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# Energy Conservation Standards for New Apartment Houses (with Four or More Habitable Stories) and Hotels

July 1982 Edition

California  
Energy  
Commission

Conservation  
Division

Item Code: P400-82-055

Foreword (not part of the Regulations)

The California Energy Commission's building regulations consist of five parts identified below. The regulations in this document have, for the most part, been in effect since 1978, but have recently been editorially revised and the order changed. The regulations, as revised, become effective on July 1, 1982, and apply to apartment buildings with four or more habitable stories and hotels. For regulations applicable to other occupancies, see the documents listed below:

Scope	Nonresidential Buildings	Apartment Buildings with four or more habitable stories and hotels	Other Residential Buildings
Administrative Regulations	Title 20 Chapter 2 Sub. Chap. 4 Article 1 1401 - 1410	Title 20 Chapter 2 Sub. Chap. 4 Article 1 1401 - 1410	Title 20 Chapter 2 Sub. Chap. 4 Article 1 1401 - 1410
Building Regulations	Title 24 Part 2 Chapter 2-53 2-5301 - 2-5307 2-5311 - 2-5344	Title 24 Part 2 Chapter 2-53 2-5301 - 2-5307 2-5361 - 2-5365	Title 24 Part 2 Chapter 2-53 2-5301 - 2-5307 2-5351 - 2-5352
Publication Number	P400-82-054	P400-82-055	P400-81-005

On July 13, 1982, Governor Brown signed into law Assembly Bill 1843 which exempts new residential housing projects which received approval by an advisory agency or other appropriate local agency on or before June 15, 1982, from the provisions of Sections 2-5351 and 2-5352, provided application for the permits to construct single family detached dwellings are submitted or filed on or before June 15, 1983, and the application for all other residential building permits are submitted or filed on or before December 31, 1983. New residential housing projects so exempted are subject to the provisions of 2-5361 through 2-5365. For the purpose of this exemption, "approval" includes approval or conditional approval of a tentative subdivision or tentative parcel map pursuant to the Subdivision Map Act [Division 2 (commencing with Section 66410) of Title 7 of the Government Code], condominium plan, or other permit for a residential housing project.





CALIFORNIA ADMINISTRATIVE CODE

BUILDING REGULATIONS

APPLICABLE TO

APARTMENT HOUSES WITH FOUR OR  
MORE HABITABLE STORIES AND HOTELS  
(Occupancy R)

Effective July 1, 1982

<u>Sections</u>	<u>Subject</u>	<u>Pages</u>
1401 through 1410	Administrative Regulations	1-1 through 1-13
2-5301 through 2-5307	Building Regulations applicable to all occupancies	179 through 196
2-5361 through 2-5365	Building Regulations applicable to new apartment houses with four or more habitable stories and hotels.	260 through 270
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4-1000	Building Regulations applicable to ducts.	4-1 through 4-2



CALIFORNIA ADMINISTRATIVE CODE

Title 20

Chapter 2  
(California Energy Commission)

Subchapter 4  
(Conservation)

Article 1  
(Energy Building Regulations)

NOTE: The administrative standards in Title 20 (Sections 1401 through 1410) apply to all new residential and nonresidential buildings.



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ARTICLE 1.--ENERGY BUILDING REGULATIONS

Section 1401. General.

This article contains administrative regulations relating to the energy building regulations found in Title 24, Part 2, Chapter 2-53.

NOTE: Authority cited: Public Resources Code, Sections 25402 and 25402.1

Reference: Public Resources Code, Sections 25402 and 25402.1

Section 1402. Definitions.

For the purpose of this article the following definitions shall apply:

"Approved calculation method" means the California Energy Commission's Public Domain Computer Program, one of the Commission's Simplified Calculation Methods, or any other calculation method approved by the Executive Director.

"Commission" means the State Energy Resources Conservation and Development Commission.

"Conditioned floor area" means the floor area of conditioned space on all floors, including basements, intermediate floor tiers, and penthouses, measured from the exterior faces of exterior walls and the exterior face of walls separating conditioned and unconditioned spaces. Conditioned floor area does not include covered walkways, open roofed-over areas, porches, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, parking garages, unheated basements, and closets for central gas forced air furnaces.

"Conditioned space" means the space, within a building, which is provided with a heat supply or a method of cooling, either of which has connected output capacity in excess of 10 Btu/hr per square foot.

"Enforcement agency" means the city, county, or state agency responsible for issuing a building permit.

"Executive Director" means the Executive Director of the Commission.

"Governmental agency" means any public agency or subdivision thereof, including any agency of the state, county, city, district, association of governments, and joint power agency.

"Nonresidential building" means any building which is of an occupancy type A, B, E, and/or H as defined in the Uniform Building Code, 1979 Edition.

"Public Adviser" means the Public Adviser of the Commission.

"Residential building" means a building which is of an occupancy type R as defined in the Uniform Building Code, 1979 edition.

"R Value" means the measure of the resistance of a material or building component to the passage of heat in  $\frac{\text{hr} - \text{ft}^2 - ^\circ\text{F.}}{\text{Btu}}$ .

NOTE: Authority cited: Public Resources Code, Section 25402 and 25402.1  
Reference: Public Resources Code, Section 25402 and 25402.1

Section 1403. Permit Requirements for New Buildings.

(a) Design and Compliance Requirements for Nonresidential Buildings.

- (1) Design. With each application for a building permit, in addition to two sets of plans and specifications, the calculations, reports, and other required documentation shall be signed by the particular licensed or registered professional responsible for their preparation. They shall include a civil engineer, mechanical engineer, electrical engineer, architect, building designer, general engineering contractor, general building contractor or specialty contractor, licensed or registered to practice by the State of California.

The designer shall provide a statement on the drawings, over his signature, that these regulations have been reviewed and the design submitted conforms substantially with these regulations.

The enforcement agency may waive any of the requirements of this subsection for buildings having a gross square feet of conditioned floor area not exceeding 1,000 square feet and an occupant load not exceeding 49 persons.

- (2) Construction Compliance. At the time of request for final inspection for any project subject to these regulations, the permittee or his authorized agent for the project shall deliver to the enforcement agency a certificate of construction compliance with these standards based on observation of construction and signed by one or more of the following: the owner, general building contractor, design architect, design engineer, or an approved independent inspector or inspection agency. This report shall indicate, based upon personal knowledge, that the work performed and the materials used and installed appear in every material respect in compliance with the approved plans and specifications for which the building permit was issued.

Such written report shall be filed prior to approval of the building for occupancy by the enforcement agency.

The term "personal knowledge" as used in this section means the personal knowledge which is obtained from periodic visits to the

project site of reasonable frequency for the purpose of general observation of the work and also which is obtained from the reporting of others as to the progress of the work, testing of materials, inspection, and superintendence of the work that is performed between the above-mentioned periodic visits. The exercise of reasonable diligence to obtain the facts is required.

(3) Nothing in this section shall be construed as limiting in any manner the responsibility of the enforcement agency for reviewing the plans of proposed nonresidential buildings to confirm that they comply with these regulations.

(b) Enforcement Agency Requirements for Residential Buildings. An enforcement agency shall not issue a building permit or renew an existing permit which was applied for on or after the effective date of this article for any new residential building unless the enforcement agency determines, in writing, that the new building is designed to comply with the requirements of Title 24, Part 2, Chapter 2-53.

The enforcement agency shall require that every application for a building permit contain plans and specifications with adequate detail for determining compliance with the requirements of Title 24, Part 2, Chapter 2-53.

The enforcement agency shall inspect new buildings to ensure that they are constructed according to the agency's approved plans and that the buildings meet the applicable requirements of Title 24, Part 2, Chapter 2-53.

(c) Statement of Design Compliance for Residential Buildings. The person who designs the building or applies for the building permit shall state on the building plans or submit a written statement with the permit application that the building design meets the requirements of Title 24, Part 2, Chapter 2-53.

(d) Insulation Certificate (All Occupancies). After installing insulation, the installer shall post in a conspicuous location in the building a certificate signed by the installer and the builder stating that the installation conforms with the requirements of Title 24, Part 2, Chapter 2-53, and that the materials installed conform with the requirements of Title 20, Chapter 2, Subchapter 4, Article 3. The certificate shall state the manufacturer's name and material identification, the installed "R" value, and (in applications of loose fill insulation) the minimum installed weight per square foot consistent with the manufacturer's labeled density for the desired "R" value.

(e) Occupant Information for Residential Buildings. The builder shall provide the original occupant a list of the heating, cooling, water heating, and lighting systems and conservation or solar devices installed

in the building and instructions on how to use them efficiently. The instructions shall be consistent with specifications set forth by the Executive Director.

- (f) Identification of Complying HVAC Equipment (All Occupancies). The efficiency of the equipment described in Title 24, Part 2, Chapter 2-53, Section 2-5306, shall be shown on the plans or in the documents submitted to the enforcement agency for approval.
- (g) Electric Resistance Comfort Heating Equipment (All Occupancies). The manufacturer of electric resistance comfort heating equipment shall make available to prospective purchasers, designers, or contractors, upon request, full-load energy input over the range of voltages at which the equipment is intended to operate.
- (h) Maintenance Information (All Occupancies). Equipment which requires preventive maintenance for efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions shall be clearly stated and incorporated on an accessible label, which may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of product. At least one copy of this information shall be furnished by the manufacturer for the original owner upon request.
- (i) Responsibility of Equipment Suppliers (All Occupancies). Suppliers of HVAC equipment shall furnish, upon request by prospective purchasers, designers, or contractors, the full and partial capacity and standby input(s) and output(s) of all equipment and components of applied systems, based on equipment in new condition, to enable determination of their compliance with these standards. This includes performance data under modes of operation and ambient conditions necessary to make the analysis outlined in these standards.

Performance data furnished by the equipment supplier or certification under a nationally recognized certification program, when available, satisfies this requirement when all energy input(s), output(s), and operating modes are included.

- (j) Exceptional Designs, Materials, and Devices for Residential Buildings, Except Apartment Houses with Four or More Habitable Stories and Hotels. When designs, materials, or devices are proposed which cannot be adequately modeled by an approved calculation method, an applicant may be granted a building permit upon approval by the Executive Director, based on a determination of energy efficiency using an alternative evaluation technique which demonstrates compliance with the standards.

To obtain approval, the applicant must submit the following materials to the Executive Director:

- (1) A copy of the detailed plans required by Subsection 1403(b).
- (2) A statement explaining why meeting the energy budget requirements cannot be demonstrated using an approved calculation method.
- (3) A letter from the enforcement agency stating that the energy budget requirements cannot be determined using an approved calculation method.
- (4) A detailed evaluation of the energy efficiency of the building's design, materials, or devices using an alternative evaluation technique.
- (5) Any additional materials requested by the Executive Director to evaluate the energy efficiency.

When the materials described above have been properly submitted, the Executive Director shall notify the applicant in writing that his application is complete. The Executive Director shall notify the applicant in writing of his determination within 45 days of the date of notification. If a determination is not made within 45 days, the enforcement agency may issue a building permit. The Executive Director may charge a fee for the review and approval of the application. The Executive Director may delegate the approval of exceptional designs, materials, and devices to a local enforcement agency.

- (k) Other Documentation Requirements for Nonresidential Buildings. Other documentation requirements are contained in Title 24, Part 2, Chapter 53, Sections 2-5313 and 2-5315.

NOTE: Authority cited: Public Resources Code, Sections 25402 and 25402.1  
Reference: Public Resources Code, Sections 25402 and 25402.1

Section 1405. Enforcement by the Commission (All Occupancies).

- (a) Where There Is No Local Enforcement Agency. The Executive Director shall review plans and specifications for proposed buildings in areas where there is no local enforcement agency and for all proposed governmental agency buildings and certify in writing that the buildings conform to the requirements of Title 24, Part 2, Chapter 2-53.
- (b) Where the Local Enforcement Agency Fails to Enforce. If a local enforcement agency fails to enforce the requirements of this article or of Title 24, Part 2, Chapter 2-53, the Commission, after furnishing 10 days written notice, may condition building permit issuance on the Executive Director's review of all plans and his written certification that specifications for proposed new buildings conform to the requirements of Title 24, Part 2, Chapter 2-53.

NOTE: Authority cited: Public Resources Code, Section 25402.1  
Reference: Public Resources Code, Section 25402.1

Section 1406. Locally Adopted Energy Standards (All Occupancies).

- (a) Requirements. Local governmental agencies may adopt and enforce energy standards for new buildings, provided the Commission finds that the standards will require the diminution of energy consumption levels permitted by the provisions of Title 24, Part 2, Chapter 2-53, currently in effect. Such actions include adopting the requirements of Chapter 2-53 prior to its effective date, requiring additional energy conservation measures, or setting more stringent energy budgets.
- (b) Documentation. Local governmental agencies wishing to enforce locally adopted energy conservation standards shall submit four copies of the following documents to the Commission:
- (1) The proposed local energy standards.
  - (2) A study and supporting materials showing how the local agency determined energy savings.
  - (3) A statement that the local standards will result in the reduction of energy consumption to or below the levels permitted by the requirements of Title 24, Part 2, Chapter 2-53.
  - (4) The basis of the agency's determination that the standards are cost effective.

The Commission or its designee may request additional information if needed for a complete staff analysis of the proposed standard.

- (c) Staff Recommendations. The Executive Director shall distribute copies of the material to the Commissioners, the Public Adviser, and all persons who have requested in writing a copy of the materials.

The Executive Director shall analyze the submitted material. No later than 60 days after submission of the materials, the Executive Director shall submit a written report which contains a recommendation and the basis of such recommendation to the Commission which shall be considered at the next regularly scheduled Commission business meeting. At least 10 days notice shall be given to the local agency.

The Executive Director shall notify the local agency of the number assigned to the filing, the Executive Director's written recommendation, the date, time, and place at which the filing will be considered by the Commission, and the general procedures of the Commission concerning hearings. Notice shall also be sent to any person who requested notice in writing.

- (d) Hearing. All interested persons may present comments on the Executive Director's recommendation at the hearing, subject to the presiding member's discretion, to limit statements to relevant issues and assure an orderly proceeding. Notice of the Commission's decision shall be sent to the local agency and to any person who has requested such notice in writing.

NOTE: Authority cited: Public Resources Code, Section 25402.1  
Reference: Public Resources Code, Section 25402.1

Section 1407. Interpretations (All Occupancies).

The Executive Director may make a determination as to the application or interpretation of any provision of this article or of Title 24, Part 2, Chapter 2-53, to any person requesting such a determination. The Executive Director's interpretation shall be placed on the consent calendar for Commission approval. Those interpretations which have wide application or interest shall be broadly publicized.

NOTE: Authority cited: Public Resources Code, Section 25402.1  
Reference: Public Resources Code, Section 25402.1

Section 1408. Claims of Exemptions (All Occupancies).

- (a) Requirements. Any person may claim exemption from the provisions of any building standard provided he can show that:

- (1) Actual site preparation and construction had not begun before the date the claim for exemption was filed.
- (2) Substantial funds had been expended in good faith on planning, designing, architecture, or engineering before the adoption date of the building standard.
- (3) Compliance with the requirements of the building standard would be impossible without both substantial delays and substantial increase in cost of construction.

The claimant has the burden of proof in establishing the claim.

- (b) Documentation. The claim shall be submitted to the Executive Director and shall include:

- (1) The completed signed claim (on a form provided by the Executive Director);
- (2) Contracts entered into by the claimant pertaining to the project;
- (3) Internal financial reports relative to the project accounts;

- (4) Dated schedules of design activities;
- (5) A progress report on project completion; and
- (6) Any additional evidence to support the claim.

The Executive Director may require additional information if needed for a complete staff analysis of the claim.

- (c) Staff Recommendations. No later than 60 days after the receipt of a claim and all required documentation, the Executive Director shall submit a recommendation to the Commission which shall be considered at its next regularly scheduled business meeting. At least 10 days notice shall be given to the claimant and to any other person who requests such notice.

The Executive Director shall notify the claimant of the number assigned to the filing, the Executive Director's written recommendation, the date, time, and place at which the claim will be considered by the Commission, and the Commission's general procedures for hearings and actions on claims.

- (d) Hearing. Claims shall be placed on the consent calendar for consideration by the Commission. The business meeting agenda need specify only that claims for exemption from provisions of the building standard will be considered. Notice of specific claims need be sent only to the claimant, the Commissioners, the Public Adviser, and those persons who have requested in writing such notice.

Upon the request of any interested person, a claim may be removed from the consent calendar and considered as a separate item of business.

The Commission shall approve or disapprove the claim in whole or in part and shall provide a statement of reasons supporting the decision. Unless otherwise decided by the Commission, the Executive Director's report shall be deemed adopted as the statement of reasons supporting the decision. The Commission's decision shall be final. Notice of the decision shall be sent to the claimant and to any person who has requested such notice.

NOTE: Authority cited: Public Resources Code, Section 25402.1  
Reference: Public Resources Code, Section 25402.1

Section 1409. Approved Calculation Methods.

- (a) Public Domain Computer Program (All Occupancies). By the effective date of this article the Executive Director shall provide at least one public domain computer program which may be used to demonstrate that proposed building designs meet the energy budget requirements of Title 24, Part 2, Chapter 2-53.

For each public domain computer program, the Executive Director shall provide instructions for using the program to demonstrate that the energy budget requirements are met. These instructions shall include a statement of those input values that are set by the Executive Director and those input values which may be varied by the building designer to model energy saving options.

- (b) Simplified Calculation Method (Residential Occupancies). By the effective date of this article the Executive Director shall provide one or more simplified calculation methods, at least one of which shall be a point system, which may be used as an alternative to the public domain computer programs to demonstrate that proposed building designs meet the requirements of Title 24, Part 2, Chapter 2-53. The use of the simplified calculation method(s) shall result in energy-saving requirements which are consistent with those in Title 24, Part 2, Chapter 2-53.
  
- (c) Certification of Alternative Calculation Methods (All Occupancies). The Executive Director shall certify alternative calculation methods which may be used to demonstrate that proposed building designs meet the requirements of Title 24, Part 2, Chapter 2-53. Any person may apply for certification of an alternative calculation method. The applicant shall provide documentation to the Executive Director that demonstrates that the alternative calculation method:
  - (1) Differentiates the estimated energy-savings results among alternative options substantially similar to the public domain computer program;
  - (2) Shows that no changes are made in any of the variables fixed by the Executive Director;
  - (3) Provides input and output documentation in a format specified by the Executive Director which facilitates the enforcement agency's review;
  - (4) Is supported by clear and concise instructions for using the alternative to demonstrate that the requirements of Title 24, Part 2, Chapter 53, are met; and
  - (5) Establishes energy budgets for that alternative calculation method by modeling the buildings used to develop the energy budgets in Title 24, Part 2, Chapter 2-53.

The Executive Director shall provide instructions to the applicant upon request which specify the certification requirements. When the applicant properly submits all required documentation, the Executive Director shall notify the applicant in writing. The Executive Director shall notify the applicant of his or her determination within 90 days of the date of notification of proper documentation.

- (d) Certification of Alternative Component Packages (Residential Occupancies). The Executive Director may certify any alternative component package which he determines will meet the energy budgets specified in Title 24, Part 2, Chapter 2-53, Section 2-5342(a), and is likely to apply to a significant percentage of new residential buildings or to a significant segment of the building construction and design community.
- (e) Publication of Commission Determinations (All Occupancies). The Executive Director shall periodically publish a manual, newsletter, or other administrative guide containing determinations made by the Executive Director and Commission pursuant to this section.

NOTE: Authority cited: Public Resources Code, Section 25402  
Reference: Public Resources Code, Section 25402

Section 1410. Appeal to Commission (All Occupancies).

Any person aggrieved by any determination made by the Executive Director pursuant to this article or Title 24, Part 2, Chapter 2-53, may appeal such determination to the California Energy Commission.

NOTE: Authority cited: Public Resources Code, Section 25402  
Reference: Public Resources Code, Section 25402

CALIFORNIA ADMINISTRATIVE CODE

Title 24  
(State Building Standards Code)

Part 2  
(State Building Code)

Chapter 2-53  
(Energy Conservation in New Building Construction)

Complete bound copies of the State Building Code, Title 24, Part 2, (1981 Edition) of which this is a part, may be obtained from:

State of California  
Documents Section  
P.O. Box 1015  
North Highlands, CA 95660



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ENERGY CONSERVATION STANDARDS FOR NEW APARTMENT  
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**CHAPTER 2-53.  
ENERGY CONSERVATION IN NEW  
BUILDING CONSTRUCTION**

**NOTE:** Chapter 53 of the U.B.C. is not adopted by reference. The provisions of this chapter represent an entire new Chapter 2-53.

Adoption Table No. 2-53A

Code Section	HCD HCD		OSA OSA OSH			DOT	AGR	YA	BOC	DOE	CA	
	BSC	1	2	SFM	SSS							HC
Entire Chapter												
2-53												X <sup>3</sup>

- NOTES:**
1. See Sections 2-105 and 2-106 for explanation of this Table.
  2. See State Building Code History Note Appendix.
  3. The building standards contained in this Chapter become effective upon publication.

- EXCEPTIONS:**
1. Until June 30, 1982,\* Sections 2-5361 through 2-5365 apply to all new buildings of Occupancy R.
  2. Effective July 1, 1982,\* Sections 2-5351 and 2-5352 apply to new buildings of Occupancy R except apartment houses with four or more habitable stories and hotels and Sections 2-5361 through 2-5365 apply to new apartment houses with four or more stories and hotels.
  3. Effective March 25, 1982, Section 2-5305(a) applies to existing buildings of Occupancy R and Sections 2-5305(b), (c) and (d) apply to existing buildings of all occupancies.
  4. For effective dates applicable to appliance efficiency standards see Section 2-5306(c)2.

**ENERGY CONSERVATION STANDARDS—PROVISIONS  
APPLICABLE TO ALL OCCUPANCIES \*\***

**Scope**

**Sec. 2-5301.**

**NOTE:** See Adoption Table No. 2-53A, Note 3, for the effective dates of building standards contained in this chapter.

- (a) **GENERAL.**
1. **All Buildings.** The provisions of Section 2-5303 and 2-5304 apply to new and existing buildings of all occupancies.
  2. **New Buildings.** The provisions of this chapter apply to new buildings of occupancies A, B, E, H, and/or R, which are heated or mechanically cooled and for which an application for a building permit or renewal of an existing permit is filed on or after the effective date of this chapter except as listed in 4. It also applies to heated or mechanically cooled new buildings of occupancies A, B, E, H, and/or R constructed by a governmental agency, whether or not a building permit is needed.
    - A. The provisions of Sections 2-5306 and 2-5307 apply to new buildings of occupancies A, B, E, H, and R.

\* These dates are based on the auxiliary implementation documents being available to the public on or before January 1, 1982. If the auxiliary documents are not available to the public on January 1, 1982 these dates will change to be six months after such documents are available to the public.

\*\* See Section 2-5301(a) 3. and 4. for details of application.

- B. The provisions of Sections 2-5311 through 2-5344 apply to new buildings of occupancies A, B, E, and H.
- C. The provisions of Sections 2-5351 and 2-5352 apply to all new buildings of occupancy R except apartment houses with four or more habitable stories and to hotels.
- D. The provisions of Section 2-5361 through 2-5365 apply to new buildings of occupancy R.

**EXCEPTION:** Effective July 1, 1982, the provisions of Sections 2-5361 through 2-5365 apply only to apartment houses with four or more habitable stories and to hotels.

3. **Existing Buildings.** The provisions of subsections 2-5305(b), (c) and (d) apply to existing buildings of all occupancies. The provisions of subsection 2-5305(a) apply only to existing buildings of occupancy R.

4. The following buildings are not subject to the provisions of this chapter.

A. Historical buildings; and

B. Building, in which no energy for space heating, space cooling, and water heating is obtained from depletable sources.

(b) **Mixed Occupancy.** When a new building contains both residential occupancy (R) and nonresidential occupancies (A, B, E, and/or H), the residential portion of the building shall comply with the provisions for residential buildings, and the nonresidential portion of the building shall comply with the provisions for nonresidential buildings with the following exceptions: 1. The entire new building may be treated, for the purpose of this chapter, as a nonresidential building if the residential portion of the building is both less than 1,000 square feet and less than 30 percent of the gross square feet of conditioned floor area of the building.

2. The entire new building may be treated, for the purpose of this chapter, as a residential building if the nonresidential portion of the building is both less than 1,000 square feet and less than 30 percent of the gross square feet of conditioned floor area of the building.

(c) **Additions, Alterations, and Repairs.** 1. Occupancies A, B, E and H (Nonresidential Buildings).

**NOTE:** See Section 2-5312 for the extent of compliance required.

2. Occupancy R (Residential Buildings).

**NOTE:** See Section 2-5361 for the extent of compliance required.

**EXCEPTION:** Effective July 1, 1982, additions to existing buildings of occupancy R other than apartment buildings with four or more stories or hotels which increase the conditioned space shall be subject to the ceiling insulation, wall insulation, floor insulation, glazing "U" value, and shading requirements of Package A for the appropriate climate zone in Tables 2-53U1 through 2-53U16 in Section 2-5351(c), and all the requirements for Sections 2-5351(b) Loose Fill Insulation, 2-5352(c) Wall Insulation, 2-5352(d) Infiltration Control, 2-5352(e) Vapor Barriers, 2-5352(f) Ducts, and 2-5352(m) Lighting, and shall have a maximum total glazing area of 16 percent of the conditioned floor area plus the glazing area that was removed from the existing building because of the addition. Alternatively, additions may meet the energy budgets in Section 2-5351(a) for the appropriate climate zone and building type. New space heating and cooling equipment installed in conjunction with an addition shall meet the requirement of 2-5352(g) Space Conditioning Equipment Sizing, 2-5352(h) Setback Thermostats, and 2-5306 Heating, Ventilation, and Air Conditioning Equipment. New water heating equipment installed in conjunction with an addition shall meet the requirements of 2-5352(i) Water Heating System Insulation and 2-5307 Water Heating Equipment.

(d) **Construction by Governmental Agencies.** No governmental agency shall begin construction of any new building unless the building is designed to comply with

the requirements of this chapter, and of Article 1, Subchapter 4, Chapter 2, Title 20, CAC.

(e) Administrative Requirements. Administrative requirements relating to permit requirements, enforcement by the California Energy Commission, locally adopted energy standards, interpretations, claims of exemption, approved calculation methods, and rights of appeal are specified in Article 1, Subchapter 4, Chapter 2, Title 20, CAC.

### Definitions

Sec. 2-5302. For the purpose of this chapter the following definitions shall apply: **ACCESSIBLE** is having access thereto, but which first may require the removal or opening of an access panel, door or similar obstruction.

**ADDITION** is an extension or increase in floor area or height of a building or structure.

**AIR CONDITIONER** is one or more factory made assemblies which include an evaporator or cooling coil and an electrically driven compressor and condenser combination, and may include a heating function.

**ALTERATION** is any change, addition or modification in construction or occupancy.

**ANSI** is the American National Standards Institute.

**APPLIANCE EFFICIENCY REGULATIONS** are the regulations adopted by the California Energy Commission regulating the minimum efficiency of certain appliances sold in California.

**APPROVED CALCULATION METHOD** is the California Energy Commission's Public Domain Computer Program, one of the California Energy Commission's Simplified Calculation Methods, or any other calculation method approved by the Executive Director of the California Energy Commission.

**ASHRAE** is the American Society of Heating, Refrigerating and Air Conditioning Engineers.

**ASTM** is the American Society for Testing and Materials.

**AUTOMATIC** is self-acting, operating by its own mechanism when actuated by some impersonal influence, as for example, a change in current strength, pressure, temperature, or mechanical configuration.

**BASIC GLAZING AREA** is an area of glazing equal to 16 percent of the gross floor area for buildings with less than four habitable stories and 40 percent of the exterior wall area for all other buildings.

**BUILDING ENVELOPE** is the elements of a building which enclose conditioned spaces and through which thermal energy may be transferred to or from the exterior.

**CLIMATE CONTROL SYSTEM** is a system that provides either collectively or individually the processes of comfort heating, ventilating, and/or cooling within or associated with a building.

**COEFFICIENT OF PERFORMANCE (COP), Cooling** is the ratio of the rate of net heat removal to the rate of total energy input, expressed in consistent units and under designated operating conditions. British thermal units shall be converted to kilowatt hours at the rate of 3413 British thermal units per kilowatt-hour.

**CONDITIONED FLOOR AREA** is the floor area of conditioned space on all floors, including basements, intermediate floor tiers, and penthouses, measured from the exterior faces of exterior walls and the exterior face of walls separating conditioned and unconditioned spaces. Conditioned floor area does not include covered walkways, open roofed-over areas, porches, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, parking garages, unheated basements, and closets for central gas forced air furnaces.

**CONDITIONED SPACE** is the space within a building which is provided with a heat supply or a method of cooling, either of which has a connected output capacity in excess of 10 Btu/hr per square foot.

**DEGREE DAY, HEATING** is a unit, based upon temperature difference and time,

used in estimating fuel consumption and specifying nominal annual heating load of a building. For any one day, when the mean temperature is less than 65°F, there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65°F. The number of degree days for specific geographical locations shall be those listed in Table 2-53D. For those localities not listed in Table 2-53D the number of degree days shall be determined by the applicable enforcing agency.

**DESIGN HEAT LOSS** is the total calculated heat loss through the building envelope under design conditions.

**EAST-FACING** is oriented to within 67½ degrees of true east.

**EFFICACY** is the ratio of light from a lamp to the electrical power consumed, including ballast losses, expressed in lumens per watt.

**ENERGY CONSERVATION DESIGN MANUAL** is a manual developed by the California Energy Commission to aid designers, builders and contractors in meeting energy conservation standards.

**ENERGY EFFICIENCY RATIO (EER)** is the ratio of net cooling capacity in BTU/hr to total rate of electric input in watts under designated operating conditions.

**ENERGY OBTAINED FROM DEPLETABLE SOURCES** is electricity purchased from a public utility or energy obtained from burning coal, oil, natural gas, or liquefied petroleum gases.

**ENERGY OBTAINED FROM NONDEPLETABLE SOURCES** is energy which is not energy obtained from depletable sources.

**ENFORCING AGENCY** is the city, county, or state agency responsible for issuing the building permit.

**EXTERIOR WALL AREA** is the gross area of wall surface adjacent to heated or cooled spaces, including glazing and doors, exposed to ambient climatic temperatures, measured for a dwelling unit or group of units served by a climate control system.

**GENERAL LIGHTING** is lighting designed to provide a substantially uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effect.

**GLAZING** is all transparent or translucent materials in exterior openings.

**GLAZING AREA** is the area of glazing in exterior openings, including the sash area.

**GOVERNMENTAL AGENCY** is any public agency or subdivision thereof, including any agency of the state, county, city, district, association of governments, and joint power agency.

**GROSS FLOOR AREA** is the floor area of space on all floors including basements, intermediate floor tiers, and penthouses, measured from the exterior faces of exterior walls. **GROSS FLOOR AREA** does not include covered walkways, open roofed over areas, porches, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, parking garages and unheated basements.

**HABITABLE STORY** is a story which contains habitable space.

**HEAT PUMP** is an air conditioner which is capable of heating by refrigeration, and which may or may not include a capability for cooling.

**HISTORICAL BUILDING** is a building that has been designated by official government action as having historical or architectural significance.

**HVAC SYSTEM** is a system that provides either collectively or individually the processes of comfort heating, ventilating, and/or cooling within or associated with a building.

**INFILTRATION** is the uncontrolled inward air leakage through cracks and interstices in any building envelope and around windows and doors of a building.

**LUMINAIRE** is a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps, and to connect the lamps to the power supply.

**MANUAL** is capable of being operated by personal intervention.

**NEW ENERGY** is electrical or chemical energy converted to thermal or mechanical energy expressly for the purpose of comfort heating or cooling.

**NONRESIDENTIAL BUILDING** is any building which is of an occupancy type A, B, E, and/or H.

**OUTSIDE AIR** is air taken from outdoors and not previously circulated through the system.

**PLENUM** is an air compartment connected to one or more air inlets or outlets.

**READILY ACCESSIBLE** is capable of being reached quickly for operation, renewal, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to the use of portable access equipment.

**RECOOL** is the application of cooling as a secondary process to either preconditioned primary air or recirculated room air.

**RECOVERED ENERGY** is energy utilized which would otherwise be wasted from an energy system.

**REHEAT** is the application of heat as a secondary process to either preconditioned primary air or recirculated room air.

**RESIDENTIAL BUILDING** is a building which is of an occupancy type R.

**SERVICE SYSTEMS** is the HVAC, service water heating, electrical distribution, and illuminating systems provided in a building.

**SERVICE WATER HEATING** is heating of water for domestic or commercial purposes other than comfort heating.

**SHADING** is externally protected from direct solar radiation by use of devices permanently affixed to the structure or by an adjacent building.

**NOTE:** Effective July 1, 1981, "Shading", as applied to buildings of occupancy R, other than apartment houses with four or more stories and hotels, is protection from direct solar radiation by use of devices affixed to the structure.

**SHADING COEFFICIENT** is the ratio of the solar heat gain through a glazing system corrected for external and internal shading to the solar gain through an unshaded single light of double strength sheet glass under the same set of conditions.

**SKYLIGHT** is any opening in the roof surface which is glazed with a transparent or translucent material.

**SOUTH-FACING** is oriented to within 22-½ degrees of true south.

**SPECIAL GLAZING** is glazing which has a maximum U value of 0.63 for all glazed surfaces.

**SYSTEM** is a combination of equipment and/or controls, accessories, interconnecting means, and terminal elements, by which energy is transformed to perform a specific function, such as climate control, service water heating or illumination.

**TASK-ORIENTED LIGHTING** is lighting designed specifically to illuminate one or more task locations, and generally confined to those locations.

**THERMAL RESISTANCE (R)** is the measure of the resistance of a material or building component to the passage of heat in hr-ft<sup>2</sup>/Btu.

**TINTED GLAZING** is glazing material which is permanently tinted or permanently surface coated by the manufacturer and provides a maximum shading coefficient as hereinafter specified.

**UNCONDITIONED SPACE** is space within a building which is not conditioned space.

**U-VALUE** (Overall Coefficient of Thermal Transmittance) is the heat flow rate through a given construction assembly, air-to-air, expressed in Btu/hr-ft<sup>2</sup>F.

**VALUE**, as used in Section 2-5312, is the estimated cost to replace the building in kind, based on current replacement costs.

**VAPOR BARRIER** is a material with a permeance of one perm or less which provides resistance to the transmission of water vapor.

**VENTILATION AIR** is that portion of supply air which comes from outside plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

**WEST-FACING** is oriented to within 67-½ degrees of true west.

**ZONE** is a space or group of spaces within a building combined for common control of heating or cooling.

**Installation of Certified Insulating Material**

Sec. 2-5303. Insulating material of the types listed in Table 2-53B shall not be installed in any building unless it has been certified by the manufacturer, to comply with the California Quality Standards for Insulating material. See Appendix 2-53A for availability of directories of certified insulating material.

**TABLE 2-53B.**  
**INSULATING MATERIALS SUBJECT TO REGULATION**

Type	Form
Aluminum foil	reflective foil
Cellular glass	board form
Cellulose fiber	loose fill and spray applied
Mineral aggregate	board form
Mineral fiber	blankets, board form, loose fill
Perlite	loose fill
Polystyrene	board form, molded, extruded
Polyurethane	board form and field applied
Polyisocyanurate	board form and field applied
Urea formaldehyde foam	field applied
Vermiculite	loose fill

**NOTE:** See the definition of "Exposed application" in Title 20, Section 1552(e) as it applies to the surface burning characteristics for mineral aggregate and mineral fiber.

**Installation of Urea Formaldehyde Foam Field Applied**

Sec. 2-5304. (a) Installation of urea formaldehyde foam insulation is prohibited unless, in addition to the requirements of Section 2-5303, the foam is installed in compliance with the following requirements.

(b) **Exterior Sidewalls, Vapor Barrier.** Application is restricted to exterior sidewalls in all buildings. A four mil thickness plastic polyethylene vapor barrier, or equivalent plastic sheeting vapor barrier, shall be installed between the urea formaldehyde foam insulation and the interior space in all applications.

**Installation of Additional Insulation**

Sec. 2-5305. Insulating material shall not be installed by a contractor unless the contractor certifies to the customer, in writing, that the insulation meets the requirements of subsections (a), (b), (c), and (d), as applicable. (a) This subsection applies only to residential buildings not subject to the requirements of Sections 2-5351, 2-5352, or 2-5361 through 2-5365 (new residential buildings). If insulating material is installed in an accessible attic, the total amount of insulation (after addition of insulation to the amount, if any, already in the attic) shall meet or exceed the higher of the thermal resistance (R-value) determined from Table 2-53C or the R-value recommended by a Residential Conservation Service audit, if one has been performed. Where adequate accessible space is not available, the contractor may install a lesser amount of insulation to fill the area being insulated.

(b) If external insulation is applied to water heaters and storage and backup tanks for solar water heating systems, it shall have a thermal resistance of at least R-6.

(c) If insulation is applied to piping in unconditioned space leading to and from water heaters, it shall have a thermal resistance of at least R-3 for the five feet of pipe closest to the water heater, or whatever shorter length is in accessible unconditioned space.

(d) If external insulation is applied to heating and cooling system ducts, it shall conform to the thermal resistance requirements of Section 1005 of the State Mechanical Code (Title 24, Part 4).

**TABLE 2-53C. MINIMUM REQUIREMENTS FOR ADDITIONAL  
ATTIC INSULATION**

<i>Degree Days</i>	<i>R-value</i> <sup>1</sup>
Up to 3000	19
3001 to 4100	20
4101 to 4800	21
4801 to 5500	22
5501 to 6050	23
6051 to 6500	24
6501 to 7000	25
7001 to 7350	26
7351 to 7650	27
7651 to 7900	28
7901 to 8150	29
8151 and up	30

For listing of degree days by locality, see Table 2-53D

<sup>1</sup>The R-values listed refer to the total of in-place insulation and insulation added.

TABLE 2-53D. ANNUAL HEATING DEGREE DAYS

<i>Location</i>	<i>Annual Heating Degree Days</i>
Alameda Naval Air Station .....	2,900
Alderpoint .....	3,290
Alpine .....	2,104
Alturas .....	6,785
Anaheim .....	1,490
Antioch .....	2,627
Arcata .....	4,800
Auburn .....	3,047
Bakersfield .....	2,122
Barrett Dam .....	2,363
Barstow .....	2,496
Beale Air Force Base .....	2,400
Beaumont .....	2,790
Benicia .....	2,600
Berkeley .....	2,850
Bishop .....	4,275
Blythe Airport .....	1,076
Bolinas .....	2,800
Bonita .....	1,897
Borrego Springs .....	1,262
Brawley .....	1,161
Brisbane .....	3,060
Burbank Airport .....	1,800
Burlingame .....	2,650
Burney .....	6,249
Buttonwillow .....	2,010
Cabrillo National Monument .....	1,653
Calaveras Big Trees .....	5,736
Calabasas .....	1,800
Campo .....	3,247
Capitola .....	2,900
Carmel .....	2,900
Carmichael .....	2,800
Carpinteria .....	2,290
Castle Air Force Base .....	2,550
Castroville .....	2,900
Central Valley .....	3,010
Ceres .....	2,750
Chico .....	2,795
China Lake .....	2,570

TABLE 2-53D. ANNUAL HEATING DEGREE DAYS—Continued

<i>Location</i>	<i>Annual Heating Degree Days</i>
Chowchilla .....	2,400
Chula Vista .....	2,229
Claremont .....	1,600
Cloverdale .....	2,666
Clovis .....	2,600
Colfax .....	3,441
Colusa .....	2,788
Concord .....	2,766
Corning .....	2,790
Corona .....	1,875
Corte Madera .....	2,600
Crescent City .....	4,545
Culver City .....	1,711
Cuyamaca .....	4,649
Daggett Airport .....	2,203
Daly City .....	3,100
Danville .....	2,700
Davis .....	2,819
Death Valley .....	1,205
Deep Springs College .....	4,300
Delano .....	2,220
Dixon .....	2,800
Dunsmuir .....	5,300
Edwards Air Force Base .....	3,123
El Cajon .....	1,920
El Capitan Dam .....	1,397
El Centro .....	1,216
Elk Valley .....	5,404
Elsinore .....	2,101
Encinitas .....	1,932
Escondido .....	2,052
Eureka .....	4,679
Fairfield .....	2,434
Fairmont .....	3,327
Fair Oaks .....	2,900
Fillmore .....	2,377
Folsom .....	2,899
Fort Bidwell .....	6,365
Fort Bragg .....	4,424
Fort Jones .....	5,614

TABLE 2—53D. ANNUAL HEATING DEGREE DAYS—Continued

<i>Location</i>	<i>Annual Heating Degree Days</i>
Fortuna .....	4,700
Fremont.....	2,906
Fresno .....	2,611
Galt .....	2,780
Garberville .....	3,510
Cardena.....	1,700
Gilroy .....	2,808
Grass Valley .....	4,400
Gridley.....	2,600
Gustine.....	2,360
Half Moon Bay.....	2,700
Hamilton Air Force Base .....	2,600
Hanford .....	2,642
Hawthorne .....	1,800
Hayward .....	2,850
Healdsburg .....	2,700
Henshaw Dam .....	3,652
Hetch Hetchy.....	4,797
Hillsdale.....	2,650
Hollister .....	2,725
Huntington Beach.....	2,361
Imperial Airport .....	1,060
Independence .....	2,995
Inyokern .....	2,570
Ione.....	2,728
Jackson .....	2,760
Julian Wynola.....	4,085
King City.....	2,655
Lafayette .....	2,700
Laguna Beach .....	2,262
La Jolla.....	1,750
Lake Arrowhead .....	5,200
Lakeport .....	3,716
Lakewood .....	1,800
La Mesa .....	1,492
Lancaster.....	3,100
Laytonville .....	4,160
Lemoore .....	2,960
Lincoln.....	2,890
Lindsay .....	2,619

TABLE 2—53D. ANNUAL HEATING DEGREE DAYS—Continued

<i>Location</i>	<i>Annual Heating Degree Days</i>
Live Oak .....	2,370
Livermore .....	2,781
Lodi .....	2,785
Lompoc .....	2,900
Long Beach Airport .....	1,803
Los Angeles Airport .....	2,061
Los Banos .....	2,267
Los Gatos .....	2,794
McCloud .....	6,007
Madera .....	2,483
Manteca .....	2,600
Maricopa .....	2,163
Mariposa .....	3,116
Markleeville .....	7,884
Martinez .....	2,650
Marysville .....	2,377
Mecca .....	1,117
Mendota .....	2,535
Merced .....	2,697
Mineral .....	7,192
Mitchell Cavern .....	2,510
Modesto .....	2,767
Moffett Naval Air Station .....	2,800
Mojave .....	2,590
Monterey .....	2,983
Morro Bay .....	1,600
Mount Shasta .....	5,800
Napa .....	2,690
Needles Airport .....	1,072
Nellie .....	4,745
Nevada City .....	4,488
Newport Beach .....	2,350
Novato .....	2,815
Oakdale .....	2,832
Oak Grove .....	3,516
Oakland .....	2,906
Oceanside .....	2,092
Orland .....	2,830
Oroville .....	2,597
Oxnard .....	2,352

TABLE 2—53D. ANNUAL HEATING DEGREE DAYS—Continued

<i>Location</i>	<i>Annual Heating Degree Days</i>
Palmdale Airport.....	3,088
Palm Springs.....	1,232
Palo Alto.....	2,869
Palomar Mt. Observatory.....	3,868
Paradise.....	4,010
Pasadena.....	1,694
Paso Robles Airport.....	2,390
Patterson.....	2,368
Perris.....	2,100
Petaluma.....	2,966
Pismo Beach.....	2,800
Pittsburg.....	2,633
Placerville.....	4,161
Point Loma.....	1,860
Pomona.....	2,166
Porterville.....	2,563
Portola.....	7,055
Quincy.....	5,852
Ramona Spaulding.....	2,223
Red Bluff.....	2,688
Redding.....	2,610
Redlands.....	2,052
Redwood City.....	2,596
Richmond.....	2,644
Ripon.....	2,700
Riverside.....	2,089
Roseville.....	2,899
Sacramento Executive Airport.....	2,782
St. Helena.....	2,833
Salinas.....	2,959
San Bernardino.....	2,018
San Clemente.....	1,877
San Diego.....	1,439
San Fernando.....	1,800
San Francisco Airport.....	3,080
San Jacinto.....	2,376
San Jose.....	2,656
San Juan Capistrano.....	1,646
San Luis Obispo.....	2,582

TABLE 2—53D. ANNUAL HEATING DEGREE DAYS—Continued

<i>Location</i>	<i>Annual Heating Degree Days</i>
San Mateo .....	2,655
San Rafael .....	2,619
Santa Ana .....	1,496
Santa Barbara .....	2,290
Santa Clara .....	2,566
Santa Cruz .....	2,900
Santa Maria .....	2,985
Santa Paula .....	2,400
Santa Rosa .....	2,980
Scotia .....	3,954
Sierraville .....	6,953
Sonora .....	3,086
South San Francisco .....	3,061
South San Gabriel .....	1,600
Squaw Valley .....	200
Stockton .....	2,690
Stony Gorge Reservoir .....	3,124
Susanville .....	6,248
Tahoe City .....	8,162
Tahoe Valley .....	8,198
Thousand Oaks .....	2,425
Tracy .....	2,616
Truckee .....	8,208
Twentynine Palms .....	2,006
Ukiah .....	3,030
Vacaville .....	2,812
Vallejo .....	2,598
Vincent .....	3,510
Visalia .....	2,526
Vista .....	2,546
Warner Springs .....	3,470
Weaverville .....	4,935
Weed .....	5,870
Willits .....	4,160
Willows .....	2,807
Woodland .....	2,447
Yosemite .....	4,800
Yreka .....	5,393
Yuba City .....	2,386

**Heating, Ventilating, and Air Conditioning Equipment**

Sec. 2-5306. (a) Electrically Operated Cooling Equipment. 1. Air conditioners of the types described below shall not be installed unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of air conditioners. See Appendix 2-53A for availability of directories of certified air conditioners.

Room air conditioners (of any capacity), central air conditioning heat pumps (of any capacity) and other central air conditioners with a cooling capacity of less than 65,000 Btu per hour.

Requirements for central air conditioning heat pumps with cooling capacity of 65,000 Btu per hour or more apply to heating performance but not cooling performance.

2. The efficiency of all air conditioners whose energy input in the cooling mode is entirely electric, and whose standard rated capacity is equal to or greater than 65,000 Btu/hour shall be not less than the values shown in Tables 2-53E and 2-53F based on one of the test procedures specified in Table 2-53C.

**Table 2-53E. MINIMUM EFFICIENCY OF ELECTRICALLY DRIVEN COOLING EQUIPMENT, 65,000 Btu/HOUR AND OVER**

<i>Classification in Table 2-53C</i>	<i>Type</i>	<i>Condensing Means</i>	<i>EER COP</i>
A .....	Air Conditioners	Any	7.5
B .....	Refrigerant Condensing Units	Air	2.5
		Evaporator or Water	3.5

**Table 2-53F. MINIMUM EFFICIENCY OF ELECTRICALLY DRIVEN WATER CHILLING PACKAGES**

<i>Classification in Table 2-53C</i>	<i>Type</i>	<i>Condensing Means</i>	<i>COP</i>
C .....	Centrifugal	Air	2.3
		Water	4.0
C .....	Rotary or Reciprocating	Air	2.2
		Water	3.4

**Table 2-53G. TEST PROCEDURES FOR ELECTRICALLY OPERATED AIR COOLING SYSTEMS**

<i>Classification</i>	<i>Type</i>	<i>Test Procedure</i>
A .....	Unitary Air-Conditioning Equipment	ARI 210-81
	Commercial and Industrial Unitary Air-Conditioning Equipment	ARI 360-75
	Air-Source Unitary Heat Pump Equipment	ARI 240-81
	Water-Source Heat Pumps	ARI 320-81
	Commercial and Industrial Unitary Heat Pump Equipment	ARI 340-76
B .....	Positive Displacement Refrigerant Condensing Units	ARI 520-78
C .....	Centrifugal or Rotary Water-Chilling Packages	ARI 550-77
	Reciprocating Water-Chilling Packages	ANSI/ARI 590-1976

(b) Heat Operated Cooling Equipment. 1. The coefficient of performance of heat-operated cooling equipment shall be not less than the values shown in Table 53H when tested at standard rating conditions established in ANSI Standard Z21.40.1-1973, ARI Standard 560-75, ASHRAE Standard 22-71 or ASHRAE Standard 24-71 as applicable. These requirements apply to, but are not limited to, absorption equipment, engine-driven equipment, and turbine driven equipment.

2. The performance of heat operated (absorption) water chilling equipment shall be based not only on the components included in the unit, but shall include cooling tower fans, pumps, and other parts of the complete system which may be supplied separately. Absorption water chilling units, employing steam or hot water as the energy source, and water cooled absorbers and condensers shall comply with the requirements of ARI Standard 560-75. Direct-fired, absorption water chillers and air conditioners shall comply with ANSI Standard Z21.40.1-1973, with Addenda Z21.40.1a-1974 and the provisions of the Boiler and Fired Pressure Vessel Safety Orders, Title 8, Chapter 4, California Administrative Code.

TABLE 2-53H. MINIMUM EFFICIENCY OF HEAT  
OPERATED COOLING EQUIPMENT

<i>Heat Source</i>	<i>COP</i>
Direct-Fired (Gas, Oil)	0.48
Indirect-Fired (Steam, Hot Water)	0.68
Performance at Sea Level	
COP = $\frac{\text{Net cooling output}}{\text{Total heat input (electrical auxiliary inputs excluded)}}$	

(c) **Combustion Type Heating Equipment.** 1. Gas-fired comfort heating equipment of the types described below shall not be installed unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of heating equipment. See Appendix 2-53A for availability of directories of certified gas-fired comfort heating equipment.

Gas space heaters excluding the following types:

- gravity type central furnaces
- fan type central furnaces with input rates of 4,000,000 Btu per hour or more
- infrared heaters

2. The appliance efficiency standards include more stringent standards for the following appliances which will become effective on the following dates:

<i>Effective Date</i>	<i>Appliance</i>	<i>Standard</i>
December 22, 1982	Gas fan type central furnaces with input rate less than 175,000 Btu per hour, except those combined with a single package central air conditioner with rated cooling capacity exceeding 65,000 Btu per hour.	71% seasonal efficiency
December 22, 1984	Gas fan type central furnaces with input rate of 175,000 Btu per hour or more and those combined with a single package central air conditioner with rated cooling capacity exceeding 65,000 Btu per hour.	71% seasonal efficiency
December 22, 1981	Fan type wall furnace	80% thermal efficiency 10 watts standby loss (natural gas) 147 watts standby loss (LPG)
December 22, 1983	Unit heaters and duct furnaces	80% thermal efficiency 10 watts standby loss (natural gas) 147 watts standby loss (LPG)

Gas-fired comfort heating equipment of the above types shall not be installed in a building for which the building permit was issued on or after the applicable effective date these standards unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of heating equipment.

Gas-fired comfort heating equipment of the above types regardless of the date of manufacture, shall not be installed in a building for which a building permit is issued more than one year after the applicable effective date unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of heating equipment.

3. Gas-fired fan type central furnaces or gas-fired fan type wall furnaces (except those designed to burn only liquefied petroleum gases) shall not be installed unless they comply with the intermittent ignition device requirements of the appliance efficiency regulations.

**NOTE:** Additional requirements related to the efficiency of gas and oil burning heating equipment in buildings of occupancy A, B, E, and H are specified in Section 2-5337.

(d) **Heat Pumps—Heating Mode.** 1. Heat pumps of the types described below shall not be installed unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of heat pump. See Appendix 2-53A for availability of directories of certified heat pumps.

- Room air conditioning and central air conditioning heat pumps

Requirements for central air conditioning heat pumps with cooling capacity of 65,000 Btu per hour or more apply to heating performance but not cooling performance.

2. Heat pumps shall be installed with controls to prevent supplementary heater operation when the heating load can be met by the heat pumps alone. Supplementary heater operation is permitted during transient periods, such as start-ups, following room thermostat setpoint advance, and during defrost.

A two stage room thermostat, which controls the supplementary heat on its second stage, shall be accepted as meeting this requirement. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Supplementary heat may be derived from any source of electric resistance heating or combustion heating.

### Water Heating Equipment

Sec. 2-5307. (a) **Equipment Efficiency.** 1. Water heaters of the type described below shall not be installed unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of water heater. See Appendix 2-53A for availability of directories of certified water heaters.

**EXCEPTION:** Water heaters of the following type are excluded:

1. Non-storage type electric water heaters.
2. Water heaters used exclusively for space heating.
2. Oil-fired automatic storage heaters shall have a recovery efficiency ( $E_r$ ) of not less than 75 percent and a standby loss percentage ( $S$ ) not exceeding

$$S = 2.3 + \frac{67}{CAP}$$

where: CAP = storage capacity in gallons

The method of test of  $E_r$  and  $S$  shall be as described in Section 2.8 of ANSI Standard Z21.10.3—1975. For oil-fired units, CF = 1.0; Q = total gallons of oil consumed; and H = total heating value of oil in Btu/gallon.

(b) **Showerheads and Faucets.** Showerheads, lavatory faucets, and sink faucets shall not be installed unless the manufacturer has lawfully certified to the California Energy Commission compliance with the appliance efficiency standards for that model of showerhead, lavatory faucet, or sink faucet. See Appendix 2-53A for availability of directories of certified showerheads, lavatory faucets and sink faucets.

(c) **Solar Water Heaters in State-Owned Buildings.** Construction shall not commence on any state-owned building which has more than 10,000 square feet of floor area and which has a heating, cooling, water heating, or lighting system expected to be used more than 1,000 hours per year, unless the building is equipped with a solar water heating system or has been exempted from this requirement by the State Architect for reasons of economic or physical infeasibility.

ENERGY CONSERVATION STANDARDS PROVISIONS  
APPLICABLE TO OTHER OCCUPANCIES

Sections 2-5311 through 2-5344 apply only to nonresidential buildings, and sections 2-5351 and 2-5352 apply only to residential buildings (other than apartment houses with four or more habitable stories and hotels). They are not included in this excerpt. Copies may be obtained by writing to the following address:

California Energy Commission  
Publications Office  
1111 Howe Avenue  
Sacramento, CA 95825

(916) 920-6216

**ENERGY CONSERVATION STANDARDS FOR NEW BUILDINGS  
OF OCCUPANCY R WITH FOUR OR MORE  
HABITABLE STORIES AND HOTELS \***

**General Provisions**

Sec. 2-5361. (a) **Scope.** The provisions of Sections 2-5361 through 2-5364 apply to new buildings of occupancy R which are heated or mechanically cooled (except historical buildings) and for which an application for a building permit or renewal of an existing permit is filed on or after the effective date of this chapter.

**NOTE:** See Table 2-53 A, Note 3, for effective dates.

(b) **Additions to Existing Buildings.** All heated or cooled additions to existing buildings of occupancy R shall be constructed to comply with this chapter.

The square footage of glazing which was physically eliminated from an existing structure by an addition may be added to that addition's basic glazing area.

The enforcement agency may approve alternate designs, including energy conservation measures in the existing structure, provided that the entire structure does not use more energy from depletable sources than would be required if the addition were constructed to conform to the provisions of this chapter.

If the gross square feet of conditioned floor area of the addition is greater than 30 percent of the gross floor area of the existing structure, the accessible attic of the existing structure shall be insulated to conform to the provisions of this chapter.

(c) **Alternate Materials, Method of Construction, Design or Insulating System.** The provisions of this chapter are not intended to prevent the use of any material, method of construction, design or insulation system not specifically prescribed herein, provided that any such alternate has been approved by the enforcement agency as set forth below.

The U value of any component of roof deck, ceiling, wall or floor may be increased and the U value for other components decreased until the overall heat gain or heat loss of the building does not exceed the total resulting from conformance to the prescribed U values. Such alternate designs shall be based upon buildings of identical configuration.

The enforcement agency may approve any alternative design, including designs using nondepletable energy sources, provided it finds that the proposed design complies with the provisions of this chapter in that the material, method of construction, design, or insulating system does not use more energy from depletable energy sources than the requirements of this chapter.

The enforcement agency shall require that sufficient evidence be submitted to substantiate any claims made regarding the installation and use of any such alternate and may require testing of the final installation.

(d) **Design Conditions.** Inside winter design temperature shall be 70° F and inside summer design temperature shall be 75° F. Outdoor design temperatures for specific locations shall be those listed in Table 2-53W. For locations not listed in Table 2-53W, the outdoor design temperature shall be those listed in the columns of the Summer dry bulb, Summer wet bulb and Winter heating temperature from "Recommended Design Temperatures," published by ASHRAE Golden Gate and Southern California Chapters as follows:

	<u>Edition</u>	<u>Cooling</u>	<u>Heating</u>
Northern California .....	1977	2½%	1%
Southern California .....	1972	0.5%	0.2%

For those locations not listed in these documents, the outdoor design temperatures shall be determined by the local enforcement agency having jurisdiction.

\* Title applies effective July 1, 1982. See 2-5361(a) for scope through June 30, 1982.

TABLE 2-53W. OUTDOOR DESIGN TEMPERATURES

<i>Location</i>	<i>Winter Design</i>	<i>Summer Design</i>
Alameda Naval Air Station.....	35° F	78° F
Alpine.....	32	98
Alturas.....	-1	90
Anaheim.....	35	91
Antioch.....	30	93
Arcata.....	32	65
Auburn.....	31	96
Bakersfield.....	30	101
Barrett Dam.....	26	97
Barstow.....	24	102
Beale Air Force Base.....	28	100
Beaumont.....	28	96
Benicia.....	33	90
Berkeley.....	39	84
Bishop.....	16	98
Blythe Airport.....	31	109
Bolinas.....	36	75
Bonita.....	32	91
Borrego Springs.....	28	106
Brawley.....	32	110
Brisbane.....	36	78
Burbank Airport.....	36	96
Burlingame.....	34	79
Burney.....	5	90
Buttonwillow.....	23	102
Cabrillo National Monument.....	43	85
Calabasas.....	31	98
Campo.....	21	96
Capitola.....	34	82
Carmel.....	35	78
Carmichael.....	31	98
Carpinteria.....	34	85
Castle Air Force Base.....	30	99
Castroville.....	32	82
Central Valley.....	29	99
Ceres.....	30	99
Chico.....	29	100
China Lake.....	22	106
Chowchilla.....	30	99
Chula Vista.....	36	80
Claremont.....	33	98
Cloverdale.....	31	96
Clovis.....	28	101
Colfax.....	25	89
Colusa.....	30	100
Concord.....	32	92
Corning.....	30	101
Corona.....	33	95
Corte Madera.....	33	88
Crescent City.....	33	69
Culver City.....	38	88
Cuyamaca.....	16	86
Daggett Airport.....	24	103

TABLE 2-53W. OUTDOOR DESIGN TEMPERATURES—Continued

<i>Location</i>	<i>Winter Design</i>	<i>Summer Design</i>
Daly City .....	37	76
Danville.....	28	94
Davis .....	30	99
Death Valley .....	35	116
Deep Springs College .....	28	95
Delano .....	31	103
Dixon .....	30	98
Dunsmuir .....	16	94
Edwards Air Force Base.....	21	102
El Cajon .....	30	96
El Capitan Dam .....	32	100
El Centro .....	31	110
Elsinore .....	28	102
Encinitas .....	39	83
Escondido .....	31	93
Eureka .....	35	65
Fairfield.....	30	95
Fairmont .....	28	94
Fair Oaks .....	29	99
Fillmore.....	33	90
Folsom .....	30	99
Fort Bragg .....	34	67
Fortuna .....	34	72
Fremont .....	30	89
Fresno .....	29	99
Galt.....	30	97
Garberville .....	30	85
Gardena.....	37	86
Gilroy.....	28	94
Grass Valley .....	26	93
Gridley.....	30	100
Gustine .....	30	100
Half Moon Bay .....	35	73
Hamilton Air Force Base .....	33	85
Hanford .....	28	100
Hawthorne .....	37	88
Hayward .....	30	85
Healdsburg .....	30	94
Henshaw Dam.....	20	96
Hetch Hetchy .....	18	90
Hillsdale .....	35	83
Hollister.....	30	91
Huntington Beach .....	40	81
Imperial Airport .....	33	109
Independence .....	19	96
Inyokern .....	23	102
Ione .....	28	96
Jackson.....	31	91
Julian Wynola .....	21	91
King City .....	25	93
Lafayette.....	29	92
Laguna Beach .....	37	80

TABLE 2-53W. OUTDOOR DESIGN TEMPERATURES—Continued

<i>Location</i>	<i>Winter Design</i>	<i>Summer Design</i>
La Jolla .....	40	84
Lake Arrowhead .....	20	86
Lakeport .....	25	89
Lakewood .....	38	90
La Mesa .....	37	91
Lancaster .....	17	102
Laytonville .....	25	90
Lemoore .....	29	100
Lincoln .....	30	100
Lindsay .....	30	100
Live Oak .....	30	100
Livermore .....	28	97
Lodi .....	30	97
Lompoc .....	30	78
Long Beach Airport .....	38	84
Los Angeles Airport .....	41	85
Los Banos .....	28	100
Los Gatos .....	32	89
McCloud .....	11	86
Madera .....	30	100
Manteca .....	30	98
Maricopa .....	32	101
Mariposa .....	27	96
Markleeville .....	8	83
Martinez .....	32	91
Marysville .....	32	100
Mecca .....	29	108
Mendota .....	29	100
Merced .....	29	99
Mitchell Cavern .....	26	99
Modesto .....	32	98
Moffett Naval Air Station .....	34	85
Mojave .....	25	100
Monterey .....	34	82
Morro Bay .....	36	83
Mount Shasta .....	14	87
Napa .....	31	92
Needles Airport .....	33	110
Nevada City .....	20	93
Newport Beach .....	37	80
Novato .....	30	89
Oakdale .....	28	99
Oak Grove .....	26	95
Oakland .....	33	85
Oceanside .....	37	82
Orland .....	30	101
Oroville .....	30	100
Oxnard .....	35	86
Palmdale Airport .....	24	101
Palm Springs .....	31	110
Palo Alto .....	34	88
Palomar, Mt. Observatory .....	21	84

TABLE 2-53W. OUTDOOR DESIGN TEMPERATURES—Continued

<i>Location</i>	<i>Winter Design</i>	<i>Summer Design</i>
La Jolla .....	40	84
Lake Arrowhead .....	20	86
Lakeport .....	25	89
Lakewood .....	38	90
La Mesa .....	37	91
Lancaster .....	17	102
Laytonville .....	25	90
Lemoore .....	29	100
Lincoln .....	30	100
Lindsay .....	30	100
Live Oak .....	30	100
Livermore .....	28	97
Lodi .....	30	97
Lompoc .....	30	78
Long Beach Airport .....	38	84
Los Angeles Airport .....	41	85
Los Banos .....	28	100
Los Gatos .....	32	89
McCloud .....	11	86
Madera .....	30	100
Manteca .....	30	98
Maricopa .....	32	101
Mariposa .....	27	96
Markleeville .....	8	83
Martinez .....	32	91
Marysville .....	32	100
Mecca .....	29	108
Mendota .....	29	100
Merced .....	29	99
Mitchell Cavern .....	26	99
Modesto .....	32	98
Moffett Naval Air Station .....	34	85
Mojave .....	25	100
Monterey .....	34	82
Morro Bay .....	36	83
Mount Shasta .....	14	87
Napa .....	31	92
Needles Airport .....	33	110
Nevada City .....	20	93
Newport Beach .....	37	80
Novato .....	30	89
Oakdale .....	28	99
Oak Grove .....	26	95
Oakland .....	35	85
Oceanside .....	37	82
Orland .....	30	101
Oroville .....	30	100
Oxnard .....	35	86
Palmdale Airport .....	24	101
Palm Springs .....	31	110
Palo Alto .....	34	88
Palomar, Mt. Observatory .....	21	84

TABLE 2-53W. OUTDOOR DESIGN TEMPERATURES—Continued

<i>Location</i>	<i>Winter Design</i>	<i>Summer Design</i>
Thousand Oaks .....	32	93
Tracy .....	30	98
Truckee .....	-4	84
Twentynine Palms .....	28	104
Ukiah .....	27	96
Vacaville .....	29	98
Vallejo .....	33	88
Vincent .....	21	99
Visalia .....	32	100
Vista .....	35	87
Warner Springs .....	24	96
Weaverville .....	16	96
Weed .....	8	86
Willits .....	17	89
Willows .....	30	100
Woodland .....	30	100
Yosemite .....	18	90
Yreka .....	13	94
Yuba City .....	31	100

**Building Envelope**

Sec. 2-5362. (a) Insulation. 1. Walls. The U value of the opaque surfaces between conditioned and unconditioned spaces shall not exceed the values shown in Table 2-53X for the building types, wall densities and degree day ranges listed.

TABLE 2-53X. MAXIMUM U VALUES FOR WALLS

<i>Degree Days</i>	<i>Building Type</i>	<i>Wall Density (pounds/square foot)</i>	<i>Maximum U Value</i>	
			<i>[1]</i>	<i>[2]</i>
3500 or less .....	All	Over 40	0.16	Not applicable
3500 or less .....	All	26-40	0.12	Not applicable
3500 or less .....	All	25 or less	0.095	0.080
Over 3500, but not over 4500 .....	All	All	0.095	0.080
Over 4500 .....	[3]	All	0.065	0.055
Over 4500 .....	[4]	All	0.095	0.080

[1] When the effects of all elements of the wall construction, including studs are considered or when all of the thermal insulation is installed so that it is not penetrated by framing members.

[2] When the effects of framing members such as studs are not considered.

[3] Buildings with less than four habitable stories.

[4] Buildings with four or more habitable stories.

2. Ceilings. A. The maximum allowable U value for ceilings in buildings with less than four habitable stories shall be as shown in Figure 2-53H.

B. The maximum allowable U value for ceilings on buildings with more than four habitable stories shall be 0.050 when the effects of framing members such as joists are not considered. When the effects of all elements of the ceiling construction are considered or when all of the thermal insulation is installed so that it is not penetrated by framing members, the U value shall not exceed 0.060.

FIGURE 1  
HEATING DEGREE DAYS (1000's)

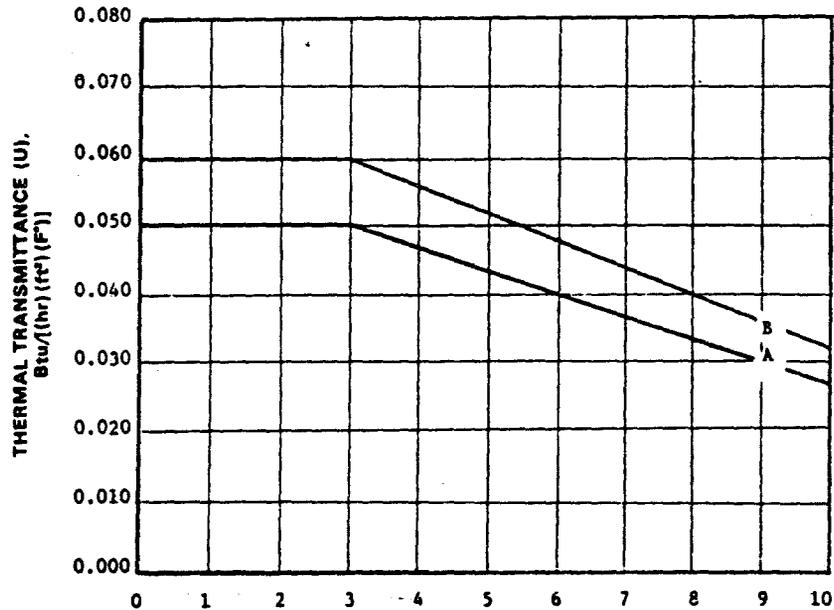


FIGURE 2-53 H  
MAXIMUM U VALUES FOR CEILINGS

NOTES: A. When the effects of framing members such as joists are not considered.

B. When the effects of all elements of the ceiling construction, including framing members such as joists, are considered or when all of the thermal insulation is installed so that it is not penetrated by framing members.

C. Blown or poured type insulating material may only be used in attic spaces where the slope of the roof is at least 2½ feet in 12 feet and the distance from the top of the bottom chord of the truss or ceiling joists to the underside of the roof sheathing is at least 30 inches at the roof ridge. When eave vents are installed, adequate baffling of the vent opening shall be provided to deflect the incoming air above the surface of the material and shall be installed at the soffit on a 45-degree angle. Baffles shall be in place at the time of framing inspection. The thermal resistance (R) of the insulation required to comply with these regulations shall be shown on the building plans.

3. Floor Section. Foundation Walls, Crawl Space Plenum Walls and Slab-on-Ground Floors. A. Floors over Unheated Spaces. For floors over unheated spaces, unheated basements, unheated garages, or ventilated crawl spaces, the U values of floor section shall not exceed the value shown in Table 2-53Y.

TABLE 2-53Y. MAXIMUM U VALUES OF FLOORS  
OVER UNHEATED SPACE

<i>Heating Degree Days</i>	<i>Maximum U Value</i>
3000 or less .....	No requirement
over 3000 .....	0.08

In lieu of the requirements of Table 2-53Y, floor insulation may be omitted from buildings with less than four habitable stories with operable crawl space louvers if the foundation walls are insulated, a vapor barrier having a permeance of less than one perm is installed on the crawl space ground surface, and the total building design heat loss with the louvers closed does not exceed the total resulting from conformance with the requirements of Table 2-53Y.

**B. Floors Over Heated Spaces.** Foundation walls of heated basements or heated crawl spaces above grade shall be insulated to provide a U value not to exceed the values shown in Table 2-53Z. Insulation may be omitted from floors over heated basement areas or crawl spaces if foundation walls are insulated.

TABLE 2-53Z. MAXIMUM U VALUES OF FOUNDATION WALL SECTIONS  
OF HEATED BASEMENTS AND HEATED CRAWL SPACES

<i>Heating Degree Days</i>	<i>Maximum U Values</i>
2500 or less .....	No requirement
over 2500 .....	0.15

When a crawl space is used as a supply or return plenum, the crawl space perimeter wall shall be insulated to provide a maximum U value of 0.15.

**C. Slab-On-Ground Floors.** For slab-on-ground floors, the edge heat loss around the perimeter of heated spaces shall not exceed the maximum value per linear foot of exposed edge of 21 Btuh for unheated slabs and 25 Btuh for heated slabs.

**4. Compliance.** The enforcement agency shall be responsible for determining that the work required by these regulations has been properly completed. Upon completion of the installation of insulation, a card certifying that the insulation has been installed in conformance with the requirements of these regulations shall be completed and executed by the insulation applicator and by the builder. This insulation compliance card shall be posted at a conspicuous location within the dwelling.

**(b) Vapor Barriers.** In areas where the winter design temperature is 25° F or below, a vapor barrier having a permeance of less than one perm shall be installed on the heated side of the insulation in all exterior walls, unvented attics, or unvented crawl spaces.

**(c) Glazing. 1. Buildings with Less Than Four Habitable Stories.** A. For heated buildings with less than four habitable stories located in areas of 3500 degree days or less, where the total glazing area exceeds the basic glazing area, treatment shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area single glazed.

B. Heated buildings with less than four habitable stories located in areas over 3500 degree days shall be provided with special glazing for all exterior glazing. Where the total glazing area exceeds the basic glazing area, treatment, as specified in Section 2-5361(c), shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area special glazed.

**2. Buildings with Four or More Habitable Stories.** A. For heated buildings with four or more habitable stories located in areas of 4500 degree days or less, where the total glazing area exceeds the basic glazing area, treatment shall be required to limit

the conducted design heat loss to that which would occur with the basic glazing area single glazed.

B. Heated buildings with four or more habitable stories located in areas over 4500 degree days shall be provided with special glazing for all exterior glazing. Where the total glazing area exceeds the basic glazing area, treatment shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area in special glazing.

3. **Passive Solar.** In buildings with less than four habitable stories, special glazing oriented within  $22\frac{1}{2}^\circ$  of true South shall be exempt from the total glazing area if:

A. The glazed area is shaded to protect it from direct solar exposure for the hours of 9:00 a.m., noon, and 3:00 p.m. solar time on August 21; and

B. The glazed area receives direct solar exposure for the hours of 9:00 a.m., noon, and 3:00 p.m. solar time on December 21; and

C. The thermal mass of the house exceeds the basic thermal mass by 30 Btu/°F for each square foot of exempt glazing.

The basic thermal mass in Btu/°F of a light-weight construction house with a slab floor is given by thermal mass =  $2.25 \times$  gross floor area (in square feet).

The thermal mass of slab floors or other massive elements inside the insulated envelope is given by thermal mass = (specific heat)  $\times$  (weight). In the case of a concrete slab floor, the maximum allowable thermal mass shall be no more than 5 Btu/°F per square foot of slab.

4. **Cooled Buildings.** Cooled buildings shall utilize tinted glazing when the total glazing area exceeds the basic glazing area. The glazing area on walls oriented within  $22\frac{1}{2}^\circ$  degrees of true North need not be included in the total glazing area. The required tinted glazing area shall not be less than the difference between the total glazing area and the basic glazing area. Permanent external shading to allow not more than 50 percent direct solar exposure on the glazing, taken on August 21 at 9:00 a.m., noon, and 3:00 p.m. solar time, may be utilized in lieu of tinted glass. Tinted glazing or permanent external shading on walls oriented within  $22\frac{1}{2}^\circ$  degrees of true North shall not be considered as part of the required tinted glazing area. For purposes of this section, tinted glazing shall have a maximum shading coefficient of 0.55.

(d) **Infiltration.** 1. **Doors and Windows.** Swinging doors and windows exposed to ambient conditions or to unconditioned areas such as garages shall be fully weather-stripped, gasketed or otherwise treated to limit infiltration. Manufactured windows and sliding glass doors shall meet the air infiltration requirements of the following standards and shall be certified and labeled:

Aluminum Prime Windows	ANSI/AAMA 302.9-1977
Aluminum Sliding Glass Doors	ANSI/AAMA 402.9-1977
Aluminum Combination Storm Windows	ANSI/AAMA 1002.10-1980
Aluminum Storm Doors	ANSI/AAMA 1102.7-1977

2. **Exhaust Fans.** Fan systems exhausting air from the building envelope to the outside shall be provided with backdraft dampers or automatic dampers installed to prevent air leakage.

### Climate Control Systems

**Sec. 2-5363.** (a) **System Selection.** Electric resistance heating systems shall not be used for space heating unless at least one of the following conditions is met: 1. The electric resistance system is used to supplement a heating and/or cooling system by which at least 60 percent of the annual energy requirement is supplied by a device using a nondepletable source of energy.

2. The electric resistance heating equipment is the supplementary electric resistance equipment for a heat pump system.

3. The capacity of the electric resistance heating system is less than 10 percent of the capacity of the total heating system.

4. A cost comparison has been performed which demonstrates that the life cycle

cost of the electric resistance heating system is lower than cost of the alternatives considered. If the building is mechanically cooled, the costs associated with cooling shall be included in the cost comparison.

The four alternatives considered shall be: A. A system in which 100 percent of the annual heating energy requirement is met by burning of natural gas in a central furnace.

B. A system in which at least 90 percent of the annual heating energy requirement is met by a heat pump.

C. A system in which at least 60 percent of the annual heating energy requirement is met by a solar collecting device or other device using a nondepletable source of energy.

D. The system proposed for installation by which more than 10 percent of the annual heating energy requirement is met by electric resistance heating.

(b) **Life Cycle Cost Calculation.** The procedure for determining life cycle costs shall take into account the initial cost of purchase and installation of the system, the expected life of the building, the expected life of the heating equipment, the replacement cost of the heating equipment and the operating and maintenance costs, year by year, for the expected life of the building. The procedure for determining life cycle costs shall be as shown in the Energy Conservation Design Manual.

(c) **Heating Equipment Sizing.**

Natural gas and liquified petroleum gas central furnaces shall be sized to meet the requirements of Subsection 2-5352(g).

(d) **Ducts.** 1. **Joints.** Transverse duct, plenum and fitting joints shall be sealed with pressure sensitive tape or mastic to prevent air loss.

2. **Insulation.** Insulation of ducts shall conform to the provisions of Section 1005 of the State Mechanical Code (Title 24, Part 4).

### Water Heating

**Sec. 2-5364.** (a) **Service Water Heating.** In addition to the requirements of Section 2-5307, electric resistance water heating systems shall not be used unless the life cycle cost of equivalent natural gas and solar systems exceeds the life cycle cost of the electric resistance system. The procedure for determining life cycle costs is shown in the Energy Conservation Design Manual.

(b) **Pipe Insulation.** Steam and steam-condensate return piping and recirculating hot water piping in attics, garages, crawl spaces, or unheated spaces other than between floors or in interior walls shall be insulated to provide maximum loss of not more than 50 Btu/hour per linear foot for piping up to and including 2 inch nominal diameter and 100 Btu/hour per linear foot for larger sizes.

(c) **Swimming Pool Heating.** 1. Any new or replacement fossil-fueled swimming pool heater system in a Type R occupancy shall be equipped with all of the following:  
A. An ON-OFF switch mounted on the outside of the heater for easy access to allow shutting off the operation of the heater without adjusting the thermostat setting and to allow restarting without relighting the pilot light.

B. A permanent easily readable weatherproof plate or card, giving instruction for the energy efficient operation of the swimming pool and for the proper care of swimming pool water when a swimming pool cover is used.

C. A length of plumbing (36" minimum) between the filter and the fossil fuel heater to allow for the future addition of solar heating equipment.

2. Any new or replacement fossil-fueled swimming pool heater shall have a thermal efficiency of at least 75 percent when tested in accordance with ANSI Z21.56-1979 and shall be so identified on the plans and the heater.

3. Outdoor pools equipped with a fossil fuel or electric heater shall also be equipped with a pool cover.

4. Time clocks shall be installed on any new or replacement pool circulation pump not already so equipped so that the pump can be set to run in the off-peak electric demand period (unless required to operate an active solar pool heating system) and

for the minimum time necessary to maintain the water in a clear and sanitary condition in keeping with applicable public health standards. Where public health standards require 24-hour operation, time clocks shall not be required.

5. All new pools shall be equipped with directional inlets which provide for adequate mixing of the pool water.

#### **Gas Cooking Appliances**

Sec. 2-5365. Gas-fired household cooking appliances, with continuously burning pilots, except those designed to burn only liquefied petroleum gases and those which do not have an electrical line voltage supply connection and have only one continuous burning pilot light consuming less than 150 British thermal units per hour, shall not be installed in a building of occupancy R.

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## APPENDIX 2-53A

# STANDARDS REFERENCED IN ENERGY CONSERVATION REGULATIONS

### STATE OF CALIFORNIA

Appliance Efficiency Regulations  
Standards for Insulating Material  
Nonresidential Design Manual  
Residential Design Manual  
Various Directories for Certified Appliances  
Directory of Certified Insulating Materials  
Available from: California Energy Commission  
Publications Office  
1111 Howe Avenue  
Sacramento, CA 95825  
(916) 920-6216

### INTERNATIONAL CONFERENCE ON BUILDING OFFICIALS

Uniform Building Code, 1979 Edition  
Uniform Mechanical Code, 1976 Edition  
Uniform Mechanical Code, 1979 Edition  
Available from: International Conference of Building Officials  
5360 South Workman Mill Road  
Whittier, CA 90601

### AIR-CONDITIONING AND REFRIGERATION INSTITUTE

ARI 210-81 Standard for Unitary Air-Conditioning Equipment  
ARI 240-81 Standard for Air-Source Unitary Heat Pump Equipment  
ARI 320-76 Standard for Water-Source Heat Pumps  
ARI 340-76 Standard for Commercial and Industrial Unitary Heat Pump  
Equipment  
ARI 360-75 Standard for Commercial and Industrial Unitary Air-Condition-  
ing Equipment  
ARI 520-78 Standard for Positive Displacement Refrigerant Compressors,  
Compressor Units, and Condensing Units  
ARI 550-77 Standard for Centrifugal and Rotary Water-Chilling Packages  
ARI 560-75 Standard for Absorption Water-Chilling Packages  
ANSI/ARI 590-1976 Standard for Reciprocating Water-Chilling Packages  
Available from: Air-Conditioning and Refrigeration Institute  
1815 North Fort Myer Drive  
Arlington, VA 22209  
703-524-8000

### AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (NATIONAL PUBLICATIONS)

#### Handbook and Product Directory

Equipment Volume, 1979 Edition.  
Systems Volume, 1980 Edition.  
Fundamentals Volume, 1981 Edition.

#### Standards

ASHRAE 22-71 Methods of Testing for Rating Water Cooled Refrigerant Con-  
densers

ASHRAE 24-71      Methods of Testing for Rating Liquid Coolers  
ANSI/ASHRAE  
55-1981            Thermal Environment Conditions for Human Occupancy  
ASHRAE 62-73      Standards for Natural and Mechanical Ventilation  
Available from: American Society of Heating, Refrigerating, and  
Air-Conditioning Engineers  
1791 Toullie Circle N.E.  
Atlanta, GA 30329  
404-636-8400

**AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND  
AIR CONDITIONING ENGINEERS (REGIONAL PUBLICATIONS)**

Recommended Outdoor Design Temperatures for Northern California, 1977

Available from: ASHRAE  
Golden Gate Chapter  
126 Post Street  
San Francisco, CA  
415-982-3042

Recommended Outdoor Design Temperatures for Southern California, Arizona, Nevada, 1972

Available from: ASHRAE  
Southern California Chapter

**AMERICAN NATIONAL STANDARDS—Z21 SERIES**

ANSI Z21.10.3—1975      Standard for Gas Water Heaters, Volume III Circulating  
Tank, Instantaneous and Large Automatic Storage Type  
Water Heaters  
ANSI Z21.11.1—1977      Standard for Gas-Fired Room Heaters, Volume I, Vented  
Room Heaters  
ANSI Z21.40.1—1973      Standard for Gas-Fired Absorption Summer Air Conditioning  
Appliance  
ANSI Z21.44—1977        Standard for Gas-Fired Gravity and Fan Type Direct Vent  
Wall Furnaces  
ANSI Z21.47—1978        Standard for Gas-Fired Gravity and Fan Type Central  
Furnaces  
ANSI Z21.48—1979        Standard for Gas-Fired Gravity and Fan Type Floor Furnaces  
ANSI Z21.49—1979        Standard for Gas-Fired Gravity and Fan Type Vented Wall  
Furnaces  
ANSI Z21.56—1979        Standard for Gas-Fired Swimming Pool Heaters  
Available from: American Gas Association Laboratories  
8510 East Pleasant Valley Road  
Cleveland, OH 44131

**ARCHITECTURAL ALUMINUM MANUFACTURERS ASSOCIATION**

ANSI/AAMA  
302.9—1977                Specifications for Aluminum Prime Windows  
ANSI/AAMA  
402.9—1977                Specifications for Aluminum Sliding Glass Doors  
ANSI/AAMA  
1002.10—1980              Specifications for Aluminum Combination Storm Windows  
for External Application  
ANSI/AAMA  
1102.7—1977                Specification for Aluminum Storm Doors  
Available from: Architectural Aluminum Manufacturers Association

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35 East Wacker Drive  
Chicago, IL 60601  
(312) 782-8236

**NATIONAL WOODWORK MANUFACTURERS ASSOCIATION**

ANSI/NWMA I.S. 1-80 Standard for Wood Flush Doors  
ANSI/NWMA I.S. 2-80 Standard for Wood Window Units  
ANSI/NWMA I.S. 3-70 Standard for Wood Sliding Patio Doors  
ANSI/NWMA I.S. 5-73 Standard for Ponderosa Pine Doors  
NWMA I.S. 610-79 Standard for Exterior Wood Swinging Doors  
Available from: National Woodwork Manufacturers Association  
205 West Touhy Avenue  
Park Ridge, IL 60068  
312-823-6747

**SHEET METAL AND AIR-CONDITIONING CONTRACTORS  
NATIONAL ASSOCIATION**

"Applicable Standards"

**FIR AND HEMLOCK DOOR ASSOCIATION**

FHDA/7-79 Industry Standard for Douglas Fir, Western Hemlock, and Sitka  
Spruce Doors.  
Available from: Fir and Hemlock Door Association  
Yeon Building  
Portland, OR 97204  
503-224-3930

**AMERICAN SOCIETY FOR TESTING AND MATERIALS**

ASTM E774-81 Specifications for Testing Seal Durability of Sealed Insulating Glass  
Units.  
Available from: American Society for Testing and Materials  
1916 Race Street  
Philadelphia, PA 19103  
215-299-5400



CALIFORNIA ADMINISTRATIVE CODE

TITLE 24

(STATE BUILDING STANDARDS CODE)

Part 4

(State Mechanical Code)

Chapter 4-10 Ducts

CHAPTER 4-10

DUCTS

4-1000. Basic Provisions.

- (a) Except as provided herein, Chapter 10 of the UMC, as set forth in the table below, is hereby adopted by reference for the purpose of providing the basic mechanical regulations relating to ducts.
- (b) The following table identifies the sections of the UMC and this part which have been adopted by the listed agencies. See Section 4-104 for explanations of the abbreviations used in the table, the application of the regulations, and their intended use.

TABLE NO. 4-10A

Code Section	CEC
Entire Chapter	x <sup>5</sup>
Entire Chapter, except as noted in this table	
1005	x <sup>6</sup>

- 5 CEC Adopted by reference for new buildings of occupancy R (except apartment houses with four or more habitable stories and hotels). See Section 2-5352(f).
- 6 CEC Adopted by reference for Occupancies A, B, E, and H; See Section 2-5334. Adopted by reference for Occupancy R; see Section 2-5363. Adopted by reference for all occupancies under specified installation conditions; see Section 2-5305.

NOTE: Authority cited: Public Resources Code, Section 25402, 25922.  
 Reference: Public Resources Code, Section 25402, 25922.