BUILDING ENERGY CODES PROGRAM

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Presentation to NASEO: DOE 2018 IECC Proposals

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David Cohan, Program Manager
david.cohan@ee.doe.gov

Development Background

- All concepts, background documents, analyses and draft and final proposals posted on energycodes.gov
- Two webinars conducted, first for original concept second for draft proposals.
- Two in-person meetings held in Denver in June and October to present concepts and draft proposals. Encouraged other groups to present their ideas.
- Public comments solicited four times
- Seven residential proposals submitted to ICC
- All proposals are cost-effective under DOE's life-cycle cost-effectiveness methodology.

R-1 Wall Framing (R402.2.3)

If you're using 2x6 framing you need to use 24-in O.C. framing.

- Not required at doors, windows, wall junctions, etc.
- Goal is to save energy by reducing thermal bridging
- Where 24-in o.c. framing is possible, its initial cost is generally lower than that of standard framing.
- Where it cannot be used (e.g., for structural reasons), the U-factor table, which is not modified by this proposal, allows flexibility.
- Not required for multifamily construction

R-2 Fenestration U-factor (R402.1)

Modifies fenestration U-factors (Tables R402.1.2 & R402.1.4) in climate zones 3-8:

- All 0.35 → 0.32
- All 0.32 → 0.30

- Matches ENERGY STAR 5.0 except that the zone-4 U-factor, which was found to be also cost-effective in zone 3, was also proposed for zone 3

- Proposed windows are in common use in all climate zones with very high market penetration.

R-3 Heat Recovery Ventilation (R403.6)

Requires HRV for ventilation in climate zones 6-8

- Minimum sensible heat recovery efficiency of 70%
- Assumes installed cost of $1300
- Simple payback:

Climate Zone	Years
6	10.8
7	6.9
8	4.5

R-4 Envelope Air Leakage (R403.6)

Changes envelope air leakage requirements from mandatory to prescriptive.

- Effect is to permit trade-offs of other building envelope elements against tested air leakage rates.
- Gives builders flexibility and/or allows them to hedge against the potential for failed envelope pressure tests, which occur after construction is complete, by improving other envelope components.
- Retains requirement that all homes be tested (i.e., conducting the test is still *mandatory*)

R-5 High-Efficacy Lighting (R202)

Changes definition of *high-efficacy lamps* to 75 lumens/Watt

- Encourages higher efficiency Light Emitting Diode (LED) lamps while still permitting the most efficient CFL products.
- Simple payback <1 year. Savings ≈ $6/year. Assumes that in 2018 LEDs will cost $4.84 per lamp compared to CFLs at $3.10 per lamp
- Don’t buy the cheap ones!

R-6 HVAC Equipment Efficiency Verification (R303.1)

Grants *code official* authority to require that builders provide the following for HVAC and water heating equipment:

- Rated efficiency
- Date of manufacture
- Geographic region(s) or state(s) where the equipment is intended to be installed (for equipment having different efficiency requirements as a function of region per CFR Title 10, Part 430)

R-7 Correct Ventilation Energy in Performance Path (R405.1)

Adds *mechanical ventilation* to the defined scope (section R405.1) of the Simulated Performance Alternative

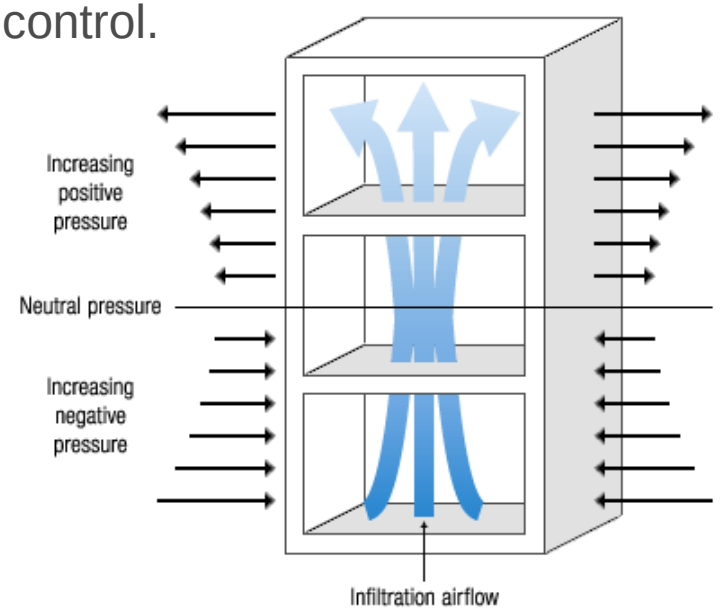
- Corrects an ambiguity in the code.
- In the performance path, ventilation is included in one part of the code text but excluded in another.
- Clarifies that energy expended for ventilation is to be included in the overall energy budget for performance-based compliance.

C-1 Building Envelope Air Leakage Testing (C402.4)

Building air leakage increases energy use for heating and cooling. In certain climates, there are also humidity issues related to uncontrolled infiltration. Implementing air barrier testing requirements has been shown to increase the care with which contractors install air barrier components and provide a reduced level of air leakage in buildings. The proposal requires testing for buildings above a certain size, depending on climate zone and building type. Testing can result in significantly reduced building leakage and consequently allow for reduced HVAC equipment sizing, better building pressurization, and energy savings due to reduced heating and cooling of infiltrated outside air. In moist climates, leakage testing can also result in better humidity control.

Requires building leak testing

- Where cost effective by floor area
- Differentiates between
  - R & I Occupancies
  - Other commercial buildings
- Test only ≤ 0.4 cfm/ft^2 (0.3 in w.g.)
- Must pass ≤ 0.6 cfm/ft^2 with diagnostics and remediation

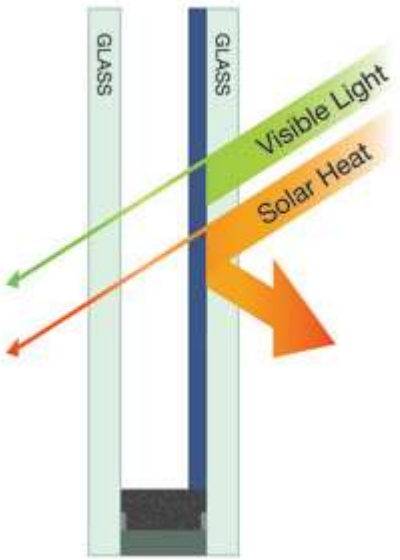


C-2 Lower SHGC (C402.4 (Table))

The solar heat gain coefficient (SHGC) for fenestration indicates how much solar gain enters the space. The proposal would reduce SHGC requirements in warmer climate zones. The proposal will result in reduced heat gain and less energy used for space cooling. Peak cooling and cooling equipment sizes may also be reduced.

Reduces SHGC upper limit

- Where cost effective:
  Thermal climate zones 1 and 2
- Applies to South, East, & West (SEW) fenestration
- At base level (PF < 0.2)
  from 0.25 to 0.22



C-3 Occupant Standby Control for HVAC (C403.2.4.2)

HVAC systems often operate in building zones that are vacant for extended periods of time. Occupant-based HVAC control uses thermostats in conjunction with occupancy sensors that switch systems to standby mode when the space is empty. The requirement is limited to high-occupancy spaces that typically have extended vacant time periods, such as conference rooms and classrooms. Occupancy sensor controls in these spaces will reduce operation of HVAC, saving fan energy, VAV reheat, and heating and cooling of unneeded outside air.

Identifies two types of Demand Controlled Ventilation (DCV)

- Modulating DCV for spaces greater than 500 square feet
- On/off DCV for spaces larger than 150 square feet
  - Density requirements remain the same (clarified) at 25 p/1000 ft^2
  - Exceptions reworded as positive statements

C-4 Limit Ventilation (C403.2.6)

Limit allowed ventilation air to 135% of IMC required ventilation. Currently there is a minimum ventilation requirement in the IMC, but no maximum ventilation restriction in energy codes. The proposal would retain compatibility with green building programs that call for higher than minimum (130%) ventilation air to maintain indoor air quality. For applications where higher ventilation rates are desired, an exception is provided for systems that include heat recovery. This proposal avoids excess ventilation and saves excess heating and cooling of outside air. Significant energy savings are expected in both warm and cold climates.

Clarifies reference to IMC for ventilation requirements

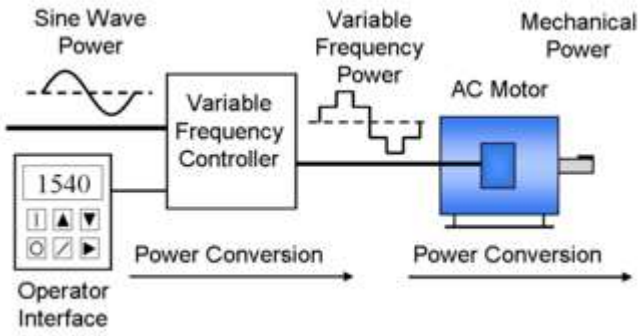
- Limits OSA to 135% of minimum
- Allows higher levels if heat recovery is used

C-5 Reduce VSD Threshold for Pump and Fan Motors (C403.4.3.2.1)

Variable speed drives (VSD) or other speed control devices are required for pumps and fans in variable flow systems at various thresholds. For this proposal, the various applications were reviewed and the thresholds for VSD requirement were reduced where found to be cost-effective. A VSD or other speed control device saves energy by reducing the motor energy input to provide part load flow when compared to simple throttling with dampers or valves. The cost of VSDs and motors with integral speed control continues to decrease, making them cost-effective for smaller motors.

Reduces limits for fan and pump speed control

- Pump limit from 7.5 to 2 HP
- Heat rejection limit from 7.5 to 5 HP
- Also removes outdated phase in requirements



C-6 Expand use of Occupancy Sensors (C405.2.1)

Occupancy sensors have become mainstream technology, and new systems are now available which are effective in open office areas. The proposal extends their use to open office areas. Greater use of occupancy sensors will reduce lighting use compared to traditional timer control systems, especially during custodial hours.

Add “open plan office areas” to occupancy sensor required list

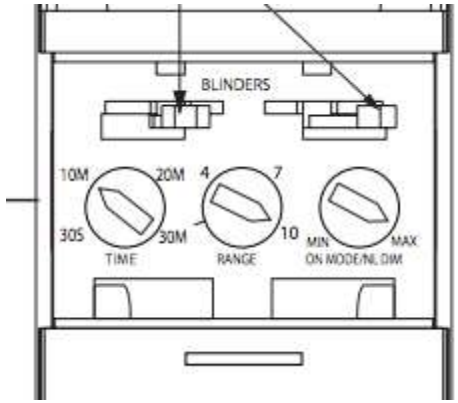
- Workstation general lighting zones
  - Required zones every 500 square feet
  - Most systems use one sensor per lighting fixture
- 20% of background general illumination can remain on while anyone is in space

C-7 Faster Shut Off for Occupancy Sensors (C405.2.1.1)

There is currently inconsistency about how quickly occupancy sensors should turn off lights. This proposal reduces shut-off delay times from 30 to 20 minutes. A shorter shut-off delay time will result in more time off for lighting with no additional cost.

Reduces occupancy sensor turn off time

- 20 minutes instead of 30
- Achieved with a simple setting



Cost-effectiveness:

- Cost: no additional cost
- Cost-effective when there are savings with no cost

C-8 Reduce Interior Lighting Allowances (C405.4.2.2)

Reduction in interior lighting power allowances

- Recognizes higher efficacy of LED lights
- Matches current 90.1 addendum out for public review
- Affects both building area and space-by-space method

Reduce lighting power in both the Building Area Method and the Space-by-Space Method for applications where new LED fixtures are found to be cost-effective. Maximum interior Lighting Power Densities (LPD) are reduced by an average of 15% for the Building Area Method and an average of 17% for the Space-by-Space method and vary depending on the application. More efficient lighting sources can provide the same lighting output with less power input. When LPD is reduced, it results in a proportional lighting energy savings.

C-9 Reduce Display Lighting Allowance (C405.4.2.2.1)

Reduce the display lighting extra power allowance for specialty sales. This allowance is provided for retail display lighting that has historically been incandescent or ceramic metal halide (CMH). New LED fixtures can provide similar display lighting with lower energy use. Extra allowances for retail areas 1, 2, and 3 are reduced by 50% and retail area 4 (jewelry, crystal and china) is reduced by 36%. LEDs are intrinsically more efficient than the incandescent or CMH lamps that have traditionally been used for display lighting. Reduced display lighting allowances will move many designers to use the more efficient lighting source in these applications. This change will result in significant savings in retail buildings where lighting is a large share of overall energy use.

Cost-effectiveness:

- Due to longer lamp life, LED display lighting total costs are lower (~43%) over a 5 year window
- Cost-effective when there are savings with no increased cost

C-10 Reduce Exterior Lighting Allowances (C405.5)

More efficient LED fixtures can be applied to exterior lighting. This proposal reduces exterior lighting allowances by an average of about 4%. More efficient lighting sources can provide the same lighting output with less power input. When LPD is reduced, it results in a proportional lighting energy savings.

Cost-effectiveness:

- Due to longer lamp life, LED parking fixture total PV costs are lower
  Incremental first cost of $237; annual lamp savings of $34
- Cost-effective when there are savings with no increased cost

C-12 Daylighting Controls Tradeoff (C405.2.3)

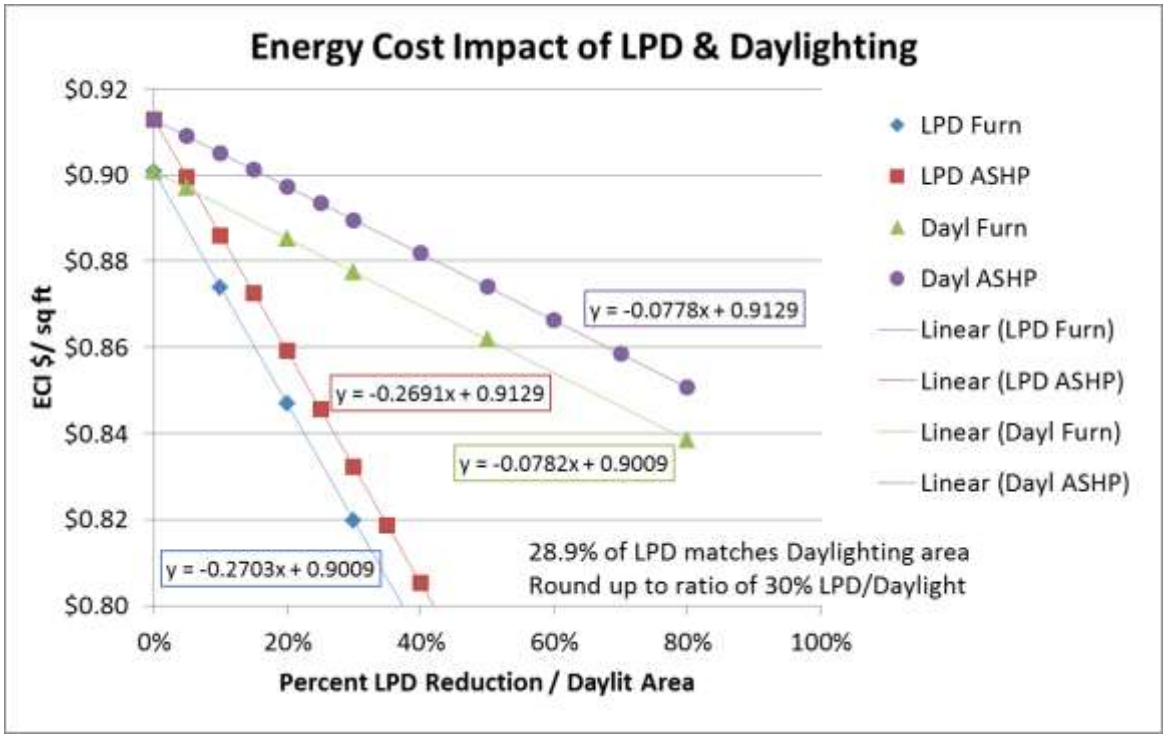
Allows for a reduction in lighting power density to avoid daylight-responsive controls. In a number of cases, faced with the cost of daylighting controls and the challenges associated with commissioning them, lighting designers have found it more cost-effective to use more efficient lamps and luminaires, reduce LPD and achieve similar savings. This proposal allows that option without the need for the performance path. This change is expected to be savings neutral, but result in more efficient base lighting systems that do not require correct control operation to provide energy savings.

For climate zone 4a:

28.9% LPD reduction

≅ daylight controls

- Round to 30% LPA proportional to daylit area; LPA averaged over entire building
- Tradeoff not allowed if window-to-wall ratio is more than 30%
- Δ LPD is more reliable energy savings
- Tradeoff does not require performance analysis



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