



# International Energy Conservation Code 2012



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IECC 2012:  
Electrical Changes &  
Solutions

# + Meet your Presenters:



## ■ Joe Crapo

- Joe Crapo is the Principal electrical engineer at Intrepid Engineering, a MEP consulting firm, which he help found ten years ago. He is a registered professional electrical engineer and has been involved in a lighting design for over 16 years. During this time he has designed projects for commercial, educational, public works, sports & recreational, industrial, medical, residential and transportation projects. Mr. Crapo is experienced in providing lighting solutions to meet those requirements. Prior to his work in consulting engineering he worked as an electrician to help pay for his education that he received at UNLV. Mr. Crapo is the current president of the Illuminating Engineering Society Las Vegas Section.

## ■ Jon Foster

- Jon Foster works at Professional Design Associates, where he has worked since 1999. Jon is a licensed Professional Engineer in Electrical Engineering, and has been the lead engineer and lighting designer on various local park and casino projects, for both new and retrofit.





Adoption of the Code and Southern Nevada  
Amendments

+  
**January 1, 2014**

City of Las Vegas will not Adopt the Code

Clark County will begin mandatory enforcement July 7, 2014

# + General Changes

A major formatting change was made to split the residential and commercial provisions of the code.

The 2012 IECC has the commercial provisions in the front of the book with a “C” preceding each section.

Residential provisions are in the back with a “R” preceding each section.

## C1.01.4.3 Additions, Alterations or Repairs

### 2012 IECC (without amendments):

The following need not comply provided the energy use of the building is not increased:

7. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

### 2012 IECC (Southern Nevada Amendments):

The following need not comply with the applicable provisions of the code, provided the AHJ deems the energy use of the building is not increased:

7. Alterations that replace less than 50 percent of the luminaires in a room or space provided that such alterations do not increase the installed interior lighting power of Sec. C405.5.2. Altered rooms or spaces created within the remodeled area must still comply with the switching requirements of section C405.2.

9. Relocations only of existing luminaires within an area enclosed by existing walls or floor-to-ceiling partitions are exempted from lighting power requirements of Sec. C405.5.2. Altered rooms or spaces created within the remodel area must still comply with the switching requirements of section C405.2.



This section in the base code (without amendments) is the same as the 2009 IECC. The Southern Nevada Amendments changed this. No longer tied to the existing condition but to the new allowed lighting power densities (LPD).

## + C401.2 Application

This section outlines the options for compliance

2012 IECC: Must comply with one of the following:

Option 1 – ANSI/ASHRAE/IESNA 90.1

Option 2 - The requirements of section C402 (envelope), C403 (Mechanical), C404 (Service Water Heating) & C405 (Lighting). In addition, commercial buildings shall comply with either Section C406.2 (efficient HVAC performance), C406.3 (efficient lighting system) or C406.4 (onsite supply of renewable energy).

Option 3 – Total Building performance method (energy model for entire building) along with the envelope, mechanical, water heating and lighting sections (C402, C403, C404 & C405) (no substantial change from 2009 IECC)

2009 IECC:

Required compliance with the envelope, HVAC, Water Heating and Lighting but did not require the additional efficiency measures.



# EfficientLighting



## + C401.2.1 Application to existing buildings

2012 IECC:

Additions, alterations & repairs to existing buildings shall comply with one of the following:

1. Sections C402 (envelope), C403 (HVAC) & C405 (lighting)
2. ANSI/ASHRAE/IESNA 90.1

This is a new section to clarify the requirements as they apply to existing buildings.



## + C405.1 Electrical Power and Lighting Systems

2012 IECC:

Exception: Dwelling Units within commercial buildings shall not be required to comply with sections C405.2 through C405.5 provided that not less than 75% of the permanently installed light fixtures, other than low voltage lighting, shall be fitted for, and contain only, high efficacy lamps

2009 IECC:

Previous code only required 50% have high efficacy lamps

SOLUTION:

High efficacy lamps defined as compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps or

>60 lumens/W for lamps over 40W

>50 lumens/W for lamps 15-40W

>40 lumens/W for lamps less than 15W





## + C405.2.1.2 Light Reduction Controls

2012 IECC:

Exceptions:

1. Areas that have only one luminaire with rated power less than 100 watts.
2. Corridors, equipment rooms, restrooms, public lobbies, electrical or medical rooms
3. Daylight spaces complying with Section C405.2.2.3.2 (automatic daylighting controls).

2009 IECC:

1. Old code use to not have a wattage limitation.
2. Equipment rooms, electrical or mechanical rooms have added to the list.
3. The addition of automatic daylight controls





## C405.2.2.1 : Automatic Time Switch Control Devices

2012 IECC: Automatic time switch controls shall be installed to control lighting in all areas of the building.

2009 IECC: Automatic time switch controls were only required in buildings larger than 5K SF





## C405.2.2.2 : Occupancy Sensors (New Section)

2012 IECC:

Occupancy sensors shall be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, storage rooms and janitorial closets, and other spaces 300 square feet (28 square meters) or less enclosed by floor-to-ceiling height partitions. These automatic control devices shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, and shall either be manual on or shall be controlled to automatically turn the lighting on to not more than 50 percent power.

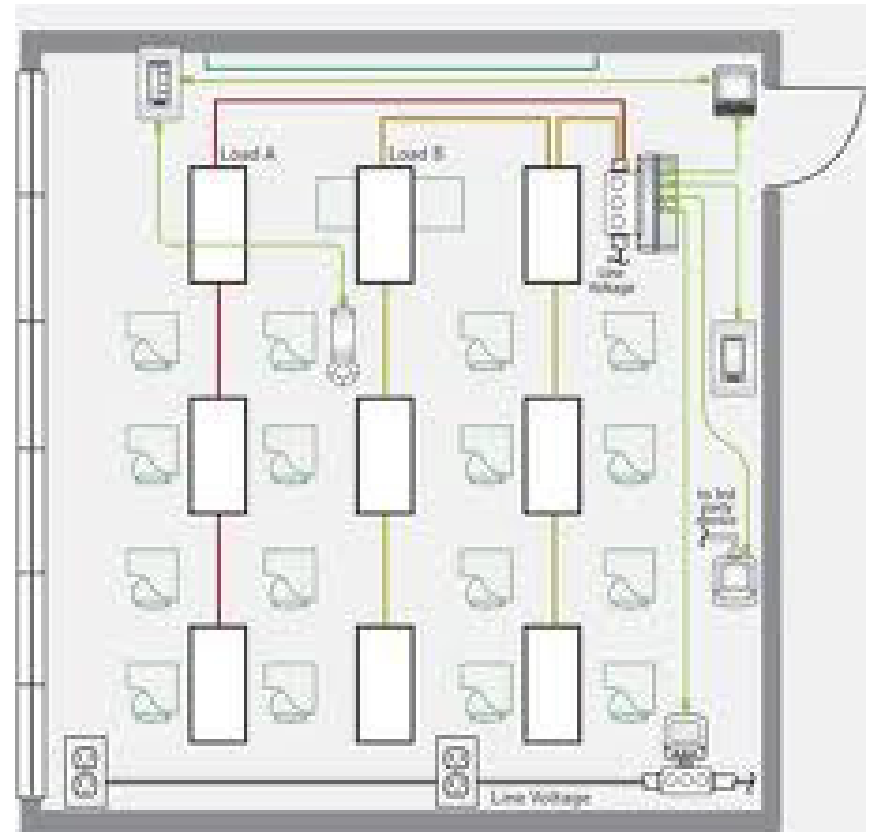
Exception: Full automatic-on controls shall be permitted to control lighting in public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.



## + C405.2.2.3 Daylight Control Zone

2012 IECC: Controlled independently of general area lighting and are controlled in accordance with either Section C405.2.2.3.1 (manual) or Section C405.2.2.3.2 (automatic)

Each daylight control zone shall not exceed 2,500 square feet (232 square meters).





# Daylight Controls



## C405.2.2.3.1 Manual Daylighting Controls

- Manual controls shall be installed in daylight zones unless automatic controls are installed in accordance with Section C405.2.2.3.2
- No real change here. It is the minimum code requirement that was included in 2009 IECC.

## C405.2.2.3.2 Automatic Daylighting Controls

- Automatic Daylighting Controls – new section that states that if automatic controls are used then they have to meet a specific criteria including set-points/controls readily accessible and automatically reduce light by
  1. Continuous dimming (dimming ballasts and daylight-sensing automatic controls that reduce lighting continuously to less than 35% of rated power at maximum light output.
  2. Stepped dimming using multi-level switching and daylight-sensing controls that reduce lighting power automatically. Must have two control channels per zone and control steps at 50-70% of design lighting power and less than 35% of design lighting power.



# C405.2.2.3.3

## Multi-level lighting Controls



Where multi-level lighting controls are required by this code, the general lighting in the daylight zone shall be separately controlled by at least one multi-level lighting control that reduces the lighting power in response to daylight available in the space. Where the daylit illuminance in the space is greater than the rated illuminance of the general lighting of daylight zones, the general lighting shall be automatically controlled so that its power draw is no greater than 35% of its rated power. The multi-level lighting control shall be located so that calibration and set point adjustment controls are readily accessible and separate from the light sensor.

Meaning... if your lighting (daylighting) is brighter than the interior lights in the daylight zone then automatic daylighting controls will be required.

## C405.2.3 Specific Application Controls

This is a new section that addresses control requirements for lighting that was previously not addressed. Some of these have special allowances or exemptions elsewhere in the code so separate controls are required.

2012 IECC:

Display and accent lighting to switch separately from general lighting.

Display case lighting to switch separately from general lighting.

Hotel/Motel sleeping units to have master control device at room entry.

Supplemental task lighting to have switch on the fixture or wall mounted control at readily accessible location.

Lighting for non-visual applications (grow-lights, heat lamps, etc.) to have separate controls.

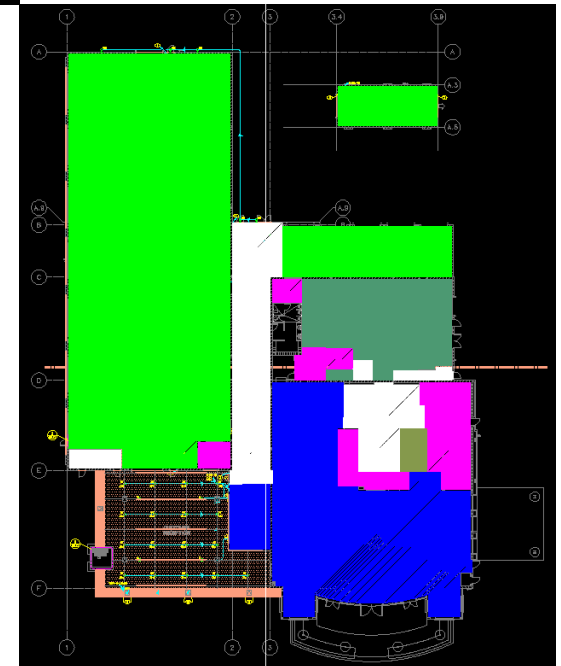
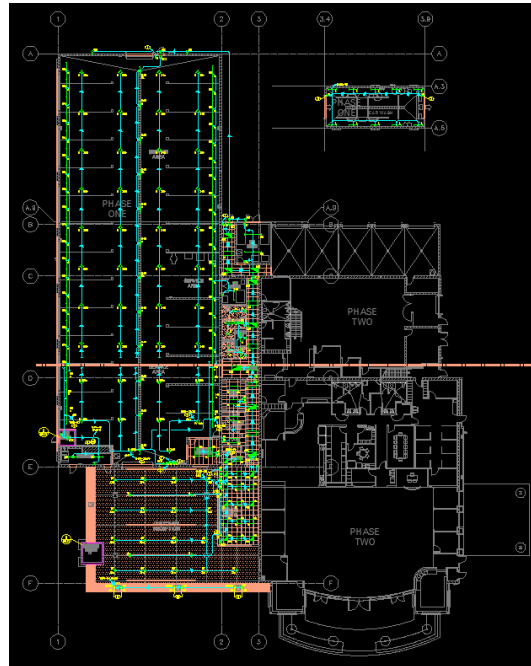
Lighting for sale or demonstration to have separate controls.



## + C405.5.2 – Interior Lighting Power

Total interior lighting power allowance (watts) is determined according to Table C405.5.2(1) using the Building Area Method, or Table C405.5.2(2) using the Space-by-Space Method.

Now have two options for determining the LPD.







## C405.5.2 Interior Lighting Power

Revisions to Table C405.5.2 (1)  
Building Area Method

Fire Station (NEW) 0.8 LPD

Office 0.9 LPD (Was 1.0 LPD)

Retail 1.4 LPD (Was 1.5 LPD)

Warehouse 0.6 LPD (Was 0.8 LPD)

NOTE:

Allowances for retail lighting removed  
from Building Area Method

## C405.5.2 (2) Interior Lighting Power Allowances

### Space by Space Method

1. All information on this table is new. Follows similar format as the 2003 IECC space by space method.
2. Additional Interior lighting Power allowances for Retail is now only 500 watts instead of 1000 watts.
3. Now separate LPD values based on different occupancy types (ex. Hotel dining room LPD=1.3, and Family dining LPD=1.4)

## + C405.6 – Exterior Lighting (Mandatory)

C405.6.2 (2) Individual  
Lighting Power  
Allowances for  
Building Exteriors

All information on this  
table is new with the  
allowed LPD's  
reduced.



# + Section C406 Additional Efficiency Package Options (New section for 2012 IECC)



- C406.1 Requirements: Buildings shall comply with at least one of the following:
  - Efficient HVAC Performance in accordance with Section C406.2
  - Efficient Lighting Systems in accordance with Section C406.3
  - On-Site Supply of Renewable Energy in accordance with Section C406.4
  
- Table C406.3 (Reduced Interior Lighting Power)
  - All information is new on this table and has been reduced from Table C405.5.2(1). This method only allows calculation based on the building area method.

## + C406.3 Efficient Lighting System

- Whole building lighting power density (Watts/sf) shall comply with the requirements of Section C406.3.1.
  - C406.3.1 Reduced lighting power density. The total interior lighting power (watts) of the building shall be determined by using the reduced whole building interior lighting power in Table C406.3 times the floor area for the building types.

# + C406.4

## On-Site Renewable Energy

- Total minimum ratings of on-site renewable energy systems shall comply with one of the following:
  1. Provide not less than 1.75 Btu (1850 W), or not less than 0.50 watts per square foot (5.4 watts per square meter) of conditioned floor area.
  2. Provide not less than 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in this chapter.

### **This equates to:**

1. **<3,700 s.f. requires 0.5W/s.f., or >3,700 s.f. requires 1,850 W (max.)**
2. **If for some reason the two values listed above are greater than 3% of the total combined HVAC, water heating and lighting loads then you could cap the size of the renewable energy system at the 3% value.**

# + Section C408 System Commissioning

## C408.3 Lighting System Functional Testing

2012 IECC (without amendments)

During code adoption committee meetings it was apparent that this section as written by the ICC was inadequate.

1. It says that the construction documents shall state the party who will conduct the required functional testing but gives broad power to the code official, stating “an approved party independent from the design or construction of the project shall be responsible for the functional testing...” Requiring an independent 3<sup>rd</sup> party test for the lighting controls is problematic because the control systems are very proprietary and there is not a universal training/accreditation program for lighting controls. Usually the person in the best position to test these systems is trained/employed by the manufacturer. Many projects really don't need special qualifications for testing occupancy sensors and time clocks.
2. Testing is required of all control devices. While this is easy to accomplish for smaller projects, it is very time consuming for larger projects, especially large hotel/casinos and could have a negative impact on project completion/opening.

# + Section C408 System Commissioning

## C408.3 Lighting System Functional Testing

2012 IECC (with amendments)

Entire section rewritten.

1. Construction documents shall state who will do the functional testing (manufacturer's representative, engineer, contractor, 3<sup>rd</sup> party commissioning agent, etc.). This is still subject to the code official's approval.
2. Larger scale projects given options for testing random samples. For example, projects with more than 7 occupancy sensors allows testing a 10% random sample of each unique combination of sensor type/space geometry.
3. Details are included on what the functional test is to include.
4. The functional test shall be complete within 90 days of occupancy. This is important so that project openings are not delayed and also so that self-programming devices have time and the proper conditions to calibrate.

## + Section R404 – Electrical Power and Lighting Systems (Mandatory)

2012 IECC - Requires high-efficacy lamps in 75% of permanently installed lights.

2009 IECC – Required only 50% high-efficacy lamps.

