

Healthcare Exceptions



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Acronyms

Table 1 presents a list of acronyms used in this report. Title24stakeholders.com also maintains a [glossary of terms](#).

Table 1: List of Acronyms

Acronym	Definition
ACM	Alternative Calculation Method
ADA	Americans with Disabilities Act
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
ATT	Acceptance Test Technician
BAS	Building Automation System
BCR	Benefit-to-cost Ratio
BEM	Building Energy Modeling
Btu	British Thermal Units
CALGreen	California Green Building Standards Code
Cal/OSHA	California Division of Occupational Safety and Health
CARB	California Air Resources Board
CASE	Codes and Standards Enhancement
CBSC	California Building Standards Commission
CBECC	California Building Energy Code Compliance Software
CBECC-Res	California Building Energy Code Compliance for Residential Buildings Software
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CBO	Community-Based Organization
CPUC	California Public Utilities Commission
CSE	California Simulation Engine
CTF	Conduction Transfer Functions
CZ	Climate Zone
DAC	Disadvantaged Community
DDC	Direct Digital Controls
DGS	California Department of General Services
DOAS	Dedicated Outdoor Air System
DOSH	Division of Occupational Safety and Health
ECC	Energy Code Compliance
ECM	Electronic Commutated Motor

Acronym	Definition
EIR	Environmental Impact Report
EPIC	Electric Program Investment Charge
ESJ	Environmental and Social Justice
FSOR	Final Statement of Reasons
GHG	Greenhouse Gas
GWh	Gigawatt-Hour
HCAI	California Department of Health Care Access and Information
HVAC	Heating, Ventilation, and Air Conditioning
IDF	Input Data File
IECC	International Energy Conservation Code
IOU	Investor-Owned Utility
ISOR	Initial Statement of Reasons
Kg/s	Kilograms per Second
kWh	Kilowatt-Hour
kWh/year	Kilowatt-Hour Per Year
LED	Light Emitting Diode
LPD	Lighting Power Density
LSC	Long-term System Cost
MeasureSET	CASE Measure Savings Estimation Template
MG	Million Gallons of Water
NAICS	North American Industry Classification System
NPDI	Net Private Domestic Investment
PEP	Public Engagement Plan
PV	Present Value
SDD	Standards Data Dictionary
SOC	Standard Occupational Classification
SPMS	Saturation Pressure Measurement Sensors
SRIA	Standardized Regulatory Impact Assessment
UL	Underwriters Laboratories
VAV	Variable Air Volume
VFD	Variable Frequency Drives
W	Watt

1. Introduction

This is a draft report. The Statewide Codes and Standards Enhancement (CASE) Team encourages readers to provide comments on the proposed code changes and supporting analyses. The CEC will evaluate proposals that the Statewide CASE Team and other stakeholders submit and may revise or reject proposals. More information about the rulemaking schedule and how to participate in the process can be found on CEC’s 2028 code cycle website. Suggested revisions will be considered when refining proposals and analyses. The final CASE Report will be submitted to the CEC later in 2026.

For this report, the Statewide CASE Team is requesting input on the following:

- 1. When assessing costs of alterations in healthcare facilities, and specifically hospitals and skilled nursing facilities, what data sources should be considered?*
- 2. Should the Statewide CASE Team establish additional thresholds at the building-system level to determine when healthcare alterations must comply with the code?*

Email comments and suggestions to info@title24stakeholders.com and Bryan Boyce (bboyce@energy-solution.com). Comments will either not be released for public review or will be anonymized if shared.

1.1 Report Context

This proposal describes specific energy-efficiency code changes (referred to as “measures”) aimed at reducing wasteful, uneconomic, inefficient, or unnecessary consumption of energy in California. These measures are submitted to the California Energy Commission (CEC) for consideration and potential inclusion in California’s Energy Code (Title 24, Part 6), which sets statewide energy efficiency requirements for newly constructed buildings and for additions and alterations to existing buildings. Measures may also be considered for inclusion in CALGreen (Title 24, Part 11) as voluntary energy efficiency standards, which would take effect only if adopted by a local jurisdiction seeking to exceed the minimum requirements of the Energy Code. Measures submitted to the CEC will be reviewed, may be modified, and may be incorporated into a broader regulatory package proposed and adopted by the CEC. To be included in the Energy Code, proposed measures must be both cost effective and technically feasible.

1.2 Proposal Sponsors

Three California Investor-Owned Utilities (IOUs) — Pacific Gas & Electric Company, San Diego Gas & Electric, and Southern California Edison sponsored this effort as a group. Where the term, “Statewide CASE Team” is used in this report, it refers the authors of the CASE report and the Codes & Standards programs of the supporting California Investor-Owned Utilities.

1.2.1 Stakeholder Engagement to Inform Proposal

When developing the code change proposal and associated technical information presented in this report, the Statewide CASE Team engaged many industry stakeholders including the California Energy Commission (CEC), California Department of Health Care Access and Information (HCAI), American Society for Health Care Engineering (ASHE), American Hospital Association, manufacturers, builders, architects and engineers, utility incentive program managers, Title 24 energy analysts, and others involved in the code compliance process. The proposal incorporates feedback received during a public stakeholder workshop that the Statewide CASE Team held on September 23, 2025.

When developing this proposal, the Statewide CASE Team worked closely with HCAI to ensure the proposed code changes are feasible and reasonable for the healthcare industry to implement. HCAI is an essential voice in this proposal, as they are responsible for regulating the design and construction of certain licensed healthcare facilities in the state, often proposing code changes and issuing Code Application Notices (CANs) to interpret how Title 24 uniquely applies to healthcare facilities. Considering that healthcare facilities are still exempted from many requirements in the California Energy Code, the Statewide CASE Team worked with HCAI to go line by line through current exceptions to determine measures that meet the following criteria: cost-effectively reduce energy use in nonresidential healthcare facilities, preserve patient care, and meet current industry practices for new and existing buildings. The Statewide CASE Team will continue to rely on HCAI’s expertise throughout the 2028 Title 24, Part 6 process to ensure proposed measures can be effectively implemented in the field. See Appendix E for details on the Statewide CASE Team’s stakeholder engagement.

2. Shut-off and Reset Controls

2.1 Shut-off and Reset Controls – Measure Description

2.1.1 Proposed Code Change

The proposed code change seeks to retain the current exception to **120.2(e), Shut-off and reset controls for space-conditioning systems**, for nonresidential healthcare facilities in Title 24, Part 6 and create another subsection specific for healthcare facilities and airflow turndown allowances. Healthcare facilities will still be exempted from 120.2(e)1,2,3, which requires automatic shut-off control, requiring controls to automatically reset to heating and cooling setbacks and occupant sensing zone controls. This exception is retained because 1) 120.2(e)1,2 - Healthcare facilities cannot shut off the system per CMC and 2) 120.2(e)3 – Occupancy sensing control only applies to spaces governed by 120.1- ventilation. Healthcare is governed by CMC Chapter 4, so this is also not applicable.

The CASE team discussed whether it would be more appropriate to address this in the CMC since it has healthcare-specific requirements, and an overlap may confuse the market. In the long term, more healthcare energy requirements will be incorporated into this code. The CASE team recommends keeping energy requirements in T24-6 and referencing CMC as appropriate.

The Statewide CASE team is instead proposing a mandatory code requirement that specifies that each space conditioning system serving healthcare facilities must be installed with controls that comply with the following:

1. For healthcare facilities, for each space where airflow turndown is permitted by Table 4-A of the California Mechanical Code and/or Title 24, Part 6, the serving HVAC system shall have controls that reset zone or terminal supply airflow to no less than the minimum allowed for that space based on occupied or unoccupied status. Spaces inside healthcare facilities not listed on Table 4-A of the California Mechanical Code shall follow Title 24 part 6 requirements.

An exception will be added for systems serving multiple spaces to ensure airflow reductions do not go below the minimum required airflow for any space served.

Table 2 summarizes the scope of the proposed code change.

Table 2: Scope of Proposed Code Change

A indicates the proposed code change is relevant.

Building Type(s)		Construction Type(s)		Type of Change			
<input type="checkbox"/> Single Family		<input checked="" type="checkbox"/> New Construction		<input checked="" type="checkbox"/> Mandatory			
<input type="checkbox"/> Multifamily		<input checked="" type="checkbox"/> Additions		<input type="checkbox"/> Prescriptive			
<input checked="" type="checkbox"/> Nonresidential (Not Group R uses)		<input checked="" type="checkbox"/> Alterations		<input checked="" type="checkbox"/> Performance			
Application Climate Zones		Energy Code Sections		Compliance Forms		Sections of ACM Reference Manuals	
Climate Zones 1-16		<ul style="list-style-type: none"> Part 6, Section 120.2(e) 		NRCC-MCH-E, NRCI-MCH-E, NRCC-CXR-E, NRCI-CXR-E -		Mandatory	
Third Party Verification)				Updates to Compliance Software			
<input type="checkbox"/> No changes to third party verification				<input type="checkbox"/> No updates			
<input checked="" type="checkbox"/> Update existing verification requirements				<input type="checkbox"/> Update existing feature			
<input type="checkbox"/> Add new verification requirements				<input checked="" type="checkbox"/> Add new feature			

2.1.2 Benefits of Proposed Change

Healthcare facilities were included in the California Energy Code purview during the 2019 code cycle but were exempted from many energy saving measures in the code. Several exemptions have remained in place, despite other national codes and standards, such as the International Energy Conservation Code (IECC) and ASHRAE Standard 90.1 that do not include blanket healthcare facility exceptions. This presents an opportunity for California hospitals, skilled nursing facilities, and other nonresidential healthcare facilities to align with national codes and standards and construction practices in other states. This alignment can help simplify design, engineering, and construction plans for firms that design and construct healthcare facilities across the country. One goal of modifying this exception and adding healthcare specific requirements, as well as others specified in this CASE Report, is to generate additional energy savings and pave the way for reviewing and potentially removing other healthcare exceptions during future code cycles.

The proposed change would yield energy and energy cost savings for healthcare facilities that do not currently install and implement setback controls on their heating, ventilation, and air-conditioning (HVAC) systems. While healthcare facilities will still be exempted from the automatic system shut-off requirement of 120.2(e) per Section 407.1.1 of the 2025 CMC which requires systems to operate continuously, systems serve many spaces that are allowed to turndown airflow per Table 4-A of the CMC. By requiring systems that can turndown to enable that feature, there is the potential for

significant energy savings. While certain spaces in hospitals and other healthcare facilities have specific ventilation requirements that limit the ability to achieve this type of system efficiency, many spaces, such as cafeterias, corridors, patient rooms, and others, can easily implement this approach. Energy savings would come from allowing HVAC systems to turn down to more efficient levels when serving specific zones and spaces in a healthcare facility where it would be safe and allowable to do so.

By referencing Table 4-A of the 2025 CMC, this creates a more targeted approach to ensure spaces that cannot be turned down due to specific ventilation requirements are exempted, while all other spaces would be subject to new turndown requirements outlined in 120.2(e). Of the 142 spaces referenced in Table 4-A, just over 70 percent allow unoccupied turndown, so this change would impact a significant portion of the hospital and drive cost-effective savings (Commission 2025). This approach also has the added benefit of aligning more closely with HCAI requirements and ASHRAE Standard 170 – Ventilation of Health Care Facilities, which was adopted as Table 4-A in the 2025 CMC. This alignment helps to reduce code complexity and potential for conflicting code requirements.

At the state level, extending this requirement to all new nonresidential healthcare facilities would have considerable cumulative impacts, as presented in the energy and cost savings section of this report.

2.1.3 Background Information

Healthcare facility HVAC systems represent one of the most significant and continuous energy loads in California’s nonresidential building stock. Historically, healthcare facilities have operated their HVAC systems continuously, always maintaining full airflow and temperature control in all spaces. This practice originated from infection-control concerns and the limitations of older control systems that could not reliably differentiate between critical and non-critical zones.

Over the past decade, both technology and healthcare codes have advanced to make variable operation feasible and safe in many healthcare spaces. ASHRAE Standard 170 introduced explicit provisions allowing temperature and airflow reset during unoccupied or standby conditions, provided that pressure relationships and minimum ventilation rates are maintained in spaces that require it. These provisions have since been incorporated into the 2025 CMC.

Notably, CMC Table 4-A now identifies several space types—including certain procedures, diagnostics, and support areas—where unoccupied airflow turndown is permissible. This marks a significant evolution in California’s mechanical design standards, formally acknowledging that many healthcare spaces can safely operate at

reduced airflow during unoccupied periods while maintaining required indoor air quality and pressurization.

The proposed update to Title 24, Part 6, Section 120.2(e) builds directly upon this advancement. By referencing the same unoccupied turndown allowances in CMC Table 4-A, the proposed reset control requirement in 120.2(e) ensures that HVAC systems can automatically respond to occupancy conditions using occupancy-sensing zone controls. When a zone transitions to an unoccupied or standby mode, the system will reduce airflow and adjust temperature setpoints accordingly—fully consistent with both the CMC and ASHRAE 170 frameworks.

In effect, this proposal would not introduce a new operational concept but rather codifies and harmonizes existing guidance from ASHRAE 170 and the 2025 CMC within Title 24, Part 6. The addition of reset control requirements would establish the automation and control logic needed to realize the energy and resilience benefits already envisioned in mechanical design standards. This change would also align California's Energy Code with the latest clinical ventilation practices, enabling healthcare facilities to operate safely, efficiently, and responsively to actual occupancy conditions.

The technical implementation of this requirement in clinical spaces is more complex than in non-clinical spaces, as the dominant technology implemented to meet this requirement is an occupancy sensor, a passive infrared technology that registers movement. In many clinical spaces that allow setbacks, occupants must lie motionless or may be asleep, making the traditional occupancy sensor less effective. While some clinical spaces, such as exam rooms, do not allow unoccupied turndown and would be exempt from this requirement, others clinical spaces, such as patient rooms would be subject to this requirement.

A variety of occupancy counting technologies exist and have been in use for many decades. The premise is that ventilation requirements per Title 24-6, ASHRAE 62.1, etc. use a per person and/or per unit area volume calculation. Occupancy levels fluctuate so that when the occupancy rate is below the design level, the volume of outside air may be reduced. This premise has had limited application in healthcare because recent healthcare ventilation requirements have been independent of occupancy levels.

Only in the last few years have standards like ASHRAE 170 clarified that the prescribed flow rates may not be enforced or may be relaxed while a space is unoccupied. It should be noted that in prior ASHRAE Standard 170 versions, the standard was silent on unoccupied conditions allowing hospitals considerable flexibility in their interpretation of the standard. In healthcare, the focus initially was on operating rooms because they are among the most energy intensive spaces in the hospital despite it also being considered the most critical environment. For example, hospital operating rooms started implementing occupancy driven setbacks as far back as 2010.

https://practicegreenhealth.org/sites/default/files/upload-files/casestudy_providence_r5_web.pdf

Per a survey conducted by Practice Greenhealth, 39% of hospitals implement operating room setbacks, and as shown in the table below it is implemented in a variety of ways.

https://practicegreenhealth.org/sites/default/files/2023-02/2022.Benchmark.Tables.Final_0.pdf

The clarified Table 7-1 from ASHRAE 170 that defines which spaces may implement setbacks was adopted into CMC for the 2025 version as shown in Table 4-A. The mature occupancy sensing market is only recently broadening its scope on healthcare because the regulatory requirements have been clarified. The key difference between past occupancy counting and ventilation reduction projects and applying it in a clinical setting is that a precise number of people need to be counted in non-clinical environments whereas in clinical settings it's still just a yes/no status for occupied/unoccupied, though that is only half the story.

The technical implementation of this requirement in clinical spaces is more complex than in non-clinical spaces, as the dominant technology implemented to meet this requirement is an occupancy sensor, a passive infrared technology that registers movement. In many clinical spaces that allow setbacks, occupants must lie motionless or may be asleep, making the traditional occupancy sensor less effective. While some clinical spaces, such as exam rooms, do not allow unoccupied turndown and would be exempt from this requirement, others clinical spaces, such as patient rooms, would be subject to this requirement.

That said, a promising emerging technology which uses an alternate form of infrared sensing to detect warm bodies and artificial intelligence to count the number of people in a room would potentially provide another compliance option and would be more effective than an occupancy sensor in certain clinical spaces. Using cameras and image recognition for occupancy counting has been around for more than a decade though it brings with it privacy concerns. Non-cooperative occupancy sensing solutions have been available for over a decade but never really caught on due to their complexity and potential for inaccuracy.

(<https://www.sciencedirect.com/science/article/abs/pii/S037877881000023X>)

For clinical applications, the total number of people is not relevant, only if the room is occupied or unoccupied. This relaxes the sensor accuracy requirement for healthcare as compared to rooms that follow a ventilation rate procedure where number of

occupants is an input for outside air quantity. This technology, called Resense Move,¹ and similar technologies are being piloted with results anticipated in early 2027, well before the adoption of this code change. A technology with the same goal but different approach is being deployed by EclimAi that uses cameras to detect occupancy and AI with edge computing to maintain privacy so that no data goes to the cloud or leaves the facility. These technologies are not laboratory experiments but are already in the field. They are new to healthcare but have already been deployed in non-healthcare occupancy sensing applications for HVAC control.

Healthcare Facility Types, Classification, and Enforcement

Healthcare facilities are treated differently in the California Building Code than other nonresidential building types, both in terms of code requirements and enforcement structure. The California Department of Health Care Access and Information (HCAI) is primarily responsible for overseeing the design, construction, standards development, and enforcement of healthcare facilities in the state, including hospitals, skilled nursing facilities, and other licensed facilities. While healthcare facilities are subject to the California Building Code provisions, including Title 24, Part 6, they are also subject to specific amendments, and interpretations and notices from HCAI known as Code Application Notices (CANs) and Policy Intent Notices (PINs), which modify or recommend code changes based on the unique needs of the healthcare construction space. For example, HCAI was instrumental in adding ASHRAE 170, Tables 7-1 and 8-1 as published to Table 4-A in the 2025 CMC. (California Building Standards Commission 2025)

As outlined in the California Building Code, Chapter 1, healthcare facilities fall under several different Office of Statewide Hospital Planning and Development (OSHPD) classifications (OSHPD 1 through OSHPD 6) and occupancy classifications, with either HCAI or the local building department serving as the Authority Having Jurisdiction (AHJ) (California Building Standards Commission 2025). Table 3 provides a summary of the types of healthcare facilities in each OSHPD classification and the agency responsible for all including plan review, inspection, and enforcement or any of the roles.

CODE APPLICATION NOTICE HSC §129851 states, “The extent of OSHPD’s jurisdiction is not simply everything inside the exterior skin (or 5 feet beyond) of those buildings or structures with everything outside the building remaining under the jurisdiction of the local enforcing agencies. Some local jurisdiction is retained inside

¹ Description from the company: *This compact device effectively combines: (1) a thermal sensor for people counting and (2) presence detection, (3) a light sensor, (4) a sound level sensor, (5) a Volatile Organic Compounds (TVOC) sensor, and (6) temperature and (7) humidity sensors (temperature and humidity sensors are not intended for regulation, but to be used as secondary/backup sensors).*
<https://www.distech-controls.com/products/detail/947946/distech-controls/resense-move>

these buildings, and OSHPD does have some jurisdiction over certain elements of the site or campus outside the building.”

This code cycle CASE report only addresses OSHPD 1 &2 facilities. The CASE team recommends revisiting and revising the Part 6 requirements for other facilities in future code cycles.

Table 3: Healthcare Facility Types, Classification, and Enforcement

OSHPD Classification	Facility Type	Occupancy Classification	Agency
OSHPD 1	Hospitals: general acute care hospitals	Institutional Group I-2	HCAI and Local Building Department
OSHPD 2	Skilled Nursing Facilities: intermediate care facilities	Institutional Group I-2	HCAI
OSHPD 3	Licensed Clinics: out-patient clinical services, primary-care clinics, and specialty clinics	Business Group B	HCAI and Local Building Department
OSHPD 4	Correctional Treatment Centers: health facility operated by the Department of Corrections and Rehabilitation, the Department of Corrections and Rehabilitation, Division of Juvenile Facilities, or a county, city, or city and county law enforcement agency	Institutional Group I-3	HCAI and Local Building Department
OSHPD 5	Psychiatric Hospitals: Acute Psychiatric Hospital	Institutional Group I-2	HCAI
OSHPD 6	Chemical Dependency Recovery Hospital: not with an acute care hospital building or psychiatric facility	Institutional Group I-2	HCAI/Local Building Department

2.1.4 Modifications to Energy Code Documents

This section provides descriptions of how the proposed code change will affect each Energy Code document. See Section 2.6: Shut-off and Reset Controls - Proposed Language of this report for detailed revisions to code language.

2.1.4.1 Energy Code Change Summary

The proposed energy code changes affect Title 24, Part 6. A brief description of these changes is provided below:

Note to CEC - HCAI is proposing an intervening cycle change for CAC 7-118 which requires healthcare facilities to comply with the Title 24, Part 6. They are expanding compliance criteria so we are removing this modification.

Title 24, Part 6

SECTION 120.2(e) – Shut-off and reset controls for space-conditioning systems.

Exceptions to Section 120.2(e): The proposed change would retain current healthcare exceptions to 120.2(e)1,2,3 and add a new section specific to healthcare facility systems. The new section will require healthcare facility to install controls in systems to reset to the minimum occupied or unoccupied turndown air flow as allowed per Table 4-A of the California Mechanical Code and based on room occupancy. As noted in footnote ff of Table 4-A, spaces using unoccupied turndown must include a 20-minute timer delay before setting back.

2.1.4.2 Reference Appendices Change Summary

The proposed changes will not impact the reference appendices as this change is only modifying the healthcare exception and does not fundamentally change mechanical system requirements in 120.2(e).

2.1.4.3 Compliance Manuals Change Summary

Chapter 4 - Mechanical Systems of the Nonresidential Compliance Manual would be updated to reflect modifications to the healthcare requirements in Section 120.2(e).

2.1.4.4 Alternative Calculation Method Reference Manual Change Summary

The Statewide CASE Team recommends that the several sections of the Nonresidential Alternative Calculation Method (ACM) Reference Manual be updated to improve modeling accuracy of the hospital prototype and account for proposed measure changes. These sections include: 5.1.3 HVAC System Map, 5.4 Space Uses, 5.6 HVAC Zone Level System, 5.7 HVAC Secondary System, and 5.8 HVAC Primary System. Specific changes being proposed are outlined in more detail in Section 2.6.6 ACM Reference Manual. There will be a separate stakeholder meeting which will address the

enhancements to the existing hospital prototype, and building geometry with ACM updates for the new SNF prototype.

2.1.4.5 Compliance Forms Change Summary

This proposed change will require the following compliance forms to be updated to include 120.2(e) as a requirement when selecting a healthcare building type. These forms include: NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning.

2.1.5 Measure Context

2.1.5.1 Comparable Model Codes or Standards

Energy use and ventilation in healthcare facilities are regulated across various national model codes and standards. In terms of energy efficiency, both the IECC and ASHRAE 90.1 do not include blanket exceptions for healthcare facilities in the same way as Title 24, Part 6. Instead, these codes and standards provide exceptions for healthcare facilities based on required design airflow rates, specified in ASHRAE Standard 170 in hospitals. This ensures that only critical areas, such as an operating room that have specific pressure relationships, unoccupied turndown limitations, and air change rates, are exempt from certain requirements, while other spaces comply fully. The Statewide CASE Team followed this approach by referencing Table 4-A of the 2025 CMC, which is consistent with ASHRAE Standard 170, to exempt critical spaces from 120.2(e).

ASHRAE Standard 90.1 2022

Section 6.4.3.3 requires similar setback and reset controls during non-use periods and does not include a blanket exception for healthcare facilities. There is an exception for HVAC systems intended to operate continuously.

In late 2025, addendum bh to ASHRAE 90.1-2022 was approved that requires air flow setbacks for certain clinical spaces. The 90.1 committee limited the scope of the addendum to spaces that are likely to be their own zone where occupancy sensors are realistic to implement. The intent of the addendum is the same as the changes that are being recommended to Title 24. The changes to Title 24 are more expansive as the newer technology identified will likely be readily available for setback by the time these changes are published in 2028 and are enforced in 2029. The change to 90.1-2022 was included in the recently published 90.1-2025 thus limiting the scope of the change. Per 90.1 committee members, this content will be revisited in a future continuous maintenance proposal to expand the space type list.

2024 International Energy Conservation Code (IECC)

Section C403.4.2 also requires similar setback and reset controls during non-use periods and does not include a blanket exception for healthcare facilities. There is an exception for HVAC systems intended to operate continuously.

ASHRAE Standard 170: Ventilation of Health Care Facilities

Standard 170 provides minimum ventilation design requirements and environmental control for healthcare facilities. This standard is used throughout the industry and Tables 7-1 and 8-1 were adopted directly in the CMC as Table 4-A, which is referenced in this proposed code change.

2.1.5.2 Interactions with Other Regulations

This change does not interact with or conflict with any federal laws or regulations. This change does interact with certain state requirements and the California Building Code.

State laws and requirements

Title 24, Part 6 uses the definitions in the California Health and Safety Code Division 2, Chapter 2, §1250 and the California Health and Safety Code Division 2, Chapter 1, Section 1204 to define a healthcare facility. This measure is not proposing to change the existing definition.

Interactions with California Building Code

This proposed measure would interact with the following provisions in the 2025 CMC:

- This proposed code change references Table 4-A to specifically identify, and exempt spaces that do not allow unoccupied turndown from the requirements as outlined in 120.2(e).
- 407.7 Unoccupied Turndown in the 2025 CMC allows air changes to be reduced in spaces that allow unoccupied turndown per Table 4-A. This provision requires the following conditions to be met for these spaces.
 - (1) *The number of air changes may be reduced to 25 percent of the indicated value in Table 4-A for pressurized spaces when the room is unoccupied.*
 - (2) *The number of air changes per hour indicated is reestablished whenever the space is occupied.*
 - (3) *The pressure relationship with surrounding rooms is maintained when the air changes per hour are reduced.*
 - (4) *All operating, class 3 imaging and cesarean delivery rooms shall maintain a minimum of six air changes per hour of total air when not in use.*

2.2 Shut-off and Reset Controls - Compliance and Enforcement

2.2.1 Compliance Considerations

Many healthcare facilities impacted by this measure are regulated and enforced by the HCAI Office of Statewide Hospital Planning and Development (OSHPD), who enforce all Title 24 codes, including Part 6. This means that HCAI staff and Inspectors or Record (IORs)—plans examiners and field inspectors—are responsible for 2.1.3. HCAI uses a similar plan review and permitting process to local jurisdictions but with a few important distinctions. Once a set of drawings are reviewed and approved by HCAI reviewers, the healthcare facility owner hires OSHPD certified Inspectors of Record (IORs) to monitor construction progress and note discrepancies between approved plans and field installation. IOR's perform continuous inspection during construction activities and are essential to quality control during construction. In addition to IORs, HCAI field inspectors periodically visit the site to verify compliance.

By modifying the exception to remove nonresidential healthcare facilities, HCAI plans examiners, field inspectors, and IORs will need to adjust their energy code plan review and inspection process to cover this new requirement. This will not fundamentally change their standard process,² but will require additional training and resources describing the measure and verification steps. Technical resources and training are readily available on Energy Code Ace, among other places, as this measure is required for all other nonresidential building types.

Ensuring compliance will require that plan examiners verify on plans that space conditioning equipment has controls with the ability to meet the requirements of these new measures to approve a construction permit. Once the equipment is installed, an HCAI field inspector or IOR will confirm the equipment on the plans has been installed and a commissioning agent will confirm the controls are appropriately set. For specific healthcare facilities enforced by local building departments, plan review and inspectors in those departments will enforce this measure in the same way as other nonresidential building types.

Section 7-118, Building energy efficiency program, of the California Administrative Code requires healthcare facilities to comply with Title 24, Part 6, but in its current form, does not provide detailed information on what compliance forms are needed. To address this issue, and provide additional clarity on required compliance documentation, HCAI has introduced an amendment to 7-118 in as part of the 2025 Intervening Code Cycle. As HCAI states in their reason statement for the code change,

² HCAI standard permit application, plan review, and inspection process is outlined here - <https://hcai.ca.gov/facilities/building-safety/building-and-construction-projects/hcai-standard-project-process/>

This section will not create a new requirement for HCAI projects. The language will coordinate documentation requirements in Section 10-103 and applicable signature requirements in HCAI regulations in Sections 7-115 and 7-141.... This amendment is for clarification only and does not materially alter the intent of existing code provisions or impact the cost of compliance.

While the Statewide CASE Team initially identified this as an issue to compliance and drafted proposed changes to Section 10-103, it is best to defer to HCAI on compliance documentation and the Statewide CASE Team will instead provide input on their proposed approach.³

2.2.2 Impact on Market Actors

The proposed change would primarily affect design teams, controls contractors, facility operators, and building inspectors, rather than introducing major new construction requirements. Most California healthcare projects already install equipment with shut-off and reset controls for non-clinical spaces and some clinical spaces such as operating rooms at the owner’s discretion and utilize building automation systems (BAS) capable of supporting these control functions. This change now requires these setbacks for clinical spaces as the ventilation code now clearly defines which spaces are safe to setback and by how much. Therefore, the proposal leverages existing infrastructure and industry capability, minimizing disruption to the market.

Table 4 summarizes impacts on market actors and suggests outreach and education that might be helpful to prepare market actors for the effective date of the requirements.

Table 4: Impacts on Market Actors and Suggested Training and Education Opportunities

Market Actor	Impact(s)	Suggested Outreach and Education
Builders^a	Limited to no impact	Coordination with design professionals and the compliance improvement team to raise awareness.
Design Professionals^b	Improved awareness that zones that allow unoccupied turndown and exclude specific airflow requirements would be subject to proposed HVAC controls. Aligning this requirement across all NR building types, including hospitals	Conduct outreach to local ASHRAE chapters, ASHE, and other design organizations. Provide direct training in the form of webinars, lunch and learn, and on-demand training through Energy Code Ace.

³ The proposed amendments to 7-118 were formally discussed during California Building Standards Commission Health Facilities Code Advisory Committee Meeting on January 28, 2026. <https://www.dgs.ca.gov/BSC/Rulemaking/2025-Intervening-Cycle/CAC-Mtgs>

Market Actor	Impact(s)	Suggested Outreach and Education
	and skilled nursing facilities, may reduce confusion.	
Construction Team^c	Greater number of healthcare HVAC systems with system, fan, and zone controls.	Provide training and resources to construction teams on code change requirements.
HCAI Inspectors^d	Plans reviewers will need to verify HVAC systems are specified with controls that meet new code requirements. IORs and HCAI inspectors will verify in the field that the system matches the plans, and controls are properly set.	Keep compliance forms the same and inform inspectors of minor change to their mechanical review scope. Provide clear directions to HCAI plans examiners, field inspectors, and IORs on how to review new controls requirements.
Verification Testers^e	Commissioning agents will need to adjust their mechanical commissioning scope to verify system controls are appropriately set and integrated across the BAS.	Provide training and resources about specific code change requirements.
Building Owners, Managers, and Occupants	Reduced energy bills and increased construction costs.	Awareness that new system controls would be required and provide training on proper maintenance and guidance on how to verify the system is working properly.
Manufacturers and Distributors	Increased demand for nonresidential healthcare systems with controls that meet this proposed change.	Awareness that nonresidential healthcare facilities would no longer be exempt from this measure.
Facility Operators	Maintaining shut-off and reset controls in spaces that are allowed per 2025 CMC Table 4-A.	Facility operators will be hesitant to adjust temperature or airflow in healthcare spaces. Training and resources should be provided related to how new requirements interact with Table 4-A, and in which spaces controls should be set.
Controls Contractors^f	Potentially expanded BAS scope to set occupancy-based scheduling and reset controls in additional spaces.	This is already part of their scope, so limited training and guidance would be needed to verify controls are set in spaces where required.

- a. Builders include builders and developers.
- b. Design professionals include architects, interior designers, engineers (mechanical, electrical, plumbing, structural), specification writers, cost estimators, commissioning agents, lighting designers, and energy consultants.

- c. Construction team includes general contractors, design-build contractors, installation contractors (e.g., HVAC, plumbing, electrical), commissioning agents, and tradespeople.
- d. HCAI plans reviewers, building inspectors, and specialty inspectors.
- e. Verification testers include commissioning agents, ECC Raters, and Acceptance Test Technicians.
- f. Service supporting integration of BAS controls across HVAC, lighting, and other equipment.

The 2028 CASE Methodology Report presents a quantitative assessment of how changes to the California building code impact builders, building designers and energy consultants, and building owners and occupants. The analysis in the methodology report is not specific to the code changes presented in this report. The following provides a qualitative description of how this specific code change affects various market actors and additional quantitative analyses of its potential impacts on building industry subsectors.

Builders. The proposed change would likely affect commercial builders; however, it would likely not impact firms focused on the construction or retrofitting of industrial buildings, utility systems, public infrastructure, or other heavy construction. The proposed change would not affect all firms and workers in the commercial building industry equally; instead, it would primarily affect specific subsectors within the industry. Table 5 shows the commercial building subsectors that the Statewide CASE Team expects to be impacted by the changes proposed in this report.

Table 5: Specific Subsectors of the California Commercial Building Industry Impacted by Proposed Change to Code/Standard by Subsector in 2025 (Estimated)

Construction Subsector	Establishments*	Employment	Annual Payroll (Billions \$)
Commercial Building Construction	5,491	87,450	\$10.6
Nonresidential Electrical Contractors	3,245	72,794	\$7.8
Nonresidential Plumbing & HVAC Contractors	2,270	55,182	\$5.8
Other Nonresidential Equipment Contractors	580	9,749	\$1.1

Source: (State of California n.d.)

*An establishment is single economic unit, typically at one physical location, that engages in one, or predominantly one, type of economic activity for which a single industrial classification may be applied. Many businesses are composed of multiple establishments. US Bureau of Labor Statistics, Handbook of Methods. <https://www.bls.gov/opub/hom/cew/concepts.htm>

If the proposal is adopted, then CBECC will be modified based on the proposed changes to the ACM, as described in Section 2.6.6.

2.2.3 Cost of Enforcement

The Statewide CASE Team acknowledges that changes to the code will impact enforcement costs. This report is an evaluation of specific measures, and the collective impact of all proposed changes for the 2028 Title 24, Part 6 may represent an increase in training and/or workload for enforcement personnel.

The Statewide CASE Team does anticipate that the adoption of this measure would require HCAI plan reviewers and inspectors to update processes and be trained on new code requirements. However, review of this measure can be integrated into existing plan review and field inspection processes and should not add significant review time or cost.

2.3 Shut-off and Reset Controls - Market and Economic Analysis

2.3.1 Market Structure and Availability

2.3.1.1 *Current Market Structure and Availability*

The technologies and design practices required to implement HVAC reset and turndown controls are fully mature and widely available in today's nonresidential and healthcare building market. The measure relies primarily on capabilities that already exist in Direct Digital Control (DDC) and BAS, which are standard in nearly all new California healthcare projects.

- **Controls Vendors and Manufacturers:**
Major suppliers such as Siemens, Johnson Controls, Schneider Electric, Honeywell, Trane, and Distech include setback, turndown, and ventilation reset logic as standard features in their BAS platforms. These systems natively support scheduling, occupancy sensing, and demand-based control sequences.
- **Design Engineers and Commissioning Providers:**
Most mechanical design firms and commissioning agents in California—including Mazzetti, Arup, HDR, and HGA—routinely specify and verify similar control sequences in other nonresidential occupancies. Extending these practices to healthcare projects requires little to no retraining.
- **Contractors and Integrators:**
Controls contractors already install and program occupancy-based scheduling and reset functions as part of standard BAS scope. The measure simply formalizes those functions as a mandatory requirement rather than a project-specific option.

- Equipment Manufacturers:**
 Modern air-handling units, VAV terminal boxes, and fan coils are delivered “controls-ready,” with integrated sensors, actuators, and variable-speed drives that enable airflow and temperature reset and turndown.

Because the proposed requirement uses existing infrastructure—standard BAS hardware, occupancy sensors, and control sequences, no significant new capital investment or specialized workforce training is necessary. Implementation is expected to be rapid once the exemption is removed. The measure effectively codifies current best practice and accelerates a transition already underway in leading health systems seeking to meet decarbonization and resilience goals.

2.3.1.2 Market Challenges and Solutions

While the proposed measure leverages widely available technology, several market and implementation challenges could influence adoption speed and consistency across the healthcare sector. These barriers are primarily related to institutional practices, risk perception, and coordination, rather than technology availability.

Table 6: Market Challenges and Solutions

Challenge	Description / Root Cause	Proposed or Existing Solutions
1. Infection-control and safety concerns	Facility managers are often hesitant to reduce airflow or adjust temperature in any healthcare space for fear of violating infection-control requirements or HCAI approvals.	Alignment with ASHRAE 170 and 2025 CMC Table 4-A explicitly confirms which spaces may safely turndown and reduce airflow. The proposed measure references these same criteria, providing clear guardrails that maintain compliance while allowing control flexibility.
2. Cultural resistance to operational change	Many hospitals default to continuous 24/7 HVAC operation as a “safe” choice, regardless of occupancy.	Develop concise owner/operator guidance showing real-world examples (e.g., Kaiser Permanente, UC Health) that demonstrate safe, verified implementation. Include case studies in IOU training materials to normalize practice.

Challenge	Description / Root Cause	Proposed or Existing Solutions
3. Commissioning and verification gaps	Inconsistent trend logging or verification can lead to reset logic being disabled post-occupancy.	Expand Cx checklists and trending templates in the Title 24 Compliance Manual. Encourage utility RCx programs to verify functionality and provide feedback loops to HCAI reviewers.
4. Fragmented responsibility between design and operations	Controls sequences are often value-engineered or overridden after hand-off to facilities staff.	Promote integrated design-to-operations workflows and require documentation of occupancy-based controls in the facility’s BAS sequence of operations. Utility-sponsored training or incentive programs can reinforce this hand-off.
5. Limited awareness among plan reviewers	Some HCAI officials may not yet be familiar with occupancy-based reset logic in clinical settings.	Provide statewide education modules and a one-page review checklist for enforcement staff. Emphasize that airflow turndown follows the 2025 CMC framework.

2.3.2 Design and Construction Practices

2.3.2.1 Current Design and Construction Practices

Under the current California Energy Code, licensed healthcare facilities are exempt from the HVAC shut-off and reset control requirements of Section 120.2(e). As a result, most hospitals, large medical facilities, and skilled nursing facilities in California are designed with continuously operating HVAC systems, regardless of actual occupancy or space utilization patterns.

2.3.2.2 Health and Safety Considerations

The proposed code change would not alter or supersede any existing federal, state, or local regulations pertaining to patient safety, infection control, or worker protection. All existing requirements enforced by the California Department of Public Health (CDPH), the California Division of Occupational Safety and Health (DOSH), and HCAI remain fully applicable.

Complying with the proposed measure would not create any adverse health or safety impacts for patients, staff, or maintenance personnel. The proposed shut-off and reset control requirements are consistent with provisions already included in ASHRAE Standard 170 and the 2025 CMC Table 4-A, both of which permit unoccupied airflow turndown and temperature reset while maintaining required pressure relationships and minimum ventilation rates.

2.3.2.3 Design and Construction Challenges and Solutions

Through targeted conversations with engineers, controls integrators, commissioning providers, facility managers, and HCAI reviewers, the Statewide CASE Team identified potential design and construction challenges that informed the final proposal.

The first concern raised by designers was whether shut-off and reset controls would conflict with required minimum air-change rates in clinical spaces. In response, we added a focused requirement for all zones covered under CMC Table 4-A, ensuring ventilation and infection-control requirements remain fully protected.

Facility managers expressed hesitation about shifting away from long-standing “always-on” operating practices, so the proposal was aligned directly with ASHRAE 170 and the 2025 CMC, which stakeholders agreed provides clear operational guardrails.

Commissioning providers also emphasized the need for reliable verification; this is addressed by relying on standard BAS trend logs and functional testing already included in healthcare commissioning scopes. For teams that require support adapting to these refined design strategies, the training and education efforts described in Table 4 in Section 2.2.2 will ensure designers, integrators, and operators can implement the measure consistently and confidently.

2.3.3 Energy Equity and Environmental Justice

The Statewide CASE Team evaluated the potential impact on environmental and social justice (ESJ) communities,⁴ including impacts related to race, class, and gender. We do not anticipate that requiring shut-off and reset controls in healthcare facilities will negatively impact ESJ communities. As outlined in Section 2.4.5, this measure is cost-

⁴ The CPUC refers to ESJ communities as “low-income or communities of color that have been underrepresented in the policy setting or decision-making process, are subject to a disproportionate impact from one or more environmental hazards, and likely to experience disparate implementation of environmental regulations and socio-economic investments in their communities” (CPUC 2022). ESJ communities also include the CPUC definition for Disadvantaged Communities, which comprises “(1) Census tracts receiving the highest 25 percent of overall scores in CalEnviroScreen 4.0 (1,984 tracts); (2) Census tracts lacking overall scores in CalEnviroScreen 4.0 due to data gaps, but receiving the highest 5 percent of CalEnviroScreen 4.0 cumulative pollution burden scores (19 tracts); (3) Census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0 (307 tracts); and (4) Lands under the control of federally recognized Tribes (OEHHA 2022).

effective and will reduce overall operating costs for healthcare facilities. Reducing operating costs of healthcare facilities may make those facilities more economically resilient and enable them to put more resources toward patient care. Keeping healthcare facilities open and operational is especially critical when serving ESJ communities where residents may not have other options for care.

The Statewide CASE Team identified potential impacts of the proposed code change via research and stakeholder input. While the listed potential impacts should be comprehensive, they may not yet be exhaustive. Recognizing the importance of engaging ESJ communities and gathering their input to inform the code change process and proposed measures, the Statewide CASE Team is working to build relationships with community-based organizations (CBOs) to facilitate meaningful engagement. Please reach out to Bryan Boyce (bboyce@energy-solution.com) if you have input on how this proposal may impact ESJ communities or if you would like to offer your perspective.

2.3.4 Impacts on Jobs and Businesses

This section will be completed for the Final CASE Report.

2.3.5 Economic and Fiscal Impacts

This section will be completed for the Final CASE Report.

2.4 Shut-off and Reset Controls - Cost Effectiveness

2.4.1 Cost Effectiveness Methodology

The Statewide CASE Team collaborated with CEC staff to confirm that the cost-effectiveness methodology aligns with CEC guidelines, including cost inclusion parameters. The 2028 CASE Methodology Report and Appendix A provide reproducibility details.

Per California Law (Public Resources Code 25000), a measure is considered cost effective if its Benefit-Cost Ratio (BCR) is 1.0 or greater, amortized over the economic life of the structure. The Statewide CASE Team calculates BCR by dividing total dollar benefits by total dollar costs over a 30-year analysis period.

Benefits are based on Long-term System Cost (LSC), which assigns an hourly dollar value to energy use. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are valued more than off-peak hours. These factors are not utility rates, forecasts, or bill estimates. The CEC develops and publishes LSC hourly conversion factors for each code cycle.

Costs include first costs and ongoing maintenance costs assessed over the 30-year period. Benefits and costs are evaluated incrementally, relative to the most recently adopted Energy Code. The analysis excludes design costs and incremental code compliance verification costs.

2.4.2 Energy and Energy Cost Savings Results

With this measure being applicable to nonresidential healthcare facilities, the Statewide CASE Team modeled the hospital prototype to represent the energy, cost, and emissions impact. While other nonresidential healthcare facilities would be impacted by the proposed change, such as skilled nursing facilities, the hospital prototype is being used in this analysis as a reasonably proxy for those facilities. In the final report, the Statewide CASE Team will develop a skilled nursing facility prototype and model the impact of this proposed change based on that building type. CBECC 2025 2.0 and EnergyPlus 25.1 and new 2028 metric files (weather, emission, source energy factor, and LSC cost) were used as the basis for the analysis.

Hospital Prototype Modifications

Through discussions with subject matter experts, the Statewide CASE Team determined that the default CBECC hospital prototype is not representative of a typical California hospital in terms of design or energy use characteristics. As such, the Statewide CASE Team modified the hospital prototype in the following ways to align with standard practice.

- Lighting and HVAC schedules were updated per typical hospital schedules
- Ventilation rate was updated to reflect 2025 CMC requirements⁵

For the final report, the Statewide CASE Team plans to further align the hospital prototype with standard practice and expected energy use in real world hospitals. These modifications are as follows:

- **Water vs. Air Cooled Chiller:** The Statewide CASE Team determined that most newly constructed hospitals install an air-cooled instead of a water-cooled chiller as the primary cooling equipment.⁶ CBECC uses a water-cooled chiller as the baseline system for hospitals. To ensure the model accurately represents the

⁵ Hospitals are subject to ventilation requirements in the CMC, which is consistent with the 2021 ASHRAE 170 ventilation rates

⁶ SMEs on the Statewide CASE Team indicated that it is common practice for hospitals to install air-cooled chillers instead of water-cooled chillers. Per CPC 611 and CMC 407.4, hospitals require backup on-site water storage capacity in case of an emergency to support essential functions. Cooling is an essential function, so a water-cooled chiller would require additional water storage capacity and nearly double the on-site tank size required without a water-cooled system. This is also allowed by exception for healthcare facilities if the air-cooled chiller is greater than 300 tons.

primary and secondary cooling system in the hospital model, additional market assessment is needed to determine the split between water and air-cooled chillers. The Statewide CASE Team has modeled hospitals with a water-cooled chiller in this draft report and will determine the likely split between water and air-cooled chillers and reflected in the final analysis.

- Hospital EUI alignment: The Statewide CASE Team compared the modeled hospital energy use (EUI) to the reported annual energy use of California hospitals based on data collected through CEC's Building Energy Benchmarking Program (CEC 2025). After analyzing the data, which require hospitals over 50,000 sq ft. to submit annual energy use data, the Statewide CASE Team determined that hospitals report an average weather normalized EUI of 200 to 250 kBtu/sf (235 kBtu/sf for 2024). The average EUI from CEC's dataset is approximately two to two and a half times larger than the EUI of a hospital modeled per the CBECC prototype.⁷ There are many reasons for this inconsistency, including, but not limited to, spaces (e.g., data center), additional plug and process loads, and increased ventilation not fully accounted for in the model. To more closely align the hospital baseline model with actual energy usage in hospitals, the Statewide CASE Team will further adjust the baseline hospital prototype which will impact overall potential savings in the final report and analysis.

Measure Specific Baseline vs. Proposed Assumptions

Because hospitals are currently exempt from the proposed shut-off and reset controls, the Statewide CASE Team could not use a code minimum baseline and instead had to establish common construction practices in hospitals as the baseline scenario. Through conversations with healthcare design and engineering firms and hospital owners, the Statewide CASE Team used the following baseline.

- System type: VAV HVAC systems that operate on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours.
- Control features: No occupancy sensing; no heating-setback or cooling-setup logic.

The proposed model assumes a hospital that is fully compliant with the proposed code change. Importantly, spaces that cannot be turned down as outlined in Table 4-A of the 2025 CMC, were not equipped with controls and were assumed to be the same as the baseline. As previously mentioned, this represents approximately 30 percent of the total space in a hospital facility.

⁷ This finding was also consistent with data derived from the American Society for Health Care Engineering (ASHE) and based on Mazzetti and Kaiser Permanente's experience.

- Each space is equipped with an occupancy sensor communicating to the BAS
- Occupied/standby mode transitions within five minutes of vacancy
- Automatic heating-setback/cooling-setup sequences per Title 24 §120.2(e)
- Airflow turndown to the minimum occupied or unoccupied air flow as allowed based on room occupancy

Results

Energy savings (electricity, natural gas, and source energy) and peak demand reductions per unit are presented in Table 7. Per-unit savings for the first year are expected to range from 0.09 to 0.11 kWh/yr-sf and -0.06 to 0.56 therms/yr-sf, depending upon climate zone. There are no demand reductions associated with this measure.

Table 8 presents total per-unit energy cost savings for newly constructed buildings and additions in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 8 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building. Total 30-year LSC savings range from 0.85 to 1.39 (2029 PV\$) per square foot across climate zones.

Table 7: Energy and Energy Cost Savings – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	0.09	0.00	0.12	0.29	0.95
2	0.10	0.00	0.15	0.32	1.04
3	0.09	0.00	0.39	0.52	1.18
4	0.10	0.00	0.17	0.33	1.04
5	0.09	0.00	0.28	0.42	1.08
6	0.10	0.00	0.54	0.66	1.36
7	0.10	0.00	0.56	0.67	1.39
8	0.10	0.00	0.47	0.61	1.34
9	0.10	0.00	0.38	0.52	1.24
10	0.10	0.00	0.36	0.51	1.24
11	0.11	0.00	0.17	0.35	1.09
12	0.10	0.00	0.22	0.38	1.09
13	0.10	0.00	0.23	0.40	1.13

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
14	0.10	0.00	0.12	0.31	1.04
15	0.11	0.00	0.29	0.46	1.24
16	0.10	0.00	(0.06)	0.14	0.85

Table 8: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	0.87	0.09	0.95
2	0.93	0.11	1.04
3	0.88	0.30	1.18
4	0.93	0.12	1.04
5	0.86	0.22	1.08
6	0.91	0.45	1.36
7	0.92	0.47	1.39
8	0.94	0.39	1.34
9	0.93	0.31	1.24
10	0.95	0.29	1.24
11	0.98	0.12	1.09
12	0.93	0.16	1.09
13	0.96	0.17	1.13
14	0.96	0.08	1.04
15	0.98	0.26	1.24
16	0.94	-0.09	0.85

2.4.3 Incremental First Cost

To assess the incremental cost of the proposed measure, the Statewide CASE Team combined the costs for the three control measures proposed in Sections 2, 3, and 4 given the integrated nature of components needed to meet these requirements. This approach helps to ensure costs are not double counted across measures and remain consistent with how the industry would collect costs and integrate space and zone controls into a hospital. Consistent with the baseline assumptions for hospitals described in 2.4.2, the Statewide CASE Team assumed required control capabilities—

such as scheduling, and temperature/airflow reset—were already included in modern DDC and BAS commonly installed in California healthcare facilities.

The proposed design adds control features consistent with this CASE Report for space-conditioning shut-off, reset, and fan-power modulation. Each space includes the addition of an occupancy sensor communicating to the BAS, enabling:

- Occupied/standby mode transitions within five minutes of vacancy
- Automatic heating-setback/cooling-setup sequences per Title 24 §120.2(e)
- Fan-power reduction consistent with §140.4(m) (e.g., proportional control)

Table 9 outlines the total incremental cost across the three proposed control measures, shut-off and reset, space-conditioning, and fan control per room. The following hardware and labor assumptions were used:

- BAS points: 1 point per space (occupancy/standby signal)
- Programming: 3–4 hours per space @ \$400 per hour ⇒ \$1,200–\$1,600 per space (includes scripting, testing, graphics update, and commissioning)

Table 9: Total Incremental Costs Per Room Across Three Control Measures

Room Types Included	Device Cost	Installed Cost (device + wiring + mount)	BAS Points	Programming (3–4 hr. @ \$400/hr.)	Installed Subtotal / Room
Patient Rooms, Offices, Corridors, Nurse Stations, Support Spaces, and Similar Areas	\$200	\$250 – \$400	1	\$1,200 – \$1,600	\$1,450 – \$2,000

Assuming each space is roughly 400 ft², the total installed per square foot cost is \$3.63 / ft² (low) to \$5.00 / ft² (high). As a conservative estimate, the Statewide CASE Team took the median cost of \$4.31 / ft² and applied that across all measures. To determine the cost for just this measure, shut off and reset controls, the median cost was divided by three, resulting in a per measure incremental cost of \$1.44 / ft².

To validate assumptions grounded in current industry practice and pricing, these costs have been validated through outreach to multiple market participants:

- Two national controls contractors active in hospital BAS retrofits.

- A health-system facilities engineer and an HCAI plan reviewer to verify constructability, infection-control compatibility, and commissioning effort.

2.4.4 Incremental Maintenance and Replacement Costs

Description of the incremental maintenance and replacement costs, as well as estimation of present value of maintenance and replacement costs, are provided in the 2028 CASE Methodology Report.

There are ongoing costs associated with maintaining sensors and control systems; however, most hospitals do not contract separately for this maintenance and replacement because the aggregate expense of such agreements is significant relative to their total operating budgets. In practice, maintenance of these devices is absorbed by in-house engineering and facilities staff.

At the same time, networked sensors and advanced control logic often reduce maintenance costs by improving system awareness. Operators receive earlier fault indications and can respond before equipment degradation results in major repairs. In effect, the addition of sensors supports preventive maintenance that offsets its own service burden.

Because the expense of maintenance and replacement is offset by the savings from early fault, no significant incremental cost is anticipated. Accordingly, within the long-term cost framework used for this analysis, the maintenance estimate in the model is set to zero. No specific data is collected by the hospital owners on this cost line item as the cost is relatively small compared to the first cost and energy savings.

2.4.5 Cost Effectiveness

Results of the per-unit cost-effectiveness analysis are presented in Table 10 new construction and additions.

In the table below, all values are presented in 2029 present value dollars (2029 PV\$). Benefits represent 30-year LSC savings and other savings, including incremental first-cost savings if the proposed first cost is less than the current first cost, incremental maintenance cost savings if the proposed maintenance costs are less than the current maintenance costs, and incremental residual value if proposed residual value is greater than current residual value at the end of the 30-year period of analysis. Costs represent the total incremental PV cost, including incremental equipment, replacement, and maintenance costs over the period of analysis. The analysis treats a negative incremental maintenance cost as a positive benefit. If total incremental costs are zero, the benefit-cost ratio (BCR) is considered infinite. Costs and other savings are discounted at a real (inflation-adjusted) three percent rate. If there are no total incremental PV costs, the BCR is infinite.

Table 10: 30-Year Cost-Effectiveness Summary Per Square Foot – New Construction and Additions

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	0.95	0.03	32.82
2	1.04	0.03	35.62
3	1.18	0.03	40.59
4	1.04	0.03	35.92
5	1.08	0.03	37.12
6	1.36	0.03	46.94
7	1.39	0.03	47.67
8	1.34	0.03	45.98
9	1.24	0.03	42.65
10	1.24	0.03	42.79
11	1.09	0.03	37.64
12	1.09	0.03	37.43
13	1.13	0.03	38.97
14	1.04	0.03	35.78
15	1.24	0.03	42.80
16	0.85	0.03	29.24

2.5 Shut-off and Reset Controls - Statewide Impacts

2.5.1 Statewide Energy and Energy Cost Savings

See the 2028 CASE Methodology Report for details on how statewide savings are calculated. Appendix C presents the assumptions on the percentage of the total construction forecast that the proposed measure would impact.

For more details on the methodology and context about estimating the current market share rate, as well as statewide energy and energy cost savings, see the 2028 CASE Methodology Report.

The tables below present the first-year statewide energy and LSC savings from newly constructed buildings and additions (Table 11) by climate zone.

Table 11: Statewide Energy and LSC Impacts – New Construction and Additions

Climate Zone	Statewide New Construction & Additions Impacted by Proposed Change in 2029 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction (MW)	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (million 2029 PV\$)
1	14,207	0.00	0.00	0.00	0.00	\$0.01
2	84,402	0.01	0.00	0.00	0.03	\$0.09
3	406,830	0.04	0.00	0.00	0.21	\$0.48
4	210,666	0.02	0.00	0.00	0.07	\$0.22
5	38,537	0.00	(0.00)	0.00	0.02	\$0.04
6	158,797	0.02	0.00	0.00	0.10	\$0.22
7	265,387	0.03	(0.00)	0.00	0.18	\$0.37
8	213,277	0.02	(0.00)	0.00	0.13	\$0.29
9	381,597	0.04	0.00	0.00	0.20	\$0.47
10	392,909	0.04	0.00	0.00	0.20	\$0.49
11	70,528	0.01	0.00	0.00	0.02	\$0.08
12	398,951	0.04	(0.00)	0.00	0.15	\$0.43
13	131,920	0.01	0.00	0.00	0.05	\$0.15
14	68,498	0.01	0.00	0.00	0.02	\$0.07
15	55,591	0.01	0.00	0.00	0.03	\$0.07
16	23,266	0.00	0.00	(0.00)	0.00	\$0.02
Total	2,915,364	0.29	0.01	0.01	1.42	\$3.50

2.5.2 Statewide Greenhouse Gas Emissions Reductions

Table 12 presents the estimated first-year reduction in GHG emissions resulting from the proposed code change. In this initial year, the Statewide CASE Team expects to avoid 82 metric tons of carbon dioxide equivalent (CO₂e) emissions. These reductions, along with their associated monetary value, were calculated using hourly GHG emissions factors published alongside the LSC hourly factors and source energy hourly factors in the research versions of CBECC, as well as data from the CEC's 2028 Metrics Report. See the 2028 CASE Methodology Report for additional information.

Table 12: First-Year Statewide GHG Emissions Impacts

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO2e)	Total Reduced GHG Emissions (Metric Ton CO2e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions	30	52	82	10,086
Alterations				
Total	30	52	82	10,086

2.5.3 Statewide Water Use Impacts

The proposed code change would not result in water use impacts.

2.5.4 Statewide Material Impacts

The proposed code change would not result in a meaningful change to materials.

2.5.5 Environmental Impacts

This measure reduces energy use and overall emissions from hospitals across California and does not result in any adverse environmental effects. Statewide emissions impacts from this change are summarized in Table 24.

2.5.6 Other Non-Energy Impacts

If the proposed enhanced space conditioning systems controls are properly implemented in healthcare facilities, it has the potential to improve occupant comfort. In a hospital environment, occupant comfort can dramatically improve the experience for the patient and improve their overall well-being.

2.6 Shut-off and Reset Controls - Proposed Language Code

2.6.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~strikethroughs~~ (deletions).

2.6.2 Administrative Code (Title 24, Part 1)

There are no proposed changes to Title 24, Part 1.

2.6.3 Energy Code (Title 24, Part 6)

120.2(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 1 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.

[Exception 2 to Section 120.2\(e\)1: Systems serving healthcare facilities](#)

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)3 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)3 is less than 100°F.
3. **Occupant sensing zone controls.** Where the system providing space conditioning also provides the ventilation required by Section 120.1 and includes occupant sensor ventilation control as specified in Section 120.1(d)5, the occupant sensing zone controls shall additionally comply with the following:
 - A. In 5 minutes or less after entering occupied-standby mode as described in Section 120.1(d).
 - i. Automatically set up the operating cooling temperature set point by 2°F or more and set back the operating heating temperature set point by 2°F or more; or

- ii. For multiple zone systems with Direct Digital Controls (DDC) to the zone level, setup the operating cooling temperature setpoint by 0.5°F or more and setback the operating heating temperature setpoint by 0.5°F or more.
- B. In 5 minutes or less after entering occupied-standby mode, mechanical ventilation to the zone shall remain off whenever the space temperature is between the active heating and cooling setpoints.
- Exception 1 to Sections 120.2(e)1, 2, 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, 3:** Systems with full load demands of 2 kW or less, if they have a readily accessible manual shut-off switch.
- Exception 3 to Sections 120.2(e) 1 and 2:** Systems serving hotel/motel guest rooms, if they have a readily accessible manual shut-off switch.
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 set up at least +5°F (+3°C) in cooling mode and set down at least -5°F (-3°C) in heating mode.
 5. [In healthcare facilities, for each space where airflow turndown is permitted by Table 4-A of the California Mechanical Code and/or Title 24, Part 6, the serving HVAC system shall have controls that reset zone or terminal supply airflow to no less than the minimum allowed for that space based on occupied or unoccupied status.](#)
- [Exception to Sections 120.2\(e\) 5: Where a zone or system serves multiple spaces, airflow shall not be reduced below the most restrictive applicable minimum required for any space served.](#)

~~**Exception 1 to Section 120.2(e):** Systems serving healthcare facilities.~~

2.6.4 Reference Appendices

There are no proposed changes to the Reference Appendices.

2.6.5 Compliance Manuals

The Statewide CASE Team will provide CEC with recommended revisions to compliance manuals after the 45-Day Language is published.

2.6.6 ACM Reference Manual

As mentioned throughout the report, the hospital prototype and certain ACM provisions do not align with standard practice and would need to be updated to improve modeling outcomes. Table 13: Proposed ACM Changes outlines all proposed changes to the

ACM Reference Manual across the Shut-off and Reset Controls, Space-conditioning zone controls, and Fan control proposed measures in the report.

Table 13: Proposed ACM Changes

ACM Section	Description	Proposed Change
5.1.3 HVAC System Map	Table 1: Nonresidential HVAC System Map	Standard design would no longer be the same as proposed design. Standard design is TBD for non-critical spaces.
5.4 Space Uses	5.4.2 Infiltration, 5.4.3 Occupancy, 5.4.4 Lighting Schedules	Standard design would no longer be same as proposed. Schedules for non-critical spaces will be modified to reflect real world hospital designs.
5.6 HVAC Zone Level System	5.6.3 Terminal Heat Capacity	Standard design would no longer be the same as proposed design. Standard design should be the same as other nonresidential buildings.
5.6 HVAC Zone Level System	5.6.4 Terminal Heat Capacity	Standard design would no longer be the same as proposed design. Standard design should be the same as other nonresidential buildings.
5.6 HVAC Zone Level System	5.6.7 Terminal Airflow	Standard design would no longer be the same as proposed design. Standard design should be the same as other nonresidential buildings.
5.6 HVAC Zone Level System	5.6.9 Outdoor Air Ventilation	Standard Design would be updated for healthcare facilities to reflect the CMC ventilation rate for healthcare facilities.

ACM Section	Description	Proposed Change
5.7 HVAC Secondary System	5.7.1 Basic System Information	Standard design would no longer be the same as proposed design. Standard design is TBD for non-critical spaces.
5.7 HVAC Secondary System	5.7.2 System Controls	Cooling and heating supply temperature standard design would be updated to reflect the same as other nonresidential buildings.
5.7 HVAC Secondary System	5.7.2.3 Supply Air Temperature Control	Standard design would no longer be the same as proposed design. Standard design should be the same as other nonresidential buildings.
5.7 HVAC Secondary System	5.7.3 Fan and Duct Systems	Standard design would no longer be the same as proposed design. Standard design should be the same as other nonresidential buildings.
5.8 HVAC Primary System	5.8.2 Chillers	If proposed chiller is air-cooled chiller, then same as proposed. If not, must follow Table 18, same as other nonresidential building types.

2.6.7 Compliance Forms

As discussed in Section 2.1.4.5, the NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning compliance forms would be updated to reflect the proposed change. The Statewide CASE Team can support the CEC in implementing these updates if the proposed change is adopted.

3. Space-conditioning zone controls

3.1 Space-conditioning zone controls - Measure Description

3.1.1 Proposed Code Change

The proposed code change seeks to modify the current exception to **140.4(d), Space-conditioning zone controls**, for nonresidential healthcare facilities in Title 24, Part 6 and develop a section specific to healthcare facilities that reduces energy use while accounting for ventilation and pressure relationship requirements. The proposed code change will retain the healthcare exception for Sections 140.4(d)1 and 140.4(d)2, which require zone controls that prevent reheating, recooling or simultaneous heating and cooling, or limiting the volume of air that is reheated. This exception is retained because 1) it's not feasible for healthcare facilities to completely prevent reheat, given the high ventilation requirements, and 2) the measures are primarily geared towards non-clinical spaces, creating implementation challenges for healthcare facilities.

As such, the Statewide CASE Team is proposing a new section, Section 3, which will require the following for occupied and unoccupied zones or mixed zones served by VAV systems:

- The volume of air to the zone or mixed zone shall not exceed minimum ventilation rates defined by Table 4-A of the CMC or the referenced design standard applicable to the space for occupied and unoccupied zones, while accounting for ventilation, temperature, humidity and pressure requirements.

Additionally, a new definition is proposed for Zone, Mixed Requirement, which describes a mixed zone and outlines the general approach to establishing the mixed requirement zone ventilation rate. Table 14 summarizes the scope of the proposed code change.

Table 14: Scope of Proposed Code Change

A indicates the proposed code change is relevant.

Building Type(s)	Construction Type(s)	Type of Change
<input type="checkbox"/> Single Family	<input checked="" type="checkbox"/> New Construction	<input type="checkbox"/> Mandatory
<input type="checkbox"/> Multifamily	<input checked="" type="checkbox"/> Additions	<input checked="" type="checkbox"/> Prescriptive
<input checked="" type="checkbox"/> Nonresidential (Not Group R uses)	<input type="checkbox"/> Alterations	<input checked="" type="checkbox"/> Performance

Application Climate Zones	Energy Code Sections	Compliance Forms	Sections of ACM Reference Manuals
Climate Zones 1-16	<ul style="list-style-type: none"> Part 6, Section 100.1 Part 6, Section 140.4(d) 	NRCC-MCH-E, NRCI-MCH-E, NRCC-CXR-E, NRCI-CXR-E	Mandatory
Third Party Verification)		Updates to Compliance Software	
<input type="checkbox"/> No changes to third party verification		<input type="checkbox"/> No updates	
<input checked="" type="checkbox"/> Update existing verification requirements		<input type="checkbox"/> Update existing feature	
<input type="checkbox"/> Add new verification requirements		<input checked="" type="checkbox"/> Add new feature	

3.1.2 Benefits of Proposed Change

In addition to the goal of paving the way to review and potentially modify other healthcare exceptions in future code cycles, as described in section 2.1.2, this proposed measure would provide significant benefits at the individual healthcare facility.

Reheating air that has previously been cooled, cooling air previously heated, or mixing supply air with air previously mechanically heated or cooled results in increased mechanical load and energy use. Subsection 3 will limit the amount of airflow going to the zones, which will reduce the amount of air that is reheated, recooled, or simultaneously heated or cooled. This will provide the following benefits:

- Building reduces unnecessary heating and cooling loads – less reheating and recooling of air will reduce mechanical loads and cooling/heating demand.
- Decrease fan energy – limiting airflow to the zones during low load conditions decreased fan energy use and prevents unnecessary air from being conditioned, distributed and potential reheated and recooled.
- Extend service life and reduce maintenance frequency – reducing simultaneous heating and cooling decreases mechanical wear on fans, heating coils, cooling coils, and terminal units.

By referencing Table 4-A of the CMC, this will create a more targeted approach for the requirement and ensure the minimum air change requirements are preserved for all spaces. This approach also has the added benefit of aligning more closely with HCAI requirements and ASHRAE Standard 170, which was fully adopted as Table 4-A in the 2025 code cycle. This alignment helps to reduce code complexity and potential for conflicting code requirements.

This measure would also have a direct impact on reducing energy consumption, energy costs, emissions, and strain on the grid. At the state level, by extending this requirement

to all new hospitals and non-residential healthcare facilities, the cumulative impacts are considerable and presented in the energy and cost savings section of this report.

3.1.3 Background Information

Zone controls, as referenced in Section 140.4(d), are the mechanisms that allow each space (or group of similar spaces) to independently regulate temperature and airflow, so the HVAC system can deliver only the conditioning that is needed. This is typically achieved through thermostats, DDC systems, VAV terminal boxes, and sensors that detect temperature and occupancy. These controls help ensure that spaces are not over-cooled or overheated, and that unnecessary reheating or recooling is minimized.

When zone controls are properly configured, the HVAC system avoids delivering cold air to a space only to warm it back up, or vice versa. Instead, the system modulates airflow and temperature based on actual demand. Reducing reheating and recooling significantly lowers the heating and cooling loads placed on boilers, chillers, and air-handling units. In hospitals where systems run 24/7 and airflow volumes are very high, this strategy can save considerable heating and cooling energy, especially during morning warm-up and afternoon peak periods.

In the past decade, zone control technology has improved in reliability, cost effectiveness, and ease of integration. Modern DDC systems now include standard with capabilities that previously required custom programming. VAV boxes, pressure-independent controls, and digital thermostats are now common in nearly all large healthcare projects. In addition, the 2025 CMC and ASHRAE Standard 170 have clarified which clinical spaces may safely reduce airflow under certain conditions, giving designers clearer operational boundaries. These changes make it much easier to implement zone-control strategies while still meeting the strict air-change and pressurization requirements that exist in healthcare spaces.

Several California healthcare systems, such as Kaiser Permanente and UC Health have already implemented zone-level reheat and airflow optimization strategies as part of decarbonization strategies. These projects demonstrate that zone control can be safely and effectively be applied in complex healthcare environments and can deliver substantial energy savings without impacting clinical operations.

3.1.4 Modifications to Energy Code Documents

This section provides descriptions of how the proposed code change will affect each Energy Code document. See Section 3.6: Shut-off and Reset Controls - Proposed Language of this report for detailed revisions to code language.

3.1.4.1 Energy Code Change Summary

The proposed energy code changes affect Title 24, Part 1 and Title 24, Part 6. A brief description of these changes is provided below:

Title 24, Part 1

SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION:

Zone, Mixed Requirement is a newly proposed definition which describes a mixed zone, which is referenced in 140.4(d)3, and outlines the general approach to establish the mixed requirement zone ventilation rate.

Title 24, Part 6

SECTION 140.4(d) – Space Conditioning Zone Controls.

Section 140.4(d)3: The proposed change would require that nonresidential healthcare spaces served by VAV systems reduce the amount of primary air supplied to the space to the minimum allowed ventilation rates, per CMC Table 4-A or ASHRAE 62.1. This would limit the amount of, recooling, or simultaneous heating and cooling, while ensuring minimum ventilation is achieved.

Exceptions to Section 140.4(d): Additionally, the proposed change would modify the existing healthcare exception to only be applicable to Sections 140.4(d)1 and 140.4(d)2
Reference Appendices Change Summary

The proposed changes do not affect the reference appendices, because they only modify the healthcare exception and do not fundamentally alter the mechanical system requirements in Section 140.4(d).

3.1.4.2 Compliance Manuals Change Summary

Chapter 4 - Mechanical Systems of the Nonresidential Compliance Manual would be updated to reflect modifications to the healthcare in Section 140.4(d).

3.1.4.3 Alternative Calculation Method Reference Manual Change Summary

The Statewide CASE Team recommends that the several sections of the Nonresidential Alternative Calculation Method (ACM) Reference Manual be updated to improve modeling accuracy of the hospital prototype and account for proposed measure changes. These sections include: 5.1.3 HVAC System Map, 5.4 Space Uses, 5.6 HVAC Zone Level System, 5.7 HVAC Secondary System, and 5.8 HVAC Primary System. Specific changes being proposed are outlined in more detail in Section 2.6.6 ACM Reference Manual.

3.1.4.4 Compliance Forms Change Summary

This proposed change will require the following compliance forms to be updated to include 140.4(d) as a requirement when selecting a healthcare building type. These forms include: NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning. Measure Context

3.1.4.5 Comparable Model Codes or Standards

ASHRAE Standard 90.1 2022

Section 6.5.2.1 requires zone control that prevents reheating, recooling, or simultaneous heating and cooling. This section also imposes similar requirements and alternative compliance options for systems with and without DDC. This section does not include a blanket exception for healthcare facilities, but it does include an exception based on airflow rate requirements.

2024 International Energy Conservation Code (IECC)

Section C403.6.1 requires systems serving multiple zones to be VAV and include controls to reduce zone reheating, recooling, or mixed heating and cooling. Unlike Title 24, Part 6 and ASRHAE 90.1-2022, this IECC section does not provide a compliance option for non-DDC systems. Requirements for systems with DDC are similar to Title 24, Part 6. This section also includes an exception based on, “airflow rate required to comply with applicable codes or accreditation standards such as pressure relationships or minimum air change rates.”

ASHRAE Standard 170: Ventilation of Health Care Facilities

Standard 170 provides minimum ventilation design requirements and environmental control for healthcare facilities. This standard is used throughout the industry, and Tables 7-1 and 8-1 are adopted directly into the CMC as Table 4-A, which is referenced in this proposed code change.

3.1.4.6 Interactions with Other Regulations

This change does not interact or conflict with any federal laws and regulations. This change does interact with certain state requirements and the California Building Code.

State laws and requirements

Title 24, Part 6 uses the definitions in the California Health and Safety Code Division 2, Chapter 2, §1250 and the California Health and Safety Code Division 2, Chapter 1, Section 1204 to define a healthcare facility. This measure is not proposing to change the existing definition.

Interactions with California Building Code

This proposed measure interacts with the 2025 CMC by referencing Table 4-A to help target the proposed change for specific spaces in healthcare facilities.

3.2 Space-conditioning zone controls - Compliance and Enforcement

3.2.1 Compliance Considerations

The Statewide Case Team does not anticipate any additional compliance considerations for this measure than what was described in Section 2.2.1.

3.2.2 Impact on Market Actors

Because this measure applies to space-conditioning zone controls, it will affect the same set of market actors identified in Section 2.2.2. Designers, control contractors, commissioning providers, facility managers, and enforcement staff will interact with the measure in similar ways as they do for other HVAC control requirements. No new market participants are introduced, and the roles and responsibilities remain consistent with standard design, construction, and commissioning workflows for nonresidential HVAC systems.

3.2.3 Compliance Software Updates

If the proposal is adopted, then CBECC will be modified based on the proposed changes to the ACM, as described in Section 2.6.6.

3.2.4 Cost of Enforcement

The Statewide CASE Team acknowledges that changes to the code will impact enforcement costs. This report is an evaluation of specific measures, and the collective impact of all proposed changes for the 2028 Title 24, Part 6 may represent an increase in training and/or workload for enforcement personnel.

While this modification will require additional education and training for HCAI plan reviewers and HCAI and IOR inspectors, the Statewide CASE Team does not anticipate the addition of this measure will increase the cost of enforcement for HCAI. Review of this measure can be easily integrated into existing plan review and field inspection processes and will not add significant review time or cost. The prescriptive process includes comparing design and code minimum supply and outdoor air flow rates, whether or not setback capabilities are in place per code or beyond code and the preprogrammed setback flow rates. Performance compliance path will compare the code required supply and outdoor air flows in the baseline and the setback schedules.

The setback schedules, like nearly all schedules, shall be the same in the baseline and proposed models unless an exceptional calculation is applied.

3.3 Space-conditioning zone controls - Market and Economic Analysis

3.3.1 Market Structure and Availability

3.3.1.1 Current Market Structure and Availability

The technologies and design strategies required to comply with healthcare changes to Section 140.4(d) are fully mature, widely available, and already standard practice across the nonresidential building controls industry. The key market actors who manufacture, supply, install, program, and commission these systems are the same as those identified in Section 2.2.2. This section highlights the major entities in the California market and the overall readiness of the supply chain.

3.3.1.2 Market Challenges and Solutions

The Statewide CASE Team determined that the proposed zone-control strategies are readily available and fully mature in the market based on engagement with controls manufacturers, distributors, and commissioning providers. All major BAS vendors operating in California, including Siemens, Johnson Controls, Honeywell, etc. have the required sequences (airflow modulation, reheating/recooling limitation, deadband control, and temperature reset) in their existing DDC platforms. Because these systems have been widely deployed in nonresidential buildings for over a decade, there is substantial market experience demonstrating product reliability, vendor stability, and consistent field performance. As a result, products and system capabilities are already available from several manufacturers, ensuring robust competition and supply diversity before the effective date of the 2028 Title 24, Part 6.

For the small subset of market actors with limited experience applying reheat-reduction logic in healthcare settings, the proposal is supported by a targeted training and education effort described in Section 2.2. These activities will ensure all designers, contractors, and facility operators are prepared for consistent implementation.

3.3.2 Design and Construction Practices

3.3.2.1 Current Design and Construction Practices

Best practices for designing zone-level space-conditioning controls in large commercial and healthcare buildings have been well established for more than a decade. Modern HVAC systems, particularly VAV air distribution systems, are designed to allow independent temperature control for each space or zone, minimizing reheating,

recooling, and simultaneous heating and cooling. The current state of practice is described below.

Zone-Level Temperature and Airflow Control

In most modern healthcare facilities, each space (or group of similar spaces) is served by a VAV terminal unit equipped with:

- A zone thermostat or digital sensor
- A DDC module with airflow measurement capability
- A modulating damper to vary air volume
- A modulating reheat coil valve

Best practice is to use pressure-independent VAV control, which ensures each zone receives the correct airflow even when system pressure fluctuates. This allows precise control, reduced reheat, and stable comfort. To minimize reheat energy, standard design practice includes:

- Supply-air temperature reset at the air-handling unit (AHU)
- Airflow minimum reset, where non-critical zones reduce minimum airflow based on load, temperature, or occupancy

These control sequences are already used in office buildings, laboratories, and higher-education facilities. Hospitals often use the same technologies but currently operate them more conservatively due to historical Title 24, Part 6 exemptions.

3.3.2.2 Health and Safety Considerations

The proposed code change does not alter or supersede any existing federal, state, or local regulations pertaining to patient safety, infection control, or worker protection. All existing requirements enforced by the California Department of Public Health (CDPH), the California Division of Occupational Safety and Health (DOSH), and HCAI remain fully applicable.

Complying with the proposed measure is not expected to create any adverse health or safety impacts for patients, staff, or maintenance personnel. The proposed space conditioning zone controls requirements are consistent with provisions already included in ASHRAE Standard 170 and the 2025 CMC Table 4-A, both of which permit unoccupied airflow turndown and temperature reset while maintaining required pressure relationships and minimum ventilation rates.

3.3.2.3 Design and Construction Challenges and Solutions

There are few design and construction challenges associated with implementing zone-level reheat and recool reduction in healthcare facilities, and stakeholder feedback confirmed these challenges are manageable with standard practices. The primary concern raised by designers was ensuring that the measure would not conflict with required minimum air-change rates in clinical spaces; this has been fully resolved by reducing airflow only to the minimum allowable range for each zone governed by 2025 CMC Table 4-A. Facility managers expressed caution about changing long-standing “always-on” operational habits; aligning the proposal with ASHRAE 170 and CMC provisions helps reduce this concern. Overall, the technical challenges identified through stakeholder engagement can be addressed with modest training, proper sequence documentation, and standard commissioning practices, as described further in Table 4 in Section 2.2.2.

3.3.3 Energy Equity and Environmental Justice

The Statewide CASE Team evaluated the potential impact on environmental and social justice (ESJ) communities, including impacts related to race, class, and gender. The Statewide CASE Team does not anticipate that requiring space-conditioning zone controls in healthcare facilities will negatively impact ESJ communities. As outlined in Section 2.4.5, this measure is cost-effective and will reduce overall operating costs for healthcare facilities. Reducing operating costs of healthcare facilities may make those facilities more economically resilient and enable them to put more resources toward patient care. Keeping healthcare facilities open and operational is especially critical when serving ESJ communities where residents may not have other options for care.

The Statewide CASE Team identified potential impacts of the proposed code change via research and stakeholder input. While the listed potential impacts should be comprehensive, they may not yet be exhaustive. Recognizing the importance of engaging ESJ communities and gathering their input to inform the code change process and proposed measures, the Statewide CASE Team is working to build relationships with community-based organizations (CBOs) to facilitate meaningful engagement. Please reach out to Bryan Boyce (bboyce@energy-solution.com) if you have input on how this proposal may impact ESJ communities or if you would like to offer your perspective.

3.3.4 Impacts on Jobs and Businesses

This section will be completed for the Final CASE Report.

3.3.5 Economic and Fiscal Impacts

This section will be completed for the Final CASE Report.

3.4 Space-conditioning zone controls - Cost Effectiveness

3.4.1 Cost Effectiveness Methodology

The Statewide CASE Team collaborated with CEC staff to confirm that the cost-effectiveness methodology aligns with CEC guidelines, including cost inclusion parameters. The 2028 CASE Methodology Report and Appendix A provide reproducibility details.

Per California Law (Public Resources Code 25000), a measure is considered cost effective if its Benefit-Cost Ratio (BCR) is 1.0 or greater, amortized over the economic life of the structure. The Statewide CASE Team calculates BCR by dividing total dollar benefits by total dollar costs over a 30-year analysis period.

Benefits are based on Long-term System Cost (LSC), which assigns an hourly dollar value to energy use. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are valued more than off-peak hours. These factors are not utility rates, forecasts, or bill estimates. The CEC develops and publishes LSC hourly conversion factors for each code cycle.

Costs include first costs and ongoing maintenance costs assessed over the 30-year period. Benefits and costs are evaluated incrementally, relative to the most recently adopted Energy Code. The analysis excludes design costs and incremental code compliance verification costs.

3.4.2 Energy and Energy Cost Savings Results

To estimate the energy and cost savings associated with this measure, the same modifications to the default CBECC hospital prototype as described in section 2.4.2 were incorporated.

Measure Specific Baseline vs. Proposed Assumptions

Hospitals are currently exempt from the space conditioning zone controls as outlined in 140.4(d) in the 2025 California Energy Code. Because of this, the Statewide CASE Team could not use a code minimum baseline and instead had to determine common construction in hospitals and use that as a baseline scenario. Through conversations with healthcare design and engineering firms and hospital owners, the Statewide CASE Team used the following baseline.

- System type: VAV HVAC systems operating on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours.
- Control features: constant-flow fan operation at full or fixed speed
- Sequence of operation: HVAC zones remain “occupied” 8760 hours per year regardless of use

The proposed assumption is a hospital that is fully compliant with the code. Importantly, zones with minimum air change requirements outlined in Table 4A of the 2025 CMC did not reduce airflow and were assumed to be the same as the baseline.

- Ventilation/fans: Fans and outdoor air modeled to allow for unoccupied turndown.

Energy savings (electricity, natural gas, and source energy) and peak demand reductions per unit are presented in Table 15. Per-unit savings for the first year are expected to range from 6.96 to 8.36 kWh/yr and 10.13 to 16.69 therms/yr, depending upon climate zone. Demand reductions/increases are expected to range between .80 kW and .91 kW, depending on climate zone.

Table 16 presents total per-unit energy cost savings for newly constructed buildings and additions in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 16 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building.

Table 15: Energy and Energy Cost Savings – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	6.96	0.80	10.13	20.80	69.33
2	7.31	0.84	10.96	21.75	72.73
3	7.26	0.86	14.11	24.61	75.48
4	7.48	0.86	11.12	22.18	74.54
5	7.34	0.83	13.06	23.58	74.72
6	7.86	0.91	16.40	27.61	83.88
7	7.93	0.90	16.69	27.91	84.54
8	8.02	0.90	16.23	27.51	84.82
9	7.84	0.89	14.74	25.93	81.82
10	7.92	0.90	15.07	26.29	82.70
11	7.72	0.88	11.98	23.38	77.77
12	7.57	0.87	12.44	23.54	76.73
13	7.86	0.88	13.39	24.83	80.21
14	7.69	0.88	10.30	21.79	76.31
15	8.36	0.90	15.95	27.49	86.73
16	7.19	0.86	4.30	16.18	66.94

Table 16: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	61.20	8.14	69.33
2	63.99	8.74	72.73
3	63.96	11.52	75.48
4	65.73	8.81	74.54
5	64.04	10.68	74.72
6	70.11	13.76	83.88
7	70.54	14.00	84.54
8	71.26	13.56	84.82
9	69.58	12.24	81.82
10	70.19	12.51	82.70
11	68.26	9.51	77.77
12	66.79	9.94	76.73
13	69.41	10.80	80.21
14	68.21	8.10	76.31
15	73.38	13.35	86.73
16	64.05	2.89	66.94

3.4.3 Incremental First Cost

The approach to deriving incremental first costs for this measure are described in 2.4.3 of this report. As described in that section, costs for all control measures were assessed together, given the integrated nature of component upgrades. Individual measure costs are split evenly across the total costs of the three control measures. As such, the total cost for this measure, space conditioning zone controls is assumed to be \$1.44 / ft².

3.4.4 Incremental Maintenance and Replacement Costs

Description of the incremental maintenance and replacement costs, as well as estimation of present value of maintenance and replacement costs, are provided in the 2028 CASE Methodology Report.

As described in 2.4.4 of this report, incremental maintenance costs are assumed to be zero for this measure.

3.4.5 Cost Effectiveness

Results of the per-unit cost-effectiveness analyses are presented in Table 17 for new construction and additions.

In the tables below, all values are presented in 2026 present value dollars (2029 PV\$). Benefits represent 30-year LSC savings and other savings, including incremental first-cost savings if the proposed first cost is less than the current first cost, incremental maintenance cost savings if the proposed maintenance costs are less than the current maintenance costs, and incremental residual value if proposed residual value is greater than current residual value at the end of the 30-year period of analysis. Costs represent the total incremental PV cost, including incremental equipment, replacement, and maintenance costs over the period of analysis. The analysis treats a negative incremental maintenance cost as a positive benefit. If total incremental costs are zero, the benefit-cost ratio (BCR) is considered infinite. Costs and other savings are discounted at a real (inflation-adjusted) three percent rate. If there are no total incremental PV costs, the BCR is infinite.

Table 17: 30-Year Cost-Effectiveness Summary Per Square Foot – New Construction and Additions

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	69.33	2.32	29.93
2	72.73	2.32	31.40
3	75.48	2.32	32.59
4	74.54	2.32	32.18
5	74.72	2.32	32.26
6	83.88	2.32	36.21
7	84.54	2.32	36.50
8	84.82	2.32	36.62
9	81.82	2.32	35.33
10	82.70	2.32	35.71
11	77.77	2.32	33.58
12	76.73	2.32	33.13
13	80.21	2.32	34.63
14	76.31	2.32	32.95
15	86.73	2.32	37.44
16	66.94	2.32	28.90
Total	79.67	2.32	34.40

3.5 Space-conditioning zone controls - Statewide Impacts

3.5.1 Statewide Energy and Energy Cost Savings

See the 2028 CASE Methodology Report for details on how statewide savings are calculated. Appendix C presents the assumptions on the percentage of the total construction forecast that the proposed measure would impact.

For more details on the methodology and context about estimating the current market share rate, as well as statewide energy and energy cost savings, see the 2028 CASE Methodology Report.

The tables below present the first-year statewide energy and LSC savings from newly constructed buildings and additions (Table 18) by climate zone.

Table 18: Statewide Energy and LSC Impacts – New Construction and Additions

Climate Zone	Statewide New Construction & Additions Impacted by Proposed Change in 2029 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Natural Gas Savings (Million Therms)	First-Year Natural Gas Savings (Million Therms) First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV\$)
1	18,469	0.13	0.01	0.00	0.38	\$1.28	
2	109,722	0.80	0.09	0.01	2.39	\$7.98	
3	528,880	3.84	0.45	0.07	13.01	\$39.92	
4	273,866	2.05	0.24	0.03	6.07	\$20.41	
5	50,098	0.37	0.04	0.01	1.18	\$3.74	
6	206,436	1.62	0.19	0.03	5.70	\$17.32	
7	345,003	2.74	0.31	0.06	9.63	\$29.17	
8	277,260	2.22	0.25	0.04	7.63	\$23.52	
9	496,076	3.89	0.44	0.07	12.86	\$40.59	
10	510,781	4.05	0.46	0.08	13.43	\$42.24	
11	91,687	0.71	0.08	0.01	2.14	\$7.13	
12	518,636	3.93	0.45	0.06	12.21	\$39.79	
13	171,496	1.35	0.15	0.02	4.26	\$13.76	
14	89,047	0.68	0.08	0.01	1.94	\$6.80	
15	72,268	0.60	0.06	0.01	1.99	\$6.27	
16	30,246	0.22	0.03	0.00	0.49	\$2.02	
Total	3,789,973	29.20	3.34	0.53	95.32	\$301.93	

a.

3.5.2 Statewide Greenhouse Gas Emissions Reductions

Table 19 presents the estimated first-year reduction in GHG emissions resulting from the proposed code change. In this initial year, the Statewide CASE Team expects to avoid 5,409 metric tons of carbon dioxide equivalent (CO₂e) emissions. These reductions, along with their associated monetary value, were calculated using hourly GHG emissions factors published alongside the LSC hourly factors and source energy hourly factors in the research versions of CBECC, as well as data from the CEC’s 2028 Metrics Report. See the 2028 CASE Methodology Report for additional information.

Table 19: First-Year Statewide GHG Emissions Impacts

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO ₂ e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO ₂ e)	Total Reduced GHG Emissions (Metric Ton CO ₂ e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions	2,630	2,779	5,409	666,087
Alterations				
Total				

3.5.3 Statewide Water Use Impacts

The proposed code change will not result in water use impacts.

3.5.4 Statewide Material Impacts

The proposed code change will not result in a meaningful change to materials.

3.5.5 Environmental Impacts

This measure reduces energy use and overall emissions from hospitals across California and does not result in any adverse environmental effects. Statewide emissions impacts from this change are summarized in Table 47.

3.5.6 Other Non-Energy Impacts

If the proposed enhanced space conditioning systems controls are properly implemented in healthcare facilities, it has the potential to improve occupant comfort. In a hospital environment, occupant comfort can dramatically improve the experience for the patient and improve their overall well-being.

3.6 Space-conditioning zone controls - Proposed Language Code

3.6.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~strikethroughs~~ (deletions).

3.6.2 Administrative Code (Title 24, Part 1)

There are no proposed changes to Title 24, Part 1.

3.6.3 Energy Code (Title 24, Part 6)

SECTION 100.1—DEFINITIONS AND RULES OF CONSTRUCTION

Zone, Mixed Requirement, is a group of two or more spaces within a building with sufficiently similar comfort requirements but refer to different ventilation criteria such as CMC Table 4-A and Title 24 Part 6. The mixed requirement zone ventilation rate shall be the sum of the separately calculated minimum supply air flow rates and outside air flow rates for each space from each reference

140.4(d) Space-conditioning zone controls. Each space-conditioning zone shall have controls designed in accordance with 1, 2, or 3:

1. Each space-conditioning zone shall have controls that prevent:
 - A. Reheating; and
 - B. Recooling; and
 - C. Simultaneous provisions of heating and cooling to the same zone, such as mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by cooling equipment or by economizer systems; or
2. Zones served by variable air-volume systems that are designed and controlled to reduce, to a minimum, the volume of reheated, recooled, or mixed air are allowed only if the controls meet all of the following requirements:
 - A. For each zone with direct digital controls (DDC):
 - i. The volume of primary air that is reheated, recooled, or mixed air supply shall not exceed the larger of:
 - a. 50 percent of the peak primary airflow; or
 - b. The design zone outdoor airflow rate as specified by Section 120.1(c)3.
 - ii. The volume of primary air in the deadband shall not exceed the design zone outdoor airflow rate as specified by Section 120.1(c)3.

- iii. The first stage of heating consists of modulating the zone supply air temperature setpoint up to a maximum setpoint no higher than 95°F while the airflow is maintained at the dead band flow rate.
 - iv. The second stage of heating consists of modulating the airflow rate from the dead band flow rate up to the heating maximum flow rate.
- B. Control sequences of operation for reheat zones shall be in accordance with ASHRAE Guideline 36. For each zone without DDC, the volume of primary air that is reheated, re-cooled, or mixed air supply shall not exceed the larger of the following:
- i. 30 percent of the peak primary airflow; or
 - ii. The design zone outdoor airflow rate as specified by Section 120.1(c)3.

Exception to Section 140.4(d)1,2: Systems serving healthcare facilities

3. Zones or Mixed Requirement Zones served by variable air-volume systems that include a space(s) designed to California Mechanical Code Table 4-A shall be designed to meet the following requirements:

A. For each occupied zone or mixed requirement zone:

- i. the volume of primary air supplied to the space designed per CMC Table 4-A shall not exceed the minimum ventilation rates defined in CMC Table 4-A for the occupied condition unless required to meet temperature or humidity setpoints or pressure differential requirements.
- ii. the volume of primary air supplied to the space not designed per CMC Table 4-A shall comply with the referenced design standard in such that it does not prevent the space designed per CMC Table 4-A from meeting ventilation, temperature, humidity, and pressure requirements.

B. For each unoccupied zone or mixed requirement zone:

- i. the volume of primary air supplied to the space designed per CMC Table 4-A shall not exceed the minimum ventilation rates defined in CMC Table 4-A for the unoccupied condition unless required to meet temperature or humidity setpoints or pressure differential requirements.
- ii. the volume of primary air supplied to the space not designed per CMC Table 4-A shall comply with the referenced design standard in such that it does not prevent the space designed per CMC Table 4-A from meeting ventilation, temperature, humidity, and pressure requirements.

Exception 1 to Section 140.4(d): Zones with special pressurization relationships or cross contamination control needs.

Exception 2 to Section 140.4(d): Zones served by space-conditioning systems in which at least 75 percent of the energy for reheating, or providing warm air in mixing systems, is provided from a site-recovered or site-solar energy source.

Exception 3 to Section 140.4(d): Zones in which specific humidity levels are required to satisfy non-covered process loads. Computer rooms or other spaces where the only process load is from IT equipment may not use this exception.

Exception 4 to Section 140.4(d): Zones with a peak supply-air quantity of 300 cfm or less.

~~**Exception 5 to Section 140.4(d):** Systems serving healthcare facilities~~

3.6.4 Reference Appendices

There are no proposed changes to the Reference Appendices.

3.6.5 Compliance Manuals

The Statewide CASE Team will provide CEC with recommended revisions to compliance manuals after the 45-Day Language is published.

3.6.6 ACM Reference Manual

See Section 2.6.6 for all proposed changes to the ACM Reference Manual for the Shut-off and Reset Controls, Space-conditioning zone controls, and Fan control proposed measures in the report.

3.6.7 Compliance Forms

As discussed in Section 2.6, the NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning compliance forms would be updated to reflect the proposed change. The Statewide CASE Team can support the CEC in implementing these updates if the proposed change is adopted.

4. Fan control

4.1 Fan control - Measure Description

4.1.1 Proposed Code Change

The proposed code change seeks to eliminate the current blanket exception to **140.4(m), Fan Control**, for nonresidential healthcare facilities in Title 24, Part 6. This prescriptive measure requires that single and multi-zone systems are equipped with VAV and have supply fans, typically with variable speed drives, which are capable of the following:

- In single zone systems (where the fans are controlled directly by the space thermostat) they shall have a minimum of two stages of fan speed with no more than 66 percent speed when operating on stage one while drawing no more than 40 percent full fan power when running at 66 percent speed.
- In multi-zone systems, fans motor demand shall be limited to no more than 30 percent of design wattage at 50 percent design air volume.
- Systems with air-side economizers that meet section 140.4(e)1 must be equipped with a minimum of two speeds of fan control during economizer operation.

Table 20 summarizes the scope of the proposed code change.

Table 20: Scope of Proposed Code Change

A indicates the proposed code change is relevant.

Building Type(s)		Construction Type(s)		Type of Change	
<input type="checkbox"/> Single Family		<input checked="" type="checkbox"/> New Construction		<input type="checkbox"/> Mandatory	
<input type="checkbox"/> Multifamily		<input checked="" type="checkbox"/> Additions		<input checked="" type="checkbox"/> Prescriptive	
<input checked="" type="checkbox"/> Nonresidential (Not Group R uses)		<input checked="" type="checkbox"/> Alterations		<input checked="" type="checkbox"/> Performance	
Application Climate Zones	Energy Code Sections	Compliance Forms		Sections of ACM Reference Manuals	
Climate Zones 1-16	<ul style="list-style-type: none"> Part 6, Section 140.4(m) 	NRCC-MCH-E, NRCI-MCH-E, NRCC-CXR-E, NRCI-CXR-E		Mandatory	
Third Party Verification)			Updates to Compliance Software		
<input type="checkbox"/> No changes to third party verification			<input type="checkbox"/> No updates		
<input checked="" type="checkbox"/> Update existing verification requirements			<input type="checkbox"/> Update existing feature		

Add new verification requirements

Add new feature

4.1.2 Benefits of Proposed Change

In addition to the goal of paving the way to review and potentially modify other healthcare exceptions in future code cycles, as described in section 2.1.2, this proposed measure would provide significant benefits at the individual healthcare facility.

Effectively requiring VAV fans with variable speed drives in hospitals and other nonresidential healthcare facilities will yield many benefits at the building level, to the building owner and occupants, but also at the state level in terms of overall energy, cost, and emissions reductions. At the building level, this technology can reduce energy consumption, lower operating costs, improve overall system control and occupant comfort, and reduce fan operation noise. In a healthcare setting, maintaining good occupant comfort is essential and can help improve the lives of staff and patients as they may spend an extended length of time in the building.

Historically, healthcare facilities have been exempted from many requirements in Title 24, Part 6, despite this not being the case in national codes and standards, such as the IECC and ASHRAE 90.1. Modifying this measure to remove the blanket healthcare exception was proposed because it will generate large energy savings and will help pave the way to review and potentially modify other healthcare exceptions in future code cycles. Additionally, by engaging with HCAI and the CEC throughout the process, this change will bring an alignment for building energy codes in healthcare facilities.

At the state level, by extending this requirement to all new hospitals and non-residential healthcare facilities, the cumulative impacts are considerable and presented in the energy and cost savings section of this report.

4.1.3 Background Information

Indoor fans are a major source of energy use in nonresidential HVAC systems, and most systems operate at full or near-full fan speed even when the cooling load is low. Section 140.4(m) of the 2025 California Energy Code addresses this by requiring cooling systems to reduce fan airflow and fan power during part-load conditions. Modern HVAC equipment can achieve this through variable-speed drives, electronically commutated motors, or multi-speed fans, all of which are widely available and now common. Reducing fan speed even slightly leads to large energy savings because fan power drops much faster than airflow; for example, a fan operating at roughly two-thirds of full speed typically uses less than half the power. Since buildings spend most operating hours at part load, these reductions translate into meaningful energy savings.

Variable-speed technology has matured considerably over the last decade. Equipment manufacturers now integrate fan modulation into most new systems and building automation systems routinely support variable airflow operation. California utilities have

also promoted variable-speed HVAC components through incentive programs and emerging-technology studies, and previous Title 24 CASE efforts have evaluated fan-control strategies, minimum airflow limits, and system performance at part load. Similar requirements appear in national model codes such as ASHRAE 90.1 and IECC, so California's fan-control rules are consistent with industry practice and achievable with standard equipment.

Healthcare facilities are currently exempt from Section 140.4(m). Historically, designers relied on constant-volume systems or limited airflow turndown to avoid potential issues with maintaining required air-change rates, pressure relationships, and overall air balance. However, hospital HVAC technology has advanced significantly. Modern air-handling units designed for healthcare settings commonly include variable-speed drives, pressure-control sensors, and DDC capable of maintaining minimum ventilation and pressure differentials even when fan speed is reduced. Many California hospitals have already adopted variable-speed fans as part of efficiency upgrades, demonstrating that modulation can be compatible with healthcare ventilation standards when properly designed.

Because these technologies and control strategies are now widely available, the rationale for the healthcare exception may no longer apply. Removing the exception would allow healthcare facilities to capture fan-energy savings and better support statewide grid flexibility goals, while still maintaining compliance with the mechanical code and standards that govern patient-care spaces.

4.1.4 Modifications to Energy Code Documents

This section provides descriptions of how the proposed code change will affect each Energy Code document. See Section 2.6: Shut-off and Reset Controls - Proposed Language of this report for detailed revisions to code language.

4.1.4.1 Energy Code Change Summary

The proposed energy code changes are limited to Section 140.4 – Fan Control

SECTION 140.4(m) – Fan Control.

Exceptions to Section 140.4(m): The proposed change would limit the existing healthcare exception to only facilities classified as a Group R or Residential Group Occupancy, as specified in Section 310 of the 2025 California Building Code.

4.1.4.2 Reference Appendices Change Summary

The proposed changes would not impact the reference appendices, as this change is only modifying the healthcare exception and does not fundamentally change mechanical system requirements in 140.4(m).

4.1.4.3 Compliance Manuals Change Summary

Chapter 4 - Mechanical Systems of the Nonresidential Compliance Manual would be updated to reflect modifications to the healthcare exception in Section 140.4(m).

4.1.4.4 Alternative Calculation Method Reference Manual Change Summary

The Statewide CASE Team recommends that the several sections of the Nonresidential Alternative Calculation Method (ACM) Reference Manual be updated to improve modeling accuracy of the hospital prototype and account for proposed measure changes. These sections include: 5.1.3 HVAC System Map, 5.4 Space Uses, 5.6 HVAC Zone Level System, 5.7 HVAC Secondary System, and 5.8 HVAC Primary System. Specific changes being proposed are outlined in more detail in Section 2.6.6 ACM Reference Manual.

4.1.4.5 Compliance Forms Change Summary

This proposed change will require the following compliance forms to be updated to include 140.4(m) as a requirement when selecting a healthcare building type. These forms include: NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E NRCC-MCH-E Mechanical Systems and NRCC-CXR-E-Nonresidential Building Commissioning.

4.1.5 Measure Context

4.1.5.1 Comparable Model Codes or Standards

ASHRAE Standard 90.1 2022

Section 6.5.3.2.1 requires supply fan airflow to modulate as a function of load. DX and chilled-water cooling units that control the capacity of mechanical cooling directly based on space temperatures shall have two stages of fan control – low speed to not exceed 66 percent of full speed and draw no more than 40 percent of fan power at full speed. All other units shall have modulating fan control– low speed to not exceed 50 percent of full speed and draw no more than 30 percent of fan power at full speed. This section also requires systems with an air side economizer have a minimum of two speeds of fan during economizer operation. There are no healthcare exceptions or exceptions based on airflow rate requirements.

2024 International Energy Conservation Code (IECC)

Section C403.8.6 requires fan airflow controls that vary indoor airflow as a function of load. This section has the same requirements as Title 24, Part 6 and Standard 90.1.

ASHRAE Standard 170: Ventilation of Health Care Facilities

Standard 170 provides minimum ventilation design requirements and environmental control for healthcare facilities. This standard is used throughout the industry and Tables 7-1 and 8-1 are adopted directly in the California Mechanical Code as Table 4-A.

4.1.5.2 Interactions with Other Regulations

This change does not interact or conflict with any federal laws and regulations. This change does interact with certain state requirements and the California Building Code.

State laws and requirements

Title 24 Part 6 uses the definitions in the California Health and Safety Code Division 2, Chapter 2, §1250 and the California Health and Safety Code Division 2, Chapter 1, Section 1204 to define a healthcare facility. This measure is not proposing to change the existing definition.

Interactions with California Building Code

This proposed measure interacts with the 2025 CMC by referencing Table 4-A in a newly modified exception to target exceptions for specific spaces in healthcare facilities.

This measure also interacts with the 2025 CBC by referencing the Section 3 residential group classification in the modified healthcare exception. Modifying the existing healthcare exception to residential group occupancies will limit proposed changes to only commercial healthcare facilities, such as hospitals.

4.2 Fan control - Compliance and Enforcement

4.2.1 Compliance Considerations

The Statewide Case Team does not anticipate any additional compliance considerations for this measure than what was described in Section 2.2.1.

4.2.2 Impact on Market Actors

Given that this measure is focused on space-conditioning controls, it will impact the same market actors as described in Section 2.2.2. Designers, controls contractors, commissioning providers, facility managers, and enforcement staff will interact with the measure in similar ways as they do for other HVAC control requirements. No new market participants are introduced, and the roles and responsibilities remain consistent with standard design, construction, and commissioning workflows for nonresidential HVAC systems.

4.2.3 Compliance Software Updates

If the proposal is adopted, then CBECC will be modified based on the proposed changes to the ACM, as described in Section 2.6.6. This would apply to 140.4(m)1,2,3 based on the design system

140.4 (m)1: Design system with staged fan mechanical cooling capacity control without economizer

140.4 (m)2: All other design systems with proportional fan control without economizer

140.4 (m)3: Design system with a minimum of two-speed fan and air-side economizers meeting Section 140.4(e)1 requirement

4.2.4 Cost of Enforcement

The Statewide CASE Team acknowledges that changes to the code will impact enforcement costs. This report is an evaluation of specific measures, and the collective impact of all proposed changes for the 2028 Title 24, Part 6 may represent an increase in training and/or workload for enforcement personnel.

The Statewide CASE Team does not anticipate the addition of this measure will increase the cost of enforcement for HCAI. Review of this measure can be easily integrated into existing plan review and field inspection processes and will not add significant review time or cost.

4.3 Fan control - Market and Economic Analysis

4.3.1 Market Structure and Availability

4.3.1.1 *Current Market Structure and Availability*

The technologies and design practices required to implement variable-speed fan control in healthcare facilities are fully mature and widely available in today's nonresidential HVAC market. The key market actors who manufacture, supply, install, program, and commission these systems are the same as those identified in Section 2.2.2. This section highlights the major entities in the California market and the overall readiness of the supply chain.

The proposed measure relies on equipment and control strategies that are already standard in California's commercial buildings and increasingly common in modern hospital projects. Variable-frequency drives (VFDs), electronically commutated motors (ECMs), multi-speed fans, and pressure-independent VAV terminal units are all established products supported by multiple manufacturers and distributors.

- **Controls Vendors and Manufacturers:**

Major BAS providers already offer native support for fan-speed modulation, duct static pressure reset, minimum ventilation control, and zone-level airflow management. These capabilities are standard features in modern BAS platforms and do not require custom software or specialized modules. Most new healthcare projects already use these systems for monitoring indoor air quality, maintaining pressure relationships, and complying with Table 4A.

- **Design Engineers and Commissioning Providers:**

Leading California engineering and commissioning firms routinely design and verify VAV systems in nonresidential buildings. Many have already implemented VFD-driven fan arrays and airflow turndown strategies in healthcare settings as part of energy retrofits and decarbonization initiatives. Extending these design practices to all healthcare projects requires minimal, if any, additional training. (For training considerations, see Section 4.2.2.)

- **Contractors and Integrators:**

Mechanical contractors and controls integrators already install VFDs, ECMs, and pressure-independent VAV boxes as standard scope in commercial projects.

- **Equipment Manufacturers:**

Manufacturers provide AHUs, fan arrays, and terminal units designed for continuous modulation. VFDs are now standard on most AHUs, and pressure-independent terminal units are routinely installed in laboratories, ambulatory care facilities, and other buildings that require stable ventilation control. These products come “controls-ready,” with airflow sensors, actuators, and built-in capacity for turndown.

No significant new capital investment or specialized workforce development is necessary because the proposed requirement relies on existing BAS platform technology, widely available fan equipment, and standard control sequences. The California market already has the equipment, expertise, and supply chain capacity to support variable-speed fan control for healthcare buildings. Implementation is expected to proceed smoothly once the exemption is removed. The measure aligns with current best practice and accelerates an ongoing market trend toward modulated HVAC systems.

4.3.1.2 Market Challenges and Solutions

While the proposed measure leverages widely available technology, several market and implementation challenges could influence adoption speed and consistency across the healthcare sector. These barriers are primarily related to institutional practices, risk perception, and coordination, rather than technology availability.

Challenge - Maintaining Minimum Air Change Rates and Pressure Relationships

Healthcare stakeholders may note that patient-care spaces have strict ventilation and pressurization requirements. The primary concern is whether fan-speed reduction could compromise required minimum air changes or directional airflow.

- **Solution:** Variable-speed fan systems do not reduce airflow below space-level minimums; they modulate only during part-load conditions when airflow exceeds minimum requirements. Pressure-independent VAV boxes and modern AHU controls can maintain required minimums even under fan turndown. Many hospitals in California already use these systems in hybrid VAV/CAV designs. Commissioning requirements ensure proper operation. This challenge is therefore manageable with current equipment and standard control logic.

Challenge - Controls Complexity and Commissioning Requirements

Facility managers express concern that duct static pressure reset and fan-turndown sequences could introduce added complexity for hospital staff.

- **Solution:** BAS vendors confirmed that fan-modulation sequences (e.g., static pressure reset, minimum-flow enforcement) are standard templates. These sequences are widely used in laboratories, universities, and outpatient facilities. ASHRAE Guideline 36 also provides standardized, tested sequences that BAS vendors already implement. Commissioning agents are comfortable verifying these controls, and staff training will be minimal (see Section 4.2.2).

Challenge - Equipment Availability and Lead Times

Hospital capital planners may have concern whether necessary equipment for implementing the measure would be available from multiple suppliers given supply-chain constraints in previous years.

- **Solution:** Most major manufacturers supply VFD-compatible fans in California. None of the required components are proprietary, and no patent restrictions limit competition. These technologies are used in most nonresidential projects today, and ample supply is expected well ahead of the code's effective date.

4.3.2 Design and Construction Practices

4.3.2.1 Current Design and Construction Practices

Best practices for designing HVAC systems with variable fan control are well established in the nonresidential market and increasingly common in healthcare facilities. Most new hospital air-handling units already use variable-speed fans because they offer better energy performance, reduced noise, and smoother control of ventilation and pressurization. These systems modulate airflow continuously in response to duct static pressure or zone demand and are controlled through standard BAS/DDC platforms used in many California healthcare projects.

A central best practice is the use of pressure-independent terminal units with integrated airflow sensors. These units maintain stable zone airflow even as duct pressure fluctuates with fan turndown, which is essential for meeting the minimum air-change and pressurization requirements. Designers routinely use these terminal units in laboratories, pharmacies, isolation rooms, and many patient-care areas, and the proposed measure reinforces this approach. Modern BAS sequences such as static pressure reset, minimum-flow enforcement, and temperature- or demand-based modulation are also standard practice; most major controls platforms provide these sequences out of the box.

Airflow measurement at the AHU or system level is another best practice that aligns well with variable-speed operation. Outdoor air stations, supply- and return-air measurement devices, and zone-level airflow sensors ensure ventilation requirements are maintained during part-load operation. These devices are already widely used in healthcare facilities to support infection control, maintain code-required minimum ventilation, and provide verifiable performance for commissioning.

Fan arrays have also become increasingly common in hospital AHUs. They use multiple small ECM or VFD-driven fans arranged in a wall or cluster, providing redundancy, lower vibration, and excellent part-load efficiency. These systems inherently support the modulation required by §140.4(m) and often reduce the physical size of the AHU compared to a single or multiple larger fans. From a construction standpoint, integrating VFDs, ECM fan assemblies, and airflow measurement devices has minimal impact on space, electrical infrastructure, or architecture. VFDs mount within standard mechanical or electrical rooms, ECM arrays fit within conventional AHU footprints, and no special duct routing or structural modifications are required.

Occupant comfort and indoor environmental quality are generally improved by these best practices. Lower fan speeds reduce noise, and pressure-independent control keeps temperature, ventilation, and room pressurization more stable. Because these practices are already common in high-performance healthcare designs, the proposed measure does not meaningfully change design methodology.

4.3.2.2 Health and Safety Considerations

The proposed code change is not expected to introduce any adverse impacts on structural or seismic design, fire-resistance ratings, moisture management, or other health and safety factors. It does not alter any existing federal, state, or local regulations enforced by the California Division of Occupational Safety and Health (DOSH) or other authorities. All existing health and safety rules remain in effect, and compliance with the proposed measure is not anticipated to negatively impact construction, commissioning, operation, or maintenance activities.

By enabling variable-speed fan operation, it helps maintain more consistent ventilation rates and indoor air quality, including proper air-change rates and pressurization in healthcare spaces. Reduced fan speeds also lower noise and vibration, contributing to a safer and more comfortable environment for patients and staff.

4.3.2.3 *Design and Construction Challenges and Solutions*

Technical feasibility is well supported by modern HVAC technologies, including VFD or ECM-driven fans, pressure-independent terminal units, and advanced building automation systems. These systems can modulate airflow without compromising air-change rates or pressurization, provided proper calibration, sensor placement, and control sequences are used. The measure allows designers to maintain minimum airflow while still benefiting from part-load fan energy savings.

Installation techniques require no fundamental changes beyond standard AHU, terminal unit, and fan control integration. Multiple equipment suppliers and controls contractors in California provide compatible hardware and integration services. The widespread availability of these products ensures that multiple providers can implement the revised techniques without limiting market competition.

Regular maintenance is critical to sustaining energy savings. Fan and terminal unit calibration, sensor verification, and BAS performance checks ensure that airflow modulation continues to meet code requirements over time. Proper commissioning and ongoing operations support consistent indoor air quality, occupant comfort, and pressure control, while reducing noise and vibration.

4.3.3 Energy Equity and Environmental Justice

The Statewide CASE Team evaluated the potential impact on environmental and social justice (ESJ) communities, including impacts related to race, class, and gender. The Statewide CASE Team does not anticipate that requiring fan control in healthcare facilities will negatively impact ESJ communities. As outlined in Section 2.4.5, this measure is cost-effective and will reduce overall operating costs for healthcare facilities. Reducing operating costs of healthcare facilities may make those facilities more economically resilient and enable them to put more resources toward patient care. Keeping healthcare facilities open and operational is especially critical when serving ESJ communities where residents may not have other options for care.

The Statewide CASE Team identified potential impacts of the proposed code change via research and stakeholder input. While the listed potential impacts should be comprehensive, they may not yet be exhaustive. Recognizing the importance of engaging ESJ communities and gathering their input to inform the code change process and proposed measures, the Statewide CASE Team is working to build relationships with community-based organizations (CBOs) to facilitate meaningful engagement.

Please reach out to Bryan Boyce (bboyce@energy-solution.com) if you have input on how this proposal may impact ESJ communities or if you would like to offer your perspective.

4.3.4 Impacts on Jobs and Businesses

This section will be completed for the Final CASE Report.

4.3.5 Economic and Fiscal Impacts

This section will be completed for the Final CASE Report.

4.4 Fan control - Cost Effectiveness

4.4.1 Cost Effectiveness Methodology

The Statewide CASE Team collaborated with CEC staff to confirm that the cost-effectiveness methodology aligns with CEC guidelines, including cost inclusion parameters. The 2028 CASE Methodology Report and Appendix A provide reproducibility details.

Per California Law (Public Resources Code 25000), a measure is considered cost effective if its Benefit-Cost Ratio (BCR) is 1.0 or greater, amortized over the economic life of the structure. The Statewide CASE Team calculates BCR by dividing total dollar benefits by total dollar costs over a 30-year analysis period.

Benefits are based on Long-term System Cost (LSC), which assigns an hourly dollar value to energy use. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are valued more than off-peak hours. These factors are not utility rates, forecasts, or bill estimates. The CEC develops and publishes LSC hourly conversion factors for each code cycle.

Costs include first costs and ongoing maintenance costs assessed over the 30-year period. Benefits and costs are evaluated incrementally, relative to the most recently adopted Energy Code. The analysis excludes design costs and incremental code compliance verification costs.

4.4.2 Energy and Energy Cost Savings Results

To estimate the energy and cost savings associated with this measure, the same modifications to the default CBECC hospital prototype as described in section 2.4.2 were incorporated.

Measure Specific Baseline vs. Proposed Assumptions

Hospitals are currently exempt from fan control requirements as outlined in 140.4(m) in the 2025 California Energy Code. Because of this, the Statewide CASE Team could not

use a code minimum baseline and instead had to determine common construction in hospitals and use that as a baseline scenario. Through conversations with healthcare design and engineering firms and hospital owners, the Statewide CASE Team used the following baseline.

- System type: VAV HVAC systems operating on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours.
- Control features: constant-flow fan operation at full or fixed speed; no coordination between zone demand and fan power
- Sequence of operation: HVAC zones remain “occupied” 8760 hours per year regardless of use

The proposed assumption is a hospital that is fully compliant with the code.

- Ventilation/fans: Fan-power reduction consistent with §140.4(m) (e.g., proportional control).

Energy savings (electricity, natural gas, and source energy) and peak demand reductions per-unit are presented in Table 21. Per-unit savings for the first year are expected to range from 2.34 to 2.69 kWh/yr and -.57 to -4.11 therms/yr, depending upon climate zone. Demand reductions/increases are expected to range between 0.25 kW and 0.28 kW, depending on climate zone.

Table 22 presents total energy cost savings per unit for newly constructed buildings and additions in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 22 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building.

Table 21: Energy and Energy Cost Savings – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	2.34	0.25	-3.96	0.30	16.52
2	2.43	0.26	-3.36	0.88	17.65
3	2.42	0.26	-2.21	1.90	18.62
4	2.48	0.27	-2.88	1.36	18.49
5	2.45	0.26	-2.61	1.54	18.41
6	2.59	0.28	-0.83	3.33	21.33

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
7	2.62	0.28	-0.57	3.62	21.85
8	2.62	0.28	-1.04	3.17	21.38
9	2.59	0.27	-1.32	2.86	20.85
10	2.59	0.27	-1.49	2.73	20.68
11	2.52	0.27	-2.55	1.72	19.17
12	2.49	0.27	-2.56	1.67	18.90
13	2.56	0.27	-1.92	2.31	20.02
14	2.55	0.27	-2.41	1.88	19.42
15	2.69	0.28	-0.72	3.53	22.22
16	2.43	0.27	-4.11	0.33	17.13

Table 22: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – New Construction and Additions– Hospital

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	19.91	-3.39	16.52
2	20.59	-2.94	17.65
3	20.58	-1.96	18.62
4	21.06	-2.57	18.49
5	20.68	-2.27	18.41
6	22.12	-0.79	21.33
7	22.40	-0.55	21.85
8	22.38	-0.99	21.38
9	22.11	-1.26	20.85
10	22.08	-1.40	20.68
11	21.50	-2.34	19.17
12	21.22	-2.32	18.90
13	21.81	-1.79	20.02
14	21.70	-2.28	19.42
15	22.93	-0.71	22.22
16	20.87	-3.74	17.13

4.4.3 Incremental First Cost

The approach to deriving incremental first costs for this measure are described in 2.4.3 of this report. As described in that section, costs for all control measures were assessed together, given the integrated nature of component upgrades. Individual measure costs are split evenly across the total costs of the three control measures. As such, the total cost for this measure, fan control, is assumed to be \$1.44 / ft².

4.4.4 Incremental Maintenance and Replacement Costs

Description of the incremental maintenance and replacement costs, as well as estimation of present value of maintenance and replacement costs, are provided in the 2028 CASE Methodology Report.

As described in 2.4.4 of this report, incremental maintenance costs are assumed to be zero for this measure.

4.4.5 Cost Effectiveness

Results of the per-unit cost-effectiveness analyses are presented in Table 17 for new construction and additions.

In the tables below, all values are presented in 2029 present value dollars (2029 PV\$). Benefits represent 30-year LSC savings and other savings, including incremental first-cost savings if the proposed first cost is less than the current first cost, incremental maintenance cost savings if the proposed maintenance costs are less than the current maintenance costs, and incremental residual value if proposed residual value is greater than current residual value at the end of the 30-year period of analysis. Costs represent the total incremental PV cost, including incremental equipment, replacement, and maintenance costs over the period of analysis. The analysis treats a negative incremental maintenance cost as a positive benefit. If total incremental costs are zero, the benefit-cost ratio (BCR) is considered infinite. Costs and other savings are discounted at a real (inflation-adjusted) three percent rate. If there are no total incremental PV costs, the BCR is infinite.

Table 23: 30-Year Cost-Effectiveness Summary Per Square Foot – New Construction and Additions

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	16.52	3.17	5.21
2	17.65	3.17	5.56
3	18.62	3.17	5.87
4	18.49	3.17	5.83
5	18.41	3.17	5.80
6	21.33	3.17	6.72
7	21.85	3.17	6.89
8	21.38	3.17	6.74
9	20.85	3.17	6.57
10	20.68	3.17	6.52
11	19.17	3.17	6.04
12	18.90	3.17	5.96
13	20.02	3.17	6.31
14	19.42	3.17	6.12
15	22.22	3.17	7.01
16	17.13	3.17	5.40
Total	19.97	3.17	6.30

4.5 Fan control - Statewide Impacts

4.5.1 Statewide Energy and Energy Cost Savings

See the 2028 CASE Methodology Report for details on how statewide savings are calculated. Appendix C presents the assumptions on the percentage of the total construction forecast that the proposed measure would impact.

For more details on the methodology and context about estimating the current market share rate, as well as statewide energy and energy cost savings, see the 2028 CASE Methodology Report.

The tables below present the first-year statewide energy and LSC savings from newly constructed buildings and additions (Table 18) by climate zone.

Table 24: Statewide Energy and LSC Impacts – New Construction and Additions

Climate Zone	Statewide New Construction & Additions Impacted by Proposed Change in 2026 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV\$)
1	8,524	0.02	0.00	-0.00	0.00	\$0.14
2	50,641	0.12	0.01	-0.00	0.04	\$0.89
3	244,098	0.59	0.06	-0.01	0.46	\$4.54
4	126,400	0.31	0.03	-0.00	0.17	\$2.34
5	23,122	0.06	0.01	-0.00	0.04	\$0.43
6	95,278	0.25	0.03	-0.00	0.32	\$2.03
7	159,232	0.42	0.04	-0.00	0.58	\$3.48
8	127,966	0.34	0.04	-0.00	0.41	\$2.74
9	228,958	0.59	0.06	-0.00	0.66	\$4.77
10	235,745	0.61	0.06	-0.00	0.64	\$4.88
11	42,317	0.11	0.01	-0.00	0.07	\$0.81
12	239,371	0.60	0.06	-0.01	0.40	\$4.52
13	79,152	0.20	0.02	-0.00	0.18	\$1.58
14	41,099	0.10	0.01	-0.00	0.08	\$0.80
15	33,355	0.09	0.01	-0.00	0.12	\$0.74
16	13,960	0.03	0.00	-0.00	0.00	\$0.24
Total	1,749,218	4.44	0.47	-0.03	4.17	\$34.94

4.5.2 Statewide Greenhouse Gas Emissions Reductions

Note to CEC – Team has identified inconsistent GHG emissions results and is conducting a quality assessment. Results will be added once we complete the QA/QC.

Table 25 presents the estimated first-year reduction in GHG emissions resulting from the proposed code change. In this initial year, the Statewide CASE Team expects to avoid 199 metric tons of carbon dioxide equivalent (CO₂e) emissions. These reductions, along with their associated monetary value, were calculated using hourly GHG emissions factors published alongside the LSC hourly factors and source energy hourly factors in the research versions of CBECC, as well as data from the CEC’s 2028 Metrics Report. See the 2028 CASE Methodology Report for additional information.

Table 25: First-Year Statewide GHG Emissions Impacts

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO ₂ e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO ₂ e)	Total Reduced GHG Emissions (Metric Ton CO ₂ e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions	365	-166	199	24,531
Alterations				
Total				

4.5.3 Statewide Water Use Impacts

The proposed code change will not result in water use impacts.

4.5.4 Statewide Material Impacts

The proposed code change will not result in a meaningful change to materials.

4.5.5 Environmental Impacts

This measure reduces energy use and overall emissions from hospitals across California and does not result in any adverse environmental effects. Statewide emissions impacts from this change are summarized in Table 70.

4.5.6 Other Non-Energy Impacts

If the proposed enhanced space conditioning systems controls are properly implemented in healthcare facilities, it has the potential to improve occupant comfort. In a hospital environment, occupant comfort can dramatically improve the experience for the patient and improve their overall well-being.

4.6 Fan control - Proposed Language Code

4.6.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~strikethroughs~~ (deletions).

4.6.2 Administrative Code (Title 24, Part 1)

There are no proposed changes to Title 24, Part 1.

4.6.3 Energy Code (Title 24, Part 6)

140.4(m) Fan control. Each cooling system listed in Table 140.4-I shall be designed to vary the indoor fan airflow as a function of load and shall comply with the following requirements:

1. DX and chilled water cooling systems that control the capacity of the mechanical cooling directly based on occupied space temperature shall:
 - A. Have a minimum of two stages of fan control with no more than 66 percent speed when operating on stage 1; and
 - B. Draw no more than 40 percent of the fan power at full fan speed, when operating at 66 percent speed.
2. All other systems, including but not limited to DX cooling systems and chilled water systems that control the space temperature by modulating the airflow to the space, shall have proportional fan control such that at 50 percent air flow the power draw is no more than 30 percent of the fan power at full fan speed.
3. Systems that include an air side economizer to meet Section 140.4(e)1 shall have a minimum of two speeds of fan control during economizer operation.

Exception 1 to Section 140.4(m): Modulating fan control is not required for chilled water systems with all fan motors < 1 HP, or for evaporative systems with all fan motors < 1 HP, if the systems are not used to provide ventilation air and all indoor fans cycle with the load.

~~**Exception 2 to Section 140.4(m):** Systems serving healthcare facilities.~~

4.6.4 Reference Appendices

There are no proposed changes to the Reference Appendices.

4.6.5 Compliance Manuals

The Statewide CASE Team will provide CEC with recommended revisions to compliance manuals after the 45-Day Language is published.

4.6.6 ACM Reference Manual

See Section 2.6.6 for all proposed changes to the ACM Reference Manual for the Shut-off and Reset Controls, Space-conditioning zone controls, and Fan control proposed measures in the report.

4.6.7 Compliance Forms

As discussed in Section 2.1.4.5, the NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning compliance forms would be updated to reflect the proposed change. The Statewide CASE Team can support the CEC in implementing these updates if the proposed change is adopted.

5. Alterations

5.1 Alterations - Measure Description

5.1.1 Proposed Code Change

Healthcare facilities are currently exempt from section 141.0.b—Alterations. This proposed measure would remove the blanket exception for nonresidential healthcare facilities and add healthcare exceptions to specific alteration provisions throughout 141.0.b. This modification would make hospitals, as well as other building types, subject to certain Title 24 requirements when undergoing alterations. 141.0(b) references many other sections that currently apply to new nonresidential healthcare, including 100.0 through 110.0, and 120.0 through 130.5, unless a healthcare exception is already present. The scope of the alterations section covers all building systems, including envelope, HVAC, service hot water, electrical, and lighting requirements.

The Statewide CASE Team worked with HCAI to conduct a thorough review of all requirements and exceptions in the alterations section to determine which requirements are applicable for healthcare facility alterations, and which should remain as an exception this code cycle to enable time to understand unique implementation challenges for healthcare. Based on this review, the following sections were determined to be applicable and thus subjecting healthcare facilities to these mandatory and prescriptive provisions when undergoing an alteration.

Table 26: Proposed Requirements for Healthcare Alterations

Section	Mandatory or Prescriptive	Description
141.0(b)1.A - Roof and Ceiling Insulation	Mandatory	Minimum levels for roof insulation
141.0(b)1.D - Fan Energy Index (FEI)	Mandatory	Generally achieving a FEI of 1.0 for constant air volume systems and 0.95 for variable air volume systems
141.0(b)1.E- Exterior Windows	Mandatory	Requires replacement windows do not exceed a maximum U-factor of 0.58

Section	Mandatory or Prescriptive	Description
141.0(b)2.B- Altered Roof	Prescriptive	Solar reflectance and minimum insulation requirements during roof replacement
141.0(b)2F – New Lighting System	Prescriptive	Spaces with lighting systems installed for the first time shall meet the requirements of Sections 110.9, 130.0, 130.1, 130.2, 130.4, 140.3(c), 140.6 and 140.7.
141.0(b)2G - Daylight responsive controls	Prescriptive	Provides an exception to alterations of daylight harvesting controls when a skylight is added.
141.0(b)2I - Altered indoor lighting systems	Prescriptive	Replacement lighting must meet certain lighting power density requirements

With this proposed update, healthcare facilities in California undergoing an alteration would be required to comply with the above provisions of the energy code, similar to healthcare facilities in other states that are subject to the IECC or ASHRAE 90.1, as well as other nonresidential building types in California. Given that other nonresidential buildings undergoing an alteration have been subject to Title 24, Part 6, and have previously demonstrated cost-effectiveness, the addition of healthcare facilities under these provisions will also be cost-effective. Furthermore, if the requirements are cost-effective for buildings that are not operating 24 hours, then they will likely be even more cost-effective for healthcare facilities that tend to have longer operating hours. For example, fans in healthcare facilities will need to achieve a fan energy index (FEI) of 1.0 or 0.95 depending on the system configuration. As fans typically operate continuously in healthcare, the savings will only increase.

Importantly, existing alteration thresholds and exceptions across building systems will still apply, so even if healthcare facilities are subject to an alteration provision, an existing threshold or exception may still exempt the requirement. For example, alterations impacting less than 2,000 ft² or 50% of the roof area, whichever is less, are exempted from the provisions of 141.0(b)2.B. Many existing healthcare facilities due to years of exemptions have maintained antiquated technology that may not be fully compatible with all alteration requirements. The goal of this change is to incrementally require hospitals to upgrade to current technology as equipment fails and as

modifications are made, and when it's most cost-effective—while also allowing functional legacy technology to operate in parallel until it is naturally replaced.

Healthcare is unique among nonresidential building types in the fact that building modifications and upgrades are routinely performed, so careful consideration was given to when alterations should be subject to energy code requirements to avoid undue burden on these facilities. The Statewide CASE Team proposed the following alteration requirements as outlined in Table 26, but is seeking additional feedback from stakeholders on this proposal. Table 27 summarizes the scope of the proposed code change.

Table 27: Scope of Proposed Code Change

A indicates the proposed code change is relevant.

Building Type(s)		Construction Type(s)		Type of Change			
<input type="checkbox"/> Single Family		<input type="checkbox"/> New Construction		<input checked="" type="checkbox"/> Mandatory			
<input type="checkbox"/> Multifamily		<input type="checkbox"/> Additions		<input checked="" type="checkbox"/> Prescriptive			
<input checked="" type="checkbox"/> Nonresidential (Not Group R uses)		<input checked="" type="checkbox"/> Alterations		<input checked="" type="checkbox"/> Performance			
Application Climate Zones		Energy Code Sections		Compliance Forms		Sections of ACM Reference Manuals	
Climate Zones 1-16		<ul style="list-style-type: none"> Part 6, Section 141.0(b) 		NRCC-ENV-E, NCRI-ENV-E, NRCC-LTI-E, NRCI-LTI-E, NRCC-MCH-E, NRCI-MCH-E, NRCC-CXR-E, NRCI-CRX-E		Mandatory	
Third Party Verification)				Updates to Compliance Software			
<input type="checkbox"/> No changes to third party verification				<input type="checkbox"/> No updates			
<input checked="" type="checkbox"/> Update existing verification requirements				<input type="checkbox"/> Update existing feature			
<input type="checkbox"/> Add new verification requirements				<input checked="" type="checkbox"/> Add new feature			

5.1.2 Benefits of Proposed Change

Removing the blanket alteration exemption for nonresidential healthcare facilities will bring into effect several energy saving requirements that have been applicable for many years in non-healthcare facilities. These energy savings requirements have already been vetted as part of the code adoption process in previous versions and have been demonstrated to save energy and be cost-effective.

Examples of code sections that would apply to healthcare alterations include envelope insulation, fan power, and lighting power. In general, technologies and strategies that

save energy are more effective the more hours that they operate (i.e., a more efficient fan only saves energy while it is operational). Nonresidential healthcare facilities tend to operate more than 12 hours per day for outpatient facilities, and 24 hours per day for inpatient facilities. Therefore, if requirements for alterations were cost effective when initially adopted into the code for non-healthcare facilities, they would likely be even more cost effective for healthcare facilities.

A secondary benefit to reduced energy use is reducing the load on the grid and increasing overall building resilience. Many hospitals struggle to provide sufficient heating, cooling, ventilation, etc. with existing infrastructure. Requiring more efficient replacement equipment and other measures that reduce loads will free up capacity on strained systems. Most hospitals have an essential power supply, typically a generator with on-site fuel oil storage. Reducing energy demands will allow the fuel supply to last longer during a potential utility outage.

5.1.3 Background Information

The proposed change to include healthcare alterations under the purview of Title 24, Part 6, is being introduced at an opportune time to maximize impact. When Senate Bill 1953 was signed into law in California in 1994, general acute care hospitals throughout the state had to conduct seismic evaluations and bring buildings up to a Structural Performance Category (SPC) of 2 or the “Life Safety Level” by January 1, 2008, with an extension to 2013 if required changes result in a diminished capacity of community healthcare services.⁸ As a result of this requirement, most older hospitals were torn down or completely retrofitted through the late 1990s and early 2000s. This means that many of these hospitals are now 20 to 30 years old and will require significant renovations to update failing or outdated systems and equipment and maintain optimal patient care in the near future. Requiring that hospitals include certain minimum efficiency measures as specified in the California Energy Code will result in significant statewide energy savings and cost-effective opportunities for hospitals across the state.

Mandatory and prescriptive requirements referenced in 141.0(b) save energy in a multitude of ways from more efficient motors, turning down flow rates, and reducing heat loss/gain through building envelopes. The proposed measures have previously gone through reviews to be adopted into the energy code and have been justified in those spaces. Nonresidential healthcare facilities are more energy intense than most building types and thus will see greater savings than most building types as the savings scale with energy use. In addition to energy savings, peak electrical and thermal demands are reduced via most of the newly activated requirements.

⁸ <https://hcai.ca.gov/facilities/building-safety/seismic-compliance-and-safety/program-overview/>

Table 28 and Table 29 outline all provisions within 141.0(b)-Alterations, and how the removal of the healthcare exception may impact a facility when undergoing an alteration. As previously mentioned, the Statewide CASE Team is recommending a handful of these provisions to apply to healthcare alterations in the 2028 Code Cycle. In future code cycles, healthcare exceptions to additional alteration measures will be considered and may be recommended for modification. Measures where healthcare facilities would be newly subject to requirements during alterations are highlighted in green.

Table 28: 141.0(b)—Mandatory Measures impacting Alterations

141.0(b) Mandatory Measures	Impacts on Healthcare Facility Alterations
100.0(e)4 activates section 110.8(d)	<ul style="list-style-type: none"> Requires that insulation be added to attics, existing water heaters, or existing ducts.
120.2(j)	<ul style="list-style-type: none"> Table 120.2-A DDC Applications and Qualifications indicates that as equipment is replaced it needs to be upgraded to include direct digital controls (DDC). The control requirements are standard across all building types and should not represent a burden on healthcare systems.⁹ The requirements found in Table 120.2 will gradually force healthcare facilities to shift away from pneumatic systems and/or expand existing DDC systems. HVAC system controls in healthcare facilities are to be more consistent with replacement and new construction control systems in non-healthcare facilities. Greater commonality among buildings will reduce cost as the solutions are standardized in addition to saving energy.

⁹ DDC technology have been available for a long time and is included as part of the baseline systems that align with the 2013 energy code. However, many hospitals tend to keep their equipment for a long time, so pneumatic controls are very prevalent in existing health care facilities. For reference, pneumatic controls use air pressure rather than electricity to actuate controllers. That pressurized air is provided by compressors and is piped throughout the hospital. It is likely that many hospitals have been using the healthcare facility control exception for many years to avoid investing in DDC systems. Also, any pneumatic to DDC conversion needs to be carefully planned to minimize disruption and cost to the health care facility. Not all the savings capabilities may be immediately available to health care facilities during partial control conversions.

141.0(b) Mandatory Measures	Impacts on Healthcare Facility Alterations
	<ul style="list-style-type: none"> • There will be a learning curve for building owners not familiar with the capabilities that the new controllers enable.
141.0(b)1.A Roof and Ceiling Insulation	<ul style="list-style-type: none"> • The minimum insulation levels for roofs and ceilings have been standard for several years now. • Also, there are exceptions related to accounting for roof top mechanical equipment and roof drains that will be in frequent use for roof alteration projects.
141.0(b)1.B Wall Insulation	<ul style="list-style-type: none"> • While the requirements are relatively modest for most constructions and should not present a challenge to healthcare facilities owners, design teams, or contractors, older curtain walls may have trouble achieving an R-4 performance as most existing curtain walls have an R-3 performance. High quality curtain walls typically achieve an R-5 performance. • Older facilities would likely use the mass wall exception as was common in older construction methods.
141.0(b)1.C Floor Insulation	<ul style="list-style-type: none"> • This would affect overhangs and crawl spaces, which are relatively uncommon in healthcare facilities. • Mass floors are relatively common in older healthcare facilities which would be exempt in this section.
141.0(b)1.D Fan Energy Index (FEI)	<ul style="list-style-type: none"> • Requires new fans to meet the requirements of section 120.10. • Generally achieving a FEI of 1.0 for constant air volume systems and 0.95 for variable air volume systems is straightforward with a thoughtful design. • Healthcare facilities commonly install fans in constrained spaces, where limited space may make meeting the FEI thresholds challenging due to system effects on the fan. It is possible that healthcare facilities may apply for relief on this requirement in alterations.
141.0(b)1.E Exterior Windows	<ul style="list-style-type: none"> • Requires replacement windows do not exceed a maximum U-factor of 0.58.

Table 29: 141.0(b)—Prescriptive Measures impacting Alterations

141.0(b) Prescriptive Measure	Impacts on Healthcare Facility Alterations
141.0(b)2.A Altered Fenestration	<ul style="list-style-type: none"> • Altered Fenestration would be required to meet new prescriptive performance requirements. • The altered glazing performance values are less stringent than new glazing requirements.
141.0(b)2.B Altered Roof	<ul style="list-style-type: none"> • The altered roof performance values are less stringent than new roof requirements, lessening the cost of the upgrade when reroofing. • Also, there are exceptions for size and scope of alteration (e.g., accounting for roof top mechanical equipment and roof drains that will be in frequent use for roof alteration projects).
141.0(b)2.C New or Replacement Space- Conditioning Systems or Components	<ul style="list-style-type: none"> • This section excludes duct work, which is regulated by 141.0(b)2.D • This section references section 140.4(b), which has 12 subsections, many of which are not applicable to healthcare facilities (e.g., Subsections 1, 3, 4, 7). Subsections 5, 6 and 8 through 12 include requirements that will not be burdensome for healthcare facilities to adopt. • 140.4(c) increases the fan power allowance accounting for challenges in fan retrofits. • 140.4(d) is documented above for new construction, which will be modified to include the updated CMC Table 4-A governing clinical space minimum turndown making this section feasible for healthcare facilities. • 140.4(e) includes Exception 2 for humidified buildings. This is heavily used for existing healthcare facilities and may be used if complying with this provision proves challenging. <ul style="list-style-type: none"> ○ Typically, the energy and energy cost savings associated with the air-side economizer will exceed the energy and energy cost loss associated with wasting humidified air. However, in certain situations it may be cost prohibitive to install an air-side economizer in an existing HVAC system. • 140.4(f) Supply air temperature reset controls is not applicable to healthcare facilities, Exception 4. <ul style="list-style-type: none"> ○ Supply air temperature reset controls are applied to hospitals, however certain spaces do have strict temperature and humidity control requirements so it is best to leave this exception in place until a more sophisticated approach is developed that can require this.

141.0(b) Prescriptive Measure	Impacts on Healthcare Facility Alterations
	<ul style="list-style-type: none"> • 140.4(g) Electric resistance heating is generally prohibited unless exceptions are applicable. <ul style="list-style-type: none"> ○ Many healthcare facilities have existing electrical resistance heating systems. Replacing those with hydronic systems would be cost prohibitive. • 140.4(h) Heat rejection systems requirements can be achieved in most healthcare facilities. • 140.4(i) Minimum chiller efficiency requirements can be achieved in most healthcare facilities. • 140.4(j) Limitation of air-cooled chillers section is not applicable to healthcare facilities, Exception 3. <ul style="list-style-type: none"> ○ Healthcare facilities are required to store water on site for resilience purposes. Cooling towers often use more than half of a hospital's total water annually, resulting in significant storage costs. • 140.4(k) Hydronic system measures section includes eight major requirements that are already typical in healthcare facilities. This includes variable flow pumping, chiller and boiler isolation, variable flow control, and other related requirements. <ul style="list-style-type: none"> ○ Chilled and hot water temperature reset controls are not applicable for healthcare facilities, Exception 2 to 140.4(k)4. However, many healthcare facilities already employ resets when feasible. • 140.4(m) fan control is already being modified for new construction and would become active for healthcare facilities when Exception 2 is removed. <ul style="list-style-type: none"> ○ The minimum flow requirements by space need to be maintained per CMC Table 4-A. ○ System alterations may not be able to make full use of the VAV fan control as downstream zones may be configured to be CAV. Though as zone level equipment is replaced this functionality will become available. • 140.4(n) Mechanical system shut-off is not applicable to healthcare facilities, Exception 3. • 140.4(o) Exhaust system transfer air s not applicable to healthcare facilities, Exception 5.

141.0(b) Prescriptive Measure	Impacts on Healthcare Facility Alterations
	<ul style="list-style-type: none"> • 140.4(p) Dedicated outdoor air systems (DOAS) are uncommon in healthcare facilities; however when implemented, they typically include active chilled beams (Exception 1) or sensible-only cooling terminal units (Exception 2). <ul style="list-style-type: none"> ○ An all-air DOAS system is technically possible in a healthcare facility; however, the fan power limitation of 0.12 W/cfm may be difficult to meet in certain cases. ○ Well-designed DOAS systems in healthcare facilities should be able to meet the requirements in this section. • 140.4(q) Exhaust air heat recovery has been used in healthcare facilities for many years. <ul style="list-style-type: none"> ○ Some spaces listed in CMC Table 4-A prohibit heat recovery with cross contamination potential such as exhaust from airborne infectious isolation rooms or radiology. ○ Exception 6 note 2 references CMC for energy recovery systems with leakage potential which sufficiently covers healthcare facilities.
141.0(b)2D Altered Duct Systems	<ul style="list-style-type: none"> • Requirements include a healthcare exception in section ii.1. This, in turn, triggers subsection iii, which references CMC section 603.8.9.2, which is already in effect for healthcare facilities.
141.0(b)2E Altered Space Conditioning Systems	<ul style="list-style-type: none"> • Thermostat with demand responsive controls is not applicable for healthcare facilities, Exception to 110.12
141.0(b)2F New Lighting System	<ul style="list-style-type: none"> • This will not have any healthcare specific challenges. Lighting retrofits are common in healthcare facilities.
141.0(b)2G Daylight Responsive Controls	<ul style="list-style-type: none"> • Provides an exception to alterations of daylight harvesting controls when a skylight is added.
141.0(b)2H and 141.0(b)2M New and External Signs	<ul style="list-style-type: none"> • Requirements for new internally and externally illuminated signs. • Healthcare facilities are exempt from Section 130.3.

141.0(b) Prescriptive Measure	Impacts on Healthcare Facility Alterations
141.0(b)2I Indoor Lighting Systems	<ul style="list-style-type: none"> • Altered indoor lighting systems - Lighting retrofits are common in healthcare facilities.
141.0(b)2L Outdoor Lighting Systems	<ul style="list-style-type: none"> • Alteration to existing outdoor lighting systems - Refers to standard lighting practice which is commonly applied in healthcare facilities.
141.0(b)2N Service water- heating systems	<ul style="list-style-type: none"> • Refers to section 140.5(a)2, which in turn refers to sections 110.1, 110.3, 120.3 and 140.5(c). <ul style="list-style-type: none"> ○ 110.1 Mandatory requirements for appliances do not contain anything that is healthcare facility specific. ○ 110.3 Mandatory requirements for service water-heating systems and equipment include requirements that healthcare facilities already meet. <ul style="list-style-type: none"> ▪ There is an exception in Section (a)1 that refers to Table 613.1 of the CPC for healthcare facilities. ▪ There are additional healthcare facility exceptions for controls on hot water distribution systems. ○ 120.3 Requirements for pipe insulation do not include any healthcare specific exceptions or requirements. ○ 140.5(c) High-capacity service water-heating systems served by natural gas require 90% efficient boilers. <ul style="list-style-type: none"> ▪ It is common in hospitals to have large central boiler plants that distribute steam, which serve steam-to-hot water converters that supply service to hot water loops. Steam boilers will not achieve 90% efficiency because the high temperature of steam precludes condensing. Boiler efficiency ranges from 75 to 80%, and may reach 86% efficiency with stack economizers.
141.0(b)2O for new interior walls or ceilings	<ul style="list-style-type: none"> • shall meet the requirements of 140.3(c). <ul style="list-style-type: none"> ○ 140.3(c) requires daylighting requirements for large, enclosed spaces, greater than 5,000 ft² and under a roof with a ceiling height greater than 15ft. ○ Typical ceiling heights in hospitals are 8 to 10 ft. This is partially done to reduce ventilation flows as requirements are

141.0(b) Prescriptive Measure	Impacts on Healthcare Facility Alterations
	<p>based on air changes per hour so as the space gets taller, the supplied air flow rate increases.</p> <ul style="list-style-type: none"> ○ Non-clinical spaces in healthcare facilities may be subject to this requirement, such as dining spaces and multi-purpose rooms.
141.0(b)2Q Existing Building Envelope	<ul style="list-style-type: none"> • Healthcare facilities are exempt from whole building air leakage tests.
141.0(b)2R Exterior doors	<ul style="list-style-type: none"> • Requirement to meet the u-factor of section 140.3(a)7 which does not have any healthcare specific requirements or constraints.

Impact of Pneumatic Control Changes

The recommended controls changes defined above will work for most existing HVAC systems in healthcare facilities; however, the exact implementation will vary on a project basis.

Many older hospitals still have pneumatic controls rather than DDC. While there is a cost of replacing control systems, maintaining pneumatic controls has become increasingly costly as fewer manufacturers and capable technicians are available to serve this shrinking market. Replacing pneumatic controls with DDC will incur costs both in installation and maintenance as two types of systems will exist for a time; it will be a long-term savings. The long-term savings come from greater control accuracy (reducing/eliminating over heating or over cooling) and generating data that could inform advanced control strategies. Operators of pneumatic control systems have limited insights into how the HVAC system operates.

Given the disruption to operations, scale, and budgets of hospitals, partial upgrades to DDC will likely be more common than complete upgrades. Electric-to-pneumatic transducers will be required to translate control signals from the DDC to the pneumatic system. This equipment is an additional cost beyond sensors and controls programming. Pneumatic controls do not necessarily have a line or low voltage connection nearby thus necessitating additional wiring.

Pneumatic controls, by and large, only provide local control and do not allow for system- and/or building-wide optimization. Initially, the new DDC will only provide local control until the entire system has been updated. For example, if occupancy sensors are added to a space that allow the ventilation, heating, and/or cooling to be setback or turned off,

it will only impact that zone. The HVAC system serving that space will not be able to make use of that data initially for greater optimization. However, as the pneumatic controls fail and are replaced over time, the DDC system will expand, eventually enabling full control of the HVAC system and the building.

Owners will likely accelerate the conversion to DDC once the HVAC system has achieved a threshold where it is cheaper to finish the conversion than maintaining two different control systems. In effect, certain features will be disabled or unavailable until the entire system has been upgraded. For example, variable speed drives may operate at constant speed because all the relevant control signals aren't available yet.

Allowing for the phasing of control replacement and sub-optimal system performance will manage capital costs while still providing some short-term benefit, and significant long-term benefit.

5.1.4 Modifications to Energy Code Documents

This section provides descriptions of how the proposed code change will affect each Energy Code document. See Section 5.6: Alterations - Proposed Language Code of this report for detailed revisions to code language.

5.1.4.1 Energy Code Change Summary

The proposed energy code changes affect Title 24, Part 6. A brief description of these changes is provided below:

SECTION 141.0 – Additions, Alterations, and Repairs

Exceptions to Section 141.0: The proposed change would remove the blanket healthcare exception and add healthcare exceptions to specific alteration provisions throughout 141.0.b. Healthcare specific exceptions would be added to the following sections: 141.0(b)1B, 141.0(b)1C, 141.0(b)2A, 141.0(b)2C, 141.0(b)2D, 141.0(b)2E, 141.0(b)2H, 141.0(b)2L, 141.0(b)2M, 141.0(b)2P. This would retain a healthcare specific exception for certain mandatory and prescriptive requirements related to wall and floor insulation, window glazing, space conditioning and duct systems, and outdoor lighting systems. As a result of the proposed changes, healthcare facilities undergoing alterations would then be subject to several mandatory provisions impacting roof/ceiling alterations, window u-factors, fans, and prescriptive measures related to roofs and indoor lighting systems.

5.1.4.2 Reference Appendices Change Summary

The proposed changes would not impact the reference appendices, as they only modify the healthcare exception and do not fundamentally change alteration requirements throughout the code.

5.1.4.3 Compliance Manuals Change Summary

Include additional guidance in the alterations section of chapters 3, 4, and 5 of the Nonresidential Compliance Manual explaining when energy code measures are required during healthcare alteration scenarios. For example, shutting off flow to a space will change the system pressure which will adversely impact the flow to other spaces that can't modulate to mitigate the change.

5.1.4.4 Alternative Calculation Method Reference Manual Change Summary

In the ACM key changes section, note that alterations would now comply with the energy code. There are no other proposed changes to the ACM Reference Manual.

5.1.4.5 Compliance Forms Change Summary

This proposed change will require the following compliance forms to be updated to include 141.0(b) and specific alteration measures as a requirement when selecting a healthcare building type. These forms include: NRCC-ENV-E and NCRI-ENV-E Envelope Component Approach, NRCC-LTI-E and NRCI-LTI-E Indoor Lighting, NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E- and NRCI-CRX-E Nonresidential Building Commissioning.

5.1.5 Measure Context

5.1.5.1 Comparable Model Codes or Standards

Unlike 2025 Title 25, Part 6, national model codes and standards, such as ASRHAE 90.1 and IECC, do not exempt healthcare facilities from efficiency requirements when implementing a building alteration or retrofit that triggers the energy code. This means that healthcare facilities in other states that have adopted one of these national standards have been subject to efficiency requirements for alterations.

The **2024 IECC** outlines requirements when altering a building in Section C503: Alterations. This section covers specific requirements impacting each building system including the envelope, lighting, mechanicals, and SHW, similar to Title 24, Part 6. In addition to these base requirements, alterations that are *substantial improvements* are subject to the additional efficiency credits, which require the designers and builders to choose a number of additional measures to achieve even greater levels of efficiency.

ASHRAE 90.1 – 2022 requires alterations of existing building assemblies, systems, and equipment comply with all sections of the code, similar to the 2024 IECC and what is being proposed for Title 24, Part 6 in this measure. Section 4.2.1.3 specifically references each section covering requirements for the building envelope, HVAC, SHW, Power, Lighting, other equipment, and additional efficiency requirements.

5.1.5.2 Interactions with Other Regulations

This change does not interact or conflict with any federal laws and regulations. This change does interact with certain state requirements and the California Building Code. The proposed measures are already present for nonresidential buildings except healthcare facilities. The healthcare facility exemption is being removed and clarifying language has been added to document how the technology is applied and limitations.

State laws and requirements

Title 24, Part 6 uses the definitions in the California Health and Safety Code Division 2, Chapter 2, §1250 and the California Health and Safety Code Division 2, Chapter 1, Section 1204 to define a healthcare facility. This measure is not proposing to change the existing definition.

Interactions with California Building Code

Title 24, Part 1: SECTION 7-118 – Building Energy Efficiency Program.

While the proposed change to Title 24, Part 6 would require healthcare facilities undergoing alterations to comply with the energy code, a similar change in scope that triggers alteration requirements would need to be incorporated in Chapter 7: Safety Standards for Health Facilities, Title 24, Part 1. Section 7-118 currently only requires newly constructed or an addition to healthcare facilities to comply with Title 24, Part 6, and does not account for alterations. To maintain consistency between Title 24, Part 1 and Part 6, and reduce confusion among industry and the enforcement community, this section should be updated to reflect energy code compliance for healthcare alterations.

5.2 Alterations - Compliance and Enforcement

5.2.1 Compliance Considerations

Many healthcare facilities impacted by this measure are regulated and enforced by the HCAI Office of Statewide Hospital Planning and Development (OSHPD), who enforce all Title 24 codes, including Part 6. (HCAI 2024) This means that HCAI staff and Inspectors or Record (IORs)—plans examiners and field inspectors—are responsible for verifying compliance with this measure for healthcare facilities outlined in Section 2.1.3. HCAI uses a similar plan review and permitting process to local jurisdictions but with a few important distinctions. Once a set of drawings are reviewed and approved by HCAI reviewers, the healthcare facility owner hires OSHPD certified Inspectors of Record (IORs) to monitor construction progress and note discrepancies between approved plans and field installation. IOR's perform continuous inspection during construction activities and are essential to quality control during construction. In addition to IORs, HCAI field inspectors periodically visit the site to verify compliance with the building code (HCAI 2024).

Considering that alterations have been previously exempt for healthcare facilities, this will present a significant change for HCAI and its plan reviewers and inspectors. Plan reviewers and inspectors will need considerable training on when specific alterations trigger an energy code requirement and how to ensure its verified and complied with on plans and in the field. Specific impact on HCAI inspectors is as follows:

While this measure will increase the enforcement burden on HCAI inspectors, this change will streamline the alterations section and reduce confusion among other market actors by requiring healthcare facilities to comply with specific alteration requirements as required in other nonresidential building types. For specific healthcare facilities enforced by local building departments, there will be limited impact on their enforcement processes, as plan review and inspectors in those departments currently enforce this measure for other nonresidential building types.

5.2.2 Impact on Market Actors

This proposed measure will require healthcare facilities to be subject to certain energy code provisions when altering a healthcare facility in which other nonresidential construction building types are already subject to. Many of the same market actors that work on healthcare facilities also support other nonresidential buildings, so added efficiency requirements for alteration scopes will not require a change in their approach.

Table 30 summarizes impacts on market actors and suggests outreach and education that might be helpful to support market actors as they prepare for the effective date of the requirements.

Table 30: Impacts on Market Actors and Suggested Training and Education Opportunities

Market Actor	Impact(s)	Suggested Outreach and Education
Builders ^a	This change aligns healthcare facilities more closely with other nonresidential buildings.	This is already common practice for most building types, no additional training needed.
Design Professionals ^b	Design professionals who specialize in healthcare are likely familiar with alteration requirements but may not have applied them in healthcare projects. This change will require some rethinking.	The newly active requirements are already standard for non-healthcare facilities, but it makes sense to have some training with examples for design professionals that specialize in healthcare facility design.
Construction Team ^c	Likely this will simplify their work as the approaches used on other building types will align more with healthcare facilities.	This is already common practice in construction, no additional training needed.

Market Actor	Impact(s)	Suggested Outreach and Education
HCAI Inspectors^d	Requiring efficiency improvements for alterations will be entirely new for HCAI and IOR inspectors. HCAI plan reviewers and inspectors will need to apply energy code requirements to alteration projects. Aside from specific threshold triggers, HCAI and IOR inspectors should be familiar with referenced sections of the code, as all these requirements apply for new construction and additions.	Substantial training and education will need to be provided to HCAI inspectors to improve understanding of energy code alteration requirements and thresholds for when measures need to comply. A training program, and additional resources, should be developed and administered through HCAI's standard training programs.
Verification Testers^e	Commissioning agents and inspectors should have an easier time validating functional compliance with the additional data available through more controls and operational flexibility.	This is already common practice for most building types; no additional training is needed other than general outreach that this is also now a health care requirement and that the exception has been repealed.
Building Owners, Managers, and Occupants	Reduced energy bills. Modified preventative maintenance routines. More data to diagnose operational issues. Non-residential healthcare facilities with antiquated controls may see significant challenges as their previous approaches to maintaining controls will no longer be permissible.	Hospitals should be notified via the California chapter of the American Society for Health Care Engineering as the primary conduit for reaching owners, operators, engineers, and manufacturers affected by this code change. The California Society for Healthcare Engineering would likely develop any necessary educational content for its membership.
Manufacturers and Distributors	The few remaining pneumatic control manufacturers may no longer be able to justify producing spare parts if the demand continues to decrease. Like many technologies supplanted by a superior solution, this is inevitable. However, this code change could accelerate the decline of this market. Given the timeline of the code change adoption, manufacturers	Most if not all controls contractors do this work on most building types. General notification of this change will be sufficient.

Market Actor	Impact(s)	Suggested Outreach and Education
	<p>should have ample time to modify production rates to not lose money.</p> <p>DDC equipment manufacturers and technicians will see increased demand for their services offsetting any impact on economic activity.</p>	

- a. Builders include builders and developers.
- b. Design professionals include architects, interior designers, engineers (mechanical, electrical, plumbing, structural), specification writers, cost estimators, commissioning agents, lighting designers, and energy consultants.
- c. Construction team includes general contractors, design-build contractors, installation contractors (e.g., HVAC, plumbing, electrical), commissioning agents, and tradespeople.
- d. Building departments include plans reviewers, building inspectors, specialty inspectors, permit counter technicians and sustainability department staff.
- e. Verification testers include commissioning agents, ECC Raters, and Acceptance Test Technicians.

The 2028 CASE Methodology Report presents a quantitative assessment of how changes to the California building code impact builders, building designers and energy consultants, and building owners and occupants. The analysis in the methodology report is not specific to the changes presented in this report. The following provides a qualitative description of how this specific code change affects various market actors and additional quantitative analyses of its potential impacts on building industry subsectors.

Builders. The proposed change would likely affect residential and/or commercial builders; however, it would likely not impact firms focused on the construction or retrofitting of industrial buildings, utility systems, public infrastructure, or other heavy construction. The proposed change would not affect all firms and workers in the residential and commercial building industries equally; instead, it would primarily affect specific subsectors within the industry.

With the alterations section impacting all other sections of the code, this change has the potential to impact a broad swath of construction subsectors. Any commercial building trade that works on the building envelope, lighting, HVAC, or SHW may be impacted, depending on the type of alteration and whether the size of change is greater than the system specific compliance thresholds specified in 141.0(b). Table 31 shows the commercial building subsectors that the Statewide CASE Team expects to be impacted by the changes proposed in this report.

Table 31: Specific Subsectors of the California Commercial Building Industry Impacted by Proposed Change to Code/Standard by Subsector in 2022 (Estimated)

Construction Subsector	Establishments	Employment	Annual Payroll (Billions \$)
Commercial Building Construction	4,919	83,028	9.0
Nonresidential Structural Steel Contractors	363	13,110	1.1
Nonresidential Framing Contractors	133	3,406	0.3
Nonresidential Masonry Contractors	229	4,246	0.3
Nonresidential Glass and Glazing Contractors	283	6,133	0.6
Nonresidential Roofing Contractors	354	10,382	0.9
Nonresidential Siding Contractors	26	668	0.0
Other Nonresidential Exterior Contractors	277	3,006	0.2
Nonresidential Electrical Contractors	3,137	74,277	7.0
Nonresidential Plumbing & HVAC Contractors	2,346	55,572	5.5
Other Nonresidential Equipment Contractors	556	9,594	1.0
All Other Nonresidential Trade Contractors	940	18,027	1.6

Source: (State of California n.d.)

Building occupants (owners and tenants). For California healthcare building owners and tenants, the proposed code changes would result in lower energy bills and the potential for improved occupant comfort. The Statewide CASE Team estimates that, on average, the proposed change to Title 24, Part 6 would increase construction costs by about \$2.20 per sq. ft. of healthcare space. However, the measure would also result in savings of \$3.52 per sq. ft. in energy and maintenance cost savings over 30 years.

5.2.3 Compliance Software Updates

If the proposal is adopted, then CBECC will be modified based on the proposed changes to the ACM, as described in Section 2.6.6.

5.2.4 Cost of Enforcement

This proposed change will require certain healthcare alterations must comply with Title 24, Part 6. With healthcare facilities having been previously exempted from these requirements, this change will increase the number of healthcare projects seeking energy code review and additional work for HCAI and IOR inspectors.

5.3 Alterations - Market and Economic Analysis

5.3.1 Market Structure and Availability

5.3.1.1 *Current Market Structure and Availability*

The proposed code change is already applicable to new healthcare facilities as well as alterations for non-healthcare facilities, so many products, services, technologies, designers, installers, and owners are familiar with implementing these requirements.

Nonresidential healthcare facility owners undergoing a major alteration will likely need to learn about requirements that are now applicable to their facility as well as new technologies that may support its implementation. Individual owners may not be familiar with these new products to achieve code compliance if they have not altered their hospital in a while or are not progressing ahead of the energy code.

5.3.1.2 *Market Challenges and Solutions*

This proposed change would likely impact healthcare facility owners most significantly, as requiring alterations now comply with Title 24, Part 6 would represent a learning curve for them and their staff. Training materials and case studies should allay most concerns as the requirements being implemented have been in use for many years in California.

Product vendors that have not previously served the healthcare sector may find onerous requirements regarding certifications and paperwork that they are not used to in other less regulated building types. The regulatory process will likely seem opaque to them. Training materials and consultants working through the adoption process will eventually overcome any of these challenges.

See Section 2.2 for a description of workforce trainings that may be needed to ensure effective design, installation, and commissioning.

5.3.2 Design and Construction Practices

5.3.2.1 *Current Design and Construction Practices*

The proposed change activates previously adopted sections of the energy code for nonresidential healthcare facilities. The design and construction practices are already in place, with most having already been adopted in some progressive healthcare facility projects.

5.3.2.2 *Health and Safety Considerations*

The proposed code change is making certain sections of the alterations code, 141.0 active for non-residential healthcare facilities. All of the requirements have already been vetted for non-healthcare facility types. A team of experts reviewed all the newly active

sections for impacts on infection prevention, delivery of care, or onerous burdens to facilities management/maintenance staff. New exceptions for healthcare facilities were suggested where appropriate.

5.3.2.3 Design and Construction Challenges and Solutions

The most significant design challenge was solved as part of the 2025 update to the CMC, which adopted ASHRAE 170 ventilation requirements into Table 4-A. Table 4-A clearly defines which spaces can implement air flow setbacks and under what conditions. This set the stage for the next step of requiring air flow setbacks in the energy code as the health and safety aspects were already addressed in the CMC. Owners and design professionals that specialize in healthcare facilities will require training to understand these new requirements.

The other sections related to equipment and component performance requirements (fans, lighting, envelope insulation, etc.) are already in standard practice in many progressive healthcare facilities. Certain products that have not been used in healthcare before may encounter regulatory hurdles to provide the necessary paperwork to meet requirements and therefore may have slow adoption.

See Table 4 in Section 2.2.2 for a description of workforce trainings that could support effective design, installation, and commissioning.

5.3.3 Energy Equity and Environmental Justice

The Statewide CASE Team evaluated the potential impact on environmental and social justice (ESJ) communities, including impacts related to race, class, and gender. The Statewide CASE Team does not anticipate that requiring fan control in healthcare facilities will negatively impact ESJ communities. As outlined in 5.4.5, this measure is cost-effective and will reduce overall operating costs for healthcare facilities. Reducing operating costs of healthcare facilities may make those facilities more economically resilient and enable them to put more resources toward patient care. Keeping healthcare facilities open and operational is especially critical when serving ESJ communities where residents may not have other options for care.

The Statewide CASE Team identified potential impacts of the proposed code change via research and stakeholder input. While the listed potential impacts should be comprehensive, they may not yet be exhaustive. Recognizing the importance of engaging ESJ communities and gathering their input to inform the code change process and proposed measures, the Statewide CASE Team is working to build relationships with community-based organizations (CBOs) to facilitate meaningful engagement. Please reach out to Bryan Boyce (bboyce@energy-solution.com) if you have input on how this proposal may impact ESJ communities or if you would like to offer your perspective.

5.3.4 Impacts on Jobs and Businesses

This section will be completed for the Final CASE Report.

5.3.5 Economic and Fiscal Impacts

This section will be completed for the Final CASE Report.

5.4 Alterations - Cost Effectiveness

5.4.1 Cost Effectiveness Methodology

The Statewide CASE Team collaborated with CEC staff to confirm that the cost-effectiveness methodology aligns with CEC guidelines, including cost inclusion parameters. The 2028 CASE Methodology Report and Appendix A provide reproducibility details.

Per California Law (Public Resources Code 25000), a measure is considered cost effective if its Benefit-Cost Ratio (BCR) is 1.0 or greater, amortized over the economic life of the structure. The Statewide CASE Team calculates BCR by dividing total dollar benefits by total dollar costs over a 30-year analysis period.

Benefits are based on Long-term System Cost (LSC), which assigns an hourly dollar value to energy use. LSC hourly factors weigh the long-term value of each hour differently, where times of peak demand are valued more than off-peak hours. These factors are not utility rates, forecasts, or bill estimates. The CEC develops and publishes LSC hourly conversion factors for each code cycle.

Costs include first costs and ongoing maintenance costs assessed over the 30-year period. Benefits and costs are evaluated incrementally, relative to the most recently adopted Energy Code. The analysis excludes design costs and incremental code compliance verification costs.

5.4.2 Energy and Energy Cost Savings Results

With this measure applying to nonresidential healthcare facilities, the Statewide CASE Team modeled the hospital prototype to represent the energy, cost, and emissions impact. While other nonresidential healthcare facilities would be impacted by the proposed change, such as skilled nursing facilities, the hospital prototype is being used in this analysis as a reasonably proxy for those facilities. In the final report, the Statewide CASE Team will develop a skilled nursing facility prototype and model the impact of this proposed change based on that building type. CBECC 2025 2.0 and EnergyPlus 25.1 and new 2028 metric files (weather, emission, source energy factor, and LSC cost) are used for analysis.

Hospital Prototype Modifications

Through discussions with subject matter experts, the Statewide CASE Team determined that the default CBECC hospital prototype is not representative of a typical California hospital in terms of design or energy use characteristics. As such, the hospital prototype was modified in the following ways to align with standard practice and more appropriately represent an existing hospital. Unlike the new construction analysis in previous measures, the Statewide CASE Team kept the baseline ventilation rates consistent with Title 24, Part 6 and a water-cooled chiller. The only updates to the hospital prototype for alterations are the following:

- Lighting and HVAC schedules were updated

For the final report, the Statewide CASE Team plans to further align the hospital prototype with standard practice and expected energy use in real world hospitals. These modifications are as follows:

- Water vs. Air Cooled Chiller: The Statewide CASE Team determined that most newly constructed hospitals install an air-cooled instead of a water-cooled chiller as the primary cooling equipment.¹⁰ CBECC uses a water-cooled chiller as the baseline system for hospitals. To ensure the model accurately represents the primary and secondary cooling system in the hospital model, additional market assessment is needed to determine the split between water and air-cooled chillers. The Statewide CASE Team has modeled hospitals with a water-cooled chiller in this draft report and will determine the likely split between water and air-cooled chillers and reflected in the final analysis.
- Hospital EUI alignment: The Statewide CASE Team compared the modeled hospital energy use (EUI) to the reported annual energy use of California hospitals based on data collected through CEC's Building Energy Benchmarking Program (CEC 2025). After analyzing the data, which require hospitals over 50,000 sq ft. to submit annual energy use data, the Statewide CASE Team determined that hospitals report an average weather normalized EUI of 200 to 250 kBtu/sf (235 kBtu/sf for 2024). The average EUI from CEC's dataset is approximately two to two and a half times larger than the EUI of a hospital modeled per the CBECC prototype.¹¹ There are many reasons for this

¹⁰ SMEs on the Statewide CASE Team indicated that it is common practice for hospitals to install air-cooled chillers instead of water-cooled chillers. Per CPC 611 and CMC 407.4, hospitals require backup on-site water storage capacity in case of an emergency to support essential functions. Cooling is an essential function, so a water-cooled chiller would require additional water storage capacity and nearly double the on-site tank size required without a water-cooled system. This is also allowed by exception for healthcare facilities if the air-cooled chiller is greater than 300 tons.

¹¹ This finding was also consistent with data derived from the American Society for Health Care Engineering (ASHE) and based on Mazzetti and Kaiser Permanente's experience.

inconsistency, including, but not limited to, spaces (e.g., data center), additional plug and process loads, and increased ventilation not fully accounted for in the model. To more closely align the hospital baseline model with actual energy usage in hospitals, the Statewide CASE Team will further adjust the baseline model and overall potential savings in the final report and analysis.

Measure Specific Baseline vs. Proposed Designs

Existing healthcare facilities across California are constructed to a wide array of design standards and practices, largely based on building vintage. To establish a single baseline, the Statewide CASE Team is using a hospital constructed to the 2019 Title 24, Part 6 standard. The Statewide CASE Team felt this was a conservative, yet appropriate, baseline as this is when healthcare facilities were initially added to the California Energy Code, creating a better comparison point when factoring in current healthcare exceptions, and ensures savings estimates remain conservative.

The proposed design is an existing hospital that is fully compliant with the minimum alteration requirements in the 2025 Title 24, Part 6 code.

As specified in 141.0(b) – Alterations, the type of building systems and the level of alteration being performed dictates whether the work is subject to energy code requirements. A detailed description of energy code requirements by building system (e.g., envelope, lighting, mechanical, and SHW) is provided in Section 5.1.3, and indicates which existing healthcare exceptions will apply based on the proposed change. As described in that section, certain alterations to envelope, lighting, and fans would be subject to certain energy code requirements, while other measures such as SHW and space conditioning system modifications would be exempt based on existing and modified healthcare exceptions.

As such, the Statewide CASE Team modeled envelope (roof and windows), lighting (LPD), and fan (FEI) improvements to hospitals separately based on alteration requirements in the 2019 Title 24, Part 6 baseline and 2025 Title 24, Part 6 proposed model. Baseline and proposed designs are provided in Table 32.

Table 32: Hospital Alterations Baseline and Proposed Model Assumptions

Building System	Building Component	Baseline Design (2019 Title 24)	Proposed Design (2025 Title 24)
Envelope	Roof	Climate Zones 1, 3-9: R-8	Climate Zones 6-8: R-17
		Climate Zones 2, 10-16: R-14	Climate Zones 1-5, 10-16: R-23
Envelope	Windows	U-factor: 0.86	U-factor: 0.58

Building System	Building Component	Baseline Design (2019 Title 24)	Proposed Design (2025 Title 24)
Lighting	LPD	App5-4A_SpaceBySpace-T24N_2019	App5-4A_SpaceBySpace-T24N_2025
HVAC	FEI	Multiple varies based on Fan name and Climate Zone	Multiple varies based on Fan name and Climate Zone

Results

Energy savings (electricity, natural gas, and source energy) and peak demand reductions per unit are presented for each building system (envelope, lighting, fans) in Table 33 through Table 38.

Envelope Alterations

Per-unit savings for envelope alterations for the first year are expected to range from -0.01 to 0.08 kWh/yr and 0.68 to 1.89 kBtu/yr, depending upon climate zone. Demand reductions/increases are expected to range between -0.0005 kW and 0.0062 kW, depending on climate zone.

Table 33 presents total per-unit energy cost savings for envelope alterations in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 34 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building.

Table 33: Energy and Energy Cost Savings – Per Square Foot – Alterations– Hospital Envelope

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	-0.01	-0.0005	1.89	1.62	1.53
2	0.01	0.0022	1.25	1.07	1.17
3	-0.01	0.0006	1.34	1.14	1.12
4	0.04	0.0044	1.84	1.60	1.88
5	0.01	0.0003	1.45	1.24	1.27
6	0.01	0.0001	0.74	0.63	0.72
7	0.02	0.0003	0.68	0.57	0.70
8	0.05	0.0021	1.05	0.90	1.22

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
9	0.05	0.0032	1.28	1.10	1.49
10	0.04	0.0023	0.92	0.79	1.06
11	0.03	0.0035	1.24	1.08	1.33
12	0.03	0.0033	1.18	1.02	1.25
13	0.05	0.0048	1.06	0.94	1.28
14	0.03	0.0027	1.18	1.02	1.25
15	0.08	0.0062	0.98	0.88	1.44
16	0.00	0.0014	1.67	1.43	1.51

Table 34: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – Alterations– Hospital Envelope

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	-0.09	1.62	1.53
2	0.11	1.07	1.17
3	-0.04	1.16	1.12
4	0.30	1.58	1.88
5	0.02	1.24	1.27
6	0.06	0.66	0.72
7	0.09	0.60	0.70
8	0.30	0.92	1.22
9	0.37	1.12	1.49
10	0.26	0.80	1.06
11	0.27	1.07	1.33
12	0.24	1.01	1.25
13	0.37	0.91	1.28
14	0.20	1.05	1.25
15	0.62	0.83	1.44
16	0.02	1.49	1.51

Lighting Alterations

Per-unit savings for lighting alterations for the first year are expected to range from 0.69 to 0.74 kWh/yr and -0.243 to -0.189 kBtu/yr, depending upon climate zone. Demand reductions/increases are expected to range between 0.0061 kW and 0.0064 kW, depending on climate zone.

Table 35 presents total per-unit energy cost savings for lighting alterations in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 36 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building.

Table 35: Energy and Energy Cost Savings – Per Square Foot – Alterations– Hospital Lighting

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	0.074	0.0062	-0.189	-0.077	0.39
2	0.072	0.0062	-0.209	-0.095	0.35
3	0.073	0.0064	-0.213	-0.098	0.36
4	0.071	0.0064	-0.234	-0.117	0.32
5	0.073	0.0063	-0.217	-0.102	0.35
6	0.072	0.0063	-0.222	-0.104	0.33
7	0.073	0.0064	-0.219	-0.101	0.35
8	0.072	0.0063	-0.225	-0.106	0.34
9	0.071	0.0062	-0.235	-0.116	0.32
10	0.072	0.0062	-0.236	-0.116	0.32
11	0.071	0.0064	-0.224	-0.108	0.33
12	0.073	0.0063	-0.218	-0.101	0.35
13	0.072	0.0064	-0.224	-0.105	0.34
14	0.071	0.0061	-0.228	-0.109	0.32
15	0.074	0.0064	-0.243	-0.119	0.33
16	0.069	0.0062	-0.204	-0.090	0.34

Table 36: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – Alterations– Hospital Lighting

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	0.58	-0.19	0.39
2	0.56	-0.21	0.35
3	0.57	-0.21	0.36
4	0.55	-0.23	0.32
5	0.56	-0.22	0.35
6	0.56	-0.22	0.33
7	0.56	-0.22	0.35
8	0.56	-0.22	0.34
9	0.55	-0.23	0.32
10	0.56	-0.24	0.32
11	0.55	-0.22	0.33
12	0.57	-0.22	0.35
13	0.57	-0.22	0.34
14	0.55	-0.23	0.32
15	0.58	-0.24	0.33
16	0.54	-0.20	0.34

Fan Alterations

Per-unit savings for mechanical alterations for the first year are expected to range from 0.22 to 0.25 kWh/yr and -0.06 to -0.37 kBtu/yr, depending upon climate zone. Demand reductions/increases are expected to range between 0.02 kW and 0.03 kW, depending on climate zone.

Table 37 presents total per-unit energy cost savings for fan alterations in terms of LSC savings realized over a 30-year period, in 2029 present value dollars (2029 PV\$). The LSC methodology allows peak electricity savings to be valued more than electricity savings during non-peak periods. Table 38 presents a breakdown of total LSC savings from electricity and natural gas cost savings for the prototypical building.

Table 37: Energy and Energy Cost Savings – Per Square Foot – Alterations– Hospital Fans

Climate Zone	First Year Electricity Savings (kWh)	First Year Peak Demand Reduction (kW)	First Year Natural Gas Savings (kBtu)	First Year Source Energy Savings (kBtu)	Total 30-Year LSC Savings (2029 PV\$)
1	0.22	0.02	-0.34	0.07	1.61
2	0.23	0.03	-0.29	0.12	1.71
3	0.23	0.03	-0.18	0.22	1.82
4	0.23	0.03	-0.26	0.15	1.78
5	0.23	0.03	-0.22	0.19	1.80
6	0.25	0.03	-0.07	0.34	2.07
7	0.25	0.03	-0.05	0.36	2.11
8	0.25	0.03	-0.09	0.32	2.06
9	0.25	0.03	-0.11	0.29	2.00
10	0.24	0.03	-0.12	0.28	1.98
11	0.24	0.03	-0.22	0.19	1.84
12	0.24	0.03	-0.22	0.18	1.82
13	0.24	0.03	-0.17	0.24	1.91
14	0.24	0.03	-0.21	0.20	1.85
15	0.25	0.03	-0.06	0.35	2.10
16	0.23	0.03	-0.37	0.06	1.67

Table 38: 2029 PV LSC Savings Over 30-Year Period of Analysis – Per Square Foot – Alterations– Hospital Fans

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
1	1.91	-0.29	1.61
2	1.97	-0.26	1.71
3	1.98	-0.16	1.82
4	2.01	-0.23	1.78
5	2.00	-0.19	1.80
6	2.13	-0.06	2.07
7	2.15	-0.04	2.11
8	2.14	-0.08	2.06
9	2.10	-0.10	2.00
10	2.10	-0.12	1.98

Climate Zone	30-Year LSC Electricity Savings (2029 PV\$)	30-Year LSC Natural Gas Savings (2029 PV\$)	Total 30-Year LSC Savings (2029 PV\$)
11	2.05	-0.21	1.84
12	2.03	-0.20	1.82
13	2.07	-0.16	1.91
14	2.06	-0.20	1.85
15	2.16	-0.06	2.10
16	2.00	-0.34	1.67

5.4.3 Incremental First Cost

Incremental costs associated with healthcare alterations will vary depending on the type and extent of the alteration being performed. By removing the healthcare exception for alterations in the code, healthcare facilities would be subject to code requirements for alterations impacting envelope, lighting, and fans, when accounting for other healthcare exceptions. Specific code provisions that healthcare building alterations would be newly subject to are outlined in Section 5.1.3.

Given the complexity of analyzing costs associated with alterations, the Statewide CASE Team is collecting additional stakeholder input from market actors specializing in healthcare buildings. These market actors include design and engineering firms, general contractors, HVAC and controls contractors, manufacturers and others closely involved in building alteration work.

Final costs will be established based on modeling assumptions described above. For envelope, incremental costs will be assessed for roof replacement, which will primarily consist of additional material insulation costs and potential parapet or structural changes if necessitated from increased insulation levels. For fenestration, the Statewide CASE Team assumes that performance improvements will result in negligible incremental costs when compared to a less efficient window, as installation and material use is the same, and difference in u-factor values are minor. Wall and floor insulation is not being analyzed as a new healthcare exemption has been proposed given it's one of the least likely alterations to be implemented.

For lighting, costs will be established for improved LPD, which is assumed to be negligible given the reduced costs of LED technologies. Lighting controls are not analyzed as part of this report and thus costs will not be considered, as healthcare facilities are currently exempt.

For fan alterations, the analysis factors in alterations that trigger improvements in FEI, so costs for those improvements will be collected.

It should be noted that all measures are already required for alterations in other nonresidential building types and have previously been proven to be cost-effective. As such, changes to healthcare facilities which operate 24/7 will be shown to be cost-effective.

For the draft report, the Statewide CASE Team established the break-even cost point for what incremental costs will show cost-effectiveness based on the projected energy cost savings. These preliminary maximum costs per system are outlined in Table 39.

Table 39: Incremental Cost Break-even Point across Altered Systems

System	Description	Minimum Costs (\$/psf)
Envelope	Roof and fenestration improvements	\$0.75
Lighting	LPD reduction	\$0.25
Fans	Fan Energy Index	\$1.20

5.4.4 Incremental Maintenance and Replacement Costs

Description of the incremental maintenance and replacement costs, as well as estimation of present value of maintenance and replacement costs, are provided in the 2028 CASE Methodology Report.

Incremental maintenance and replacement costs will differ by building system being impacted. For example, building envelope measures like roof insulation and window fenestration general require little maintenance impacted by the proposed code change and have long measure lifetimes, so measure replacement is rare. Windows are typically only replaced when broken and roof insulation can be replaced during a roof membrane replacement. Given the long lifetimes of these measures, this 30-year analysis does not assume any replacement costs. While there is maintenance costs associated with roof care, these are needed regardless of whether the roof is insulated or not.

By using the 2019 code as a baseline, the Statewide CASE Team is comparing like-for-like LED fixtures. LEDs have long lifetimes and will likely be replaced for cosmetic improvements before they need to be replaced due to failure. As such, maintenance cost effects are negligible and are not included.

The analysis models fan alterations that improve FEI. As described in section 2.4.4, maintenance and replacement costs are outweighed by cost savings through improved system awareness and early fault detection.

5.4.5 Cost Effectiveness

Results of the per-unit cost-effectiveness analyses are presented in Table 40 through and Table 42 for alterations based on covered systems.

In the tables below, all values are presented in 2029 present value dollars (2029 PV\$). Benefits represent 30-year LSC savings and other savings, including incremental first-cost savings if the proposed first cost is less than the current first cost, incremental maintenance cost savings if the proposed maintenance costs are less than the current maintenance costs, and incremental residual value if proposed residual value is greater than current residual value at the end of the 30-year period of analysis. Costs represent the total incremental PV cost, including incremental equipment, replacement, and maintenance costs over the period of analysis. The analysis treats a negative incremental maintenance cost as a positive benefit. If total incremental costs are zero, the benefit-cost ratio (BCR) is considered infinite. Costs and other savings are discounted at a real (inflation-adjusted) three percent rate. If there are no total incremental PV costs, the BCR is infinite.

Table 40: 30-Year Cost-Effectiveness Summary Per Square Foot – Alterations – Hospital Envelope

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	1.53	0.75	2.04
2	1.17	0.75	1.57
3	1.12	0.75	1.49
4	1.88	0.75	2.51
5	1.27	0.75	1.69
6	0.72	0.75	0.96
7	0.70	0.75	0.93
8	1.22	0.75	1.62
9	1.49	0.75	1.98
10	1.06	0.75	1.41
11	1.33	0.75	1.78
12	1.25	0.75	1.66
13	1.28	0.75	1.70
14	1.25	0.75	1.66
15	1.44	0.75	1.92
16	1.51	0.75	2.02
Total	1.22	0.75	1.63

Table 41: 30-Year Cost-Effectiveness Summary Per Square Foot – Alterations – Hospital Lighting

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	0.42	0.25	1.66
2	0.39	0.25	1.55
3	0.39	0.25	1.56
4	0.36	0.25	1.42
5	0.38	0.25	1.51
6	0.37	0.25	1.46
7	0.38	0.25	1.51
8	0.37	0.25	1.48
9	0.36	0.25	1.42
10	0.36	0.25	1.42
11	0.37	0.25	1.47
12	0.39	0.25	1.53
13	0.38	0.25	1.51
14	0.36	0.25	1.42
15	0.37	0.25	1.47
16	0.37	0.25	1.48
Total	0.37	0.25	1.48

Table 42: 30-Year Cost-Effectiveness Summary Per Square Foot – Alterations – Hospital Mechanical

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
1	1.61	1.20	1.34
2	1.71	1.20	1.43
3	1.82	1.20	1.52
4	1.78	1.20	1.48
5	1.80	1.20	1.51
6	2.07	1.20	1.73
7	2.11	1.20	1.76
8	2.06	1.20	1.72
9	2.00	1.20	1.67

Climate Zone	Benefits LSC Savings + Other PV Savings (2029 PV\$)	Costs Total Incremental PV Costs (2029 PV\$)	Benefit-to-Cost Ratio
10	1.98	1.20	1.65
11	1.84	1.20	1.54
12	1.82	1.20	1.52
13	1.91	1.20	1.59
14	1.85	1.20	1.55
15	2.10	1.20	1.75
16	1.67	1.20	1.39
Total	1.93	1.20	1.61

5.5 Alterations - Statewide Impacts

5.5.1 Statewide Energy and Energy Cost Savings

See the 2028 CASE Methodology Report for details on how statewide savings are calculated. Appendix C presents the assumptions on the percentage of the total construction forecast that the proposed measure would impact.

For more details on the methodology and context about estimating the current market share rate, as well as statewide energy and energy cost savings, see the 2028 CASE Methodology Report.

The tables below present the first-year statewide energy and LSC savings from alterations (Table 43 through Table 45) by climate zone and impacted systems.

Table 43: Statewide Energy and LSC Impacts – Alterations – Hospital Envelope

Climate Zone	Statewide Alterations Impacted by Proposed Change in 2026 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV\$)
1	50,382	-0.00071	-0.00002	0.00095	0.08137	\$0.08
2	299,430	0.00443	0.00067	0.00373	0.32132	\$0.35
3	1,304,910	-0.00675	0.00083	0.01744	1.48551	\$1.46
4	666,090	0.02865	0.00292	0.01229	1.06472	\$1.25
5	136,485	0.00090	0.00004	0.00198	0.16875	\$0.17
6	762,750	0.00933	0.00009	0.00568	0.47826	\$0.55
7	733,050	0.01312	0.00022	0.00498	0.41766	\$0.51
8	1,100,790	0.05551	0.00232	0.01158	0.98998	\$1.34
9	1,886,760	0.09796	0.00611	0.02408	2.06634	\$2.81
10	1,069,200	0.04171	0.00249	0.00980	0.84463	\$1.13
11	299,970	0.00989	0.00106	0.00371	0.32452	\$0.40
12	1,435,860	0.04026	0.00476	0.01689	1.46958	\$1.79
13	607,230	0.02863	0.00294	0.00645	0.56904	\$0.77
14	237,654	0.00685	0.00063	0.00280	0.24190	\$0.30
15	135,918	0.01089	0.00084	0.00133	0.12007	\$0.20
16	87,318	0.00000	0.00013	0.00146	0.12487	\$0.13
Total	10,813,797	0.34	0.03	0.13	10.77	\$13.24

Table 44: Statewide Energy and LSC Impacts – Alterations – Hospital Lighting

Climate Zone	Statewide Alterations Impacted by Proposed Change in 2026 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV\$)
1	167,940	0.012	0.001	-0.000	-0.013	\$0.07
2	998,100	0.072	0.006	-0.002	-0.095	\$0.39
3	4,349,700	0.319	0.028	-0.009	-0.425	\$1.72
4	2,220,300	0.158	0.014	-0.005	-0.259	\$0.80
5	454,950	0.033	0.003	-0.001	-0.046	\$0.17
6	2,542,500	0.184	0.016	-0.006	-0.263	\$0.94
7	2,443,500	0.179	0.016	-0.005	-0.246	\$0.93
8	3,669,300	0.266	0.023	-0.008	-0.390	\$1.37
9	6,289,200	0.447	0.039	-0.015	-0.732	\$2.25
10	3,564,000	0.255	0.022	-0.008	-0.415	\$1.28
11	999,900	0.071	0.006	-0.002	-0.108	\$0.37
12	4,786,200	0.348	0.030	-0.010	-0.484	\$1.86
13	2,024,100	0.146	0.013	-0.005	-0.213	\$0.77
14	792,180	0.056	0.005	-0.002	-0.087	\$0.28
15	453,060	0.034	0.003	-0.001	-0.054	\$0.17
16	291,060	0.020	0.002	-0.001	-0.026	\$0.11
Total	36,045,990	2.60	0.23	-0.08	-3.86	\$13.47

Table 45: Statewide Energy and LSC Impacts – Alterations – Hospital Mechanical

Climate Zone	Statewide Alterations Impacted by Proposed Change in 2026 (Square Feet)	First-Year Electricity Savings (GWh)	First-Year Peak Electrical Demand Reduction	First-Year Natural Gas Savings (Million Therms)	First-Year Source Energy Savings (Million kBtu)	30-Year Present Valued LSC Savings (Million 2029 PV\$)
1	50,382	0.01	0.00	-0.00017	0.00	\$0.08
2	299,430	0.07	0.01	-0.00087	0.03	\$0.51
3	1,304,910	0.30	0.03	-0.00239	0.28	\$2.37
4	666,090	0.16	0.02	-0.00170	0.10	\$1.18
5	136,485	0.03	0.00	-0.00030	0.03	\$0.25
6	762,750	0.19	0.02	-0.00050	0.26	\$1.58
7	733,050	0.18	0.02	-0.00035	0.26	\$1.54
8	1,100,790	0.27	0.03	-0.00096	0.35	\$2.26
9	1,886,760	0.46	0.05	-0.00207	0.55	\$3.77
10	1,069,200	0.26	0.03	-0.00131	0.30	\$2.12
11	299,970	0.07	0.01	-0.00067	0.06	\$0.55
12	1,435,860	0.34	0.04	-0.00321	0.26	\$2.62
13	607,230	0.15	0.02	-0.00103	0.14	\$1.16
14	237,654	0.06	0.01	-0.00050	0.05	\$0.44
15	135,918	0.03	0.00	-0.00008	0.05	\$0.29
16	87,318	0.02	0.00	-0.00032	0.00	\$0.15
Total	10,813,797	2.61	0.28	-0.01644	2.74	\$20.88

5.5.2 Statewide Greenhouse Gas Emissions Reductions

Table 46 through Table 48 presents the estimated first-year reduction in GHG emissions resulting from the proposed code change. In this initial year, the Statewide CASE Team expects to avoid **xx** metric tons of carbon dioxide equivalent (CO₂e) emissions. These reductions, along with their associated monetary value, were calculated using hourly GHG emissions factors published alongside the LSC hourly factors and source energy hourly factors in the research versions of CBECC, as well as data from the CEC’s 2028 Metrics Report. See the 2028 CASE Methodology Report for additional information.

Table 46: First-Year Statewide GHG Emissions Impacts – Hospital Envelope

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO2e)	Total Reduced GHG Emissions (Metric Ton CO2e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions				
Alterations	30.62	678.47	709.09	87,322
Total	30.62	678.47	709.09	87,322

Table 47: First-Year Statewide GHG Emissions Impacts – Hospital Lighting

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO2e)	Total Reduced GHG Emissions (Metric Ton CO2e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions				
Alterations	234.16	-417.52	-183.36	-22,764
Total	234.16	-417.52	-183.36	-22,764

Table 48: First-Year Statewide GHG Emissions Impacts – Hospital Mechanical

Construction Type	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e)	Reduced GHG Emissions from Natural Gas Savings (Metric Tons CO2e)	Total Reduced GHG Emissions (Metric Ton CO2e)	Total Monetary Value of Reduced GHG Emissions (\$)
New Construction & Additions				
Alterations	235.06	1461.32	1,696.38	212,297
Total	235.06	1461.32	1,696.38	212,297

5.5.3 Statewide Water Use Impacts

The proposed code change will not result in water use impacts.

5.5.4 Statewide Material Impacts

As previously described, healthcare building systems that would be subject to alteration requirements include envelope, lighting, and mechanical system modifications. Some of these modifications will result in more material use while other changes, such as reductions in LPD will result in fewer materials. To derive material impacts for each building system resulting from this proposed code change when moving from a 2019 baseline to 2025 Title 24, Part 6 requirements, the Statewide CASE Team used material impact analyses from recent CASE Reports.

Lighting

As specified in 141.0(b), alterations of indoor lighting systems that affect more than 10 percent of luminaires serving an enclosed space are subject to new LPD requirements. The *2022 Nonresidential Indoor Lighting CASE Report* proposed new LPD values for LEDs from a 2019 code baseline. LPD values have not changed since the 2022 update, so the Statewide CASE Team will use these results to demonstrate material impacts. As noted in that report, reduced LPD values also result in a reduction in material use (Lerner, et al. 2020).

Table 49: First-Year Statewide Impacts on Material Use - Lighting

Material	Impact	Per-Unit Impacts (Pounds per Unit)
Antimony	D	3.3 x 10 ⁻⁴
Barium	D	9.6 x 10 ⁻⁴
Cerium	D	2.0 x 10 ⁻⁵
Chromium	D	3.2 x 10 ⁻⁴
Copper	D	8.3 x 10 ⁻²
Gallium	D	2.8 x 10 ⁻⁴

Material	Impact	Per-Unit Impacts (Pounds per Unit)
Iron	D	3.2×10^{-2}
Lead	D	4.5×10^{-5}
Nickel	D	4.0×10^{-4}
Phosphorus	D	3.4×10^{-4}
Silver	D	4.2×10^{-4}
Zinc	D	1.2×10^{-2}
TOTAL	N/A	N/A

Envelope

While certain modifications to envelope components will trigger energy code requirements in Title 24, not all changes will impact materials. Updates to fenestration will result in improved u-factor requirements, but this will not result in any additional materials given the window materials and installation are the same.

For opaque assemblies, roof alterations are the most common opaque assembly that is altered given the need to replace or recover roofing materials several times over the life of a building. Moving from the roof insulation as specified in Table 141.0-C in the 2019 code to 2025 levels will increase overall insulation materials, which may be foam, mineral wool or other materials. To determine statewide material impacts from increased roof insulation, the Statewide CASE Team:

1. Determined the average weight of a typical 4x8' sheet of insulation meeting 2019 and 2025 insulation levels, as shown in Table 32, averaged across all climate zones.
2. Subtracted the relative material weight from 2019 levels to determine the per unit impact.
3. Multiplied the per unit impact by the total roof area of existing hospitals likely to replace a roof in any given year.

Table 50: First-Year Statewide Impacts on Material Use – Roof Insulation

Material	Impact	Per-Unit Impacts (Pounds per Unit)	First-Year Statewide Impacts (Pounds)	Embodied GHG emissions saved (Metric Tons CO ₂ e)
Insulation	I	0.439	892,259	-990

Aside from increased insulation materials, no additional materials would likely be impacted. An increase in wall or floor insulation is not modeled given a new healthcare exemption would be added.

Fans

Updating FEI is not expected to result in material impacts.

For more information on the Statewide CASE Team’s methodology and assumptions used to calculate embodied GHG emissions, see the 2028 CASE Methodology Report.

5.5.5 Environmental Impacts

This measure reduces energy use and overall emissions from hospitals across California and does not result in any adverse environmental effects. Statewide emissions impacts from this change are summarized in Table 70.

5.5.6 Other Non-Energy Impacts

Healthcare alterations that implement efficiency measures, such as increased levels of insulation, more efficient space conditioning systems and enhanced controls, or lighting retrofits have the potential to improve occupant comfort. In a hospital environment, occupant comfort can dramatically improve the experience for the patient and improve their overall well-being.

5.6 Alterations - Proposed Language Code

5.6.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue underlining (new language) and ~~striketroughs~~ (deletions).

5.6.2 Administrative Code (Title 24, Part 1)

There are no proposed changes to Title 24, Part 1.

5.6.3 Energy Code (Title 24, Part 6)

SECTION 141.0 – ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING NONRESIDENTIAL, AND HOTEL/MOTEL BUILDINGS, TO EXISTING OUTDOOR LIGHTING, AND TO INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS

Additions, alterations, and repairs to existing nonresidential, and hotel/motel buildings, existing outdoor lighting for these occupancies, and internally and externally illuminated signs, shall meet the requirements specified in Sections 100.0 through 110.12, and 120.0 through 130.5 that are applicable to the building project, and either the performance compliance approach (energy budgets) in Section 141.0(a)2 (for additions) or 141.0(b)3 (for alterations), or the prescriptive compliance approach in Section 141.0(a)1 (for additions) or 141.0(b)2 (for alterations), for the Climate Zone in which the building is located. Climate zones are shown in FIGURE 100.1-A.

Covered process requirements for additions, alterations, and repairs to existing nonresidential, and hotel/motel buildings are specified in Section 141.1.

~~[Exception to Section 141.0: Alterations to healthcare facilities are not required to comply with this Section.](#)~~

(b) **Alterations.** Alterations to components of existing nonresidential, hotel/motel, or relocatable public school buildings, including alterations made in conjunction with a change in building occupancy to a nonresidential, high-rise residential, or hotel/motel occupancy shall meet item 1, and either Item 2 or 3 below:

1. **Mandatory Requirements.** Altered components in a nonresidential, or hotel/motel building shall meet the minimum requirements in this Section.

A. **Roof/Ceiling Insulation.** The opaque portions of the roof/ceiling that separate conditioned spaces from unconditioned spaces or ambient air shall meet the requirements of Section 141.0(b)2Bii.

B. **Wall Insulation.** For the altered opaque portion of walls separating conditioned spaces from unconditioned spaces or ambient air shall meet the applicable requirements of Items 1 through 4 below:

1. **Metal Building.** A minimum of R-13 insulation between framing members, or the area-weighted average U-factor of the wall assembly shall not exceed U-0.113.

2. **Metal Framed.** A minimum of R-13 insulation between framing members, or the area-weighted average U-factor of the wall assembly shall not exceed U-0.217.

3. **Wood Framed and Others.** A minimum of R-11 insulation between framing members, or the area-weighted average U-factor of the wall assembly shall not exceed U-0.110.

4. **Spandrel Panels and Glass Curtain Walls.** A minimum of R-4, or the area-weighted average U-factor of the wall assembly shall not exceed U-0.280.

Exception 1 to Section 141.0(b)1B: Light and heavy mass walls.

~~[Exception 2 to Section 141.0\(b\)1B: Alterations to healthcare facilities.](#)~~

C. **Floor Insulation.** For the altered portion of raised floors that separate conditioned spaces from unconditioned spaces or ambient air shall meet the applicable requirements of Items 1 through 3 below:

1. **Raised Framed Floors.** A minimum of R-11 insulation between framing members, or the area-weighted average U-factor of the floor assembly shall not exceed the U-factor of U-0.071.

2. **Raised Mass Floors in Hotel/Motel Guest Rooms.** A minimum of R-6 insulation, or the area-weighted average U-factor of the floor assembly shall not exceed the U-factor of U-0.111.

3. **Raised Mass Floors in Other Occupancies.** No minimum U-factor requirement.

~~[Exception to Section 141.0\(b\)1C: Alterations to healthcare facilities.](#)~~

D. **Fan Energy Index:** New fan systems serving an existing building shall meet the requirements of Section 120.10.

E. **Exterior windows.** Fenestration alterations other than repairs shall meet the following requirements:

1. Vertical fenestration alterations. Where over 150 square feet of the entire building's vertical fenestration is replaced, the maximum U-factor of the replaced units shall not exceed U-0.58.

2. Added vertical fenestration. Where over 50 square feet of vertical fenestration is added, it shall meet the requirements of Section 120.7(d). Where 50 square feet or less of vertical fenestration is added, this requirement shall not apply.

2. **Prescriptive approach.** The altered components of the envelope, or space conditioning, lighting, electrical power distribution and water heating systems, and any newly installed equipment serving the alteration, shall meet the applicable requirements of Sections 110.0 through 110.9, Sections 120.0 through 120.6, and Sections 120.9 through 130.5.

Exception to Section 141.0(b)2: The requirements of Section 120.2(i) shall not apply to alterations of space-conditioning systems or components.

A. Fenestration alterations other than repair and those subject to Section 141.0(b)2 shall meet the requirements below:

- i. Vertical fenestration alterations shall meet the requirements in Table 141.0-A.
- ii. Added vertical fenestration shall meet the requirements of TABLE 140.3-B, C, or D.
- iii. All altered or newly installed skylights shall meet the requirements of TABLE 140.3-B, C or D.

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[Exception 4 to Section 141.0\(b\)2A: Alterations to healthcare facilities.](#)

C. **New or Replacement Space-Conditioning Systems or Components** other than new or replacement space-conditioning system ducts shall meet the requirements of Section 140.4 applicable to the systems or components being altered and meet the following:

i. Additional Fan Power Allowances are available when determining the Fan Power Budget (Fan kWbudget) as specified in Table 141.0-D. These values can be added to the Fan Power Allowance values in Tables 140.4-A and Table 140.4-B.

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ii. New or replacement single zone packaged rooftop systems with direct expansion cooling with rated cooling capacity less than 65,000 Btu/hr shall meet the applicable requirements specified in Table 141.

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Exception 7 to Section 141.0(b)2C: Alterations to healthcare facilities.

D. Altered Duct Systems. New or replacement space-conditioning system ducts installed to serve an existing building shall meet the requirements of Section 120.4(a) through (f) and meet i, ii, or iii below:

- i. Entirely new or complete replacement duct systems installed as part of an alteration shall be leakage tested in accordance with Section 120.4(g). This applies to replacement duct systems installed as part of an alteration that are constructed of at least 75 percent new duct material. Up to 25 percent of that alteration may consist of reused parts from the building's existing duct system, including registers, grilles, boots, air handlers, coils, plenums, and ducts, if the reused parts are accessible and can be sealed to prevent leakage.
- ii. If the new ducts are an extension of an existing duct system and the combined new and existing duct system meets the criteria in Subsections 1, 2, 3, and 4 below, the duct system shall be sealed to a leakage rate not to exceed 15 percent of the nominal air handler airflow rate as confirmed through acceptance testing, in accordance with the applicable procedures in Reference Nonresidential Appendix NA7.5.3:
 1. The duct system does not serve a healthcare facility;
 2. The duct system provides conditioned air to an occupiable space for a constant volume, single zone, space-conditioning system;
 3. The space conditioning system serves less than 5,000 square feet of conditioned floor area; and
 4. The combined surface area of the ducts located outdoors or in unconditioned space is more than 25 percent of the total surface area of the entire duct system.

Exception 1 to Section 141.0(b)2Dii: When it is not possible to achieve the duct leakage criterion in Section 141.0(b)2Dii, then all accessible leaks shall be sealed and verified through a visual inspection and a smoke test performed by a certified mechanical acceptance test technician utilizing the methods specified in Reference Nonresidential Appendix NA7.5.3.

Exception 2 to Section 141.0(b)2Dii: Duct Sealing. Existing duct systems that are extended, which are constructed, insulated or sealed with asbestos are not required to comply with subsection 141.0(b)2Dii.

iii. If new ducts installed as part of an alteration are not required to comply with leakage testing specified by section 141.0(b)2Di or 141.0(b)2Dii, then the new ducts shall meet the duct leakage testing requirements of CMC Section 603.9.2.

Exception 1 to Section 141.0(b)2D: Alterations to healthcare facilities.

E. Altered Space-Conditioning Systems. When a space-conditioning system is altered by the installation or replacement of space-conditioning system equipment (including

replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, or cooling or heating coil:

- i. For all altered units where the existing thermostat does not comply with the requirements for demand responsive controls specified in Section 110.12, the existing thermostat shall be replaced with a demand responsive thermostat that complies with Section 110.12. All newly installed space-conditioning systems requiring a thermostat shall be equipped with a demand responsive thermostat that complies with Section 110.12; and
- ii. The duct system that is connected to the new or replaced space-conditioning system equipment shall be sealed in accordance with Section 141.0(b)2Dii.

Exception 1 to Section 141.0(b)2Eii: Duct Sealing. Buildings altered so that the duct system no longer meets the criteria of Section 141.0(b)2Dii.

Exception 2 to Section 141.0(b)2Eii: Duct Sealing. Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in the Reference Nonresidential Appendix NA2.

Exception 3 to Section 141.0(b)2Eii: Duct Sealing. Existing duct systems constructed, insulated, or sealed with asbestos are not required to comply with Subsection 141.0(b)2Eii.

[Exception 1 to Section 141.0\(b\)2E: Alterations to healthcare facilities.](#)

H. New internally and externally illuminated signs shall meet the requirements of Sections 110.9, 130.3 and 140.8.

[Exception to Section 141.0\(b\)2H: Alterations to healthcare facilities.](#)

L. Alterations to existing outdoor lighting systems in a lighting application listed in TABLE 140.7-A or 140.7-B shall meet the applicable requirements of Sections 130.0, 130.2(b), and 130.4, and:

- i. In alterations that increase the connected lighting load, the added or altered luminaires shall meet the applicable requirements of Section 130.2(c) and the requirements of Section 140.7 for general hardscape lighting or for the specific lighting applications containing the alterations; and
- ii. In alterations that do not increase the connected lighting load, where 10 percent or more of the existing luminaires are replaced in a general hardscape or a specific lighting application, the alterations shall meet the following requirements:
 - a. In parking lots and outdoor sales lots where the bottom of the luminaire is mounted 24 feet or less above the ground, the replacement luminaires shall comply with Section 130.2(c)1 AND Section 130.2(c)3; and

b. For parking lots and outdoor sales lots where the bottom of the luminaire is mounted greater than 24 feet above the ground and for all other lighting applications, the replacement luminaires shall comply with Section 130.2(c)1 AND EITHER comply with Section 130.2(c)2 or be controlled by lighting control systems, including motion sensors, that automatically reduce lighting power by at least 40 percent in response to the area being vacated of occupants.

Exception to Section 141.0(b)2Lii: Alterations where less than 5 existing luminaires are replaced.

iii. In alterations that do not increase the connected lighting load, where 50 percent or more of the existing luminaires are replaced in general hardscape or a specific application, the replacement luminaires shall meet the requirements of subsection ii above and the requirements of Section 140.7 for general hardscape lighting or specific lighting applications containing the alterations.

Exception 1 to Section 141.0(b)2Liii: Alterations where the replacement luminaires have at least 40 percent lower power consumption compared to the original luminaires are not required to comply with the lighting power allowances of Section 140.7.

Exception 2 to Section 141.0(b)2Liii: Alterations where less than 5 existing luminaires are replaced.

Exception to Section 141.0(b)2L: Acceptance testing requirements of Section 130.4 are not required for alterations where controls are added to 20 or fewer luminaires.

[Exception to Section 141.0\(b\)2L: Alterations to healthcare facilities.](#)

M. Alterations to existing internally and externally illuminated signs that increase the connected lighting load, replace and rewire more than 50 percent of the ballasts, or relocate the sign to a different location on the same site or on a different site shall meet the requirements of Section 140.8.

Exception to Section 141.0(b)2M: Replacement of parts of an existing sign, including replacing lamps, the sign face or ballasts, that do not require rewiring or that are done at a time other than when the sign is relocated, is not an alteration subject to the requirements of Section 141.0(b)2M.

[Exception to Section 141.0\(b\)2M: Alterations to healthcare facilities.](#)

P. **Electrical Power Distribution Systems.** Alterations to electrical power distribution systems shall meet the applicable requirements of Section 130.5 as follows:

i. **Service Electrical Metering.** New or replacement electrical service equipment shall meet the requirements of Section 130.5(a) applicable to the electrical power distribution system altered.

ii. **Separation Of Electrical Circuits for Electrical Energy Monitoring.** For entirely new or complete replacement of electrical power distribution systems, the entire system shall meet the applicable requirements of Section 130.5(b).

iii. **Voltage Drop.** Alterations of feeders and branch circuits where the alteration includes addition, modification, or replacement of both feeders and branch circuits, the altered circuits shall meet the requirements of Section 130.5(c).

Exception to Section 141.0(b)2Piii: Voltage drop permitted by California Electrical Code Sections 647.4, 695.6 and 695.7.

iv. **Circuit Controls for 120-Volt Receptacles and Controlled Receptacles.** For entirely new or complete replacement of electrical power distribution systems, the entire system shall meet the applicable requirements of Sections 130.5(d) and 130.5(e).

[Exception to Section 141.0\(b\)2P: Alterations to healthcare facilities.](#)

5.6.4 Reference Appendices

There are no proposed changes to the Reference Appendices.

5.6.5 Compliance Manuals

The Statewide CASE Team will provide CEC with recommended revisions to compliance manuals after the 45-Day Language is published.

5.6.6 ACM Reference Manual

In the ACM key changes section, note that alterations would now comply with the energy code. There are no other proposed changes to the ACM Reference Manual.

5.6.7 Compliance Forms

As discussed in Section, the NRCC-ENV-E and NRCI- ENV-E Envelope Component Approach, NRCC-LTI-E and NRCI-LTI-E Indoor Lighting, NRCC-MCH-E and NRCI-MCH-E Mechanical Systems and NRCC-CXR-E and NRCI-CXR-E Nonresidential Building Commissioning compliance forms would be updated to reflect the proposed change. The Statewide CASE Team can support the CEC in implementing these updates if the proposed change is adopted.

6. Bibliography

- ASHRAE. 2022. *ANSI/ASHRAE 90.4-2022, Energy Standard for Data Centers*. National Standard, Peachtree City, GA: ASHRAE.
- ASHRAE. 2022. *ANSI/ASHRAE/IES 90.1-2022, Energy Standard for Buildings Except Low-Rise*. National Standard, Peachtree Corners: ASHRAE.
- California Air Resources Board. 2022. "2022 Scoping Plan for Achieving." Sacramento, CA.
- California Building Standards Commission. 2025. "2025 California Building Code, California Code of Regulations, Title 24, Volume 1 of Part 2." International Code Council.
- . 2025. *2025 Title 24 California Code Changes*. Accessed November 26, 2025. <https://www.dgs.ca.gov/BSC/Resources/2025-Title-24-California-Code-Changes>.
- California Energy Commission. 2022. "Final Staff Workshop on Energy Accounting for the 2025 Building Energy Efficiency Standards." *California Energy Commission*. Prepared for the California Energy Commission. November 10. <https://www.energy.ca.gov/event/workshop/2022-11/final-staff-workshop-energy-accounting-2025-building-energy-efficiency>.
- CEC. 2025. *Building Energy Benchmarking Program*. December. Accessed December 23, 2025. <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-benchmarking-program>.
- Commission, California Building Standards. 2025. *2025 California Mechanical Code*. Regulation, IAPMO.
- Donnellan, Douglas, Andy Lawrence, Daniel Bizo, Peter Judge, John O'Brien, and et. al. 2024. *Uptime Institute Global Data Center Survey 2024*. Uptime Institute.
- Federal Reserve Economic Data (FRED). n.d. *Data series relied on: Net Domestic Private Investment, Corporate Profits After Taxes*. Accessed September 18, 2022. <https://fred.stlouisfed.org> .
- HCAI. 2024. *CODE APPLICATION NOTICE - Enforceable Codes*. Code Application Notice, Sacramento: HCAI.
- HCAI, Office of Statewide Hospital Planning and Development. 2024. "Design Guide for Working on Projects Under OSHPD Jurisdiction." Design Guide, Sacramento, CA.
- International Code Council. 2024. *2024 International Energy Conservation Code (IECC)*. International Standard, District of Columbia: International Code Council.
- Lerner, Marissa, Jasmine Shepard, Christopher Uraire, and Yao-Jung, et.al Wen. 2020. *Nonresidential Indoor Lighting*. 2022 California Energy Code - CASE Report, Codes and Standards Enhancement (CASE) Initiative.

OEHHA. 2022. *SB 535 Disadvantaged Communities*. Accessed 2025.

<https://oehha.ca.gov/calenviroscreen/sb535>.

SBW Consulting, Inc. 2022. *Water-Energy Calculator 2.0 Project Report*. Project Report, San Francisco: California Public Utility Commission.

Shehabi, Arman, Alex Newkirk, Sarah Smith, Alex Hubbard, Lei Nuo, Md Abu Bakar Siddik, and et. al. 2024. *2024 United States Data Center Energy Usage Report*. Lawrence Berkeley National Laboratory.

State of California. n.d. *Employment Development Department, Quarterly Census of Employment and Wages (data search tool)*. Accessed September 1, 2022.

<https://www.labormarketinfo.edd.ca.gov/cgi/dataanalysis/areaselection.asp?tablename=industry>.

Appendix A: Assumptions for Cost-effectiveness Analysis

Shut-off and Reset Controls

Key Assumptions for Energy Savings Analysis

- The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and energy cost impacts.
- To model the energy savings for reset controls, the Statewide CASE Team used and modified the default CBECC hospital prototype to represent hospital characteristics and energy use profile more accurately.
- While the proposed change applies to all nonresidential healthcare facilities, including skilled nursing facilities, hospitals were modeled to represent a reasonable proxy for per unit savings across other healthcare facilities. A prototype is being developed to represent skilled nursing facilities, and an analysis of that building type reflecting impacts of proposed measures will be included in the final report.

Energy Savings Methodology per Prototypical Building

The 2028 CASE Methodology Report provides details on estimating energy savings per prototypical building and unit. The CEC directed the Statewide CASE Team to model energy impacts using specific prototypical building models that represent typical building geometries for different building types. Table 51 presents the prototype buildings used in the analysis.

Table 51: Prototype Buildings Used for Energy, Demand, Cost, and Environmental Impacts Analysis

Prototype Name	Number of Stories	Floor Area (Square Feet)	Description
Hospital	5	241,501	The prototype contains Title 24, Part 6, minimally compliant envelope features and lighting. For HVAC systems, the AIA guidelines recommended using VAV systems wherever possible. 8 Patient Room zones, 8 Office zones, 1 Kitchen zone, 7 HspSurgOutptLab zones, 2 Dining zones.

There are no existing Title 24, Part 6 requirements that address the building system in question. The Statewide CASE Team modified the Standard Design to calculate energy impacts of the most common current or industry-standard practices. The baseline design assumed the following:

- System type: VAV HVAC systems that operate on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours.
- Control features: No occupancy sensing; no heating-setback or cooling-setup logic

The Proposed Design was identical to the Standard Design in all ways except for the revisions that represent the proposed changes to the code. Table 52 presents the parameters modified and the values used in the Standard Design and Proposed Design. Specifically, the proposed conditions assume:

- Each space equipped with an occupancy sensor communicating to the BAS
- Occupied/standby mode transitions within five minutes of vacancy.
- Automatic heating-setback/cooling-setup sequences per Title 24 §120.2(e).

Table 52: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	AirTerminal:SingleDuct:VAV:Reheat	Zone Minimum Air Flow Input Method	FixedFlowRate	Constant
Hospital	All	AirTerminal:SingleDuct:VAV:Reheat	Fixed Minimum Air Flow Rate	Defined (zone-specific)	Blank
Hospital	All	AirTerminal:SingleDuct:VAV:Reheat	Minimum Air Flow Fraction Schedule Name	None	PATROOM_TURNDOWN_MULT_025
Hospital	All	Schedule:Compact	Minimum Air Flow Fraction Schedule	None	PATROOM_TURNDOWN_MULT_025

The energy impacts of the proposed code change do vary by climate zone. The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and LSC impacts.

Detailed Modeling Implementation – Hospital Prototype

The proposed measure was implemented in the hospital prototype through modifications to terminal unit control logic for selected non-ICU patient-room zones. The baseline hospital

prototype models ventilation airflow using a fixed minimum airflow rate at the VAV terminal unit level. In the proposed design, this logic was modified to allow airflow turndown using a minimum airflow fraction schedule.

The following patient-room zones were modified in the hospital prototype:

Table 53: Patient Room Zones Modified in Hospital Prototype

Zone Name	Multiplier (Rooms Represented)	Floor Area (ft ²)
PATROOM1_MULT10_FLR_3	10	2,250
PATROOM2_FLR_3	1	375
PATROOM2_FLR_4	1	375
PATROOM3_MULT10_FLR_3	10	2,175
PATROOM4_FLR_3	1	375
PATROOM4_FLR_4	1	375
PATROOM6_FLR_3	1	300
PATROOM6_FLR_4	1	300
PATROOM8_FLR_3	1	300
PATROOM8_FLR_4	1	300
Total	28	7,125

These zones correspond to patient-room spaces explicitly modeled in the prototype and represent a subset of all non-ICU patient rooms in the building.

Table 54: Prototype Coverage of Modified Zones

Metric	Value
Total conditioned floor area (prototype)	241,524 ft ²
Total patient-room floor area	20,402 ft ²
Number of patient rooms in prototype	88
Number of modified patient rooms	28
Percent of patient rooms modified	31.8%
Percent of patient floor area modified	35.0%
Percent of total hospital CFA impacted	2.95%

Room counts reflect zone multipliers defined in the hospital prototype model. The modified zones represent approximately 2.95% of the total hospital conditioned floor area and 35.0% of total patient-room floor area within the hospital prototype. The modeling approach represents a conservative implementation focused on explicitly modeled non-ICU patient-room zones in the prototype.

For these zones, the following terminal unit control changes were implemented.

Table 55: Terminal Unit Control Logic Modifications

Field	Baseline	Proposed
Zone Minimum Air Flow Input Method	FixedFlowRate	Constant
Fixed Minimum Air Flow Rate	Defined (zone-specific)	Blank
Constant Minimum Air Flow Fraction	0.3	0.3
Minimum Air Flow Fraction Schedule	None	PATROOM_TURNDOWN_MULT_025

The PATROOM_TURNDOWN_MULT_025 schedule maintains 100 percent airflow during occupied periods and reduces airflow to 25 percent during unoccupied periods.

This preliminary evaluation represents a conservative implementation limited to explicitly modeled non-ICU patient-room zones within the prototype. Final statewide savings will reflect the ultimate applicability defined in adopted Section 120.2(e) language.

Airflow turndown in modified patient-room zones was implemented through a minimum airflow fraction schedule applied to the terminal unit.

The schedule PATROOM_TURNDOWN_MULT_025 was created using a Schedule:Compact object and applied to the *Minimum Air Flow Fraction Schedule Name* field of the AirTerminal:SingleDuct:VAV:Reheat object.

Table 56: Patient Room Airflow Turndown Schedule (PATROOM_TURNDOWN_MULT_025)

Time Period	Airflow Fraction
00:00 – 06:00	0.25 (unoccupied)
06:00 – 12:00	1.00 (occupied)
12:00 – 18:00	0.25 (unoccupied)
18:00 – 24:00	1.00 (occupied)

This schedule represents 16 hours of occupied operation and 8 hours of reduced airflow operation per day, consistent with a simplified occupancy-based control sequence intended to approximate unoccupied conditions.

During unoccupied periods, terminal airflow is reduced to 25% of the minimum airflow rate, consistent with the airflow turndown allowance described in Section 407.7 of the California Mechanical Code. ICU patient rooms (IC_PATROOM*) present in the prototype were not modified in this preliminary implementation due to differing ventilation and pressurization requirements.

Space-conditioning zone controls

Key Assumptions for Energy Savings Analysis

- The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and energy cost impacts.
- To model the energy savings for space-conditioning zone controls, the Statewide CASE Team used and modified the default CBECC hospital prototype to represent hospital characteristics and energy use profile more accurately.
- While the proposed change applies to all nonresidential healthcare facilities, including skilled nursing facilities, hospitals were modeled to represent a reasonable proxy for per unit savings across other healthcare facilities.

Energy Savings Methodology per Prototypical Building

The 2028 CASE Methodology Report provides details on estimating energy savings per prototypical building and unit. The CEC directed the Statewide CASE Team to model energy impacts using specific prototypical building models that represent typical building geometries for different building types. Table 57 presents the prototype buildings used in the analysis.

Table 57: Prototype Buildings Used for Energy, Demand, Cost, and Environmental Impacts Analysis

Prototype Name	Number of Stories	Floor Area (Square Feet)	Description
Hospital	5	241,501	The prototype contains Title 24, Part 6, minimally compliant envelope features and lighting. For HVAC systems, the AIA guidelines recommended using VAV systems wherever possible. 8 Patient Room zones, 8 Office zones, 1 Kitchen zone, 7 HspSurgOutptLab zones, 2 Dining zones.

There are no existing Title 24, Part 6 requirements that cover the building system in question. The Statewide CASE Team modified the Standard Design to calculate the energy impacts of the most common current or industry-standard practices. The baseline design assumed the following:

- System type: VAV HVAC systems that operate on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours
- Control features: constant-flow fan operation at full or fixed speed
- Sequence of operation: HVAC zones remain “occupied” 8760 hours per year regardless of use

The Proposed Design was identical to the Standard Design in all ways except for the revisions that represent the proposed changes to the code. Table 58 presents the parameters modified and the values used in the Standard Design and Proposed Design. Specifically, the proposed conditions assume:

- Ventilation/fans: Fans and outdoor air modeled to allow for unoccupied turndown

Table 58: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	Fan:VariableVolume,	Multiple including Fan Type	Multiple Parameters related to Constant Volume	Parameters related to VariableVolume
Hospital	All	Air Loop	AirTerminal:SingleDuct	Multiple Parameters related to ConstantVolume:Reheat	Multiple Parameters related to VAV:Reheat

The energy impacts of the proposed code change do vary by climate zone. Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and LSC impacts.

Fan Control

Key Assumptions for Energy Savings Analysis

- The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and energy cost impacts.
- To model the energy savings for fan control, the Statewide CASE Team used and modified the default CBECC hospital prototype to represent hospital characteristics and energy use profile more accurately.
- While the proposed change applies to all nonresidential healthcare facilities, including skilled nursing facilities, hospitals were modeled to represent a reasonable proxy for per unit savings across other healthcare facilities.

Energy Savings Methodology per Prototypical Building

The 2028 CASE Methodology Report provides details on estimating energy savings per prototypical building and unit. The CEC directed the Statewide CASE Team to model energy impacts using specific prototypical building models that represent typical building geometries for different building types. Table 59 presents the prototype buildings used in the analysis.

Table 59: Prototype Buildings Used for Energy, Demand, Cost, and Environmental Impacts Analysis

Prototype Name	Number of Stories	Floor Area (Square Feet)	Description
Hospital	5	241,501	The prototype contains Title 24, Part 6, minimally compliant envelope features and lighting. For HVAC systems, the AIA guidelines recommended using VAV systems wherever possible. 8 Patient Room zones, 8 Office zones, 1 Kitchen zone, 7 HspSurgOutptLab zones, 2 Dining zones.

There are no existing Title 24, Part 6 requirements that address the building system in question. The Statewide CASE Team modified the Standard Design to calculate energy impacts based on the most common current or industry-standard practices. The baseline design assumed the following:

- System type: VAV HVAC systems operating on a continuous schedule, without automatic shut-off or setback functionality during unoccupied hours.
- Control features: constant-flow fan operation at full or fixed speed; no coordination between zone demand and fan power
- Sequence of operation: HVAC zones remain “occupied” 8760 hours per year regardless of use

The Proposed Design was identical to the Standard Design in all ways except for the revisions that represent the proposed changes to the code. Table 60 presents the parameters modified and the values used in the Standard Design and Proposed Design. Specifically, the proposed conditions assume:

- Ventilation/fans: Fan-power reduction consistent with §140.4(m) (e.g., proportional control).

Table 60: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	Fan:VariableVolume	VAV1 and VAV2	Varies based for each system	Varies based for each system

The energy impacts of the proposed code change do vary by climate zone. The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and LSC impacts.

Alterations

Key Assumptions for Energy Savings Analysis

- The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and energy cost impacts.
- To model the energy savings for fan control, the Statewide CASE Team used and modified the default CBECC hospital prototype to represent hospital characteristics and energy use profile more accurately.
- While the proposed change applies to all nonresidential healthcare facilities, including skilled nursing facilities, hospitals were modeled to represent a reasonable proxy for per unit savings across other healthcare facilities.

Energy Savings Methodology per Prototypical Building

The 2028 CASE Methodology Report provides details on estimating energy savings per prototypical building and unit. The CEC directed the Statewide CASE Team to model energy impacts using specific prototypical building models that represent typical building geometries for different building types. Table 61 presents the prototype buildings used in the analysis.

Table 61: Prototype Buildings Used for Energy, Demand, Cost, and Environmental Impacts Analysis

Prototype Name	Number of Stories	Floor Area (Square Feet)	Description
Hospital	5	241,501	The prototype contains Title 24, Part 6, minimally compliant envelope features and lighting. For HVAC systems, the AIA guidelines recommended using VAV systems wherever possible. 8 Patient Room zones, 8 Office zones, 1 Kitchen zone, 7 HspSurgOutputLab zones, 2 Dining zones.

There are no existing Title 24, Part 6 requirements that address alteration requirements in nonresidential healthcare facilities. The Statewide CASE Team modified the Standard Design to calculate energy impacts of the most common current or industry-standard practices. The baseline design assumed the following:

- Existing healthcare facilities across California are constructed to a wide array of design standards and practices, largely based on building vintage. To establish a single baseline and ensure savings estimates remain conservative, the Statewide CASE Team is using a 2019 Title 24, Part 6 baseline. This is when healthcare facilities were initially subject to the California Energy Code.

The Proposed Design was identical to the Standard Design in all ways except for the revisions that represent the proposed changes to the code. Table 62 through Table 64

presents the parameters modified and the values used in the Standard Design and Proposed Design. Specifically, the proposed conditions assume:

- A minimally compliant hospital built to the 2025 Title 24, Part 6 standard.

Table 62: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change – Hospital Envelope

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	Windowmaterial:Simple GlazingSystem	Window U-factor	0.86	0.58
Hospital	All	Construction: FlatNonresWoodFramingAndOtherRoof	Roof Insulation	R8 (CZ1,3-9) & R14 (CZ2,10-16)	R17 (CZ6-8) & R-23 (all other CZ)

Table 63: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change – Hospital Lighting

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	Lights	Watts/Floor Area	Varies based on Space type (T24 2019 Section 140.6)	Varies based on Space type (T24 2025 Section 140.6)

Table 64: Modifications Made to Standard Design in Each Prototype to Simulate Proposed Code Change – Hospital Mechanical

Prototype ID	Climate Zone	Objects Modified	Parameter Name	Standard Design Parameter Value	Proposed Design Parameter Value
Hospital	All	Fan:VariableVolume	Pressure Rise {Pa}	Multiple varies based on Fan name and Climate Zone	Multiple varies based on Fan name and Climate Zone

The energy impacts of the proposed code change do vary by climate zone. The Statewide CASE Team simulated the energy impacts in every climate zone and applied the climate-zone-specific LSC hourly factors when calculating energy and LSC impacts.

Appendix B: Purpose and Necessity of Proposed Code Changes

Introduction

The sections below provide the purpose and necessity of proposed changes to Title 24, Part 1; Title 24, Part 6; and the reference appendices. This section intends to provide the CEC with the information needed for the Initial Statement of Reasons.

See Section 2.6 of this report for marked-up code language.

Shut-off and Reset Controls

Purpose and Necessity of Changes to Title 24, Part 6

Section: Section 120.2(e)

Purpose: The purpose of this change is to modify the current exception for shut-off and reset controls for nonresidential healthcare facilities to only be applicable to subsection 1 and establish a more targeted approach through a new subsection to require system level airflow turndown in spaces that allow it per California Mechanical Code Table 4-A.

Necessity: This change is necessary to align minimum energy code requirements for nonresidential healthcare facilities with standard design and construction practice in California. Direct Digital Control (DDC) and Building Automation Systems (BAS) are standard in nearly all new California healthcare projects so this code change will ensure controls are programmed in spaces where it's safe to do so and healthcare operators experience operational energy and cost savings. Additionally, this change demonstrates that other healthcare exceptions in Title 24, Part 6 should be evaluated and potentially modified.

Purpose and Necessity of Changes to the Reference Appendices

There are no proposed changes to reference appendices.

Space-conditioning zone controls

Purpose and Necessity of Changes to Title 24, Part 1

Section:

Purpose:

Necessity:

Purpose and Necessity of Changes to Title 24, Part 6

Section: Section 140.4(d)

Purpose: The purpose of this change is to add a new healthcare specific subsection that requires occupied and unoccupied zones or mixed zones served by VAV systems to reduce the volume of air to the zone shall to the minimum ventilation rates defined by Table 4-A of the CMC or the referenced design standard applicable to the space, while accounting for ventilation, temperature, humidity and pressure requirements. This will reduce the amount of air that is reheated, re-cooled, or simultaneously heated or cooled, while ensuring minimum level of airflow still serves the space.

Necessity: This change is necessary to align minimum energy code requirements for nonresidential healthcare facilities with standard design and construction practice in California. Direct Digital Control (DDC) and Building Automation Systems (BAS) are standard in nearly all new California healthcare projects so this code change will ensure controls are programmed in spaces where it's safe to do so and healthcare operators experience operational energy and cost savings. Additionally, this change demonstrates that other healthcare exceptions in Title 24, Part 6 should be evaluated and potentially modified.

Purpose and Necessity of Changes to the Reference Appendices

There are no proposed changes to reference appendices.

Fan Control

Purpose and Necessity of Changes to Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

Purpose and Necessity of Changes to Title 24, Part 6

Section: Section 140.4 (m)

Purpose: The purpose of this change is to require that nonresidential healthcare spaces be equipped with VAV capable of modulating fan speed as a function of load.

Necessity: This change is necessary to align minimum energy code requirements for nonresidential healthcare facilities with standard design and construction practice in California. VAV is standard in new California healthcare projects so this code change will ensure Title 24, Part 6 reflects this as a minimum standard for healthcare facilities. Additionally, this change demonstrates that other healthcare exceptions in Title 24, Part 6 should be evaluated and potentially modified.

Purpose and Necessity of Changes to the Reference Appendices

There are no proposed changes to reference appendices.

Alterations

Purpose and Necessity of Changes to Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

Purpose and Necessity of Changes to Title 24, Part 6

Section: Section 141.0

Purpose: The purpose of this change is to eliminate the blanket exception for nonresidential healthcare facilities undergoing building alterations and incorporate more targeted exceptions for specific altered building systems. Altered building systems will be subject to the alteration requirements as specified in 141.0(b), unless a new healthcare exception was established or an existing exception already exists.

Necessity: This change is necessary to align alteration requirements across healthcare and other nonresidential buildings in California, as well as healthcare facilities in other states. With frequent modifications to healthcare facilities, and their 24/7 operation, the proposed code change will result in significant energy and cost savings that persist year over year.

Purpose and Necessity of Changes to the Reference Appendices

There are no proposed changes to reference appendices.

Appendix C: Assumptions for Statewide Savings Estimates

The Statewide CASE Team is anticipating updated construction forecasts to be released by the California Energy Commission in February 2026. This will impact statewide energy savings but not the cost effectiveness of the proposal. The final CASE Report will present the updated savings based on the new forecasts.

Shut-off and Reset Controls

The Statewide CASE Team estimated statewide impacts for the first year by multiplying per-unit savings estimates by statewide construction forecasts for healthcare facilities provided by the CEC. The healthcare facilities CEC construction forecast includes new construction estimates for hospitals as well as skilled nursing facilities, or OSHPD 1 and OSHPD 2. As previously mentioned, the Statewide CASE Team used the hospital prototype to determine the potential per unit impact of the proposed code change and has extrapolated those savings across CEC healthcare construction projections. In the final report, the Statewide CASE Team will separately assess savings impacts on skilled nursing facilities by developing a separate prototype, but for the draft report, savings derived from modeling the hospital prototype is used as a proxy. The 2028 CASE Methodology Report includes additional information about the methodology and assumptions used to calculate statewide energy impacts.

The statewide savings and cost estimates take the current market share rate into account. The Statewide CASE Team estimated that the current market share rate for the proposed code change is 50 percent for the new construction market. The current market share rate is estimated based on the Statewide CASE Team's professional judgment and data from the evaluation of past Title 24 code cycles.

Table 65 presents the projected nonresidential new construction that the proposed code change will impact in 2026. The Statewide CASE Team developed these estimates using the methods described in this section.

The Statewide CASE Team estimated the percentage of newly constructed floorspace that the proposed code change would impact. Table 66 shows the assumed percentage of affected floorspace by building type. If a proposed code change does not apply to a specific building type, the Statewide CASE Team assumes that zero percent of the floorspace would be impacted. If the assumed percentage is non-zero, but less than 100 percent, the proposal is expected to affect some—but not all—buildings. Table 67 represents the assumed percentage of affected floorspace by climate zone.

The Statewide CASE Team adjusted the overall floor space impact of this measure based on the percentage of spaces that are impacted. To account for spaces that are exempted based

on turndown specifications as outlined in Table 4-A, the Statewide CASE Team assumed 70 percent of hospital space is affected.

Table 65: Estimated New Nonresidential Construction Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.01	0.08	0.41	0.21	0.04	0.16	0.27	0.21	0.38	0.39	0.07	0.40	0.13	0.07	0.06	0.02	2.92
TOTAL	0.0	0.1	0.4	0.2	0.0	0.2	0.3	0.2	0.4	0.4	0.1	0.4	0.1	0.1	0.1	0.0	2.9

Table 66: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Hospital	100%	0%

Table 67: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	3%	0%
2	2%	0%
3	2%	0%
4	2%	0%
5	2%	0%
6	1%	0%
7	3%	0%
8	1%	0%
9	1%	0%
10	3%	0%
11	2%	0%
12	2%	0%
13	2%	0%
14	2%	0%
15	3%	0%
16	2%	0%

Space-conditioning zone controls

The Statewide CASE Team estimated statewide impacts for the first year by multiplying per-unit savings estimates by statewide construction forecasts for healthcare facilities provided by the CEC. The healthcare facilities CEC construction forecast includes new construction estimates for hospitals as well as skilled nursing facilities, or OSHPD 1 and OSHPD 2. As previously mentioned, the Statewide CASE Team used the hospital prototype to determine the potential per unit impact of the proposed code change and has extrapolated those savings across CEC healthcare construction projections. In the final report, the Statewide CASE Team will separately assess savings impacts on skilled nursing facilities by developing

a separate prototype, but for the draft report, savings derived from modeling the hospital prototype is used as a proxy. The 2028 CASE Methodology Report includes additional information about the methodology and assumptions used to calculate statewide energy impacts.

The statewide savings and cost estimates take the current market share rate into account. The Statewide CASE Team estimated that the current market share rate for the proposed code change is 35 percent for the new construction market. The current market share rate is estimated based on the Statewide CASE Team’s professional judgment and data from the evaluation of past Title 24 code cycles.

Table 68 presents the projected nonresidential new construction that the proposed code change will impact in 2026. The Statewide CASE Team developed these estimates using the methods described in this section.

The Statewide CASE Team estimated the percentage of newly constructed floorspace that the proposed code change would impact. Table 69 shows the assumed percentage of affected floorspace by building type. If a proposed code change does not apply to a specific building type, the Statewide CASE Team assumes that zero percent of the floorspace would be impacted. If the assumed percentage is non-zero, but less than 100 percent, the proposal is expected to affect some—but not all—buildings. Table 70 represents the assumed percentage of affected floorspace by climate zone.

The Statewide CASE Team adjusted the overall floor space impact of this measure based on the percentage of spaces that are impacted. To account for spaces that are exempted based on turndown specifications as outlined in Table 4-A, the Statewide CASE Team assumed 70 percent of hospital space is affected.

Table 68: Estimated New Nonresidential Construction Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.02	0.11	0.53	0.27	0.05	0.21	0.35	0.28	0.50	0.51	0.09	0.52	0.17	0.09	0.07	0.03	3.79
TOTAL	0.0	0.1	0.5	0.3	0.1	0.2	0.3	0.3	0.5	0.5	0.1	0.5	0.2	0.1	0.1	0.0	3.8

Table 69: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Hospital	65%	0%

Table 70: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	3%	0%
2	3%	0%
3	3%	0%
4	2%	0%
5	3%	0%
6	1%	0%
7	4%	0%
8	1%	0%
9	2%	0%
10	4%	0%
11	3%	0%
12	3%	0%
13	3%	0%
14	3%	0%
15	4%	0%
16	3%	0%

Fan Control

The Statewide CASE Team estimated statewide impacts for the first year by multiplying per-unit savings estimates by statewide construction forecasts for healthcare facilities provided by the CEC. The healthcare facilities CEC construction forecast includes new construction estimates for hospitals as well as skilled nursing facilities, or OSHPD 1 and OSHPD 2. As previously mentioned, the Statewide CASE Team used the hospital prototype to determine the potential per unit impact of the proposed code change and has extrapolated those savings across CEC healthcare construction projections. In the final report, the Statewide CASE Team will separately assess savings impacts on skilled nursing facilities by developing a separate prototype, but for the draft report, savings derived from modeling the hospital prototype is used as a proxy. The 2028 CASE Methodology Report includes additional information about the methodology and assumptions used to calculate statewide energy impacts.

The statewide savings and cost estimates take the current market share rate into account. The Statewide CASE Team estimated that the current market share rate for the proposed code change is 70 percent for the new construction market. The current market share rate is estimated based on the Statewide CASE Team's professional judgment and data from the evaluation of past Title 24 code cycles.

Table 68 presents the projected nonresidential new construction that the proposed code change will impact in 2026. The Statewide CASE Team developed these estimates using the methods described in this section.

The Statewide CASE Team estimated the percentage of newly constructed floorspace that the proposed code change would impact. Table 69 shows the assumed percentage of affected floorspace by building type. If a proposed code change does not apply to a specific building type, the Statewide CASE Team assumes that zero percent of the floorspace would be impacted. If the assumed percentage is non-zero, but less than 100 percent, the proposal is expected to affect some—but not all—buildings. Table 70 represents the assumed percentage of affected floorspace by climate zone.

The Statewide CASE Team adjusted the overall floor space impact of this measure based on the percentage of spaces that are impacted. To account for spaces that are exempted based on turndown specifications as outlined in Table 4-A, the Statewide CASE Team assumed 70 percent of hospital space is affected.

Table 71: Estimated New Nonresidential Construction Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.01	0.05	0.24	0.13	0.02	0.10	0.16	0.13	0.23	0.24	0.04	0.24	0.08	0.04	0.03	0.01	1.75
TOTAL	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.1	0.2	0.2	0.0	0.2	0.1	0.0	0.0	0.0	1.7

Table 72: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Hospital	65%	0%

Table 73: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	2%	0%
2	1%	0%
3	1%	0%
4	1%	0%
5	1%	0%
6	1%	0%
7	2%	0%
8	1%	0%
9	1%	0%
10	2%	0%
11	1%	0%
12	1%	0%
13	1%	0%
14	1%	0%
15	2%	0%
16	1%	0%

Alterations

The Statewide CASE Team estimated statewide impacts for the first year by multiplying per-unit savings estimates by statewide construction forecasts for existing healthcare facilities provided by the CEC. The healthcare facilities CEC construction forecast includes existing floor area estimates for hospitals as well as skilled nursing facilities, or OSHPD 1 and OSHPD 2. As previously mentioned, the Statewide CASE Team used the hospital prototype to determine the potential per unit impact of the proposed code change and has extrapolated those savings across CEC healthcare construction projections. In the final report, the Statewide CASE Team will separately assess savings impacts on skilled nursing facilities by developing a separate prototype, but for the draft report, savings derived from modeling the hospital prototype is used as a proxy. The 2028 CASE Methodology Report includes additional information about the methodology and assumptions used to calculate statewide energy impacts.

The statewide savings and cost estimates take the current market share rate into account. The Statewide CASE Team estimated that the current market share rate for the proposed code change is 5-10 percent for the new construction market. The current market share rate is estimated based on the Statewide CASE Team's professional judgment and data from the evaluation of past Title 24 code cycles.

Table 74 shows the projected nonresidential existing statewide building stock that the proposed code change for each building system (envelope, lighting, mechanical) would affect through alterations in 2026. The Statewide CASE Team developed these estimates using the methods described in this section.

The Statewide CASE Team estimated the percentage of newly constructed floorspace that the proposed code change would impact. Table 75, Table 78, and Table 81 shows the assumed percentage of affected floorspace per altered building system by building type. If a proposed code change does not apply to a specific building type, the Statewide CASE Team assumes that zero percent of the floorspace would be impacted. If the assumed percentage is non-zero, but less than 100 percent, the proposal is expected to affect some—but not all—buildings. Table 76, Table 79, and Table 82 represents the assumed percentage of affected floorspace per altered building system by climate zone.

Table 74: Estimated Nonresidential Alterations Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet) – Hospital Envelope

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.05	0.30	1.30	0.67	0.14	0.76	0.73	1.10	1.89	1.07	0.30	1.44	0.61	0.24	0.14	0.09	10.81
TOTAL	0.1	0.3	1.3	0.7	0.1	0.8	0.7	1.1	1.9	1.1	0.3	1.4	0.6	0.2	0.1	0.1	10.8

Table 75: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Large Office	0%	0%
Medium Office	0%	0%
Small Office	0%	0%
Large Retail	0%	0%
Medium Retail	0%	0%
Strip Mall	0%	0%
Mixed-Use Retail	0%	0%
Large School	0%	0%
Small School	0%	0%
Non-refrigerated Warehouse	0%	0%
Hotel	0%	0%
Assembly	0%	0%
Hospital	0%	2.7%
Laboratory	0%	0%
Restaurant	0%	0%
Enclosed Parking Garage	0%	0%
Open Parking Garage	0%	0%
Grocery	0%	0%
Refrigerated Warehouse	0%	0%
Controlled-Environment Horticulture	0%	0%
Vehicle Service	0%	0%
Manufacturing	0%	0%
Unassigned	0%	0%

Table 76: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	0.00%	0.15%
2	0.00%	0.15%
3	0.00%	0.13%
4	0.00%	0.11%
5	0.00%	0.14%
6	0.00%	0.10%
7	0.00%	0.13%
8	0.00%	0.10%
9	0.00%	0.11%
10	0.00%	0.11%
11	0.00%	0.16%
12	0.00%	0.14%
13	0.00%	0.16%
14	0.00%	0.10%
15	0.00%	0.10%
16	0.00%	0.11%

Table 77: Estimated Nonresidential Alterations Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet) – Hospital Lighting

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.19	1.11	4.83	2.47	0.51	2.83	2.72	4.08	6.99	3.96	1.11	5.32	2.25	0.88	0.50	0.32	40.05
TOTAL	0.2	1.1	4.8	2.5	0.5	2.8	2.7	4.1	7.0	4.0	1.1	5.3	2.2	0.9	0.5	0.3	40.1

Table 78: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type – Hospital Lighting

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Large Office	0%	0%
Medium Office	0%	0%
Small Office	0%	0%
Large Retail	0%	0%
Medium Retail	0%	0%
Strip Mall	0%	0%
Mixed-Use Retail	0%	0%
Large School	0%	0%
Small School	0%	0%
Non-refrigerated Warehouse	0%	0%
Hotel	0%	0%
Assembly	0%	0%
Hospital	0%	10%
Laboratory	0%	0%
Restaurant	0%	0%
Enclosed Parking Garage	0%	0%
Open Parking Garage	0%	0%
Grocery	0%	0%
Refrigerated Warehouse	0%	0%
Controlled-Environment Horticulture	0%	0%
Vehicle Service	0%	0%
Manufacturing	0%	0%
Unassigned	0%	0%

Table 79: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone – Hospital Lighting

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	0.00%	0.54%
2	0.00%	0.54%
3	0.00%	0.48%
4	0.00%	0.42%
5	0.00%	0.53%
6	0.00%	0.37%
7	0.00%	0.50%
8	0.00%	0.36%
9	0.00%	0.40%
10	0.00%	0.41%
11	0.00%	0.58%
12	0.00%	0.54%
13	0.00%	0.61%
14	0.00%	0.38%
15	0.00%	0.39%
16	0.00%	0.41%

Table 80: Estimated Nonresidential Alterations Impacted by Proposed Code Change in 2026, by Climate Zone and Building Type (Million Square Feet) – Hospital Mechanical

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16	All
Hospital	0.06	0.33	1.45	0.74	0.15	0.85	0.81	1.22	2.10	1.19	0.33	1.60	0.67	0.26	0.15	0.10	12.02
TOTAL	0.1	0.3	1.4	0.7	0.2	0.8	0.8	1.2	2.1	1.2	0.3	1.6	0.7	0.3	0.2	0.1	12.0

Table 81: Percentage of Nonresidential Floorspace Impacted by Proposed Code Change in 2026, by Building Type

Building Type	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
Large Office	0%	0%
Medium Office	0%	0%
Small Office	0%	0%
Large Retail	0%	0%
Medium Retail	0%	0%
Strip Mall	0%	0%
Mixed-Use Retail	0%	0%
Large School	0%	0%
Small School	0%	0%
Non-refrigerated Warehouse	0%	0%
Hotel	0%	0%
Assembly	0%	0%
Hospital	0%	3%
Laboratory	0%	0%
Restaurant	0%	0%
Enclosed Parking Garage	0%	0%
Open Parking Garage	0%	0%
Grocery	0%	0%
Refrigerated Warehouse	0%	0%
Controlled-Environment Horticulture	0%	0%
Vehicle Service	0%	0%
Manufacturing	0%	0%
Unassigned	0%	0%

Table 82: Percentage of Nonresidential Floorspace Impacted by Proposed Measure, by Climate Zone

Climate Zone	New Construction Impacted (Percent Square Footage)	Existing Building Stock (Alterations) Impacted (Percent Square Footage)
1	0.00%	0.16%
2	0.00%	0.16%
3	0.00%	0.15%
4	0.00%	0.13%
5	0.00%	0.16%
6	0.00%	0.11%
7	0.00%	0.15%
8	0.00%	0.11%
9	0.00%	0.12%
10	0.00%	0.12%
11	0.00%	0.17%
12	0.00%	0.16%
13	0.00%	0.18%
14	0.00%	0.11%
15	0.00%	0.12%
16	0.00%	0.12%

Appendix D: Environmental Analysis

Shut-off and Reset Controls

Potential Significant Environmental Effect of Proposal

The Statewide CASE Team has considered the environmental benefits and adverse impacts of its proposal, including—but not limited to—an evaluation of factors contained in the California Code of Regulations, Title 14, section 15064, and has determined that the proposal will not result in a significant effect on the environment.

Direct Environmental Impacts

Direct Environmental Benefits

This measure is expected to result in energy savings and GHG emissions reductions by requiring shut-off and reset controls installed and programmed in nonresidential healthcare facilities. The estimated impact of these benefits has been quantified in this report.

Direct Adverse Environmental Impacts

This measure is not expected to result in any direct adverse environmental impacts.

Indirect Environmental Impacts

Indirect Environmental Benefits

This measure is not expected to result in any indirect environmental benefits.

Indirect Adverse Environmental Impacts

This measure is not expected to result in any indirect adverse environmental impacts.

Mitigation Measures

The Statewide CASE Team has considered opportunities to minimize the environmental impact of the proposal, including an evaluation of “specific economic, environmental, legal, social, and technological factors” (Cal. Code Regs., tit. 14, § 15021). The Statewide CASE Team determined this measure would not result in significant direct or indirect adverse environmental impacts, so mitigation measures were not considered or developed.

Reasonable Alternatives to Proposal

The Statewide CASE Team has considered alternatives to the proposal and determined that no alternative would achieve its purpose with less environmental effect.

Water Use and Water Quality Impacts Methodology

There are no impacts on water quality or water use.

Space-conditioning zone controls

Potential Significant Environmental Effect of Proposal

The Statewide CASE Team has considered the environmental benefits and adverse impacts of its proposal, including—but not limited to—an evaluation of factors contained in the California Code of Regulations, Title 14, section 15064, and has determined that the proposal will not result in a significant effect on the environment.

Direct Environmental Impacts

Direct Environmental Benefits

This measure is expected to result in energy savings and GHG emissions reductions by preventing reheating, recooling, and simultaneous heating and cooling in nonresidential healthcare facilities. The estimated impact of these benefits has been quantified in this report.

Direct Adverse Environmental Impacts

This measure is not expected to result in any direct adverse environmental impacts.

Indirect Environmental Impacts

Indirect Environmental Benefits

This measure is not expected to result in any indirect environmental benefits.

Indirect Adverse Environmental Impacts

This measure is not expected to result in any indirect adverse environmental impacts.

Mitigation Measures

The Statewide CASE Team has considered opportunities to minimize the environmental impact of the proposal, including an evaluation of “specific economic, environmental, legal, social, and technological factors” (Cal. Code Regs., tit. 14, § 15021). The Statewide CASE Team determined this measure would not result in significant direct or indirect adverse environmental impacts, so mitigation measures were not considered or developed.

Reasonable Alternatives to Proposal

The Statewide CASE Team has considered alternatives to the proposal and determined that no alternative would achieve its purpose with less environmental effect.

Water Use and Water Quality Impacts Methodology

There are no impacts on water quality or water use.

Fan Control

Potential Significant Environmental Effect of Proposal

The Statewide CASE Team has considered the environmental benefits and adverse impacts of its proposal, including—but not limited to—an evaluation of factors contained in the California Code of Regulations, Title 14, section 15064, and has determined that the proposal will not result in a significant effect on the environment.

Direct Environmental Impacts

Direct Environmental Benefits

This measure is expected to result in energy savings and GHG emissions reductions by requiring VAV fans capable of adjusting indoor airflow as a function of load in nonresidential healthcare facilities. The estimated impact of these benefits has been quantified in this report.

Direct Adverse Environmental Impacts

This measure is not expected to result in any direct adverse environmental impacts.

Indirect Environmental Impacts

Indirect Environmental Benefits

This measure is not expected to result in any indirect environmental benefits.

Indirect Adverse Environmental Impacts

This measure is not expected to result in any indirect adverse environmental impacts.

Mitigation Measures

The Statewide CASE Team has considered opportunities to minimize the environmental impact of the proposal, including an evaluation of “specific economic, environmental, legal, social, and technological factors” (Cal. Code Regs., tit. 14, § 15021). The Statewide CASE Team determined this measure would not result in significant direct or indirect adverse environmental impacts, so mitigation measures were not considered or developed.

Reasonable Alternatives to Proposal

The Statewide CASE Team has considered alternatives to the proposal and determined that no alternative would achieve its purpose with less environmental effect.

Water Use and Water Quality Impacts Methodology

There are no impacts on water quality or water use.

Alterations

Potential Significant Environmental Effect of Proposal

The Statewide CASE Team has considered the environmental benefits and adverse impacts of its proposal, including—but not limited to—an evaluation of factors contained in the California Code of Regulations, Title 14, section 15064, and has determined that the proposal will not result in a significant effect on the environment.

Direct Environmental Impacts

Direct Environmental Benefits

This measure is expected to result in energy savings and GHG emissions reductions by requiring VAV fans capable of adjusting indoor airflow as a function of load in nonresidential healthcare facilities. The estimated impact of these benefits has been quantified in this report.

Direct Adverse Environmental Impacts

This measure is not expected to result in any direct adverse environmental impacts.

Indirect Environmental Impacts

Indirect Environmental Benefits

This measure is not expected to result in any indirect environmental benefits.

Indirect Adverse Environmental Impacts

This measure is not expected to result in any indirect adverse environmental impacts.

Mitigation Measures

The Statewide CASE Team has considered opportunities to minimize the environmental impact of the proposal, including an evaluation of “specific economic, environmental, legal, social, and technological factors” (Cal. Code Regs., tit. 14, § 15021). The Statewide CASE Team determined this measure would not result in significant direct or indirect adverse environmental impacts, so mitigation measures were not considered or developed.

Reasonable Alternatives to Proposal

The Statewide CASE Team has considered alternatives to the proposal and determined that no alternative would achieve its purpose with less environmental effect.

Water Use and Water Quality Impacts Methodology

There are no impacts on water quality or water use.

Appendix E: Summary of Stakeholder Engagement

Introduction to Stakeholder Engagement

Collaborating with stakeholders who may be affected by proposed code changes is a core component of the Statewide CASE Team's process. The Statewide CASE Team engages interested parties to identify and address issues related to the proposals, with the goal of submitting recommendations to the CEC in this Draft CASE Report that reflect broad support. Public stakeholders provide valuable feedback on draft analyses and help identify and address adoption challenges, including cost effectiveness, market and technical barriers, compliance and enforcement, and potential impacts on human health or the environment. Some stakeholders also provide data that the Statewide CASE Team uses to support analyses.

This appendix summarizes the stakeholder engagement conducted by the Statewide CASE Team during the development and refinement of the report's recommendations.

All Measures

Utility-Sponsored Stakeholder Meetings

Utility-sponsored stakeholder meetings provide an opportunity to learn about the Statewide CASE Team's role in the advocacy effort and to hear about specific code change proposals that the Statewide CASE Team is pursuing for the 2028 code cycle. The goal of these meetings is to solicit input on proposals from stakeholders early enough to ensure the proposals and the supporting analyses are vetted and have as few outstanding issues as possible. To promote transparency in the development of code change proposals, the Statewide CASE Team uses stakeholder meetings to solicit feedback on:

- Proposed code changes
- Draft code language
- Draft assumptions and results of analyses
- Data to support assumptions
- Compliance and enforcement
- Technical and market feasibility

The Statewide CASE Team hosted one stakeholder meeting for the proposed healthcare measures via webinar, as described in Table 83. The Statewide CASE Team will host a second stakeholder meeting on the proposed measure to gather feedback on this draft report. Please see below for dates and links to event pages on Title24Stakeholders.com. Materials from each meeting, such as slide presentations,

proposal summaries with code language, and meeting notes, are included in the bibliography section of this report.

Table 83: Utility-Sponsored Stakeholder Meetings

Meeting Name and Link to Materials	Meeting Date	Summary of Items Discussed
First Round of Nonresidential HVAC, Covered Processes Utility-Sponsored Stakeholder Meeting	Tuesday, September 23, 2025	<ul style="list-style-type: none"> • Proposed code change measures impacting new construction and alterations • Market and technical barriers • Compliance changes and challenges • Energy modeling and hospital prototype changes

The first round of utility-sponsored stakeholder meetings began in September 2025 and served as an early forum to promote transparency and gather stakeholder feedback on measures under consideration by the Statewide CASE Team.

The objectives of the first round of stakeholder meetings were to solicit input on the scope of the 2025 code cycle proposals; request data and feedback on the specific approaches, assumptions, and methodologies for the energy impacts and cost-effectiveness analyses; and understand potential technical and market barriers. The Statewide CASE Team also presented the initial draft code language for stakeholders to review.

The Statewide CASE Team received the following feedback from stakeholders during this meeting.

- Stakeholders provided guidance on other healthcare exceptions that could be eliminated. These included load reduction and controls, simultaneous heating and cooling, and commissioning and acceptance testing requirements.
- Stakeholders resoundingly agreed that changes to the hospital prototype modeling baseline are needed, and performance credit should be provided in the performance path.
- In response to this feedback, the Statewide CASE Team:
 - Modified the hospital prototype in this report to appropriately reflect a hospital design and operation.
 - Proposes to allow performance credit for the proposed mechanical equipment changes in this CASE Report.

The second round of utility-sponsored stakeholder meetings will occur in March 2026 to provide updated details on proposed code changes and engage additional stakeholders impacted by the proposed measures. This meeting will introduce early results of energy,

cost effectiveness, and incremental cost analyses, and solicit additional feedback on refined draft code language.

Utility-sponsored stakeholder meetings are open to the public. For each stakeholder meeting, two promotional emails were distributed from info@title24stakeholders.com. One email was sent to the full Title 24 Stakeholders listserv, which includes over 3,000 individuals. A second email targeted specific recipients based on their subscription preferences.

The Title 24 Stakeholders listserv is an opt-in service comprising participants from a diverse industries and trades, such as manufacturers, advocacy groups, local government, and building and energy professionals. Each meeting was announced on the Title 24 Stakeholders LinkedIn page and cross-promoted on the CEC LinkedIn page approximately two weeks in advance to engage individuals, organizations, and broader channels outside beyond the listserv. The Statewide CASE Team conducted extensive personal outreach to stakeholders identified in initial work plans who had not yet opted in to the listserv. Exported webinar meeting data captured attendance numbers, individual comments, and results from live attendee polls to help evaluate stakeholder participation and support.

Statewide CASE Team Communications

The Statewide CASE Team held personal communications over email and phone with numerous stakeholders when developing this report. The organizations listed in Table 84 provided input on the proposed measures and content in the report. In addition to those stakeholders, the Statewide CASE Team engaged market actors who manage hospitals, design and engineering firms, and national experts involved in healthcare projects across the country.

Table 84: Engaged Stakeholders

Organization/Individual Name	Market Role	Mentioned in CASE Report Sections
California Energy Commission (CEC)	State Regulator	No
California Department of Healthcare Access and Information (HCAI)	State Regulator	Throughout report
Kaiser Permanente	Healthcare Owner and Operator	Market Structure and Availability
American Hospital Association (AHA)	Trade Association	Cost Effectiveness
American Society for Health Care Engineering (ASHE)	Trade Association	Cost Effectiveness

Organization/Individual Name	Market Role	Mentioned in CASE Report Sections
Taylor Engineers	Engineering Firm	No
Flad Architects	Design Firm	No
ASHRAE Technical Committee 9.6 Committee	Standards Development	No
ASHRAE SSPC Committee 170	Standards Development	No