

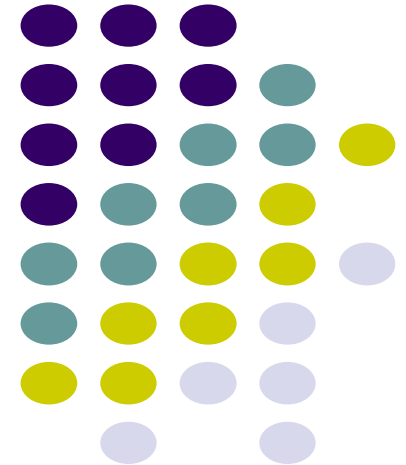
City of Scottsdale Energy Code Adoption



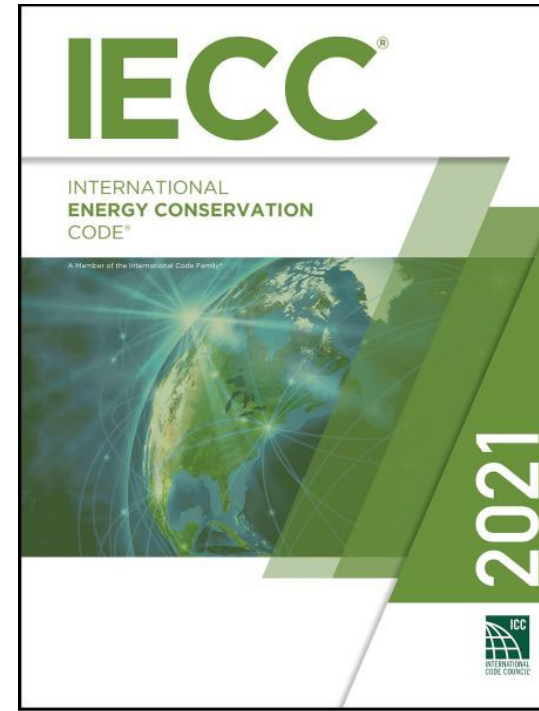
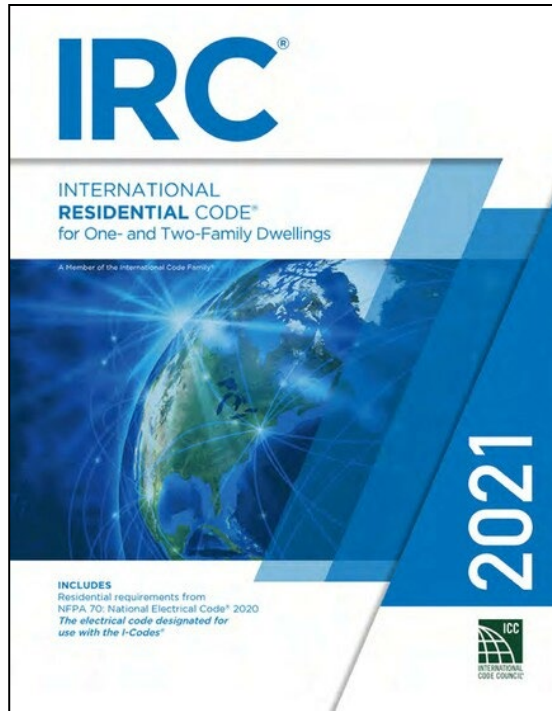
Top 10 Commercial Energy Code Changes 2021 International Energy Conservation Code

April 16, 2024

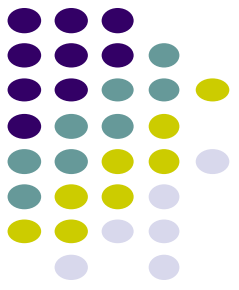
Anthony Floyd, FAIA, LEED BD+C, CEM
Office of Environmental Initiatives
Planning and Development
Community and Economic Development
City of Scottsdale



The IRC and IECC codes became effective January 7, 2023

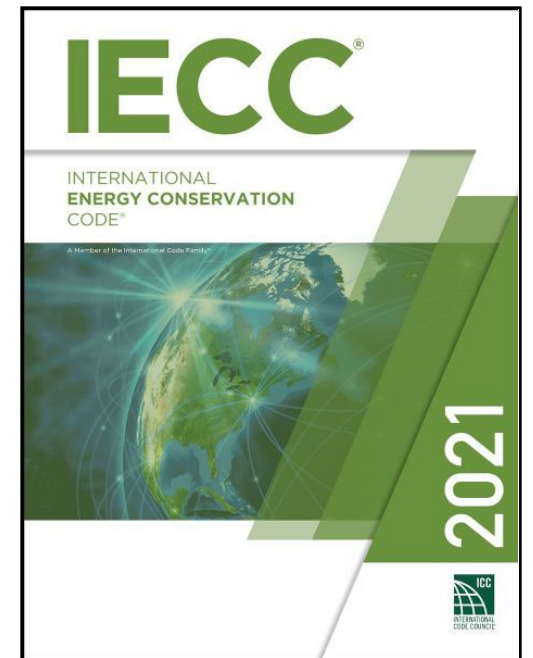


IECC for Multifamily and Commercial



- **Top 10 Energy Code Changes**

1. Thermal envelope certificate/air leakage
2. Cool roofs for low slope roofs
3. Demand control ventilation and energy recovery
4. Automatic HVAC controls in hotel guestrooms
5. Lighting controls and power allowance
6. Automatic receptacle control in offices
7. EV capable charging infrastructure
8. Rooftop solar-ready zones
9. Additional efficiency requirement options
10. Commissioning of mechanical and lighting systems



Highlighted text applies to both new construction and tenant improvements. All others only apply to new construction.

1 Thermal Envelope Certificate – C401.3

- A permanent thermal certificate shall be completed by the builder or other *approved* party and posted on a wall in the space where the furnace is located, a utility room or other *approved* location:
 1. *R*-values of insulation in or on ceilings, roofs and walls.
 2. *U*-factors and *solar heat gain coefficient*.
 3. Results from any building envelope air leakage testing.

Commercial Thermal Envelope Certificate

Name of Designer/Builder: _____ Location (address): _____
 Energy Code Edition: _____
 2021 IECC: Yes No Permit Date: _____
 ASHRAE 90.1-2019 Yes No Permit #: _____
 Other (please indicate): _____ Building Area (sf): _____

1. Insulation Rating			
Designation	R-Value <small>(per assembly)</small>	% <small>(of component)</small>	R-Value <small>(area-weighted average)</small>
Ceiling/Roof	<input type="text"/>	<input type="text"/>	<input type="text"/>
Walls (Above Grade)	<input type="text"/>	<input type="text"/>	<input type="text"/>
(Above Grade)	<input type="text"/>	<input type="text"/>	<input type="text"/>
(Below Grade)	<input type="text"/>	<input type="text"/>	<input type="text"/>
(Below Grade)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Floors/Slabs	<input type="text"/>	<input type="text"/>	<input type="text"/>
Ducts	<input type="text"/>	<input type="text"/>	<input type="text"/>
<small>(Unconditioned space)</small>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<small>(Outdoor ducts)</small>	<input type="text"/>	<input type="text"/>	<input type="text"/>

2. Fenestration Rating					
Designation	NFRC U-Factor <small>(per assembly)</small>	NFRC SHGC <small>(per assembly)</small>	% <small>(of component)</small>	NFRC U-Factor <small>(area-weighted average)</small>	NFRC SHGC <small>(area-weighted average)</small>
Window	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Opaque door	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Skylight	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

3. Air Leakage Test Results

Blower door cfm/sf 75 Pa. Test date: Tested by:

smartenergy.illinois.edu/energy-code/ | 800.214.7954 | energycode@illinois.edu

1 Air Leakage - Thermal Envelope – C402.5

● Air Barriers

- IgCC deletes exception for climate zone 2B
- Accepted air barrier materials and assemblies
- Inspection of continuous air barrier installation
- Commissioning report by design professional or approved 3rd party entity

- or -

● Air Leakage Testing of Thermal Envelope

- Measured air leakage shall not exceed 0.40 cfm/ft² of the building thermal envelope area.





Energy Compliance Certificate

2021 IECC – Commercial

Includes multifamily (R-1; R-2) not covered under IECC residential.

Plan Review No.: _____ Permit No.: _____

Project Name: _____ Date: _____

Address: _____ Plan Check No.: _____

OWNER'S NOTIFICATION OF ENERGY INSPECTIONS

To be completed and signed by **Owner** before a building permit is issued.

In accordance with Sections C105.4 of the International Energy Conservation Code, the code official is authorized to accept reports of third-party inspection agencies for verification of energy compliance. I, as owner/legal agent, do hereby certify that I have retained _____ to be responsible for the energy inspections.

(Registered design professional or 3rd party energy inspection agency) - please print

Owner's Name: _____ Owner's Signature: _____ Date: _____

CERTIFICATE OF RESPONSIBILITY

To be signed by the registered design professional or 3rd party energy inspection agency before the building permit is issued.

As the registered design professional or 3rd party energy inspection agency, I certify that I am familiar with the design of the project and hereby assume full responsibility for carrying out the required energy inspections in accordance with Section C105 of the International Energy Conservation Code.

Signature of licensed design professional or energy inspection representative.

Print name: _____

Company name: _____

Date: _____

CERTIFICATE OF COMPLIANCE

To be signed by the registered design professional or 3rd party energy inspection agency before the C of O is issued.

I certify that, to the best of my knowledge, the requirements of the IECC and approved plans/specifications have been complied with, insofar as the portion of work requiring energy inspections, except for previously reported deviations. A guarantee that the building is in full accordance is neither intended nor implied.

Signature of licensed design professional or energy inspection representative.

Print name: _____

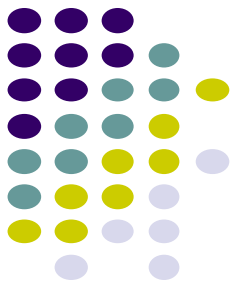
Company name: _____

Date: _____

LIST OF REQUIRED COMMERCIAL ENERGY INSPECTIONS

1.	<u>Thermal envelope</u> (C105.2.2) – Continuous air barrier components.
2.	<u>Plumbing system</u> (C105.2.3) – Hot water pipe insulation, efficient supply piping, circulation systems and controls.
3.	<u>Mechanical system</u> (C105.2.4) – HVAC equipment, controls, system insulation, dampers, fan efficiency, required economizers and energy recovery ventilation.
4.	<u>Electrical system</u> (C105.2.5) – Lighting system controls and components.
5.	<u>Final inspection</u> (C105.2.6) – Verification of installation, operations, controls and <u>commissioning report</u> per Section C408.

Building Envelope Performance Verification– C402.5.1.5

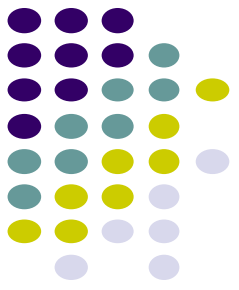


2 Cool/Light Reflective Coated Roofs

Low Slope roofs (less than 2 in 12 slope) – C402.3

- Minimum solar reflectance index (SRI) of 64 over conditioned and non-conditioned spaces
- Required under both prescriptive and performance compliance paths

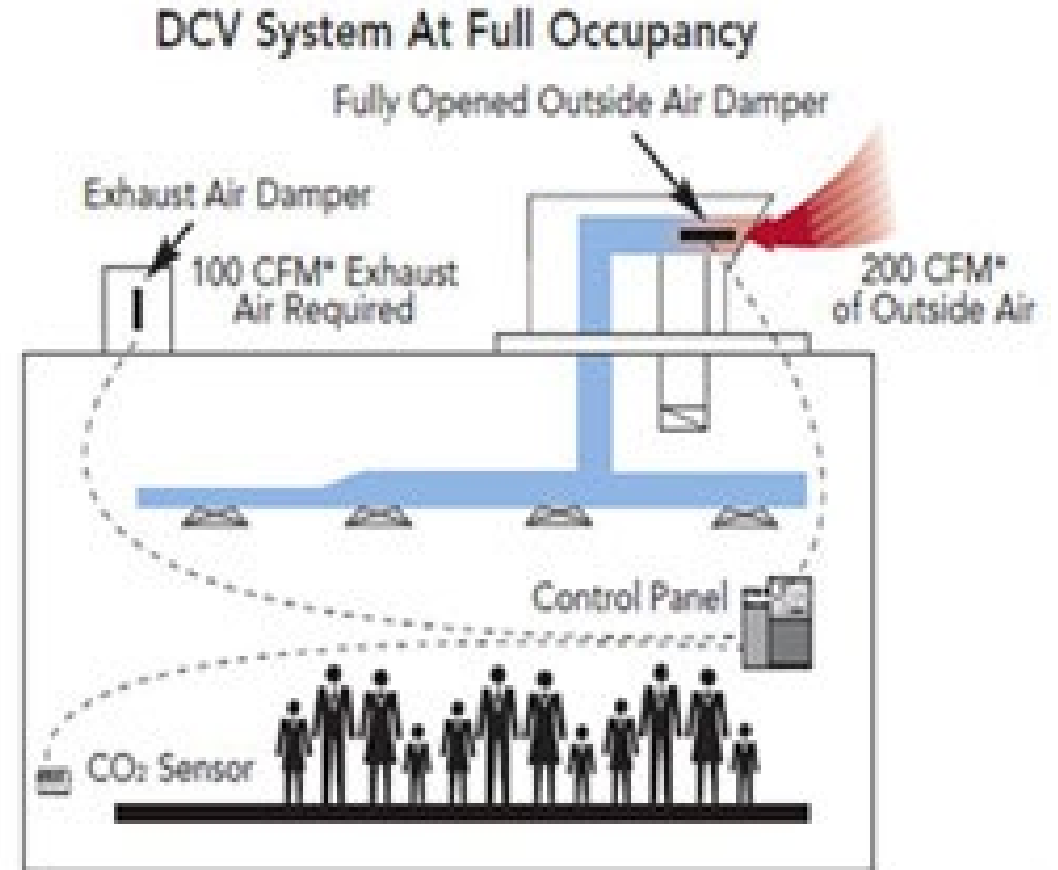


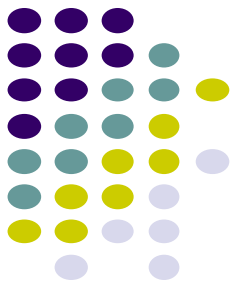


3

Demand Control Ventilation – C403.7.1

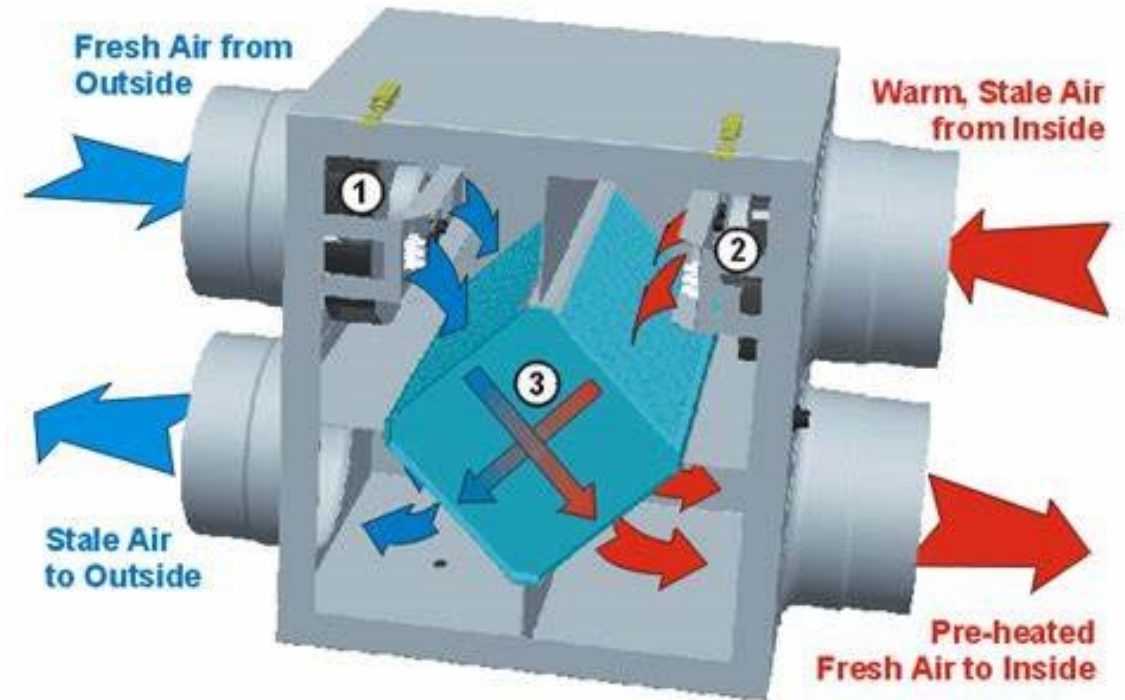
- Required for spaces larger than 500 sf and with an average occupant load of 15 people or greater per 1,000 sf of floor area
- Exceptions include systems supplied with an energy recovery ventilation system

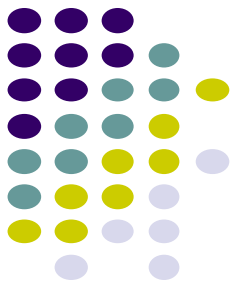




3 Energy Recovery Systems – C403.7.4

- Non-transient dwelling units
 - Exceptions:
 - Dwelling units not more than 500 sf
 - Enthalpy recovering ratio at heating design condition
- Spaces other than non-transient dwellings
 - Required where supply airflow rate of fan system exceeds values specified in Tables C403.7.4.2(1) and (2)
 - Exceptions include enthalpy recovering ratio at heating design condition



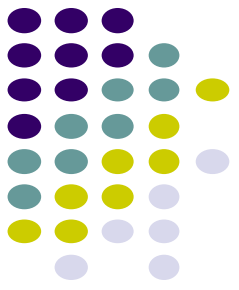


4 Automatic HVAC System Controls in Hotel Guestrooms – C403.7.6

- Group R-1 buildings containing more than 50 guestrooms
 - Temperature setpoint control on each HVAC system that are capable of and configured with three modes of temperature control
 - Rented but unoccupied
 - Unrented and unoccupied
 - Occupied
 - Ventilation controls
 - Automatically turn off ventilation and exhaust fans within 30 minutes of occupants leaving the guestroom

Networked guestroom control system

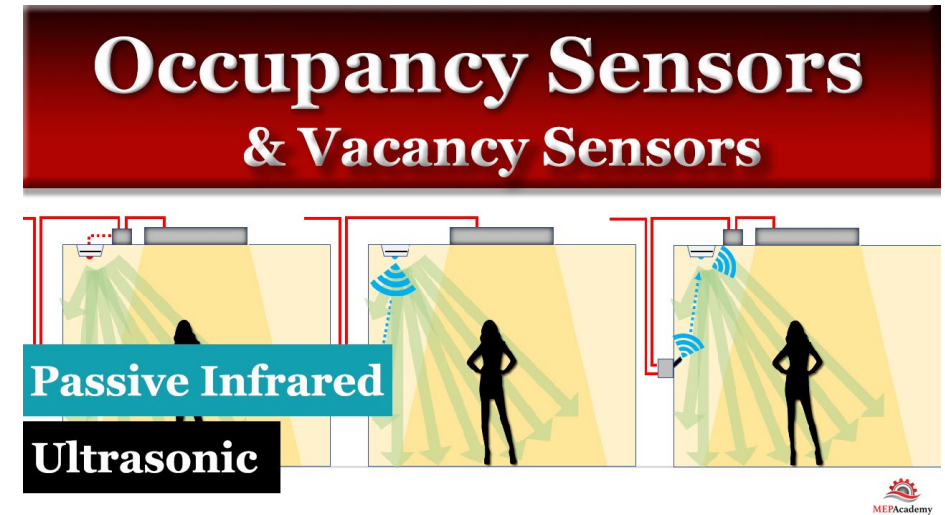




5 Occupant Sensor Controls C405.2.1

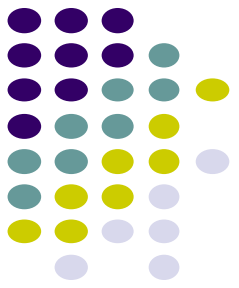
- Occupant sensor controls shall be installed to control lights in the following space types:

1. Classrooms/lecture/training rooms.
2. Conference/meeting/multipurpose rooms.
3. Copy/print rooms.
4. Lounges/breakrooms.
5. Enclosed offices.
6. Open plan office areas
7. Restrooms.
8. Storage rooms.
9. Locker rooms.
10. Corridors.
11. Warehouse storage areas.
12. Other spaces 300 square feet or less that are enclosed by floor-to-ceiling height partitions.



5

Time-Switch Controls C405.2.2



- Where not provided with occupant sensor controls, general lighting shall be provided with time-switch controls that comply with the following:
 1. Automatically turn off lights when the space is scheduled to be unoccupied.
 2. Have a minimum 7-day clock.
 3. Setting capability for seven different day types per week.
 4. Automatic holiday “shutoff” feature.
 5. Have program backup capabilities to prevent loss of settings if power is interrupted.
 6. Override switch with manual control that when initiated, permit the controlled lighting to remain on for not more than 2 hours for an area not larger than 5,000 sq. ft.

LUMINAIRE LEVEL LIGHTING CONTROLS

Simple Installation
Sensors and control programming are integrated into fixtures for straightforward setup out of the box.

Occupant Comfort
With the ability to adjust each individual fixture, LLLCs boost occupant comfort and productivity.

Flexible Control
Adaptable for changes in space usage, LLLCs reduce cost of change-over to new occupants.

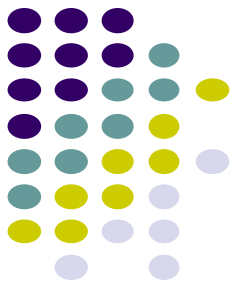
Savings
Energy savings of 25 to 75%, and decreased installation and maintenance costs.

Better Lighting
Overall light quality is improved with LED and sensor light fixtures.

Building Improvement
LLCs can enable emergency lighting, demand response, asset tracking and integrate with other building systems.

SMARTER CONTROLS, BIG BENEFITS
Combining LEDs with integrated controls and sensors, Luminaire Level Lighting Controls (LLC) offer a single solution that will improve buildings, deliver maximum energy savings and enable long-term flexibility.

BETTERBRICKS

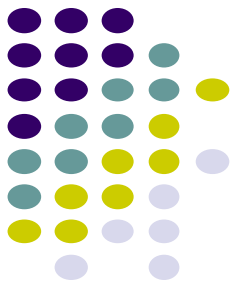


5

Light Reduction Controls C405.2.3

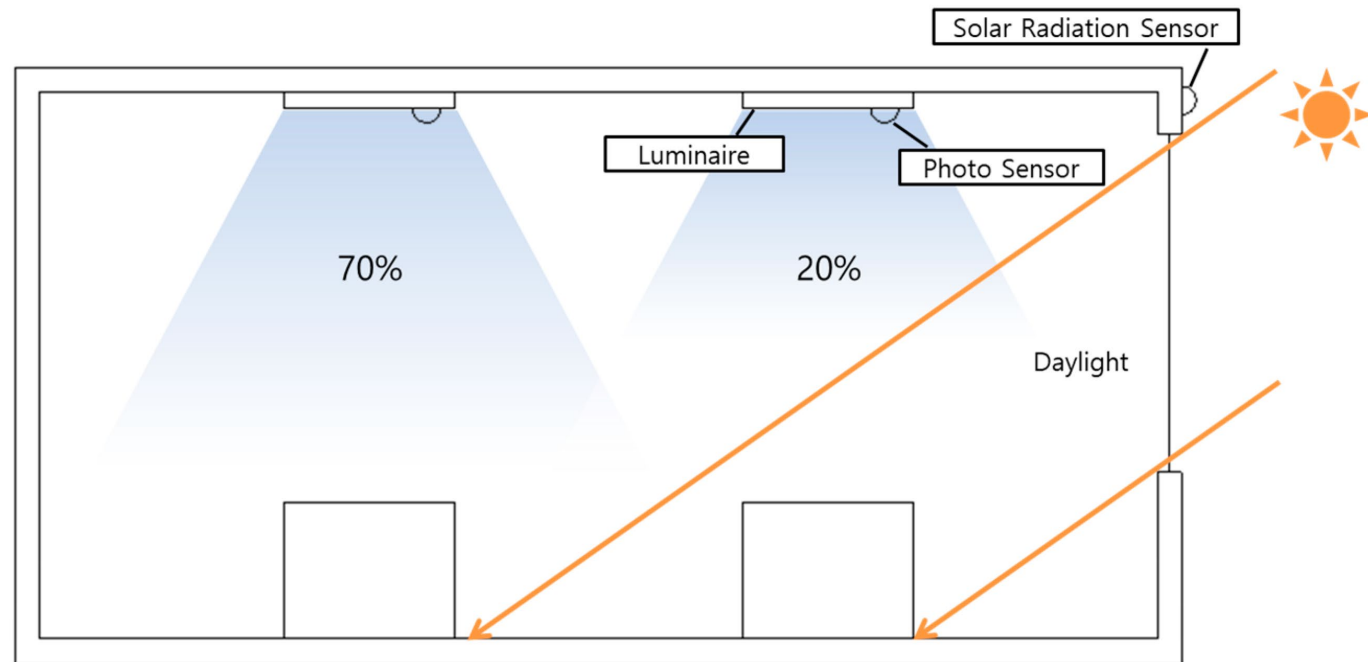
- Where not provided with occupant sensor controls, general lighting shall be provided with one of the following light-reduction controls
 - Manual control that allows the occupant to reduce the connected lighting load by not less than 50% in a uniform illumination pattern with an intermediate step in addition to full on/off position; or
 - Continuous dimming control; or
 - Switching alternate luminaires or rows of luminaires to achieve a reduced output

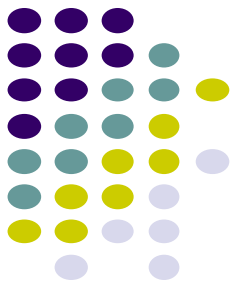




5 Daylight-Responsive Controls C405.2.4

- Daylight-responsive controls shall be provided to control the general lighting within daylight zones in the following spaces:
 - Spaces with more than 150 watts of general lighting within primary sidelit daylight zones.
 - Spaces with more than 300 watts of general lighting within sidelit daylight zones.
 - Spaces with more than 150 watts of general lighting within toplit daylight zones.



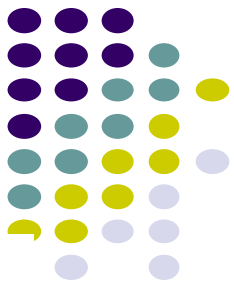


5

Parking Garage Lighting Control- C405.2.8

- Parking garage lighting shall be controlled by an occupant sensor or a time-switch control. Additional lighting controls shall be provided as follows:
 - Lighting power of each luminaire shall be automatically reduced by not less than 30 percent when there is no activity detected within a lighting zone for 20 minutes.
 - Lighting zones for this requirement shall be not larger than 3,600 sq. ft.





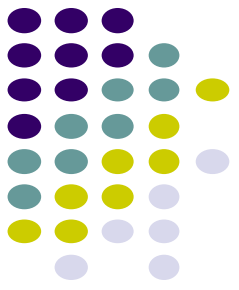
5

Reduced Lighting Power Allowances C405.3.2

- Interior lighting power allowance
 - Measured in watts per sq. ft.
 - Sometimes referred to as lighting power density (LPD)
 - It serves as a yardstick by which the total connected interior lighting power is measured to determine whether a building is within limits for interior lighting power

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

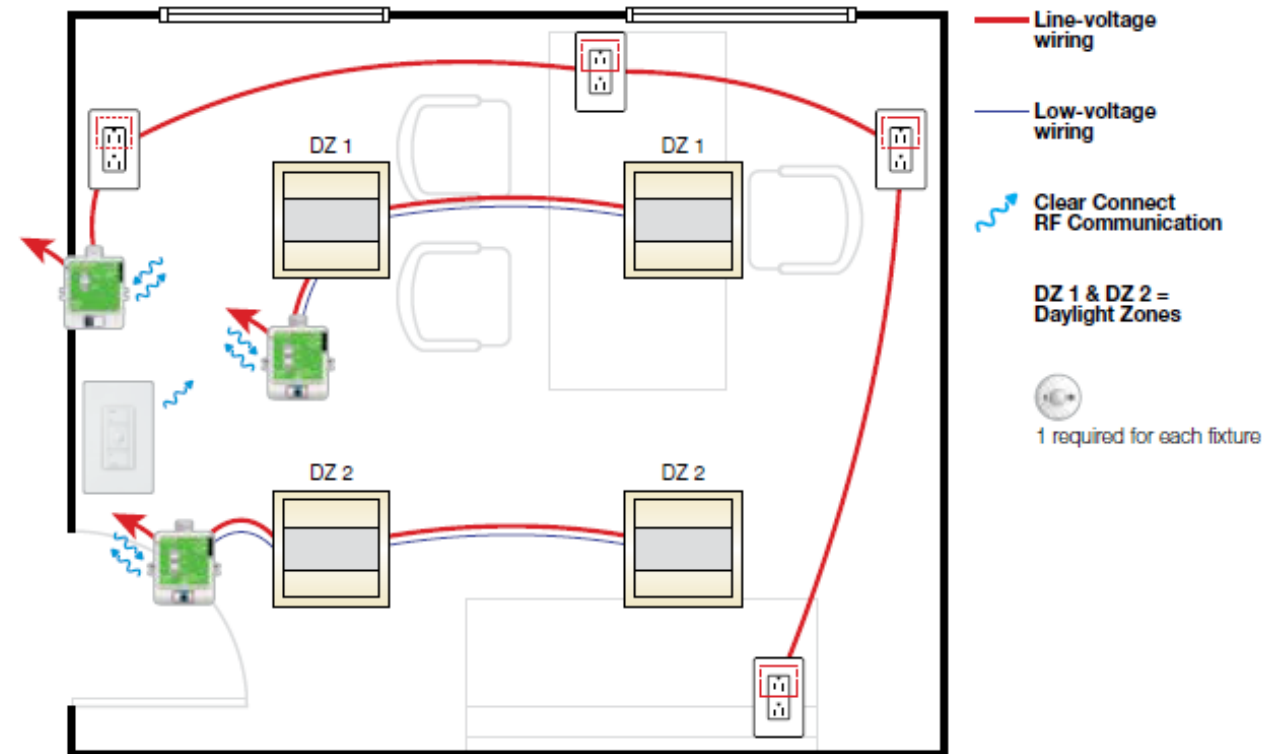
BUILDING AREA TYPE	LPD (watts/ft ²)
Automotive facility	0.75
Convention center	0.64
Courthouse	0.79
Dining: bar lounge/leisure	0.80
Dining: cafeteria/fast food	0.76
Dining: family	0.71
Dormitory ^{a, b}	0.53
Exercise center	0.72
Fire station ^a	0.56
Gymnasium	0.76
Health care clinic	0.81
Hospital ^a	0.96
Hotel/Motel ^{a, b}	0.56
Library	0.83
Manufacturing facility	0.82
Motion picture theater	0.44
Multiple-family ^c	0.45
Museum	0.55
Office	0.64

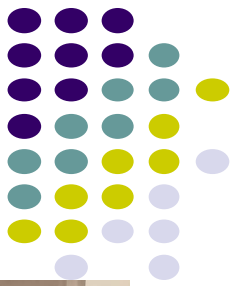


6

Automatic Receptacle Control – C405.11

- At least 50% of all 125V, 15- and 20-amp receptacles located in:
 - Enclosed offices, conference rooms, breakrooms, classrooms and individual workstations provided with either:
 - Split controlled receptacles or
 - Controlled receptacle within 12 inches of each uncontrolled receptacle





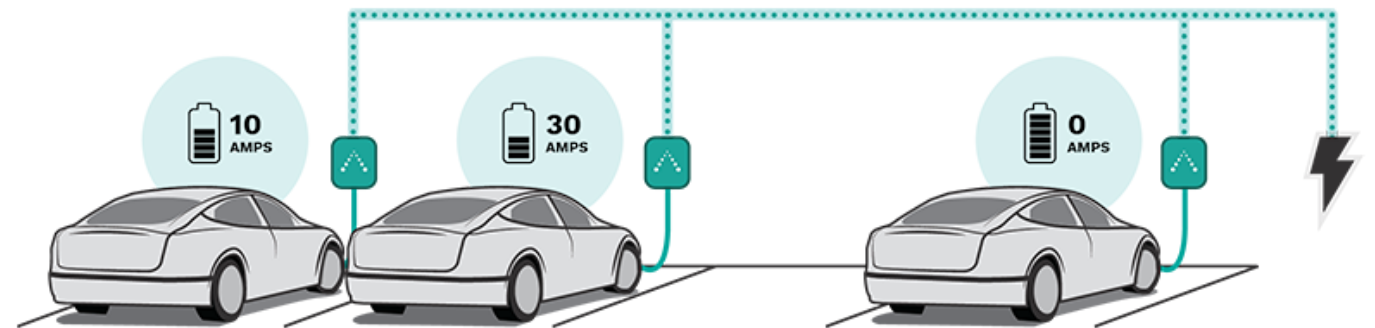
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Electric Vehicle Capable Charging – C405.13

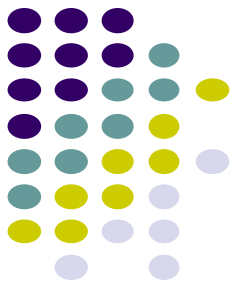
● EV-capable for new multifamily & hotels



- 4%-installed and 20% EV-capable parking spaces shall provide accommodates for future EV charging (ALMS)
- For EV-capable, reserve electrical service panel space for future circuit breakers labeled “Future EV Charging”
- Install raceway from the electrical service panel to parking area, with junction box or outlet labeled “Future EV Charging”.



Source: EverCharge SmartPower



8

Solar-Ready Zones – CB103

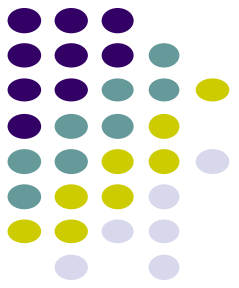
- Minimum 40% of roof area free and clear of obstructions including mechanical equipment and vents
- Provide electrical pathway for conduit run from solar-ready zone to electrical service panel with reserved space for 2-pole circuit breaker(s)
- Capped roof penetration sleeve shall be provided on roofs with a slope of 1 in 12 or less



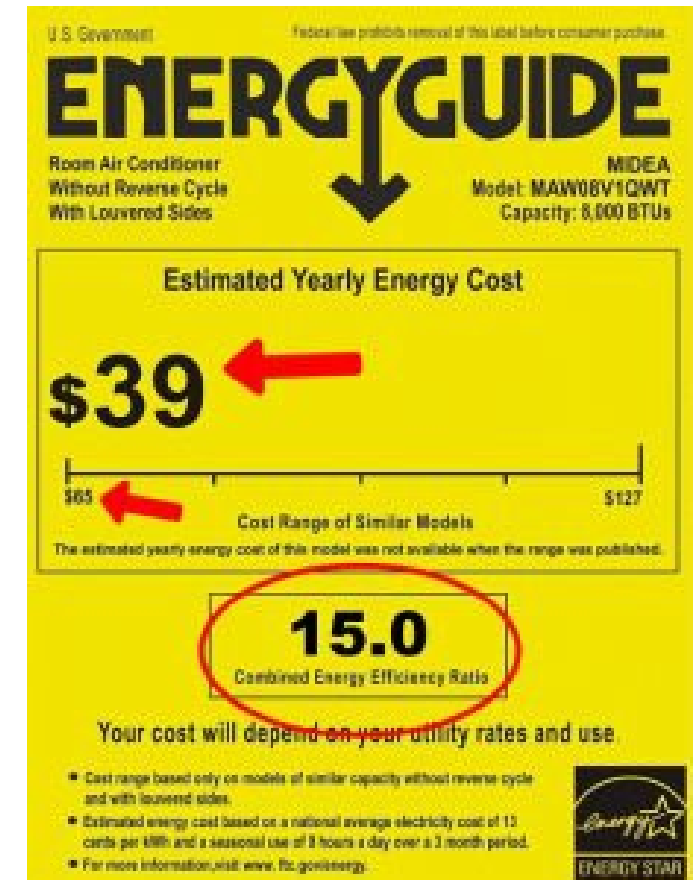
Credit: Carlisle Roof Foam

9

Additional Efficiency Requirements C406 Prescription Compliance Path – 10 credits

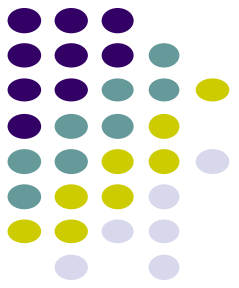


1. More efficient HVAC equipment performance
2. Reduced lighting power
3. Enhanced lighting controls
4. On-site renewable energy
5. Dedicated outside air system
6. High efficiency service water-heating
7. Enhanced envelope performance
8. Reduced air infiltration
9. Energy monitoring system
10. Fault detection and diagnostics system
11. Efficient kitchen equipment



10

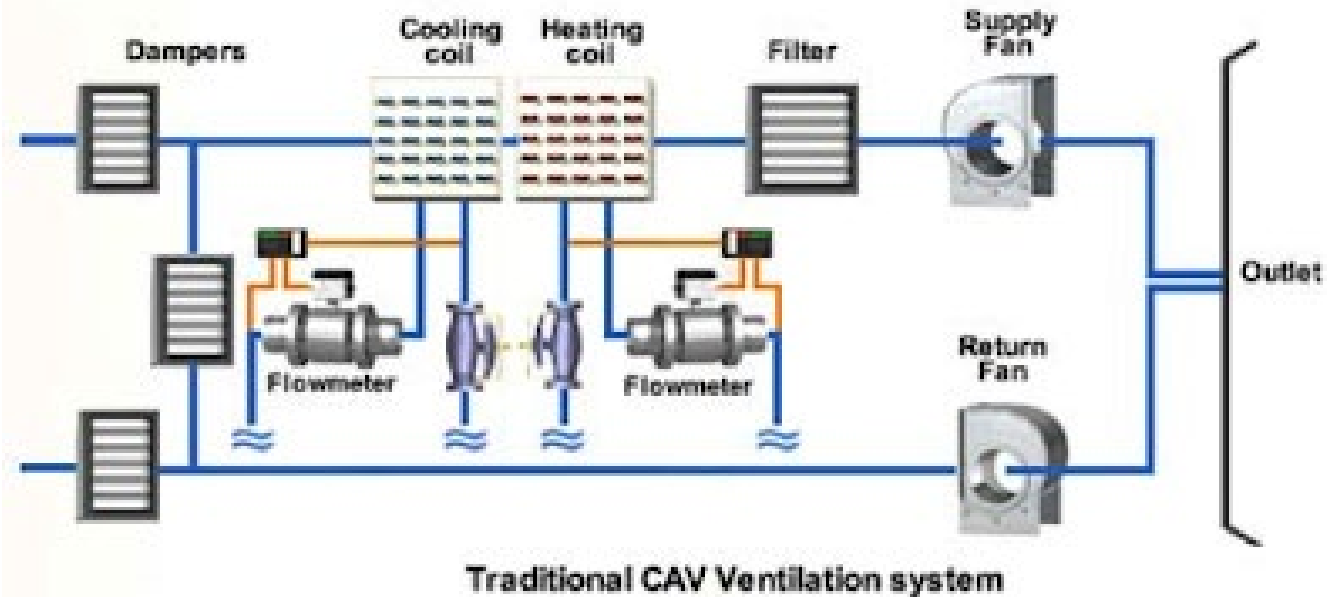
Maintenance Information and System Commissioning - C408



● Functional Testing of Mechanical and Service Water-heating Systems – C408.2

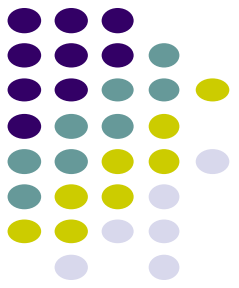
Exceptions :

- Total mechanical equipment capacity less than 180,000 Btu/h (15 tons) for cooling, 300,000 Btu/h (87.9 kW) for space-heating and 10,000 cfm for ventilation.
- Service water-heating systems rated under 50,000 Btu/h.



10

Maintenance Information and System Commissioning - C408



● Functional Testing of Lighting Fixtures – C408.3

- Lighting control systems shall be tested to ensure control hardware and software are calibrated, adjusted, programmed and in proper working condition.
 - Occupant sensor controls
 - Time-switch controls
 - Daylight responsive controls
- Operation manuals
- Report
 - Performance test results

LIGHTING SYSTEM FUNCTIONAL TESTING

PER IECC C408.3, AN APPROVED PARTY, INDEPENDENT FROM THE CONSTRUCTION OF THE PROJECT SHALL BE RESPONSIBLE FOR THE FUNCTIONAL TESTING AND SHALL PROVIDE DOCUMENTATION TO THE BUILDING OFFICIAL CERTIFYING THAT THE INSTALLED LIGHTING CONTROLS MEET THE PROVISIONS OF IECC C405.

WHERE OCCUPANT SENSORS, TIME SWITCHES, PROGRAMMABLE SCHEDULE CONTROLS, PHOTO SENSORS OR DAYLIGHTING CONTROLS ARE INSTALLED, THE FOLLOWING PROCEDURES SHALL BE PERFORMED:

1. CONFIRM THAT THE PLACEMENT, SENSITIVITY, AND TIME-OUT ADJUSTMENTS FOR OCCUPANT SENSORS YIELD ACCEPTABLE PERFORMANCE.
2. CONFIRM THAT THE TIME SWITCHES AND PROGRAMMABLE SCHEDULE CONTROLS ARE PROGRAMMED TO TURN THE LIGHTS OFF.
3. CONFIRM THAT THE PLACEMENT AND SENSITIVITY ADJUSTMENTS FOR PHOTO SENSOR CONTROLS REDUCE ELECTRIC LIGHT BASED ON THE AMOUNT OF USABLE DAYLIGHT IN THE SPACE AS SPECIFIED.

FUNCTION TESTING SHALL BE IN ACCORDANCE WITH SECTIONS C408.3.1.1 THROUGH C408.3.1.3 FOR THE APPLICABLE CONTROL TYPE.

ALL TEST DOCUMENTATION AND MANUALS PER IECC C408.3.2 SHALL BE PROVIDED IN A TIMELY MANNER AND PRESENTED TO THE PARTIES REQUIRING THEM.

FUNCTIONAL TESTING OF LIGHTING CONTROLS (IECC C408.3)

Prior to passing final inspection, the registered design professional or approved agency 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 (occupant sensor controls), C408.3.1.2 (time-switch controls), and C408.3.1.3 (daylight responsive controls) for the applicable control type. All test documentation, including manuals and reports shall comply with C408.3.2.

Plan Review Correction Stamps

IECC COMMISSIONING

IECC Section C408 requires commissioning of mechanical systems, service water-heating, and lighting controls. Construction document shall clearly indicate provisions for commissioning and completion requirements in accordance with the provisions of the code.

A commissioning plan shall be developed and submitted to the city as a part of plan review by a registered design professional or approved agency in accordance with IECC Section C408.2.1.

In addition, complete the following Commissioning Certificate form – [2021+IECC+Commercial+Commissioning+Certificate.pdf \(scottsdaleaz.gov\)](https://www.scottsdaleaz.gov/2021+IECC+Commercial+Commissioning+Certificate.pdf)



Commercial Commissioning Certificate 2021 IECC or ASHRAE 90.1-2019

Project Name: _____ Date: _____

Address: _____ Plan Check No.: _____ Permit No.: _____

OWNER'S NOTIFICATION OF COMMISSIONING

To be filled in and signed by Owner before a building permit is issued.

The International Energy Conservation Code (IECC) and ASHRAE 90.1 requires a registered design professional or commissioning agency to ensure buildings are designed, constructed, and commissioned in accordance with the approved plans, specifications and commissioning plan.

I, as owner/legal agent, do hereby certify that I have retained _____ to be responsible for building commissioning services in accordance with this certificate.

Signed: _____ Print name: _____
(Signature of owner or legal representative)

Relation to Project (owner/legal agent): _____ Date: _____

COMMISSIONING RESPONSIBILITY

To be filled in and signed by the registered design professional or commissioning agency before a building permit is issued.

As the commissioning agency for the above-named project, I certify that I am familiar with the design of the project and hereby assume full responsibility for carrying out the required commissioning responsibilities in accordance with this certificate.

Signed: _____ Print name: _____
(Signature of registered design professional or commissioning agency)

Design Professional Registration Number: _____ Expiration Date: _____

Name of Commissioning Agency: _____ Date: _____
(registered design professional or commissioning agency must be independent from the contractor responsible for the work being inspected)

Processed by _____ Date _____
City Plans Examiner

IECC COMMISSIONING REQUIREMENTS (Section C408)

IECC Section C408 requires commissioning of the building mechanical systems, service water-heating, lighting controls and continuous air barrier (Section C402.5.1.5). Construction document shall clearly indicate provisions for commissioning and completion requirements in accordance with the provisions of the code.

Exceptions: The following mechanical and service water-heating systems are exempt:

1. Mechanical systems in buildings where the total mechanical equipment capacity is less than 180,000 Btu/h (15 tons) for cooling capacity, 300,000 Btu/h (87.9kW) for space-heating and 10,000 cfm for ventilation.
2. Service water-heating systems rated under 50,000 Btu/h (14.7kW).
3. Water pumping and mixing systems under 5 hp (4kW).
4. Systems included in Section C403.5 that serve individual *dwelling units and sleeping units.*

ASHRAE 90.1-2019 COMMISSIONING REQUIREMENTS (Section 4.2.5)

ASHRAE 90.1 Section 4.2.5.2 requires commissioning of the building mechanical systems, service water-heating, lighting controls and building envelope. Commissioning requirements shall be incorporated into the construction documents.

Exceptions: The following mechanical and service water-heating systems are exempt:

1. Buildings, additions, or alterations with less than 10,000 ft² of conditioned space and combined heating, cooling, and service water heating equipment totaling less than 960,000 Btu/h in capacity.
2. Buildings or portions of buildings that use the Simplified Approach Option for HVAC Systems in Section 6.3.
3. Dwelling units.
4. Nonrefrigerated warehouses.

COMMISSIONING PLAN

A commissioning plan shall be developed and submitted to the city as a part of plan review by a registered design professional or approved agency in accordance with IECC Section C408.2.1 or ASHRAE 90.1 Section 4.2.5.2.2 and ASHRAE 202 Section 7.

BUILDING OPERATIONS AND MAINTENANCE INFORMATION

Building operations and maintenance documents shall be provided to the owner in accordance with IECC C408.1.1 or ASHRAE 90.1 Section 4.2.2.3.

PRELIMINARY COMMISSIONING REPORT

A preliminary report of commissioning test procedures and results shall be completed and certified by the registered design professional or approved agency and provided to the building owner or the owner's authorized agent. The report shall be organized in accordance with IECC Section C408.2.4 or ASHRAE 90.1 Section 4.2.5.2.2.

FINAL COMMISSIONING REPORT

A system balancing report shall be written describing the activities and measurements completed in accordance with IECC Section C408.2.5.1 or ASHRAE 90.1 Section 6.7.3.3 and ASHRAE 202 Section 14.

A final commissioning report shall be delivered to the building owner or owner's authorized agent. The report shall be organized in accordance with IECC Section C408.2.5.2 and C408.3.2.3 or ASHRAE 90.1 Section 4.2.5.2.2 and ASHRAE 202 Section 17.

CERTIFICATE OF COMPLIANCE

To be signed by commissioning agency prior to Certificate of Occupancy issuance.

I certify that, to the best of my knowledge, the requirements of the International Energy Conservation Code or ASHRAE 90.1 including approved plans and specifications have been complied with, insofar as the portion of the work requiring verification and commissioning in accordance with the responsibilities listed on this certificate. A preliminary commissioning report has been provided to the building owner indicating that the work was or was not completed in conformance with the approved construction documents and discrepancies have been brought to the attention of the contractor for correction.

Within 90 days of the date of receipt of the Certificate of Occupancy, an operating and maintenance information, system balancing report and final commissioning report shall be provided to the building owner in accordance with this certificate. Contractor's responsibilities shall be in accordance with the performance obligations set by the Arizona Registrar of Contractors.

Signed: _____ Print name: _____
(Signature of approved commissioning agency representative)

Name of Commissioning Agency: _____ Date: _____
(commissioning agency must be independent from the contractor responsible for the work being inspected)

Copy – to be maintained in plan review records after the Commissioning Responsibility box is signed.

Original – to be retained by commissioning agency until completion of project and Certificate of Compliance is signed; then returned to Building Inspections prior to issuance of Certificate of Occupancy.

Planning and Development
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