CALIFORNIA STATEWIDE
UTILITY CODES AND STANDARDS PROGRAM

2016 Title 24 Codes & Standards Enhancement (CASE) Proposal

ASHRAE Electricity Savings – Direct Digital Control (DDC)

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Scott Bailey, EIT
ASWB Engineering
2501 Chambers Road, Suite 103, Tustin CA
(714) 731-8193

Pre-rulemaking Workshop: Agenda

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Code Change Overview

Direct Digital Control (DDC)

- Proposed new code would add mandatory requirements for Direct Digital Control (DDC) systems to be installed in certain building applications
- Energy saving measures, that are facilitated by DDC systems, will also be adopted from ASHRAE 90.1 (2013)

Current Code Requirements

2013 Title 24 Requirements:

- The installation of a DDC system is not a requirement for buildings under Title 24
- *IF* a DDC system is installed to the zone level voluntarily, then current Title 24 requirements apply:
  - Demand Control Ventilation – Title 24 Section 120.1(c)
  - Automatic demand shed control – Title 24 Section 120.2(h)
  - Set point reset for Variable Air Volume (VAV) systems – Title 24 Section 140.4(c)2C

Current Code Requirements

- Title 24 defines the term DDC, however it does not specify the required capabilities of DDC
- Title 24 Definition:

  Direct Digital Control is a type of control where controlled and monitored analog or binary data, such as temperature and contact closures, are converted to digital format for manipulation and calculations by a digital computer or microprocessor, then converted back to analog or binary form to control mechanical devices.

Proposed Code Change Language

SECTION 120.2 REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

(j) **Direct Digital Controls (DDC)**. Direct Digital Control shall be required as follows:

1. DDC shall be provided in the applications and qualifications listed in Table 120.2-A.
2. Where DDC is required by Section 120.2(j), the DDC system shall be capable of all of the following, as required, to provide the control logic required in Sections 120.1(c), 120.2(h) and 140.4(c)2C:
   A. Monitor zone and system demand for fan pressure, pump pressure, heating, and cooling.
   B. Transfer zone and system demand information from zones to air distribution system controllers and from air distribution systems to heating and cooling plant controllers.
   C. Automatically detect those zones and systems that may be excessively driving the reset logic and generate an alarm or other indication to the system operator.
   D. Readily allow operator removal of zone(s) from the reset algorithm.
   E. For new buildings, the DDC system shall be capable of trending and graphically displaying input and output points.

Proposed Code Change Language

- Table 120.2-A, to be added to Title 24, defines which buildings will be required to have DDC; requiring a minimum of 4 zones and a minimum HVAC equipment size capacity to qualify.

TABLE 120.2-A DDC Applications and Qualifications

BUILDING STATUS	APPLICATION	QUALIFICATIONS
New building	Air-handling system and all zones served by the system	Individual systems supplying more than three zones and with fan system bhp of 10 hp and larger
New building	Chilled-water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design cooling capacity of 300,000 Btu/h and larger
New building	Hot-water plant and all coils and terminal units served by the system	Individual plants supplying more than three zones and with design heating capacity of 300,000 Btu/h and larger

Proposed Code Change Language

TABLE 120.2-A DDC Applications and Qualifications (cont.)

BUILDING STATUS	APPLICATION	QUALIFICATIONS
Alteration or addition	Zone terminal unit such as VAV box	Where existing zones served by the same air-handling, chilled-water, or hot-water system have DDC
Alteration or addition	Air-handling system or fan coil	Where existing air-handling system(s) and fan-coil(s) served by the same chilled- or hot-water plant have DDC
Alteration or addition	New air-handling system and all new zones served by the system	Individual systems with fan system bhp of 10 hp and larger and supplying more than three zones and more than 75% of zones are new
Alteration or addition	New or upgraded chilled-water plant	Where all chillers are new and plant design cooling capacity is 300,000 Btu/h and larger
Alteration or addition	New or upgraded hot-water plant	Where all boilers are new and plant design heating capacity is 300,000 Btu/h and larger

Measure Impacts

- Applies to all new buildings, additions and retrofits (alterations) except for very small buildings where DDC would not be cost effective; based on the Qualifications in Table 120.2-A.
- The mandated DDC systems will facilitate:
  - Improved building HVAC operations
  - Implementation of energy efficiency measures
  - Management of building energy demand
- LEED Performance Credits can apply

Proposed Code Change History

- The proposed measure is derived from ASHRAE 90.1 (2013) Section 6.4.3.10 and has already been vetted publically
- ASHRAE includes additional energy saving measures when DDC is installed to the zone level, which will be incorporated into Title 24:
  - Multiple-Zone VAV System Ventilation Optimization – reduce outdoor air intake
  - Optimum Start Controls – heating and cooling systems shall have optimum start times

Typical Practices

- Small buildings
  - Typically small buildings are not built with an Energy Management Control System or DDC
  - Would benefit from DDC and its measures
- Medium and large buildings
  - Typically medium and large buildings have an Energy Management Control System (EMCS)
  - An EMCS is a digital system and therefore considered to be DDC; so existing Title 24 requirements for set point reset logic, demand control ventilation and automatic demand shed controls would already be implemented

Methodology for Savings Analysis

- Energy and Demand Impacts
  - The energy saving methodology takes into consideration the following:
    - CEC projections for new construction
    - Applicable buildings and HVAC systems
    - Minimum compliant DDC systems for Title 24
    - California Climate Zones
  - Energy savings will be modeled using eQUEST energy analysis software on representative building prototypes across all California climate zones

Assumptions for Savings Analysis

- Current Assumptions:
  - Cost of implementation is based on size of building and number of HVAC zones
  - The proposed measure will have the greatest impact on small buildings and limited impact on medium and large buildings
  - Most savings will be derived from Demand Control Ventilation, set point reset and optimum start controls
  - Savings from automatic demand shed controls will not be included because participation in IOU demand response programs is not required

Initial Data and Findings

- Initial Findings:
  - Analysis is still underway to refine building prototypes
  - Initial findings indicate savings will be low relative to other measures because:
    - buildings most likely impacted will be of small size
    - medium and large buildings will have to comply with the proposed measure, but typically these buildings already have Energy Management Control Systems and therefore are in compliance

Stakeholder Meeting Feedback

- Stakeholder meeting held May 20, 2014
  - Demand Control Ventilation requirements are already established by Title 24 Section 120.1(c)
  - Thermal Storage or Permanent Load Shifting do not satisfy Title 24 requirement for automatic demand shed controls
  - For more feedback from the meeting, visit Title24Stakeholders.com

Requests from Stakeholders

- We would greatly appreciate any information you are able to provide to assist our efforts
  - technical information
  - market trends and forecast
  - cost data

- If you would like to provide us with any additional feedback or information, send an email to sebailey@aswb-engineering.com

Questions?

Scott Bailey
ASWB Engineering
(714) 731-8193
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