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## SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

Space-conditioning systems shall be installed with controls that comply with the applicable requirements of Subsections (a) through (i).

- (a) **Thermostatic Controls for Each Zone.** The supply of heating and cooling energy to each space-conditioning zone or dwelling unit shall be controlled by an individual thermostatic control that responds to temperature within the zone and that meets the applicable requirements of Section 120.2(b).

**EXCEPTION to Section 120.2(a):** An independent perimeter heating or cooling system may serve more than one zone without individual thermostatic controls if:

1. All zones are also served by an interior cooling system;
2. The perimeter system is designed solely to offset envelope heat losses or gains;
3. The perimeter system has at least one thermostatic control for each building orientation of 50 feet or more; and
4. The perimeter system is controlled by at least one thermostat located in one of the zones served by the system.

- (b) **Criteria for Zonal Thermostatic Controls.** The individual thermostatic controls required by Section 120.2(a) shall meet the following requirements as applicable:

1. Where used to control comfort heating, the thermostatic controls shall be capable of being set, locally or remotely, down to 55°F or lower.
2. Where used to control comfort cooling, the thermostatic controls shall be capable of being set, locally or remotely, up to 85°F or higher.
3. Where used to control both comfort heating and comfort cooling, the thermostatic controls shall meet items 1 and 2 and shall be capable of providing a temperature range or dead band of at least 5°F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

**EXCEPTION to Section 120.2(b)3:** Systems with thermostats that require manual changeover between heating and cooling modes.

4. Thermostatic controls for all unitary single zone, air conditioners, heat pumps, and furnaces, shall comply with the requirements of Section 110.2(c) and Reference Joint Appendix JA5 or, if equipped with DDC to the Zone level, with the Automatic Demand Shed Controls of Section 120.2(h).

**EXCEPTION 1 to Section 120.2(b)4:** Systems serving exempt process loads that must have constant temperatures to prevent degradation of materials, a process, plants or animals.

**EXCEPTION 2 to Section 120.2(b)4:** Gravity gas wall heaters, gravity floor heaters, gravity room heaters, non-central electric heaters, fireplaces or decorative gas appliances, wood stoves, room air conditioners, and room air-conditioner heat pumps.

- (c) **Hotel/Motel Guest Room and High-rise Residential Dwelling Unit Thermostats.**

1. Hotel/motel guest room thermostats shall:
  - A. Have numeric temperature setpoints in °F and °C; and
  - B. Have setpoint stops, which are accessible only to authorized personnel, such that guest room occupants cannot adjust the setpoint more than ±5°F (±3°C); and
  - C. Meet the requirements of Section 150.0(i).

**EXCEPTION to Section 120.2(c)1:** Thermostats that are integrated into the room heating and cooling equipment.

2. High-rise residential dwelling unit thermostats shall meet the requirements of Section 150.0(i).
- (d) **Heat Pump Controls.** All heat pumps with supplementary electric resistance heaters shall be installed with controls that comply with Section 110.2(b).
- (e) **Shut-off and Reset Controls for Space-conditioning Systems.** Each space-conditioning system shall be installed with controls that comply with the following:
1. The control shall be capable of automatically shutting off the system during periods of nonuse and shall have:
    - A. An automatic time switch control device complying with Section 110.9, with an accessible manual override that allows operation of the system for up to 4 hours; or
    - B. An occupancy sensor; or
    - C. A 4-hour timer that can be manually operated.

**EXCEPTION to Section 120.2(e)1:** Mechanical systems serving retail stores and associated malls, restaurants, grocery stores, churches, and theaters equipped with 7-day programmable timers.
  2. The control shall automatically restart and temporarily operate the system as required to maintain:
    - A. A setback heating thermostat setpoint if the system provides mechanical heating; and
 

**EXCEPTION to Section 120.2(e)2A:** Thermostat setback controls are not required in nonresidential buildings in areas where the Winter Median of Extremes outdoor air temperature determined in accordance with Section 140.4(b)4 is greater than 32°F.
    - B. A setup cooling thermostat setpoint if the system provides mechanical cooling.
 

**EXCEPTION to Section 120.2(e)2B:** Thermostat setup controls are not required in nonresidential buildings in areas where the Summer Design Dry Bulb 0.5 percent temperature determined in accordance with Section 140.4(b)4 is less than 100°F.
  3. Multipurpose room less than 1000 ft<sup>2</sup>, classrooms greater than 750 ft<sup>2</sup> and conference, convention, auditorium and meeting center rooms greater than 750 ft<sup>2</sup> that do not have processes or operations that generate dusts, fumes, vapors or gasses shall be equipped with occupant sensor(s) to accomplish the following during unoccupied periods:
    - A. Automatically setup the operating cooling temperature set point by 2°F or more and setback the operating heating temperature set point by 2°F or more; and
    - B. Automatically reset the minimum required ventilation rate with an occupant sensor ventilation control device according to Section 120.1(c)5.

**EXCEPTION 1 to Sections 120.2(e)1, 2, and 3:** Where it can be demonstrated to the satisfaction of the enforcing agency that the system serves an area that must operate continuously.

**EXCEPTION 2 to Sections 120.2(e)1, 2, and 3:** Where it can be demonstrated to the satisfaction of the enforcing agency that shutdown, setback, and setup will not result in a decrease in overall building source energy use.

**EXCEPTION 3 to Sections 120.2(e)1, 2, and 3:** Systems with full load demands of 2 kW or less, if they have a readily accessible manual shut-off switch.

**EXCEPTION 4 to Sections 120.2(e)1 and 2:** Systems serving hotel/motel guest rooms, if they have a readily accessible manual shut-off switch.

**Exception 5 to Sections 120.2(e)3:** If Demand Control Ventilation is implemented as required by Section 120.1(4).
  4. Hotel and motel guest rooms shall have captive card key controls, occupancy sensing controls, or automatic controls such that, no longer than 30 minutes after the guest room has been vacated, setpoints are setup at least +5°F (+3°C) in cooling mode and set-down at least -5°F (-3°C) in heating mode.

- (f) **Dampers for Air Supply and Exhaust Equipment.** Outdoor air supply and exhaust equipment shall be installed with dampers that automatically close upon fan shutdown.
- EXCEPTION 1 to Section 120.2(f):** Where it can be demonstrated to the satisfaction of the enforcing agency that the equipment serves an area that must operate continuously.
- EXCEPTION 2 to Section 120.2(f):** Gravity and other nonelectrical equipment that has readily accessible manual damper controls.
- EXCEPTION 3 to Section 120.2(f):** At combustion air intakes and shaft vents.
- EXCEPTION 4 to Section 120.2(f):** Where prohibited by other provisions of law.
- (g) **Isolation Area Devices.** Each space-conditioning system serving multiple zones with a combined conditioned floor area of more than 25,000 square feet shall be designed, installed, and controlled to serve isolation areas.
1. Each zone, or any combination of zones not exceeding 25,000 square feet, shall be a separate isolation area.
  2. Each isolation area shall be provided with isolation devices, such as valves or dampers that allow the supply of heating or cooling to be reduced or shut-off independently of other isolation areas.
  3. Each isolation area shall be controlled by a device meeting the requirements of Section 120.2(e)1.
- EXCEPTION to Section 120.2(g):** A zone need not be isolated if it can be demonstrated to the satisfaction of the enforcement agency that the zone must be heated or cooled continuously.
- (h) **Automatic Demand Shed Controls.** HVAC systems with DDC to the Zone level shall be programmed to allow centralized demand shed for non-critical zones as follows:
1. The controls shall have a capability to remotely setup the operating cooling temperature set points by 4 degrees or more in all non-critical zones on signal from a centralized contact or software point within an Energy Management Control System (EMCS).
  2. The controls shall have a capability to remotely setdown the operating heating temperature set points by 4 degrees or more in all non-critical zones on signal from a centralized contact or software point within an EMCS.
  3. The controls shall have capabilities to remotely reset the temperatures in all non-critical zones to original operating levels on signal from a centralized contact or software point within an EMCS.
  4. The controls shall be programmed to provide an adjustable rate of change for the temperature setup and reset.
  5. The controls shall have the following features:
    - A. Disabled. Disabled by authorized facility operators; and
    - B. Manual control. Manual control by authorized facility operators to allow adjustment of heating and cooling set points globally from a single point in the EMCS; and
    - C. Automatic Demand Shed Control. Upon receipt of a demand response signal, the space-conditioning systems shall conduct a centralized demand shed, as specified in 120.2(h)1 and 120.2(h)2, for non-critical zones during the demand response period.
- (i) **Economizer Fault Detection and Diagnostics (FDD).** All newly installed air-cooled unitary direct-expansion units, equipped with an economizer and with mechanical cooling capacity at AHRI conditions of greater than or equal to 54,000 Btu/hr, shall include a Fault Detection and Diagnostics (FDD) system in accordance with subsections 120.2(i)1 through 120.2(i)9. Air-cooled unitary direct expansion units include packaged, split-systems, heat pumps, and variable refrigerant flow (VRF), where the VRF capacity is defined by that of the condensing unit.
1. The following temperature sensors shall be permanently installed to monitor system operation: outside air, supply air, and return air; and
  2. Temperature sensors shall have an accuracy of  $\pm 2^{\circ}\text{F}$  over the range of 40°F to 80°F; and
  3. Refrigerant pressure sensors, if used, shall have an accuracy of  $\pm 3$  percent of full scale; and
  4. The controller shall have the capability of displaying the value of each sensor; and

5. The controller shall provide system status by indicating the following conditions:
  - A. Free cooling available
  - B. Economizer enabled
  - C. Compressor enabled
  - D. Heating enabled
  - E. Mixed air low limit cycle active
6. The unit controller shall manually initiate each operating mode so that the operation of compressors, economizers, fans, and heating system can be independently tested and verified; and
7. Faults shall be reported to a fault management application accessible by day-to-day operating or service personnel, or annunciated locally on zone thermostats; and
8. The FDD system shall detect the following faults:
  - F. Air temperature sensor failure/fault
  - G. Not economizing when it should
  - H. Economizing when it should not
  - I. Damper not modulating
  - J. Excess outdoor air
9. The FDD System shall be certified by the Energy Commission as meeting requirements 120.2(i)1 through 120.2(i)8 in accordance with Section 100(h).