This article is the second in a series examining aspects of the Illinois Energy Conservation Code (IL ECC) building mechanical system requirements that SEDAC considers particularly important. Incentive funding is available through ILLINOIS ENERGY NOW programs for both existing equipment upgrades and new construction projects that go beyond the IL ECC requirements discussed in this series. The first article in this series discussed the need for accurate calculation of heating and cooling loads, appropriate sizing of mechanical equipment, and specifying high efficiency equipment.


This article highlights aspects of system control, required for compliance with the IL ECC, which help ensure that both heating and cooling equipment operate only when truly necessary for space conditioning.

Zone Thermostatic Control: HVAC zones are defined as a space or group of spaces within a building with heating and/or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device (e.g. thermostat). To comply with the IL ECC, commercial buildings are required to establish multiple zones of control if differing heating or cooling requirements exist between spaces (2009 IECC® § 503.2.4.1 and ASHRAE 90.1 § 6.4.3.1.1).

Note this key difference between the IL ECC requirements for commercial buildings and the more familiar forms of thermostat control found in a residence (for example)—where it is common to have only one thermostat control an entire dwelling. Use of a single thermostat for multiple zones can result in significantly varying temperatures throughout a building. For example, if a thermostat is located in a south-facing room with lots of windows, it may call for cooling that other zones do not require. Similarly, if the thermostat is located in a core zone with little heat requirement, perimeter zones that need heat may become uncomfortably cold.

The Code addresses the need for independent thermostatic controls to meet varying zone conditions by requiring the establishment of multiple
zones of control and by requiring the zone control to respond to actual zone temperatures (as opposed to outdoor air temperatures, for example). Code requirements tighten temperature control so that heating and cooling can be supplied only as needed to maintain each zone in its desired operating range. Energy savings and improved occupant comfort result from this enhanced control—by avoiding over-conditioning some areas based on the conditioning needs of another area with different thermal conditions. SEDAC strongly recommends carefully planned implementation and operation of zone thermostatic controls wherever varying zone conditions exist.

Dead Band Control: Dead band control prevents systems from fighting each other by shuttling between heating and cooling. Both the 2009 IECC® and ASHRAE 90.1 restrict the overlap of temperature setpoints by requiring zone thermostatic controls to provide a 5 °F or more temperature range (or “dead band”) between heating and cooling in which minimal or preferably no conditioning occurs (2009 IECC® § 503.2.4.2; ASHRAE 90.1 § 6.4.3.1.2). SEDAC strongly recommends installation and operation of dead band control for systems with both heating and cooling in the same zone that do not have manual change-over between modes.

Off-Hour Control: Off-hour control allows scheduling equipment to turn off during unoccupied hours with safeguards that cycle equipment on during these setback hours to avoid freezing conditions in winter or high humidity conditions in summer. To comply with the IL ECC, most HVAC systems must be provided with off-hour control (2009 IECC® § 503.2.4.3; ASHRAE 90.1 § 6.4.3.3). Controls should allow at least seven daily schedules and have battery backup to maintain schedules during a power outage. Further, override capability should be provided (such as a push button, timer, or occupant sensor) to permit last minute schedule changes. This override should operate for about 2 hours. Properly functioning off-hour controls can result in significant energy savings. SEDAC strongly recommends installation and operation of off-hour controls to minimize run-time of HVAC systems when buildings or individual areas (zones) of buildings are unoccupied.

Optimum Start Controls: Optimum start controls activate HVAC systems as late as possible to bring the building up to temperature set points for the start of occupancy. Optimum start control routines vary the start of heating and cooling systems based on the difference between outside and interior space temperatures, adjusting for the building’s thermal storage and heat loss properties. For example, in more temperate weather, the building HVAC system needs little time to recover from its night temperature setback, so equipment start-up could be delayed. Similarly, equipment reactivation would not be postponed during weather extremes or after interior temperatures have drifted farther from desired setpoints. ASHRAE 90.1 (§ 6.4.3.3.3) requires individual heating and cooling air distribution systems (with a total design supply air capacity > 10,000 cfm; served by one or more supply fans) to have optimum start controls. The same type of control routines can also be programmed to shut systems down as early as possible while maintaining comfortable temperature set points. SEDAC strongly recommends installation and operation of optimum start controls.