

VERSION W/JUSTIFICATIONS

ORDINANCE NO. _____

BILL NO. _____ (2018)

A BILL FOR AN ORDINANCE REPEALING CHAPTER 16.16A, MAUI COUNTY CODE, AND ESTABLISHING A NEW CHAPTER 16.16B, MAUI COUNTY CODE, PERTAINING TO THE ENERGY CODE

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Chapter 16.16A, Maui County Code, is repealed in its entirety.

SECTION 2. The “2015 *International Energy Conservation Code*®” as copyrighted and first published in 2014 by the International Code Council, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478, is hereby incorporated herein by reference and made a part of hereof and adopted, subject to the provisions of Chapter 16.16B, Maui County Code, as herein enacted and as hereafter may be amended.

SECTION 3. Title 16, Maui County Code, is amended by adding a new chapter to be appropriately designated and to read as follow:

Chapter 16.16B

ENERGY CODE

Sections:

16.16B.010	The International Energy Conservation Code incorporated.
16.16B.C101.1	Subsection C101.1 amended.

16.16B.C101.4	Subsection C101.4 amended.
16.16B.C102.1	Subsection C102.1 amended.
16.16B.C103.1	Subsection C103.1 deleted in its entirety and replaced.
16.16B.C103.3	Subsection C103.3 deleted in its entirety and replaced.
16.16B.C103.4	Subsection C103.4 deleted in its entirety and replaced.
16.16B.C103.5	Subsection C103.5 deleted in its entirety and replaced.
16.16B.C104	Section C104 deleted in its entirety and replaced.
16.16B.C106.1.1	Subsection C106.1.1 amended.
16.16B.C106.1.2	Subsection C106.1.2 amended.
16.16B.C107	Section C107 deleted in its entirety and replaced.
16.16B.C108	Section C108 deleted in its entirety and replaced.
16.16B.C109	Section C109 deleted in its entirety and replaced.
16.16B.C201.3	Subsection C201.3 amended.
16.16B.C402.1.1	Subsection C402.1.1 amended.
16.16B.C402	Table C402.1.3 deleted in its entirety and replaced.
16.16B.C402.2.3	Subsection C402.2.3 amended.
16.16B.C402.4.3.5	Subsection C402.4.3.5 added.
16.16B.C402.5	Subsection C402.5 amended.
16.16B.C403.2.4.2.4	Subsection C402.4.2.4 added.
16.16B.C405.2	Subsection C405.2 amended.
16.16B.C405.2.4	Subsection C405.2.4 amended.
16.16B.C405.10	Subsection C405.10 added.
16.16B.C406.3	Subsection C406.3 amended.
16.16B.C407.3	Subsection C407.3 amended.
16.16B.C407.4	Subsection C407.4 deleted in its entirety.
16.16B.C407.4.1	Subsection C407.4.1 amended.
16.16B.C407.6	Subsection C407.6 amended.
16.16B.C407.6.1	Subsection C407.6.1 deleted in its entirety.
16.16B.C407.6.3	Subsection C407.6.3 amended.
16.16B.C408.2	Subsection C408.2 amended.
16.16B.C408.2.4.1	Subsection C408.2.4.1 deleted in its entirety.
16.16B.C408.3.1	Subsection C408.3.1 amended.
16.16B.C501.4	Subsection C501.4 amended.
16.16B.C503.3.1	Subsection C503.3.1 amended.

16.16B.R101.1	Subsection R101.1 amended.
16.16B.R101.4	Subsection R101.4 amended.
16.16B.R102.1	Subsection R102.1 amended.
16.16B.R103.1	Subsection R103.1 deleted in its entirety and replaced.
16.16B.R103.3	Subsection R103.3 deleted in its entirety and replaced.
16.16B.R103.4	Subsection R103.4 deleted in its entirety and replaced.
16.16B.R103.5	Subsection R103.5 deleted in its entirety and replaced.
16.16B.R104	Section R104 deleted in its entirety and replaced.
16.16B.R106.1.1	Subsection C106.1.1 amended.
16.16B.R106.1.2	Subsection C106.1.2 amended.
16.16B.R107	Section R107 deleted in its entirety and replaced.
16.16B.R108	Section R108 deleted in its entirety and replaced.
16.16B.R109	Section R109 deleted in its entirety and replaced.
16.16B.R201.3	Subsection R201.3 amended.
16.16B.R401.2	Subsection R401.2 amended.
16.16B.R401.2.1	Subsection R401.2.1 amended.
16.16B.R401.3	Subsection R401.3 amended.
16.16B.R402.1	Subsection R402.1 amended.
16.16B.R402	Table R402.1.2 deleted in its entirety and replaced.
16.16B.R402.2	Subsection R402.2 amended.
16.16B.R402.3.2	Subsection R402.3.2 amended.
16.16B.R402.4.1.2	Subsection R402.4.1.2 amended.
16.16B.R403.5.5	Subsection R403.5.5 added.
16.16B.R404.2	Subsection R404.2 added.
16.16B.R404.3	Subsection R404.3 added.
16.16B.R405	Table R405.5.2(1) amended.
16.16B.R407	Section R407 added.
16.16B.R501.4	Subsection R501.4 amended.
16.16B.R503.1.1	Subsection R503.1.1 amended.

16.16B.010 The International Energy Conservation Code
incorporated. The “2015 International Energy Conservation Code®” herein referred to as the “International Energy Conservation Code”, “Energy Code,” or “this code,” as copyrighted and first published in 2014 by the International Code Council, Inc. 4051 West Flossmoor Road, Country Club Hills, IL 60478, is incorporated by reference and made a

part hereof, subject to the amendments set forth in chapter 16.16B, Maui County Code, as hereinafter enacted and as hereinafter may be amended.

16.16B.C101.1 Subsection C101.1 amended. Subsection C101.1 of the International Energy Conservation Code is amended to read as follows:

101.1 Title. This code shall be known as the International Energy Conservation Code of the County of Maui, and shall be cited as such. It is referred to herein as “this code.”

16.16B.C101.4 Title. Subsection C101.4 amended. Subsection C101.4 of the International Energy Conservation Code is amended to read as follows:

R101.4 Applicability. Where, in any specific case, different sections of this code or other adopted codes specify different materials, methods of construction or other requirements, the [most restrictive shall govern] code official shall determine which code requirement prevail. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

County of Maui (COM) Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.C102.1 Subsection C102.1 amended. Subsection C102.1 of the International Energy Conservation Code is amended to read as follows:

C102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The code official shall be permitted to approve an alternative material, design or method of construction where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. The code official may allow lower energy conservation standards for nonstandard building materials, unique or limitations of design, special methods of construction, and geographical location. The code official may require construction plans, research reports, and tests prepared by a registered design professional in order to allow such lower standards.

COM Justification – The code should not prohibit nonstandard building materials like indigenous Hawaiian architecture and membrane structures,

limitation on design like timber frame construction, open beam roofs, especially addition to existing conditions, geographical locations in valleys and other obstructions.

16.16B.C103.1 Subsection C103.1 deleted in its entirety and replaced. Subsection C103.1 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

C103.1 General. When the requirements in this code apply to a building as specified in Section C101, plans, specifications, or other construction documents submitted for a building, electrical, or plumbing permit required by the jurisdiction shall comply with this code and shall be prepared, designed, approved, and observed by a registered design professional as required by Chapter 464 of the Hawaii Revised Statutes. The registered design professional shall provide on the plans a statement certifying that the project substantially conforms with this code.

Exception: Any building, electrical, or plumbing work that is not required to be prepared, designed, approved, or observed by a licensed architect or engineer pursuant to Chapter 464 of the Hawaii Revised Statutes.

COM Justification – This subsection is amended to provide for compatibility with State of Hawaii laws and administrative rules.

16.16B.C103.3 Subsection C103.3 deleted in its entirety and replaced. Subsection C103.3 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

C103.3 Examination of documents. Examination of documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C103.4 Subsection C103.4 deleted in its entirety and replaced. Subsection C103.4 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

C103.4 Amended construction documents. Amended construction documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C103.5 Subsection C103.5 deleted in its entirety and replaced. Subsection C103.5 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

C103.5 Retention of construction documents. Retention of construction documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C104 Section C104 deleted in its entirety and replaced. Section C104 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION C104 **INSPECTIONS**

C104.1 General. Inspections shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C106.1.1 Subsection C106.1.1 amended. Subsection C106.1.1 of the International Energy Conservation Code is amended to read as follows:

C106.1.1 Conflicts. The code official shall make the final determination [W]where conflicts occur between provisions of this code and referenced codes and standards[, the provisions of this code shall apply].

COM Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.C106.1.2 Subsection C106.1.2 amended. Subsection C106.1.2 of the International Energy Conservation Code is amended to read as follows:

C106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the code official shall determine which shall take precedence, the provisions of this code or [, as applicable, shall take precedence over] the provisions in the referenced code or standard.

COM Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.C107 Section C107 deleted in its entirety and replaced. Section C107 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION C107
FEES

C107.1 General. Fees shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C108 Section C108 deleted in its entirety and replaced. Section C108 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION C108
STOP WORK ORDER

C108.1 General. Stop work order shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C109 Section C109 deleted in its entirety and replaced.

Section C109 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION C109
VARIANCES AND APPEALS

C109.1 General. Variances and Appeals shall comply with the Variances and Appeals provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.C201.3 Subsection C201.3 amended. Subsection C201.3 of the International Energy Conservation Code is amended to read as follows:

C201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the International Building code, [International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code] or the International Residential Code shall have the meanings ascribed to them in those codes.

COM Justification – The International Fire Code, International Fuel Gas Code, International Mechanical Code, and International Plumbing Code are not applicable to the County of Maui.

16.16B.C402.1.1 Subsection C402.1.1 amended. Subsection C402.1.1 of the International Energy Conservation Code is amended to read as follows:

C402.1.1 Low-energy buildings. The following low-energy buildings, or portions thereof separated from the remainder of the building by building thermal envelope assemblies complying with this section, shall be exempt from the building thermal envelope provisions of Section C402.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt per square foot (10.7 W/m²) of floor area for space conditioning purposes.
2. [Those that do not contain conditioned space.] Unconditioned space that does not contain habitable space.
3. Greenhouses.

State of Hawaii (SOH) Justification – The amended language ensures that habitable space, even if unconditioned, will be covered by the provisions of the energy code to increase occupant comfort and reduce the possibility of installing air conditioning in the future.

16.16B.C402 TABLE C402.1.3 deleted in its entirety and replaced. TABLE C402.1.3 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

**TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM
REQUIREMENTS, R-VALUE METHOD^a**

CLIMATE ZONE	1	
	All Other	Group R
Roofs		
<u>Insulation entirely above roof deck</u>	<u>R-10ci</u>	<u>R-12.5ci</u>
<u>Metal buildings^{a b}</u>	<u>R-30 or R-19 w/cool roof</u>	<u>R-30 or R-19 w/cool roof</u>
<u>Attic and other room</u>	<u>R-30 or R-19 w/cool roof</u>	<u>R-30 or R-19 w/cool roof</u>
Walls, above grade		
<u>Mass</u>	<u>R-5.7ci^c</u>	<u>R-5.7ci^c</u>
<u>Metal building</u>	<u>R-13 + R-6.5ci</u>	<u>R-13 + R-6.5ci</u>
<u>Metal framed</u>	<u>R-13 + R-5ci</u>	<u>R-13 + R-5ci</u>
<u>Wood framed and other</u>	<u>R-13 + R-3.8ci or R-20</u>	<u>R-13 + R-3.8ci or R-20</u>
Walls, below grade		
<u>Below-grade wall</u>	<u>NR</u>	<u>NR</u>
Floors		
<u>Mass</u>	<u>NR</u>	<u>NR</u>
<u>Joist/framing</u>	<u>NR</u>	<u>NR</u>
Slab-on-grade floors		
<u>Unheated slabs</u>	<u>NR</u>	<u>NR</u>
<u>Heated slabs^d</u>	<u>R-7.5 for 12" below</u>	<u>R-7.5 for 12" below</u>
Opaque doors		
<u>Nonswinging</u>	<u>R-4.75</u>	<u>R-4.75</u>

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

ci = Continuous insulation, NR = No requirement, LS = Liner system.

- a. Assembly descriptions can be found in ANSI/ASHRAE/IESNA Appendix A.
- b. Where using R-value compliance method, a thermal spacer block shall be provided, otherwise use the U-factor compliance method in Table C402.1.4.
- c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C 90, ungrouted or partially grouted at 32 inches or less on center vertically and 48 inches or less on center horizontally, with ungrouted cores filled with materials having maximum thermal conductivity of 0.44 Btu-in/h-²°F. See Section C402.2.3.
- d. Steel floor joist systems shall be insulated to R-38.

SOH Justification – Commercial Buildings must have Cool Roof Rating Council (CRRC) compliant reflective roofs which significantly reduce the need for insulation, especially in Hawaii’s mild climate. Reducing required insulation by 50% significantly reduces construction costs while minimally increasing interior temperatures.

16.16B.C402.2.3 Subsection C402.2.3 amended. Subsection C402.2.3 of the International Energy Conservation Code is amended to read as follows:

C402.2.3 Thermal resistance of above-grade walls. The minimum thermal resistance (R-value) of materials installed in the wall cavity between framing members and continuously on the walls shall be as specific in Table C402.1.3, based on framing type and construction materials used in the wall assembly.

Exceptions:

Continuous insulation for wood, mass, and metal framed walls are not required when one of the following conditions are met:

1. Walls have a covering with a reflectance of equal to or greater than 0.64.
2. Walls have overhangs with a projection factor equal to or greater than 0.3. The projection factor is the horizontal distance from the surface of the wall to the farthest most point of the overhang divided by the vertical distance from the first floor level to the bottom most point of the overhang.
3. Concrete, CMU, and similar mass walls 6 inches or greater in thickness.

The R-value of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3.

Mass walls shall include walls:

1. Weighing not less than 35 psf (170kg/m²) of wall surface area.
2. Weighing not less than 25 psf (120 kg/m²) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m³).
3. Having a heat capacity exceeding 7 Btu/ft² · °F (144 kJ/m² · K).
4. Having a heat capacity exceeding 5 Btu/ft² · °F (103 kJ/m² · K), where the material weight is not more than 120 pcf (1900 kg/m³).

SOH Justification - Modeling analysis shows that R-13 is the most impactful level of insulation for buildings and that removing continuous insulation on steel frame walls does not significantly impact whole building energy use. Adding shading to the wall system with a projection factor of at least 0.3 eliminates the need for continuous insulation in exterior wall systems resulting in an energy equivalent installation. In a tropical climate, the impact of wall insulation is diminished for commercial buildings with more importance placed on roof insulation and window solar heat gain coefficient (SHGC). Envelope trade-offs for residential construction can be extrapolated to commercial construction for wall systems allowing the trade-off for a projection factor on wall systems to work for both residential and commercial buildings.

Adding reflective coatings on wall systems is also an effective trade-off for continuous insulation in residential exterior wall systems. As with the projection factor, this trade-off can be transferred to commercial buildings as an energy neutral trade-off. A reflective coating trade-off for continuous insulation is appropriate for commercial wall systems by providing an energy neutral trade-off. The full analysis is contained in the “Analyses and Proposal of Hawaii Amendments to the 2015 International Energy Conservation Code.” dated May 2016.

COM Justification – Exception 3 will reduce the footprint of the structure when using mass wall, which will reduce construction cost.

16.16B.C402.4.3.5 Subsection C402.4.3.5 added. Subsection C402.4.3 Maximum U-factor and SHGC of the International Energy Conservation Code is amended by adding Subsection 402.4.3.5 to read as follows:

C402.4.3.5 Area-weighted SHGC. In commercial buildings, an area-weighted average of fenestration products shall be permitted to satisfy SHGC requirements.

SOH Justification – Modeling by the National Renewable Energy Laboratory (NREL) indicated that shading fenestration was as effective as solar heat gain coefficient (SHGC) requirements in Hawaii’s mild climate. Area weighting allows trade-offs between fenestration SHGC allowing a higher

SHGC to be installed on the North elevation and offsetting that with lower SHGC requirements for windows on the East, West, and South.

16.16B.C402.5 Subsection C402.5 amended. Subsection C402.5 of the International Energy Conservation Code is amended to read as follows:

C402.5 Air leakage—thermal envelope (Mandatory). The thermal envelope of buildings shall comply with Sections C402.5.1 through C402.5.8, or the building thermal envelope may [shall] be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) [or an equivalent method approved by the code official] and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft² (0.2 L/s • m²). Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

COM Justification – Due to concerns of timeliness, added costs, and availability of a certified contractor, this “blower door test” is being made optional instead of mandatory. The registered design professional may require this on behalf of the owner.

16.16B.C403.2.4.2.4 Subsection C403.2.4.2.4 added. Subsection C403.2.4.2 of the International Energy Conservation Code is amended by adding Subsection 403.2.4.2.4 to read as follows:

C403.2.4.2.4 Subsection C403.2.4.2.4 Door Switches. Opaque and glass doors opening to the outdoors in hotel and motel sleeping units, guest suites and time-share condominiums, shall be provided with controls that disable the mechanical cooling, or reset the cooling setpoint to 90° F or greater within five minutes of the door opening. Mechanical cooling may remain enabled if the outdoor air temperature is below the space temperature.

SOH Justification – This change will require automatic controls that reset the cooling system temperature in a hotel and motel sleeping unit, guest suites and time share condominiums when doors to the outdoors are let open. A similar requirement is contained in the American Society of Heating and Air-Conditioning Engineers (ASHRAE) 90.1-2013 Section 6.5.10. Research indicates that there is a potential for significant savings when in-room energy management systems are employed. A study by Pacific Gas and Electric as well as research by Magnum Energy Solutions, found that key card energy control systems provided an estimated savings of 35% - 45% per room. Additionally, prior research conducted for the State of Hawaii

indicated that occupancy-based guest room controls could provide at least 5% savings for the entire hotel.

A study conducted in 2002 by Jeff Stein of Taylor Engineering and created for the California Statewide Utility Codes and Standards Program estimated savings of almost 60% for operable windows and/or doors with switches versus operable windows and/or doors without switches. The full analysis is contained in the “Analyses and Proposal of Hawaii Amendments to the 2015 International Energy Conservation Code.

16.16B.C405.2 Subsection C405.2 amended. Subsection C405.2 of the International Energy Conservation Code is amended as follows:

C405.2 Lighting controls (Mandatory). Lighting systems shall be provided with controls as specified in Sections C405.2.1, C405.2.2, C405.2.3, C405.2.4 and C405.2.5.

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency egress lighting that is normally off.
4. Spaces that use 60% or less of designated watts per square foot are exempt from sections C405.2.2 (Time-switch controls) and C405.2.3 (Daylight-responsive controls).

SOH Justification – Electrical engineers, including speakers at the 2017 National Energy Codes Conference, indicate that compliance with the lighting controls are difficult and may result in non-compliance. By reducing lighting power density, a 40% energy savings is realized while reducing design, installation and maintenance costs. Including Section C405.1 (occupant sensor controls) is the simplest, most cost effective and most easily maintained control system.

Including C405.2.4 (specific application controls) is necessary to cover control of hotel and motel guest room lighting as tourism is ubiquitous in Hawaii.

Studies indicate that 85% of the savings in lighting is attributable to the LED sources, and 15% to the controls.

16.16B.C405.2.4 Subsection C405.2.4 amended. Subsection C405.2.4 of the International Energy Conservation Code is amended to read as follows:

C405.2.4 Specific applications controls. Specific application controls shall be provided for the following:

1. Display and accent light shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
2. Lighting in cases used for display case purposes shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
3. Hotel and motel sleeping units, [and] guest suites and time-share condominiums shall be have a master control device that is capable of automatically switching off all installed luminaires and switched receptacles within 20 minutes after all occupants leave the room.

Exception: Lighting and switched receptacles controlled by captive key systems.

4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided that the control device is readily accessible.
5. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.
6. Lighting equipment that is for sale or for demonstrations in lighting education shall be controlled by a dedicated control that is independent of the controls for other lighting within the room or space.

SOH Justification – The current 2015 IECC code language only includes a master control device for hotel and motel sleeping units and guest suites. Time share condominiums are added to the requirements because they have the same transient use pattern as a hotel and motel overnight room and the energy savings potential will be similar.

16.16B.C405.10 Subsection C405.10 added. Section C405 Electrical Power and Lighting Systems of the International Energy

Conservation Code is amended by adding Subsection 405.10 to read as follows:

C405.10 Sub-metering (Mandatory). In new buildings with tenants, metering shall be collected for individually for each tenant occupying 1,000 ft² (total enclosed and unenclosed) (93 m³) or more. Tenants shall have access to data collected for their space. A tenant is defined as “one who rents or leases from a landlord.”

SOH Justification – Numerous studies indicate that sub-metering, combined with tenant access to consumption data, results in substantial energy use reduction and is cost effective.

16.16B.C406.3 Subsection C406.3 amended. Subsection C406.3 of the International Energy Conservation Code is amended to read as follows:

C406.3 Reduced lighting power density. The total interior lighting power (watts) of the building shall be determined by using [90] 80 percent of the lighting power values specified in Table C405.4.2(1) times the floor area for the building types, or by using [90] 80 percent of the interior lighting power allowance calculated by the Space-by-Space Method in Section C405.4.2.

SOH Justification – The current code was written in 2014, allowing Hertz’s law to have considerable effect. Reducing lighting power density also reduces construction costs by requiring fewer fixtures.

16.16B.C407.3 Subsection C407.3 amended. Subsection C407.3 of the International Energy Conservation Code is amended to read as follows:

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (proposed design) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design. Energy prices shall be taken from a reputable source [approved by the code official], such as the Department of Energy, Energy Information Administration’s State Energy Price and Expenditure Report. [Code officials shall be permitted to require time-of-use pricing in energy cost calculations.] Nondepletable energy collected off site shall be treated and priced the same as purchased energy. Energy from nondepletable energy sources collected on site shall be omitted from the annual energy cost of the proposed design.

COM Justification – Due to the lack of qualified staff (i.e., mechanical engineer, energy engineer, etc.), references to the code official are deleted.

Pursuant to Subsection C103.1, we rely on the certification of the registered design professional to ensure compliance with this subsection.

16.16B.C407.4 Subsection C407.4 deleted in its entirety.

Subsection C407.4 of the International Energy Conservation Code is deleted in its entirety.

COM Justification – This subsection requires documentation verifying that the methods and accuracy of compliance software tools conform to the provisions of this section be provided to the code official. Pursuant to Subsection C103.1, we rely on the certification of the registered design professional to ensure compliance with this subsection.

16.16B.C407.4.1 Subsection C407.4.1 amended. Subsection C407.4.1 of the International Energy Conservation Code is amended to read as follows:

C407.4.1 Compliance report. [Permit submittals shall include a] A report documenting that the proposed design has annual energy costs less than or equal to the annual energy costs of the standard reference design shall be submitted to the owner or owner’s representative. The compliance documentation shall include the following information:

1. Address of the building.
2. An inspection checklist documenting the building component characteristics of the proposed design as specified in Table C407.5.1(1). The inspection checklist shall show the estimated annual energy cost for both the standard reference design and the proposed design.
3. Name of individual completing the compliance report.
4. Name and version of the compliance software tool.

COM Justification - The compliance report should be under the purview of the owner or owner’s representative. The County of Maui does not monitor annual energy costs.

16.16B.C407.6 Subsection C407.6 amended. Subsection C407.6 of the International Energy Conservation Code is amended to read as follows:

C407.6 Calculation software tools. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between

the standard reference design and the proposed design and shall include the following capabilities.

1. Building operation for a full calendar year (8,760 hours).
2. Climate data for a full calendar year (8,760 hours) and shall reflect approved coincident hourly data for temperature, solar radiation, humidity and wind speed for the building location.
3. Ten or more thermal zones.
4. Thermal mass effects.
5. Hourly variations in occupancy, illumination, receptacle loads, thermostat settings, mechanical ventilation, HVAC equipment availability, service hot water usage and any process loads.
6. Part-load performance curves for mechanical equipment.
7. Capacity and efficiency correction curves for mechanical heating and cooling equipment.
8. Printed [code official] inspection checklist listing each of the proposed design component characteristics from Table C407.5.1(1) determined by the analysis to provide compliance, along with their respective performance ratings including, but not limited to, R-value, U-factor, SHGC, HSPF, AFUE, SEER, EF.

COM Justification – Due to the lack of qualified staff (i.e., mechanical engineer, energy engineer, etc.), references to the code official are deleted. Pursuant to Subsection C103.1, the County of Maui rely on the certification of the registered design professional to ensure compliance with this subsection.

16.16B.C407.6.1 Subsection C407.6.1 amended. Subsection C407.6.1 of the International Energy Conservation Code is deleted in its entirety.

COM Justification - The registered design professional is responsible for the calculation software tools and procedures.

16.16B.C407.6.3 Subsection 407.6.3 amended. Subsection C407.6.3 is amended to read as follows:

C407.6.3 Exceptional calculation methods. Where the simulation program does not model a design, material or device of the proposed

design, an exceptional calculation method [shall] may be used [where approved by the code official]. Where there are multiple designs, materials or devices that the simulation program does not model, each shall be calculated separately and exceptional savings determined for each. The total exceptional savings shall not constitute more than half of the difference between the baseline building performance and the proposed building performance. [Applications for approval of an] An exceptional method shall include all of the following:

1. Step-by-step documentation of the exceptional calculation method performed, detailed enough to reproduce the results.
2. [Copies of all] All spreadsheets used to perform the calculations.
3. A sensitivity analysis of energy consumption where each of the input parameters is varied from half to double the value assumed.
4. The calculations shall be performed on a time step basis consistent with the simulation program used.
5. The performance rating calculated with and without the exceptional calculation method.

COM Justification - The registered design professional is responsible for the exceptional calculation methods and procedures.

16.16B.C408.2 Subsection C408.2 amended. Subsection C408.2 of the International Energy Conservation Code is amended to read as follows:

C408.2 Mechanical systems and service water-heating systems commissioning and completion requirements. [Prior to the final mechanical and plumbing inspections, the] The registered design professional or approved agency shall provide evidence of mechanical systems commissioning and completion in accordance with the provisions of this section to the owner or owner's authorized agent.

Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner or owner's authorized agent and made available to the code official upon request in accordance with Sections C408.2.4 and C408.2.5.

Exceptions: The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity.
2. Systems included in Section C403.3 that serve individual dwelling units and sleeping units.

COM Justification - The registered design professional is responsible for the mechanical systems and service water-heating systems commissioning. The required documents should be submitted to the owner or owner's representative for their information and record.

16.16B.C408.2.4.1 Subsection C408.2.4.1 deleted in its entirety. Subsection C408.2.4.1 of the International Energy Conservation Code is deleted in its entirety.

COM Justification - Verification of submittal of the Preliminary Commissioning Report should be coordinated between the registered design professional and the owner or owner's representative.

16.16B.C408.3.1 Subsection C408.3.1 amended. Subsection C408.3.1 of the International Energy Conservation Code is amended to read as follows:

C408.3.1 Functional testing. [Prior to passing final inspection, the] The registered design professional shall provide to the owner or owner's representative 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 instruction. Functional testing shall be in accordance with Section C408.3.1.1 and C408.3.1.2 for the applicable control type.

COM Justification - This amendment simplifies and streamlines the functional testing process.

16.16B.C501.4 Subsection C501.4 amended. Subsection C501.4 of the International Energy Conservation Code is amended to read as follows:

C501.4 Compliance. Alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions and regulations for alterations, repairs,

additions and changes of occupancy or relocation, [respectively, in the International Building Code, International Fire Code, International fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code and NFPA 70.] as adopted by the authorities having jurisdiction.

SOH Justification - This amendment provides consistency with §107-25 Hawaii state building codes; requirements, Hawaii Revised Statutes.

16.16B.C503.3.1 Subsection C503.3.1 amended. Subsection C503.3.1 of the International Energy Conservation Code is amended to read as follows:

C503.3.1 Roof replacement. Roof replacement[s shall comply with Table C402.1.3 or C402.1.4 where the existing roof assembly is part of the building thermal envelope and contains insulations entirely above the roof deck.] of uninsulated roofs shall include at least one of the following:

1. Energy Star compliant roof covering
2. Radiant barrier
3. Attic ventilation via solar attic fan(s), or ridge ventilation, or gable ventilation.

SOH Justification – The Roofing Contractors of Hawaii reported that the 2015 IECC code requirement for insulating existing roofs would double the cost. This amendment provides an alternative compliance path which addresses the cost issue.

16.16B.R101.1 Title. Subsection R101.1 amended. Subsection R101.1 of the International Energy Conservation Code is amended to read as follows:

R101.1 Title. This code shall be known as the International Energy Conservation Code the County of Maui and shall be cited as such. It is referred to herein as “this code.”

16.16B.R101.4 Subsection R101.4 amended. Subsection R101.4 of the International Energy Conservation Code is amended to read as follows:

R101.4 Applicability. Where, in any specific case, different sections of this code or other adopted codes specify different materials, methods of construction or other requirements, the [most restrictive shall govern] code official shall determine which code requirement prevail. Where there

is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

COM Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.R102.1 Subsection R102.1 amended. Subsection R102.1 of the International Energy Conservation Code is amended to read as follows:

R102.1 General. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. The code official shall be permitted to approve an alternative material, design or method of construction where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code. The code official may allow lower energy conservation standards for nonstandard building materials, unique or limitations on design, special methods of construction, and geographical location. The code official may require construction plans, research reports, and tests prepared by a registered design professional in order to allow such lower standards.

COM Justification – The code should not prohibit nonstandard building materials like indigenous Hawaiian architecture and membrane structures, limitation on design like timber frame construction, open beam roofs, especially addition to existing conditions, geographical locations in valleys and other obstructions.

16.16B.R103.1 Subsection R103.1 deleted in its entirety and replaced. Subsection R103.1 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

R103.1 General. When the requirements in this code apply to a building as specified in Section R101, plans, specifications or other construction documents submitted for a building, electrical, or plumbing permit required by the jurisdiction shall comply with this code and shall be prepared, designed, approved, and observed by a registered design professional as required by Chapter 464 of the Hawaii Revised Statutes. The registered design professional shall provide on the plans a statement certifying that the project substantially conforms with this code.

Exception: Any building, electrical, or plumbing work that is not required to be prepared, designed, approved, or observed by a licensed architect or engineer pursuant to Chapter 464 of the Hawaii Revised Statutes.

COM Justification – This subsection is amended to provide compatibility with State of Hawaii laws and administrative rules.

16.16B.R103.3 Subsection R103.3 deleted in its entirety and replaced. Subsection R103.3 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

R103.3 Examination of documents. Examination of documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R103.4 Subsection R103.4 deleted in its entirety and replaced. Subsection R103.4 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

R103.4 Amended construction documents. Amended construction documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R103.5 Subsection R103.5 deleted in its entirety and replaced. Subsection R103.5 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

R103.5 Retention of construction documents. Retention of construction documents shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R104 Section R104 deleted in its entirety and replaced. Section R104 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION R104
INSPECTIONS

R104.1 General. Inspections shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R106.1.1 Subsection R106.1.1 amended. Subsection R106.1.1 of the International Energy Conservation Code is amended to read as follows:

R106.1.1 Conflicts. The code official shall make the final determination [W]where conflicts occur between provisions of this code and referenced codes and standards[, the provisions of this code shall apply].

COM Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.R106.1.2 Subsection R106.1.2 amended. Subsection R106.1.2 of the International Energy Conservation Code is amended to read as follows:

R106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the code official shall determine which shall take precedence, the provisions of this code or [, as applicable, shall take precedence over] the provisions in the referenced code or standard.

Justification – This will allow the code official to review code conflicts and make the most reasonable determination.

16.16B.R107 Section R107 deleted. Section R107 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION R107
FEES

R107.1 General. Fees shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in Chapter 16.26B, Maui

County Code or the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R108 Section R108 deleted. Section R108 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION R108
STOP WORK ORDER

R108.1 General. Stop work order shall comply with the provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R109 Section R109 deleted. Section R109 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

SECTION R109
VARIANCES AND APPEALS

R109.1 General. Variances and Appeals shall comply with the Variances and Appeals provisions of Chapter 1 of the International Building Code, as amended, in the current adopted International Building Code, as amended by the Maui County Code.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R201.3 Subsection R201.3 amended. Subsection R201.3 of the International Energy Conservation Code is amended to read as follows:

R201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the International Building code, [International Fire Code, International Fuel Gas Code, International Mechanical Code,

International Plumbing code] or the International Residential Code shall have the meanings ascribed to them in those codes.

COM Justification – This amendment is being made to refer to the same provisions in the International Building Code. This will provide consistency and avoid redundancy in administering the 2015 IECC.

16.16B.R401.2 Subsection R401.32 amended. Subsection R401.2 of the International Energy Conservation Code is amended to read as follows:

R401.2 Compliance. Projects shall comply with one of the following:

1. Sections R401.3 through R404.
2. Section R405 and the provisions of Sections R401 through R404 labeled “Mandatory.”
3. An energy rating index (ERI) approach in Section R406.
4. The Tropical zone requirements in Section R401.2.1

SOH Justification – This amendment provides clarifying language on the options available to the code user and specifically references the Tropical Zone requirements as an option.

16.16B.R401.2.1 Subsection R401.2.1 amended. Subsection R401.2.1 of the International Energy Conservation Code is amended to read as follows:

R401.2.1 Tropical zone. Residential buildings in the tropical zone at elevations below 2,400 feet (731.5 m) above sea level shall be deemed to comply with this chapter where the following conditions are met:

1. Not more than one-half of the [occupied space] dwelling unit is air conditioned at the time of initial construction.

COM Justification – The post installation of window and split systems are difficult to enforce.

2. The [occupied space] dwelling unit is not heated.

SOH Justification – Occupied space is changed to dwelling unit because occupied space includes all buildings within a project e.g. an unconditioned garage that would be considered out of the scope of this code provision. Dwelling unit is a more appropriate term.

3. Solar, wind or other renewable energy source supplies not less than [80] 90 percent of the energy for service water heating.

SOH Justification – Solar water heater systems per §196-6.5 Solar water heater systems required for new single-family residential construction Hawaii Revised Statutes are specified to be consistent with state legislation.

4. Glazing in [conditioned space has a] dwelling units shall have a maximum solar heat gain coefficient [of less than or equal to 0.40, or has an overhang with a projection factor equal to or greater than 0.30.] as specified in Table R401.2.1.

Table 401.2.1. Window SHGC Requirements

<u>Projection Factor of overhang from base of average window sill*</u>	<u>SHGC</u>
<u>< .30</u>	<u>.25</u>
<u>.30 - .49</u>	<u>.40</u>
<u>≥ .50</u>	<u>N/A</u>

***Exception:** North-facing windows with pf > .20 are exempt from the SHGC requirement.

SOH Justification – An SHGC projection factor trade-off is provided for the vertical fenestration SHGC to account for the shading effects of overhangs. This provides an energy neutral trade-off.

5. Skylights in dwelling units shall have a maximum U-factor as specified in Table R402.1.2.

SOH Justification – No thermal or SHGC requirements for skylights were included in Tropical Zone requirements. The skylight provision addition provides a link to the prescriptive requirements in the 2015 IECC. Installing lower SHGC skylights will reduce the cooling load in the space and will increase occupant comfort.

- [5.]6. Permanently installed lighting is in accordance with Section R404.

- [6.]7. [The exterior roof surface complies with one of the options in Table C402.3 or the roof/ceiling has insulation with an R-value of R-15 or greater. If present, attics above the insulation are vented and attics below the insulation are unvented.] The roof/ceiling complies with one of the following options:

A. Comply with one of the roof surface options in Table C402.3 and install R-13 insulation or greater.

B. Install R-19 insulation or greater.

If present, attics above the insulation are vented and attics below the insulation are unvented.

Exception: The roof/ceiling assembly are permitted to comply with Section R407.

SOH Justification – R-13 roof/ceiling insulation with the addition of a cool roof membrane or R-19 insulation only performs equally based on analysis. The analysis shows significant savings using insulation in addition to a cool roof membrane instead of relying on a cool roof membrane only.

- [7. Roof surfaces have a minimum slope of ¼ inch per foot of run. The finished roof does not have water accumulation areas.]
8. Operable fenestration provides ventilation area equal to not less than 14 percent of the floor area in each room. Alternatively, equivalent ventilation is provided by a ventilation fan.
9. Bedrooms with exterior walls facing two or more different directions shall have operable fenestration to provide for cross ventilation if the room layout permits [or exterior walls facing two directions].

COM Justification – Re-worded to clarify intent for cross ventilation.

10. Interior doors to bedrooms are capable of being secured in the open position.
11. A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.
12. Jalousie windows shall have an air infiltration rate of no more than 1.2 cfm per square foot (6.1 L/s/m²).

SOH Justification – This amendment increases air infiltration rates for jalousie windows for Tropical Zone houses. These windows aid cross ventilation which eliminates the need for air conditioning in semi-heated houses. Jalousie windows cannot meet the current

air infiltration rate of 0.3 cfm per square foot currently in the 2015 IECC.

13. Walls, floors, and ceilings separating air conditioned spaces from non-air conditioned spaces shall be constructed to limit air leakage in accordance with the requirements in Table R402.4.1.1. Blower door test is optional.

SOH Justification – Air sealing between the air conditioned space and non-air conditioned space is important to keep the space conditioning in the areas where it was intended. Sealing up assemblies between the two spaces will also reduce the possibility of moisture issues within the framed cavities.

16.16B.R401.3 Subsection R401.3 amended. Subsection R401.3 of the International Energy Conservation Code is amended to read as follows:

R401.3 Certificate (Mandatory). When required by the code official a [A] permanent certificate shall be completed by the builder or registered design professional and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and floor) and ducts outside conditioned spaces; U-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall list “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters.

COM Justification – This amendment carries over from the previously adopted 2006 IECC.

16.16B.R402.1 Subsection R402.1 amended. Subsection R402.1 of the International Energy Conservation Code is amended to read as follows:

R402.1 General (Prescriptive). The building thermal envelope shall meet the requirements of Sections R402.1.1 through R402.1.5.

Exception: The following low-energy buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this section shall be exempt from the building thermal envelope provisions of Section R402.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h · ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space-conditioning purposes.
2. [Those that do not contain conditioned space.] Unconditioned space that does not contain habitable space.

SOH Justification – The amended language ensures that habitable space, even if unconditioned, will be covered by the provisions of this code to increase occupant comfort and reduce the possibility of installing air conditioning in the future.

16.16B.R402 TABLE R402.1.2 amended. TABLE R402.1.2 of the International Energy Conservation Code is deleted in its entirety and replaced with the following:

**TABLE R402.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

<u>CLIMATE ZONE</u>	<u>FENESTRATION U-FACTOR^b</u>	<u>SKYLIGHT U-FACTOR^b</u>	<u>GLAZED FENESTRATION SHGC^{b, c}</u>	<u>CEILING R-VALUE^d</u>	<u>WOOD FRAME WALL R-VALUE^d</u>	<u>MASS WALL R-VALUE^e</u>	<u>FLOOR R-VALUE</u>	<u>BASEMENT WALL R-VALUE</u>	<u>SLAB R-VALUE & DEPTH</u>	<u>CRAWL SPACE WALL R-VALUE</u>
<u>1</u>	<u>NR</u>	<u>.75</u>	<u>.25</u>	<u>30</u>	<u>13</u>	<u>3/4</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>

For SI: 1 foot= 304.8 mm

- R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.
- The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in climate zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
- Fenestration on North facing and well shaded walls are exempt.
- R402.2 allows use of R407.
- The second R-value applies when more than half the insulation is on the interior of the mass wall. Concrete, CMU, and similar mass walls 6 inches in thickness are exempt.

COM Justification – Note e. Previous energy code did not have a R-value for mass walls. By not having this exemption mass walls will need to add another wall or layer to achieve the R-3/4 value. This would increase the overall floor area or reduce

the usable interior floor area of the structure and increase cost of mass wall construction.

16.16B.R402.2 Subsection R402.2 amended. Subsection R402.2 of the International Energy Conservation Code is amended to read as follows:

R402.2 Specific insulation requirements (Prescriptive). In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.13.

Exception: Above-grade walls and ceilings shall be permitted to comply with Section R407.

SOH Justification – The addition of a Points Option (see Section R407) provides energy neutral trade-offs allowing efficiencies in the wall system to be traded-off with increased efficiency levels in other parts of the building. This will allow a prescriptive trade-off for continuous insulation in metal framed walls to be traded off with reflective paint on the walls or shading the walls with an overhang. The full analysis and background information is contained in the “Analyses and Proposal of Hawaii Amendments to the 2015 International Energy Conservation Code.”

16.16B.R402.3.2 Subsection R402.3.2 amended. Subsection 402.3.2 of the International Energy Conservation Code is amended to read as follows:

R402.3.2 Glazed fenestration SHGC. Fenestration shall have a maximum solar heat gain coefficient as specified in Table R402.1.2. An area-weighted average of fenestration products more than 50-percent glazed shall be permitted to satisfy the SHGC requirements.

Dynamic glazing shall be permitted to satisfy the SHGC requirements of Table R402.1.2 provided the ratio of the higher to lower labeled SHGC is greater than or equal to 2.4, and the dynamic glazing is automatically controlled to modulate the amount of solar gain into the space in multiple steps. Dynamic glazing shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall not be permitted.

Exception: Dynamic glazing is not required to comply with this section when both the lower and higher labeled SHGC already comply with the requirements of Table R402.1.1.

SOH Justification – The added language links the allowance for an area weighted average SHGC with the specific SHGC requirement in Section R402.3.2. This change will clarify the requirement.

16.16B.R402.4.1.2 Subsection R402.4.1.2 amended. Subsection R402.4.1.2 of the International Energy Conservation Code is amended to read as follows:

R402.4.1.2 Testing. The building or dwelling unit [shall] may be tested and verified as having an air leakage rate not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ASTM E 779 or ASTM E 1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). [Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official.] Testing shall be performed at any time after creation of all penetrations of the building thermal envelope
During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, if installed at the time of the test, shall be open.
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.
5. Heating and cooling systems, if installed at the time of the test, shall be turned off.
6. Supply and return registers, if installed at the time of the test, shall be fully open.

COM Justification – Due to concerns of timeliness, added costs, and availability of a certified contractor, this “blower door test” is being made optional instead of mandatory. The registered design professional may require this on behalf of the owner.

16.16B.R403.5.5 Subsection R403.5.5 added. Subsection R403.5.5 of the International Energy Conservation Code is added to read as follows:

R403.5.5 Solar water heating. Solar water heating systems are required for new single-family residential construction pursuant to §196-6.5, HRS.

SOH Justification – Solar water heater systems per §196-6.5 Solar water heater systems required for new single-family residential construction Hawaii Revised Statutes are specified to be consistent with state legislation.

16.16B.R404.2 Subsection R404.2 added. Subsection R404.2 of the International Energy Conservation Code is added to read as follows:

R404.2 Ceiling fans (mandatory). A ceiling fan or ceiling fan rough-in is provided for bedrooms and the largest space that is not used as a bedroom.

SOH Justification – The effect of ceiling fans can be significant in increasing thermal comfort for the occupants of the space. Ceiling fans result in a perceived cooling effect of 5.4°F to 12.6°F based on fan speed (air speed of approximately 3.3 ft/s to 9.84 ft/s respectively). Ceiling fans, coupled with the thermal envelope requirements will reduce the need to cool the space with traditional air conditioning. At a minimum, the ceiling fan rough-in would allow the homeowner to easily install a ceiling fan after the house is occupied. The cost of the installation would include only the cost of the fan and installation. Without the rough-in the cost would include providing power to the fan location in addition to support for the fan which could be a barrier to installing fans in the house.

16.16B.R404.3 Subsection R404.3 added. Section R404 of the International Energy Conservation Code is amended by adding a new Subsection R404.3 to read as follows:

R404.3 Electrical vehicle charger power. An electrical rough-in for a future electrical vehicle may be installed in a garage/carport area.

SOH/COM – Provides low cost option for future installation of an electric vehicle charger.

16.16B.R405 TABLE R405.5.2(1) amended. TABLE R405.5.2(1) of the International Energy Conservation Code is amended as follows:

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass wall if proposed wall is mass; otherwise wood frame.	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table R402.1.4	As proposed
	Solar absorptance = 0.75	As proposed
	Remittance = 0.90	As proposed
	Type: same as proposed	As proposed
	Gross area: same as proposed	As proposed

Basement and crawl space walls	<i>U</i> -factor: from Table R402.1.4, with insulation layer on interior side of walls	As proposed
Above-grade floors	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	<i>U</i> -factor: as specified in Table R402.1.4	As proposed
Ceilings	Type: wood frame	As proposed
	Gross area: same as proposed	As proposed
	<i>U</i> -factor: as specified in Table R402.1.4	As proposed
Roofs	Type: composition shingle on wood sheathing	As proposed
	Gross area: same as proposed	As proposed
	Solar absorptance = 0.75	As proposed
	Emittance = 0.90	As proposed
Attics	Type: vented with aperture = 1 ft ² per 300 ft ² ceiling area	As proposed
Foundations	Type: same as proposed	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed	As proposed
Opaque doors	Area: 40 ft ²	As proposed
	Orientation: North	As proposed
	<i>U</i> -factor: same as fenestration from Table R402.1.4	As proposed
Vertical fenestration other than opaque doors	Total area ^b = (a)The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b)15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	<i>U</i> -factor: as specified in Table R402.1.4	As proposed
	SHGC: as specified in Table R402.1.2 except that for climates with no requirement (NR) SHGC = 0.40 shall be used.	As proposed
	Interior shade fraction: 0.92-(0.21 x SHGC for the standard reference design)	0.92-(0.21 x SHGC as proposed)
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed
Air exchange rate	Air leakage rate of 5 air changes per hour in climate zones 1 and 2, and 3 air changes per hour in climate zones 3 through 8 at a pressure of 0.2 inches w.g. (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than 0.01 x CFA + 7.5 x ($N_{br} + 1$) where: CFA = conditioned floor area N_{br} = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation.	For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate ^a . The mechanical ventilation rate ^b shall be in addition to the air leakage rate and shall be as proposed.

Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: $kWh/yr = 0.03942 \times CFA + 29.565 \times (N_{br} + 1)$ where: CFA = conditioned floor area N_{br} = number of bedrooms	As proposed
Internal gains	$IGain = 17,900 + 23.8 \times CFA + 4104 \times N_{br}$ (Btu/day per dwelling unit)	Same as standard reference design.
Internal mass	An internal mass for furniture and contents of 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element ^c but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs, 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls, as proposed, but with insulation required by Table R402.1.4 located on the interior side of the walls	As proposed
	For other walls, for ceilings, floors, and interior walls, wood frame construction	As proposed]
Heating systems ^[d, e]	[As proposed for other than electric heating without a heat pump, where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC-Commercial Provisions.] <u>Fuel type: same as proposed design.</u> <u>Efficiencies:</u> <u>Electric: Air-source heat pump with prevailing federal minimum standards.</u> <u>Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards.</u> <u>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards.</u> Capacity: sized in accordance with Section R403.7.	[As proposed] <u>As proposed</u> <u>As proposed</u> <u>As proposed</u> <u>As proposed</u>
Cooling systems ^[d, f]	[As proposed] <u>Fuel type: Electric</u> <u>Efficiency: in accordance with prevailing federal minimum standards.</u> Capacity: sized in accordance with Section R403.7.	<u>As proposed</u> <u>As proposed</u>
Service water heating ^[d, e, f, g]	[As proposed] <u>Fuel type: same as proposed design.</u> <u>Efficiency: in accordance with federal minimum standards.</u> Use: same as proposed design	[As proposed] <u>As proposed</u> <u>As proposed</u> $gal/day = 30 + (10 \times N_{br})$
[Thermal distribution systems]	[Duct insulation: From Section R403.2.1 A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the	[As tested or as specified in Table R405.5.2(2) if not tested. Duct insulation shall be as proposed.]

[Thermal distribution systems]	heating and cooling system efficiencies for all systems other than tested duct systems.] [For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft ² (9.29 m ²) of <i>conditioned floor</i> area at a pressure of differential of 0.1 inches w.g. (25 Pa).]	
[Thermostat]	[Type: Manual, cooling temperature setpoint = 75° F; Heating temperature setpoint = 72° F]	[Same as standard reference]

[For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the “Whole-house Ventilation” provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For the case of a proposed design without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.]

SOH Justification – Energy neutral trade-offs are proposed by including the ability to trade-off high efficiency heating, cooling and water heating system efficiencies with building envelope features.

16.16B.R407 SECTION R407 added. Section R407 of the International Energy Conservation Code is added to read as follows:

SECTION R407
POINTS OPTION

R407.1 General (Prescriptive). Above-grade walls and roofs are permitted to comply with the points option as an alternative to complying with Section R401.2.1 and R402.2.

R407.2 Requirements. One or more efficiency measures shall be selected for roof and above-grade wall systems from Table 407.1 that cumulatively equal or exceed 0 (zero) points. As an alternative, above-grade walls and roofs are permitted to comply separately by scoring 0 (zero) or greater.

TABLE R407.1
POINTS OPTION

		<u>Standard Home Points</u>	<u>Tropical Home Points</u>
<u>Wood Framed</u>			
	<u>R-13 Cavity Wall Insulation</u>	<u>0</u>	<u>1</u>
	<u>R-13 Wall Insulation + high reflectance walls⁴</u>	<u>1</u>	<u>2</u>
	<u>R-13 Wall Insulation + 90% high efficacy lighting and Energy Star Appliances⁵</u>	<u>1</u>	<u>2</u>
	<u>R-13 Wall Insulation + exterior shading wpf=0.3⁶</u>	<u>1</u>	<u>2</u>
	<u>R-19 Roof Insulation</u>	<u>-1</u>	<u>0</u>
	<u>R-19 Roof Insulation + Cool roof membrane¹ or Radiant Barrier³</u>	<u>0</u>	<u>1</u>
	<u>R-19 Roof Insulation + Attic Venting²</u>	<u>0</u>	<u>1</u>
	<u>R-30 Roof Insulation</u>	<u>0</u>	<u>1</u>
	<u>Ductless Air Conditioner⁷</u>	<u>1</u>	<u>1</u>
	<u>1.071 X Federal Minimum SEER for Air Conditioner</u>	<u>1</u>	<u>1</u>
	<u>1.142 X Federal Minimum SEER for Air Conditioner</u>	<u>2</u>	<u>2</u>
	<u>No air conditioning installed</u>	<u>Not Applicable</u>	<u>2</u>
	<u>House floor area ≤ 1,000 ft²</u>	<u>1</u>	<u>1</u>
	<u>House floor area ≥ 2,500 ft²</u>	<u>-1</u>	<u>-1</u>
	<u>Energy Star Fans⁸</u>	<u>1</u>	<u>1</u>
	<u>Install 1 kW or greater of solar electric</u>	<u>1</u>	<u>1</u>
<u>Steel</u>			

Framed			
	<u>R-13 +R 3 Wall Insulation</u>	<u>0</u>	<u>1</u>
	<u>R-13 cavity Wall insulation + R-0</u>	<u>-1</u>	<u>0</u>
	<u>R-13 Wall Insulation + high reflectance walls⁴</u>	<u>0</u>	<u>1</u>
	<u>R-13 wall insulation + 90% high efficacy lighting and Energy Star Appliances⁵</u>	<u>1</u>	<u>2</u>
	<u>R-13 Wall Insulation + exterior shading wpf=0.3⁶</u>	<u>0</u>	<u>1</u>
	<u>R-30 Roof Insulation</u>	<u>-1</u>	<u>0</u>
	<u>R-19 Roof Insulation</u>	<u>-1</u>	<u>0</u>
	<u>R-19 + Cool roof membrane¹ or Radiant Barrier³</u>	<u>0</u>	<u>1</u>
	<u>R-19 Roof Insulation + Attic Venting²</u>	<u>0</u>	<u>1</u>
	<u>Ductless Air Conditioner⁷</u>	<u>1</u>	<u>1</u>
	<u>1.071 X Federal Minimum SEER for Air Conditioner</u>	<u>1</u>	<u>1</u>
	<u>1.142 X Federal Minimum SEER for Air Conditioner</u>	<u>2</u>	<u>2</u>
	<u>No air conditioning installed</u>	<u>Not Applicable</u>	<u>2</u>
	<u>House floor area ≤ 1,000 ft²</u>	<u>1</u>	<u>1</u>
	<u>House floor area ≥ 2,500 ft²</u>	<u>-1</u>	<u>-1</u>
	<u>Energy Star Fans⁷</u>	<u>1</u>	<u>1</u>
	<u>Install 1 kW or greater of solar electric</u>	<u>1</u>	<u>1</u>

¹Cool roof with three-year aged solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75 or 3-year aged solar reflectance index of 64.

²One cfm/ft² attic venting.

³Radiant barrier shall have an emissivity of no greater than 0.05 as tested in accordance with ASTM E-408. The radiant barrier shall be installed in accordance with the manufacturer's installation instructions.

⁴Walls with covering with a reflectance of ≥ 0.64.

⁵Energy Star rated appliances include refrigerators, dishwashers, and clothes washers and must be installed for the Certificate of Occupancy

⁶The wall projection factor is equal to the horizontal distance from the surface of the wall to the farthest most point of the overhang divided by the vertical distance from the first floor level to the bottom most point of the overhang.

⁷All air conditioning systems in the house must be ductless to qualify for this credit.

⁸Install ceiling fans in all bedrooms and the largest space that is not used as a bedroom.

SOH Justification - The Points Option provides energy neutral trade-offs for different building assembly types. A prescriptive format was selected to increase

the usability of the compliance approach. Energy analysis and research was done to determine the point allowances for each feature. All of the features are given +/- 1 point with the exception of high efficiency cooling equipment which is either given one (1) or two (2) points based on the SEER rating. The options that are included in the code reflected trade-offs from earlier versions of the Hawaii code e.g. eliminating continuous insulation for metal framed walls by using reflective paint or high SEER cooling equipment as a trade-off for continuous insulation.

16.16B.R501.4 Subsection R501.4 amended. Subsection R501.4 of the International Energy Conservation Code is amended to read as follows:

R501.4 Compliance. Alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for alterations, repairs, additions and changes of occupancy or relocation, [respectively in the International Residential Code, International Building Code, International Fire Code, International Fuel Gas Code, International Mechanical Code, International Plumbing Code, International Property Maintenance Code, International Private Sewage Disposal Code and NFPA 70] as adopted by the authorities having jurisdiction.

*SOH Justification - This amendment provides consistency with **§107-25 Hawaii state building codes; requirements, Hawaii Revised Statutes.***

16.16B.R503.1.1 Subsection R503.1.1 amended. Subsection R503.1.1 is amended to read as follows:

R503.1.1 Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.2 or R402.1.4, Sections R402.2.1 through R402.2.12, R402.3.1, R402.3.2, R402.4.3 and R402.4.4

Exception: The following alterations need not comply with the requirements for new constructions provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed
4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.] Roof

replacement of uninsulated roofs which include at least one of the following:

- a. Energy Star compliant roof covering.
 - b. Radiant barrier.
 - c. Attic ventilation via solar attic fans, ridge ventilation, or gable ventilation.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided the code does not require the glazing or fenestration assembly to be replaced.

SOH Justification – The Roofing Contractors of Hawaii reported that the 2015 IECC code requirement for insulating existing roofs would double the cost. This amendment provides an alternative compliance path which addresses the cost issue.

SECTION 4. If any provision of this ordinance shall for any reason be held invalid or unconstitutional by a court of competent jurisdiction, such judgment shall not affect the validity of the remaining portions.

SECTION 5. Work performed under a permit issued before the effective date of this ordinance and which is inspected on or after the effective date shall be approved if it meets the requirements of either this code or the code being replaced by this ordinance.

SECTION 6. This ordinance shall apply to all applications for permits to be issued pursuant to Chapters 16.18B, 16.20B, and 16.26B, Maui County Code, that are deemed complete by the Department of Public Works on or after the effective date of this ordinance. Applications accepted before the effective date shall be approvable if it meets the requirements of either this chapter or the code being replaced by this ordinance.

SECTION 7. Material to be repealed is bracketed. New material is

underscored. In printing this bill, the County Clerk need not include the brackets, the bracketed material, or the underscoring.

SECTION 8. This ordinance shall take effect 90 days after its approval, but nothing in this ordinance shall be construed to prohibit any person from complying with the provisions of this chapter and any amendments thereto adopted prior to enactment of this ordinance.

APPROVED AS TO FORM AND LEGALITY:

Department of the Corporation Counsel
County of Maui

gau (w/justifications)1/06/19