Commercial Code FAQs:

2012 International Energy Conservation Code (IECC) with MA Amendments & MA Stretch Energy Code

*Brief answers have been provided to commonly received questions regarding the 2012 IECC with MA Amendments and the MA Stretch Energy Code. If additional information is needed, please call Mass Save® Energy Code Technical Support toll-free at **855-757-9717**.*

GENERAL

Q: When did the new code go into effect?

A: The Massachusetts Board of Building Regulations and Standards (BBRS) updated the "base" building energy code, 780 CMR, to be consistent with the 2012 International Energy Conservation Code (IECC). Effective since July 1, 2014, all commercial construction must comply with the 2012 IECC commercial provisions with Massachusetts Amendments or ASHRAE 90.1-2010.

Q: What if I live in a municipality that has adopted the Stretch Code?

A: Most newly constructed commercial buildings over 5,000 square feet located in municipalities designated as "Green Communities" need to comply with the provisions of Appendix AA: Stretch Energy Code (780 CMR 115.AA) in lieu of complying with the 2012 IECC. See **www.mass.gov/eea/energy-utilities-clean-tech/energy-efficiency/policies-regs-for-ee/building-energy-codes.html**

SCOPE AND ADMINISTRATION

Q: What are the specific Massachusetts Amendments to the 2012 IECC?

A: There are three significant amendments to the 2012 IECC:

1. Added subsection C406.4 which allows for the limited use of select biomass fuel
2. Added subsection C407.6.1.1 which lists COMcheck Version 3.9.2 and REM/Rate or other RESNET accredited software approved calculation software tools that meet the requirements of subsection C407.6
3. Added subsection C407.7 which lists the RESNET Approved Software for the Home Energy Rating System (HERS) and the Passive House Institute US (PHIUS) Approved Software: Passive House Planning Package (PHPP) as approved alternative energy performance methods

Q: Does the energy code apply to existing buildings?

A: Yes, but only when a renovation, repair, addition or change of use is executed.

Q: What determines if a renovation or alteration needs to meet the energy code?

A: The code states that additions, alterations, renovations or repairs to existing buildings, or building systems, must comply "as they relate to new construction." This is interpreted to mean that if the renovation includes changes that are covered by the code for new construction, the code provisions must be met for the renovation. There are several exceptions (based on the condition that the energy use for the building is not increased), where compliance with the energy code is not required, including:

- Installing storm windows over existing windows
- Replacing glass only
- Existing wall, floor, or ceiling cavities exposed during construction, if filled with insulation
- Existing wall, floor, or ceiling cavities not exposed during construction
- Re-roofing when neither the cavity nor roof sheathing is exposed
- Replacing existing doors separating exterior from conditioned space will not require a revolving door or vestibule. In this circumstance, however, pre-existing vestibules may not be removed.
- Replacement of less than 50% of luminaires (light fixtures) in the space, provided the installed lighting power is not increased
- Replacement of lamps and ballasts of existing lighting fixtures as long as the existing lighting power is not increased

Q: How do I determine if a building repair needs to meet the energy code?

A: Repairs that are "related to new construction" must meet the energy code. For example, replacing a non-functional heating system would require complying with the energy code provisions associated with the replaced components. However, the repair of a leaking heat exchanger in an existing boiler would not require energy code compliance as the project does not "relate to new construction." See the above question for specific exceptions to this requirement.

Q: When does a change in occupancy or use require compliance with the energy code?

A: If a change in occupancy or use will result in an increase in demand for electricity or fossil fuel, the project must comply with energy code provisions. In addition, a change in use requires that the lighting power requirements for the new space type be met.

Q: What other compliance paths are there besides the prescriptive path?

A: The option to follow the performance path is available by utilizing the "Energy Cost Budget" (ECB) methodology detailed in ASHRAE Standard 90.1-2010. If choosing that path, all code requirements identified as "mandatory" in Chapter 4 of the energy code must be complied with in addition to meeting the performance requirements. It is recommended that projects use the ECB approach as defined in ASHRAE Standard 90.1-2010 and not the performance provisions in the 2012 IECC.

Additionally, the code official can, at their option, allow the written approval of a building for an "above code program" to be submitted as evidence of energy code compliance. The code official must approve this compliance path in advance.

Q: Can I use COMcheck to demonstrate compliance with the energy code?

A: COMcheck is allowed to be used with the approval of the building official as a "deemed to comply" tool under Alternative Methods and Materials. This option is limited to buildings with window to wall ratios not exceeding 40% and does not allow for trade-offs between envelope, HVAC and lighting systems.

ENVELOPE

Q: I noticed that there are U-factor tables and R-value tables. What is the difference?

A: U-factor is the amount of heat that flows through one square foot of an assembly in one hour when there is a 1°F temperature difference across the surface. A smaller U-factor for the assembly indicates there is less heat flow through the envelope. R-value is the inverse of U-factor and therefore measures the resistance to heat flow. The U-factors in the code tables list the maximum allowable values for the entire opaque envelope assembly indicated. The R-value tables list the minimum values for the different cavity insulation materials that typically are combined to make the opaque envelope assembly indicated. Code compliance is demonstrated by meeting either U-factor or R-value requirement.

Q: Are there pre-calculated insulation assemblies that meet the code that I can reference?

A: Appendix A of ASHRAE Standard 90.1-2010 includes pre-calculated insulation performance levels for particular assemblies that can be used as an alternative to the R-values listed in table C402.2.

Q: What are C-factors and F-factors and when are these factors applicable?

A: These factors are alternatives to using insulation R-values for below grade walls (C-factor) and slabs (F-factor). Both factors are pre-calculated insulation performance levels for particular assemblies. The assemblies are described and provided with default C or F-factors in Appendix A of ASHRAE Standard 90.1-2010. These default values can only be utilized for the particular assemblies specifically listed in Appendix A of ASHRAE 90.1-2010. Otherwise, R-values listed in C402.2 should be utilized for below grade walls and slabs.

Q: What exactly is meant by continuous insulation?

A: It is a layer of insulation that is not "broken" by the framing. It is typically rigid or semi-rigid insulation foam board installed on the inside or outside of the assembly cavity.

Q: I am working on a metal building and am not sure what the liner system (LS) requirement is.

A: Metal buildings using the R-value compliance are required to include a continuous liner system below the purlins and shall not be interrupted by framing members. This liner system provides a vapor barrier between the metal structural elements and the conditioned interior space. Additionally, a thermal spacer block is required between the metal purlins and roofing material.

Q: Is it possible to increase the cavity insulation and avoid installing continuous insulation?

A: No, wherever continuous insulation is mandated, it must be installed regardless of the R-value of the cavity insulation.

Q: What is needed to meet the requirements for a continuous air barrier?

A: A continuous air barrier must be installed to seal the building envelope assemblies from air leakage. It must connect all the components of the envelope, and it must meet the specifications listed in section C402.4.1 of the code.

Q: Can the air barrier be installed outside the sheathing?

A: It is most commonly installed outside the sheathing, but may be placed inside, outside, or within envelope assemblies.

Q: What is the difference between air barriers and vapor barriers or retarders?

A: Vapor barriers and retarders are designed to prevent vapor from entering envelope assemblies through diffusion. The air barrier is intended to stop air leakage. Some air barriers serve as both air and vapor barriers.

Q: What are the requirements for vapor barriers or retarders in the new code?

A: Vapor barriers are no longer required as building scientists have determined that if envelope assemblies are properly sealed against air leakage, separate vapor retarders are not necessary. This does not mean that you cannot use vapor retarders, only that they are not required.

Q: Doesn't a well-sealed building result in poor indoor air quality (IAQ) for building occupants and are there alternative compliance paths for meeting the air sealing requirements in the code?

A: As an alternative to meeting all of the air sealing requirements, a blower door test shall be conducted to demonstrate air tightness performance. But in order to pass the blower door test, the building will need to be sealed in similar fashion to the prescriptive air sealing requirements. Many studies show that sealing buildings from uncontrolled air leakage and introducing controlled ventilation results in better energy performance and improved indoor air quality.

Q: The new code has reduced the allowable percentage of glass to 30% of the wall area. The past codes allowed 40%, but we often installed more and followed the performance path for compliance. Now the performance path has been deleted. What compliance options do we have?

A: There are two options available in Massachusetts which allow for a larger percentage of glazed area. The maximum area may be increased to 40% of the wall area if the project can meet the daylight requirements of C402.3.1.1. Because there is additional glazing allowed in this section, it requires minimum amounts of daylight area and automatic daylighting controls in those areas. The other option is to utilize ASHRAE/IESNA Standard 90.1-2010 for code compliance, utilizing the "Energy Cost Budget" methodology. With this methodology there are no restrictions for the amount of glazed area, as the total building performance is determined through a modeling procedure.

Q: If one of the envelope assemblies we wish to use does not meet the R-value or U-factor requirement listed in the tables, can a tradeoff be made with other assemblies that are designed to perform better than the code requires?

A: Yes, some tradeoffs are allowable within the envelope provisions. But it is best to discuss such tradeoffs with a local code official prior to construction, to make sure that the tradeoff is allowable. Although the tradeoff calculation can be done manually, COMcheck automatically performs tradeoff calculations as the envelope section is completed.

Q: Why are some envelope provisions termed "mandatory" and others are not?

A: The term mandatory means that the provisions cannot be "traded-off" with other envelope provisions, and that it still must be complied with when utilizing the ASHRAE 90.1-2010 Energy Cost Budget compliance methodology.

Q: Can lighting or mechanical systems provide tradeoffs with envelope performance?

A: No, envelope assemblies and components can only be traded off with other envelope assemblies and components.

Q: How does the code give credit for reducing solar gains by providing shading?

A: The code allows design teams to determine the projection factor of an overhang (A/B in Figure 1) and adjust the Solar Heat Gain Coefficient of the glazing that is being shaded based on the projection factor.

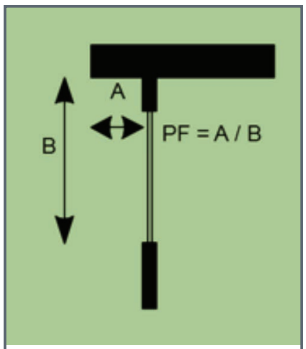

Figure 1: Projection Factor Calculation

Q: Are the U-factors in the fenestration tables for center-of-glass?

A: No. The U-factors in the code apply to the whole window unit including glazing, frame and spacers in accordance with the rating methodology put forth by the National Fenestration Rating Council (NFRC).

Q: What if the fenestration that is being specified for a project is not NFRC rated or needs to be site-built or assembled?

A: There are three options to receiving an NFRC rating:

1. Provide the test and simulation for the specified products on a project
2. Review the Certified Products Directory and request a specific certified product from the supplier or contractor
   a. Inform the code official what certified system will be used
   b. Code official then obtains all pertinent data and issues a label certificate to the contractor or architect
3. Request that a supplier provide a test and simulation report for a product to an accredited lab in accordance with NFRC 100

Q: When do the default tables for fenestration performance apply?

A: These tables are utilized when the factory applied performance label is not attached to the window or door. The default tables are conservative, so it is best (and is a code requirement) to retain the rating labels until the code official has viewed them.

Q: Some provisions limit total skylight area while other provisions require skylight installation. This is confusing. Can you provide some guidance?

A: In most cases, both of the following will apply:

- The total skylight maximum area may not exceed 3% of the roof area
  - However, the allowable skylight area increases to 5% of the gross roof area if automatic daylight controls are utilized in the space where the skylights are installed
- Minimum skylight area with automatic daylight controls is required for all of the following spaces:
  - Enclosed spaces with floor area greater than 10,000 ft^2, with ceiling heights greater than 15 feet, have an installed general lighting LPD greater than 0.5 W/ft^2, a minimum of 50% of the roof area over the enclosed area receives direct sunlight (objects don't block direct beam sunlight for more than 1,500 daytime hours/year between 8 am and 4 pm), and fall under the following use categories:

Office	Corridor	Automotive Service	Distribution/Sorting Area
Lobby	Storage	Manufacturing	Transportation Area
Atrium	Gymnasium/Exercise Center	Non-refrigerated Warehouse	Workshop
Concourse	Convention Center	Retail Store	

  - For these spaces, the daylight zone must at a minimum cover at least 50% of the floor area, and the skylight area must be at least 3% of the daylight zone or there must be a minimum aperture size of 1%.

Q: The energy code now requires skylights for some spaces. What is the relative electrical lighting savings compared to the heat loss through the skylights?

A: The code requirements for skylights and daylighting were developed to produce large enough electrical lighting savings to offset any associated heat loss. Analysis of these savings is available from Pacific Northwest National Lab at www.pnnl.gov/main/publications/external/technical_reports/PNNL-22760.pdf

The New Building Institute (NBI) has developed a series of daylighting pattern guides that can be helpful when meeting the code requirements. They are available at http://patternguide.advancedbuildings.net/

Q: When re-roofing an existing commercial building, does it need to meet the insulation requirements in the code?

A: The answer is based on the extent of work and existing conditions as follows:

- If neither the roof's sheathing nor insulation are exposed, the roof does not need to be brought up to current code insulation levels
- However, if either the sheathing or insulation is exposed, or if the roof is found to have no insulation in the cavity, the roof is required to be insulated either above or below the sheathing, to current code levels

Q: Are there any financial incentives available for energy efficient construction?

A: Yes. The Mass Save® program, which is sponsored by the gas and electric Program Administrators in the state, offers a variety of energy efficiency incentives for commercial buildings. Information is available at: www.masssave.com/business.

LIGHTING

Q: What types of lamps and light fixtures meet the code requirements for interior lighting?

A: The energy code allows flexibility for lamp and light fixture choices. Compliance is determined by the installed lighting wattage, per floor area, for a space type, or a building type. The resulting calculation of installed watts/ft^2 is termed "lighting power density (LPD)." The maximum installed wattage allowed by code for a space or building type is termed the "lighting power allowance (LPA)." An exception to this code relates to residential spaces within commercial buildings. For these spaces, commercial lighting requirements are waived if 75% of the lamps installed are "high efficacy" lamps.

Q: What is the definition of "high efficacy" lamps?

A: The energy code defines high efficacy lamps as T8 or smaller diameter fluorescent lamps, or lamps that meet the following efficacy levels:

1. 60 lumens per watt for lamps over 40 watts
2. 50 lumens per watt for lamps between 15 and 40 watts
3. 40 lumens per watt for lamps 15 watts or less

In practice T5, T8, compact fluorescent (CFL) and LED lamps meet these efficacy levels.

Q: Why is the term efficacy used? Isn't it the same as "efficiency?"

A: Efficacy is the efficiency of the lamp in producing light in lumens per watt. Efficiency typically is used for the purpose of describing the ability of the lamp, ballast and fixture to deliver light to the desired area for a reduced number of total kWh in a space.

Q: How do I calculate the LPD for a given space?

A: It is an easy calculation involving 3 steps:

1. Determine the rated wattage for each light fixture to be installed in the space
2. Total the rated wattage
3. Divide that total by the floor area in square feet to obtain the LPD

Q: Does COMcheck calculate the rated fixture watts when the lamp and ballast data is entered?

A: No, you must determine the rated fixture watts and enter it in the tool. Note that COMcheck does not prove compliance; it is simply a calculation tool and in order to demonstrate compliance you need to enter the maximum socket wattage for any screw-in lamp.

Q: How do I determine the rated fixture wattage?

A: It depends on the lamp type, as follows:

- Linear Fluorescent and High Intensity Discharge (HID): It is the rated wattage for the ballast when powering the specified lamps. This can be found on the ballast specification sheet (cut sheet) or is often listed on the fixture cut sheet for a given lamp/ballast combination. The rated wattage may be higher or lower than the sum of the lamp nominal wattages.
- Compact fluorescent lamps (CFL): For one piece CFLs using a bayonet (G2) socket, it is the listed wattage. For two-piece CFLs, it is determined the same way as linear fluorescent. A commonly accepted rated wattage for two-piece CFLs is the nominal lamp wattage plus 2 watts for the ballast.
- Incandescent, screw-in CFLs, and screw-in LEDs: The rated wattage is the maximum rated wattage of the socket.
- Hardwired LEDs: It is the LED plus the driver wattage. This is typically available on the specification sheet.

Q: Are there any alternative ways to determine the rated wattage?

A: Yes – Mass Save® maintains a list of rated wattages which can be used for fluorescent, HID, and other hardwired fixture types. For screw-in lamps you must use the socket maximum wattage. The list can be found here: www.masssave.com/~/media/Files/Business/Applications-and-Rebate-Forms/Retrofit/Device-Codes-and-Rated-Lighting-System-Wattage-Table-Retrofit.pdf

Q: How do I choose whether to use the "space-by-space" or "building area" lighting power method for a project?

A: In most cases, it is simpler to use the building area method as it allows similar contiguous areas to be calculated as one area. It also allows many of the areas specified in the space-by-space method to be included in larger general areas. For example, hallways, closets, mechanical rooms, etc. can all be included with general areas, such as "office" in the building area method. In addition, if choosing "reduced lighting power" as the section C406 "Additional Efficiency Package" option, the building area method must be used.

Q: We have chosen "reduced lighting power" as the section C406 "Additional Efficiency Package" option for a project. The code book refers to table C406.3.1 but we cannot find the table?

A: The table was mistakenly not included in the current 2012 IECC book. The reduction is approximately 10% lower than the LPAs listed in the standard building area table, C405.5.2 (1). The option can be selected in COMcheck.

Q: Our firm does mostly renovation work. Do renovations need to comply with the lighting power requirements?

A: Yes, section C101.4 outlines the applicability of the lighting provisions for renovations as follows:

- When 50% or more of the light fixtures in a space are replaced.
- When a change in occupancy or usage would result in a lower LPA requirement. For example, converting an office space to a storage area.
- When lighting alterations create an increase in LPD for a space. For example, if converting a storage area to office space requires additional lighting, the lighting provisions in the energy code must be met.

Q: It appears that the standard automatic on/off occupancy sensors no longer meet the code for private offices, conference rooms, classrooms and other enclosed spaces. Is that correct?

A: They can still be used to meet the requirements for these space types, but only if they automatically turn on 50% or less of the lighting-up occupancy. The remaining lighting could be turned on manually, but all lighting would need to be turned off automatically. Manual on/auto-off occupancy sensors, often termed vacancy sensors, are one method of meeting this requirement. They are available for controlling single and dual circuits. A 2-circuit vacancy sensor facilitates compliance with both the occupancy and 50% light reduction requirements.

Q: For what types of spaces should manual-on occupancy sensors (vacancy sensors) be installed, and where should standard automatic on/off occupancy sensors be installed?

A: Manual-on vacancy sensors should be installed in enclosed spaces where there is sufficient ambient light (daylight or light from other spaces) to allow the lighting to remain off during some occupied periods. Typically private offices, conference rooms, and classrooms are good candidates for vacancy sensors, especially if there are windows or skylights in the space. Automatic on/off occupancy sensors work best in larger open spaces such as open office areas, lobbies, etc.

Q: With 2012 IECC, does all interior lighting now need to be controlled by a timer?

A: What has changed with the 2012 IECC is that previous codes required spaces 5,000 ft^2 and larger to be controlled by a timer. The new code extends this provision to all space sizes. However, the exceptions remain in place, and include emergency egress lighting and any lighting controlled by occupancy or vacancy sensors.

Q: Where do I need to install daylighting controls?

A: The code requires that areas under skylights and areas adjacent to vertical fenestrations that receive daylight be identified as "daylight zones." Daylight zones must be controlled separately from the general lighting. This provision can be met with manual controls that allow occupants to turn off the lighting when daylight is available, or automatic controls that dim the lighting in response to daylight. Options for automatic daylight harvesting control include continuous dimming with a 100% to <35% light output range or multilevel (stepped) controls offering 100%, a step between 50% and 70%, and another step between OFF and 35%.

Q: How does the code define "daylight zones"?

A: Daylight zones are determined based on location of the window or skylight in relation to floor to ceiling partitions.

- For vertical windows, daylight zones depth ends at 15 feet, or if floor to ceiling height partition is located less than 15 (H in Figure 2) feet from the window. The daylight zone width is either the width of the window plus 2 feet on each side of the window, or one-half the distance to an adjacent skylight or vertical fenestration, whichever is least.
- For skylights, daylight zones are equal to the size of the skylight plus the floor-to-ceiling height in each direction, or the dimension to a partition or half the distance to an adjacent skylight or vertical fenestration, whichever is least.

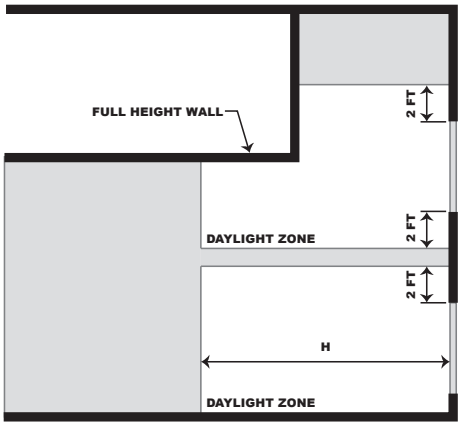

Figure 2: Plan view of daylight area calculation methodology.

Q: What are the functional testing requirements for the lighting control systems and who is the responsible party?

A: Where occupant sensors, time switches, programmable schedule controls, photosensors, and daylighting controls are installed, it is required that the following be confirmed:

- Placement, sensitivity and time-out adjustments for occupancy sensors yield acceptable performance
- Time switches and programmable schedule controls are programmed to turn the lights off
- Placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified

The construction documents should state the party who will conduct the required functional testing.

Q: Is the procedure for meeting the outdoor lighting power provisions the same as for interior lighting power?

A: Similar to interior lighting, the lighting power allowance (LPA) for exterior lighting is based on the rated watts per area in ft^2. Section C405.6.2 of the code provides guidelines for establishing "exterior lighting zones" which describe different types of outdoor "spaces". The maximum LPA for each zone is listed in table C405.6.2 (2). In addition, the rated LPAs also vary depending on whether the project is located in an urban, rural, or "wilderness" type of area.

Q: Do the exterior lighting power provisions of the code mean that lighting must be provided in the listed zones?

A: No, the provisions simply restrict outdoor lighting to a maximum installed power (watts/ft^2.) Decisions regarding whether or not to install exterior lighting, and to what level (up to the code maximum) are outside the scope of the energy code.

Q: Are there any financial incentives available for installing efficient lighting?

A: Yes. The Mass Save® program, which is sponsored by the gas and electric Program Administrators in the state, offers a variety of energy efficiency incentives for commercial buildings. Information is available at: www.masssave.com/business

HVAC SYSTEMS

Q: Can any "rules of thumb" be used in load calculation and/or with sizing a mechanical system?

A: "Rules of thumb" cannot be used as the basis for system sizing. In addition, safety factor upsizing, or putting some extra capacity into a heating or cooling system, is not permitted by the code. Heating and cooling loads should be determined according to C403.2.1, while using an acceptable method such as ANSI/ASHRAE/ACCA Standard 183. The equipment must be selected to match the load or be consistent with the next commercially available size option. Proper load calculation and sizing will reduce energy consumption and maximize operating system efficiency.

Q: There are several equipment efficiency ratings that can be found for different types of HVAC systems. Which should be utilized in the design process?

A: Different types of heating and cooling equipment are commonly characterized by a single type of efficiency rating. For example, rooftop cooling systems are characterized by EER. Efficiencies for any planned piece of equipment must meet the minimum efficiencies shown in Tables C403.2.3 (1) through C403.2.3 (8). If values are not supplied for a piece of equipment, or if it is comprised of several components (small air handler and field-attached heating coil), the designer must be able to provide calculations to demonstrate that the overall system meets the required rating. Further, when using the equipment manufacture's rating, it is important to use ratings that encompass an entire system (for example: to capture the overall efficiency of a DX split-system.) Additionally, for chillers that have variable speed drives for optimized part-load condition operation, proper calculated part-load efficiencies must meet the part-load specifications in the tables.

Q: In the 2012 IECC commercial code, in Table C403.2.3(2) regarding electrically operated unitary and applied heat pumps, the minimum efficiency requirements for air cooled equipment has both an EER and IEER rating listed. Most manufacturers apparently only list one of these and not both. How is this handled in terms of meeting the code?

A: If a manufacturer cannot provide a Published Rating that includes both EER and IEER performance as required by ANSI/AHRI Standard 340/360 2007 then their equipment does not meet the minimum requirements of the 2012 IECC. Air-cooled unitary and heat pump equipment must comply with the ANSI/AHRI Standard 340/360-2007 test procedures. That test procedure was amended to include the IEER test procedures and requirements that became effective on January 1, 2010. Section 7 of the Standard clearly states the minimum criteria for Published Ratings of equipment. For both unitary and heat pump equipment this includes both EER and IEER ratings. The test procedure can be found at the following URL: ANSI/AHRI Standard 340/360 - 2007

Q: I want to use a combination boiler that provides both domestic hot water and space heat for the air handling system within an apartment complex. How does the efficiency rating system account for this?

A: A boiler system providing both domestic hot water and reheat hot water to the air handler needs to meet the efficiency requirement of each separate system.

Q: If a facility runs 24 hours per day for a 5 day week, is a temperature setback control required?

A: Yes. The code mandates that the installed temperature control be capable of automatically scheduling space temperatures for each day of the week independently. This will enable temperature adjustment for occupied and unoccupied periods of the week. The exception would be if the building (or particular areas) consumed less than 2kW at full load, and had an accessible manual OFF switch.

Q: Can a single thermostat be used for contiguous spaces, such as a full floor of office cubicles?

A: There must be at least one thermostatic control for each zone in the building, where the zone characterizes a space with unique heating and cooling requirements. Therefore, if the entire floor in this example represents a single zone, only one thermostat is required. However, if there are different heating and cooling requirements (representing multiple zones), then multiple thermostats are required. In such a case, use of a single control point would be inefficient.

Q: If I am not using a direct digital control (DDC) system, do I need to worry about a deadband between heating and cooling?

A: Yes, C403.2.4.2 requires a 5°F separation of heating functions to prevent short cycling between heating and cooling. Most programmable automatic changeover thermostats have this function.

Q: We are installing an Energy Management System (EMS) in our project. Will this type of system meet the HVAC control requirements in the code?

A: Yes. EMS systems will typically include the capability to meet all of the control requirements in the code for HVAC as well as lighting systems. However, the EMS system must be calibrated to ensure that it is meeting the minimum requirements in the code. This process is covered by the commissioning requirements.

Q: Do installed mechanical systems need to be commissioned?

A: Yes. According to C403.2.9, installed mechanical systems shall be commissioned according to C408.2 in order to verify that the systems operate according to their design intent. The requirements include:

- Submitting a commissioning plan with the building plans that covers:
  - System adjusting and balancing
  - Functional performance testing of:
    - Equipment
    - Controls
    - Economizer
- A preliminary commissioning report submitted prior to Certificate of Occupancy and a final commissioning report submitted by the building owner demonstrating that the system is functioning as designed

Q: What defines a "simple" versus a "complex" mechanical system?

A: A simple mechanical system is one that typically uses a single piece of cooling or heating equipment for serving a single zone, such as a basic rooftop unit, a split system, or a through-the-wall heat pump. Several pieces of the same type of equipment may serve multiple single zones throughout a building. A complex mechanical system is one that is assembled from many components such as those with a central plant, consisting of chillers, boilers, pumps, air handlers, and complex distribution networks. Simple systems are described in section C403.3. Complex systems are described in section C403.4.

Q: Are automatic control dampers required on all duct connections to the buildings' exterior?

A: No. Gravity or back-draft dampers can be used in buildings with less than three (3) stories because the stack effect in shorter buildings is less pronounced. Gravity dampers can also be used in smaller exhaust fans, less than 300 cfm.

Q: What is demand control ventilation? Is it always required?

A: Demand control ventilation (DCV) is a specialized ventilation control system that is intended for spaces that experience highly variable occupancy (cafeterias, auditoriums, etc.). The approach with DCV is to modulate (reduce) the amount of outside air and supply air to a space as CO2 levels fluctuate due to varying occupancy levels, thereby reducing fan and heating/cooling energy. DCV is not required for all spaces. Only spaces which exceed a specified number of occupants per square foot and a certain rate of outside air flow need to have such a system. Spaces with certain specialty applications, i.e. ventilation provided for process loads, are an exception to this requirement.

Q: What is Energy Recovery Ventilation? When is it required?

A: Energy recovery ventilation (ERV) reduces energy use associated with ventilation requirements by recapturing waste energy in the exhaust air flow. Whether this type of system is required depends upon the percent of outdoor air being supplied, and the supply airflow rate (CFM) as specified in Table C403.2.6.

Q: I am designing a laboratory area. Do I need to use an energy recovery unit?

A: No, not if the fume hoods in the space utilize a variable volume control where the make-up and exhaust volumes can be turned down by 50%, or if direct make-up air is used to supply the fume hood with limited tempering.

Q: Does ductwork in a conditioned space need to be insulated?

A: Ductwork running in a conditioned space only needs to be insulated if the temperature difference between the air in the duct (any duct) and the space temperature is greater than 15°F.

Q: Is ductwork required to be pressure tested?

A: Ductwork does not need to be pressure tested unless it will run at over 3" w.c., in which case it is considered to be a high pressure duct system and will need to be tested.

Q: Does a small rooftop AC unit require the use of a simple air economizer for the system?

A: Yes. As long as the system has a cooling capacity >33 MBH, an economizer is required. The economizer must have limits that lock-out the function when the outside air cannot provide the required cooling.

Q: What are the functional testing or commissioning requirements for economizers?

A: Section C408.2.3.3 requires functional testing of economizers to ensure that they operate in accordance with manufacturers' specifications.

Q: When are variable speed drives required on variable air volume (VAV) supply fans?

A: According to C403.4.2, the code states that when the supply fan motor is larger than 7.5 hp, there must be some automatic mechanism for varying the supply air volume, either by electrical or mechanical means. This is most commonly done with a variable frequency drive (VFD).

Q: Do I need to utilize an air temperature reset on my air handler?

A: Yes. According to C403.4.5.4, an air temperature reset is required unless 75% of the reheating energy comes from solar energy, is site-recovered, or the zones are supplied with peak supply volumes of 300 cfm or less.

Q: We want to use the efficient HVAC performance option to meet the C406.1 requirement, but we can't find equipment that meets the specifications in the tables. What are our options?

A: If the equipment type is not included in the tables, it cannot be used to meet this requirement and the designer has to either pick a piece of equipment that is listed or pick another C406.1 option.

Q: Is a snowmelt system possible within the energy code?

A: Yes. Note that the snowmelt system cannot cause an increase in the purchased energy from the power supplier, as certified by the designing P.E. The interpretation here is that the snowmelt system can take advantage of waste heat or a renewable source like photovoltaic electricity or solar hot water.

Q: Are there any financial incentives available for installing efficient HVAC?

A: Yes. The Mass Save® program, which is sponsored by the gas and electric Program Administrators in the state, offers a variety of energy efficiency incentives for commercial buildings. Information is available at: www.masssave.com/business

SERVICE HOT WATER

Q: What are the pipe insulation requirements for circulating hot water?

A: The provision accounts for two different piping configurations:

1. Automatic circulating hot water or heat-traced systems piping need a minimum of R-3.7 insulation (per inch)
2. The first 8 feet of piping in non-hot-water supply temperature maintenance systems served by equipment without a heat trap need a minimum of R-1.8 of insulation (per inch)

Q: The water heating equipment we specified does not have heat traps. Do they need to be included?

A: Yes. If the water heating equipment specified for a non-circulating system does not include integral heat traps, they need to be installed on the supply and discharge piping.

Q: What kinds of controls are required on hot water reheat systems?

A: Variable flow or supply temperature reset controls are required for systems larger than 300,000 Btu/hr.