | |
|---|---|
| **Equipment Category** | **Incentive** |
| Condominium submetering | $150 per billed unit |
| Small Business / Tenant submetering | $150 per billed unit |

| Controls | |
|---|---|
| **Equipment Category** | **Incentive** |
| Energy Management Systems | $0.12 per kWh |
| Hotel Room EMS | $75 per unit |
| Garage Exhaust Ventilation | $0.12 per kWh |
| Vending Machines | $50 per system |

### Pumps & Motors

Pre-approval required.
Existing equipment must not have VFD and all motors must meet CEE Premium Efficiency Standards.
*Please see corresponding worksheet for eligibility requirements*

| Motors | |
|---|---|
| **Equipment Category** | **Incentive** |
| Electronically Commutative Motors (ECM) & Speed Control for **Commercial Refrigeration** (retrofit only) | $85 each |
| Electronically Commutative Motors (ECM) & Speed Control for **HVAC Fan Coil Applications** | $55 each |
| Premium Efficiency Motors | Refer to worksheet |

| Pumps | |
|---|---|
| **Equipment Category** | **Incentive** |
| VFDs for Pool Pumps<br>• Pre-approval required<br>• 3HP or less (> 3HP see Customized)<br>• Existing equipment must not have VFD | $225 per HP |
| VFD Domestic Water Pump System<br>• Retrofit only; pre-approval required<br>• Total HP must ≤ to existing system; limited to system reduction of ≤ 129HP.<br>• All motors must meet CEE Premium Efficiency Standards. | $3,000 + $80 per HP reduced |

### Water Heating

*Heat pump requirements*

| Tons | 5 - 11.25 | > 11.25 |
|---|---|---|
| COP | 3.3 | 3.2 |

*Please see corresponding worksheet for eligibility requirements*

| Commercial Water Heating | |
|---|---|
| **Equipment Category** | **Incentive** |
| Heat Pump Water Heating | Based on size and COP |
| Commercial Solar Water Heating | $250 / ton de-rated output |

### Whole Building Assistance

Requires pre-approval and must meet other Program requirements, see corresponding Rules & Requirements for details.
*Incentives capped by building square footage as well.*

| Whole Building Assistance | |
|---|---|
| **Equipment Category** | **Incentive** |
| Re-Commissioning & Retro-Commissioning | 1. 20¢ per sq.ft. of the commissioned facility up to $30,000, but capped at 50% of the Re\|Retro-Commissioning cost<br>2. Additional 8¢ per kWh saved in the first year |
| ASHRAE Level 2 Audit* | 5¢ per sq.ft. of the audited facility up to $15,000, but capped at 85% of the audit cost |
| ASHRAE Level 3 Audit* | 10¢ per sq.ft. of the audited facility up to $25,000, but capped at 85% of the audit cost |

*Additional 10% will be applied to projects identified in audits (Level 2 & 3) and implemented within 2 years of audit completion.

### Building Envelope

*New construction, shaded or north-facing windows not eligible. Solar heat gain coefficient must be < 0.435 or shading coefficient < 0.5.*

| Building Envelope | |
|---|---|
| **Equipment Category** | **Incentive** |
| Window Film | $0.85 per sq. ft. |
| Incentive rate is halved for replacement window film, see worksheet | |

### Customized Projects

*Lighting projects must have a payback > 6 months. Non-lighting projects must have a payback > 1 year.*
*Incentive cannot exceed 50% of incremental project cost.*

| Custom | | |
|---|---|---|
| **Equipment Category** | **Equipment Life** | **Incentive** |
| Lighting Projects | ≤ 5 Years | $0.08 / kWh |
| Lighting Projects | > 5 Years | $0.12 / kWh |
| Non-Lighting Projects | ≤ 5 Years | $0.08 / kWh |
| Non-Lighting Projects | > 5 Years | $0.12 / kWh |

### Transformers

- Commercial customer-sited and customer-owned transformer (not utility-owned)
- Must meet or exceed DOE 2016 efficiency standards
- Existing transformer must be manufactured/installed prior to 2007
  - Transformers installed after 2007 may still qualify on a case-by-case basis; contact Hawaii Energy for more information.
- Must serve the same load as the pre-existing transformer

> 1000 kVA may qualify under the Custom Incentive Program

| Transformers | |
|---|---|
| **Equipment Category** | **Incentive** |
| New Transformer | $0.12 / kWh + $125 per kW (5pm-9pm) |

### Electric Vehicle Charging Stations

**Important:**
***Available through September 30, 2019.***

- UL-listed, dual-port, Level 2 EV Charging Stations with network connectivity
- Charging station usage for tenants, employees and/or authorized guests; not intended for fleet-charging, individually-owned parking stalls or single family homes
- Appropriate number of parking stalls and regulatory signage required

**For more details:**
*https://hawaiienergy.com/evcharging*

| EV Charging Stations | |
|---|---|
| **Equipment Category** | **Incentive** |
| **Workplace**: Place of business generally open between 7am-5pm | **New installation: $5,000 per dual-port station** (i.e., no pre-existing station)<br>**Retrofit: $1,500 per dual-port station** (i.e., upgrade from a single-port to dual-port station) |
| **Multi-Unit Dwelling:** Apartment/Condos with at least 8 parking stalls | |

### New Construction

*For new construction projects, contact us at hawaiienergy@leidos.com*

| New Construction | |
|---|---|
| **Equipment Category** | **Incentive** |
| Various measures that exceed code and will result in a more energy-efficient project, subject to Hawai'i Energy approval. | Customized |

# Mahalo!

## Stay Connected

**Oahu: 537-5577** (Residential) **839-8880** (Business)

**Neighbor Islands: 1-877-231-8222 toll-free**

**www.hawaiienergy.com**

facebook.com/hawaiienergy @myhawaiienergy

# Section 5

## Wrap Up

# Q&A

Howard Wiig, State Energy Office

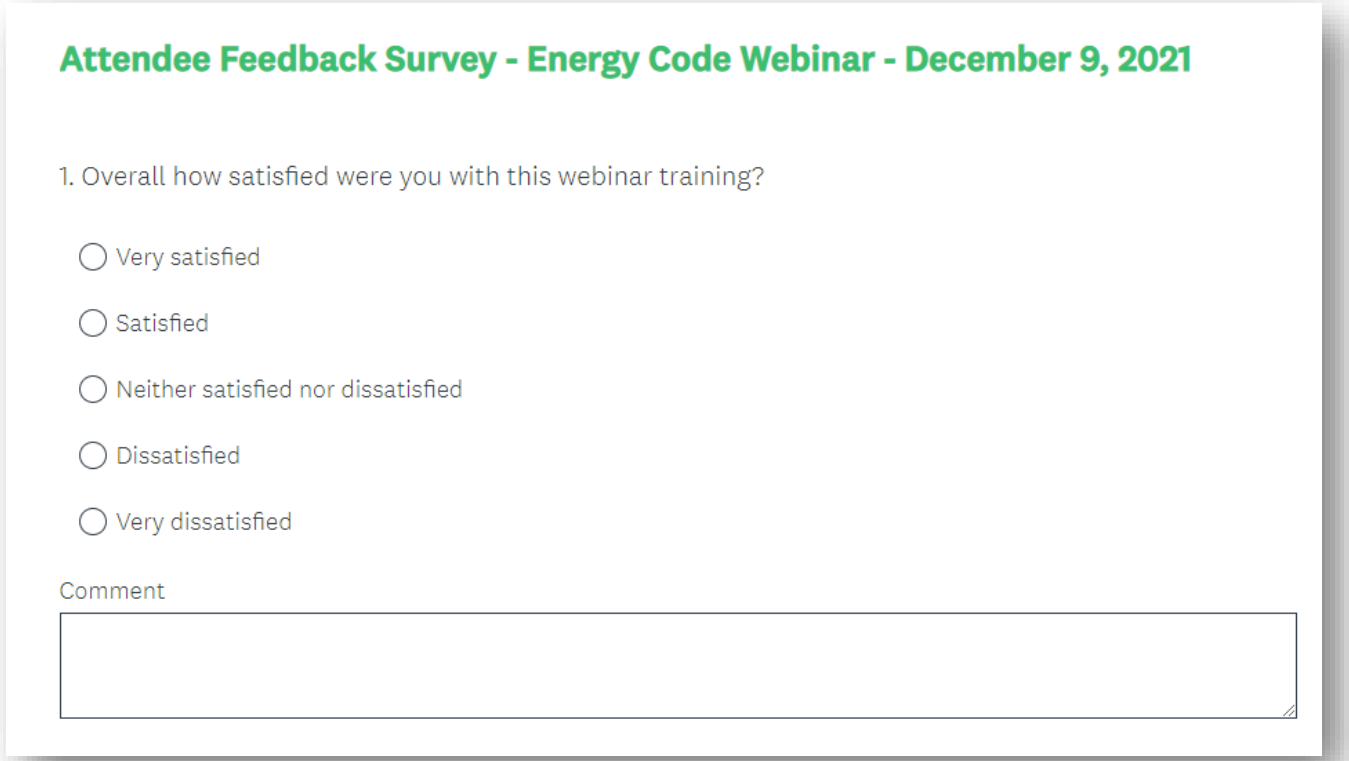
Erik Kolderup, PE, Kolderup Consulting

Ramsey Brown, Hawaii Energy

Lacey Shimabukuro, Hawaii Energy

# Evaluation Survey

https://www.surveymonkey.com/r/33WFJD6



**Attendee Feedback Survey - Energy Code Webinar - December 9, 2021**

1. Overall how satisfied were you with this webinar training?

- ◯ Very satisfied
- ◯ Satisfied
- ◯ Neither satisfied nor dissatisfied
- ◯ Dissatisfied
- ◯ Very dissatisfied

Comment

# For more energy code information


Howard C. Wiig

Energy Analyst, Hawaii State Energy Office

Office (808) 590-9555

Howard.c.wiig@Hawaii.gov


2018 IECC available:

- http://iccsafe.org/publications
- https://codes.iccsafe.org/content/iecc2018

State Energy Code Website:

- http://energy.hawaii.gov/hawaii-energy-building-code

Hawaii Energy Code Website

- https://hawaiienergy.com/codes

Get PDF of these slides

https://energy.hawaii.gov/building-code-training