

CALIFORNIA ENERGY COMMISSION

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FINAL STATEMENT OF REASONS

**ADOPTED BUILDING STANDARDS
OF THE CALIFORNIA ENERGY COMMISSION:**

**CALIFORNIA CODE OF REGULATIONS, TITLE 24,
PARTS 1 and 6 (CALIFORNIA ENERGY CODE)**

**CALIFORNIA ENERGY COMMISSION
DOCKET NUMBER 12-BSTD-1:
2013 BUILDING ENERGY EFFICIENCY STANDARDS**

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I. INTRODUCTION

This Final Statement of Reasons (FSOR) describes the purposes, rationales, and necessity of the California Energy Commission's adopted amendments to its energy efficiency standards for buildings, which would go into effect on January 1, 2014, if approved by the California Building Standards Commission.¹ The FSOR also contains all of the other material required by California's Administrative Procedure Act. Following the Introduction, the main text beginning on page 5 follows the organization of the statutory provisions that describe FSOR requirements.

A. A Brief History of the Energy Commission's Building Standards

In 1975, the Department of Housing and Community Development adopted the State's first energy conservation standards for buildings, under the State Housing Law, which required basic levels of insulation. Also in that year, the Energy Commission began operations under the Warren-Alquist Act.² That Act gives specific directives to the Energy Commission regarding adoption of building standards, what the standards are to address, what criteria are to be met in developing standards, and what implementation tools, aids, and technical assistance are to be provided.³ The most important requirement is that the standards save building owners more money in reduced bills for electricity and natural gas than any additional construction costs that the standards impose.

The building standards must also meet the requirements of the Administrative Procedure Act (e.g., that they carry out the purpose of the enabling statute, that they are clear, and that they have been adopted in an open public process in which alternatives are thoroughly considered) and the California Environmental Quality Act.⁴ These requirements help ensure that the standards promote the State's goal to have a reliable, economic, and environmentally-sound energy supply.⁵

In 1976, the Energy Commission adopted its first building standards, which addressed space heating and cooling, water heating, and windows, in addition to updating the existing insulation standards. Since then the Energy Commission has updated the standards in conjunction with the Building Standards Commission's publication of all the State's building codes, usually every three years. The updates incorporate some of the most advanced developments in energy conservation (e.g., in the 2013 Standards, new lighting technologies, and new types of roofs that reflect unneeded heat) to ensure that new construction in California will be as energy-efficient as possible, consistent with the requirement that the standards be cost-effective for consumers. Today, the standards

1 The FSOR refers to the proposed standards in various ways, e.g., "2013 Building Energy Efficiency Standards," "proposed standards," and "2013 Standards"; in addition, it uses "amendments" or "proposed regulations" as a shorthand reference for new provisions, revisions to existing provisions, and deletions of existing provisions, in Parts 1 and 6 of Title 24 of the California Code of Regulations. In addition, "California Energy Commission" is sometimes shortened to "Energy Commission."

2 Pub. Resources Code § 25000 et seq.

3 Pub. Resources Code §§ 25402, subd. (a)-(b), 25402.1 - 25402.8.

4 ("CEQA", Pub. Resources Code § 21000 et seq., which requires that state agency actions not cause undue environmental harm.

5 See, e.g., Pub. Resources Code §§ 25001, 25300, subd. (a)-(b).

contain energy efficiency – and, as recently required by statute, water efficiency – requirements for newly constructed buildings, additions to existing buildings, alterations to existing buildings, and, in the case of nonresidential buildings, repairs to existing buildings.

The Energy Commission's building energy efficiency standards are contained in two parts of Title 24 of the California Code of Regulations. Administrative regulations, such as how the standards' requirements are integrated with local governments' building permit processes, are in Part 1 of Title 24, and the substantive requirements for building construction are in Part 6 of Title 24 (collectively, the Standards). In addition, voluntary or "reach" guidelines for sustainable building practices that are more protective of the environment than the minimum standards are in Part 11 of Title 24, the California Green Building Standards.

B. How the Standards Work

The standards are divided into several sections, some of which apply to all buildings and all types of construction, and some of which apply only to specified subsets.

The first division in the standards is between administrative regulations in Part 1 of Title 24, and substantive regulations in Part 6 of Title 24. The former describe procedural requirements, such as what information must be on building permit applications; the latter describe how buildings must be constructed.

The substantive, how-buildings-must-be-constructed regulations in Part 6 are further subdivided. In general, each building must (1) comply with various mandatory requirements, and (2) meet an energy goal. In turn, meeting the energy goal can be accomplished either (a) by demonstrating, under the "performance" compliance approach, that the building will consume no more energy than is set forth in an "energy budget", which is established on an energy-use-per-square-foot basis (the "performance compliance" approach); or (b) by installing a package of specified measures (e.g., R-30 ceiling insulation, high-performance windows) in the "prescriptive" compliance approach. The energy budget and the prescriptive requirements vary among different building types (which are nonresidential (e.g., retail, office), low-rise residential, high-rise residential, and hotel/motel) and among 16 different "climate zones" within the state. There are also differences between construction of brand-new buildings, on the one hand, and additions, alternations, and repairs to existing buildings, on the other hand. The (1) mandatory, (2)(a) energy budget, and (2)(b) prescriptive provisions, and the different types of buildings and construction, appear in Part 6 as follows:

Subchapter 1 describes the scope of the standards: which building types and which types of construction are covered. It also sets forth the definitions and the rules of construction that apply to Part 6.

Subchapter 2 contains mandatory requirements for all buildings.

Subchapters 3 through 5 apply to new nonresidential, high-rise (4 or more habitable stories), residential, and hotel/motel buildings, thus:

Subchapter 3 contains additional mandatory requirements for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 4 contains still more mandatory requirements for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 5 sets the performance (energy budget) and prescriptive (package of measures) compliance approaches for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 6 establishes the requirements for additions, alterations, and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 7 contains the mandatory requirements for new low-rise (1, 2, or 3 stories) residential buildings.

Subchapter 8 sets for the performance (energy budget) and prescriptive (package of measures) compliance approaches for new residential buildings.

Subchapter 9 establishes the requirements for additions and alterations to existing low-rise residential buildings. (Repairs to such buildings are not covered by the standards.)

C. Summary of the Changes Proposed in This Rulemaking Proceeding

As adopted by the California Energy Commission on May 31, 2012, the 2013 Standards will be a major stride forward in energy efficiency. It is the policy of the State that by the year 2020 all new residential buildings should be “zero net energy” – that is, that all the energy required to operate the buildings’ heating, cooling, water heating, and lighting systems, and their appliances – should be produced on-site, or, if some energy is needed from electricity and natural gas utilities, that the buildings produce an equivalent amount of energy for delivery to the system.⁶ This will require both (1) that buildings be highly energy-efficient, so that as little energy as possible is needed, and (2) that buildings have on-site energy production systems, such as rooftop solar equipment. The 2013 Standards move towards this goal by requiring that the next generation of new buildings use around one-third less energy than is required by the current standards.

The 2013 Standards focus on several key areas to improve energy efficiency, including measures designed to reduce energy use during critical peak demand periods; they also will enable future solar system installations. The most significant efficiency improvements for residential buildings are for windows, wall and floor insulation, and testing for Heating, Ventilating, and Air-Conditioning (“HVAC”) systems; for nonresidential buildings, the most significant improvements are for lighting controls, windows, HVAC equipment, and “building commissioning” (“building commissioning” is the pre-occupancy process of thoroughly testing and adjusting a building’s energy systems to ensure that they function properly).

⁶ Energy Commission, 2008 Energy Action Plan, pp. 8, 9, and 14; Energy Commission, 2007 Integrated Energy Policy Report, pp.83, 87, and 94 ; Energy Commission, 2008 California Energy Efficiency Strategic Plan, pp.xiv through xxi; 1-4 through 1-7; 2-2 through 2-18; 2-27; 3-1 through 3-6; 3-16; 3-17; 7-1; 7-2; 7-7; 9-3; 11-4 through 11-7; and 12-3.

In addition, for the first time, efficiency requirements for “process loads” (energy use for the commercial or industrial processes that go on inside the building, as opposed to energy use to make the building itself habitable), such as commercial refrigeration, data centers, kitchen exhaust systems, and compressed air systems, are included in the nonresidential Standards. The 2013 Standards also include expanded criteria for pre-occupancy acceptance testing of HVAC, water, and lighting systems in both residential and nonresidential buildings, as well as new requirements for code compliance data to be collected in a Commission-managed repository.

Furthermore, enabling residential and small commercial buildings to respond to critical electricity peak demand events by reducing air conditioning loads is a new aspect of the 2013 Standards. Capabilities to enable remote utility communication of critical events, and to allow automatic demand response to reduce critical peak air conditioning loads, are proposed as requirements for all thermostats controlling “unitary” heating and air conditioning systems. Facilitating future solar electric and solar thermal system installations is another new element of the 2013 Standards.

II. FSOR ANALYSES REQUIRED BY THE ADMINISTRATIVE PROCEDURE ACT

A. Update of the Information Contained in the Initial Statement of Reasons

1. **The specific purpose of each adoption, amendment, or repeal; the problem the Energy Commission intends to address; and the rationale for the Energy Commission's determination that the regulation is reasonably necessary to carry out the purpose and address the problem for which it is proposed.**

The Initial Statement of Reasons (ISOR) described, among other things, the purposes of the initially-proposed Standards (the 45-Day Language), the problems they were designed to address, and the necessity for their adoption to carry out their purposes and address the specified problems. As a result of the oral and written comments made on the 45-Day Language during the Energy Commission's extensive public review process, many changes were made to the 45-Day Language; those modifications were published in 15-Day Language and most were adopted by the Energy Commission. This part of the FSOR describes the Standards as adopted by the Energy Commission, the problems they are intended to address, and the benefits of each section and how they further the statutory goals of prescribing cost-effective building energy and water efficiency standards.

a. The purpose, rationale, and necessity of the proposed regulations in general

The Legislature has found:

. . . that electrical energy is essential to the health, safety and welfare of the people of this state and to the state economy, and that it is the responsibility of state government to ensure that a reliable supply of electrical energy is maintained at a level consistent with the need for such energy for protection of public health and safety, for promotion of the general welfare, and for environmental quality protection.

[T]he present rapid rate of growth in demand for electric energy is in part due to wasteful, uneconomic, inefficient, and unnecessary uses of power and a continuation of this trend will result in serious depletion or irreversible commitment of energy, land and water resources, and potential threats to the state's environmental quality.^[7]

Accordingly:

7 Pub. Resources Code, §§ 25001, 25002.

It is . . . the policy of the state and the intent of the Legislature to employ a range of measures to reduce wasteful, uneconomical, and unnecessary uses of energy, thereby reducing the rate of growth of energy consumption, prudently conserve energy resources, and assure statewide environmental, public safety, and land use goals.^[8]

Improvements in energy efficiency are among the best, and often the cheapest and most environmentally-friendly, methods of balancing the state’s electricity demand and supply. Thus existing law requires the Energy Commission to adopt energy efficiency standards for buildings.⁹ The benefits of the Standards^[10] – both previous editions of the Standards as well as the 2013 Standards proposed here for approval by the Building Standards Commission – are considerable:

- Promotion of a reliable electrical system;
- Elimination or mitigation of wasteful, uneconomic, inefficient, and unnecessary uses of electricity;
- Reductions in the trend of increasing electricity consumption;
- Protection of energy, land and water resources, and the state's environmental quality;
- Creation of jobs; and
- Reduced energy costs for consumers and businesses.

And all of these benefits are achieved in a manner that saves money for consumers, because the Standards must, by law, be cost-effective.¹¹

Table 1 summarizes the cost-effective analysis. None of the subsequent revisions to the Standards added any costs, and many reduced costs, so the numbers in the Table are conservative (i.e., the 2013 Standards are actually more cost-effective than shown).

Table 1. Summary of Statewide Costs and Energy Bill Savings

Sector	Statewide Measure Costs	Statewide Energy Bill Savings	Statewide Net Savings
Residential	\$132.46 Million	\$319.77 Million	\$187.31 Million
Nonresidential	\$1.08 Billion	\$1.37 Billion	\$285.29 Million
Total	\$1.21 Billion	\$1.68 Billion	\$472.60 Million

8 Pub. Resources Code, § 25007.

9 See, e.g., Pub. Resources Code §§ 25213, 25402, subd. (a)-(b), 25402.1, 25402.4, 25402.5, 25402.8, and 25910.

10 See Gov. Code, § 11346.2(b)(1).

11 Pub. Resources Code, § 25402, subd. (b)(3).

b. The specific purpose, rationale, and necessity of each section of the proposed regulations

TITLE 24, PART 1, CHAPTER 10 (ADMINISTRATIVE REGULATIONS), ARTICLE 1 – ENERGY BUILDING REGULATIONS

SECTION 10-102 – DEFINITIONS

The specific effects, purposes, and rationales for the proposed regulations in this section are to add new definitions, delete obsolete definitions, and modify existing definitions, in order to reflect and be consistent with related changes to the Standards and changes in other relevant law.

The changes are necessary to eliminate ambiguities, simplify regulatory language, and bring the regulations into conformance with applicable law.

SECTION 10-103 – PERMIT, CERTIFICATE, INFORMATIONAL, AND ENFORCEMENT REQUIREMENTS FOR DESIGNERS, INSTALLERS, BUILDERS, MANUFACTURERS, SUPPLIERS, AND THIRD-PARTY VERIFIERS

Subsection 10-103(a): The existing subsection has requirements for a “Certificate of Compliance”, which is required to ensure that building permit applicants document compliance with the Standards.

The specific effects, purposes, and rationales of the regulations are as follows:

First, clarify the format, content, informational order, and signature authority for the Certificate of Compliance, in order to improve code compliance and enforcement;

Second, add documentation requirements for nonresidential building commissioning (pre-occupancy testing and adjustment of equipment), in order to help ensure that a building’s energy efficiency features are fully implemented;

Third, add requirements to submit all nonresidential compliance documents to a data registry. (As provided elsewhere in the Standards, a “data registry” is a web service hosted by a Home Energy Rating Service (“HERS”) provider,¹² or another entity approved by the Energy Commission, that receives and stores the official versions of Standards compliance documents.) In the 45-Day Language, data registries were limited to HERS providers only. In response to stakeholder concerns, other entities approved by the Commission were added. This requirement will provide better access to these records by local enforcement agencies and by the third-party verifiers who are required to review buildings to ensure that they have been constructed in compliance with the specifications in the building permit; and

Finally, add requirements for data registries to submit the Certificate of Compliance to an Energy Commission electronic document repository. This additional compliance document and data storage process will improve the Energy Commission’s ability to track code compliance and specific building design alternatives, which in turn will allow the Energy Commission to propose more effective regulations in the future.

¹² See Pub. Resources Code § 25942; tit. 20, Cal. Code Regs., § 1670 et seq.

Subsection 10-103(a)2: The regulations clarify building permit application processes and enforcement agency authority, as they apply to the building standards, in order to improve code compliance and enforcement. In addition, the regulations allow the enforcement agency to create simplified compliance documents for small addition and alteration projects, which will eliminate unnecessary burdens for builders as well as provide flexibility to the local enforcement agencies and improve their code enforcement procedures.

Subsection 10-103(a)3, 4, 5: The existing subsections contain requirements for Installation Certificates, Certificates of Acceptance, and Certificates of Field Verification and Diagnostic Testing, all of which deal with ensuring that various types of building equipment and systems are installed and operate in accordance with the standards and operate as they are intended to. The regulations clarify the content, signature authority, and submittal requirements for these certificates in two basic ways.

First, new definitions are added for “Documentation Author” and “Field Technician” to better explain the compliance documentation signature responsibilities. The Documentation Author is the person who completes the Certificate of Compliance documentation and the Field Technician is the person who physically performs the required acceptance tests. The Field Technician must also now sign the Certificate of Acceptance. A requirement is also added for the Installation Certificate to be signed by the professional (as specified by Division 3 of the Business and Professions Code) accepting responsibility for the construction and installation. Adding signature requirements for each of the job disciplines involved in a measure’s installation and testing will make the appropriate professionals accountable for their work and will allow the building departments to better enforce the testing requirements in the regulations.

Second, the regulations add requirements for data registries to submit the Installation Certificates, Certificates of Acceptance, and Certificates of Field Verification and Diagnostic Testing to an Energy Commission electronic document repository. This process will improve the Energy Commission’s ability to track code compliance and specific building design alternatives. By keeping track of how buildings are implementing the Standards, the Energy Commission can better analyze building trends, the costs of measures, and the constructability of specific technologies. This information will improve the Energy Commission’s Standards development process, which will allow the Energy Commission to propose more effective regulations in the future.

Subsection 10-103(d)2: The regulations clarify that the enforcement agency inspection duties apply to additions and alterations to all existing buildings, and to repairs to existing nonresidential buildings, as well as to newly constructed buildings. These clarifications will improve the effectiveness of the Standards.

SECTION 10-106 – LOCALLY ADOPTED ENERGY STANDARDS

The regulations remove and reorganize language to simplify the requirements for local government agencies when they adopt local energy efficiency ordinances. These modifications will improve the ability of local governments to promulgate cost-effective and environmentally sound local energy efficiency ordinances. In addition, the regulations now expressly require local agencies to state that local ordinances require

buildings to consume no more energy than is allowed by Part 6, which is required by the governing statute on local ordinances.¹³

SECTION 10-109 – COMPLIANCE SOFTWARE, ALTERNATIVE COMPONENT PACKAGES, EXCEPTIONAL METHODS, DATA REGISTRIES AND RELATED INPUT SOFTWARE, AND ELECTRONIC DOCUMENT REPOSITORIES

The changes to the title of the section reflect the substantive changes discussed below.

This section has been reorganized into subsections, in order to help readers understand (a) the submittal requirements for compliance software, alternative component packages, and exceptional methods; (b) the Energy Commission’s processes for dealing with those matters; and (c) the administrative requirements for data registries and repositories. (“Compliance software” are the computer programs certified by the Energy Commission to implement the performance compliance path for the Standards. “Alternative components packages” are sets of prescriptive requirements that match the required maximum building energy use, in the prescriptive compliance approach documented in the Standards. “Exceptional methods” analyze a design, material, or device that cannot be adequately modeled using the public domain compliance software. “Data registries” and the “data repository” are discussed above, under Subsection 10-103(a).) The modifications to this section simplify the requirements to obtain Energy Commission approval for compliance software, alternative component packages, and exceptional methods, thereby reducing the costs of submitting these for Energy Commission approval. A subsection is added to explain the submittal requirements for data registries and explain how both data registries and data repositories will be approved by the Energy Commission. A new subsection explains the administrative requirements for data registries and repositories, which will enable these data and document archival and retrieval services to be implemented successfully, thereby improving the Energy Commission’s ability to require use of these compliance documentation services as a key part of the code compliance process.

SECTION 10-110 – PROCEDURES FOR CONSIDERATION OF APPLICATIONS UNDER SECTIONS 10-104, 10-106, 10-108 AND 10-109

The regulations clarify that the Energy Commission does not charge fees for the review of locally adopted energy standards.

SECTION 10-111 – CERTIFICATION AND LABELING OF FENESTRATION PRODUCT U-FACTORS, SOLAR HEAT GAIN COEFFICIENTS, AND AIR LEAKAGE

The regulations add a requirement to include visual transmittance data on all fenestration labels. They also introduce additional fenestration rating requirements for the National Fenestration Rating Council, which acts as the supervisory entity for the Energy Commission’s fenestration certification program. These requirements will improve code compliance and enforcement by making sure that code-related performance metrics are effectively displayed on all fenestration products.

SECTION 10-113 – CERTIFICATION AND LABELING OF ROOFING PRODUCT REFLECTANCE AND EMITTANCE

A requirement is added for the Cool Roof Rating Council (CRRRC), which acts as the supervisory entity for the Energy Commission’s roofing product certification program, to provide an annual report to the Energy Commission that summarizes compliance with its

¹³ Pub. ResourcesCode § 25402.1, subd. (h)(2).

requirements as a supervisory entity. These requirements will provide the Energy Commission with information needed to judge the effectiveness of the CRRC at maintaining roofing energy-related product performance. Since the CRRC is certifying cool roof products for use in code compliance, the CRRC's success will improve the effectiveness of the Standards.

SECTION 10-114 – DETERMINATION OF OUTDOOR LIGHTING ZONES AND ADMINISTRATIVE RULES FOR USE

The regulations remove the existing language pertaining to the requirements for local authorities to follow a public process and notify the Energy Commission in regards to the adoption of a local outdoor lighting ordinance. Removing these requirements simplifies the Standards, thereby improving code compliance and enforcement.

TITLE 24, PART 6 – EFFICIENCY STANDARDS

Please see pp. 1 – 3 above for an overview of the structure of the Standards and how they work.

Note: all numbering of Part 6 sections has been modified, in order to accommodate current and potential future additions to the Standards. The renumbering, however, retains some of the format of the old numbering system. For example, Section 100 has been changed to Section 100.0 and Section 102 has been changed to Section 100.2. These numbering changes will allow additional subsection requirements to be introduced when needed without needing to reserve code sections for future use, since the new numbering scheme accommodates a vast number of section and subsection divisions. Several reserved code sections are removed in these regulations.

SUBCHAPTER 1 – All Occupancies – General Provisions

SECTION 100.0 – SCOPE

The regulations add a subsection that clarifies the scope of the Part 6 Standards as they apply to “covered processes,” which are energy-related activities that are not related to the space conditioning, lighting, service water heating, or ventilating of a building for human occupancy. The “covered processes” are commercial refrigeration, compressed air systems, process boilers, equipment efficiencies in computer rooms, commercial kitchen ventilation, parking garage air exhaust systems, and laboratory air exhaust systems. This scope provision is necessary to understand which energy-related activities are covered by the Building Standards. In addition, the regulations add an exception to the standards that allows the lighting provisions of Part 6 to be met for only one of the occupancy types within a mixed-occupancy building if specific conditions are met. This exception simplifies code compliance and thereby improves the effectiveness of the Standards.

SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION

The regulations add new definitions, delete obsolete definitions, and modify existing definitions, in order to reflect and be consistent with related changes to the Standards and changes in other relevant law, to clarify and eliminate ambiguities, and to simplify regulatory language. Where such an amendment needs specific discussion, it is described below under the heading of the substantive requirement to which it pertains.

***SUBCHAPTER 2 -- All Occupancies- Mandatory Requirements for the
Manufacture, Construction and Installation of Systems, Equipment and
Building Components***

SECTION 110.1 – MANDATORY REQUIREMENTS FOR APPLIANCES

The regulations more clearly specify the appliance design and performance data needed to prove compliance with the Title 20 appliance efficiency regulations, in order to be consistent with the Title 20 regulations and to clarify when the Title 20 regulations are relevant to these Part 6 regulations.

SECTION 110.2 – MANDATORY REQUIREMENTS FOR SPACE-CONDITIONING EQUIPMENT

First, the regulations update the space-conditioning equipment efficiency requirements to match current federal equipment efficiency standards. This update is required by federal law. Second, the regulations add requirements for upgradable setback thermostats that facilitate demand response (demand response is the adjustment of electrical demand by the user in response to fluctuations in the price of electricity). This update improves the opportunity for building owners to manage their energy costs. Finally, requirements are added for evaporative or open cooling towers to be installed with makeup water controls (these controls maximize the use of water within cooling towers, by measuring the concentration of specific chemicals in the water and only replacing tower water if these concentrations become too high), flow meters, overflow alarms, and drift eliminators (drift eliminators prevent water in open cooling towers from getting windswept), in order to increase the water efficiency (and thereby the energy efficiency) of this equipment.

SECTION 110.3 – MANDATORY REQUIREMENTS FOR SERVICE WATER-HEATING SYSTEMS AND EQUIPMENT

The regulations eliminate an exception to the requirement for automatic hot water shut off controls to be installed in hot water distribution systems that serve single dwelling units. This exception is no longer appropriate, because shut off control technology is now available and cost-effective for all types of residential dwelling units.

The regulations also add requirements for shower heads: they must (1) use no more water than the currently-proposed federal standard and (2) include individual valves for each shower head where there are multiple shower heads in a single shower. These requirements cost-effectively increase the stringency of the Standards, thereby minimizing the water and energy use of buildings.

SECTION 110.6 – MANDATORY REQUIREMENTS FOR FENESTRATION PRODUCTS AND EXTERIOR DOORS

The regulations make several changes to this section, as follows:

First, add an exception that states that neither fenestration products (basically, windows and skylights) nor exterior doors are subject to air leakage requirements if they are “field fabricated,” which means that the product, in this case a fenestration product, is constructed at the building site rather than in a manufacturer’s factory. This new exception will improve the ability of site-built fenestration products to comply with the Standards.

Second, reduce the threshold for when National Fenestration Rating Council (“NFRC”)

ratings are required for field fabricated fenestration products, from 10,000 square feet to 1,000 square feet of fenestration area. Requiring NFRC ratings on all but the smallest field fabricated fenestration projects will improve the energy performance of fenestration that is site-built.

Finally, add a provision to the existing requirement that fenestration products be rated according to NFRC procedures; the new provision requires that visual transmittance be included among the product characteristics that must be tested and labeled. Including visual transmittance performance data on fenestration product labels will allow the building industry to more easily specify products that comply with the daylighting requirements of the Standards.

SECTION 110.7 – MANDATORY REQUIREMENTS TO LIMIT AIR LEAKAGE

The specific purpose and rationale for the regulations are to make nonsubstantive changes for clarification. Detailed specifications are added for the design and construction of building envelopes with a continuous air barrier. These improved specifications will allow builders to understand the installation requirements for air barriers when they are required, and will therefore improve code compliance.

SECTION 110.8 – MANDATORY REQUIREMENTS FOR INSULATION, ROOFING PRODUCTS, AND RADIANT BARRIERS

First, the regulations add radiant barriers to this section title to clarify that there are requirements related to this building envelope component in this section. Second, the calculation for “aged solar reflectance” (the estimated solar reflectance of a specific roofing product after three years of operation) is revised. The revised equation will improve estimates of the cool roof metric that is the basis of code requirements, thereby improving the effectiveness of the Standards. Third, terminology has been change to be consistent with nationally recognized terminology. Finally, the regulations add specifications for the maximum thermal emittance of radiant barriers and for radiant barrier products to be certified by the Department of Consumer Affairs. By requiring radiant barriers to limit the amount of heat transferred into the building space, the regulations save energy. Clarifying the specifications and required certification for radiant barriers will improve the quality of this product when used to meet the Part 6 code requirements, thereby improving the effectiveness of the Standards.

SECTION 110.9 – MANDATORY REQUIREMENTS FOR LIGHTING CONTROL DEVICES AND SYSTEMS, BALLASTS, AND LUMINAIRES

In general: the regulations add “and systems” to this section title to clarify that there are requirements related to lighting control systems in this section, and they reorganize this section and delete obsolete language, in order to simplify and clarify the Standards. Substantive changes are discussed below, under the subsections of this section.

Subsection 110.9(a): The regulations remove the existing language providing instructions on certification of lighting control devices to lighting product manufacturers. These instructions are no longer necessary in Title 24, Part 6 because self contained lighting control devices are now regulated under the Title 20 Appliance Efficiency Regulations. Lighting control classifications and requirements for lighting product certification in accordance with Title 20 are also added to be consistent with new Appliance Efficiency Regulations.

Subsection 110.9(b): The regulations add requirements for lighting control systems to be

fully functional and to meet the same criteria that self contained lighting control devices must meet under Title 20. This requirement clarifies that lighting control systems continue to be regulated by Title 24, Part 6 even though there are new lighting equipment regulations in Title 20. Time switch lighting controls, daylighting controls, dimmers, occupant sensing controls, and part-night outdoor lighting controls (controls that reduce or turn off outdoor lighting for a portion of the night) are now required to meet the criteria listed in this subsection before they can be used to meet Title 24, Part 6 requirements.

Subsection 110.9(c-k): The regulations remove existing language for lighting control requirements that is no longer needed due to the reorganization of this code section and due to the new lighting control requirements in Title 20.

Subsection 110.9(c): The regulations clarify the required functionality of track lighting integral current limiters (electrical current limiters that are built directly into the track lighting fixture) and add lighting control acceptance requirements for these devices. These changes will improve the performance of current limiters and thereby save energy.

Subsection 110.9(d): The regulations add this entire subsection. The required functionality of supplementary overcurrent protection panels (electrical panels that provide a limited amount of overcurrent protection for track lighting systems, designed exclusively for specific track lighting products) are relocated from existing Section 130(d) (now renumbered as Section 130.0(c)) to this subsection. They are also modified to specify the required functionality and installation location of supplementary overcurrent protection panels. Finally, the proper installation of supplementary overcurrent protection panels must now be verified, to ensure that the equipment functions properly. These new requirements will improve the performance of protection panels (and the track lighting systems they affect) and will thereby save energy.

Subsection 110.9(e): The regulations modify the required functionality of residential high efficacy LED lighting as follows: First, the term “with integral heat sink” was removed for clarity because it was superfluous. Second, the word “residential,” and the sentence, “Nonresidential LED lighting is not required to be certified to the Energy Commission” were added to clarify that this requirement does not apply to nonresidential LED lighting. Third, the reference to Table 150-C was removed and a reference to Reference Joint Appendix JA-8 was added because information previously in Table 150-C was moved to JA-8 for clarity. Fourth, the requirement for luminaire power to be determined as specified by Section 130(d)5 was removed for clarity because it is redundant with new language in Section 130.0(c)9. These clarifications will improve code compliance.

Subsection 110.9(f): The regulations add language stating that the ballast requirements for residential recessed luminaires in this subsection apply only to ballasts for compact fluorescent lamps, to clarify that the requirement was not intended to apply to ballasts for high intensity discharge lamps, or to ballasts for linear fluorescent lamps, both of which are also found in residential recessed luminaires. The regulations also remove language related to power adjustment factors because these are no longer used in the Standards.

SECTION 110.10 – MANDATORY REQUIREMENTS FOR SOLAR READY BUILDINGS
The regulations add this new section, which requires that buildings be designed and constructed with adequate access for future solar thermal and solar electric equipment

("solar ready" requirements). The various subsections specify (1) the building types covered, (2) requirements for "solar zone" dimensions for piping, (3) how interconnection pathways must be indicated on construction documents, (4) solar ready documentation requirements, and (5) requirements for capacity and reserved space of main electrical service panels. The changes are necessary to allow building owners to install future solar thermal and solar electric systems more cost-effectively, which will help minimize fossil-fuel use in buildings.

SUBCHAPTER 3 – Nonresidential, High-Rise, Hotel/Motel Occupancies, and Covered Processes – Mandatory Requirements

The regulations modify this subchapter title to clarify that all mandatory requirements for nonresidential, high-rise residential and hotel/motel buildings are included in this subchapter, not just those requirements related to space conditioning and water heating. Also, the chapter title was modified to expand the scope of refrigerated warehouses to include all covered processes regulated by Title 24 in this subchapter.

SECTION 120.1 – REQUIREMENTS FOR VENTILATION

The regulations make several changes to this section, as follows:

First, modify general ventilation requirements from applying to enclosed spaces in buildings that are normally used for humans, to applying to enclosed spaces in a building with the exception of refrigerated warehouses and other spaces or buildings that are not normally used for human occupancy and work. This modification clarifies specifically to which spaces the ventilation requirements apply, thereby increasing the precision and ease-of-compliance of the Standards.

Second, add occupant sensor ventilation control devices (devices that sense human occupancy based on motion detection technology, then control ventilation rates according to the requirements in this code section) to allow another possible approach to reduce outdoor air flow rates when specific building spaces are unoccupied. The addition of another type of ventilation control device that can be used to meet the demand ventilation control requirements makes the regulations easier to comply with.

Third, add requirements for the control of outdoor air flow rates in space conditioning systems, such that the systems must measure and control outdoor air flow within 10 percent of the required air flow rates.

Finally, add an exception to when occupant sensors shall be used to reduce the rate of outdoor air flow when occupants are not present, to exclude spaces equipped with an occupant sensor, when vacant during hours of expected occupancy and the occupied ventilation rate required by Section 120.1(b)2 is not provided – in which case the system or zone controls shall cycle or operate to maintain the average outdoor air rate over an averaging period of 120 minutes.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

SECTION 120.2 – REQUIRED CONTROLS FOR SPACE-CONDITIONING SYSTEMS

The regulations make several changes to this section, as follows:

First, add sensor and control requirements for specific building types so that cooling and heating temperature setpoints and ventilation rates will be automatically adjusted during unoccupied periods.

Second, add specifications for automatic demand shed controls (controls that can receive an electronic signal to reduce energy use and react to this signal by automatically adjusting setpoint temperatures and turning off non-critical equipment), include requirements for these controls to be disabled by authorized facility operators, and include the ability for an operator to issue a single manual command (such as increasing cooling setpoint temperatures) that is automatically distributed to all appropriate temperature controllers. Also, add requirements for direct expansion equipment to include fault detection and diagnostics for economizer operations (the ability to identify when its economizer is not operating properly and diagnose the probable reason for this malfunction).

Third, expand requirements for occupancy sensors and controls, and for automatic shed controls, and the new requirements for economizer fault detection and diagnostics.

Finally, add an exception to the zonal thermostat controls for specific types of heaters; add requirements for shut off and reset controls for space-conditioning systems in small multi-purpose rooms, classrooms, conference rooms, conventions, auditoriums, and meeting center rooms; move the requirements for captive key controls in motel guest rooms from proposed section 150.0(f) to Section 120.2(e)4; and add requirements for temperature sensors to be included in economizer fault detection and diagnostic systems.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

SECTION 120.3 – REQUIREMENTS FOR PIPE INSULATION

The regulations update the pipe insulation requirements to match the federal efficiency standards. This update is necessary under law.

SECTION 120.4 – REQUIREMENTS FOR AIR DISTRIBUTION SYSTEM DUCTS AND PLENUMS

The regulations add a requirement to meet American National Standards Institute (“ANSI”) and Sheet Metal and Air Conditioning Contractors’ National Association (“SMACNA”) duct construction standards, which improves the consistency between Title 24, Part 6 and the California Mechanical Code (Title 24, Part 4).

SECTION 120.5 – REQUIRED NONRESIDENTIAL MECHANICAL SYSTEM ACCEPTANCE

The regulations clarify an exception to the air economizer acceptance requirements to better convey that the construction inspection steps in the acceptance process must be completed even if the economizer is factory installed, calibrated, and tested.

The regulations also add construction inspection and functional testing requirements for supply air temperature reset controls, condenser water reset controls, and energy management control systems.

These clarifications and additions will improve compliance with the Standards, and thus increase their energy savings, by ensuring that the efficiency measures are installed and operate as intended.

SECTION 120.6 – MANDATORY REQUIREMENTS FOR COVERED PROCESSES

The regulations modify this section title to clarify that all mandatory requirements for all “covered processes” – that is, energy-related activities covered in Part 6 that are not related to human occupancy – are now included in this section. Within the text of the section, requirements for refrigerated warehouses have been moved to the first subsection, and subsections have been added for commercial refrigeration, enclosed parking garages, process boilers, and compressed air systems; the substantive changes are discussed immediately below.

Subsection 120.6(a):

The regulations make several changes to this subsection, as follows:

First, exclude quick chilling and quick freezing condensers and compressors from the Standards’ refrigerated warehouse efficiency requirements if the condensers and compressors make up more than 20 percent of the total refrigeration system capacity.

Second, require (i) increased amounts of insulation in refrigerated warehouses; (ii) all evaporator fans serving compressors that are not variable speed to have the ability to reduce fan speed by at least 40 percent while the compressor is not running; (iii) refrigeration systems to include condensing temperature reset controls; (iv) fan-powered condensers to meet a minimum efficiency; and (v) air infiltration barriers to be installed in refrigerated warehouses.

Finally, add construction inspection and functional testing requirements (also known as “acceptance tests”) for electric resistance under-slab heating systems, evaporators, evaporative condensers, air-cooled condensers, and variable speed compressors.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 120.6(b): The regulations add this commercial refrigeration subsection. Requirements are created for condenser speed controls, fan-powered condenser efficiency, compressor system controls, display case lighting controls, and refrigeration heat recovery in commercial refrigeration. By including commercial refrigeration systems in the standards and adopting cost-effective energy efficiency requirements for them, these regulations will result in economic and environmental benefits.

Subsection 120.6(c): The regulations add this enclosed parking garage subsection. Requirements are created for mechanical ventilation systems to modulate ventilation rates in response to the automatic detection of specified levels of contaminants in the air; in addition, when contaminant levels are below a specified limit, ventilation systems must be shut-off, saving energy during times when there is no automobile activity in the parking garage. The new efficiency requirements will cost-effectively increase the stringency of the Standards, thereby minimizing the energy use of enclosed parking garages, saving money, and reducing environmental damage.

Subsection 120.6(d): The regulations add this process boiler subsection. Requirements are created for process boilers (which serve a load that is not related to the space conditioning, lighting, water heating, or ventilating of a building as it relates to human occupancy) to be equipped with a combustion air shut-off device, for fan motors serving such boilers to be variable speed or to limit demand based on airflow rate, and for process boilers to limit the amount of excess oxygen used in the combustion process. The new efficiency requirements will cost-effectively increase the stringency of the Standards, thereby minimizing the energy use of buildings with process boilers and saving money for building owners and operators, and also reducing environmental harm.

Subsection 120.6(e): The regulations add this subsection on compressed air systems. Such systems must (i) have trim compressors (compressors with variable speed capability so that they can be operated to specifically meet the compressed air load), compressed air storage, and system controls; and (ii) undergo construction, inspection, and functional testing. The new efficiency requirements will cost-effectively increase the stringency of the Standards, thereby minimizing the energy use of buildings with compressed air systems, with resulting economic and environmental benefits; the new testing requirements will improve compliance with the Standards by ensuring that the specified systems are installed and operate as intended.

SECTION 120.7 – MANDATORY INSULATION REQUIREMENTS

The regulations add this section to specify the mandatory minimum levels of roof, wall, and floor insulation in newly constructed nonresidential, high-rise residential, and hotel/motel buildings. These cost-effective requirements will save energy, reduce utility bills, and lessen environmental damage.

SECTION 120.8 – BUILDING COMMISSIONING

The regulations add this section to consolidate and improve the mandatory requirements for the commissioning of nonresidential, high-rise residential, and hotel/motel buildings. Commissioning is a quality assurance process that ensures that buildings are designed and operate as the owners intend. The current applicable commissioning requirements in Title 24, Part 11 are relocated to this section. In addition, requirements are added for design review, which is a secondary review of the construction drawings and specifications that seeks to improve compliance with the Title 24 regulations, encourage adoption of best practices in design, and encourage designs that are constructible and maintainable. These building commissioning requirements, including design review, will improve compliance with the standards (thereby saving energy and money, and reducing environmental damage) and will provide building owners with more information about their buildings' systems, equipment, and energy efficiency features, which should lead to even more savings.

SECTION 120.9 – MANDATORY REQUIREMENTS FOR COMMERCIAL BOILERS

The regulations add this section to specify new mandatory requirements for commercial boilers that are used for heating, ventilating, or water heating (as opposed to process boilers, which are discussed under Subsection 120.6(d) above). Requirements are added for boilers to be equipped with a combustion air shut-off device, for fan motors to be variable speed or to limit demand based on airflow rate, and for commercial boilers to limit the amount of excess oxygen used in the combustion process. The new efficiency requirements will increase the stringency of the Standards, thereby minimizing the energy use of buildings and producing associated economic and environmental benefits.

SUBCHAPTER 4 – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Mandatory Requirements for Lighting Systems and Equipment, and Electrical Power Distribution Systems

The regulations add “and electrical power distribution systems” to this section title to indicate that the Standards include requirements for these systems.

SECTION 130.0 – LIGHTING CONTROLS AND EQUIPMENT—GENERAL

The regulations reorganize this section and delete obsolete language. They also make substantive changes, discussed below under individual subsections of section 130.0.

Subsection 130.0(b): The regulations combine the current requirements in subsections 130(b) and (c), for identifying specific space types within nonresidential buildings that are required to comply with the residential lighting standards, into new subsection 130.0(b). Fire station dwelling accommodations have been added as a residential building space type. Dormitory and senior housing units have been moved from the nonresidential lighting requirements in Table 146-F and added as residential building space types, normally in nonresidential buildings, which are required to comply with the residential lighting requirements. These modifications improve the organization of the Standards, thereby making the requirements easier to understand and comply with.

Subsection 130.0(c): The regulations modify the following language this subsection as follows.

First, add new requirements for the classification of luminaires (light fixtures). The luminaire classifications in the regulations (i) designate as “incandescent” all lighting systems that have components that would allow incandescent lamps to be used in any fixture; and (ii) prevent lighting systems from being classified as “LED” (light-emitting diode, which is highly efficient) if they do not have all of the specified functions of true LED systems. This ensures that both low-efficiency systems (those that have the characteristics of incandescent systems), which waste energy that must be made up for in other aspects of a building’s lighting system, and systems for which designers want to get “extra credit” for installing (those that are designated as LED systems), are in fact classified correctly and are regulated accordingly.

Second, clarify and simplify the criteria that must be used to determine luminaire power (the wattage of a light fixture).

Third, state that screw-base adaptors (sockets in light fixtures that allow screw-in bulbs to be installed), and LED screw-based lamps, cannot be used to meet the lighting efficiency requirements of Title 24, Part 6. This is because luminaires into which such screw based products are installed can be readily converted back to incandescent luminaires, allowing them to consume significantly more energy than is allowed by the Standards.

Fourth, differentiate the requirements for transformers serving dynamic loads from the requirements for transformers serving static loads, thereby making the requirements for each more appropriate and accurate (and thus more energy-saving) than the previous requirements, which lumped both types of transformers together.

Fifth, require a post-installation field inspection for integral current limiters for track lighting (current limiters that are built directly into a track lighting fixture). This will improve the performance of such systems.

Sixth, modify the test requirement for LED lamps, such that LEDs must now adhere to a nationally recognized test standard. This will ease compliance for manufactures and increase the functionality of LED lamps.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 130.0(d): This new subsection clarifies that all lighting controls must comply with the applicable requirements in Section 110.9 and be installed according to manufacturer instructions. These are not new requirements; they have been relocated here from Section 110.9 so that all lighting requirements are in one place in the Standards.

SECTION 130.1 – INDOOR LIGHTING CONTROLS THAT SHALL BE INSTALLED
The regulations reorganize this section and delete obsolete language. They also make substantive changes, discussed below under individual subsections of section 130.1.

Subsection 130.1(a): The regulations reduce the amount of lighting without controls that may be installed in specified building areas, which reduces the energy use of buildings.

Subsection 130.1(b):

The regulations modify the following language in this subsection in several ways:

First, reduce the threshold (measured in watts per square foot) at which multi-level lighting controls must be installed. This results in the multi-level lighting control requirements applying to more spaces in more buildings.

Second, the requirements for multi-level lighting controls to operate in steps and to produce light uniformly are modified to be applicable to specific lighting technologies, and a requirement is added for lighting controls to include at least one of the five listed control types.

Finally, an exception to the multi-level lighting control requirements is added for classroom lighting, because the record shows that it is not technically feasible to require the same type and level of controls for classrooms as is required for other building types.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 130.1(c): The proposed language clarifies that countdown timer switches do not qualify as automatic shut off controls, except for limited applications, thereby saving energy where countdown switches are less effective than automatic controls. Requirements have been added, for some applications, to partially shut off lighting that uses occupancy sensing controls, saving additional energy.

Subsection 130.1(d): Exceptions to the daylighting control requirements, which required complex engineering analysis to be completed in order to qualify for the exceptions, have been removed, simplifying the standards, and saving additional energy. A requirement is added for daylighting controls in parking garages, which increases the stringency of the Standards, thereby minimizing the energy use of parking garages.

Subsection 130.1(e): The regulations reduce the threshold (measured in a building's square feet) at which demand-responsive lighting controls are required, and they add an option for meeting the requirements. The threshold reduction increases the number of buildings with the capability of reducing loads during peak electricity periods, which in turn minimizes the energy costs of these buildings. The addition of the compliance option gives additional flexibility to building designers, which is likely to reduce costs and increase compliance.

SECTION 130.2 – OUTDOOR LIGHTING CONTROLS AND EQUIPMENT

There are several changes to this section, as follows:

Subsection 130.2(a): The regulations modify this subsection so that motion sensors, which were required to be installed on all inefficient lighting technologies, defined as not meeting a minimum threshold of lumens per watt, now are required only for incandescent luminaires. This change reflects the current state of lighting technologies, where mercury vapor lighting (a relatively inefficient light source) has been eliminated by federal regulations, so that incandescent technology remains as the primary inefficient outdoor lighting technology. Also, existing exceptions to these requirements are no longer necessary because efficient lighting technologies are now readily available for the special outdoor lighting applications that were previously excepted. These modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 130.2(b): The regulations replace luminaire cutoff requirements (shielding of light) with new requirements for Backlight (light applied to the back of a subject being lit), Uplight (light applied from below a subject being lit), and Glare ratings. The new requirements for backlight, uplight, and glare (collectively referred to as “BUG”) ratings reflect a change in industry metrics for outdoor lighting applications and thereby make the Standards easier for building designers to understand.

Also, the luminaire wattage threshold, which determines when the BUG requirements apply, has been reduced, and the existing exceptions to these requirements are removed because they are no longer necessary in that efficient technologies are now readily available for the previously-excepted outdoor lighting applications. These modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 130.2(c): The regulations remove exceptions that are no longer necessary because efficient lighting technologies are now readily available for the outdoor lighting applications that were previously excepted. In addition, requirements are added for outdoor lighting to be switched independently from other electrical loads. Finally, specified outdoor luminaires now must be controlled by (i) multi-level motion sensors (where light fixtures are required to have a low light level for periods when no motion is detected, and to allow a higher light level for when motion is detected); (ii) part-night

lighting control devices (controls that reduce or turn off outdoor lighting for a portion of the night); or (iii) centralized time-based zone lighting controls (where lighting in multiple zones can be scheduled to turn on and off from a central location). These changes increase the precision and stringency of the Standards, thereby minimizing the energy use of buildings, which in turn improves the state's economic and environmental health.

SECTION 130.3 – SIGN LIGHTING CONTROLS

The regulations eliminate an exception for specific types of sign lighting because control technologies are now readily available for these types. These modifications minimize the energy use of buildings, which in turn improves the state's economic and environmental health.

SECTION 130.4 – REQUIRED NONRESIDENTIAL LIGHTING CONTROL ACCEPTANCE

The regulations add requirements for nonresidential lighting control acceptance testing. Requirements have been added for installation certificates to be submitted for specified voluntary measures that can be used to increase lighting power, in order to validate that such voluntary measures have been appropriately applied. These clarifications improve code compliance by ensuring that lighting controls are installed and tested according to the requirements in the Standards.

SECTION 130.5 - ELECTRICAL POWER DISTRIBUTION SYSTEM

The regulations add this subsection to set requirements for service metering, disaggregation of electrical circuits, maximum voltage drop, receptacle circuit controls, demand response signals, and energy management control systems. These new requirements will reduce the costs for building owners to submeter their energy end use loads and to control building power during peak demand periods, thereby minimizing the ownership and energy costs of buildings.

SUBCHAPTER 5 – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Performance and Prescriptive Compliance Approaches for Achieving Energy Efficiency

SECTION 140.0 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES

As described in the Introduction to this document, the building standards contain two basic requirements that all new buildings must meet: (i) a set of mandatory measures, and (ii) an overall energy goal for each building type. Up to this point, the FSOR has described the mandatory measures (and general provisions that are applicable throughout all of the Standards). The FSOR now turns to the provisions that describe how the overall energy goal must (or may) be met.

The overall energy goal may be met either by demonstrating that the building's energy use will be lower than a specified "energy budget," or by installing a set of "prescriptive measures." These two alternate compliance options are called the "performance compliance approach" and the "prescriptive compliance approach", respectively, in the Standards.

Section 140.1 describes the performance compliance approach for new nonresidential, high-rise residential, and hotel/motel buildings. Sections 140.2 - 140.9 describe the prescriptive compliance approach for new nonresidential, high-rise residential, and

hotel/motel buildings. Each one of those Sections is discussed in more detail below. (Requirements for additions, alterations, and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings are in Subchapter 6 (sections 141.0 - 141.1), which is discussed below. Requirements for new construction of, and for additions and alterations to, other building types are discussed in subsequent subchapters.)

With regard to the introductory material in Section 140.0:

First, this section's title is modified to clarify that the performance and prescriptive compliance approaches are described in this section.

Second, a reference to the Joint Appendix is added in a note to explain the zip code basis of all climate zone descriptions. Using a zip code basis, rather than the metes and bounds used in previous Standards, to identify the appropriate climate zone of a building location will make it easier for building owners and energy consultants to comply with, and building officials to enforce, the Standards.

Finally, the regulations clarify that buildings must comply with all mandatory measures as well as either the prescriptive or performance compliance approaches.

These modifications will improve compliance with the Standards by making them easier to understand.

SECTION 140.1 – PERFORMANCE APPROACH: ENERGY BUDGETS

The regulations delete existing language that is extraneous and clarify the energy budgets for the “standard design building” in the performance approach. These modifications simplify the language, thereby improving the effectiveness of the Standards.

SECTION 140.2 –PRESCRIPTIVE APPROACH

The regulations add prescriptive requirements for “covered processes,” by adding a subsection that references section 140.9, where those prescriptive requirements are detailed. The addition of this subsection makes it clear that the prescriptive approach includes these new covered process requirements, thereby improving compliance with the Standards.

SECTION 140.3 – PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES

Building “envelopes” are the components that make up the “outside” of the building and thus separate the occupied interior from outside conditions: walls, roofs, doors, windows, and the like. The regulations modify prescriptive requirements (i.e., those that must be met by all, or specified, buildings within the scope of the subchapter) for specified types of envelope components, as follows.

Subsection 140.3(a): The regulations modify the following provisions in this subsection:

First, minimum reflectance requirements for specified types of roofs are added or increased. Reflectance requirements provide a minimum level of roofing product reflectivity, which reduces solar heat gains to buildings. The regulations (i) increase the minimum reflectance requirements for low-sloped roofs on nonresidential buildings, and (ii) add reflectance requirements for steep-sloped roofs on high-rise residential and hotel/motel buildings.

Second, requirements are added for minimum levels of fenestration product (glass envelope component) visual transmittance (which measures how much light comes through fenestration products). These changes will require nonresidential buildings to use windows and skylights that provide more daylight into the building, thereby reducing the need for electrical lighting.

Third, envelope air barrier requirements, which limit the amount of outside air that is unintentionally introduced into a building through cracks in the building envelope, are added for buildings in specified climate zones.

Finally, the regulations add area-weighted performance requirements for (i) fenestration product U-factors (which measure how rapidly heat gets transferred through building components), (ii) relative solar heat gain coefficients (which measure how much heat is gained when the sun shines on fenestration products), and (iii) visual transmittance (explained above). Currently, those requirements must be met for each separate fenestration product (each window, for example). Area-weighted performance requirements allow building designers to meet these requirements averaged over, for example, all of the windows in a building, so that some windows will exceed the requirements and some will not, as long as the average performance of all windows taken together is no worse than the performance would have been had each individual window meet its own prescriptive requirements. The modifications will provide more flexibility to building owners and designers in complying with envelope requirements, which will reduce costs and improve the effectiveness of the Standards.

All of the above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 140.3(b): The regulations remove the Envelope Tradeoff Procedure as an alternative prescriptive compliance approach. This procedure is very complex and, as such, was difficult to use and enforce. Instead, alternative envelope measures can be used in the performance compliance approach. Eliminating this complex procedure will improve enforcement of the Standards.

Subsection 140.3(c): The regulations increase the minimum requirements, for the percentage of floor areas that shall be daylit, for large enclosed spaces in low-rise buildings. These modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

SECTION 140.4 – PRESCRIPTIVE REQUIREMENTS FOR SPACE CONDITIONING SYSTEMS

Space conditioning systems, such as furnaces and air conditioners, are the mechanical equipment that heats and cools the interior spaces in buildings for occupant comfort, and that ensures that indoor air quality is adequate to protect health. The various subsections in this section contain requirements that all, or specified types of, space conditioning systems must meet in the buildings within the scope of the subchapter (i.e., nonresidential, high-rise residential, and hotel/motel).

Subsection 140.4(b)10: The regulations clarify that miscellaneous equipment, which is subject to the efficiency requirements in subsection 140.4(a), includes equipment loads

that are “other than process loads” so as to not conflict with the new process load requirements in Section 120.6.

Subsection 140.4(c): Currently, this subsection contains requirements for a small subset of systems (variable air volume fans and motors, where motor size is ten horsepower or larger). The regulations replace those with more expansive requirements for all single and multiple zone space conditioning systems in a new subsection 140.4(m). The new requirements are consistent with newly proposed national ASHRAE Standards.

In addition, a requirement is added for fractional fan and pump motors to be electronically-commutated (a specific motor type that is inherently energy efficient) or to meet a minimum specified level of energy efficiency.

The above modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 140.4(d): This subsection currently requires a specific type of space conditioning system to have zonal controls, so that different spaces in a building can be heated or cooled differently, or not at all, thereby allowing more efficient use of the systems than would be possible if they could be adjusted only on a whole-building basis. The subsection also contains various exceptions to the requirements. The regulations expand the criteria necessary to qualify for an exception to the space-conditioning zone control requirements, so that direct digital control systems intended to qualify for the exception must now include two-stage heating controls. These modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 140.4(e): This subsection currently requires specified types of space conditioning systems to have economizers, which use outside air to meet indoor cooling requirements when the local climate conditions are appropriate. All of the regulations in this subsection increase the stringency of the standards, either by tightening, or by expanding the scope of, the requirements, as follows.

First, the regulations reduce the size threshold for when space conditioning systems must include an economizer.

Second, they remove an exception to the economizer requirements for computer rooms; as a result, computer rooms, now included by the regulations as a covered process in Section 140.9(a), cannot use the same exception for other space types that must meet specific humidity levels required for the process loads in these spaces. The computer room requirements in Section 140.9(a) include economizer requirements that would otherwise conflict with the current exception.

Third, the regulations update the allowable economizer and equipment efficiency trade-offs (which provide a prescriptive alternative to the economizer requirements by substituting higher efficiency space cooling equipment). These updates are necessary to provide the appropriate levels of cooling system performance, such that performance is equivalent in expected annual energy usage to the annual energy use expected from the new economizer requirements in each climate zone.

Fourth, the regulations modify the air economizer high-limit shut-off control requirements in Table 140.4-B, to (i) provide requirements that are more climate-zone specific for some economizer types; (ii) specify the air shut-off control requirements for a new type of economizer (a fixed-enthalpy, fixed dry bulb economizer); and (iii) prohibit the use of economizer controls that use enthalpy alone as the control parameter (e.g., fixed enthalpy, electronic enthalpy, and differential enthalpy economizers).

Fifth, the regulations add required criteria for air economizers and return air dampers in the areas of warranty, drive mechanism, damper reliability testing, damper leakage, adjustable setpoint controls, relief air system and damper control sensor location, accuracy, and calibration. Each of these new specifications upgrades the functionality, manufacturer testing, and manufacturer support of economizers.

Finally, the regulations add requirements, for all space conditioning systems that must include economizers, to use integrated economizer controls (economizer controls that are interlocked with mechanical cooling controls, such that the economizer is used to the greatest extent possible, when appropriate, before mechanical cooling is used). Requirements are also added for direct expansion systems to stage or modulate cooling capacity, such that reduced cooling capacity must be delivered with a corresponding reduction in electrical power demand.

All of the above modifications increase the stringency of the standards or add functionality requirements for equipment. All are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 140.4(h): The regulations add requirements that must be met when multiple cell heat rejection equipment is installed.

Subsection 140.4(i): Where chillers are used, the regulations require them to meet the ASHRAE 90.1 Path B efficiency requirements (which are the more stringent of the two optional paths provided in the ASHRAE standard that is referenced as a mandatory requirement in Section 110.2(a)). By setting the Path B chiller efficiencies as the prescriptive requirement, the regulations will save energy, reduce utility bills, and lessen environmental damage.

Subsection 140.4(j): The regulations modify the airflow requirements for multi-zone and single-zone HVAC systems by following ASHRAE 90.1-2010, which expands the scope of the standards by including smaller sized units than were previously covered, thus increasing the stringency of the standards. The new requirements are consistent with newly proposed national ASHRAE Standards and have the support of national product manufacturers. The modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

SECTION 140.6 – PRESCRIPTIVE REQUIREMENTS FOR INDOOR LIGHTING

The regulations reorganize this section and remove redundant language to improve clarity; the regulations also delete requirements that are no longer relevant to this section because in the regulations they are “mandatory” rather than “prescriptive” (see Section 130.0 and 130.1). Substantive changes to individual subsections are as follows:

Subsection 140.6(a):

First, the regulations (i) increase the amount of watts per square foot of portable lighting

that does not need to be included in the calculation of the total building lighting power density, and (ii) reduce the allowable watts per square foot for office lighting. The combination of allowing slightly more portable lighting and allowing less overall lighting power densities results in more energy efficient lighting systems.

Second, the regulations modify the requirement for interlocks between multiple lighting systems to specify that interlocks need be applied to no more than two lighting systems serving the same building space. These clarifications will improve compliance with the Standards.

Third, the regulations remove the Power Adjustment Factors (PAFs) for daylighting controls, because daylighting controls have been changed from prescriptive to mandatory and the PAFs apply only to prescriptive lighting power density levels. (PAFs provide energy credits for specified lighting controls when a building designer is calculating allowable lighting power densities.)

Fourth, because PAFs apply only to permanent lighting installations, the regulations add criteria that determine when furniture-mounted general lighting can be considered permanently installed. This will increase the precision, and thus the energy savings, of the Standards.

Finally, requirements are added for installation certificates, to verify that installed PAFs match the PAFs described in building permit applications. These requirements will improve the effectiveness of the Standards by improving compliance verification.

Subsection 140.6(a)3: The requirements for refrigerated cases are revised to be consistent with the Title 20 Appliance Efficiency Regulations. Also, elevator lighting has been excluded from the calculation of the allowable building lighting power density, in order to be consistent with ASHRAE/IESNA Standard 90.1, 2010.

Subsection 140.6(b): The regulations reorganize and clarify the general rules for calculation of allowed indoor lighting power density. Lighting power trade-offs provide flexibility in by allowing more lighting in one area of the building if there is less lighting in another area. The changes to this section clarify when this lighting power trade-off option can be used, which will improve code compliance.

Subsection 140.6(c): The regulations make the following changes to this subsection:

First, they reduce the watts per square foot of lighting power allowed for specified building types and areas within buildings. These reductions will cost-effectively increase the stringency of the Standards, thereby minimizing the energy use of buildings, which in turn improves the state's economic and environmental health. Second, the regulations modify the power credit that is available for display lighting, by stating that the credit is available only when using the "tailored method" for compliance with lighting requirements, and only for wall display lighting and floor display lighting. The power credit should not be available for ceiling display lighting because a high light delivers less illumination than does a low light. Both of these modifications are cost-effective and will save energy, reduce utility bills, and lessen environmental damage.

Finally, the regulations update the terminology used to measure the light falling on a

horizontal surface, which is used to determine the allowable lighting power density in specified circumstances, to be consistent with the new 10th Edition of the Illuminating Engineering Society's Lighting Handbook.

Subsection 140.6(d): The regulations add this new subsection, which requires the installation of automatic daylight controls in secondary daylit zones. (Automatic daylight controls measure how much light is entering a building space from windows or skylights and reduce the amount of electrical lighting accordingly. A secondary daylit zone is an area located a horizontal distance from a window that is twice the vertical distance between the floor and the top of the window.) Requiring daylight controls for the portions of a building that are not directly adjacent to windows, but still receive enough indirect light through the windows to allow reductions in electric lighting, will allow the daylight entering these spaces to be used in order to save energy cost-effectively and thereby reduce utility bills and lessen environmental damage.

SECTION 140.7 – PRESCRIPTIVE REQUIREMENTS FOR OUTDOOR LIGHTING

The regulations make several modifications to this section, as follows:

First, they remove the additional amount of outdoor lighting power allotment that the current standards allow in specific locations when a local ordinance requires minimum outdoor lighting levels. This additional allotment is not needed to provide appropriate levels of outdoor light recommended by the Illuminating Engineering Society of North America, in its new 10th Edition Handbook.

Second, the regulations remove an exception to outdoor lighting power requirements, which is currently provided for water feature lighting, because cost-efficient lighting technologies are now readily available for these lighting applications and thus the exception is no longer justified. Removing the exception saves energy.

Third, the regulations reduce lighting power allotments for paved areas like streets and sidewalks, and for building entrances and exits, vehicle service station canopies, and outdoor dining areas. The reductions save energy cost-effectively.

SECTION 140.9 – PRESCRIPTIVE REQUIREMENTS FOR COVERED PROCESSES

The regulations add this section to describe the prescriptive requirements for three processes: computer rooms, commercial kitchens, and laboratory exhaust systems, all of which are described further below. These are the only covered processes that have prescriptive requirements in the Standards. (The other covered processes only have mandatory requirements, which are explained above in Section 120.6.) All of the requirements save energy cost-effectively, thereby reducing utility costs and environmental damage.

Subsection 140.9(a): Computer Rooms. The regulations include requirements for economizers, prevention of reheat, humidification, fan power consumption, fan control, and air containment.

Subsection 140.9(b): Commercial Kitchens. The regulations include requirements for exhaust system replacement air, exhaust airflow rates, kitchen ventilation, and acceptance testing for kitchen exhaust systems.

Subsection 140.9(c): Laboratory exhaust systems. The regulations require that exhaust systems be capable of reducing zone exhaust and makeup airflow rates when the laboratory exhaust hoods are not operating.

SUBCHAPTER 6 – Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies – Additions, Alterations, and Repairs

Subchapter 6, like subchapter 5, covers nonresidential, high-rise residential, and hotel/motel buildings. However, while subchapter 5 covers the performance and prescriptive compliance approaches for new construction in such buildings, subchapter 6 covers the requirements that are applicable to additions, alterations, and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings. In general, the performance and prescriptive requirements for new buildings remain applicable to additions, but more limited requirements are applicable to alterations and to repairs.

SECTION 141.0 – ADDITIONS, ALTERATIONS, AND REPAIRS TO (1) EXISTING BUILDINGS THAT WILL BE NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, OR HOTEL/MOTEL OCCUPANCIES, (2) EXISTING OUTDOOR LIGHTING FOR THESE OCCUPANCIES, AND (3) INTERNALLY AND EXTERNALLY ILLUMINATED SIGNS FOR THESE OCCUPANCIES

Subsection 141.0(a) [Additions, which is construction that adds floor space to existing buildings]: The regulations modify the performance compliance approach for construction projects that include both additions and alterations, in order to be more consistent with the prescriptive compliance approach, and to make the performance compliance approach easier to implement. In addition, the regulations add exceptions to various requirements for additions to which the new solar zone requirements apply (see Section 110.10). These modifications improve compliance because they explain each type of compliance approach for additions, and they describe the special cases for which exceptions exist (the new, cost-effective solar zone requirements will more than make up for any energy loss caused by the new exceptions).

Subsection 141.0(b) [Alterations, which is construction that modifies specified features or equipment and that affects energy use, but that does not add floor space, in existing buildings]: The regulations make a number of modifications, as follows:

First, they add exceptions to various requirements for alterations to which the new solar zone requirements apply (see Section 110.10). By adding specificity, the regulations improve compliance, while the new solar zone requirements will cost-effectively more than make up for any energy loss caused by the new exceptions.

Second, the regulations add cost-effective conductive heat transfer (U-factor) and solar heat gain (SHGC) criteria for fenestration. The new requirements will save energy.

Third, the regulations increase the roof reflectance requirements for low-slope roof alterations, but add a new exception to the requirements if (i) specified levels of insulation are added to the roof; (ii) a specified portion of the roof is covered by an integrated solar system; or (iii) the roofing product used in the alteration contains a specified minimum amount of thermal mass (thermal mass is characteristic that allows solar energy to be absorbed during the day and released at night). In addition, a current exception to the roof alteration requirements for specified roof and recoating types is

removed because among those types there are products that can meet the reflectance requirements cost-effectively, so the exception is no longer appropriate. The new requirements and the elimination of the current exception will increase the stringency of the standards and thereby save energy.

Fourth, the regulations remove one option for sealing ducts in altered spaces, which allowed compliance with the sealing requirements to be met by verifying that the altered duct system was 60 percent less leaky than the original system. This option has proved difficult to enforce in the field. The modified requirements now require that altered duct systems leak a total of 15 percent or less, and if this level of duct sealing cannot be achieved, then all visible leaks must be sealed and verified with a smoke test (a process where smoke is introduced into the space conditioning air stream, and the ducts are then visually inspected to see if the smoke leaks, in which case the leaky spots must be patched). Even though the required percentage of leakiness is relaxed, the increased testing requirements are likely to result in overall energy savings in a cost-effective manner.

Fifth, the regulations require space conditioning systems with economizers to have control systems that cost-effectively integrate economizer and cooling operations. This requirement will ensure that space conditioning systems use outside air for space cooling as much as possible, thereby minimizing energy use.

Sixth, the regulations reduce the threshold that determines when a lighting alteration must comply with the Standards from 50 percent of the light fixtures per space to 10 percent. This cost-effective threshold reduction will require more alterations to meet the lighting efficiency requirements, thereby increasing energy savings.

Seventh, the regulations introduce a new term, "Luminaire Modifications-In-Place," to describe changes to light fixtures where the fixture is not relocated and the electrical wiring for the fixture is not altered, and the requirements for altered lighting systems are separated into two subsections, one for Luminaire Alterations and the other for Luminaire Modifications-In-Place, with separate definitional criteria and efficiency requirements for each. By making the Standards more precise, the modified language improves compliance.

Eighth, the regulations add requirements for outdoor lighting systems, such that (i) alterations must comply with the mandatory requirements for newly installed outdoor lighting if more than 10 percent of the existing outdoor lighting system is altered, and (ii) alterations must comply with the prescriptive requirements for newly installed outdoor lighting if the alteration increases the electrical load of the existing outdoor lighting system. These new requirements save energy cost-effectively.

Finally, the regulations modify the performance compliance method that is available for alterations, so that that method, for projects that include both additions and alterations, is more consistent with the prescriptive compliance approach. By making the performance compliance approach easier to implement and by increasing the precision of the Standards, the regulations will increase compliance and save energy.

SECTION 141.1 – REQUIREMENTS FOR COVERED PROCESSES IN ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING BUILDINGS THAT WILL BE NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES

The regulations explain where, in other sections of the standards, requirements for covered processes for additions, alterations, and repairs to existing buildings are located. The covered processes included in the section are refrigerated warehouses, commercial refrigeration, enclosed parking garages, process boilers, and compressed air systems.

SUBCHAPTER 7 – Low-Rise Residential Buildings – Mandatory Features and Devices

The Standards now turn from nonresidential, high-rise residential, and hotel/motel buildings to low-rise residential buildings. As before, there are (i) requirements for mandatory features and devices, (ii) an energy goal that can be met either by complying with an energy budget or by installing prescriptive features, and (iii) special requirements for additions and alterations (the Standards do not cover repairs to low-rise residential buildings). We first examine the mandatory features and devices, which are in Subchapter 7.

SECTION 150.0 – MANDATORY FEATURES AND DEVICES

Subsection 150.0(a): The regulations add insulation requirements for attic access doors to lessen the heat transfer between the unconditioned attic and the conditioned house.

Subsection 150.0(c): The regulations add an exception to the wall insulation requirements for existing walls that are already adequately insulated.

Subsection 150.0(f): The regulations remove the language for air retarder wraps because it is duplicative with the revised subsection (150.0(g)) for vapor retarders.

Subsection 150.0(g): The regulations add references to Class I and Class II vapor retarders in exterior walls. Each vapor retarder “class” refers to a specific level of vapor resistance; these class differentiations are used in the California Building Code and other national and international building codes.

Subsection 150.0(h): The regulations add requirements for the location of outdoor condensing units and the installation of central forced-air furnaces, in order to ensure proper operations. Condensing units must now be located at least five feet from dryer vents, and forced-air furnaces must be designed and installed to meet the manufacturer’s specifications for maximum temperature rise (the temperature increase from the furnace inlet to the furnace outlet). By requiring better HVAC system performance, these new requirements save energy.

Subsection 150.0(j): The regulations require below-grade hot water piping to be insulated, which will cost-effectively increase the stringency of the Standards, thereby minimizing energy use, reducing utility bills, and lessening environmental damage.

Subsection 150.0(k): The regulations reorganize this subsection for clarity. In addition, they:

First, change the method used to classify high efficacy luminaires (fixtures that efficiently deliver high quality light) from an efficacy calculation to a simple list of luminaire types. This modification improves the effectiveness of the Standards by simplifying compliance.

Second, require that if an Energy Management Controls System (EMCS) is installed to comply with the requirement for installation of a vacancy sensing lighting control, multi-scene programmable lighting control, or dimming lighting control, then the EMCS must meet all of the requirements for each respective lighting control for which it is installed to comply. This will ensure that EMCSes will perform as efficiently as possible.

Third, require a minimum of one high efficacy luminaire be installed in each bathroom; require all lighting in garages, laundry rooms, and utility rooms to be high efficacy; and require all lighting in garages to be controlled by vacancy sensors. All of these requirements will reduce energy use.

Fourth, reorganize the outdoor lighting requirements for single and multi-family outdoor lighting to more precisely differentiate them. This will increase the precision of the Standards, thereby saving energy and improving compliance.

Finally, add multi-family buildings to those that must meet outdoor lighting requirements. This new requirement will cost-effectively save energy.

Subsection 150.0(m): The regulations modify this subsection as follows:

First, they change the title to clarify that ducts, plenums, and fans serving ventilation systems are covered by the requirements in this subsection.

Second, they require field verification to ensure that space conditioning ducts are completely sealed when located in conditioned spaces. This field verification will improve compliance with the Standards.

Third, the regulations require the sealing of all space conditioning ducts regardless of where they are installed, in order to minimize duct leakage and thereby increase energy savings.

Fourth, the regulations require the installation of a permanent label on the space conditioning system at the air filter location, listing the particle filtration efficiency required by the Standards, the air flow rate at which the system is designed to operate, and the required pressure drop for replacement filters. Currently, air filters are often installed in space conditioning systems with no attention paid to the filter pressure drop or system air flow rate, and the result is that the system has too much pressure loss to deliver conditioned air at the expected rate. The new air filter labeling requirements will improve the performance of space conditioning systems and thereby save energy.

Fifth, the regulations require the testing of all space conditioning ducts to confirm that they deliver air at or above a specified rate when using fan power at or below a specified level. The new requirements will improve the performance of space conditioning systems.

Sixth, the regulations prohibit the use of bypass ducts to deliver conditioned supply air

directly to the space conditioning system return duct. Bypass ducts allow conditioned air to be delivered directly to the return side of the system, thereby “bypassing” the delivery of this conditioned air to the house, which reduces the efficiency of the space conditioning system. Prohibiting bypass ducts avoid this waste of energy.

Finally, the regulations modify (i) exceptions for static pressure hole (for the placement of a static pressure probe) locations; and (ii) the criteria for bypass ducts and zonally controlled central forced air systems. These changes will give builders more flexibility in meeting the standards, which will decrease costs while not increasing energy use.

Subsection 150.0(n): The regulations add water heater installation requirements that will enable the cost-effective future installation of high efficiency water heaters; the requirements deal with electrical receptacle proximity, venting, drainage, and fuel supply pipe sizing.

Subsection 150.0(o): The regulations disallow the use of continuously operating central forced air system fans to meet the whole building ventilation compliance option of the current mechanical ventilation requirements. Restricting the delivery of outside air for ventilation, to technologies that can provide this function cost-effectively, increases the stringency of the Standards, thereby reducing energy use, lowering energy costs, and reducing the environmental impacts of energy use.

The regulations also require the performance of mechanical ventilation systems to be field verified to ensure that outside air is being delivered for ventilation purposes only according to the criteria in the Standards, and not in ways that would increase energy use.

Subsection 150.0(q): The regulations add new requirements for the maximum conductive heat transfer (the heat that transfers through solid materials) allowed for fenestration products (windows, skylights, glass doors) that separate conditioned space from unconditioned space. These modifications are cost-effective requirements that will save energy, reduce utility bills, and lessen environmental damage.

Subsection 150.0(r): The regulations require that buildings meet the solar-ready requirements in Section 110.10 of Subchapter 2, which will allow home-owners to install future solar systems more cost-effectively, which in turn will help minimize fossil-fuel use and save energy.

SUBCHAPTER 8 – Low-Rise Residential Buildings – Performance and Prescriptive Compliance Approaches for Newly Constructed Buildings

This FSOR continues the discussion of the Standards for low-rise residential buildings, moving from the mandatory features and devices specified in Subchapter 7 (discussed above) to the performance and prescriptive compliance approaches for meeting the overall energy goal.

SECTION 150.1

Subsection 150.1(a): The regulations change the basis of all climate zones from metes and bounds to postal zip codes. Using a zip code basis rather than metes and bounds

(used in previous standards) will make it easier for building owners and energy consultants to comply with, and for building officials to enforce, the Standards.

Subsection 150.1(b): The regulations delete existing language that is extraneous, and they simplify the explanations of the energy budgets used in the performance approach. By making the Standards easier to read, these changes will improve compliance.

Subsection 150.1(c): The regulations made a number of changes to this subsection, as follows:

First, they remove the alternative package for all-electric buildings (known as “Package C” in the 2008 standards) from the prescriptive compliance approach, because the most recent analysis can no longer demonstrate that the all-electric package is equivalent in energy performance to the base prescriptive package (known as Package A) in all climate zones. The performance compliance approach still remains available for all-electric buildings, and it provides greater flexibility for builders than does the existence of multiple packages in the prescriptive approach. Thus removing the all-electric package will not decrease flexibility, but it will ensure greater consistency of energy performance.

Second, the minimum amount of insulation for wood-framed walls required in the prescriptive compliance approach is increased for all climate zones, in order to cost-effectively save energy.

Third, the regulations increase the stringency of the current requirements for U-factor (a measure of the amount of heat that conducts through the solid materials in a window or glass door) and SHGC (solar heat gain coefficient, a measure of how much heat from the sun’s rays passes through the glass panes), thereby reducing the amount of heat gain through windows and glass doors and in turn saving energy.

Fourth, the regulations increase the minimum aged solar reflectance (the estimated solar reflectance of a roofing product after three years of operation) for low-sloped roofs that is required in the prescriptive compliance approach for climate zones 13 and 15 (these are the hottest areas in California). This requirement cost-effectively increases the stringency of the Standards.

Fifth, the regulations add requirements for field verification of R-values and U-factors for envelope assemblies. This will improve the energy performance of buildings. The regulations also remove obsolete requirements and requirements that are now mandatory rather than prescriptive, which will make the standards easier to use. Finally, the regulations add an exception to the insulation subsection; it explains that alternative wall, ceiling, roof, or floor constructions may be allowed if approved by the Energy Commission, thereby providing additional compliance flexibility without reducing energy efficiency.

Sixth, the regulations add several items to the list of what must be field tested or verified, in order to ensure that buildings perform according to the specifications in their building permits and thereby achieve the greatest possible energy savings under the Standards: installation of whole house fans, insulation, space conditioning refrigerant charge, and mechanical ventilation system performance.

Seventh, the new Standards add requirements for water heating systems serving multiple dwelling units to be equipped with a demand control system, split the recirculation system into two loops, and provide a specified percentage of the annual water heating energy with a solar thermal system. All of these new requirements cost-effectively save energy.

Finally, the regulations allow electric resistance water heating systems serving single dwelling units to be installed only if gas service is unavailable, and if used, they must be installed inside the building envelope and provide half of the annual water heating energy with a solar thermal system. These cost-effective limitations will reduce unnecessary energy use by electric resistance water heaters.

SUBCHAPTER 9 – Low-Rise Residential Buildings – Additions and Alterations in Existing Low-Rise Residential Buildings

SECTION 150.2 – ENERGY EFFICIENCY STANDARDS FOR ADDITIONS AND ALTERATIONS IN EXISTING BUILDINGS THAT WILL BE LOW-RISE RESIDENTIAL OCCUPANCIES

Subsection 150.2(a): Additions: The regulations clarify which portions of the mandatory and prescriptive requirements for new buildings apply to additions, and they add criteria that additions must meet in order to be exempted from those requirements. The increased precision will increase the energy savings from the Standards.

Also, the requirements for second water heaters installed in building additions are modified to be consistent with the applicable requirements for building alterations, which will reduce confusion and thereby increase compliance.

Subsection 150.2(b): Alterations: The regulations make a number of changes to this subsection, as follows:

First, they clarify which portions of the mandatory and prescriptive requirements for new buildings apply to alterations, and they add criteria that alterations must meet in order to be exempted from these requirements.

Second, the regulations add an exception to the replacement fenestration requirements, such that if an alteration is to a part of an existing building that has a limited amount of glazing area with minimally-acceptable thermal and solar gain performance, then the alteration project is not required to meet the replacement fenestration requirements. This proposed language improves the user-friendliness of the Standards by limiting the fenestration requirements to the areas of alteration projects where substantial energy efficiency improvements are feasible.

Third, the regulations cost-effectively require duct sealing in all climate zones (the current standards require duct sealing only in some of the climate zones).

Fourth, the regulations clarify the requirements to provide and verify the proper amount of refrigerant in space-conditioning systems. Also, language is added that explains how non-standard space conditioning systems can comply with these refrigerant verification requirements. These clarifications will improve code compliance by providing the information necessary for all types of space conditioning systems to meet the Standards.

Finally, the regulations simplify the performance compliance approach for alterations, so that the approach addresses projects that include both additions and alterations. They also modify the performance compliance approach for additions and alterations to be more consistent with the prescriptive compliance approach, and to make the performance compliance approach more flexible and easier to implement.

2. Technical, theoretical, and empirical studies, reports, and similar documents relied upon

All of these documents are in the record of, and were available to the public, during the Energy Commission's rulemaking proceeding. They were listed in the Initial Statement of Reasons. Additional documents relied upon in drafting the 15-Day Language are listed at the end of this section.

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- CASE Initiative “Automated Lighting Controls and Switching Requirements in Warehouses and Libraries”, September 2011
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- International Accreditation Forum, IAF MLA and IAF USA Members and Signatories web pages, January 10, 2012
- International Accreditation Service, Certificate of Accreditation, United Laboratories Inc., January 4, 2012
- Keith A. Temple, P.E., Proposed Improvements to Residential HVAC Diagnostic Test Protocols, Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.1A, E Task Report
- Keith A. Temple, P.E., Subcooling Dependence on Condenser Airflow for Unitary Air Conditioning Systems with TxV Expansion Device, Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.1B Task Report, June 9, 2011
- Keith A. Temple, P.E., Efficiency and Subcooling Variation with Refrigerant Charge for Unitary Air Conditioning Systems with TxV Expansion Device, Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.1B Task Report, June 9, 2011
- Keith A. Temple, P.E., Review of Requirements and Recommendations for Charge Indicator Display (CID), Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.1C Task Report, June 30, 2011
- Keith A. Temple, P.E., Comments and Recommendations for Saturation Temperature Measurement Sensors (STMS), Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.1D Task Report, August 22, 2011

- Keith A. Temple, P.E., Comments and Recommendations for Mini-Split Air Conditioner and Heat Pump Systems, Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.2 Task Report, September 27, 2011
- Keith A. Temple, P.E., Supplemental Data for Weigh-In Charge Method, Energy Commission Contract 400-09-001, Work Authorization # 6, Subtask 2.3 Task Report, December 5, 2011
- Lennox HPXA19 Outdoor Unit Installation Instructions, August 16, 2010
- CASE Initiative “Residential Refrigerant Charge Testing and Related Issues, December 2011
- E-Mail Exchange between Jeff Miller (Energy Commission) and Keith Temple , Updated Draft CASE Report on Refrigerant Charge, December 30, 2011
- E-Mail Exchange between Jeff Miller (Energy Commission) and Glen Friedman (Taylor Engineering), RE: Draft 2013 Appendix NA2 – Non-Residential Air Distribution Systems Leakage Testing, January 26, 2012

ADDITIONAL DOCUMENTS RELIED UPON FOR THE 15-DAY LANGUAGE

- Infiltration Modeling Guidelines for Commercial Building Energy Analysis, May 15, 2012
- Revised Lifecycle costing for non-residential roofing, May 15, 2012
- Resnet Draft Air leakage testing Chapter 8 Standards, July 22
- Recommendations for digital Hygrometer Accuracy; Subtask 2.4; Work Authorization # 6; Contract #400-09-001; Covering Tasks 3 Subtask 2; 2013 RESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS; Prepared April 29, 2012; B Keith A. Temple, P.E.
- Derivation of Duct Leakage Percentage for ASHRAE Standard 193 M.O.T. Test Pressure; E-mail Excerpt from Iain Walker, Ph.D., Staff Scientist, LBNL 5/4/2012 4:34 PM; Context added by Martha Brook, P.E., Senior Mechanical Engineer, Energy Commission 5/11/2012 4:00 PM
- CASE Initiative “Solar Water Heating – Residential and Specialty Commercial”, October 2011
- CASE Initiative “New Section 130.5 Requirements for Electrical Distribution Systems”, August 2011

3. Documents referenced in the proposed building energy efficiency standards

All of these documents, which are incorporated by reference in the Parts 1 and 6 Standards, are in the record of the Energy Commission’s rulemaking proceeding. In addition, they were made available to the public upon request directly from the Energy Commission, or were reasonably available to the affected public from a commonly known or specified source.¹⁴ They were listed in the Initial Statement of Reasons, and no additional documents were referenced in the 15-Day Language.

Each one of the documents incorporated by reference is of such length, or is subject to

¹⁴ See OAL Regulations, tit. 1, Cal. Code Regs., § 20(c)(2).

copyright restrictions, that it would be cumbersome, unduly expensive, or otherwise impractical to expressly publish it as part of the Standards.¹⁵

ALTERNATIVE CALCULATION METHOD (ACM) APPROVAL MANUALS FOR THE 2013 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

The Energy Commission may approve computer programs as an Alternative Calculation Method that building permit applicants may then use to demonstrate compliance with the performance standards (energy budgets) in Part 6. The Residential and Nonresidential Alternative Calculation Method (ACM) Approval Manuals contain requirements that developers of computer software must meet for the Energy Commission to approve their software for showing compliance with the Standards.

There are two components in the current ACM Approval Manuals: (i) the requirements for Energy Commission approval of compliance software used to demonstrate compliance with the Building Energy Efficiency Standards for Residential and Nonresidential Buildings, and (ii) detailed procedures required to implement compliance with the Standards. The current Residential and Nonresidential ACM Approval Manuals are large documents with a combined total of over 400 pages. Thus, it is cumbersome, unduly expensive, and impractical to expressly publish these documents as part of the Standards.

The ACM Approval Manuals are extensively revised to improve their clarity and organization. The proposed ACM Approval Manuals include information needed by developers of computer software to understand how their software will be tested, how compliance software programs are certified and decertified by the Energy Commission, and what needs to be included in an application submitted to the Energy Commission for software certification in accordance with Part 1, Section 10-109(b)2.

ALTERNATIVE CALCULATION METHOD (ACM) REFERENCE MANUALS FOR THE 2013 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

The Residential and Nonresidential ACM Reference Manuals will be developed and approved by the Energy Commission after the adoption of the Standards. Detailed procedures required to validate compliance with the standards will be documented in new ACM Reference Manuals, including a series of simulation tests on proposed compliance software submitted by developers of computer software, pursuant to the requirements in the ACM Approval Manuals.

These ACM Reference Manuals also act as guidance documents for the performance compliance approach pursuant to Sections 140.1 and 150.1(b) of the standards, similar to the way that the Energy Commission's Residential and Nonresidential Compliance Manuals are guidance documents for the prescriptive compliance approach pursuant to Sections 140.0 and 150.1(c) of the standards.

Assumptions used in the software to model a building's compliance with the standards will also be published in the ACM Reference Manuals. Having this information in the

¹⁵ See OAL Regulations, California Code of Regulations, title 1, § 20(c)(2).

ACM Reference Manuals, rather than in the ACM Approval Manuals, improves the effectiveness of the performance compliance approach to the standards.

2013 RESIDENTIAL ALTERNATIVE CALCULATION METHOD (ACM) APPROVAL MANUAL

The current standards allow third party software providers to develop independent software based on the rules provided by the standards. The most significant change for the Residential ACM Approval Manual is the new requirement for all compliance software developed by third parties to include within the software a feature developed by the Energy Commission, known as the Compliance Manager. This new Compliance Manager compares the energy use of a building built to the prescriptive approach, with the energy use of the building design being proposed by the builder, pursuant to Section 150.1 of the standards. This Compliance Manager will perform compliance calculations and produce the compliance reports required by Part 1, Section 10-103. The Compliance Manager provides the comparison between the Standard Design Building, as defined in Section 100.1, and the proposed building design, by computing annual energy budgets for both designs and generating the compliance reports. These proposed changes improve the ease-of-use and the effectiveness of the Standards by performing all of the necessary modeling within the Compliance Manager software.

2013 NONRESIDENTIAL ALTERNATIVE CALCULATION METHOD (ACM) APPROVAL MANUAL

The most significant changes to the Nonresidential ACM Approval Manual are those indicated in sections above titled, "*Alternative Calculation Method (ACM) Approval Manuals for the 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings*," and "*Alternative Calculation Method (ACM) Reference Manuals for the 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings*," where the certification processes and vendor requirements are organized into the ACM Approval Manual and the detailed modeling procedures of the reference method and the required certification tests are documented in the ACM Reference Manual.

REFERENCE APPENDICES FOR THE 2013 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

The Reference Appendices include background information (such as the precise definitions of each climate zone, and performance characteristics of various building materials). The regulations update the three types of Reference Appendices: the Joint Appendices (for all building types), the Residential Appendices, and the Nonresidential Appendices.

JOINT APPENDICES

JA1 – Glossary: The regulations add new definitions, delete obsolete definitions, and modify existing definitions, in order to be consistent with related changes to the Standards and changes in other relevant law, to clarify and eliminate ambiguities, and to simplify regulatory language.

JA2 - Reference Weather/Climate Data: The regulations replace the city and county

climate zone lookup table with a city, county, and zip code climate zone lookup table. Using a zip code basis to identify the climate zones for buildings will allow more precise applications of the climate-specific requirements in the Standards. In addition, the lookup table is now sorted by city, making it easier to use. Finally, the regulations remove an explanation of a weather data format that is no longer used in the Standards.

JA3 - Time Dependent Valuation (TDV) Data: The regulations update all Time Dependent energy Valuation (TDV) data. TDV data is used in the performance compliance approach to incorporate the time-varying costs of energy into the energy budgets.

JA4 - U-factor, C-factor, and Thermal Mass Data: The regulations add, modify and delete data to reflect the updated Standards language. JA4 is no longer used by either the residential or nonresidential compliance software so many of the existing entries are eliminated. Only the heat transfer data for assemblies relevant to the prescriptive compliance approach are now included in this appendix.

JA5 – Reference Design for Upgradeable Setback Thermostats: The regulations add this appendix to support the new mandatory requirements for thermostats in the Standards.

JA6 – HVAC Fault Detection and Diagnostic Technology: The regulations (i) expand this appendix to include both charge indicator display and saturation pressure measurement sensor specifications, which are newly-required in the Standards; (ii) provide compliance alternatives for refrigerant charge pressure verifications that are non-intrusive from a HERS rater's perspective (thus helping to provide relief from professional liability risks); and (iii) clarify that device approval must be by the Energy Commission.

JA7 – Data Registry Requirements: The regulations (i) add this appendix to reflect updates to the Standards language on the roles and responsibilities of authorized registry users, document registration requirements, electronic and digital signature requirements, data exchange requirements, and data registry approval; and (ii) give registry approval responsibility to the Energy Commission.

JA8 – Qualification Requirements for Residential Luminaires Using LED Light Sources: The regulations (i) modify this appendix to reflect the changes to the lighting standards, (ii) change the title of this appendix to be consistent with nationally recognized terminology, (iii) replace existing test protocols with references to nationally recognized test standards, (iv) relocate existing language from the mandatory and prescriptive code sections for residential lighting to this appendix in order to organize all qualification requirements into one reference appendix, and (v) add lighting quality requirements consistent with the Standards.

JA9 – Qualification Requirements for Low Leakage Air Handling Units: The regulations add this appendix to reflect updates to the Standards language and to national test standards for low leakage air handlers.

RESIDENTIAL APPENDICES

RA1 – Special Case Residential Field Verification and Diagnostic Test Protocols: The regulations replace the existing RA1 appendix with explanations of residential field test

protocols, in order to reflect updates to the Standards language. The HVAC sizing methodology is removed because it is relevant only as documentation of the residential ACM reference method, and it is therefore documented in the Residential ACM Reference Manual. A new process for special case test protocol approval is documented. Field verification and diagnostic test protocols are added for measuring HVAC system refrigerant charge as required by the Standards.

The regulations also eliminate a proposal for a liquid line temperature charge verification, because of manufacturers' intellectual property concerns about potential public use of the protocol for the verification. A winter setup for the standard charge verification procedure is introduced to provide alternatives for compliance with the refrigerant charge verification requirements when the outdoor temperature is below 55 degrees F and the standard charge verification cannot be used.

RA2 – Residential HERS Verification, Testing and Documentation Procedures: The regulations modify this appendix for clarity and to reflect updates to the Standards language. Roles are explained for the documentation author, installing contractor, and HERS rater in the document registration procedures. The changes update and clarify the RA2 requirements in accordance with the 2013 Standards, and provide direction for compliance with new data registry requirements in Appendix JA7.

RA3 – Residential Field Verification and Diagnostic Test Protocols: The regulations modify this appendix to update existing test protocols. Revisions are made to the refrigerant charge and insulation test protocols to be consistent with the Standards. The verified duct design compliance description, and the duct surface area, R-value, and leakage verification protocols, are reorganized and rewritten for clarity. A reference to the new JA9 appendix is added for low leakage air handler testing, which is newly required by the Standards. New field verification protocols are added for duct designs, air filter devices, zonally controlled HVAC systems, and mechanical ventilation. Specifications are updated or added for sensor accuracy and response times, flow capture hood airflow measurements, digital revenue meter measurements, and charge indicator display devices. All of these changes update the testing protocols to make them consistent with the regulations, and they make corrections to diagnostic apparatus specifications, both of which will improve compliance with the Standards.

RA4 – Eligibility Criteria for Energy Efficiency Measures: The regulations modify this appendix for clarity and the solar water heating system eligibility criteria are expanded. The changes save energy and improve compliance with the Standards.

RA5 – Interior Mass Capacity: The regulations remove this entire appendix. Interior mass capacity is no longer used in the Standards as a performance metric that requirements are based on.

NONRESIDENTIAL APPENDICES

NA1 – Nonresidential HERS – Required Verification, Testing, and Documentation Procedures: The regulations modify this appendix to reflect updates to the Standards language. The document registration procedures are updated and references to new appendices JA7 for registry requirements and RA1 for special case verification protocols are added. In addition, the changes update and clarify the NA1 requirements in accordance with the 2013 Standards, and provide direction for compliance with new data

registry requirements in JA7. All of these changes will improve compliance

NA2 – Nonresidential Field Verification and Diagnostic Test Procedures: The regulations modify the duct leakage protocols in this appendix to improve clarity and enforceability. The changes update and clarify the protocol to be consistent with comparable procedures in the residential protocol in RA3.1 and as described in the record.

NA3 - Fan Motor Efficiencies: The regulations update the efficiency data in this appendix to reflect updates to the Standards language. The changes save energy, make the standards consistent with national standards, and improve compliance.

NA5 - Envelope Tradeoff Procedure: The regulations remove this entire appendix to reflect updates to the Standards language. The envelope tradeoff procedure is no longer specified as a prescriptive compliance option for nonresidential buildings.

NA6 - Alternate Default Fenestration Procedure to Calculate Thermal Performance: The regulations modify this appendix, including a new calculation for the default visual transmittance, in order to reflect corresponding changes to the Standards.

NA7 – Acceptance Requirements for Nonresidential Buildings: The regulations modify this appendix to reflect updates to the Standards language. Construction inspection and functional testing requirements are added and expanded for HVAC, lighting, and covered process equipment and controls, as described in the new Standards.

NA8 - Luminaire Power: The regulations modify this appendix and the title is changed to accurately represent the content. Many technologies are deleted because they are no longer commonly used. Updates are made to the description of several technologies to reflect changes to combinations of lamps and ballasts as they are described in the Standards and used in the field.

4. The reasons why mandating the use of specific technologies or equipment is required

The Standards mandate the use of specific technologies and equipment to assure that buildings always meet minimum, cost-effective efficiency requirements whether the prescriptive method (pursuant to Sections 140.0 and 150.1(c)) or the performance method (pursuant to Sections 140.1 and 150.1(b)) of compliance is used. If these proven, simple, highly cost-effective, long-lasting energy saving technologies and equipment were not mandatory, they could be “traded off” against measures that have not been documented to save energy as persistently, simply, or cost-effectively.

(Note also that although some measures and equipment appear in the “prescriptive” compliance method, none of those are mandatory. That is because the prescriptive compliance method is a voluntary alternative to the performance compliance method. Moreover, there are several different “packages” of measures and equipment in the prescriptive compliance method, which further demonstrates the voluntary nature of the prescriptive compliance method.)

5. Consideration of reasonable alternatives, including those that would lessen any adverse impact on small business

For more than thirty-five years, legislative enactments and state energy policies have directed the Energy Commission to adopt cost-effective building standards to improve energy efficiency and thereby improve the state's economy, energy security, and environment.¹⁶ The record of the Energy Commission's rulemaking proceeding does not disclose any alternatives to the regulations (i.e., the regulations that were adopted by the Energy Commission and that are being submitted to the CBSC for approval) that would be equally or more effective in meeting those goals or in achieving cost-effective energy savings and less burdensome to affected persons, or that would be equally effective and have a lower adverse impact on small businesses (or on any other economic interests), and which were considered but rejected.¹⁷ However, as described below, a number of alternatives to the initially developed regulations were considered and accepted as part of the mandatory pre-rulemaking public participation process and during the rulemaking proceeding, many of them in order to reduce impacts on businesses large and small.¹⁸

Any alternatives that lessen any adverse economic impacts, but likewise do not achieve the energy savings of the proposed regulations, would not be a reasonable fulfillment of the Energy Commission's statutory obligations to establish cost-effective building energy and water efficiency standards. Proposed alternatives that were rejected are described in the Comments and Responses section of this FSOR.

Many of the measures in the proposed Standards were developed by the Codes and Standards Enhancement (CASE) Program of California's investor-owned utilities, a statewide program that is funded with a surcharge on energy bills and that is dedicated to the advancement of California's building and appliance energy efficiency standards. In 2010 and 2011 CASE representatives held numerous meetings with building industry stakeholders to vet potential code updates, identify industry concerns, and resolve issues. In the spring of 2011, the Energy Commission began a series of 13 pre-rulemaking public workshops for all interested parties to build upon and continue this process.

During the pre-rulemaking workshops, which focused on the feasibility and cost-effectiveness of potential revisions to the Standards, the Commission received a large number of comments. Based on the comments the Energy Commission developed preliminary draft Standards and held two more public workshops to obtain public comment on those; in turn, many more comments were received and in response to them the Energy Commission produced the initially-regulations that were published in February of this year. Thus even in the pre-rulemaking process there was an extraordinarily detailed consideration of alternatives.

That consideration of alternatives continued during the formal rulemaking process that began with the publication of the Notice of Proposed Action. The Energy Commission accepted many proposed alternatives that were designed to reduce impacts to small businesses (and to other businesses and individuals as well, of course). The

¹⁶ See, e.g., Pub. ResourcesCode §§ 25007 and 25402, subd. (a)(1), (a)(3), & (b)(3); 2011 Integrated Energy Policy Report, pp. 61 and 69.

¹⁷ See Gov. Code §§ 11346.2, subd. (b)(5), § 11346.9, subd. (a)(4).

¹⁸ See Pub. ResourcesCode § 25402, subd. (c)(2); Gov. Code §§ 11346.2, subd. (b)(5), (6), 11346.9, subd. (a)(5).

suggestions that the Energy Commission did not accept are discussed in the Comments & Responses part of this FSOR.

In sum, there are no reasonable (e.g., feasible and cost-effective) alternatives that would lessen adverse economic impacts or other burdens on small or other businesses.

6. Facts, evidence, documents, testimony, or other evidence of no significant adverse economic impact on business

The discussion in the immediately preceding section, on the consideration of alternatives, demonstrates that the Energy Commission made extensive changes in both preliminary versions of the regulations, as well as to the 45-Day Language, in order to reduce impacts on businesses, especially small businesses. The Comments & Responses part of this FSOR further demonstrates that no other viable alternatives were proposed. Of course, the regulations will increase the costs of construction, but the building purchasers and owners who will absorb those costs will also save substantially more money on their energy bills than the cost of complying with the Standards. For owners and operators of commercial buildings, those savings will translate directly into increased profits (or expanded business operations, which in turn will create more jobs and ultimately more profits). In addition, businesses that provide energy efficiency products and services associated with the Standards' requirements will have new and increased sales and service opportunities. Thus the regulations are likely to result in the creation of new jobs and an increase in the revenues, profits, and competitiveness of California businesses.

7. Duplication or conflicts with federal regulations

The regulations do not duplicate or conflict with any federal regulations.

The United States Department of Energy (DOE) is required by law (in the Energy Conservation and Production Act (ECPA)) to determine whether the latest edition of ASHRAE Standard 90.1 (for commercial and multi-family high-rise residential buildings) or the latest version of the International Energy Conservation Code (for low-rise residential buildings) will improve energy efficiency compared to the previous edition of the corresponding standard or code. DOE has one year to publish a determination in the Federal Register after each new edition of the standard/code is published.¹⁹

Federal law also requires that DOE publish determinations as to whether new editions of ASHRAE Standard 90.1 and the International Energy Conservation Code will improve energy efficiency. The determinations are based on analysis by the Building Energy Codes Program (BECP) and is required by Section 304 of the Energy Conservation and Production Act (ECPA, Public Law 94-385), as modified by the Energy Policy Act of 1992 (EPA 1992). DOE has one year to publish the determination after the newest edition of the standard is published. Determination results are published in the Federal Register.²⁰

If DOE finds that the newest version of ASHRAE Standard 90.1 is more energy efficient than the previous version, states are required by EPA 1992 to certify that their building

¹⁹ <http://www.energycodes.gov/regulations>

²⁰ <http://www.energycodes.gov/regulations/determinations>

energy codes or standards meet or exceed the requirements of the new standard within two years. Ever since the federal requirement went into effect, each time the Title 24 Building Energy Efficiency Standards have been updated, they have exceeded not only ASHRAE Standard 90.1 but also all other nationwide building standards, and the same is true of the proposed 2013 Standards.

B. Mandate on Local Agencies or School Districts

The proposed modifications to the standards will not impose new mandates on local agencies. Existing law already obligates local building departments to serve as enforcement agencies for the Standards.²¹ Existing law also already requires compliance with the Standards as they apply to school buildings, and all other buildings, owned by local agencies.²² While the proposed Standards add requirements for schools and other building types owned by local agencies, those requirements are the same as those applicable to all nonresidential buildings regardless of owner. Moreover, the proposed Standards recognize the unique characteristics of relocatable public school buildings, and they establish procedures to facilitate compliance by relocatables. Finally, the Standards for schools, and for all other buildings, are cost effective, and they will thereby reduce the costs of building and operating school buildings.

C. Objections and Recommendations, and the Energy Commission's Responses

This discussion is presented in the spreadsheets labeled Response to Comments.

D. Consideration of Reasonable Alternatives, Including Those That Would Lessen Any Adverse Impact on Small Business

E. Facts, Evidence, Documents, Testimony, or Other Evidence of No Significant Adverse Economic Impact on Business

These two sections D. and E. appear on pages 52 and 53 above, in sections II.A.5. and II.A.6.

²¹ Pub. Resources Code §§ 25402, subd. (a)-(b), 25402.1.

²² California Code of Regulations, Title 24, Part I, Administrative Regulations of Department of School Administration.