STANDARDS/REGULATIONS

BUILDING ENERGY EFFICIENCY STANDARDS

1986 Edition

For historical reference
Current Title 24 Standards are available at:
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December 1986

CALIFORNIA ENERGY COMMISSION

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P400-86-009

California Energy Commission

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IMPORTANT NOTICE CONCERING THE 1986 EDITION OF STANDARDS

The Standards apply to all new construction for occupancies A, B, E, H, and R. This edition of the Standards includes amendments adopted in 1986 to:

California Administrative Code, Title 20

- o Amendments to clarify and facilitate administration and enforcement.

California Administrative Code, Title 24

- o Residential Building Standards including:
  - Admendments to extend the current provisions of AB 163.
- o Nonresidential Building Standards including:
  - Office Standards that become mandatory on January 1,1987
  - Retail and Wholesale Standards which are voluntary beginning January 1,1987 and become mandatory on January 1,1988.

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CALIFORNIA ADMINISTRATIVE CODE
TITLE 20
CHAPTER 2, SUBCHAPTER 4
ARTICLE 1.--ENERGY BUILDING REGULATIONS

Sec. 1401. Scope.

(a) This article contains administrative regulations relating to the energy building regulations in Chapter 2-53. This article applies to all residential and nonresidential buildings.

(b) Nothing in this Article lessens any necessary qualifications or responsibilities of licensed or registered building professionals or other designers or builders, or the duties of enforcement agencies, that exist under state or local law.

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

Sec. 1402. Definitions.

In this article the following definitions apply:

"Appliance Standards" means the California Administrative Code, Title 20, Chapter 2, Subchapter 4, Article 4, Sections 1601 to 1608.

"Approved Calculation Method" means a Public Domain Computer Program approved under Section 1409(a), or any Alternative Calculation Method approved under Section 1409(b).

"Building Permit" means an electrical, plumbing, mechanical, building, or other permit or approval, that is issued by an enforcement agency, and that authorizes any construction that is subject to Chapter 2-53.

"Chapter 2-53" means California Administrative Code, Title 24, Part 2, Chapter 2-53.

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

"Compliance approach" means any one of the allowable methods by which the design and construction of a building may be demonstrated to be in compliance with Chapter 2-53. The compliance approaches are the performance compliance approach and the prescriptive compliance approach. The requirements for each compliance approach are set forth in Section 2-5304 of Chapter 2-53.

"Conditioned floor area" means "conditioned floor area" as defined in Section 2-5302 of Chapter 2-53.

"Energy Budget" means "energy budget" as defined in Section 2-5302 of Chapter 2-53.

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

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

"Fan Performance Index" means "fan performance index" as calculated under Section 2-5332 of Chapter 2-53.

"Fan Wattage Index" means "fan watt index" as calculated under Section 2-5342 (e)2.C. of Chapter 2-53.

"HVAC system" means "HVAC system" as defined in Section 2-5302 of Chapter 2-53.

"Manufactured device" means "manufactured device" as defined in Section 2-5302 of Chapter 2-53.

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

"R Value" means the measure of the resistance of a material or building component to the passage of heat in [hr x ft^2 x °F] ÷ Btu.

"Source Cooling Power Index" means "source cooling power index" as calculated under Section 2-5342(e)2.B. of Chapter 2-53.

"Source Heating Power Index" means "source heating power index" as calculated under Section 2-5342(e)2.A. of Chapter 2-53.

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

Sec. 1403. Permit, Certificate, Informational, and Enforcement Requirements for Designers, Installers, Builders, Manufacturers and Suppliers.

(a) Documentation.

1. Responsibility for signing.

Each document described in Sections 1403(a)2 and 1403(a)3 shall be signed by the person responsible for its preparation. The signer shall be a civil engineer, mechanical engineer, electrical engineer, architect, general building contractor, mechanical contractor, or electrical contractor licensed or registered to practice by the State of California or other individual eligible under the Business and Professions Code to sign such documents. Document signers are subject to the limitations in the Business and Professions Code. If more than one person has responsibility for building design or construction, each person may prepare and sign the document or documents applicable to that portion of the design or construction for which the person was responsible; or alternatively, the person with chief responsibility for design or construction may prepare and sign the document for the entire design or construction.

2. Design; application for a building permit.

Each application for a building permit subject to Chapter 2-53 shall contain at least one copy of the documents listed in Sections 1403(a)2.A., 1403(a)2.B., and 1403(a)2.C.

A. For all new buildings designated to allow a conditioned use of an occupancy group or type regulated by Chapter 2-53 the applicant shall file a certificate of compliance on the plans. This certificate shall indicate the features and performance specifications needed to comply with Chapter 2-53, and shall be approved by the local enforcement agency by stamp or authorized signature. The individual with overall responsibility for the design and the owner of the building or property sign the certificate of compliance. The owner of the building shall retain a copy of this certificate of compliance and transmit it to any subsequent purchaser of the building.

B. Plans and specifications showing the characteristics of each feature, material, component, and manufactured device proposed to be installed in order to have the building meet the requirements of Chapter 2-53, and of any other feature, material, component, or manufactured device that Chapter 2-53 requires be indicated on the plans and specifications. If any characteristic of any such feature, material, component, or manufactured device is materially changed before final construction and installation, the change shall be indicated on amended plans and specifications and shall be submitted to the enforcement agency. Such characteristics shall include the efficiency (or other characteristic regulated by Chapter 2-53) of each device, and the source heating power index, source cooling power index, fan wattage index, and fan performance index of each proposed HVAC system.

C. A designation of the compliance approach for the building, and of the sections of Chapter 2-53 with which the building is intended to comply.

(1) If a building permit has been previously issued for any part of the building subject to Chapter 2-53, the compliance approach in the current application shall be consistent with the compliance approach approved in the previous permit.

(2) If the application proposes a performance compliance approach, the designation shall contain:

a. the approved calculation method used;

b. a statement that the input values used for the items listed in Section 2-5304(d)4.B. of Chapter 2-53 were the values required by that section;

c. the energy budget allowed by Chapter 2-53, and the energy consumption of the proposed building modelled by the approved calculation method, in annual Btu per square foot of conditioned floor area;

d. a statement that the proposed building modelled is consistent with the plans and specifications described in Section 1403(a) 2.A.; and

e. the calculation outputs, including the standardized inputs and outputs described in the Energy Conservation Manual, produced by the modeling of the proposed building.

3. Alterations.

For nonresidential buildings originally permitted after January 1, 1987, the applicant is required to submit a copy of the original certificate of compliance for the whole building when applying for an alteration to said building. The applicant is responsible for obtaining a copy of the original certificate of compliance from the building owner. If the applicant cannot obtain a copy of the certificate of compliance, the applicant shall demonstrate compliance with Chapter 2-53 for the entire building.

When compliance is demonstrated for the building as a whole, a new certificate of compliance is required to be submitted on the plans for the alterations. This new certificate shall indicate the features and performance specifications needed to comply with Chapter 2-53, the original building permit number or designation for the original building and the building permit number or designation for new construction. The new certificate shall be approved by the local enforcement agency by stamp or authorized signature, and shall be signed by the individual with professional responsibility for the design of the altered portions of the building and the owner of the building.

4. Construction.

A. Before the enforcement agency determines whether the building may be occupied, the person with overall responsibility for construction or the person or persons responsible for the installation of regulated manufactured devices shall post, adjacent to the building permit(s) issued for the building, installation certificates for manufactured devices regulated by the appliance standards or Chapter 2-53.

These certificates shall:

(1) identify features required to verify compliance with the appliance standards and Chapter 2-53;

(2) include a statement indicating that the installed devices conform to the appliance standards and Chapter 2-53 and the requirements for such devices given in the plans and specifications approved by the local enforcement agency;

(3) state the number of the building permit under which the construction or installation was performed.

B. The enforcement agency may require the person with overall responsibility for the construction to provide any other reasonable information to determine that the building as constructed is consistent with approved plans and specifications and complies with Chapter 2-53.

C. If construction on any portion of the building subject to Chapter 2-53 will be impossible to inspect because of subsequent construction, the enforcement agency may require the installation certificate(s) to be posted upon completion of that portion.

5. Insulation Certificate.

After installing wall, ceiling, or floor insulation, the installer shall post in a conspicuous location in the building a certificate signed by the installer stating that the installation is consistent with the plans and specifications described in Section 1403 (a)(2)(A) and for which the building permit was issued and conforms with the requirements of Chapter 2-53. The certificate shall also 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 installed design density for the desired "R"-value.

(b) Occupant Operating and Maintenance Information to Be Provided by Builder

1. The builder shall provide the building owner, manager, and the original occupants a list of the heating, cooling, water heating, and lighting systems and features, materials, components, and mechanical devices 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.

If a builder uses the group averaging method, as set forth in Section 2-5351(e) of Chapter 2-53, Title 24 of this Code, to demonstrate compliance with the energy budget requirements of Section 2-5351(a), the builder shall provide notice to potential buyers that such method was used and that the performance of any individual building in the group relative to the energy budget is available on request. Such notice shall be provided in the following manner.

(A) By including the notice in a sales brochure, if a sales brochure is provided to potential buyers;

(B) By including the notice in a poster that is displayed prominently in the builder's sales area, if the builder provides a sales area for potential buyers; and

(C) By including the notice in at least one of the following additional documents:

(I) The insulation certificate required by subdivision (d) of this section;

(II) The Final Subdivision Public Report;

(III) The insulation addendum required by the Federal Trade Commission;

(IV) The purchase agreement;

(V) The deposit receipt.

2. The builder shall provide maintenance information to the building owner, manager, and original occupant(s) for all features, materials, components, and manufactured devices that require routine maintenance for efficient operation. Required routine maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of feature, material, component or manufactured device.

3. The builder shall provide the building owner, manager, and original occupants a description of the quantities of outdoor and recirculated air that the ventilation systems are designed to provide to each area.

EXCEPTION: Buildings of occupancy group R need not comply with Section 1403(b)2 and 1403(b)3.

(c) Equipment Information to be Provided by Manufacturer or Supplier.

The manufacturer or supplier of any manufactured device shall, upon request, provide to building designers and installers information about the device. The information shall include the efficiency (and other characteristics regulated by Chapter 2-53).

(d) Enforcement Agency Requirements.

1. Permits.

An enforcement agency shall not issue a building permit for any construction unless the enforcement agency determines in writing that the construction is designed to comply with the requirements of Chapter 2-53 that are in effect on the date the building permit was applied for.

If a building permit has been previously issued, there has been no construction under the permit, and the permit has expired, the enforcement agency shall not issue a new permit unless the enforcement agency determines in writing that the construction is designed to comply with the requirements of Chapter 2-53 in effect on the date the new permit is applied for.

"Determines in writing" includes but is not limited to approval of a building permit with a stamp normally used by the enforcement agency.

2. Inspection.

The enforcement agency shall inspect new construction to determine whether it is consistent with the agency's approved plans and specifications, and complies with Chapter 2-53.

Note: Authority cited: Public Resources Code, Section 25402. Reference: Public Resources Code, Section 25402.

EXCEPTION:

Nonresidential buildings that have 1,000 square feet or less of conditioned floor area and that have an occupant load of 49 persons or less may be permitted without complying with Section 1403(a), if a statement of compliance with Chapter 2-53 is submitted and signed by a licensed mechanical engineer or the licensed architect with chief responsibility for the design.

Sec. 1404. Exceptional Designs.

(a) Requirements.

If a building permit applicant proposes to use a performance compliance approach, and the building designs, cannot be adequately modeled by an approved calculation method, an applicant shall be granted a building permit if the Commission finds:

1. that the design cannot be adequately modeled with an approved calculation method;

2. using an alternative evaluation technique, that the design complies with Chapter 2-53; and

3. that the enforcement agency has determined that the design complies with all other legal requirements.

(b) Applications.

The applicant shall submit four copies of a signed application with the following materials to the Executive Director:

1. A copy of the plans and specifications required by Section (a)2.A.;.

2. A statement explaining why meeting the energy budget cannot be demonstrated using an approved calculation method;

3. Documentation from the enforcement agency stating that (i) meeting the energy budget requirements cannot be demonstrated using an approved calculation method, and (ii) the design complies with all other legal requirements; and

4. A detailed evaluation of the energy consumption of the proposed building and the building's materials, components, and manufactured devices proposed to be installed to meet the requirements of Chapter 2-53, using an alternative evaluation technique. The evaluation shall include a copy of the technique, instructions for its use, a list of all input data, and all other information required to replicate the results.

NOTE: See Section 1409 for approval of calculation methods and Alternative Component Packages.

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

Sec. 1405. Enforcement by the Commission.

(a) Where There Is No Local Enforcement Agency. Before new construction may begin in an areas where there is no local enforcement agency, and on any proposed governmental agency building, the Executive Director must determine in writing that the buildings design conforms to the requirements of Chapter 2-53. The person proposing to construct the building shall submit the information described in Section 1403(a)(2) and 1403(a)(3) to the Executive Director when such a determination is sought.

(b) Where the Local Enforcement Agency Fails to Enforce. If a local enforcement agency fails to enforce the requirements of this article or of Chapter 2-53, the Commission, after furnishing 10 days written notice, may condition building permit issuance on submission of the information described in Sections 1403(a)(2) and 1403(a)(3) to the Executive Director and on his or her written certification determination that proposed construction conforms to the requirements of Chapter 2-53.

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

Sec. 1406. Locally Adopted Energy Standards.

(a) Requirements.

Local governmental agencies may adopt and enforce energy standards for new buildings, provided the Commission finds that the standards will require buildings to be designed to consume no more energy than permitted by Chapter 2-53. Such local standards include but are not limited to adopting the requirements of Chapter 2-53 before their effective date, requiring additional energy conservation measures, or setting more stringent energy budgets. Local adoption of the requirements of Chapter 2-53 before their effective date is a sufficient showing that the local standards meet the requirements of this section and Section 25402.1(f)(2) of the Public Resources Code; in such a case only the documentation listed in Section 1406(b), and a statement that the standards are those in Chapter 2-53, need be submitted.

(b) Documentation Application.

Local governmental agencies wishing to enforce locally adopted energy conservation standards shall submit four copies of an application with the following materials to the Executive Director:

1. The proposed local energy standards.

2. A study with supporting analysis showing how the local agency determined energy savings.

3. A statement that the local standards will require buildings to be designed to consume no more energy than permitted by Chapter 2-53.

4. The basis of the agency's determination that the standards are cost effective.

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

Sec. 1407. Interpretations.

(a) The Commission may make a written determination as to the applicability or interpretation of any provision of this article or of Chapter 2-53, upon written application, if a dispute concerning a provision arises between an applicant for a building permit and the enforcement agency, and the dispute has been heard by the local board of permit appeals or other highest local review body. Notice of any such appeal, including a summary of the dispute and the section of the regulations involved, shall if possible be sent to the Commission 15 days before the appeal is heard, and the result of the appeal shall be sent to the Commission within 15 days after the decision is made. Either party to the dispute may apply for a determination but shall concurrently deliver a copy of the application to the other party. The determinations are binding on the parties.

(b) The Executive Director may, upon request, give written advice concerning the meaning of any provision of this article or of Chapter 2-53. Such advice is not binding on any person.

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

Sec. 1408. Exemptions.

(a) Requirements.

The Commission may exempt any building from any provisions of Chapter 2-53 if it finds that:

1. Substantial funds had been expended in good faith on planning, designing, architecture, or engineering of the building before the adoption date of the provision.

2. Compliance with the requirements of the provision would be impossible without both substantial delays and substantial increases in costs of construction above the reasonable costs of the measures required to comply with the provision.

(b) Application.

The applicant shall submit four copies of a signed application with the following materials to the Executive Director:

1. A summary of the claimant's contracts for the project;

2. A summary of internal financial reports to on the project;

3. Dated schedules of design activities; and

4. A progress report on project completion.

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

Sec. 1409. Calculation Methods and Alternative Component Packages.

NOTE: See Section 1404 for approval of exceptional designs.

(a) Public Domain Computer Programs.

In addition to the present approved public domain computer programs, the Commission may, upon written application or its own motion, approve additional public domain computer programs that may be used to demonstrate that proposed building designs meet energy budgets.

1. The Commission shall ensure that users' manuals or guides for each approved program are available.

2. The Commission shall approve a program only if when it models building designs or features, it predicts energy consumption substantially equivalent to that predicted by the computer program used by the Commission to set energy budgets.

(b) Alternative Calculation Methods (All Occupancies).

1. Requirements.

The Commission may approve alternative calculation methods, in addition to the present approved point system for residential occupancies, which may be used to demonstrate that proposed building designs meet the energy budgets, if it finds that the method:

A. Makes no changes in any input parameter values specified in the Energy Conservation Manual and (for other parameters) lists any default values used;

B. Provides input and output documentation which that facilitates the enforcement agency's review;

C. Is supported by clear and concise instructions for using the method to demonstrate that the energy budget requirements of Chapter 2-53, are met;

D. Is reliable and accurate; and

E. Establishes factors that, when applied to method's outputs, result in energy budgets for that alternative calculation method that are equivalent to those in Chapter 2-53, when the buildings used to develop the energy budgets in Chapter 2-53 are modeled.

2. Application.

The applicant shall submit four copies of a signed application with the following materials to the Executive Director:

A. The method's analytical capabilities and limitations with respect to the occupancies, designs, materials, and devices covered by Chapter 2-53; and,

B. A demonstration that the criteria in Section 1409(b)(1). are met.

3. Exceptional Methods.

The alternative calculation method analyzes designs, materials, or devices that cannot be adequately modeled using the public domain computer programs, the method may be approved as an exceptional method. Applications for approval of exceptional methods shall include theoretical and empirical information that verify the method's accuracy, and shall also include the other documentation required by subsection 1409(b).

4. Approval.

The Commission may approve a method unconditionally, may restrict approval to specified occupancies, designs, materials, or devices, or may reject the application. The Commission may charge a fee to recover the costs of processing and reviewing the application.

5. Resubmittal.

An applicant may resubmit a rejected method or may request modification of a restricted approval. Such application shall include the information specified in Section 1409(b)(2) and shall indicate how the method has been changed to enhance its accuracy or capabilities.

6. Modification.

Whenever an approved calculation method is changed in any way, the method shall be resubmitted under this Section for reapproval. The Executive Director may waive any of the requirements of this paragraph for nonsubstantive changes.

(c) The Commission may modify or withdraw certification of a program or method under Section 1409(a) or 1409(b) based upon approval of other programs or methods that are more suitable.

(d) Alternative Component Packages.

The Commission may approve any alternative component package, in addition to the packages in Sections 2-5342 and 2-5351(c) of Chapter 2-53, which it determines will meet the energy budgets and is likely to apply to a significant percentage of new buildings or to a significant segment of the building construction and design community. The Commission may charge a fee to recover the costs of processing and and reviewing the application.

(e) Publication of Commission Determinations.

The Executive Director shall annually publish a manual, newsletter, or other administrative guide containing determinations made by the Executive Director and the Commission pursuant to this section on or before December 31 of the calendar year.

NOTE: Authority cited: Public Resources Code, section 25402.1.
Reference: Public Resources Code, section 25402.1.

Sec. 1410. Procedures for Consideration of Applications Under Sections 1404, 1406, 1408, and 1409.

(a) If the application is complete, the Executive Director shall make a copy or copies of the application available to interested parties. Comments from interested parties must be submitted within 60 days after acceptance of the application.

(b) Within 75 days of receipt of an application, the Executive Director may request any additional information needed to evaluate the application. If the additional information is incomplete, consideration of the application will be delayed until the applicant submits complete information.

(c) Within 75 days of receipt of the application, the Executive Director may convene a workshop to gather additional information from the applicant and other interested parties. Interested parties will have 15 days after the workshop to submit additional information regarding the application.

(d) Within 90 days after the Executive Director receives the application or within 30 days after receipt of complete additional information requested under Section 1410(b) or within 30 days after the receipt of additional information submitted by interested parties under Section 1410(c), whichever is later, the Executive Director shall submit to the Commission a written recommendation on the application.

(e) The application and the Executive Director's recommendation shall be placed on the consent calendar and considered at the next business meeting after submission of the recommendation. The matter may be removed from the consent calendar at the request of any person.

(f) The Executive Director may charge a fee to recover the costs of processing and reviewing applications.

(g) All applicants have the burden of proof to establish that their applications should be granted.

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

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CALIFORNIA ADMINISTRATIVE CODE
TITLE 24
PART 2

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	BSC	HCD 1	HCD 2	SFM	OSA SSS	OSA HC	OSH PD	DHS	OSHA	CEC	SHB	DOT	AGR	YA	BOC	DOE	CA
Entire Chapter 2-53	-	-	-	-	-	-	-	-	-	X[3]	-	-	-	-	-	-	-

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:

Until January 1, 1988, building permit applicants for new retail and wholesale stores (except groceries) in buildings may comply with the standards in Sections 2-5321 through 2-5333 as an alternative to the pertinent requirements in Sections 2-5341 through 2-5343. After January 1, 1988, building permit applicants for retail and wholesale stores (except groceries) in buildings shall comply with Sections 2-5341 through 2-5343.

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ENERGY CONSERVATION STANDARDS--GENERAL PROVISIONS

Sec. 2-5301. Scope.

(a) General.

Chapter 2-53 establishes energy efficiency standards for buildings that 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 the provisions. Chapter 2-53 also applies to buildings constructed by a governmental agency.

EXCEPTIONS: The following building types need not comply with Chapter 2-53:

I. Qualified historical buildings, to the extent provided under the State Historical Building Code (Title 24, part 8).

II. Buildings in which no energy for space heating, space cooling, water heating, or lighting is derived from depletable sources.

III. Buildings for which actual site preparation and construction have begun before the effective date of the amendments.

(b) All Buildings. Sections 2-5301, 2-5302, and 2-5311, apply to all buildings

(c) New Buildings.

1. Sections 2-5303, 2-5304, and 2-5312 through 2-5319 apply to new buildings of occupancies A, B, E, H, and R.

   EXCEPTION: Buildings of occupancy group R need not comply with Sections 2-5315, 2-5316(c), or 2-5319.

2. Sections 2-5321 through 2-5333 apply to new buildings of occupancies A, B (except offices), E, and H.

3. Sections 2-5341 through 2-5343 apply to new office occupancies, and to new retail and wholesale stores (except groceries).

4. Sections 2-5351 through 2-5352 apply to all new buildings of occupancy group R except apartment houses with four or more habitable stories, and hotels.

   EXCEPTION: Seasonally occupied agricultural housing limited by state or federal agency contract to occupancy not more than 180 days in any calendar year need not comply with the provisions of Section 2-5351.

5. The provisions of Sections 2-5361 and through 2-5365 apply to new apartment houses with four or more habitable stories, and to new hotels.

(d) New Construction in Existing Buildings.

1. Installation of additional insulation. Sections 2-5313(b) and (c) apply to existing buildings of all occupancies. Section 2-5313(a) applies only to existing buildings of occupancy group R.

2. Additions, Alterations (Occupancies A, B, E H and R)

A. All additions and alterations shall comply with those portions of Sections 2-5311 to 2-5319 that apply to the building component, equipment, or system being altered or installed in conjunction with the addition.

B. Alterations to nonresidential buildings permitted after January 1, 1987, which do not involve a change in occupancy type of a previously conditioned space, shall meet the requirements of Chapter 2-53 for the whole building. This may be demonstrated by demonstrating compliance for the building as a whole or by demonstrating that the requirements specified in the certificate of compliance, required in Title 20, Section 1403(a)2.A., have been met.

C. For buildings permitted before January 1, 1987, alterations which increase or create conditioned space and all additions shall comply with (1), (2), or (3).

(1) The lighting system and the building envelope of such additions or alterations shall comply with the provisions of Sections 2-5321 through 2-5333 (for buildings of occupancy A, B (except for offices), E, and H), 2-5342 (for offices), or 2-5362 through 2-5364 (for apartment houses of four or more stories and hotels).

(2) For R occupancy buildings, other than apartment buildings with four or more stories or hotels, additions and alterations which increase conditioned space shall be subject to the ceiling insulation, wall insulation, slab perimeter insulation, and suspended exterior floor insulation, glazing U-value and shading requirements of Alternative Component Package A for the appropriate climate zone in Tables 2-53Z1 through 2-53Z16 in Section 2-5351(c), and all the requirements for Sections 2-5352(b) Loose Fill Insulation, 2-5352(d) Installation of Fireplaces, 2-5352(f) Vapor Barriers, and 2-5352(j) Lighting; and shall have a maximum total glazing area of 16 percent of newly conditioned floor area plus the glazing area that was removed from the existing building because of the addition. Space conditioning equipment installed in conjunction with an addition or alteration that increases conditioned space shall meet the requirements of 2-5352(g) Space Conditioning Equipment Sizing and 2-5352(h) Setback Thermostats. Water heating equipment installed in conjunction with an addition or alteration that increases conditioned space shall meet the requirements of 2-5352(i) Water Heating Equipment.

(3) If the addition or alteration uses a performance compliance approach, either the addition may meet the appropriate energy budget alone or the energy efficiency of the existing building may be improved and used to offset the energy consumption of the addition; the energy consumption of the improved existing building and the addition shall be equal to or less than that of the unimproved existing building plus an addition that complies with the applicable energy budget, as shown by an approved calculation method.

EXCEPTION: Hotel alterations that are not additions need not comply with section 2-5301(d)2.B. or C.

D. New manufactured devices installed in conjunction with additions or newly conditioned space shall comply with Sections 2-5311 through 2-5319.

EXCEPTION: Expanding an existing space conditioning system to heat or cool an addition shall be permitted provided that new ductwork and piping, and those portions of existing ducts and pipes that are altered, shall comply with Sections 2-5312, 2-5313, and 2-5316.

E. For buildings permitted before January 1, 1987, alterations that do not increase conditioned space, and for buildings permitted after January 1, 1987, alterations that are made in conjunction with a change to or from an occupancy type that do not increase conditioned space shall meet the requirements for the specific systems below if those systems are altered.

(1) Building Envelope. Alterations may be made to the building envelope if the overall U-value and OTTV of the building envelope are not increased or the envelope meets the requirements of Package A of the table in Section 2-5342, for the applicable climate zone and occupancy type.

(2) HVAC Systems and Equipment. New HVAC equipment, new HVAC components, and new HVAC systems shall meet all relevant HVAC requirements in Sections 2-5341 to 2-5342, including any of the sets of power indices for the applicable climate zone and occupancy type for the new equipment, new components, or new systems installed.

(3) Lighting Systems. Alterations to existing lighting systems that increase the connected load shall comply with the lignting requirements in Section 2-5342 for offices and stores and Section 2-5333 for buildings of occupancy A, B (except for offices and stores), E, or H.

EXCEPTION [to subsection 2-5301(d)2.E.(3)]:

Alterations to lighting systems that do not involve recircuiting and that do not increase the connected power load of the altered lighting system need not comply with Section 2-5319.

3. Repairs.

   Repairs shall not increase the pre-existing energy consumption of the repaired component, system, or equipment.

4. Any addition, alteration, or repair may comply with the requirements of Chapter 2-53 by meeting the requirements for new buildings for the building as a whole.

EXCEPTIONS:

I. Hotels and buildings of occupancy R need not comply with Section 2-5301(d)2.E.or 2-5301(d)3.

II. Any building constructed before January 1, 1978 need not comply with Section 2-5301(d)2.E. or 2-5301(d)3. if the building permit applicant demonstrates to the satisfaction of the enforcement agency that the cost of compliance would exceed the value of the resulting energy savings, amortized over the economic life of the alteration or repair.

(e) Mixed Occupancy.

This subsection applies to new buildings and to new construction in existing buildings of occupancy A, B, E, H, and R.

When a building is designed and constructed for more than one type of occupancy, the space for each occupancy shall meet the provisions of Chapter 2-53 applicable to that occupancy, if a prescriptive compliance approach is used, and if a performance compliance approach is used, Section 2-5304(d)3 shall be met.

EXCEPTION: The entire building may comply with the provisions applicable to one of the occupancies in the building if all other occupancies combined total less than 1,000 square feet and less than 30 percent, of the conditioned floor area of the building, or if all other occupancies constitute less than 10 percent of the conditioned floor area of the building.

(f) 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 California Administrative Code, Title 20, Sections 1401-1410.

(g) Certification Requirements for Manufactured Devices.

Chapter 2-53 limits the use of manufactured devices to only those that have been certified by their manufacturer to meet or exceed minimum specifications or efficiencies adopted by the Commission. Certification requirements apply to the following manufactured devices:

1. Insulating materials (Section 2-5311).

2. Refrigerators, refrigerator-freezers, and freezers [Section 2-5314(a)].

3. Room air conditioners [Section 2-5314(a)].

4. Central air conditioning heat pumps and other central air conditioners [Section 2-5314(a)].

5. Gas space heaters [Section 2-5314(a)].

6. Other heating and cooling equipment [Section 2-5314(b)].

7. Water heaters [Section 2-5314(a)].

8. Plumbing fittings [Section 2-5314(a)].

9. Fluorescent lamp ballasts [Section 2-5314(a)].

10. Manufactured doors and windows (Section 2-5317).

11. Oil-fired storage heaters and combination service water heating/space heating boilers [Section 2-5318(a)].

12. Pool heaters (Section 2-5318(d)).

13. Occupant sensing devices (Section 2-5319).

14. Concrete-slab floor perimeter insulation [Section 2-5351(c)].

Enforcement agencies, builders and designers may determine the certification status of any manufactured product of the types specified in this subsection by consulting directories published by the Commission, copies of the letter of certification, accepted by Commission staff, from the manufacturer to the Commission regarding such equipment or products, or a Commission approved label on such equipment or products.

NOTES: 1. See Appendix 2-53A for availability of directories of certified products.

2. Chapter 2-53 does not require a builder, designer, or enforcement agency to test any certified product to determine its compliance with minimum specifications and/or efficiencies adopted by the Commission.

3. See Sections 2-5313 and 2-5319(e) for certification requirements that apply to installers of additional insulation and of daylighting or lumen maintenance controls.

TABLE 2-53B

Chapter 2-53 Sections	Applicable Building Type	Mandatory	Performance	Prescriptive
2-5301, 2-5302, & 2-5311	All Occupancies	2-5301, 2-5302, & 2-5311	--	--
2-5303,2-5304, & 2-5312-2-5319	Occupancies A,B,E,H, & R however, R occupancies are exempt from 2-5315, 2-5316(c) and 2-5319	2-5303,2-5304, & 2-5312-2-5319		
2-5321-2-5333	Nonresidential (A, B, E, H except offices)	2-5321	2-5322-2-5325	2-5324-2-5333
2-5341-2-5343	Offices	2-5343	2-5341	2-5342
2-5351-2-5352	Residential (less than 4 stories	2-5352	2-5351(a), (b)	2-5351(c)
2-5361-2-5364	Residential (4 and more stories	2-5361	not applicable	2-5362-2-5364
4-1000	All	4-1000		

Sec. 2-5302 Definitions

For the purpose of these standards, certain terms, phrases, words, and their derivatives shall be defined as specified in Section 2-5302. Special terms not found in Section 2-5302 shall be defined as specified in Chapter 2-4 of the California Administrative Code, Title 24, Part 2. Special terms not found in either Chapter 2-53, Section 2-5302 or in Chapter 2-4 of Title 24, Part 2, of the California Administrative Code shall be defined as specified in Part II, Chapter 4, of the 1985 edition of the Uniform Building Code. Where terms are not defined in any of the aforementioned references, they shall have their ordinary accepted meanings within the context with which they are used. Webster's Third New International Dictionary of the English Language, Unabridged, copyright 1981 shall be considered as providing ordinarily accepted meanings.

ACCESSIBLE is having access thereto, but which first may require the removal or opening of an access panel, door or similar obstruction.

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

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.

AREAL HEAT CAPACITY is the amount of heat, in Btu, that can be stored per square foot of wall assembly by raising the average temperature of the wall assembly one degree Fahrenheit.

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

ASTM is the American Society for Testing and Materials.

BASIC GLAZING AREA is an area of glazing equal to 16 percent of the gross floor area for residential 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 new building which enclose conditioned spaces and through which thermal energy may be transferred to or from the exterior.

CHAPTER 2-53 means the California Administrative Code, Title 24, Part 2, Chapter 2-53.

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.

COMFORT CONDITIONING is the provision of heating, cooling, humidification, or dehumidification, for the provision of human comfort, by transporting air through ducts or plenums, or by heated or cooled surfaces whose output is greater than 10 Btu per hour per square foot of floor area.

CONDITIONED CROSS-SECTIONAL AREA is the horizontal cross-sectional area of enclosed conditioned space at the level of any single floor upon which people can walk.

CONDITIONED FLOOR AREA is the floor area of enclosed conditioned space on all floors as measured from the interior surfaces of exterior partitions.

EXCEPTION: For buildings of occupancy R these areas shall be measured from the exterior surfaces of exterior partitions.

CONDITIONED SPACE is enclosed space that (a) is provided with comfort conditioning; or (b) is indirectly conditioned space.

DAYLIT SPACE is the space on or above the floor bounded by the vertical planes or partitions defining the daylit area and the floor or roof above including the interior surfaces of those boundaries.

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 the Energy Conservation Manual. For those localities not listed in the applicable Energy Conservation Manual 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 45 degrees of true east, including 45°0'0" south of east (SE) but excluding 45°0'0" north of east (NE).

ECONOMIZER, AIR: A ducting arrangement and automatic control system that allows a cooling supply fan system to supply up to 100% outside air to reduce or eliminate the need for mechanical refrigeration during mild or cold weather. With integrated economizers, the economizer controls are integrated with refrigeration controls so that the cooling effect of the water economizer is modulated to provide the desired supply air temperature that would otherwise be provided by the refrigeration system. An integrated system also allows concurrent operation of the economizer and the refrigeration system; when weather conditions are such that the economizer cannot maintain the supply temperature, the economizer shall provide as much of the load as possible, while the refrigeration system operates concurrently to provide the remainder of the load. The economizer shall reduce air flow to the minimum allowed for ventilation when the introduction of more outside air would increase the enthalpy (for enthalpy economizers) or the temperature (for temperature economizers) of the supply air above that of the return or mixed air.

ECONOMIZER, WATER: A system by which the supply air of a cooling system is cooled directly and/or indirectly by evaporation of water, or other appropriate fluid, in order to reduce or eliminate the need for mechanical refrigeration. With integrated water economizers, the economizer controls are integrated with refrigeration controls so that the cooling effect of the water economizer is modulated to provide the desired supply air temperature that would otherwise be provided by the refrigeration system. An integrated system also allows concurrent operation of the economizer and the refrigeration system; when weather conditions are such that the economizer cannot maintain the supply temperature, the economizer shall provide as much of the load as possible, while the refrigeration system operates concurrently to provide the remainder of the load. The economizer shall shut-off when its operation would increase the enthalpy (direct evaporation systems) or temperature (indirect evaporation systems) of the supply air above that of the return or mixed air.

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

ENCLOSED SPACE is space that is surrounded by solid surfaces and/or intake and exhaust vents for HVAC systems.

ENERGY BUDGET is a requirement in Chapter 2-53 that a proposed building be designed to consume no more than a specified number of British thermal units (Btu) per year per square foot of conditioned floor area.

ENERGY CONSERVATION MANUAL is the manual(s) developed by the California Energy Commission, under Section 25402.1(c) of the Public Resources Code, to aid designers, builders and contractors in meeting energy efficiency 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 PARTITION is a partition or a surface with conditioned space on one side and unconditioned space, ambient conditions, or the ground on the other side of the surface. The ground itself is an exterior partition when there is enclosed conditioned space directly above in contact with the ground.

EXTERIOR ROOF/CEILING is a roof or a ceiling with conditioned space on one side and unconditioned space or ambient conditions on the other side.

EXTERIOR WALL is a wall that has conditioned space on one side and unconditioned space or ambient air on the other side.

EXTERIOR WALL AREA is the gross area of the exterior surface of exterior walls, including glazing and doors.

FLICKER-FREE OPERATION means that the light does not oscillate on and off in the readily noticeable frequency range of 0.01 to 30 Hertz.

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.

MANUAL is capable of being operated by personal intervention.

MANUFACTURED DEVICE is any heating, cooling, ventilation, lighting, water heating, refrigeration, cooking, plumbing fitting, insulation, door, window or any other appliance, device, or system subject to Section 2-5311, 2-5314, 2-5317, or 2-5318 of Chapter 2-53.

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 group A, B, E, and/or H.

OCCUPANCY TYPE is the occupancy category used in Sections 2-5341 to 2-5343 that have separate budgets for compliance with Chapter 2-53. Current occupancy types include:

OFFICES:	Offices and occupancys providing services
RETAIL & WHOLESALE STORES:	Occupancys whose primary activity is the sale of merchandise.

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

PERFORMANCE COMPLIANCE APPROACH is a method of complying with Chapter 2-53 that is described in Section 2-5304.

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

POWER INDICES are the HVAC power indices or power criteria as defined in subsection 2-5342(e)2. They include the source heating power index, the source cooling power index, and the fan wattage index.

PRESCRIPTIVE COMPLIANCE APPROACH is a method of complying with Chapter 2-53 that is described in Section 2-5304.

R_t is the total "R" value or overall assembly resistance to heat flow including all heat flows through framing members, multiple layers, connections, and air films, and other series and parallel heat flows in [hr x ft^2 x °F]÷ Btu.

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 sensible cooling of air that has been previously heated by HVAC systems serving the same building.

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

REHEAT is the heating of air that has been previously cooled either by mechanical refrigeration or economizer cooling systems.

RESIDENTIAL BUILDING is a building which is of an occupancy group 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 purposes other than comfort heating.

SETS OF POWER INDICES are specific related combinations of the fan wattage index, the source heating power index, and the source cooling power index used in the Alternative Component Packages in Section 2-5342 for prescriptive compliance with Chapter 2-53 for the types of buildings regulated by Sections 2-5341 to 2-5343.

SHADING is the protection from heat gains due to direct solar radiation by permanent exterior devices, glazing materials, adherent materials applied to glazing, or an adjacent building.

EXCEPTION:

In buildings of occupancy R, other than apartment houses with four or more stories and hotels, shading 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 45 degrees of true south, including 45°0'0" west of south (due SW) but excluding 45°0'0" east of south (SE).

SPECIAL GLAZING is glazing which has a maximum U value of 0.65 for all glazed surfaces.

SUSPENDED EXTERIOR FLOOR is a floor that has conditioned space on one side and unconditioned space or ambient air on the other side.

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^2°F/Btu.

TINTED GLAZING is glazing material which is permanently tinted or permanently surface coated by the manufacturer and provides a maximum shading coefficient as specified in Chapter 2-53.

TOTAL R-VALUE is R_t as that term is defined.

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 x ft^2 x °F].

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 45 degrees of true west, including 45°0'0" due north of west (NW) but excluding 45°0'0" south of west (SW).

ZONE is a space or group of spaces within a building with sufficiently similar comfort conditioning requirements so that comfort conditions can be maintained throughout by a single controlling device.

Sec. 2-5303. Design Conditions and Calculation of Energy Consumption

(a) For the purposes of sizing HVAC systems for buildings of occupancy R, the determination of annual energy consumption for compliance with the energy budgets in Sections 2-5322 and 2-5341, and overall thermal transfer value (OTTV), where required by Chapter 2-53, indoor design temperatures shall be 70°F for heating and 78°F for cooling. For other load calculations that may be done in conjunction with compliance with these standards, indoor design conditions shall be in accordance with ANSI/ASHRAE 55-1981, except that humidification and dehumidification need not be considered. Heating and cooling design loads shall be determined in accordance with the procedures described in the ASHRAE Handbook, 1985 Fundamentals Volume, the ASHRAE Cooling and Heating Load Calculation Manual (1978), or comparable computation procedure. Outdoor design air temperatures shall be those listed in the 0.2 percent Winter Dry Bulb column for heating and the 0.5 percent Summer Dry Bulb and the 0.5 percent Wet Bulb columns for cooling, based on percent-of-year in ASHRAE publication SPCDX: Climatic Data for Region X, Arizona, California, Hawaii, and Nevada, 1982.

(b) For purposes of calculating energy consumption of a building, where required by this chapter, the total calculated annual consumption of electricity, natural gas, fuel oil, and propane shall be converted to source Btu at the rates shown in Table 2-53C.

TABLE 2-53C. SOURCE ENERGY CONVERSION RATES

Energy Sources	Btu per unit consumption
Electricity	10,239 Btu/kilowatt-hour
Natural Gas	100,000 Btu/therm
Fuel Oil	138,400 Btu/gallon
Propane	91,080 Btu/gallon

Sec. 2-5304. Compliance Approaches

(a) General. Chapter 2-53 establishes two compliance approaches for new buildings. Under the performance compliance approach, a building must comply with specified mandatory features, and must be designed to consume no more energy than specified in the applicable energy budget. Under the prescriptive compliance approach, a building must comply with the same specified mandatory features, and must also comply with prescriptive requirements that the Commission has determined will result in a design meeting the energy budget.

(b) Applicable Sections. Table 2-53B lists the sections with which new buildings must comply.

(c) Determination of Number of Stories; Applicability of Standards. The energy budgets for offices in Section 2-5341 differ for buildings of three or fewer, and four or more, habitable stories. The provisions of Sections 2-5351 and 2-5352 apply only to buildings of occupancy R that have three or fewer habitable stories.

Only those habitable stories that have more than 50 percent of their volume above grade as defined in the 1982 UBC shall be counted in determining how many habitable stories a building has.

All conditioned floor area in a story shall comply with Chapter 2-53, whether or not the story is above ground and whether or not it is habitable.

(d) Requirements for Performance Compliance Approach. When a building uses a performance compliance approach, the rules in Sections 2-5304(d)1 - 2-5304(d)4 apply.

1. Design consumption.

The building shall be designed to consume no more British thermal units (Btu) of energy per square foot of conditioned floor area per year than shown in the applicable energy budget, for the applicable climate zone.

2. Multi-story buildings with occupancies covered by Section 2-5341.

The energy budget for occupancies covered in Section 2-5341 in a multi-story building shall be:

$$EB = [(CFA_{s1} \times EB_{s1}) + (CFA_{s2} \times EB_{s2}) + \ldots + (CFA_{sn} \times EB_{sn})] \div [CFA_{s1} + CFA_{s2} + \ldots + CFA_{sn}]$$

where EB = building energy budget for all Section 2-5341 occupancies and EB_{s1}, EB_{s2}, ..., EB_{sn} are the energy budgets for the Section 2-5341 occupancies for each story, s1, s2, s3, ..., sn, and, CFA_{s1}, CFA_{s2}, ..., CFA_{sn} are the total conditioned floor areas of Section 2-5341 occupancies for each story, s1, s2, ..., sn.

The energy budget for any story, si (i=1,2,...,n) is:

$$EB_{si} = [(CFA_{o1} \times EB_{o1}) + (CFA_{o2} \times EB_{o2}) + \ldots + (CFA_{on} \times EB_{on})] \div [CFA_{si}]$$

where EB_{si} is the energy budget for Section 2-5341 occupancies for the ith story, and:

$CFA_{o1,o2,\ldots,on}$ = Conditioned office floor areas for each of the Section 2-5341 occupancies, o1,o2,...,on, on the ith story.

$EB_{o1,o2,\ldots,on}$ = The Section 2-5341 energy budget for occupancy, o1,o2,...,on, on the ith story based on the occupancy and the conditioned cross-sectional area of the ith story.

CFA_{si} = $CFA_{o1} + CFA_{o2} + \ldots + CFA_{on}$, the sum of the floor areas of the Section 2-5341 occupancies on the ith story.

3. Mixed occupancy buildings.

A building with more than one type of occupancy complies with the applicable energy budgets if EITHER

A. Each occupancy complies with the applicable energy budget; or

B. (1) All conditioned floor areas for occupancies covered in Section 2-5341 in the building meet the energy budget for a multi-story building as indicated in section 2-5304(d)2 above; and

(2) The occupancies not covered by Section 2-5341 in the entire building meet a budget for the entire building EB_e, calculated as follows:

$$EB_e = [(CFA_{o1} \times EB_{o1}) + (CFA_{o2} \times EB_{o2}) + \ldots + (CFA_{on} \times EB_{on})]$$
$$[CFA_{o1} + CFA_{o2} + \ldots + CFA_{on}]$$

where EB_e = energy budget for the building

$CFA_{o1, o2, \ldots, on}$ = Conditioned floor area of occupancy 1, 2,..., n. not covered by Section 2-5341.

$EB_{o1, o2, \ldots, on}$ = Energy budget applicable to non-office occupancy 1, 2,..., n. (From Table 2-53K.) not covered by Section 2-5341.

Heat transfers between Section 2-5341 occupancies and other conditioned occupancies may be considered by the building designer to be zero for the purpose of complying with the energy budgets in these standards.

4. Calculation of Energy Consumption.

A. Calculation Method. The CEC's Public Domain Computer Program for Building Energy Calculation or any other calculation method approved under California Administrative Code, Title 20, Section 1409 shall be used to calculate the building's annual energy consumption.

B. Basis for Comparison.

(1) Operating Conditions. The same operating conditions regarding indoor temperature and humidity criteria, occupancy loads, and schedules, equipment loads and operation schedules including lighting, HVAC, and miscellaneous electrical, and outdoor weather conditions that were used by the Commission in establishing the energy budget shall be used to calculate the annual energy consumption of the building.

EXCEPTION:

For all nonresidential buildings, the lighting load or power density shall be that lighting load designed for installation into the building, but the lighting shall be used on the same schedule, which gives the fraction of the installed load used for each hour, that was used by the Commission in establishing the energy budget.

(2) The same physical characteristics of building pressurization, interior heat transfer, film coefficients, the shading coefficient and operation of installed interior shading devices, ground temperatures, and the method of determining slab heat loss that were used by the Commission in establishing the energy budget shall be used to calculate the annual energy consumption of the building.

(3) The applicable design conditions and physical characteristics described in Sections 2-5304(d)4.B.(1)-(2) are listed in the Energy Efficiency Manual for the applicable building type and climate zone.

C. Energy Consumption Included in Calculation.

(1) Energy.

The total calculated annual energy consumption shall include all energy used for comfort heating, comfort cooling, ventilation for the health and comfort of occupants, service water heating, and lighting, except as described in Sections 2-5304(d)4.C.(2), 2-5304(d)4.C.(3), and 2-5304(d)4.C.(4). It shall also include equipment loads referred to in Section 2-5304(d)4.B.(1) used according to the assumed schedule for such loads and the heating and/or cooling energy required for those loads.

(2) Heat Transfer to Spaces not Covered by the Permit.

Heat transfers to adjacent spaces within the same building that are independently provided with comfort conditioning may be considered to be zero. Heat transfers to spaces not yet provided with conditioning may be modeled as separate unconditioned zones, or as outdoor conditions.

(3) Nondepletable Energy Sources.

The total calculated annual energy consumption need not include energy from any nondepletable source, regardless of the purpose of the energy consumed.

(4) Energy for Process Equipment.

The total calculated annual consumption need not include any energy from process equipment in excess of the equipment loads referred to in Section 2-5304(d)4.B.(1) including energy recovered from process equipment. Process equipment means equipment that has a function other than comfort heating, comfort cooling, ventilation for the health and comfort of the occupants, service water heating, or lighting. Process equipment includes but is not limited to the equipment supplying make-up air or water to process equipment. If the building permit applicant wishes to exclude such energy, he or she shall demonstrate to the satisfaction of the enforcement agency that the proposed building will contain such equipment, including but not limited to indicating the equipment on the plans or specifications or both plans and specifications submitted with the building permit application.

(5) Energy for Heating, Cooling, and Ventilation of Process Equipment.

The total calculated annual energy consumption need not include energy consumed for heating, cooling, or ventilation for the health and comfort of occupants that is caused by process equipment specified in Section 2-5304(d)4.C.(3).

If the building permit applicant wishes to exclude such energy, he or she shall model the proposed building using an adjusted fan size (in cubic feet per minute, CFM_a) and an adjusted coil size (in tons of cooling capacity, T_a) rather than the actual fan and cooling equipment sizes of the HVAC equipment proposed to be installed and shall calculate the HVAC power and performances indices based on such adjusted sizes, as determined by Equations 2-53A through 2-53D.

a. Fan Size

Equation 2-53A

$$CFM_a = CFM_p - CFM_{pe}$$

Where CFM_p = fan size of HVAC equipment proposed for installation

CFM_a = adjusted fan size

Equation 2-53B

$$CFM_{pe} = \frac{Q_s}{\left(\frac{1.08 \text{ Btu x min}}{°F \text{ x } ft^3 \text{ X hr}}\right)(\Delta T)}$$

Where Q_s = sensible cooling load, in Btu resulting from the peak load of all process equipment during normal operation.

ΔT = absolute value of difference between supply air temperature and thermostat setting in the zone.

CFM_{pe} = incremental fan size, in cubic feet per minute, resulting from process equipment.

b. Cooling Equipment

Equation 2-53C

$$T_{pe} = Q_{s1} \times \frac{1 \text{ ton}}{12{,}000 \frac{\text{Btu}}{\text{hour}}}$$

Where Q_{s1} = the sensible and latent cooling load, in Btu per hour, resulting from the peak load of all process equipment during normal operation.

T_{pe} = incremental cooling equipment, in tons, resulting from process equipment.

Equation 2-53D

$$T_a = T_p - T_{pe}$$

Where T_p = cooling equipment of HVAC equipment proposed for installation

T_a = adjusted cooling equipment

(6) Redundant Equipment

The building's total annual energy consumption may be calculated assuming that redundant equipment does not exist, provided that the plans and specifications submitted with the building permit application show that the redundant equipment is designed with controls so that it will operate only when the initial equipment is not operating.

Energy consumed by equipment that is designed to operate intermittently in conjunction with other equipment shall be included in the total annual calculated energy consumption, by modelling its operation as designed, with all controls designated on the plans and specifications submitted with the building permit application.

(7) Mixed Conditioned and Unconditioned Spaces

When part of a building is conditioned, the total calculated energy consumption shall be determined for the conditioned area only. The energy used in the unconditioned part of the building shall not be included in the calculation, but any heating, cooling, ventilating, lighting, and water heating systems located in the unconditioned part of the building shall be designed to comply with Sections 2-5311 through 2-5319.

(8) Future Expansion of the Building

For all nonresidential buildings and hotels, HVAC systems may be sized to account for planned additions, alterations, or changes of occupancy, provided that additions, alterations, or changes appear on the plans and specifications required by Section 1403(a)2.A of Title 20, California Administrative Code.

(9) Recovered Energy

The total calculated annual energy consumption need not include any energy (a) that otherwise would be wasted, (b) that is mechanically recovered from HVAC, service water heating, lighting, or process equipment after the energy has performed its original function, and (c) that is used to provide comfort heating, comfort cooling, ventilation, or service water heating. If the approved calculation method does not model such recovery and the applicant wishes to exclude such energy, he or she shall determine the net amount of energy used to recover the energy by another approved calculation method, and shall show the means by which the energy will be recovered and subsequently used on the plans and specifications submitted with the building permit application.

(10) Air Treatment

Where air must be treated in order to meet the requirements of Section 2-5343, the additional energy consumption resulting from the purification of outdoor or recirculated air or from the pressure drop from the filter or other treatment in excess of 0.50 inches of water need not be included in the total calculated annual energy consumption.

ENERGY CONSERVATION STANDARDS--PROVISIONS APPLICABLE TO ALL OCCUPANCIES

Sec. 2-5311. Installation of Certified Insulating Material.

(a) Insulating material of the types listed in Table 2-53D shall be installed in any building only if the insulating material 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 2-53D.
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

(b) All insulating materials shall be installed in compliance with the flame-spread rating and smoke density requirements of Sections 1712 and 1713 of the 1982 Uniform Building Code.

(c) Application of urea formaldehyde foam insulation 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.

Sec. 2-5312. Piping Insulation.

[recodifies, with amendments, current §§ 2-5305(c), 2-5334, 2-5352(i)(2), 2-5352(j), 2-5364(j)]

Piping shall be insulated in accordance with Table 2-53E.

EXCEPTIONS:

I. For new buildings of Occupancy Group R (residential buildings), except apartment houses with four or more habitable stories and hotels, piping in unconditioned space leading to and from water heaters shall be insulated with an installed thermal resistance of at least R-3 for the five feet of pipe closest to the water heater, or whatever shorter length is in unconditioned space. In all group R occupancies, other hot water piping that does not recirculate and all piping in conditioned space need not comply with the insulation requirements of Section 2-5312.

II. Piping insulation need not comply with Section 2-5312 if:

A. Piping is installed within HVAC equipment;

B. Piping conveys fluids at temperatures between 60°F and 105°F;

C. The heat loss or heat gain of the piping, without insulation, does not increase the new energy requirements of the building.

TABLE 2-53E

MINIMUM PIPE INSULATION

Piping System Types	Fluid Temperature Range, °F	Pipe Diameter (in inches)					
		Runouts[1] Up to 2	Branches, Mains, and Loops[2]				
			1 and Less	1.25-2	2.50-4	5-6	8 and Larger
		Insulation Thickness[3] (in inches)					
SPACE HEATING AND WATER HEATING SYSTEMS							
Steam & Hot Water							
High Pressure/Temp	306-460	1.5	2.5	2.5	3.0	3.5	3.5
Medium Pressure/Temp	251-305	1.5	2.0	2.5	2.5	3.0	3.0
Low Pressure/Temp	201-250	1.0	1.5	1.5	2.0	2.0	2.0
Low Temperature	105-200	0.5	1.0	1.0	1.5	1.5	1.5
Steam Condensate (for Feed Water)	Any	1.0	1.0	1.5	2.0	2.0	2.0
COOLING SYSTEMS							
Chilled Water.....	40-60	0.5	0.5	0.75	1.0	1.0	1.0
Refrigerant or Brine....	Below 40	1.0	1.0	1.5	1.5	1.5	1.5

NOTES:

1. "Runouts" are piping that is 12 feet long or less and that is connected to fixtures or individual terminal units.

2. "Branches, Mains, and Loops" are circulating piping and piping that is over 12 feet long and that is connected to fixtures or individual terminal units.

3. Insulation thickness in Table 2-53E is based on materials having thermal resistance in the range of R = 4.0 to 4.6 per inch. For materials with thermal resistance less than R = 4.0 per inch, the minimum insulation thickness shall be determined as follows:

$$\frac{4.0 \times \text{Table 2-53E Thickness}}{\text{Actual R}} = \text{New Minimum Thickness}$$

For materials with thermal resistance more than R = 4.6 per inch, the minimum insulation thickness shall be permitted to be reduced as follows:

$$\frac{4.6 \times \text{Table 2-53E Thickness}}{\text{Actual R}} = \text{New Minimum Thickness}$$

Sec. 2-5313. Installation of Additional Insulation.

Any contractor installing additional insulating material shall certify to the customer, in writing, that the insulation meets the requirements of Subsections (a), (b), and (c), 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 2-53F 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 external insulation is applied to heating and cooling system ducts, it shall conform to the thermal resistance requirements of Section 1005 of the 1982 Uniform Mechanical Code.

Table 2-53F
MINIMUM REQUIREMENTS FOR ADDITIONAL ATTIC INSULATION

Degree Days	R-value[1]
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

NOTE: For listing of degree days by locality, see the 1984 Energy Conservation Manual.

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

Sec. 2-5314. Installation of Appliances and Equipment.

[recodifies, with amendments, current §§ 2-5306(a)-(c), 2-5306(d)(1), 2-5307(b), 2-5337, 2-5352(1), 2-5365]

(a) Certified Appliances.

If any appliance of the types listed in Table 2-53G is installed, it shall have been certified to the California Energy Commission by its manufacturer to comply with the efficiency standards for such appliances. See Appendix 2-53A for availability of directories of certified appliances.

EXCEPTION: Effective December 22, 1984, a fan type central furnace (175,000 to 400,000 Btu/hr input rate) certified solely on the basis of minimum seasonal efficiency or minimum steady state efficiency shall be permitted to be installed, provided that both of the following conditions are met:

A. The furnace was manufactured before December 22, 1984.

B. The furnace was sold to the builder or contractor no later than December 22, 1985.

Table 2-53G. APPLIANCES SUBJECT TO CERTIFICATION

1. Refrigerators, refrigerator-freezers, and freezers which can be operated by alternating current electricity

EXCEPTIONS: The following refrigerators, refrigerator-freezers, and freezers shall not be subject to the requirements of this subsection:

I. Those with total refrigerated volume exceeding 39 cubic feet.

II. Those designed to be used without doors.

III. Those which do not include a compressor and condensor unit as an integral part of the cabinet assembly.

2. Room air conditioners

3. Central air conditioners (regardless of capacity) and other central air conditioning heat pumps with a cooling capacity less than 135,000 Btu per hour

4. Gas space heaters of the following types:

a. Fan type central furnaces with input rate less than 400,000 Btu per hour.

b. Boilers.

Table 2-53G. APPLIANCES SUBJECT TO CERTIFICATION--Continued

c. Wall furnaces.

d. Floor furnaces.

e. Room heaters.

f. Unit heaters.

g. Duct furnaces.

EXCEPTIONS:

I. The following gas space heaters shall not be subject to the requirements of this subsection:

A. Gravity type central furnaces.

B. Fan type central furnaces with input rate of at least 400,000 Btu per hour.

C. Infrared heaters.

II. See Subsection (b) for requirements applicable to gravity type central furnaces and to fan type central furnaces with input rates of at least 400,000 Btu per hour.

5. Water Heaters

EXCEPTION: Nonstorage type electric water heaters shall not be subject to the requirements of this subsection.

6. Plumbing fittings, including showerheads, lavatory faucets, and sink faucets.

7. Fluorescent lamp ballasts (and luminaires with fluorescent lamp ballasts) which are intended to operate at nominal input voltages of 120 or 277 volts, have an input frequency of 60 Hz, have maximum lamp operating currents greater than 350 milliamperes but less than 500 milliamperes, and can be used to operate fluorescent lamp types F40T12 or F96T12.

EXCEPTIONS: The following fluorescent lamp ballasts (and luminaires with such fluorescent lamp ballasts) shall not be subject to the requirements of this subsection:

I. Those designed to be used in ambient temperatures of 0°F or less.

II. Those with power factors less than 0.60.

III. Those designed for dimming.

(b) Minimum Efficiency of Equipment.

1. Cooling Equipment. If any equipment of the types specified in Table 2-53G is installed, it shall meet or exceed the corresponding minimum efficiency in Table 2-53H. Such minimum efficiency shall be certified by the manufacturer of the equipment and shall have been determined by testing using the procedure specified in Table 2-53I for that type of equipment.

   For equipment classified as B or C in Table 2-53H, the COP specified is for the water-chilling package or hydronic heat pump as furnished by the manufacturer. For water-chilling packages the COP does not include energy to drive chilled-water and condenser-water pumps or cooling tower fans. For hydronic heat pumps the COP does not include the energy to drive circulating water pumps or cooling tower fans, but does include the conditioned supply-air fan-motor energy when included as a part of the model number of the hydronic heat pump.

   For equipment classified as D in Table 2-53H, COP shall be calculated as the net cooling output divided by the total heat input, but excluding electrical auxillary inputs.

Table 2-53H. MINIMUM EFFICIENCY OF COOLING EQUIPMENT, 65,000 Btu/HOUR AND OVER

Classification in Table 2-53	Type	Condensing Means	EER	COP
A	Electrically Driven Air Conditioners	Air	8.2	-
		Evaporative or Water	9.2	-
B	Electrically Driven Water Chilling Packages			
	Centrifugal or Rotary Type, with Condenser	Air	-	2.34
		Water	-	4.04
	Reciprocating Type, with Condenser	Air	-	2.46
		Water	-	3.51
	Reciprocating Type, without Condenser	Air	-	2.90
		Water	-	3.51
	Hydronic Heat Pumps, Reciprocating Type	Water	-	2.75
C	Electrically Driven Condensing Units	Air	-	2.78
		Evaporative or Water	-	3.66
D	Heat Operated			
	Direct Fired (gas, oil)		-	0.48
	Indirect Fired (steam, hot water)		-	0.68

Table 2-53I. TEST PROCEDURES FOR COOLING EQUIPMENT, 65,000 Btu/HOUR AND OVER

Classification	Type	Test Procedure
A	Unitary Air-Conditioning Equipment	ARI 210-81
	Commercial and Industrial Unitary Air Conditioning Equipment	ARI 360-81
	Air-Source Unitary Heat Pump Equipment	ARI 240-81
	Water-Source Heat Pumps	ARI 320-81
	Commercial and Industrial Heat Pump Equipment	ARI 340-82
B	Centrifugal or Rotary Water-Chilling Packages	ARI 550-83
	Reciprocating Water-Chilling Packages	ANSI/ARI 590-81
	Water-Source Heat Pumps	ARI 320-81
C	Positive Displacement Refrigerant Condensing Units	ARI 520-78
D	Absorption Water-Chilling Packages	ARI 560-82
	Gas Fired Absorption Summer Air-Conditioning Appliances	ANSI Z21.40.1-1981

2. Gas-fired heating equipment. If a fan type central furnace with input rate of at least 400,000 Btu per hour or a gravity type central furnace is installed, it shall have a minimum thermal efficiency of 75 percent, as certified by the manufacturer of the equipment, based on the test procedure ANSI Z21.47-1978.

3. Oil-fired heating equipment. If oil-fired heating equipment is installed, it shall have a minimum combustion efficiency of 75 percent at maximum rated output, as certified by the manufacturer of the equipment. Combustion efficiency is defined as 100 percent minus stack losses in percent of heat input. Stack losses are:

   A. Loss due to sensible heat in dry flue gas.

   B. Loss due to incomplete combustion.

   C. Loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

(c) Ignition of Gas Appliances.

If any gas appliance of the following types is installed, it shall not be equipped with a continuously burning pilot:

1. Fan type central furnaces.

2. Fan type wall furnaces.

3. Residential type clothes dryers.

4. Residential type cooking appliances.

5. Pool heaters.

EXCEPTIONS: The following gas appliances shall be permitted with a continuously burning pilot:

1. Those designed to burn only liquefied petroleum gases.

2. Any residential type cooking appliance which meets all of the following conditions:

   A. It does not have an electrical supply voltage connection.

   B. It has no more than one continuously burning pilot light.

   C. The pilot light consumes less than 150 Btu per hour.

3. Any pool heater that was sold to the builder before February 24, 1984.

(d) Heat Pumps--Space Heating Mode.

Heat pumps shall be installed with controls to prevent electric resistance supplementary heater operation when the heating load can be met by the heat pumps alone. Electric resistance supplementary heater operation is permitted during transient periods, such as start-ups and following room thermostat setpoint advance, when controls are provided which use preferential rate control, intelligent recovery, staging, ramping, or similar control mechanisms designed to preclude the unnecessary operation of supplementary heating during the recovery period. Supplementary heater operation is also permitted during defrost.

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.

Heat pumps with supplementary heat derived from sources other than electric resistance need not comply with the requirements of this subsection.

(e) Lavatories in Restrooms of Public Facilities.

1. Shall be equipped with:

   A. Outlet devices that limit the flow of hot water to a maximum of 0.5 gallons per minute, or with;

   B. Self-closing faucets that limit delivery to a maximum of 0.25 gallons of hot water for recirculating systems and to a maximum of 0.50 gallons for nonrecirculating systems, and;

2. Shall be equipped with devices that limit the outlet tempoerature to a maximum of 110 °F.

Sec. 2-5315. HVAC Controls.

(a) Each HVAC system shall be equipped with at least one automatic device to setback or shut-off the system during periods of non-use or alternate use of the building spaces or zones served by the system.

(b) Each zone or residential dwelling unit shall be provided with at least one automatic temperature control device for the regulation of space temperature. Each floor of a nonresidential building with conditioned space shall contain at least one zone. Zone temperature controls shall:

1. Be able to maintain space temperature set points from 55°F to 85°F. Two or more replaceable fixed set point devices, one for cooling and one for heating, may be used in lieu of continuously adjustable set point devices.

2. Be able to operate zone heating and cooling in sequence if both are provided.

3. Provide a temperature range adjustable up to 10°F between full heating and full cooling capacity to the zone, if the zone has both heating and cooling capability. If the HVAC system uses reheat or recool for conditioning this zone, this control shall reduce cooling capacity to the zone before reheating and reduce heating capacity to the zone before recooling.

EXCEPTIONS:

I. Hotels are not required to comply with subsection 2-5315(a).

II. Small ancillary HVAC systems whose input power is less than 500 watts may have readily acccesible manual on/off switching in lieu of the requirements of subsection 2-5315(a).

Sec. 2-5316. Ventilation Systems

[recodifies, with amendments, current §§ 2-5327, 2-5332, 2-5335, 2-5336, 2-5352(d)(4), 2-5352(f), 2-5362(d)(2), and 2-5363(d)]

(a) Air handling duct systems shall be constructed, installed, sealed, and insulated as provided in Chapter 10 of the State Mechanical Code (Title 24, Part 4).

(b) On mechanical ventilation supply and exhaust systems capable of moving more than 5,000 cfm of air, automatic dampers interlocked and closed on fan shutdown shall be provided. On gravity ventilating systems, either automatic or readily accessible manually operated dampers in all openings to the outside, other than combustion air openings, shall be provided.

EXCEPTION: In buildings of occupancy R, all fan systems, regardless of volumetric capacity, exhausting air from the building to the outside shall be provided with backdraft or automatic dampers to prevent air leakage.

(c) The ventilation system serving an area shall:

1. Be capable of meeting the acceptable ventilation air quality criteria established in Sections 3.1 to 3.4 of ASHRAE Standard 62-73.

2. Except in offices, for any area in which smoking is prohibited, be capable of supplying at least the "minimum" quantity of outdoor air listed for the area in Section 6 of ASHRAE Standard 62-73, or 5 cfm per person, whichever is higher.

3. Except in offices, for any area in which smoking is permitted, be capable of supplying at least the "recommended" quantity of outdoor air listed for the area in Section 6 of ASHRAE Standard 62-73, or 5 cfm per person, whichever is higher.

4. HVAC systems which are designed to utilize outside air for cooling may reduce outside air requirements to 33 percent of those required in Section 6 of ASHRAE 62-73, so long as a minimum 5 cfm per person of outside air is delivered to each space or zone at all times such spaces or zones are occupied.

5. In office buildings, comply with the requirements of Section 2-5343.

EXCEPTION: Buildings of occupancy R need not comply with the requirements of Section 2-5316(c).

Sec. 2-5317. Infiltration/Exfiltration Controls.

[recodifies, with amendments, current §§ 2-5324, 2-5352(d)(1)-(3), 2-5362(d)(1)]

(a) Doors and windows between conditioned and unconditioned spaces, such as garages and closets for central forced air gas furnaces using outside air for combustion, shall be designed to limit air leakage into or from the building envelope.

(b) Manufactured doors and windows shall have air infiltration rates certified by the manufacturer as not exceeding those shown in Table 2-53J. Labels indicating testing and compliance with industry standards, approved by the Executive Director, are adequate demonstration and certification of compliance with this subsection, 2-5317(b).

(c) Site-constructed doors and windows, exterior joints, and openings in the building envelope that are observable sources of air leakage shall be caulked, gasketed, weather-stripped or otherwise sealed.

EXCEPTIONS:

I. Fire rated doors and windows, unframed glass doors, and exterior elevator shafts do not have to meet the requirements of this Section.

II. Elevator shaft ventilation dampers are not required if the walls between the elevator and conditioned space meet the requirements for exterior walls.

TABLE 2-53J. ALLOWABLE AIR INFILTRATION RATES[1,2]

WINDOWS	RESIDENTIAL DOORS	NONRESIDENTIAL DOORS	
(cfm/ft of operable sash crack)	(cfm/ft^2 of door area	(cfm/ft^2 of door area)	
	swinging, sliding	sliding, swinging (single door)	swinging (double door)
0.50	0.50	0.50	1.0

Notes:

1. When tested at a pressure differential of 1.567 lb./ft^2, which is equivalent to the pressure of a 25 mph wind.

2. Compliance with the criteria for air leakage shall be determined by Specification E283-73 of ASTM (Standard Method of Test for Air Leakage Through Exterior Windows, Curtain Walls, and Doors).

Sec. 2-5318. Installation of Service Water-Heating Systems and Pool Heaters

[recodifies, with amendments, current §§ 2-5307(a) [part], 2-5307(c), 2-5338, 2-5339, 2-5340, 2-5352(i)(), 2-5352(k), 2-5364(c)]

(a) Heat Losses.

1. If an oil-fired automatic storage heater is installed, the manufacturer shall have certified the water heater to have a recovery efficiency (E_r) of at least 75 percent and a standby loss percentage (S) less than or equal to:

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

where CAP = storage capacity in gallons.

The test method for E_r and S shall be as described in Section 2.8 of ANSI Standard Z21.-10.3-1981. For oil-fired units, CF = 1.0; Q = total gallons of oil consumed; and H = total heating value of oil in Btu/gallon.

2. Combination Service Water-Heating/Space-Heating Boilers. If a boiler is installed to provide both winter space-heating and service water-heating, manufacturer shall have certified the boiler to have a standby loss (in Btu/hr) less than

$$\frac{13.3\ pmd + 400}{N}$$

Where pmd is the probable maximum demand in gallons per hour determined as per Chapter 37 of the 1980 ASHRAE Handbook and Product Directory, Systems Volume, and N is the fraction of the year when outdoor daily mean temperature is more than 65°F.

The standby loss is to be determined for a test period of 24-hour duration while maintaining a boiler water temperature of 90°F above ambient.

3. Unfired Hot Water Storage Tanks. If an unfired hot water storage tank is installed, the tank shall be insulated to a thermal resistance of at least R-12.

EXCEPTIONS:

I. An unfired hot water storage tank may be insulated to a thermal resistance of less than R-12, if the tank is insulated to limit heat loss to a maximum 7.5 Btu ÷ [hr x ft^2] of external tank surface area. The design ambient temperature shall be 65°F.

II. If an unfired storage tank is installed as the collector in an integral collector/storage solar system, heat loss from the tank shall be limited to one Btu ÷ [°F x hour x gallon] of water stored.

(b) Controls.

1. Temperature. Service water-heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use as listed in Table 2, Chapter 37 of the 1980 ASHRAE Handbook and Product Directory, Systems Volume.

2. Pumps. If a circulating hot water system is installed, it shall have a control capable of automatically turning off the circulating pump(s) when hot water is not required.

(c) Solar Water Heaters in State Buildings. Any new building to be constructed by the state shall be designed and constructed to derive its service water heating from a solar system.

EXCEPTIONS: The following state buildings are exempt:

I. Buildings with a maximum of 10,000 square feet of floor area.

II. Buildings whose heating, cooling, service water heating, or lighting system is expected to operate a maximum of 1,000 hours per year.

III. Buildings for which the State Architect determines that solar water heating is economically or physically infeasible.

(d) Pool Heating.

1. Any new or replacement fossil-fueled pool heater system in a building of occupancy R 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 pool and for the proper care of pool water when a 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 pool heater shall have a thermal efficiency, as certified by the manufacturer, of at least 75 percent when tested in accordance with ANSI Z21.56-1979.

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 so equipped by the manufacturer, 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.

Sec. 2-5319. Control Devices for Indoor Lighting

[recodifies, with amendments, current § 2-5343(b)]

Controls for lighting loads within the building envelope shall meet each of the following requirements.

(a) Each area enclosed by ceiling-height partitions shall have independent control of the lighting within that area.

(b) Each area enclosed by ceiling-height partitions shall have at least one readily accessible manually operated switching device to control lighting within the area. For lighting controls, "readily accessible" means located so that a person using the device can see the controlled lights or the area being lit. Switching devices in addition to, but not instead of, the required readily accessible manually operated switching devices shall also be permitted.

(c) The general lighting of any enclosed area 100 square feet or larger in which the connected lighting load exceeds 1.0 watt per square foot for the area as a whole, shall be controlled so that the load for the lights may be reduced by at least one-half while maintaining a reasonably uniform level of illuminance throughout the area. A reasonably uniform level of illuminance may be maintained by controlling all lamps or luminaires with dimmers; by dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps; by switching the middle lamps of three lamp luminaires independently of the outer lamps; or by switching each luminaire or each lamp.

(d) In all areas where effective use may be made of natural light, lighting circuiting shall be arranged so that units, in all portions of the area where natural light is available at the same time, are switched independently of the remainder of the area.

(e) If daylighting or lumen maintenance controls are installed to comply with Section 2-5341(b) or 2-5342(d), they shall have minimum specifications and be installed in accordance with the following:

1. Daylighting controls shall be capable of reducing the general lighting of the controlled area by at least one-half while maintaining a uniform level of illuminance throughout the area.

2. If the control is a dimmer, the control shall have the capability, as certified by the manufacturer, of providing electrical outputs to the lamp for flicker-free operation throughout the dimming range and without causing premature lamp failure.

3. The controls shall incorporate time delay circuits to prevent undesirable cycling of light level changes.

4. If the control uses step switching with separate "on" and "off" settings for the steps, adjustment shall allow sufficient separation of "on" and "off" points to prevent cycling.

5. Each photocell sensor shall be a light diffusing type and shall not have a mechanical slide cover or other device that would permit easy unauthorized disabling of the control.

6. The manufacturer shall provide step-by-step instructions for installation and start-up calibration to design footcandle levels.

7. Daylighting controls shall also incorporate either:

   (A) programmable timing controls capable of separate schedules for weekdays and weekends as well as temporary override and automatic return. The temporary override need not be wired in series with other switching; OR

   (B) occupancy sensing devices to automatically turn off all daylit controlled non-emergency lighting in the absence of occupants. These devices shall meet specifications stated in Section 2-5319, Exception II.

8. The installer of controls shall do all of the following:

   (A) Locate the photocell sensor in accordance with the designer's or manufacturer's instructions.

   (B) Provide to the building owner or occupant certification that the initial calibration of the controls was done according to the designer's or manufacturer's instructions.

   (C) Install the daylighting controls so as to control only luminaires within the daylit area(s).

(f) If occupant-sensing devices are installed to comply with Sections 2-5341(b) or 2-5342(d), they shall have the specifications of Sections 2-5319(e)2 and 2-5319(e)3.

(g) If daylighting controls, lumen maintenance controls, or occupant-sensing devices are installed to comply with Sections 2-5341(b) or 2-5342(d), they shall visibly or audibly warn the occupants or building operators when they have failed or malfunctioned.

(h) For retail and wholesale stores, complying with Sections 2-5341 through 2-5343, valance lighting shall be separately switched and feature displays shall be separately switched on 20 amp circuits. If the total lighting power for feature displays in a store exceeds four 20 amps circuits, switching shall be controlled by an automatic programmable timer that must be capable of:

1. Programming different schedules for weekdays and weekends; and

2. Temporary override by occupants with automatic return to original schedules (override controls shall be readily accessible).

(i) One-lamp or three-lamp fluorescent lighting luminaires, of the type listed as subject to certification in Table 2-53G, recess mounted or surface mounted within 10 feet of each other or pendant mounted within one (1) foot of each other shall be tandem wired to eliminate unnecessary use of single lamp ballasts. Tandem wiring consists of pairs of luminaires operating with one lamp in a luminaire powered from a single two-lamp ballast contained in a second luminaire.

EXCEPTIONS (to Section 2-5319):

I. Hotels and other group R occupancies are not required to comply with Section 2-5319.

II. Any area whose actual installed connected lighting load is less than 1.0 watt per square foot throughout the entire area, or in which a single light source (lamp) produces all of the illumination in the area, need not comply with Subsection (c).

III. Any area in which the lights are controlled by an occupant-sensing device that automatically turns the lights off soon after the area is vacated, need not comply with Subsections (b) or (c), provided that the manufacturer of the device has certified to the Executive Director of the California Energy Commission that the device meets the criteria of either A. or B. below:

A. The device does not emit any radiated energy (including but not limited to electromagnetic, ultraviolet, microwave, or infrared radiation) as a signal for sensing occupants within an area.

B. If the device emits ultrasonic radiation as a signal for sensing occupants within an area, the device:

(1) is one for which an Initial Report has been submitted to the Bureau of Radiological Health, Federal Food and Drug Administration under 21 code of Federal Regulations, Section 1002.10, and a copy of the report has been submitted to the California Energy Commission;

(2) emits no audible sound; and

(3) does not emit ultrasound in excess of the following decibel (dB) values, measured no more than five feet from the source, on axis:

Midfrequency of Sound Pressure Third-Octave Band (in kHz)	Maximum dB level within Third Octave Band (in dB reference 20 micropascals)
less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

NOTE: These Values are based on American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended changes for 1981," Page 90, Table 12, 1981).

C. If the device emits microwave radiation as a signal for sensing occupants within an area, the device:

(1) Complies with all applicable Federal Communications Commission rules and regulations codified in 47 Code of Federal Regulations, Part 15, and a copy of the approved FCC ID number as it appears on all units of the device has been submitted to the California Energy Commission:

(2) does not emit radiation in excess of one (1) milliwatt per square centimeter measured at no more than five (5) centimeters from the emission surface of the device; and

(3) has permanently affixed to it installation instructions recommending that it should be installed at least twelve (12) inches from any area normally used by room occupants.

NOTE: The Executive Director shall regularly publish a list of devices certified as meeting these criteria.

IV. Any area controlled by a programmable timing system that automatically turns off nonemergency lights need not comply with Subsection (c), if the system:

A. can program different schedules for weekdays and weekends; and

B. can be temporarily overridden by occupants, with automatic return to the original schedule.

V. Exit signs and illumination subject to Section 2-3312 of the State Building Code, and lighting whose switching is regulated by Article 3-700 of the State Electrical Code (Title 24, Part 2), need not comply with Section 2-5319.

VI. Up to one-half watt per square foot of lighting in any area that must be continuously illuminated for reasons of building security need not comply with Subsection (b) if:

A. the area is designated a security area on the plans and specifications submitted to the enforcement agency under Section 1403(a)2.A.; and

B. the area is controlled by switches accessible to authorized personnel.

FIRST GENERATION

NONRESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS

ENERGY CONSERVATION STANDARDS

FOR NEW NONRESIDENTIAL BUILDINGS OF OCCUPANCIES A, B, E AND H

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ENERGY CONSERVATION STANDARDS FOR NEW NONRESIDENTIAL BUILDINGS OF OCCUPANCIES A, B, E, AND H

Sec. 2-5321. Design Requirements

Buildings of occupancy group A, B, E, or H comply with Chapter 2-53 if they comply with the requirements of Subsection (a), (b), or (c), as applicable.

NOTE: See Sections 2-5341 to 2-5343 for alternative standards applicable to offices.

(a) A building of occupancy group A, B, E, or H complies with Chapter 2-53 if it is designed and constructed so that its service systems consume no more energy than is permitted by Section 2-5322 as determined by the analysis described in Section 2-5323 and to comply with Sections 2-5311 through 2-5319.

(b) A building of occupancy group A, B, E, or complies with Chapter 2-53 if it is designed and constructed so that nondepletable energy sources provide either of the following: Over 40 percent of the annual thermal energy requirement (heating, cooling, and service water heating) or over 20 percent of the annual total energy requirement for all service systems. Documentation, as described in the Energy Conservation Design Manual, shall be provided to verify the percentage of annual energy use derived from such nondepletable sources.

(c) A building of occupancy group A, B, E, or H complies with Chapter 2-53 if it is designed and constructed in accordance with Sections 2-5324 through 2-5333 and Sections 2-5311 through 2-5319.

Sec. 2-5322. Energy Budgets

(a) A building of occupancy group A, B, E, or H complies with Chapter 2-53 if it is designed and constructed to comply with Sections 2-5311 through 2-5319 and if the total calculated annual energy consumption of its service systems (excluding energy from nondepletable sources) does not exceed the product of the square feet of conditioned floor area and the allowable energy budget (in Btu per year per square foot) set forth in Table 2-53K.

TABLE 2-53K
MAXIMUM ALLOWABLE ENERGY CONSUMPTION PER YEAR PER STORY
(THOUSANDS OF BRITISH THERMAL UNITS PER SQUARE FEET OF CONDITIONED FLOOR AREA)

UBC Occupancy[1]	Occupant Load[2]	Climatic Thermal[3] Zones 1-5			Climatic Thermal Zones 6, 8, 9, 10			Climatic Thermal Zone 7			Climatic Thermal Zones 11, 12, 13			Climatic Thermal Zones 14, 15		
		Heated[4] & Cooled	Heated Only	Cooled Only	Heated & Cooled	Heated Only	Cooled Only	Heated & Cooled	Heated Only	Cooled Only	Heated & Cooled	Heated Only	Cooled Only	Heated & Cooled	Heated Only	Cooled Only
Group A-Drinking and dining establishments		131	126	82	108	102	82	104	103	80	132	119	96	148	109	126
· all others		159	154	64	123	114	68	118	106	71	155	140	86	189	120	141
B-1		180	171	163	191	163	184	189	162	184	196	173	185	243	168	236
offices	under 300	141	135	134	145	133	142	145	132	143	148	139	140	165	137	160
	over 299	126	125	124	129	128	128	131	130	131	134	131	130	132	129	128
retail grocery stores		214	212	167	194	189	176	192	187	176	235	216	199	255	204	229
B-2 other retail stores	under 300	180	171	163	191	163	184	189	162	184	196	173	185	243	168	236
	over 299	200	195	190	207	195	202	209	196	204	213	199	205	231	205	225
drinking and dining establishments		131	126	82	108	102	82	104	103	80	132	119	96	148	109	126
classrooms		120	118	77	105	94	82	101	94	83	156	143	89	142	97	123
storage		104	104	104	65	65	65	63	63	63	92	92	92	80	80	80
B-3 B-4 H		104	104	104	65	65	65	63	63	63	92	92	92	80	80	80
E		120	118	77	105	94	82	101	94	83	156	143	89	142	97	123

NOTES

1. Occupancy, as defined in the Uniform Building Code, 1982 Edition. Occupancies A and B-2 have been further subdivided. For B group occupancies (other than offices) not listed, use the subdivision which most closely describes the occupancy.
2. Occupant load, calculated as described in Table 2-53L.
3. Climatic thermal zone, as described in Figure 2-53A.
4. Use appropriate columns for buildings that are heated and cooled, heated only or cooled only.

TABLE 2-53L. OCCUPANT LOAD VALUES

Use	Square Feet Per Occupant
Aircraft Hangars	500
Auction Rooms	7
Assembly Areas	
Concentrated Use (without fixed seats)	
Auditoriums	7
Bowling Alleys (Assembly areas)	7
Churches and Chapels	7
Dance Floors	7
Lodge Rooms	7
Reviewing Stands	7
Stadiums	
Assembly Areas	
Less Concentrated Use	
Conference Rooms	15
Dining Rooms	15
Drinking Establishments	15
Exhibit Rooms	15
Gymnasiums	15
Lounges	15
Skating Rinks	15
Stages	15
Classrooms	20
Garage, Parking	200
Kitchen, Commercial	200
Library Reading Room	50
Locker Rooms	50
Mechanical Equipment Room	300
Offices(when complying with Section 2-5321 through 2-5333)	100
School Shops and Vocational Rooms	50
Stores, Retail	30
Warehouses	300
All Others	100

NOTES: 1. The occupant load in any building or portion thereof shall be determined by dividing the square feet of conditioned floor area assigned to the specified use by the square feet per occupant set forth in this table.

2. When the square feet of conditioned floor area per occupant are not given for a particular occupancy, it shall be determined by the enforcing agency based on the area given for the occupancy which it most nearly resembles.

3. The occupant load of an area having fixed seats shall be determined by the number of fixed seats installed. Aisles serving the fixed seats and not used for any other purpose shall not be assumed as adding to the occupant load.

Sec. 2-5323. Energy Analysis Program

The CALCON 1 Public Domain Computer Program for Building Energy Calculation or any other calculation method approved, for the occupancy type of the building for which a permit is sought, under California Administrative Code, Title 20, Section 1409, shall be used to determine the annual energy consumption for comparison with the maximum allowable energy consumption listed in Table 2-53K.

Sec. 2-5324. Building Envelope: General

A building that will be both heated and cooled shall meet the more stringent of the heating or cooling design requirements for the building envelope provided in Sections 2-5325 and 2-5326. A building that is to be heated only shall meet the requirements of Section 2-5325. A building that is to be cooled only shall meet the requirements of Section 2-5326.

The U-value of any component such as roof/ceiling, wall, or floor may be increased and the U-value for other components decreased until the overall heat gain or heat loss for the entire building envelope does not exceed the total resulting from conformance to the stated U-values.

Sec. 2-5325. Heating Design Criteria

(a) Walls. The combined thermal transmittance value (U_{ow} value) for the gross area of exterior walls consisting of opaque wall areas, window areas, and door areas, that enclose interior heated space, and including areas of foundation walls above grade that enclose heated space, shall not exceed the values shown in Figure 2-53B for the degree days applicable.

Equation 2-53E shall be used to determine acceptable combinations of wall, window, and door areas, and thermal properties to meet the requirements of Figure 2-53B.

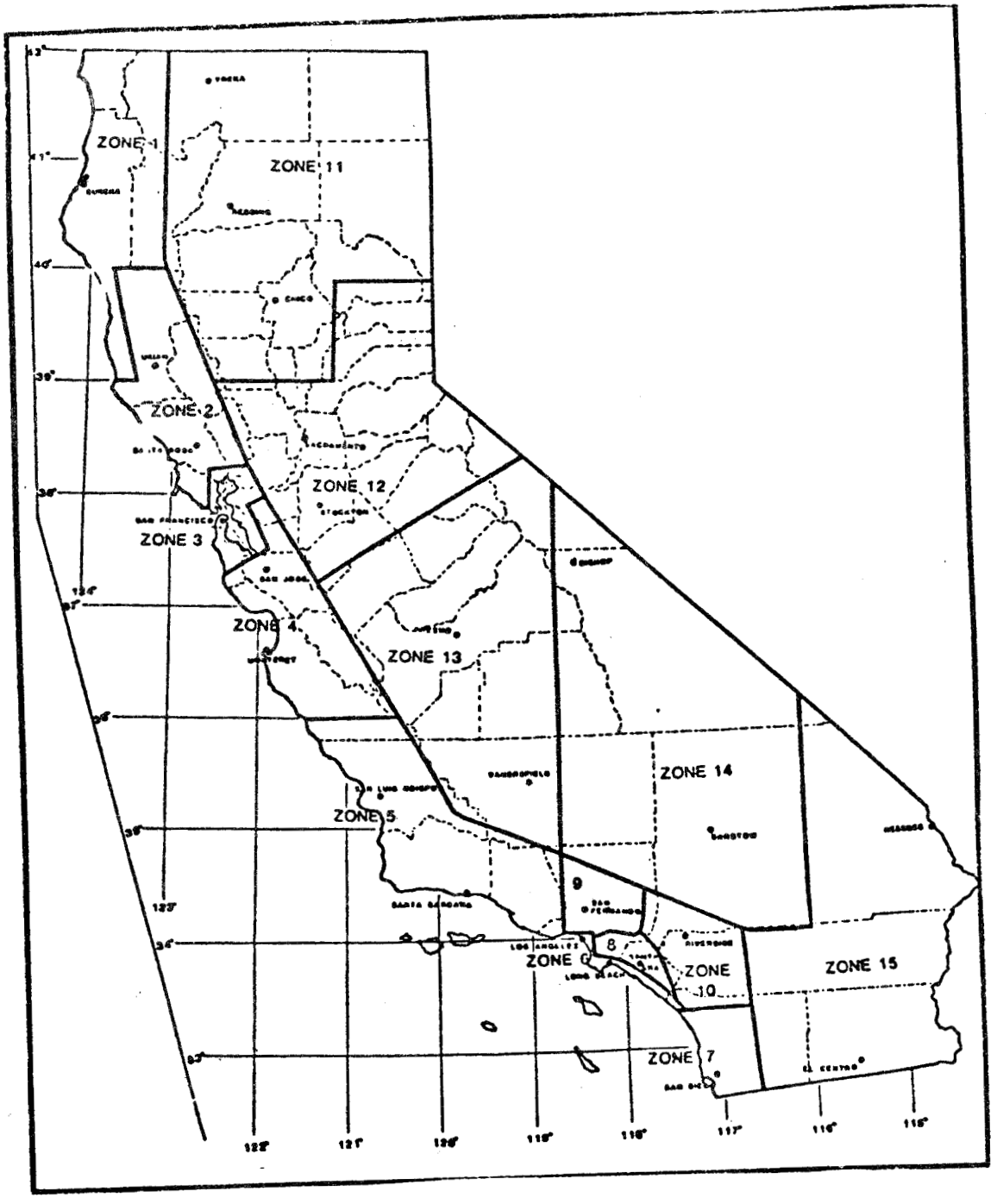


FIGURE 2-53A

CLIMATE ZONES FOR OCCUPANCIES A, B

(OTHER THAN OFFICES), E, and H

FIGURE 2-53B

MAXIMUM U_{ow} VALUES FOR WALLS, HEATING

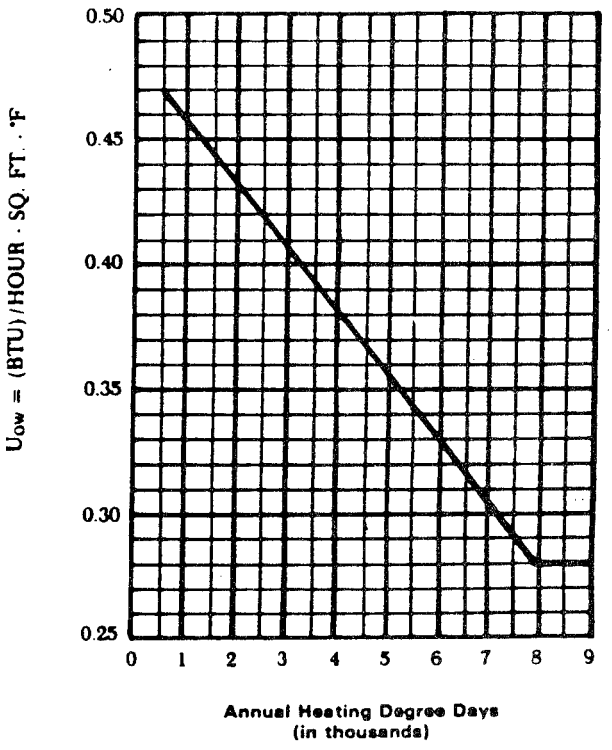
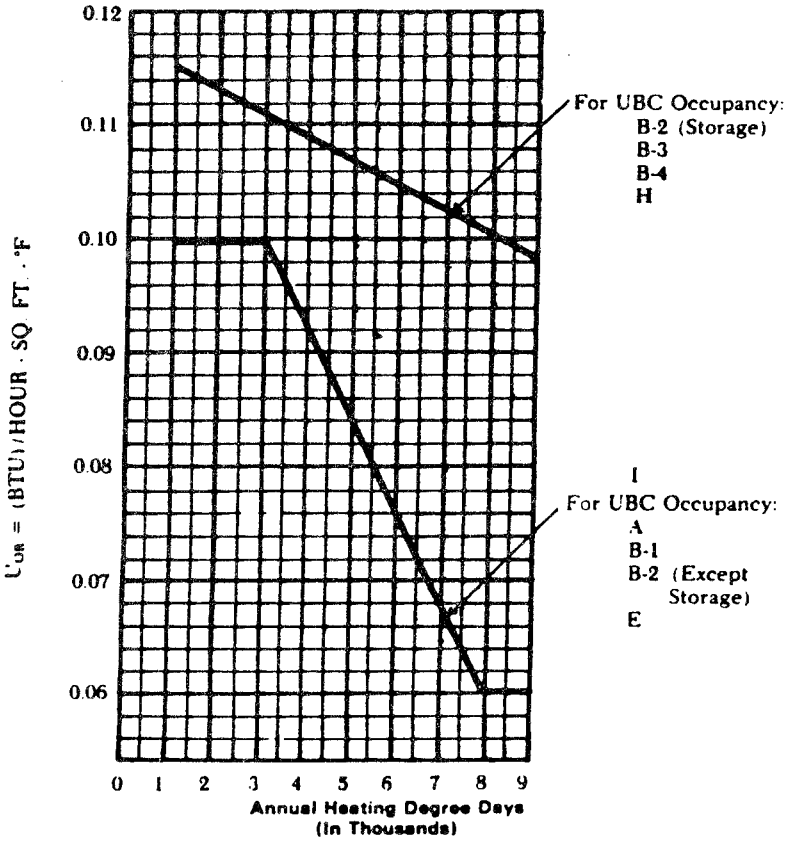


FIGURE 2-53C

MAXIMUM U_{or} VALUES FOR ROOFS AND CEILINGS, HEATING



EQUATION 2-53E

$$U_{ow} = \frac{U_{wall} A_{wall} MCF + U_{window} A_{window} + U_{door} A_{door}}{A_{ow}}$$

where U_{ow} = the average thermal transmittance of the gross wall area, Btu/(hr x ft^2 x °F)

A_{ow} = the external exposed above grade gross wall area of building that faces heated spaces, ft^2

U_{wall} = the thermal transmittance of all elements of the opaque insulated building section, Btu/(hr x ft^2 x °F)

A_{wall} = opaque wall area, ft^2

MCF = Mass Correction Factor, value given in Table 2-53M

U_{window} = the thermal transmittance of the window area, Btu/(hr x ft^2 x °F)

A_{window} = window area including sash, ft^2

U_{door} = the thermal transmittance of the door, considered as an assembly, including the frame, Btu/(hr x ft^2 x °F)

A_{door} = door area including frame, ft^2

NOTE: Where more than one type of wall, window, and/or door is used, the term or terms for the exposure shall be expanded into its subelements as

$$U_{wall} = U_{wall_1} \times A_{wall_1} \times MCF_1 + U_{wall_2} \times A_{wall_2} \times MCF_2 \times \ldots$$

TABLE 2-53M. MASS CORRECTION FACTOR VALUES

Weight of Wall Construction Feet (lb/ft^2)	MCF	NOTE: The values apply in areas with less than 3500 degree days. For areas having at least 3500 degree days MCF = 1.00.
0-25	1.00	
26-40	0.85	
41-80	0.75	
81 and above	0.65	

(b) Roof/Ceiling. The combined thermal transmittance value (U_{or}) for the gross roof area, including skylights, that enclose heated spaces shall not exceed the values shown in Figure 2-53C for degree days applicable. A roof assembly shall be considered as those components of the roof envelope through which heat flows, creating building transmission heat loss. If a ceiling is employed as an element of a plenum, the thermal performance of the assembly shall be the thermal performance of the roof portion only.

Equation 2-53F shall be used to determine acceptable combinations of roof and skylight areas and thermal properties to meet the requirements of Figure 2-53C.

1. For buildings that are heated only, skylight areas up to 5 percent of the gross ceiling or roof area are exempt from the U_{or} calculations of Equation 2-53F. The daylighting and solar heat gain from skylights that are considered in the exempt area cannot be used to increase the U-values of any portion of the building envelope.

2. When more than 5 percent of the gross roof area is in skylights, automatic light sensitive switching will be required and the skylight area in excess of 5 percent must be included in the U_{or} calculations in Equation 2-53F.

EQUATION 2-53F

$$U_{or} = \frac{U_{roof} A_{roof} + U_{skylight} A_{skylight}}{A_{or}}$$

where U_{or} = the average thermal transmittance of the gross roof/ceiling area, Btu/(hr x ft^2 x °F)

A_{or} = the external exposed gross roof/ceiling area of the building over heated spaces, ft^2

U_{roof} = the thermal transmittance of all elements of the opaque roof/ceiling area, adjusted for the effect of framing in the insulated building section, Btu/(hr x ft^2 x °F)

A_{roof} = opaque roof/ceiling area, ft^2

$U_{skylight}$ = the thermal transmittance of the skylight area, Btu/(hr x ft^2 x °F)

$A_{skylight}$ = skylight area, ft^2

NOTE: Where more than one type of roof/ceiling and/or skylight is used, the U x A term for that exposure shall be expanded into its subelements, as

$$U_{roof_1} A_{roof_1} + U_{roof_2} A_{roof_2}, \text{ etc.}$$

(c) Floors Over Unheated Spaces. For floors of heated spaces over unheated spaces or outdoors, the U-value of the floor section shall not exceed the value shown in Figure 2-53D for the degree days applicable.

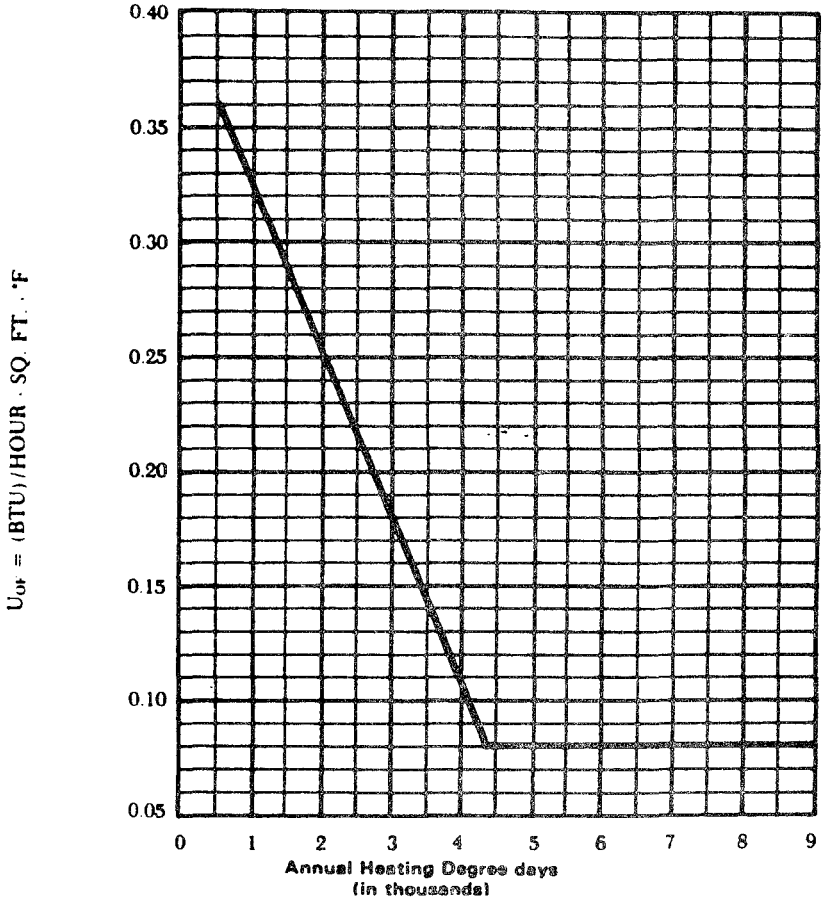


FIGURE 2-53D

MAXIMUM U_{of} VALUES FOR FLOORS OVER UNHEATED SPACES

Sec. 2-5326. Cooling Design Critera

(a) Walls. The overall thermal transfer value, Btu/(hr x ft^2), for the gross area of exterior walls consisting of opaque wall area and fenestration areas that enclose interior cooled spaces shall not exceed the values given in Figure 2-53E.

Equation 4-3 shall be used to determine the acceptable combination of opaque wall, fenestration areas, and thermal properties to meet the requirements of Figure 2-53E.

The solar factor for windows oriented within 22 1/2° of true north shall be considered to be 30 Btu/hr/ft^2 for the purpose of inclusion in Equation 2-53G.

The solar factor for windows or portions of windows which are not exposed to direct sunlight between the hours of 8:00 a.m. and 5:00 p.m. solar time on April 21 through October 21 because of orientation or fixed exterior shading devices (such as roof overhangs) shall be considered to be 30 Btu/hr/ft^2 for the purpose of inclusion in Equation 2-53G.

The solar factor for other windows or portions of windows shall be determined from Figure 2-53F for the purpose of inclusion in Equation 2-53G.

EQUATION 2-53G

$$OTTV_w = \frac{(U_w \times A_w \times TD_{eq}) + (A_f \times SF \times SC) + (U_f \times A_f \times \Delta T)}{A_{ow}}$$

$OTTV_w$ = overall thermal transfer value for walls, Btu/(hr x ft^2)

where U_w = the thermal transmittance of opaque walls, and doors, Btu/(hr x ft^2 x °F)

A_w = area of opaque wall, ft^2

U_f = the thermal transmittance of fenestration, Btu/(hr x ft^2 x°F)

A_f = area of fenestration, ft^2

TD_{eq} = equivalent temperature difference, °F from Table 2-53N

SC = shading coefficient of fenestration

ΔT = temperature difference between exterior and interior design conditions, °F

A_{ow} = total area of wall opposite cooled spaces, ft^2

SF = solar factor value given in Figure 2-53F, Btu/(hr x ft^2)

NOTE: Where more than one type of wall and/or fenestration is used, the respective term or terms shall be expanded into subelements, as

$$(U_{w_1} \times A_{w_1} \times TD_{eq_1}) + (U_{w_2} \times A_{w_2} \times TD_{eq_2}), \text{ etc.}$$

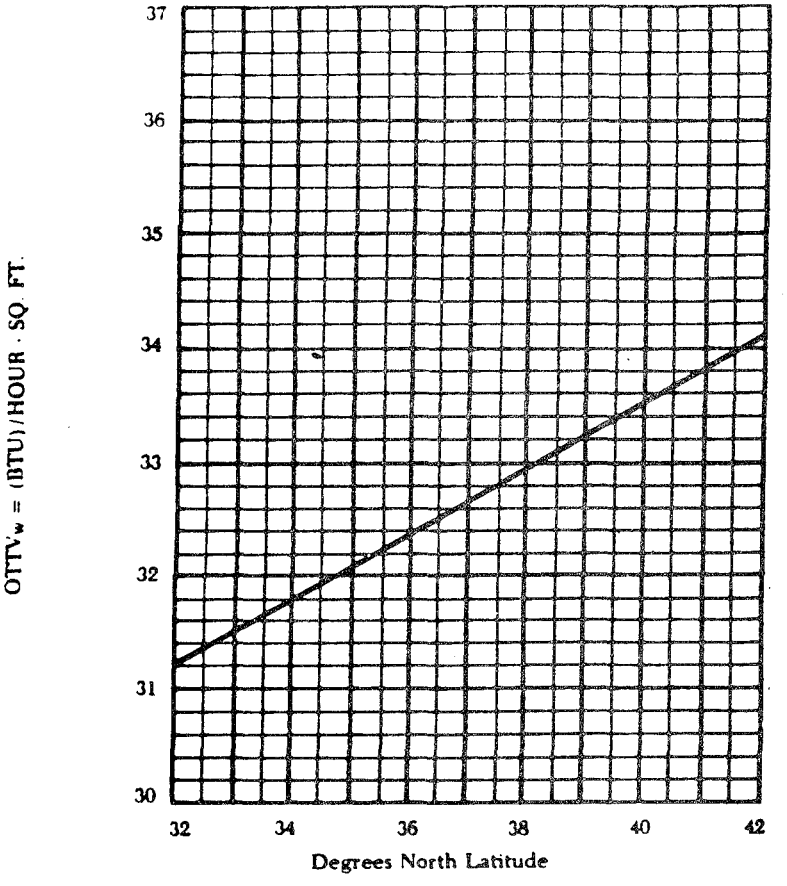


FIGURE 2-53E

OVERALL THERMAL TRANSFER VALUES FOR WALLS, COOLING

TABLE 2-53N
EQUIVALENT TEMPERATURE DIFFERENCE VALUES

Weight of Wall (lb/ft^2)	TD_{eq}
0-25	44
26-40	37
41-70	30
71 and above	23

Weight of wall construction shall be determined from Chapter 26 of the 1981 ASHRAE Handbook of Fundamentals.

(b) Roof/Ceiling. The overall thermal transfer value in $Btu/hr/ft^2$ for the gross area of the exterior roof consisting of opaque roof areas and fenestration areas that enclose interior cooled spaces shall not exceed $41 \times U_{or}$ from Figure 2-53C. Equation 2-53H shall be used to determine the acceptable combinations of opaque roof and fenestration areas.

(c) Fenestration Shading Coefficient. The shading coefficient values to be used in Equations 2-53G and 2-53H shall be obtained from Chapter 27 of the 1981 edition of the ASHRAE Handbook of Fundamentals.

EQUATION 2-53H

$$OTTV_r = \frac{(41\ U_r A_r \times A_c M_c) + 118\ SC_s A_s + \Delta T U_s A_s)}{A_{or}}$$

$OTTV_r$ = overall thermal transfer value for roofs, $Btu/(hr \times ft^2)$

where U_r = the thermal transmittance of opaque roof, $Btu/(hr \times ft^2 \times °F)$

A_r = area of opaque roof, ft^2

A_c = absorptance coefficient, from Table 2-53P

U_s = the thermal transmittance of skylight, $Btu/(hr \times ft^2 \times °F)$

A_s = area of skylight, ft^2

SC = shading coefficient of skylights

ΔT = temperature difference between exterior and interior design conditions, °F

M_c = mass coefficient, from Table 2-530

A_{or} = the external exposed gross roof/ceiling area of the building over cooled spaces, ft^2

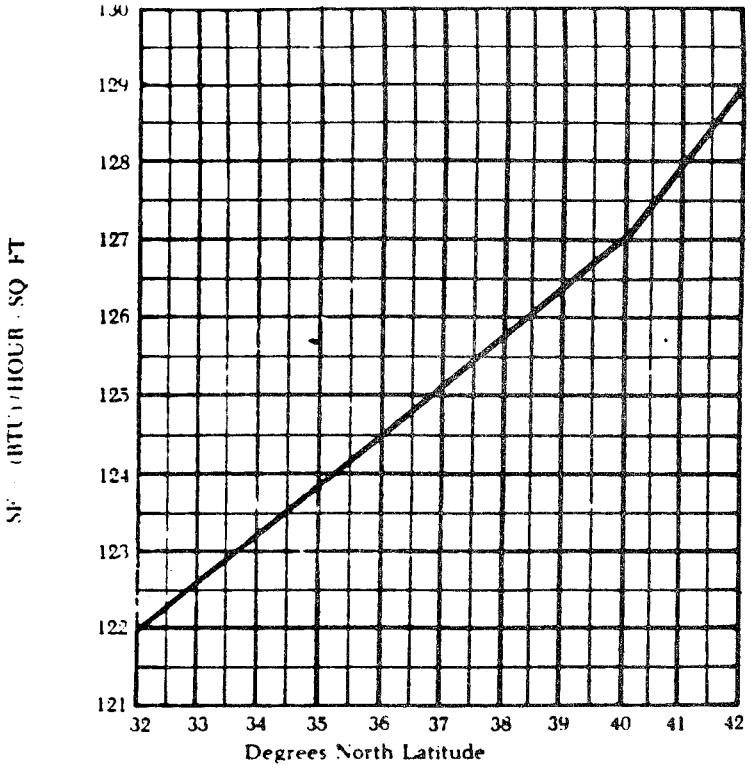


FIGURE 2-53F

SOLAR FACTOR

TABLE 2-530

MASS COEFFICIENT VALUES (M_c)

Wt, lb/ft^2	Class	M_c
0-15	Light	1.00
16-40	Medium	0.92
41 and above	Heavy	0.84

TABLE 2-53P

ABSORPTANCE COEFFICIENT VALUES (A_c)

Surface	Absorptance	A_c
Asphalt, "dark roof"	0.90	1.00
Gravel	0.70	0.79
ASHRAE "light roof"	0.45	0.52
Intense white	0.35	0.42

Sec. 2-5327. HVAC Systems

Scope. Section 2-5314 establishes HVAC system efficiency requirements for efficient utilization of energy.

Section 2-5328 establishes the method of calculating heating and cooling loads that shall be the basis for HVAC equipment selection. Section 2-5329 establishes restrictions on simultaneous heating and cooling. Section 2-5330 establishes requirements for cooling with outdoor air. Section 2-5331 establishes restrictions on the use of electric resistance heating. Section 2-5332 establishes requirements for the power consumption of fans.

Sec. 2-5328. Calculation of Heating and Cooling Loads

(a) Design Loads. Heating and cooling design loads shall be determined in accordance with one of the procedures described in Chapters 25 and 26 of the 1981 ASHRAE Handbook of Fundamentals or an equivalent computing procedure.

(b) Design Parameters. The following design parameters, in conjunction with Section 2-5303(a), shall be used for HVAC system design load determination for general comfort applications.

1. Outdoor Air. The heating and/or cooling design loads caused by the outdoor portion of the ventilation air supplied to the occupied spaces shall be based upon the air quantities tabulated in Section 6 of ASHRAE Standard 62-73. For those HVAC systems which are designed to utilize outside air for cooling, design loads shall be based upon outdoor air quantities not more than 33 percent of the tabulated recommended ventilation rates. For those HVAC systems which are designed to use a fixed minimum amount of outside air, design loads shall be based upon outdoor air quantities of not more than the tabulated minimum ventilation rates. In both instances, the quality of the air shall conform with the requirements of ASHRAE Standard 62-73, and in no case shall there be less than 5 cfm per person.

   A. If values of outdoor air, other than those indicated above, are proposed because of special occupancy or process requirements or source control of air contaminants, these outdoor air quantities shall be utilized only after local enforcement agency approval and shall be used as the basis of calculating the heating and/or cooling design loads.

   B. The use of recirculated air as set forth in ASHRAE Standard 62-73 will be acceptable when not in conflict with Sections 2-5329 through 2-5332.

2. Infiltration. When infiltration calculations employ the air change method, heating and cooling design load determinations for the entire structure shall include infiltration at the rate of no more than 0.5 air changes per hour for all buildings that are not pressurized. In pressurized buildings, the infiltration shall be offset by the outdoor air portion of the ventilation air requirements of Section 2-5328(b)3.

Sec. 2-5329. Simultaneous Heating and Cooling

Buildings shall be designed and constructed to minimize use of new energy for simultaneous heating and cooling of a zone by reheat, recooling, or concurrent operation of independent heating and cooling systems, as follows:

(a) Recovered Energy. Recovered energy including new energy expended in the recovery process (provided the amount expended is less than the amount recovered) may be used for control of temperature and humidity.

(b) Reheat Systems. HVAC systems that reheat at least 20 percent of the total air in the system shall meet the following requirements, as applicable.

   1. Systems serving multiple zones, including those employing variable air volume for temperature control, shall be provided with controls that will automatically reset the system cold air supply to the highest temperature level that will satisfy the zone requiring the most cooling. Single zone reheat systems shall be controlled so as to sequence reheat and cooling.

   2. Constant volume reheat systems which utilize new energy to simultaneously cool and heat air streams, shall only be used where a specific humidity level is required to satisfy the process needs.

Exterior and interior zones of constant volume reheat systems shall not be served by the same cooling coil if the total air quantity serving exterior spaces exceeds 20 percent of the total air quantity through the cooling coil.

(c) Dual Duct and Multizone Systems.

1. Constant volume dual duct or multizone systems which utilize new energy to simultaneously heat and cool air streams which are subsequently mixed for temperature control are prohibited for buildings larger than 20,000 square feet of conditioned space.

2. The hot deck temperatures of these systems shall be automatically reset to the lowest temperatures necessary to satisfy the zone requiring the most heating.

3. The cold deck temperature shall be automatically reset to the highest temperatures necessary to satify the zone requiring the most cooling.

4. The air leakage for dampers utilized in these systems for the mixing of heating and cooling air shall be limited to a maximum 3 percent of the total air quantity handled by the dampers when operating at the maximum system pressure to which the dampers will be subjected. Manufacturer's label or name plate shall state leakage rates.

5. The amount of outside air used with these systems may be fixed. Economizer cycles need not be used.

(d) Recooling Systems. If an HVAC system recools at least 20 percent of the total air in the system, recooling of heated air, directly or indirectly by refrigeration to control space temperature. shall be limited by automatically resetting the temperature to which the supply air is heated to the lowest temperature that will satisfy the zone requiring the most heating.

(e) Temperature Reset. For the purpose of resetting hot and cold deck temperatures or fan discharge air temperatures as required in Sections 2-5329(b) through 2-5329(d), one representative zone may be chosen to represent a maximum of 10 zones with similar heating or cooling requirements.

(f) Concurrent Operation. Concurrent operation of independent heating and cooling systems serving common spaces, and requiring the use of new energy for heating, shall be minimized by one or both of the following:

1. By providing sequential temperature control of both heating and cooling capacity in each zone.

2. By limiting the heating energy input, through automatic resetting of the heating medium temperature (or energy input rate), to only that necessary to offset heat loss due to transmission and infiltration

Sec. 2-5330. Cooling with Outdoor Air

Each cooling fan system (other than those covered under Section 2-5329(d)) capable of more than 134,000 Btu/hr total cooling or more than 5,000 cfm air volume, shall be designed with an economizer cycle to use up to 100 percent of the fan system capacity for cooling with outdoor air whenever cooling, requiring new energy, is needed and:

1. The enthalpy of outdoor air is lower than that of the indoor air, or

2. The outdoor dry bulb temperature is lower than that of the return or indoor air.

EXCEPTIONS: Cooling with outdoor air is not required under any of the following conditions.

I. The quality of the outdoor air, as defined in Table 1 of ASHRAE Standard 62-73, is so poor as to require extensive treatment of air.

II. The need for humidification or dehumidification requires the use of more energy than is conserved by outdoor air cooling.

III. The use of outdoor air cooling may affect the operation of other systems (such as return air fans or supermarket refrigeration) so as to increase the overall energy consumption of the building.

Sec. 2-5331. Electric Resistance Heating Systems

Electric resistance heating systems shall not be used for space heating unless at least one of the following conditions is met:

(a) 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.

(b) The electric resistance heating equipment is the supplementary electric resistance equipment for a heat pump system.

(c) The capacity of the electric resistance heating system is less than 10 percent of the capacity of the total heating system.

(d) A cost comparison has been performed which demonstrates that the life cycle cost of the electric resistance heating system is lower than the cost of the alternatives considered. If the building is mechanically cooled, the costs associated with cooling shall be included in the cost comparison.

1. In areas where natural gas utility service is available, the two alternatives considered shall be:

A. A system in which 100 percent of the annual heating energy is met by burning of natural gas, or oil in a boiler or furnace. The type of fuel, boiler and/or furnace to be considered is at the option of the building designer.

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

2. In areas where natural gas utility service is not available, the two alternatives considered shall be:

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

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

The method of calculating life cycle cost is defined in the Energy Conservation Design Manual.

Sec. 2-5332. Power Consumption of Fans

(a) General. Overall air capacity and air handling system components, such as ducts, filters, coils, etc., shall be selected so as to provide an average fan performance index (FPI) of less than 5.0 cfm-inches per gross square foot of the conditioned floor area of the heated or cooled space. The fan performance index shall be calculated in accordance with Equation 2-53I.

EQUATION 2-53I

$$FPI = \frac{CFM_t \times TP_t}{\text{Gross Floor Area}}$$

Where CFM_t = The total supply air quantity, cfm.
TP_t = The total pressure of the supply fan, inches of water.

(b) Process Loads. The factor CFM_t in Equation 2-53I may be adjusted in accordance with Equation 2-53J or 2-53K when systems serve process heating or cooling loads or make-up air. Where state or local jurisdictions require special air filtration to meet the requirements of Table 1 of ASHRAE Standard 62-73 or Tables I or II of ASHRAE Standard 62-1981, the pressure drop resulting from these special air filtration requirements may be subtracted from the TP_t values used above for the portion of air subject to these special requirements.

EQUATION 2-53J

$$CFM_{ta} = CFM_t - CFM_p$$

Where: CFM_{ta} = Adjusted total CFM
CFM_p = CFM required for processing heating, cooling, or make-up.

EQUATION 2-53K

$$CFM_p = CFM_t \times \frac{H_{sp}}{H_{st}}$$

Where: H_{sp} = Sensible heat of process load.

H_{st} = Total system room sensible heat, including process heat.

(c) Special Occupancies. Where the design square feet per occupant in a space is less than 50, the fan performance index may be increased as follows:

1. More than 15 square feet per person: FPI = 6.0

2. 15 square feet per person or less: FPI = 6.5

(d) Variable Air Volume Systems. The factor FPI may be modified to reflect the average power consumed by variable air volume systems in accordance with Equations 2-53L, 2-53M, 2-53N, and 2-53O.

EQUATION 2-53L

$$FPI_a = FPI_m \times C_{va}$$

Where FPI_a = Adjusted fan performance index.
FPI_m = Fan performance index at maximum flow.
C_{va} = Variable volume constant.

The value of C_{va} shall be determined as follows:

1. For systems having no static pressure control other than discharge side dampers.

EQUATION 2-53M

$$C_{va} = \frac{CFM_a}{CFM_m}$$

2. For systems having static pressure control operating vortex type inlet vanes on centrifugal fans.

EQUATION 2-53N

$$C_{va} = \frac{CFM_a}{CFM_m} \times \frac{TP_a}{TP_m}$$

3. For systems having static pressure control operating fan speed or variable pitch axial fan blades.

EQUATION 2-53O

$$C_{va} = \frac{CFM_a}{CFM_m} \times \frac{TP_a}{TP_m}$$

Where CFM_a = Average air flow, cfm.
CFM_m = Maximum air flow, cfm.
TP_a = Average system total pressure, inches of water.
TP_m = Maximum system total pressure, inches of water.

In the absence of verifying calculations, CFM_a may be assumed to be 0.85 x CFM_m.

Sec. 2-5333. Maximum Connected Lighting Load

The maximum allowable connected lighting load in watts for lighting inside the building envelope shall be determined in accordance with this Section.

(a) Calculate room cavity ratio for each area from Equation 2-53P.

EQUATION 2-53P

$$RCR = \frac{5h\ (L + W)}{LW}$$

Where RCR = room cavity ratio
L = length of room
W = width of room
h = vertical distance from the work plan to the lighting fixture.

(b) Select from Table 2-53Q, the maximum allowable value in watts per square foot, based on the applicable task or area and the applicable room cavity ratio.

If the applicable task or area in Table 2-53Q is referenced to Note 1, determine the allowable square feet per occupant of each area from Table 2-53L, calculate the number of occupants in the area by dividing the area by the allowable square feet per occupant, and calculate the watts allowed for task-oriented lighting and general area lighting as per Note 1. Total the watts of task-oriented lighting and general lighting for the area.

If Note 2 applies, calculate the additional wattage required to provide the allowable foot-candle level on the task.

(c) For entire building, total the wattages for each area to obtain maximum connected lighting load for the building. This total includes wattages required to provide the illumination levels called for by Note 2.

TABLE 2-53Q

MAXIMUM CONNECTED LIGHTING LOAD

The maximum connected lighting load (watts per square foot) for each task and/or area shall be obtained from this table. Where no listing of load is found for a task or area, the designer shall select a load based on a similar listed task, and submit information for approval on the task, the similar task, and the reasoning behind the selection.

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Aircraft manufacturing			
Stock parts			
Production	2.9	3.8	1
Inspection	(200)	(200)	2
Parts manufacturing			
Drilling, riveting, screws	2.4	3.4	1
Spray booths	2.9	3.8	1
Sheet layout and template work, shaping & smoothing of parts	2.9	3.8	1
Welding			
General illumination	2.0	2.7	
Precision manual arc welding	(1000)	(1000)	2
Subassembly			
Landing gear, fuselage, wing sections, etc.	2.9	3.8	1
Final Assembly			
Placing of motors, wing sections, landing gear, etc.	2.9	3.8	1
Inspection of assembled craft	2.9	3.8	1
Machine tool repairs	2.9	3.8	1
Aircraft hangars			
Repair service	2.9	3.8	
Armories			
Drill	1.0	1.4	
Exhibitions	1.3	2.0	
Art Galleries			
General	1.1	1.6	
On paintings	(30)	(30)	2
On statuary & other displays	(100)	(100)	2
Assembly, manufacturing			
Rough easy seeing	1.4	2.0	
Rough difficult seeing	2.1	2.7	
Medium	2.9	3.8	1
Fine	(500)	(500)	2
Extra Fine	(1000)	(1000)	2

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Auditoriums			
Assembly	0.7	1.0	
Exhibitions	1.1	1.6	
Social activities	0.3	0.4	
Automobile manufacturing			
Frame assembly	2.0	2.7	
Chassis assembly	1.4	3.4	1
Final assembly, inspection	(200)	(200)	2
Body manufacturing			
Parts	2.4	3.4	1
Assembly	2.9	3.8	1
Finishing & Inspecting	(200)	(200)	2
Bakeries			
Mixing room	2.0	2.7	
Fermentation room	1.3	2.0	
Makeup room	2.0	2.7	
Proofing room	1.3	2.0	
Oven room	1.3	2.0	
Fillings & other ingredients	2.0	2.7	
Decorating & icing			
Hand	2.9	3.8	1
Mechanical	2.0	2.7	
Scales & thermometers	2.0	2.7	
Wrapping	1.3	2.0	
Banks			
Lobby			
General	1.7	2.5	
Writing areas	3.6	4.4	1
Tellers stations	5.0	6.0	1
Posting & keypunch	5.0	6.0	1
Barber shops & beauty parlors	3.6	4.1	1
Bookbinding			
Folding, stitching, cutting, etc.	2.4	3.4	1
Embossing & Inspection	(200)	(200)	2
Breweries			
Brew house, boiling, keg washing	1.3	2.0	
Filling	2.0	2.7	
Candy making			
All except decorating, sorting	2.0	2.7	
Decorating, sorting	2.9	3.8	1
Canning & preserving			
Inspection, color grading	(200)	(200)	2
Labeling & cartoning	1.3	2.0	
All other	2.9	3.6	1

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Central station			
Chemical laboratory	2.5	3.4	1
Turbine room	1.3	2.0	
Auxiliaries, battery rooms, boiler feed, tanks, burner platforms, hydrogen & CO, manifold, greenhouse, switch gear, telephone equip, gallery & water treatment area	1.0	1.4	
All other	0.6	0.8	
Chemical works	1.3	2.0	
Churches & synagogues			
Alter, ark, rerodos	(100)	(100)	2
Choir & chancel	1.0	1.6	
Pulpit, rostrum	3.8	5.0	1
Main worship area	0.7	1.0	
Clay products & cements			
Grinding, presses, kiln	1.3	2.0	
Molding, pressing, trimming	1.3	2.0	
Enameling, rough color & glazing	2.9	3.7	1
Fine color & glazing	(300)	(300)	2
Cleaning & pressing			
Checking, sorting, cleaning	2.0	2.7	
Inspection & spotting	(500)	(500)	2
Pressing	3.2	4.0	1
Repair & alteration	(200)	(200)	2
Cloth products			
Cloth inspection	(2000)	(2000)	2
Cutting, pressing	(300)	(300)	2
Sewing	(500)	(500)	2
Clothing manufacture			
Receiving, storing, shipping, sponging, decating, winding, measuring, fitting bundling	1.3	2.0	
Pattern making, preparation of trimming, piping, canvas & shoulder pads	2.0	2.7	
Shops, piling up & marketing	2.9	3.7	1
Cutting, pressing	(300)	(300)	2
Sewing, inspection	(500)	(500)	2
Examining (perching)	(2000)	(2000)	2
Club and lounge rooms	1.0	1.6	
Coal tipples & cleaning plants			
Breaking, screening, cleaning	0.6	0.8	
Picking	(300)	(300)	2
Control & dispatch rooms			
General illumination	1.7	2.5	
Vertical boards	(50)	(50)	2

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Cotton gin industry			
Overhead equipment, bale press	1.3	2.0	
Gin stand, control console, lint cleaner	2.0	2.7	
Court rooms			
Seating area	1.0	1.6	
Court activity area	3.6	4.4	1
Dairy products			
Filing inspection, laboratory	3.1	4.1	1
Bottle sorting, gauges, scales	2.0	2.7	
All other areas	1.3	2.0	
Dance halls	0.3	0.4	
Depots, terminals, stations			
Ticket offices	4.1	4.7	1
Baggage check	1.7	2.5	
Waiting room, restrooms	1.0	1.6	
Concourse	0.5	0.75	
Electrical equipment manufacturing			
Impregnating	2.0	2.7	
Insulating, coil winding, testing	2.9	3.7	
Elevators	-	1.0	
Engraving (wax)	(200)	(200)	2
Explosives manufacturing	1.4	2.0	
Farms, dairy			
Milking operation	1.0	1.4	
Milk handling equipment			
General	1.0	1.4	
Washing area, bulk tank interior	2.9	3.6	1
Feed area	1.0	1.4	
Livestock housing area	0.4	0.6	
Flour mills			
Rolling, sifting, purifying	2.0	2.7	
Product control	2.9	3.6	1
General	1.4	2.0	
Forge shops	2.1	2.7	
Foodservice facilities			
Dining Areas			
Cashier	(50)	(50)	2
General	1.0	1.4	
Food Displays	(50)	(50)	2
Commercial kitchen	2.4	3.4	
Foundries			
Annealing, cleaning, shakeout	1.4	2.0	
Pouring, sorting	2.1	2.7	
Core making, inspection, grinding and chipping, molding	2.9	3.6	1

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Garages, auto and truck			
Service garages			
Repairs	3.4	4.4	1
Active traffic areas	1.2	1.7	
Parking garages			
Entrance	(50)	(50)	2
Traffic & parking areas	1.0	1.4	
Glass works			
Mix & furnace rooms, pressing & lehr, glassblowing machines	1.4	2.0	
Grinding, cutting, silvering	2.0	2.7	
Fine grinding, bevel, polish	2.9	3.6	1
Inspection, etching, decorating	(200)	(200)	2
Glove manufacturing			
Knitting, sorting	2.9	3.6	1
Pressing, cutting	(300)	(300)	2
Sewing, inspection	(500)	(500)	2
Hat manufacturing			
Dyeing, stiffing, braiding, etc.	2.9	3.7	1
Forming, sizing, pouncing, etc.	(200)	(200)	2
Sewing	(500)	(500)	2
Ice Making, engine & compressor room	1.0	1.4	
Inspection			
Ordinary	(50)	(50)	2
Difficult	(100)	(100)	2
Highly difficult	(200)	(200)	2
Very difficult	(500)	(500)	2
Most difficult	(1000)	(1000)	2
Iron and steel manuacturing			
Control platforms, hot top, mixer building	1.3	2.0	
Charging floor, slag pits stripping yard	1.0	1.4	
Rolling mills			
Pipe, rod, tube, wire drawing	2.0	2.7	
All other areas	1.3	2.0	
Tin plate mills	2.0	2.7	
Motor, machine room	1.3	2.0	
Inspection			
Black plate, bloom & billet chipping	2.7	4.0	1
Tin plate & other bright surfaces	(200)	(200)	2
All other areas	0.5	0.75	
Jewelry & watch manufacturing	(500)	(500)	2
Laundries			
Washing	1.3	2.0	
Flatwork ironing, listing, marking	2.0	2.7	
Machine & press finishing, sorting	2.4	3.4	1
Fine hand ironing	2.9	4.0	1

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Leather manufacturing			
Cleaning, tanning, stretching, vat	1.3	2.0	
Cutting, fleshing, stuffing	2.0	2.7	
Finishing & scarfing	2.9	4.0	1
Leather working			
Pressing, winding, glazing	(200)	(200)	2
Grading, matching, cutting scarfing, sewing	(300)	(300)	2
Libraries			
Reading areas			
Reading printed material	2.0	2.5	
Study and note taking	3.8	4.0	1
Conference areas	2.0	2.5	
Seminar room	3.8	4.0	1
Book stacks	2.0	2.5	
Book repair & binding	2.3	3.4	1
Cataloging	3.8	4.0	1
Card Files	4.1	4.7	1
Carrels	3.8	4.0	1
Circulation desk	3.8	4.0	1
Rare book rooms, archives			
Storage areas	1.0	1.6	
Reading areas	4.1	4.7	1
Map, picture & print rooms			
Storage areas	1.3	1.9	
Use areas	4.1	4.7	1
Audiovisual areas	2.3	3.4	1
Audio listening areas			
General	1.3	1.9	
Note taking	3.8	4.0	1
Record inspection	3.0	3.6	1
Locker rooms	0.9	1.3	
Machine shops			
Rough bench & machine work	2.0	2.7	
Medium bench & machine work, automatic machines, rough grinding, medium buffing & polishing	3.0	3.7	1
Fine bench and machine work, medium grinding, fine buffing & polishing	(500)	(500)	2
Extra-fine work	(1000)	(1000)	2
Materials handling			
Wrapping, packing labeling	2.3	3.2	
Picking stock, classifying	1.6	2.2	
Loading, trucking	1.2	1.7	

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Meat packing			
Slaughtering	1.6	2.2	
Cleaning, cutting, cooking, grinding, canning, packing	2.9	3.7	1
Municipal buildings--fire, police			
Police			
Identification records	5.0	6.0	1
Jail cells & interrogation rooms	1.6	2.2	
Fire hall			
Dormitory	0.9	1.3	
Recreation room, wagon room	1.3	1.9	
Offices			
Drafting rooms			
Detailed drafting, cartography	(200)	(200)	2
Rough layout drafting	5.0	6.0	1
Accounting offices			
Auditing, tabulating, bookkeeping, business machine operation	5.0	6.0	1
General offices			
Reading poor reproductions, business machine operation, computer operation	5.0	6.0	1
Reading handwriting in hard pencil or on poor paper, reading fair reproductions, active filing, mail sorting	4.0	4.7	1
Reading handwriting in ink or medium pencil on good quality paper, intermittent filing	3.6	3.8	1
Private offices--same except:			
Reading high contrast or well printed materials	1.7	2.0	
Conferring and interviewing	1.0	1.6	
Medical and Dental Offices, Clinics			
Dental suite			
General, operatory	2.7	4.0	
Recovery room	0.3	0.4	
Examination & treatment rooms			
General	2.0	3.0	
Examining table	3.6	4.8	1
Laboratories			
General	2.0	3.0	
Close work areas	4.1	4.7	1
Nurses desk	3.7	3.7	1
Therapy, physical			
General	1.3	1.9	
Lip reading	4.5	6.0	1
Therapy, occupational			
Work area, general	2.0	3.0	
Work tables, fine work	3.6	4.8	1

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Paint manufacturing			
General	1.3	2.0	
Color matching	(200)	(200)	2
Paint shops			
Dipping, spraying, firing	2.0	2.7	
Rubbing, hand painting & finishing, art, stencil, special spraying	2.0	2.7	
Fine hand painting and finishing	2.7	3.7	1
Extra-fine hand work	(300)	(300)	2
Paper box manufacturing	2.0	2.5	
Paper manufacturing			
Beaters, grinders, calendaring	1.3	2.0	
Finishing, fitting, trimming, papermaking machines	2.0	3.0	
Hand counting, wet end of paper machine	2.4	3.4	1
Paper machine reel, paper inspection, laboratories	3.1	4.1	1
Rewinder	3.8	5.0	1
Plating	1.6	2.2	
Polishing and burnishing	2.7	3.7	1
Post offices			
Lobby, on tables	1.0	1.6	
Sorting, mailing, etc.	3.1	4.1	1
Poultry industry			
Brooding, production, laying rooms	1.0	1.5	
Hatcheries			
General	1.0	1.5	
Dubbing station	3.8	5.0	1
Sexing	(1000)	(1000)	2
Egg handling	2.0	2.7	
Egg processing	2.3	3.4	
Fowl processing			
Unloading and killing	1.0	1.4	
General	2.3	3.4	
Inspection & grading station	3.1	4.1	1
Feed storage	0.6	0.8	
Charts and records, gauges	1.3	2.0	
Printing industries			
Type foundries			
Matrix making, dressing type, casting	2.9	4.1	1
Font assembly, sorting	10	17	
Printing plants			
Color inspection	(200)	(200)	2
Machine composition	3.1	4.1	1
Composing room	3.1	4.1	1
Presses	2.4	3.4	1
Proofreading	3.8	5.0	1

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Electrotyping			
Molding, routing, finishing, leveling molds, trimming	3.1	4.1	1
Blocking, tinning, electroplating, washing, backing	2.0	2.7	
Photoengraving			
Etching, staging, blocking	2.0	2.7	
Routing, finishing, proofing, tint laying, masking	2.9	3.7	1
Rubber goods, mechanical			
Stock preparation			
Plastering, milling, banbury	1.3	2.0	
Calendering	2.0	2.7	
Fabric preparation, stock cutting, hose looms, extruded & molded products, curing	2.0	2.7	
Inspection	(200)	(200)	2
Rubber tire manufacturing			
Banbury	1.3	2.0	
Tread stock			
General	2.0	2.7	
Booking and inspection, extruder, checking, weighing, width measuring	2.9	3.7	1
Calendering	2.0	2.6	
Stock cutting			
General	1.3	2.0	
Cutters & splicers	2.9	3.7	1
Bead building	2.0	2.7	
Tire building			
General	2.0	2.7	
At machines	3.2	3.9	
In-process stock	1.3	2.0	
Curing			
General	1.3	2.0	
At molds	2.4	3.4	1
Inspection			
General	2.9	3.7	1
At tires	(300)	(300)	2
Storage	1.0	1.4	
Sawmills			
Grading redwood lumber	(300)	(300)	2
Schools			
Classrooms			
Grade A	3.7	-	3
Grade B	3.2	-	3
Grade C	2.7	-	3
Grade D	2.2	-	3

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Shops	3.1	4.1	1
Service space			
Stairways, corridors	-	1.0	
Toilets, wash rooms	-	1.6	
Service Stations			
Service bays	1.3	2.0	
Sales room	2.0	2.7	
Sheet metal works			
General	2.0	2.7	
Tin plate inspection, scribing	(200)	(200)	2
Shoe manufacturing, leather			
Cutting and stitching	(300)	(300)	2
Making and finishing	(200)	(200)	2
Shoe manufacturing, rubber			
Washing, coating, mill run, compounding	1.3	2.0	
Varnishing, vulcanizing, calendering, upper and sole cutting	2.0	2.7	
Sole rolling, lining, finishing	2.9	3.7	1
Show windows--varies, see note 2	-	-	2
Soap manufacturing	1.7	2.3	
Stone crushing and screening			
Screens	1.0	1.4	
All other	0.6	0.8	
Storage battery manufacturing	2.0	2.7	
Storage rooms or warehouses			
Inactive	0.3	0.4	
Active			
Rough bulky	0.6	0.8	
Medium	1.0	1.4	
Fine	2.0	2.7	
Stores			
Circulation areas	1.0	1.6	
Merchandising areas	3.1	4.1	1
Showcases, displays, see note 2	-	-	2
Alteration room			
General	1.7	2.5	
Pressing	3.8	5.0	1
Sewing	(200)	(200)	2
Fitting room			
General	1.7	2.5	
Fitting areas	(200)	(200)	2
Structural steel fabrication	2.0	2.7	
Sugar refining			
Grading	2.0	2.7	
Color inspection	(200)	(200)	2
Testing laboratories			
General	2.0	3.0	
Meters, scales, etc.	(200)	(200)	2

TABLE 2-53Q--Continued

Task or Area	Watts per Square Foot Room Cavity Ratio 0-5	5+	Refer to Notes
Textile mills			
General	2.0	3.0	
Warping, weaving, spinning, dyeing, finishing	2.9	3.7	1
Inspection--varies, see note 2	-	-	2
Threatres and motion picture houses			
Auditorium & foyer	0.3	0.4	
Lobby	0.9	1.3	
Tobacco products			
Drying, stripping, general	1.3	2.0	
Grading & sorting	(200)	(200)	2
Toilets, wash rooms, lounges	1.0	1.6	
Upholstering	2.9	3.7	1
Welding			
General	2.0	3.0	
Precision welding	(1000)	(1000)	2
Woodworking			
Rough sawing & bench work	1.3	2.0	
Sizing, planning, rough sanding, medium machine and bench work, gluing, veneer, cooperage	2.0	3.0	
Stockrooms	1.3	2.0	
Fine bench & machine work	2.9	3.7	1

NOTES:

1. Maximum connected lighting load for these tasks shall be based on a combination of general and task-oriented lighting. Values given in Table 2-53Q are for task-oriented lighting. Maximum connected load for general lighting shall not be more than one-third of the listed level for the task, and not more than two watts per square foot unless a specific load is listed for the general area involved. In this case the general and task areas are calculated separately. Where several types of tasks in the same area require differing loads, the load for general lighting shall not be more than one-third of the area-weighted loads for the tasks. Where task-oriented lighting is used, it should be designed for maximum effectiveness for the particular task and generally confined to the task area. Task area is defined as 50 square feet in area, centered at the major task location and of any shape appropriate to the task, for all areas with an occupant rating from Table 2-53L of 50 square feet per occupant or more. For occupant ratings of less than 50 square feet per occupant, task area shall equal occupant rating.

NOTES: (Continued)

2. Numbers in parentheses are recommended illumination levels in footcandles. Lighting for these tasks shall be obtained by local or localized general lighting, and must be confined to the specific task area, which must be described. No wattage limit applies, but the wattage required must be included in the maximum connected lighting load Power allotment for general lighting in the same area shall not exceed two watts per square foot unless a specific value is given for the general area. Note that the wattage obtained under this Note is the actual required design wattage and not a power allotment.

3. Grade letters apply to Performance Grade (ESI) only. For determination of grade of visual performance to be obtained, refer to "California School Lighting Design and Evaluation," 1977 revision, California State Department of Education, Bureau of School Facilities Planning, Sacramento, CA, and Los Angeles, CA.

4. Purely decorative or ornamental lighting must comply with the wattage limitations of the particular area.

EXCEPTION: Areas where lighting is an integral part of the process such as stage lighting in theaters, lighting for plant growth, photographic lighting, and areas where control requirements dictate the use of specific systems such as those requiring incandescent dimming or frequent switching, are exempt from the watts per square foot limitation only. The maximum connected lighting load for these areas must be reported. In general, this will be light which is present for reasons other than to perform a visual task.

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SECOND GENERATION

NONRESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS

ENERGY CONSERVATION STANDARDS

FOR NEW OFFICES, RETAIL AND WHOLESALE STORES

ENERGY CONSERVATION STANDARDS FOR NEW OFFICES
RETAIL AND WHOLESALE STORES

Sec. 2-5341. Requirements

(a) Proposed new offices, retail and wholesale stores shall comply with Sections 2-5301 through 2-5304, 2-5311 through 2-5319, 2-5343, and either 2-5341(b) or 2-5342.

(b) Energy Budgets--Performance Compliance Approach.

1. Any new office, retail and wholesale store using a performance compliance approach shall be designed to use no more British thermal units (Btu) of energy per square foot of conditioned floor area per year from depletable sources than that specified in Table 2-53R, Table 2-53S, Table 2-53Sa for the applicable building type, and the applicable climate zone shown in Figure 2-53G. Any such building shall also comply with Sections 2-5301 through 2-5304, 2-5311 through 2-5319 and 2-5343. Energy required for building cooling shall be included in the energy consumption calculated for the building even if the plans and specifications do not indicate that air conditioning will be installed.

2. The budgets in Tables 2-53R, 2-53S, and 2-53Sa may be adjusted when the optional calculation for maximum connected lighting load in Section 2-5342(d)2. indicates more than the watts per square foot for the Maximum Adjusted Lighting Power Density for Alternative Component Package A. The adjusted budget may be calculated by the following formula:

$$AEB = EB + [(MCLL - MALPD \text{ watts/ft}^2) * 38.0 \text{ kBtu/watt-year}]$$

AEB = Adjusted Energy Budget.

EB = Energy Budget from Table 2-53R, Table 2-53S, or Table 2-53Sa.

MCLL = Maximum connected lighting load from § 2-5342(d)2 in watts/ft^2.

MALPD = Maximum Adjusted Lighting Power Density from Alternative Component Package A for nonresidential buildings (Tables 2-53V1 through 2-53WA16) for the appropriate occupancy and climate zone.

3. The total calculated annual energy consumption for these energy budgets need not include any energy used by equipment to transfer energy into or out of an energy storage medium designed to shift energy use away from the utilities' peak demand period. This excludable energy includes the added energy consumption due to additional pressure drops from longer pipe or duct runs or heat exchangers and the energy required to maintain the energy storage medium in the desired temperature range or the stored energy state. To exclude such energy, the building permit applicant shall demonstrate to the satisfaction of the enforcement agency that the proposed building will contain such equipment, by indicating said equipment on the plans and specifications submitted with the building permit application.

Table 2-53R. ENERGY BUDGETS FOR OFFICES OF THREE OR FEWER HABITABLE STORIES
[kBtu per square foot of conditioned floor area per year]

Climate Zone	Conditioned Cross-Sectional Area of a Story in Square Feet[1/]						
	3,750 or less	3,751 to 5,000	5,001 to 7,500	7,501 to 10,000	10,001 to 15,000	15,001 to 20,000	more than 20,000
1	181	144	127	110	101	93	89
2	212	175	156	137	127	116	111
3	162	134	120	106	100	93	90
4	167	140	126	112	105	98	95
5	171	141	126	111	104	97	93
6	204	174	157	140	130	119	114
7	157	136	125	114	108	101	98
8	173	147	134	121	114	106	103
9	184	157	142	127	119	111	107
10	206	174	157	140	130	121	115
11	246	205	183	159	147	133	126
12	230	190	169	148	137	126	120
13	227	191	172	151	140	128	122
14	252	211	189	166	153	140	133
15	279	235	211	185	171	156	147
16	228	185	162	139	127	115	108

[1/] The budgets for a multi-story building may be met on a total building basis under Section 2-5304(d)2.

Table 2-53S. ENERGY BUDGETS FOR OFFICES
OF FOUR OR MORE HABITABLE STORIES
[kBtu per square foot of conditioned floor area per year]

Climate Zone	Conditioned Cross-Sectional Area of a Story in Square Feet[1/]		
	10,000 or less	10,001 to 22,500	greater than 22,500
1	111	107	99
2	130	124	113
3	107	103	96
4	112	108	100
5	113	109	101
6	129	124	114
7	106	103	97
8	113	109	101
9	117	113	104
10	127	122	112
11	147	141	126
12	145	139	131
13	141	135	122
14	152	144	128
15	159	151	135
16	139	133	118

[1/] The budgets for a multi-story building may be met on a total building basis under Section 2-5304(d)2.

Table 2-53Sa. ENERGY BUDGETS FOR
RETAIL AND WHOLESALE STORES
[kBtu per square foot of conditioned floor area per year]

Climate Zone	Conditioned Cross-Sectional Area of a Story in Square Feet 1/							
	3,750 or less	3,751 to 5,000	5,001 to 7,500	7,501 to 10,000	10,000 to 12,500	12,501 to 15,000	15,001 to 20,000	more than 20,000
1	171	162	155	145	138	133	130	127
2	257	238	222	199	185	176	170	164
3	174	164	156	144	137	132	129	125
4	194	181	171	157	147	142	138	134
5	185	174	164	151	142	137	133	129
6	296	267	244	212	191	179	171	163
7	186	174	165	151	143	137	134	130
8	209	195	183	167	156	150	146	142
9	229	212	199	180	168	160	155	150
10	268	246	229	205	189	180	174	168
11	317	289	266	235	215	203	195	188
12	295	270	249	220	201	189	181	173
13	302	275	255	225	207	196	189	182
14	330	300	276	243	222	210	202	193
15	369	336	309	271	248	233	224	214
16	249	230	215	194	180	172	167	161

1/ The budgets for a multi-story building may be met on a total building basis under Section 2-5304(d)2.

Sec. 2-5342. Alternative Component Packages: Prescriptive Compliance Approach

Any new office, retail, or wholesale store using a prescriptive compliance approach shall have installed the measures in Alternative Component Package A, B, or C, listed in Tables 2-53V1 through 2-53V16 and 2-53W1 through 2-53W16 and described further in Sections 2-5342(a)-2-5342(e), for the applicable building type, and for the applicable climate zone in Figure 2-53G. Any such building shall also comply with Sections 2-5301 through 2-5304, 2-5311 through 2-5319, and 2-5343.

(a) Opaque Building Envelope.

1. The roof and suspended exterior floor shall have a total R-value (R_t) of at least the value shown in the Alternative Component Package. Where parts of the roof or floor have an R-value different from other parts, the total R-value shall be determined using the weighted average technique shown in Equation 2-53R.

2. The opaque wall shall have a total R-value (R_t) of at least the value shown for the areal heat capacity of the opaque wall. Where parts of the opaque wall have a heat capacity or R-value different from other parts, the total R-value shall be determined using the weighted averaging techniques shown in Equations 2-53Q and 2-53R. The wall complies if R_a is at least R_m.

A. Different Heat Capacities.

Equation 2-53Q

$$R_m = \frac{A_T}{\left(\frac{A_{HC1}}{R_{HC1}} + \frac{A_{HC2}}{R_{HC2}} + \ldots + \frac{A_{HC5}}{R_{HC5}}\right)}$$

Where

R_m = Minimum total R-value required for the opaque wall as a whole.

$A_{HC1\ (2,\ldots,5)}$ = Total area of all parts of the opaque wall with an areal heat capacity shown in the first (second,...,fifth) category in the Alternative Component Package.

$R_{HC1\ (2,\ldots,5)}$ = Minimum total R-value required in the Package for the first (second,...fifth) areal heat capacity category.

A_T = Total opaque wall area.

B. Different R-values.

Equation 2-53R

$$R_a = \frac{A_T}{\left(\frac{A_1}{R_1} + \frac{A_2}{R_2} + \ldots + \frac{A_n}{R_n}\right)}$$

Where

R_a = Weighted average total R-value of opaque wall proposed to be installed.

$A_{1(2,\ldots,n)}$ = Total area of all parts of the opaque wall with a total R-value of $R_{1(2,\ldots,n)}$

$A_T = A_1 + A_2 + \ldots + A_n$

3. If Alternative Component Package C is installed, wall insulation shall be integral with or exterior to the rest of the wall assembly.

(b) Glazing in Walls.

1. The glazing area in walls for the entire building shall be no more than the percentage of the exterior surface area of walls (excluding parapets, wing walls, and other protrusions from the exterior walls) shown in the Alternative Component Package for the specified range of shading coefficients for the glazing.

2. For office's Alternative Component Packages D, E, & F, the area of glazing on west-facing walls shall be no more than the percentage of the area of the exterior surface of the west-facing walls (excluding parapets, wing walls, and other protrusions from the exterior surfaces of walls) shown in the Alternative Component Package for the specified range of shading coefficients for the glazing.

3. In determining the maximum percentage of glazing allowed under (b)1. and (b)2., if the shading coefficients of different parts of glazing vary, the glazing percentage shall be no more than the value shown, shown, for the area-weighted average of the shading coefficients of the glazing.

4. If Alternative Component Package E is used for compliance, all glazing in walls meeting the criteria of Note 6 of Table 2-53T must be accompanied by daylighting controls for luminaires lighting surfaces in corresponding daylit spaces as required in Section 2-5342(d)1.C.

5. For the purpose of complying with Sections 2-5342(b)1. and 2-5342(d)2., vertical glazing with a shading coefficient of 1.00 to 0.72 may be treated as vertical glazing with an overall shading coefficient as shown in Table 2-53TS if:

   The vertical glazing is shaded with an opaque exterior overhang that:

   (1) runs the entire horizontal width of the vertical glazing;

   (2) is attached to the exterior wall above the glazing; and

   (3) is located so that the overhang angle, the angle between a vertical line from the bottom of the glazing, and a line from the bottom of the glazing to the outside edge of the overhang, is equal to or greater than the overhang angle shown in Table 2-53TS.

Table 2-53TS

	Overhang Angle	Equivalent Shading Coefficient
East/West Facing	30°	0.65
	45°	0.55
North/South Facing	30°	0.60
	45°	0.45

6. For climate zones 1 and 16, all glazing must be special glazing with a maximum overall U-value of 0.65 in Alternative Component Packages A, B, C, D, E, & F, except for Alternative Component Packages for High Rise Offices.

(c) Glazing in Roofs.

1. Horizontal glazing (skylights) is the light transmissive part of glazing with a plane of installation equal to or less than 60° from the horizontal.

2. Horizontal glazing is not allowed in Alternative Component Package A or C.

3. If glazing in roofs is installed in conjunction with any of the Alternative Component Packages, the area of glazing in roofs shall be equal or less than the percentage of the area of its corresponding daylit area for glazing in roofs shown in the Alternative Component Package for the range of shading coefficients of the glazing in roofs.

4. Daylit area for glazing in roofs is the area on any floor lit by said glazing and enclosed by the following boundaries:

   A. Any floor-to-ceiling interior or exterior wall or vertical partition whose area 30 inches or more above the floor has an area-averaged visible transmission of less than 40 percent;

   B. Vertical planes that are parallel to the edges of the ceiling opening of the horizontal glazing, and whose horizontal distance from the vertical line from the center of the glazing to the floor is the lesser of (1) and (2) below.

      (1) The sum of: the horizontal distance from the vertical line through the center of the glazing to the midpoint of the edge of the ceiling opening plus three quarters of the floor-to-ceiling height.

      (2) The vertical distance from the floor to the exterior plane of the roof measured along the vertical line from the center of the horizontal glazing.

5. Daylit area for horizontal glazing does not include daylit areas for vertical glazing when the lights directly above that area are controlled by daylighting controls that respond to light from the vertical glazing.

6. If an area is lit by two or more separate horizontal glazings areas, it shall be accounted for as horizontal daylit area for only one of the glazings areas.

7. Horizontal glazing with a shading coefficient of 1.00 to 0.51 shall have a visible light transmission of at least 70 percent. Horizontal glazing with a shading coefficient of 0.50 to 0.01 shall have a visible light transmission of at least 25 percent.

8. For climate zones 1 and 16, all glazing must be special glazing with a maximum overall U-value of 0.65 in Alternative Component Packages A, B, C, D, E, & F, except for Alternative Component Packages for High Rise Offices.

(d) Lighting. Lighting shall be limited to (1) the Maximum Adjusted Lighting Power Density shown in the Alternative Component Package and described in Section 2-5342(d)1; or (2) the Maximum Adjusted Connected Lighting Load described in Section 2-5342(d)2.

1. Maximum Adjusted Lighting Power Density.

A. The lighting watts per square foot of conditioned floor area, as adjusted under Section 2-5342(d)1.B., shall be equal to or less than the Maximum Adjusted Lighting Power Density shown in the Alternative Component Package.

B. For the purpose of demonstrating compliance with Section 2-5342 (d)1.A., the design lighting power density of the building may be adjusted in accordance with Equation 2-53S. Adjustments for daylighting controls shall not be allowed in Alternative Component Package B.

Equation 2-53S

$$ALPD = \frac{[W_T - (CW_1)(PSAF_1) - (CW_2)(PSAF_2) - \ldots - (CW_n)(PSAF_n)]}{CFA}$$

Where

ALPD = adjusted lighting power density

W_T = total lighting watts in building

$CW_{1,\,2,\,\ldots\,n}$ = watts of lighting in space 1, 2, ..., n with controls as specified in Table 2-53T

$PSAF_{1,\,2,\,\ldots\,n}$ = power savings adjustment factor for space 1, 2, ... , n, as specified in Table 2-53T

CFA = conditioned floor area of the building

C. If Alternative Component Package B is installed all luminaires lighting surfaces within daylit areas for glazing in roofs shall have daylighting controls meeting the criteria of Notes 4 and 5 of Table 2-53T. If Alternative Component Package E is installed, all luminaires lighting surfaces within daylit spaces shall have daylighting controls meeting the criteria of Notes 4 and 5 of Table 2-53T. A daylit area is any area that is either (1), (2), or (3) below:

(1) a daylit area for glazing in walls, as defined below:

Daylit area for glazing in walls is the smallest area on the floor within the following boundaries.

A. Any floor-to-ceiling interior or exterior wall or partition, including that of the vertical glazing;

B. A vertical plane or planes extended perpendicular to the plane of the glazing two feet horizontally distant from end points of the widest horizontal extent of the opening for the glazing in the wall;

and

C. A vertical plane parallel to the greatest horizontal width of the glazing opening in the wall, 15 feet distant from this width on the side of the glazing that is provided with comfort conditioning.

(2) a daylit area for glazing in roofs, as defined in Section 2-5342(c)4.

(3) a daylit area for both glazing in walls and glazing in roofs.

D. If Alternative Component Package D for retail and wholesale stores is installed, all luminaires in daylit spaces corresponding to daylit areas for horizontal glazing shall be controlled by daylighting controls meeting the criteria of Note 4 to Table 2-53T and the requirements of Section 2-5319 and all lights shall be controlled by a programmable timer meeting the requirements specified in Table 2-53T and its footnotes.

TABLE 2-53T. ADJUSTMENT FACTORS FOR SPECIAL LIGHTING CONTROLS[1/]

Control Type	Power Savings Adjustment Factor[2/]	Applicable Building Space(s)
Occupant-Sensing Devices[3/,5/]	0.30	Any single space up to 250 square feet and enclosed by ceiling height partitions; classrooms, conference rooms, computer rooms, storage areas, corridors, or waiting rooms
Daylighting Controls[4/,5/]		Any daylit space[6/]
Continuous Dimming	0.30	
Stepped Controls	0.20	
Programmable Timing Controls[7/]	0.15	Any space
Lumen Maintenance Controls[5/]	0.10	Any space
Daylighting Controls[4/,5/] with Occupant-Sensing Devices[3/,5/]	0.44	Any single space up to 250 square feet within daylit spaces, and enclosed by ceiling height partitions
Occupant-Sensings Devices[3/,5/] with Lumen Maintenance Controls	0.37	Any single space up to 250 square feet and enclosed by ceiling height partitions

NOTES:

1. No adjustment factor shall be allowed for controls required by an alternative component package or required under provisions of Section 2-5319. Dimming controls of incandescent lamps or luminaires shall not qualify.

2. Except as shown, only one adjustment factor may be used for each building space or luminaire, and 50% or more of the luminaire shall be within the applicable space to qualify for the power savings adjustment factor. These controls must be installed in series with the lights and in series with all manual switching devices in order to qualify for an adjustment factor.

3. To qualify for the power savings adjustment factor, occupant-sensing devices shall meet the criteria of A or B in Exception II to Section 2-5319. Separate sensors and switching must be provided for each enclosed space or area.

NOTES: For Table 2-53T (Continued)

4. Daylighting controls shall be able to reduce electric power consumption for the controlled lighting to 50 percent or less of maximum power consumption, shall control all luminaires delivering 50 percent or more of their light output to surfaces within daylit spaces, and shall not control any luminaire delivering more than 50 percent of its light output to surfaces outside daylit spaces. Daylighting control power savings adjustments are not allowed when using Alternative Component Package B for compliance.

5. Lighting controls shall meet the requirements of Section 2-5319.

6. The daylit space must be illuminated by either:

   A. Glazing in walls more than 3 feet in vertical extent with its highest edge 4 or more feet above the floor of the daylit area; or

   B. Glazing in roofs with sash, 2 square feet or more in area.

7. Programmable timing controls used for credit in conjunction with Table 2-53T must be capable of:

   A. Programming different schedules for weekdays and weekends; and

   B. Temporary override by occupants with automatic return to the original schedules. Override controls shall be readily accessible; and

   C. Providing independent control of each lighting load which is required to be separately controlled in Section 2-5319 as requiring independent control. Exception IV to Section 2-5319 does not apply and provisions of Section 2-5319(c) must be met.

2. Optional Calculation for Maximum Adjusted Connected Lighting Load.

The watts of the building's adjusted connected lighting load shall be no more than the maximum calculated as indicated below in Section 2-5342(d)2.A. This section, Section 2-5342(d)2., shall not be used in Alternative Component Package C for office buildings, and shall be used only if the plans and specifications submitted under Section 1403(a)2(A) of Title 20, California Administrative Code, show the occupancy and use in each space.

A. Calculate the maximum connected lighting load for lighting inside the building envelope as indicated below as a summation of wattage allotments determined for individual areas, rooms, and task locations in the building envelope as shown in the required plans, based on the illuminance category and the room cavity ratio (RCR) calculated as shown in Equation 2-53P.

(1) For offices the appropriate illuminance category for each area/activity shall be selected from the Office Lighting American National Standard Practice, ANSI/IES RP-1 1982.

Spaces designated for illuminance category F and higher shall be identified on the plans and specifications submitted under Section 1402(a)2(A) of Title 20, California Administrative Code, showing locations of individual tasks and equipment to provide illumination of those tasks.

The illuminance category for visual task requirements selected for each task space shall not be based upon an incidental task or combination of tasks which specify use of a given illuminance category or higher when the incidence of these tasks totals less than two hours per working day.

Selection of a higher level illuminance category to accommodate poor quality tasks shall be permitted only if task quality cannot be improved. Task quality may be improved if the equipment or procedure that produces the poor quality task is controlled by the occupant. Tasks with quality that cannot be improved are generated outside of the control of the business of the occupant working with these tasks. A "poor quality task" is a visual task that requires illuminance category "E" or greater and is due to choice of a writing or printing method that produces characters that are of smaller size or lower contrast than good quality alternatives that are regularly used in offices. Poor quality tasks include the following:

Ditto copy
Thermal copy, poor copy
Xerography, 3rd generation or greater
Thermal printer
Impact printer. 2nd carbon or later
Typed print. 2nd carbon or later
Printing-6 pt type
Handwritten carbon copies
Handwritten #4 and harder pencil

Examples of good quality alternatives which are regularly used in offices and which may be selected to replace one of the above poor quality tasks include:

Mimeograph and xerograph copy
Impact printers with good ribbon
Typed originals in 8 pt and larger type
Handwritten originals in #2 pencil or pen

(2) For retail and wholesale stores, the lighting power level for merchandising and associated service areas of stores as defined in Table 1 of the Illuminating Engineering Society Publication, "RP2" Recommended Practice for Lighting Merchandising Areas, shall be the Table 2-53U watts per square foot listed for the following illuminance categories:

Area or Task	Designate as Illuminance Category:
Gross Sales Area [1]	D/E
Valance [2]	F
Feature Displays [3]	G
Show Windows	G
All Others	See Section 2-5342(d)A(3)

NOTES:

1. Gross sales area equals the total of merchandise, display, sales transaction, fitting room and associated circulation and entry areas.

2. Valance lighting is defined, for the purpose of determining its power allotment, as a system of luminaires arranged to provide accent lighting power illumination along a wall surface. The valance lighting power allotment equals the task-oriented watts per square foot value shown for illuminance category F and RCR 0 to 3.5 multiplied by the area formed by multiplying a two foot wall surface width times the fluorescent luminaire length. This is equivalent to 10 watts per linear foot times the flourescent luminaire length.

Section 2-5342(d)2.A(2) NOTES: (Continued)

Detailed dimensioned documentation on plans must be shown when an allotment is taken for more than one tier of valance luminaires. To qualify as a separate tier, a minimum of 2 feet vertical separation between valances must exist. For valance lighting systems using non-fluorescent types of luminaires, the area used for the allotment shall be calculated as the length of accented wall times a two foot wall surface width.

3. Feature display is defined as an item or items requiring special highlighting to visually attract attention and set apart from the surrounding area. Such items in stores larger than 1,000 square foot are not a part of merchandise directly assessible to customers.

   The lighting power allotment for feature display shall be:

   a. The greater of 1000 watts or the wattage determined by multiplying the Table 2-53U watts per square foot value times 5 percent of the gross sales area; and

   b. Where lighting is provided for wall mounted feature displays, a separate additional allotment equal to the wattage determined by multiplying the Table 2-53U watts per square foot value times 10 percent of the total wall area in the gross sales area, excluding fitting rooms. When valance lighting is installed, the wall display allotment calculation shall exclude an area equal to the valance length times six feet for the first tier and times two feet for subsequent tiers of valance.

   The watts per square foot value shall be determined as a weighted average of the Table 2-53U values based upon the actual number of displays in each task area/ throw distance category.

   In areas where luminaires must be at or above 15 foot mounting heights the allotment may be increased by the following multipliers:

Required Mounting Height (Feet)	Multiplier
15	1.15
16	1.21
17	1.47
18	1.65
19	1.84
20	2.04

Allotments calculated for floor mounted displays and wall mounted displays are separate and any excess wattage above what is actually installed for one may not be added to the allotment of the other.

Areas established for determining feature display allotments need not be excluded from calculation of gross sales area allotment. Feature display allotments are in addition to the gross sales area allotment.

EXCEPTIONS:

1. If detailed documentation of actual areas with specific dimensions of all feature displays and each luminaire designated for each of these displays is provided, the feature display allotment may be used up to a maximum of 10 percent of the gross sales area.

2. If very valuable merchandise, not directly accessible to the customer, is presented as feature displays in floor mounted, counter cases that are externally lighted from above; an allotment of 20 watts per square foot times the actual area of lighted case top may be used. Detailed documentation on plans must show actual placement with specific dimensions of enclosed counter display cases and each luminaire designated to provide lighting for each case.

   NOTE: Very valuable merchandise includes: jewelry, rare coins, small art objects and similiar items where selling involves customer inspection of very fine detail from outside of a locked counter case.

Office spaces in retail buildings shall have lighting power allotments based upon provisions of Section 2-5342(d)2.A(1).

(3) For spaces in either office or retail buildings which are not covered by provisions of Section 2-5342(d)2.A(1) or (2) above, the appropriate illuminance category shall be selected from the IES Lighting Handbook, 1981 Reference Volume, Appendix A, Figure 2-2.

(4) Calculate the allotted watts for each space by multiplying the square feet of area by the watts per square foot value for the selected illuminance category from Table 2-53U. For illuminance categories A, B, C and D, the entire space is allotted the designated watts per square foot value for the category. For illuminance categories E and F, a task-oriented lighting allotment at the designated watts per square foot value for the category is allowed for 50 percent of the area and the balance of the area is allowed a general lighting allotment at one-third the designated watts per square foot value for the category. For illuminance categories G, H and I, the allotted watts per square foot value for the category shall be allowed for only the actual task area as shown on the plans. For illuminance categories A through F, if values from RCR columns "RCR 3.5 to 7" or "RCR 7+" are used, calculation of the RCR shall be made from Equation 2-53P.

(5) The total allotted watts shall be determined as the summation of allotted watts for all A, B, C, D, E and F illuminance category spaces plus either the allotted watts or actual design watts, whichever is smaller, for each G, H and I illuminance category space.

(6) Multiple allotments for the same space are allowed if two or more distinctly different lighting systems are required for multiple use of the space and are independently circuited and interlocked to permit only one system to be operated at a time.

TABLE 2-53U. WATTS PER SQUARE FOOT VALUES APPLICABLE TO OFFICES, RETAIL & WHOLESALE STORES

Illuminance Category**	Watt Per Square Foot RCR 0 to 3.5	RCR 3.5+ to 7	RCR 7+	See Note
A(3)	.2	.3	.4	-
B(7.5)	.4	.5	.8	-
C(15)	.6	.8	1.2	-
D(30)	1.2	1.5	1.8	-
D/E(30-75)	2.2	2.8	3.5	-
E(75)	2.8	3.6	4.7	1
F(150)	5.0	6.0	10.1	1
	Task Area < 2 ft^2 OR Throw Distance* > 8 Ft.		Task Area ≥ 2 ft^2	
G(300)	26		13	2
H(750)	63		33	2
I(1,500)	130		65	2

* "Throw Distance" is defined as distance, documented on plans, between luminaire and center of lighted plane on a feature display.

** Numbers in parentheses are the mid-range footcandle levels for the illuminance category.

NOTES:

1. Maximum connected lighting load for these tasks shall be based on a combination of general and task-oriented lighting. Values given in Table 2-53Q are for task-oriented lighting. Maximum connected load for general lighting shall not be more than one-third of the listed level for the task, and not more than two watts per square foot unless a specific load is listed for the general area involved. In this case the general and task areas are calculated separately.

Where several types of tasks in the same area require differing loads, the load for general lighting shall not be more than one-third of the area-weighted loads for the tasks. Where task-oriented lighting is used, it should be designed for maximum effectiveness for the particular task and generally confined to the task area. Task area is defined as 50 square feet in area, centered at the major task location and of any shape appropriate to the task, for all areas with an occupant rating from Table 2-53L of 50 square feet per occupant or more. For occupant ratings of less than 50 square feet per occupant, task area shall equal occupant rating.

2. Lighting for these tasks or retail feature displays shall be obtained by local lighting, and shall be confined to the specific task area, which shall be described. For store feature displays, in lieu of description of specific task areas, the location of each feature display and identification of its lighting equipment shall be shown on plans. Any lighting power allotment determined for these tasks, that is more than the lighting power level actually installed, shall not be applied to other task areas.

B. Lighting Controls. For the purpose of demonstrating compliance with Section 2-5342(d)2.A., the design lighting watts of the building may be adjusted for lighting controls in accordance with Equation 2-53T. Adjustments for daylighting controls shall not be allowed in Alternative Component Package B , or Alternative Component Package D for Retail and Wholesale Stores.

Equation 2-53T

$$ACLL = \frac{[W_T - (CW_1)(PSAF_1) - (CW_2)(PSAF_2) - \ldots - (CW_n)(PSAF_n)]}{CFA}$$

Where

ACLL = adjusted connected lighting load

W_T = total lighting watts in building

$CW_{1, 2, \ldots, n}$ = watts of lighting in space 1, 2, ..., n with controls as specified in Table 2-53T

$PSAF_{1, 2, \ldots, n}$ = power savings adjustment factor for space 1, 2, ..., n, as specified in Table 2-53T

CFA = conditioned floor area of the building

C. To demonstrate lighting compliance for any of the Alternative Component Packages in accordance with this subsection 2-5342(d)2 where a non-zero Lighting Control Reduction, LCR, is specified for the package, lighting controls are required. To meet the LCR requirement, a minimum wattage of lighting in the building must be controlled by the energy saving controls listed in Table 2-53T. This minimum is determined by using the controlled lighting to calculate the Actual Lighting Control Reduction, ALCR, ALCR must be at least as large as LCR to comply with the requirements. Where ALCR:

$$ALCR = \frac{[(CW_1)(PSAF_1) + (CW_2)(PSAF_2) + \ldots + (CW_n)(PSAF_n)]}{CFA}$$

Where

ALCR = Actual Lighting Control Reduction, watts per square foot, calculated for the applicant's actual building.

$CW_{1,\ 2,\ \ldots,\ n}$ = the controlled wattage of lighting in space 1, 2, ... , n with controls as specified in Table 2-53T and notes to that Table.

$PSAF_{1,\ 2,\ \ldots,\ n}$ = power savings adjustment factor for space 1, 2, ..., n, as specified in Table 2-53T

CFA = conditioned floor area of the building

Power savings adjustments or control credits used to calculate ALCR for an Alternative Component Package, may not be used for other compliance credits or adjustments. All controlled lighting need not be included in the calculation of ALCR.

(e) Space Conditioning Systems:

Space conditioning systems installed as part of Alternative Component Package A, B, or C shall meet the control and sizing requirements of Section 2-5342(e)1., and one of the alternative sets of space conditioning performance criteria of Section 2-5342(e)2.

1. Control and Sizing Requirements For Space Conditioning Systems.

A. All HVAC systems installed as part of an Alternative Component Package shall include an integrated temperature or enthalpy economizer cycle or integrated water economizer cycle; or a separate ventilation system(s) capable of supplying outdoor air for ventilation and capable of bringing in outside air under thermostatic control while locking out other mechanical heating or cooling systems. The economizer shall be capable of operating and providing partial cooling, even when additional mechanical cooling is required to meet part of the load.

EXCEPTIONS:

1. Systems of less than 3,000 CFM peak supply air volume and direct expansion cooling systems of 15 tons or less nominal cooling capacity may use a two position economizer that is not able to provide partial cooling when mechanical cooling must operate simultaneously.

2. The quality of outside air, as defined in Table I of ASHRAE Standards 62-81, is so poor as to require extensive treatment of air, and the system is 60 tons or less nominal cooling load and not water cooled.

3. The system serves only perimeter zones of which no part is located more than 15 feet from an exposed wall.

4. Systems with no mechanical cooling capability.

5. The total capacity of cooling systems without economizers serving the building is less 5 percent of the total installed cooling capacity.

B. All HVAC systems that are installed as part of an Alternative Component Package shall:

(1) provide thermostatic controls for each zone which control the supply of heating and cooling to that zone independently of other zones.

EXCEPTION: Independent perimeter systems may serve mutiple zones of the primary/interior system with the following limitations:

(a) The perimeter system shall include at least one thermostatic control zone for each major building exposure. A major building exposure is an area of the building which contains exterior walls all facing one of the cardinal orientations, north, east, south, or west (as defined in Section 2-5302) for 50 continguous feet or more. Minor exposures, those with exterior walls facing one cardinal orientation for less than 50 contiguous feet, may be served by an adjacent perimeter system control zone whose exterior wall orientation is no greater than 90 degrees from the orientation of the minor exposure.

(b) The perimeter system heating and/or cooling supply shall be controlled by thermostat(s) located within the zones(s) served by the system.

C. Systems that reheat, recool, mix warm and cold air streams, or otherwise operate heating and cooling systems serving the same zone or zones simultaneously, shall meet the requirements of (1) or (2) below:

(1) The system is a variable air volume system with the capability of reducing air volume, during periods of occupancy, to 30 percent or less of the supply air volume, or the minimum allowed to meet ventilation requirements of Section 2-5343, whichever is greater, before mixing, reheating, or recooling takes place. The system controls shall also reset supply air temperatures by the representative zone requiring the most cooling (for cooling systems) or the most heating (for heating systems). Heating supply air may be reset based on outside air temperatures rather than the zone calling for the most heating. Representative zones shall include at least two separate zones of different non-north exposures, and one interior zone.

(2) The energy used for reheating, recooling or heating warm air in mixing systems is provided entirely from nondepletable energy sources or energy recovered from lighting, heating, cooling, water heating or processes which would otherwise be wasted.

D. Variable Air Volume systems installed as part of an Alternative Component Package shall include supply fan(s) (and return fan(s), if present) that

(1) are capable of reducing the total air flow as a function of the total heating or cooling load, and

(2) have a part load performance such that the fan wattage index, when supply fans (and return fans, if present) are operating at 50 percent of volumetric flow for the design cooling load, is less than 50 percent of the fan wattage index (FWI) listed for the HVAC Power Criteria Set selected.

2. <u>HVAC Power Criteria</u>.

Any HVAC system installed as part of an Alternative Component Package shall meet one of the sets of performance criteria listed in the Alternative Component Package. There is only one set of performance criteria for Alternative Component Packages in offices of four or more stories. Please note that all site energy consumed shall be converted to source energy as per Table 2-53B

A. Source heating power index, HPI_s, shall be calculated as shown in Equation 2-53U, when all energy power inputs are converted to Btu/hr in accordance with Table 2-53B.

Equation 2-53U

$$HPI_s = \frac{(E_1+E_2+\ldots+E_n)}{CFA}$$

Where

HPI_s = Source Heating Power Index

$E_{1,2,\ldots,n}$ = Source energy inputs (in source Btu/hr) for all HVAC components used to deliver heat to the building at design conditions, including, but not limited to, those to the furnace, pumps, all fans, heat pumps, boilers, and packaged HVAC units used to deliver or distribute heat to the zones. The energy inputs shall also include return fans used to bring recirculated air back to the HVAC system. The energy inputs need not include exhaust fans or other equipment that are not part of the HVAC heating system(s).

CFA = the conditioned floor area of the building in ft^2.

B. Source cooling power index, CPI_s, shall be calculated as shown in Equation 2-53V, and adjusted where applicable by Equation 2-53W, where all energy power inputs are converted to Btu or Btu/hr in accordance with Table 2-53B.

Equation 2-53V

$$CPI_s = \frac{(E_1+E_2+\ldots+E_n)}{CFA}$$

Where

CPI_s = Source Cooling Power Index

$E_{1,2,\ldots,n}$ = Energy inputs (in source Btu/hr) for all HVAC components used to remove heat from the building zones at design conditions, including, but not limited to, those to cooling towers, chillers, condensers, fans, pumps, heat pumps, packaged HVAC units, and supply and return fans, and duct systems. It need not include exhaust fans or other equipment that are not part of the HVAC cooling system(s).

CFA = the conditioned floor area of the building in ft^2.

The CPI_s may be adjusted as shown in Equation 2-53W for process loads as defined in Section 2-5304(d)4.C.(3).

Equation 2-53W

$$CPI_{as} = CPI_s \times \left[1 - \frac{H_p}{H_t} \right]$$

Where

CPI_{as} = Adjusted source cooling power index

CPI_s = Source cooling power index

H_p = Sensible and latent heat of process loads

H_t = Total sensible and latent heat (including process heat) cooled by the system

C. The fan wattage index, FWI, for the fans that deliver ventilation air to the zones or return said air to the supply fans shall be calculated as shown in Equation 2-53X.

Equation 2-53X

$$FWI = \frac{(FW_1 + FW_2 + \ldots + FW_n)}{CFA}$$

Where

FWI = fan wattage index

$FW_{1,2,\ldots,n}$ = the power requirement for each fan at design cooling conditions, in watts

CFA = the conditioned floor area of the building in ft^2.

The FWI may be adjusted for process loads and for added pressure drop due to specially required in treatment (purification) of outside or recirculated air as shown in Equations 2-53Y and 2-53Z below.

Equation 2-53Y

$$FWI_{apc} = FWI \times \left[1 - \frac{H_p}{H_t} \right]$$

Where

FWI = Fan Wattage Index before adjustment for process loads

FWI_{apc} = Fan Wattage Index adjusted for process loads

H_p = Sensible heat of process loads

H_t = Total sensible heat cooled by the system

Equation 2-53Z

$$FWI_{apd} = FWI \times \left[1 - \frac{P_{at}}{P_o} \right]$$

Where

P_{at} = Additional pressure drop of equipment (filters, adsorption media treatment, or electrostatic precipitation) required for purification of recirculated or outdoor air.

P_o = Total system pressure drop including special filters, equipment or devices and ordinary filters.

D. If set I of the HVAC system power criteria is used in an office of three or fewer stories, it is required to have a gas-fired furnace for heating, or no heating capability.

E. For low rise buildings, HVAC alternative set IV is limited to central, builtup HVAC systems that can vary the amount of air to each zone separately.

TABLE 2-53V1. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #01 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.40	12.40	15.00
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	5.15	11.00	11.00	11.00
4.0-9.99	7.38	7.38	3.46	10.20	10.20	4.50
10.0-14.99	6.63	6.63	2.96	8.60	8.60	3.60
15.0-19.99	5.97	5.97	2.77	7.70	7.70	3.20
20.0 or more	5.51	5.51	2.49	7.20	7.20	3.10
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING (Special Glazing is required for Climate Zone 01)						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	25%	25%	25%	26%	37%	26%
0.71-0.66	27%	27%	27%	30%	42%	30%
0.65-0.56	29%	29%	29%	34%	48%	34%
0.55-0.36	32%	32%	32%	37%	47%	37%
0.35-0.01	41%	41%	41%	47%	56%	47%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	7%	None	None	7%	None
0.50-0.01	None	11%	None	None	11%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.43	0.45	1.00	1.30
Source Heating Power Index	88.60	91.60	33.00	37.40
Source Cooling Power Index	36.70	31.00	32.50	36.90

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V2. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #02 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	2.90
4.0-9.99	7.57	7.57	3.00	9.90	9.90	2.50
10.0-14.99	6.35	6.35	2.30	7.00	7.00	1.90
15.0-19.99	5.97	5.97	1.55	4.90	4.90	1.60
20.0 or more	3.56	3.56	1.40	3.20	3.20	1.50
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	22%	22%	22%	24%	42%	24%
0.71-0.66	25%	25%	25%	30%	52%	30%
0.65-0.56	26%	26%	26%	31%	57%	31%
0.55-0.36	32%	32%	32%	33%	60%	33%
0.35-0.01	42%	42%	42%	42%	62%	42%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	9%	None	None	9%	None
0.50-0.01	None	16%	None	None	16%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.55	0.52	1.25	1.69
Source Heating Power Index	116.60	104.90	40.00	47.40
Source Cooling Power Index	51.20	46.10	51.50	62.70

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #03 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	2.90
4.0-9.99	7.57	7.57	3.00	9.90	9.90	2.50
10.0-14.99	6.35	6.35	2.30	7.00	7.00	1.90
15.0-19.99	5.97	5.97	1.55	4.90	4.90	1.60
20.0 or more	3.56	3.56	1.40	3.20	3.20	1.50
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	22%	22%	22%	24%	42%	24%
0.71-0.66	25%	25%	25%	30%	52%	30%
0.65-0.56	26%	26%	26%	31%	57%	31%
0.55-0.36	32%	32%	32%	33%	60%	33%
0.35-0.01	42%	42%	42%	42%	62%	42%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	9%	None	None	9%	None
0.50-0.01	None	16%	None	None	16%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.43	0.42	0.83	1.44
Source Heating Power Index	90.70	84.60	30.50	42.00
Source Cooling Power Index	33.10	31.10	28.80	51.70

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V4. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #04 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.70	11.00	11.00	3.20
4.0-9.99	7.98	7.98	3.00	10.30	10.30	2.80
10.0-14.99	6.96	6.96	2.30	7.20	7.20	2.00
15.0-19.99	4.97	4.97	1.55	4.40	4.40	1.70
20.0 or more	2.54	2.54	1.40	2.30	2.30	1.50
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	24%	24%	24%	24%	40%	24%
0.71-0.66	25%	25%	25%	30%	48%	30%
0.65-0.56	27%	27%	27%	31%	50%	31%
0.55-0.36	31%	31%	31%	34%	54%	34%
0.35-0.01	42%	42%	42%	41%	58%	41%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	8%	None	None	8%	None
0.50-0.01	None	13%	None	None	13%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.53	0.47	.88	1.44
Source Heating Power Index	110.10	95.20	33.00	42.10
Source Cooling Power Index	56.10	39.10	34.90	51.70

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V5. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #05 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.70	11.00	11.00	3.20
4.0-9.99	7.98	7.98	3.00	10.30	10.30	2.80
10.0-14.99	6.96	6.96	2.30	7.20	7.20	2.00
15.0-19.99	4.97	4.97	1.55	4.40	4.40	1.70
20.0 or more	2.54	2.54	1.40	2.30	2.30	1.50
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	24%	24%	24%	24%	40%	24%
0.71-0.66	25%	25%	25%	30%	48%	30%
0.65-0.56	27%	27%	27%	31%	50%	31%
0.55-0.36	31%	31%	31%	34%	54%	34%
0.35-0.01	42%	42%	42%	41%	58%	41%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	8%	None	None	8%	None
0.50-0.01	None	13%	None	None	13%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.51	0.50	0.93	.49
Source Heating Power Index	108.2	101.0	34.20	43.30
Source Cooling Power Index	43.4	40.60	35.80	54.00

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V6. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #06 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	8.50
4.0-9.99	7.50	7.50	3.00	8.70	8.70	5.30
10.0-14.99	4.62	4.62	2.30	4.60	4.60	2.10
15.0-19.99	2.30	2.30	1.45	2.60	2.60	1.40
20.0 or more	1.69	1.69	1.20	1.40	1.40	1.40
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	22%	22%	22%	22%	41%	22%
0.71-0.66	25%	25%	25%	30%	50%	30%
0.65-0.56	26%	26%	26%	31%	52%	31%
0.55-0.36	32%	32%	32%	34%	54%	34%
0.35-0.01	42%	42%	42%	52%	65%	52%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	6%	None	None	6%	None
0.50-0.01	None	12%	None	None	12%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.50
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.99	0.78	1.43	2.00
Source Heating Power Index	198.00	150.60	47.60	51.90
Source Cooling Power Index	78.70	52.60	52.60	65.10

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V7. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #07 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	8.50
4.0-9.99	7.50	7.50	3.00	8.70	8.70	5.30
10.0-14.99	4.62	4.62	2.30	4.60	4.60	2.10
15.0-19.99	2.30	2.30	1.45	2.60	2.60	1.40
20.0 or more	1.69	1.69	1.20	1.40	1.40	1.40
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	22%	41%	22%
0.71-0.66	25%	25%	25%	30%	50%	30%
0.65-0.56	28%	28%	28%	31%	52%	31%
0.55-0.36	36%	36%	36%	34%	54%	34%
0.35-0.01	63%	63%	63%	52%	65%	52%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	6%	None	None	6%	None
0.50-0.01	None	12%	None	None	12%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.50
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.49	0.48	0.89	1.46
Source Heating Power Index	100.60	90.30	27.10	35.40
Source Cooling Power Index	49.20	46.00	41.80	55.90

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V8. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #08 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	8.50
4.0-9.99	7.50	7.50	3.00	8.70	8.70	5.30
10.0-14.99	4.62	4.62	2.30	4.60	4.60	2.10
15.0-19.99	2.30	2.30	1.45	2.60	2.60	1.40
20.0 or more	1.69	1.69	1.20	1.40	1.40	1.40
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	22%	41%	22%
0.71-0.66	25%	25%	25%	30%	50%	30%
0.65-0.56	28%	28%	28%	31%	52%	31%
0.55-0.36	36%	36%	36%	34%	54%	34%
0.35-0.01	63%	63%	63%	52%	65%	52%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	6%	None	None	6%	None
0.50-0.01	None	12%	None	None	12%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.50
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.50	0.49	95.80	1.53
Source Heating Power Index	101.30	96.00	32.50	37.90
Source Cooling Power Index	51.80	0.49	42.90	56.70

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V9. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #09 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	8.50
4.0-9.99	7.50	7.50	3.00	8.70	8.70	5.30
10.0-14.99	4.62	4.62	2.30	4.60	4.60	2.10
15.0-19.99	2.30	2.30	1.45	2.60	2.60	1.40
20.0 or more	1.69	1.69	1.20	1.40	1.40	1.40
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	22%	41%	22%
0.71-0.66	25%	25%	25%	30%	50%	30%
0.65-0.56	28%	28%	28%	31%	52%	31%
0.55-0.36	36%	36%	36%	34%	54%	34%
0.35-0.01	63%	63%	63%	52%	65%	52%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	6%	None	None	6%	None
0.50-0.01	None	12%	None	None	12%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.50
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.53	0.50	1.14	1.87
Source Heating Power Index	108.30	90.50	33.00	43.20
Source Cooling Power Index	54.30	49.10	44.70	59.40

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V10. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #10 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.00	11.00	11.00	8.50
4.0-9.99	7.50	7.50	3.00	8.70	8.70	5.30
10.0-14.99	4.62	4.62	2.30	4.60	4.60	2.10
15.0-19.99	2.30	2.30	1.45	2.60	2.60	1.40
20.0 or more	1.69	1.69	1.20	1.40	1.40	1.40
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	22%	41%	22%
0.71-0.66	25%	25%	25%	30%	50%	30%
0.65-0.56	28%	28%	28%	31%	52%	31%
0.55-0.36	36%	36%	36%	34%	54%	34%
0.35-0.01	63%	63%	63%	52%	65%	52%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	6%	None	None	6%	None
0.50-0.01	None	12%	None	None	12%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.50
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.58	0.52	1.31	2.15
Source Heating Power Index	120.20	100.90	45.70	59.60
Source Cooling Power Index	69.30	60.30	46.80	62.20

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V11. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #11 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft²]						
0.0-3.99	7.52	7.52	4.90	11.00	11.00	4.20
4.0-9.99	7.00	7.00	3.00	9.80	9.80	3.50
10.0-14.99	5.37	5.37	2.30	7.30	7.30	2.40
15.0-19.99	4.15	4.15	1.55	5.80	5.80	2.00
20.0 or more	3.09	3.09	1.40	4.60	4.60	1.80
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	24%	33%	24%
0.71-0.66	25%	25%	25%	30%	41%	30%
0.65-0.56	27%	27%	27%	31%	47%	31%
0.55-0.36	33%	33%	33%	33%	51%	33%
0.35-0.01	50%	50%	50%	46%	56%	46%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	5%	None	None	5%	None
0.50-0.01	None	8%	None	None	8%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.62	0.54	1.32	1.79
Source Heating Power Index	131.30	108.70	52.40	54.90
Source Cooling Power Index	70.00	60.90	61.90	72.50

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V12. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #12 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	4.90	11.00	11.00	4.20
4.0-9.99	7.00	7.00	3.00	9.80	9.80	3.50
10.0-14.99	5.37	5.37	2.30	7.30	7.30	2.40
15.0-19.99	4.15	4.15	1.55	5.80	5.80	2.00
20.0 or more	3.09	3.09	1.40	4.60	4.60	1.80
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	24%	33%	24%
0.71-0.66	25%	25%	25%	30%	41%	30%
0.65-0.56	27%	27%	27%	31%	47%	31%
0.55-0.36	33%	33%	33%	33%	51%	33%
0.35-0.01	50%	50%	50%	46%	56%	46%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	5%	None	None	5%	None
0.50-0.01	None	8%	None	None	8%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.74	0.71	1.38	1.98
Source Heating Power Index	124.40	107.90	48.70	51.50
Source Cooling Power Index	47.90	43.80	58.80	69.90

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V13. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #13 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.50	9.50	12.40
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	4.90	11.00	11.00	4.20
4.0-9.99	7.00	7.00	3.00	9.80	9.80	3.50
10.0-14.99	5.37	5.37	2.30	7.30	7.30	2.40
15.0-19.99	4.15	4.15	1.55	5.80	5.80	2.00
20.0 or more	3.09	3.09	1.40	4.60	4.60	1.80
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	21%	21%	21%	24%	33%	24%
0.71-0.66	25%	25%	25%	30%	41%	30%
0.65-0.56	27%	27%	27%	31%	47%	31%
0.55-0.36	33%	33%	33%	33%	51%	33%
0.35-0.01	50%	50%	50%	46%	56%	46%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	5%	None	None	5%	None
0.50-0.01	None	8%	None	None	8%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.58	0.55	1.31	1.80
Source Heating Power Index	121.20	109.10	46.80	49.50
Source Cooling Power Index	57.89	52.20	58.20	68.10

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V14. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #14 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.40	12.40	15.00
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft²]						
0.0-3.99	7.52	7.52	3.10	11.00	11.00	4.70
4.0-9.99	7.23	7.23	3.00	9.90	9.90	3.90
10.0-14.99	6.30	6.30	2.30	7.70	7.70	2.60
15.0-19.99	5.34	5.34	2.47	6.20	6.20	2.10
20.0 or more	4.62	4.62	2.07	5.10	5.10	1.90
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	20%	20%	20%	23%	32%	23%
0.71-0.66	23%	23%	23%	30%	40%	30%
0.65-0.56	25%	25%	25%	30%	42%	30%
0.55-0.36	30%	30%	30%	31%	46%	31%
0.35-0.01	46%	46%	46%	41%	56%	41%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	4%	None	None	4%	None
0.50-0.01	None	7%	None	None	7%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.59	0.55	1.33	1.81
Source Heating Power Index	128.30	111.10	42.10	48.10
Source Cooling Power Index	62.30	56.40	62.50	70.90

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V15. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #15 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.40	12.40	15.00
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	3.10	11.00	11.00	4.70
4.0-9.99	7.23	7.23	3.00	9.90	9.90	3.90
10.0-14.99	6.30	6.30	2.30	7.70	7.70	2.60
15.0-19.99	5.34	5.34	2.47	6.20	6.20	2.10
20.0 or more	4.62	4.62	2.07	5.10	5.10	1.90
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	20%	20%	20%	23%	32%	23%
0.71-0.66	23%	23%	23%	30%	40%	30%
0.65-0.56	25%	25%	25%	30%	42%	30%
0.55-0.36	30%	30%	30%	31%	46%	31%
0.35-0.01	46%	46%	46%	41%	56%	41%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	4%	None	None	4%	None
0.50-0.01	None	7%	None	None	7%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.59	0.55	1.36	1.93
Source Heating Power Index	128.30	111.10	37.70	36.50
Source Cooling Power Index	62.30	56.40	66.40	79.10

* See Section 2-5342(d)2.

** See Section 2-5342(e)1.

TABLE 2-53V16. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #16 FOR LOWRISE OFFICES

Component	PACKAGE A	B	C	D	E	F
OPAQUE ENVELOPE						
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.40	12.40	15.00
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]						
0.0-3.99	7.52	7.52	5.15	11.00	11.00	11.00
4.0-9.99	7.38	7.38	3.46	10.20	10.20	4.50
10.0-14.99	6.63	6.63	2.96	8.60	8.60	3.60
15.0-19.99	5.97	5.97	2.77	7.70	7.70	3.20
20.0 or more	5.51	5.51	2.49	7.20	7.20	3.10
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50	9.50	9.50
GLAZING (Special Glazing is required for Climate Zone 16)						
Maximum Allowed Total Vertical Glazing (one of the following):						
Shading Coefficient						
1.00-0.72	25%	25%	25%	26%	37%	26%
0.71-0.66	27%	27%	27%	30%	42%	30%
0.65-0.56	29%	29%	29%	34%	44%	34%
0.55-0.36	32%	32%	32%	37%	47%	37%
0.35-0.01	41%	41%	41%	47%	55%	47%
See Section 2-5342(b)5. for overhang equivalents.						
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):						
Shading Coefficient						
1.00-0.51	None	7%	None	None	7%	None
0.50-0.01	None	11%	None	None	11%	None
LIGHTING (Either:)						
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50	1.40	1.50	1.50	1.40
Daylighting Controls Required	No	Yes	No	No	Yes	No
Programmable Timing Controls Required	No	No	No	No	No	No
(or:)						
Maximum Adjusted Connected Lighting Load, watts	*	*	*	*	*	*
Lighting Control Reduction Required (W/SF)	None	None	0.10	None	None	0.10
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)						
General Requirements	**	**	**	**	**	**

HVAC Power Criteria (select one of columns I, II, III or IV; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III	IV
Fan Wattage Index	0.56	0.45	1.23	1.68
Source Heating Power Index	129.80	94.20	49.90	48.00
Source Cooling Power Index	54.30	41.90	52.70	64.60

* See Section 2-5342(d)2.
** See Section 2-5342(e)1.

TABLE 2-53W1. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #01 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.9
4.0-9.99	6.5	6.5	3.3
10.0-14.99	4.7	4.7	2.4
15.0-19.99	3.9	3.9	2.1
20.0 or more	3.5	3.5	2.0
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	29%	37%	29%
0.71-0.61	35%	45%	35%
0.60-0.46	38%	50%	38%
0.45-0.01	43%	56%	43%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	7%	Not Allowed
0.50-0.01	Not Allowed	11%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.02		
Source Heating Power Index	32.80		
Source Cooling Power Index	19.50		

TABLE 2-53W2. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #02 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.1
4.0-9.99	6.5	6.5	2.6
10.0-14.99	4.4	4.4	1.7
15.0-19.99	3.0	3.0	1.4
20.0 or more	2.0	2.0	1.3
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	29%	42%	29%
0.71-0.61	35%	49%	35%
0.60-0.46	38%	56%	38%
0.45-0.01	45%	61%	43%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	9%	Not Allowed
0.50-0.01	Not Allowed	16%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1

Performance Criteria (applicable to any Alternative Component Package)

Fan Wattage Index	1.34
Source Heating Power Index	39.00
Source Cooling Power Index	33.60

TABLE 2-53W3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #03 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.1
4.0-9.99	6.5	6.5	2.6
10.0-14.99	4.4	4.4	1.7
15.0-19.99	3.0	3.0	1.4
20.0 or more	2.0	2.0	1.3
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	29%	42%	29%
0.71-0.61	35%	49%	35%
0.60-0.46	38%	56%	38%
0.45-0.01	45%	61%	45%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	9%	Not Allowed
0.50-0.01	Not Allowed	16%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.10		
Source Heating Power Index	34.90		
Source Cooling Power Index	24.00		

TABLE 2-53W4. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #04 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.5
4.0-9.99	6.6	6.6	3.0
10.0-14.99	4.6	4.6	2.1
15.0-19.99	3.2	3.2	1.7
20.0 or more	2.2	2.2	1.5
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	31%	41%	31%
0.71-0.61	35%	45%	35%
0.60-0.46	38%	48%	38%
0.45-0.01	43%	50%	43%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	8%	Not Allowed
0.50-0.01	Not Allowed	13%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.20		
Source Heating Power Index	35.70		
Source Cooling Power Index	29.80		

TABLE 2-53W5. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #05 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.5
4.0-9.99	6.6	6.6	3.0
10.0-14.99	4.6	4.6	2.1
15.0-19.99	3.2	3.2	1.7
20.0 or more	2.2	2.2	1.5
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	31%	41%	31%
0.71-0.61	35%	45%	35%
0.60-0.46	38%	48%	38%
0.45-0.01	43%	50%	43%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	8%	Not Allowed
0.50-0.01	Not Allowed	13%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.27		
Source Heating Power Index	38.80		
Source Cooling Power Index	30.60		

TABLE 2-53W6. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #06 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	2.5
4.0-9.99	6.3	6.3	2.2
10.0-14.99	3.9	3.9	1.5
15.0-19.99	2.6	2.6	1.2
20.0 or more	1.7	1.7	1.1
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	42%	27%
0.71-0.61	35%	53%	35%
0.60-0.46	41%	61%	41%
0.45-0.01	52%	65%	52%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	6%	Not Allowed
0.50-0.01	Not Allowed	12%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.42		
Source Heating Power Index	43.90		
Source Cooling Power Index	33.20		

TABLE 2-53W7. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #07 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	2.5
4.0-9.99	6.3	6.3	2.2
10.0-14.99	3.9	3.9	1.5
15.0-19.99	2.6	2.6	1.2
20.0 or more	1.7	1.7	1.1
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	42%	27%
0.71-0.61	35%	53%	35%
0.60-0.46	41%	61%	41%
0.45-0.01	52%	65%	52%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	6%	Not Allowed
0.50-0.01	Not Allowed	12%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.23		
Source Heating Power Index	31.70		
Source Cooling Power Index	30.70		

TABLE 2-53W8. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #08 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	2.5
4.0-9.99	6.3	6.3	2.2
10.0-14.99	3.9	3.9	1.5
15.0-19.99	2.6	2.6	1.2
20.0 or more	1.7	1.7	1.1
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	42%	27%
0.71-0.61	35%	53%	35%
0.60-0.46	41%	61%	41%
0.45-0.01	52%	65%	52%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	6%	Not Allowed
0.50-0.01	Not Allowed	12%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.26		
Source Heating Power Index	33.70		
Source Cooling Power Index	30.50		

TABLE 2-53W9. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #09 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	2.5
4.0-9.99	6.3	6.3	2.2
10.0-14.99	3.9	3.9	1.5
15.0-19.99	2.6	2.6	1.2
20.0 or more	1.7	1.7	1.1
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	42%	27%
0.71-0.61	35%	53%	35%
0.60-0.46	41%	61%	41%
0.45-0.01	52%	65%	52%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	6%	Not Allowed
0.50-0.01	Not Allowed	12%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.30		
Source Heating Power Index	30.30		
Source Cooling Power Index	33.50		

TABLE 2-53W10. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #10 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	2.5
4.0-9.99	6.3	6.3	2.2
10.0-14.99	3.9	3.9	1.5
15.0-19.99	2.6	2.6	1.2
20.0 or more	1.7	1.7	1.1
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	42%	27%
0.71-0.61	35%	53%	35%
0.60-0.46	41%	61%	41%
0.45-0.01	52%	65%	52%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	6%	Not Allowed
0.50-0.01	Not Allowed	12%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.39		
Source Heating Power Index	40.40		
Source Cooling Power Index	34.40		

TABLE 2-53W11. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #11 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.5
4.0-9.99	6.4	6.4	2.9
10.0-14.99	4.2	4.2	2.0
15.0-19.99	3.0	3.0	1.6
20.0 or more	2.1	2.1	1.4
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	28%	34%	28%
0.71-0.61	35%	45%	35%
0.60-0.46	40%	53%	40%
0.45-0.01	49%	62%	49%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	5%	Not Allowed
0.50-0.01	Not Allowed	8%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.61		
Source Heating Power Index	47.60		
Source Cooling Power Index	41.70		

TABLE 2-53W12. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #12 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.5
4.0-9.99	6.4	6.4	2.9
10.0-14.99	4.2	4.2	2.0
15.0-19.99	3.0	3.0	1.6
20.0 or more	2.1	2.1	1.4
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	28%	34%	28%
0.71-0.61	35%	45%	35%
0.60-0.46	40%	53%	40%
0.45-0.01	49%	62%	49%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	5%	Not Allowed
0.50-0.01	Not Allowed	8%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.79		
Source Heating Power Index	55.20		
Source Cooling Power Index	40.60		

TABLE 2-53W13. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #13 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.5
4.0-9.99	6.4	6.4	2.9
10.0-14.99	4.2	4.2	2.0
15.0-19.99	3.0	3.0	1.6
20.0 or more	2.1	2.1	1.4
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	28%	34%	28%
0.71-0.61	35%	45%	35%
0.60-0.46	40%	53%	40%
0.45-0.01	49%	62%	49%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	5%	Not Allowed
0.50-0.01	Not Allowed	8%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			

Fan Wattage Index	1.44
Source Heating Power Index	43.70
Source Cooling Power Index	36.80

TABLE 2-53W14. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #14 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.8
4.0-9.99	6.5	6.5	3.2
10.0-14.99	4.8	4.8	2.2
15.0-19.99	3.9	3.9	1.8
20.0 or more	3.5	3.5	1.7
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	34%	27%
0.71-0.61	35%	42%	35%
0.60-0.46	40%	51%	40%
0.45-0.01	50%	62%	50%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	4%	Not Allowed
0.50-0.01	Not Allowed	7%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.51		
Source Heating Power Index	45.50		
Source Cooling Power Index	39.50		

TABLE 2-53W15. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #15 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.8
4.0-9.99	6.5	6.5	3.2
10.0-14.99	4.8	4.8	2.2
15.0-19.99	3.9	3.9	1.8
20.0 or more	3.5	3.5	1.7
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	27%	34%	27%
0.71-0.61	35%	42%	35%
0.60-0.46	40%	51%	40%
0.45-0.01	50%	62%	50%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	4%	Not Allowed
0.50-0.01	Not Allowed	7%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.55		
Source Heating Power Index	33.90		
Source Cooling Power Index	41.60		

TABLE 2-53W16. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #16 FOR HIGH RISE OFFICE BUILDINGS

Component	PACKAGE A	PACKAGE B	PACKAGE C
OPAQUE ENVELOPE			
Minimum Roof Total R-Value (R_t)	14.9	14.9	22.9
Minimum Opaque Wall Total R-Value (R_t) (one of the following):			
Heat Capacity [Btu/°F/ft^2]			
0.0-3.99	7.4	7.4	3.9
4.0-9.99	6.5	6.5	3.3
10.0-14.99	4.7	4.7	2.4
15.0-19.99	3.9	3.9	2.1
20.0 or more	3.5	3.5	2.0
Minimum Suspended Exterior Floor Total R-value (R_t)	9.5	9.5	9.5
GLAZING			
Maximum Allowed Total & West-Facing Vertical Glazing (one of the following):			
Shading Coefficient			
1.00-0.72	29%	37%	29%
0.71-0.61	35%	45%	35%
0.60-0.46	38%	50%	38%
0.45-0.01	43%	56%	43%
See Section 2-5342(b)5. for adjustment for overhangs.			
Maximum Allowed Horizontal Glazing (one of the following):			
Shading Coefficient			
1.00-0.51	Not Allowed	7%	Not Allowed
0.50-0.01	Not Allowed	11%	Not Allowed
LIGHTING (Either:)			
Maximum Adjusted Lighting Power Density, watts per square foot	1.50	1.50 Daylighting Controls Required	1.40
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2	See Section 2-5342(d)2	Not Allowed
SPACE CONDITIONING SYSTEM (Both:)			
General Requirements	See Section 2-5342(e)1	See Section 2-5342(e)1	See Section 2-5342(e)1
Performance Criteria (applicable to any Alternative Component Package)			
Fan Wattage Index	1.33		
Source Heating Power Index	42.70		
Source Cooling Power Index	33.10		

TABLE 2-53WA1. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #01 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.51
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	5.15	7.52
4.0-9.99	7.38	7.38	3.46	7.38
10.0-14.99	6.63	6.63	2.96	6.63
15.0-19.99	5.97	5.97	2.77	5.97
20.0 or more	5.51	5.51	2.49	5.51
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING (Double Glazing is required for Climate Zone 01)				
Maximum Allowed Total Vertical Glazing (one of the following): Shading Coefficient				
1.00-0.72	25%	25%	25%	6.0%
0.71-0.66	27%	27%	27%	6.1%
0.65-0.56	29%	29%	29%	6.5%
0.55-0.36	32%	32%	32%	7.3%
0.35-0.01	41%	41%	41%	8.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following): Shading Coefficient				
1.00-0.51	None	11%	None	11%
0.50-0.01	None	16%	None	16%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.44	0.46	1.21
Source Heating Power Index	95.90	93.30	29.30
Source Cooling Power Index	31.50	31.10	41.50

TABLE 2-53WA2. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #02 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.57	7.57	3.00	7.57
10.0-14.99	6.35	6.35	2.30	6.35
15.0-19.99	5.97	5.97	1.55	5.97
20.0 or more	3.56	3.56	1.40	3.56
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	22%	22%	22%	1.7%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	26%	26%	26%	4.0%
0.55-0.36	32%	32%	32%	4.5%
0.35-0.01	42%	42%	42%	7.0%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	16%	None	16%
0.50-0.01	None	24%	None	24%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.58	0.53	1.65
Source Heating Power Index	124.90	107.10	37.70
Source Cooling Power Index	55.70	48.30	41.50

TABLE 2-53WA3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #03 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	PACKAGE B	PACKAGE C	PACKAGE D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.57	7.57	3.00	7.57
10.0-14.99	6.35	6.35	2.30	6.35
15.0-19.99	5.97	5.97	1.55	5.97
20.0 or more	3.56	3.56	1.40	3.56
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	22%	22%	22%	1.7%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	26%	26%	26%	4.0%
0.55-0.36	32%	32%	32%	4.5%
0.35-0.01	42%	42%	42%	7.0%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	16%	None	16%
0.50-0.01	None	24%	None	24%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.43	0.46	1.06
Source Heating Power Index	92.10	91.10	29.30
Source Cooling Power Index	34.30	34.20	47.80

TABLE 2-53WA4. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #04 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.70	7.52
4.0-9.99	7.98	7.98	3.00	7.98
10.0-14.99	6.96	6.96	2.30	6.96
15.0-19.99	4.97	4.97	1.55	4.97
20.0 or more	2.54	2.54	1.40	2.54
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	24%	24%	24%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	27%	27%	27%	4.0%
0.55-0.36	31%	31%	31%	4.5%
0.35-0.01	42%	42%	42%	6.0%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.52	0.52	1.36
Source Heating Power Index	111.50	105.40	31.20
Source Cooling Power Index	52.20	49.80	60.30

TABLE 2-53WA5. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #05 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	PACKAGE B	PACKAGE C	PACKAGE D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.70	7.52
4.0-9.99	7.98	7.98	3.00	7.98
10.0-14.99	6.96	6.96	2.30	6.96
15.0-19.99	4.97	4.97	1.55	4.97
20.0 or more	2.54	2.54	1.40	2.54
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	24%	24%	24%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	27%	27%	27%	4.0%
0.55-0.36	31%	31%	31%	4.5%
0.35-0.01	42%	42%	42%	6.0%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.50	0.51	1.33
Source Heating Power Index	109.60	103.60	30.80
Source Cooling Power Index	40.40	38.70	56.70

TABLE 2-53WA6. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #06 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.50	7.50	3.00	7.50
10.0-14.99	4.62	4.62	2.30	4.62
15.0-19.99	2.30	2.30	1.45	2.30
20.0 or more	1.69	1.69	1.20	1.69
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	22%	22%	22%	1.7%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	26%	26%	26%	4.0%
0.55-0.36	32%	32%	32%	4.5%
0.35-0.01	42%	42%	42%	7.0%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	1.01	0.90	2.33
Source Heating Power Index	206.70	173.30	40.00
Source Cooling Power Index	70.10	58.70	79.80

TABLE 2-53WA7. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #07 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft²]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.50	7.50	3.00	7.50
10.0-14.99	4.62	4.62	2.30	4.62
15.0-19.99	2.30	2.30	1.45	2.30
20.0 or more	1.69	1.69	1.20	1.69
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	28%	28%	28%	2.0%
0.55-0.36	36%	36%	36%	2.2%
0.35-0.01	63%	63%	63%	4.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	No
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required. (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.50	0.53	1.17
Source Heating Power Index	105.00	101.50	22.80
Source Cooling Power Index	43.80	43.00	63.30

TABLE 2-53WA3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #08 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.50	7.50	3.00	7.50
10.0-14.99	4.62	4.62	2.30	4.62
15.0-19.99	2.30	2.30	1.45	2.30
20.0 or more	1.69	1.69	1.20	1.69
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	28%	28%	28%	2.0%
0.55-0.36	36%	36%	36%	2.2%
0.35-0.01	63%	63%	63%	4.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	No
Programmable Timing Controls Required (or:)	No	No	No	Yes
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.51	0.53	1.26
Source Heating Power Index	105.70	100.60	27.30
Source Cooling Power Index	46.10	45.50	65.00

TABLE 2-53WA9. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #09 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft²]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.50	7.50	3.00	7.50
10.0-14.99	4.62	4.62	2.30	4.62
15.0-19.99	2.30	2.30	1.45	2.30
20.0 or more	1.69	1.69	1.20	1.69
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	28%	28%	28%	2.0%
0.55-0.36	36%	36%	36%	2.2%
0.35-0.01	63%	63%	63%	4.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	No
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.50	0.53	1.50
Source Heating Power Index	105.00	101.50	27.80
Source Cooling Power Index	43.80	43.00	67.80

TABLE 2-53WAIO. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #10 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.00	7.52
4.0-9.99	7.50	7.50	3.00	7.50
10.0-14.99	4.62	4.62	2.30	4.62
15.0-19.99	2.30	2.30	1.45	2.30
20.0 or more	1.69	1.69	1.20	1.69
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	1.5%
0.71-0.66	25%	25%	25%	2.0%
0.65-0.56	28%	28%	28%	2.0%
0.55-0.36	36%	36%	36%	2.2%
0.35-0.01	63%	63%	63%	4.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	12%	None	12%
0.50-0.01	None	21%	None	21%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	No
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.59	0.57	1.72
Source Heating Power Index	125.50	113.40	38.40
Source Cooling Power Index	61.70	56.40	71.00

TABLE 2-53WA11. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #11 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	4.90	7.52
4.0-9.99	7.00	7.00	3.00	7.00
10.0-14.99	5.37	5.37	2.30	5.37
15.0-19.99	4.15	4.15	1.55	4.15
20.0 or more	3.09	3.09	1.40	3.09
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	10.0%
0.71-0.66	25%	25%	25%	12.4%
0.65-0.56	27%	27%	27%	13.5%
0.55-0.36	33%	33%	33%	15.5%
0.35-0.01	50%	50%	50%	21.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	7%	None	7%
0.50-0.01	None	11%	None	11%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.67	0.59	2.00
Source Heating Power Index	143.80	119.50	44.50
Source Cooling Power Index	73.90	62.50	77.60

TABLE 2-53WA12. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #12 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following):				
Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	4.90	7.52
4.0-9.99	7.00	7.00	3.00	7.00
10.0-14.99	5.37	5.37	2.30	5.37
15.0-19.99	4.15	4.15	1.55	4.15
20.0 or more	3.09	3.09	1.40	3.09
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	10.0%
0.71-0.66	25%	25%	25%	12.4%
0.65-0.56	27%	27%	27%	13.5%
0.55-0.36	33%	33%	33%	15.5%
0.35-0.01	50%	50%	50%	21.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	7%	None	7%
0.50-0.01	None	11%	None	11%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.80	0.77	2.00
Source Heating Power Index	166.20	148.60	41.70
Source Cooling Power Index	52.60	47.00	74.80

TABLE 2-53WA3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #13 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	9.52	9.52	12.51	9.52
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	4.90	7.52
4.0-9.99	7.00	7.00	3.00	7.00
10.0-14.99	5.37	5.37	2.30	5.37
15.0-19.99	4.15	4.15	1.55	4.15
20.0 or more	3.09	3.09	1.40	3.09
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	21%	21%	21%	10.0%
0.71-0.66	25%	25%	25%	12.4%
0.65-0.56	27%	27%	27%	13.5%
0.55-0.36	33%	33%	33%	15.5%
0.35-0.01	50%	50%	50%	21.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as a per cent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	7%	None	7%
0.50-0.01	None	11%	None	11%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.63	0.60	1.81
Source Heating Power Index	132.70	119.90	40.10
Source Cooling Power Index	61.00	53.60	72.90

TABLE 2-53WA14. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #14 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.51
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.10	7.52
4.0-9.99	7.23	7.23	3.00	7.23
10.0-14.99	6.30	6.30	2.30	6.30
15.0-19.99	5.34	5.34	2.47	5.34
20.0 or more	4.62	4.62	2.04	4.62
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	20%	20%	20%	10.5%
0.71-0.66	23%	23%	23%	13.0%
0.65-0.56	25%	25%	25%	14.0%
0.55-0.36	30%	30%	30%	16.5%
0.35-0.01	46%	46%	46%	23.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	6%	None	6%
0.50-0.01	None	9%	None	9%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.66	0.61	1.87
Source Heating Power Index	141.00	122.10	40.80
Source Cooling Power Index	68.90	60.50	74.40

TABLE 2-53WA15 ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #15 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	PACKAGE B	PACKAGE C	PACKAGE D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.51
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	3.10	7.52
4.0-9.99	7.23	7.23	3.00	7.23
10.0-14.99	6.30	6.30	2.30	6.30
15.0-19.99	5.34	5.34	2.47	5.34
20.0 or more	4.62	4.62	2.04	4.62
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	20%	20%	20%	10.5%
0.71-0.66	23%	23%	23%	13.0%
0.65-0.56	25%	25%	25%	14.0%
0.55-0.36	30%	30%	30%	16.5%
0.35-0.01	46%	46%	46%	23.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	6%	None	6%
0.50-0.01	None	9%	None	9%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.66	0.61	1.93
Source Heating Power Index	141.00	122.10	36.50
Source Cooling Power Index	68.90	60.50	79.10

TABLE 2-53WA16. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE #16 FOR RETAIL AND WHOLESALE STORES

Component	PACKAGE A	B	C	D
OPAQUE ENVELOPE				
Minimum Roof Total R-Value (R_t)	12.51	12.51	15.24	12.51
Minimum Opaque Wall Total R-Value (Rt) (one of the following): Heat Capacity [Btu/°F/ft^2]				
0.0-3.99	7.52	7.52	5.15	7.52
4.0-9.99	7.38	7.38	3.46	7.38
10.0-14.99	6.63	6.63	2.96	6.63
15.0-19.99	5.97	5.97	2.77	5.97
20.0 or more	5.51	5.51	2.49	5.51
Minimum Suspended Exterior Floor Total R-value (R_t)	9.50	9.50	9.50	9.50
GLAZING (Double Glazing is required for Climate Zone 16)				
Maximum Allowed Total Vertical Glazing (one of the following):				
Shading Coefficient				
1.00-0.72	25%	25%	25%	6.0%
0.71-0.66	27%	27%	27%	6.1%
0.65-0.56	29%	29%	29%	6.5%
0.55-0.36	32%	32%	32%	7.3%
0.35-0.01	41%	41%	41%	8.5%
See Section 2-5342(b)5. for overhang equivalents.				
Maximum Allowed Horizontal Glazing as percent of daylit area (one of the following):				
Shading Coefficient				
1.00-0.51	None	11%	None	11%
0.50-0.01	None	16%	None	16%
LIGHTING (Either:)				
Maximum Adjusted Lighting Power Density, watts per square foot	2.00	2.00	1.80	2.90
Daylighting Controls Required	No	Yes	No	Yes
Programmable Timing Controls Required	No	No	No	Yes
(or:)				
Maximum Adjusted Connected Lighting Load, watts	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.	See Section 2-5342(d)2.
Lighting Control Reduction Required (W/SF)	None	None	0.2	None
SPACE CONDITIONING SYSTEM (Both Heating and Cooling:)				
General Requirements	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.	See Section 2-5342(e)1.

HVAC Power Criteria (select one of columns I, II, or III; any column may be used in any Alternative Component Package; see Section 2-5342(e)2. for additional requirements)

	I	II	III
Fan Wattage Index	0.57	0.49	1.68
Source Heating Power Index	126.40	102.40	53.90
Source Cooling Power Index	51.80	42.20	68.80

Sec. 2-5343. Ventilation Requirements

(a) Any new office building, retail and wholesale shall have an HVAC system that:

1. Complies with Sections 5 (except Section 5.7) and 6.1.5 of ASHRAE Standard 62-1981; and

2. For offices, is capable of supplying the volumetric rates for outdoor air given for smoking areas listed in Section 6.1, Table 3, of ASHRAE standard 62-1981 based upon the greater of the occupancy densities in that table or the design occupant density. For retail and wholesale stores, is capcable of supplying the volumetric rates for outdoor air given for non-smoking areas listed in Section 6.1, Table 3 of ASHRAE Standard 62-1981 based upon the greater of the occupancy densities in that table or the design occupant density.

EXCEPTIONS:

I. Recirculated air may be used to meet part of the outdoor requirement of Sections 2-5343(a)2., if such use is consistent with Section 6.1.4 of ASHRAE Standard 62-1981. In no case shall there be less than 5 cfm of outdoor air per person, or the amount listed in Table 3, Section 6.1 of ASHRAE Standard 62-1981, whichever is greater.

II. In areas where supply air must be exhausted, such as toilets, janitorial closets, and kitchen and fume hoods, the outside air requirements of Sections 2-5343(a)2. may be met by exhaust or recirculated air from other interior spaces or may be totally outside air. The ventilation system shall be capable of supplying the larger of the following:

A. Total system exhaust air for such areas; or

B. The quantity of outdoor air determined under Sections 2-5343(a)2. and 2-5343(c).

NOTE: An HVAC system that otherwise complies with this section need not be operated at its full design capability in an area of a building designated and maintained as a nonsmoking area, if the following conditions are met:

A. The system is operated to provide the nonsmoking area not less than the greater of the rates for ventilation air for nonsmoking areas listed in Table 3 of ASHRAE Standard 62-1981, or the rate of 10 cubic feet per minute of outdoor air per person, based on the occupancy values in Table 3 or the design occupancy, whichever occupant density is larger.

B. The areas of buildings to be maintained as nonsmoking areas are served by an HVAC system that does not return air from areas where smoking is permitted.

(b) The quality of ventilation air supplied under Sections 2-5343(a)2. shall have contaminants no greater in concentration than those in with Table 1 of ASHRAE Standard 62-1981, for the contaminants listed in that table.

NOTE: Maintaining the air quality levels in Table 2 of ASHRAE Standard 62-1981 is recommended.

(c) The ventilation system(s), including variable air volume systems with air economizers, shall be controlled to provide at least the minimum flow rate(s) of ventilation air, including ourdoor air and any required treated recirculated air as determined from section 2-5343(a) above, to the building spaces or zones at all times such spaces or zones are occupied.

ENERGY CONSERVATION STANDARDS FOR NEW BUILDINGS OF OCCUPANCY R (RESIDENTIAL BUILDINGS) OTHER THAN APARTMENT HOUSES WITH FOUR OR MORE HABITABLE STORIES AND HOTELS

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ENERGY CONSERVATION STANDARDS FOR NEW BUILDINGS OF OCCUPANCY R (RESIDENTIAL BUILDINGS) OTHER THAN APARTMENT HOUSES WITH FOUR OR MORE HABITABLE STORIES AND HOTELS

Sec. 2-5351. Energy Performance Standards

(a) Energy Budgets. Buildings shall be designed to use no more British thermal units (Btu) of energy from depletable sources than that specified in Tables 2-53X and 2-53Y for the appropriate building type and appropriate climate zone shown in Figure 2-53G. The maximum allowable energy use from depletable sources is the sum of the annual space conditioning budget and the annual water heating budget. The annual space conditioning budget is the product of the square feet of conditioned floor area and the total space conditioning budget shown in Table 2-53X. Energy required for building cooling must be included in the design energy budget even if the building plans do not indicate that air conditioning will be installed.

EXCEPTION: If a single continuous subdivision of tract falls in more than one climate zone, all the buildings in the subdivision or tract shall be designed to meet the energy budget of the climate zone which contains the most dwelling units.

NOTE: The California Energy Commission shall periodically update, publish, and make available to interested persons and local building departments a document entitled "California Climate Zone Descriptions for New Buildings," which shall contain a precise description of the metes and bounds for climate zone boundaries depicted in Figure 2-53G and a list of the communities in each zone.

New buildings shall also meet the requirements of Sections 2-5311 through 2-5318 and 2-5352.

(b) Calculation of Energy Consumption. The application for a building permit shall include documentation which demonstrates, using an approved calculation method, that the new building has been designed to not exceed the allowable energy use in Tables 2-53X and 2-53Y for the appropriate climate zone.

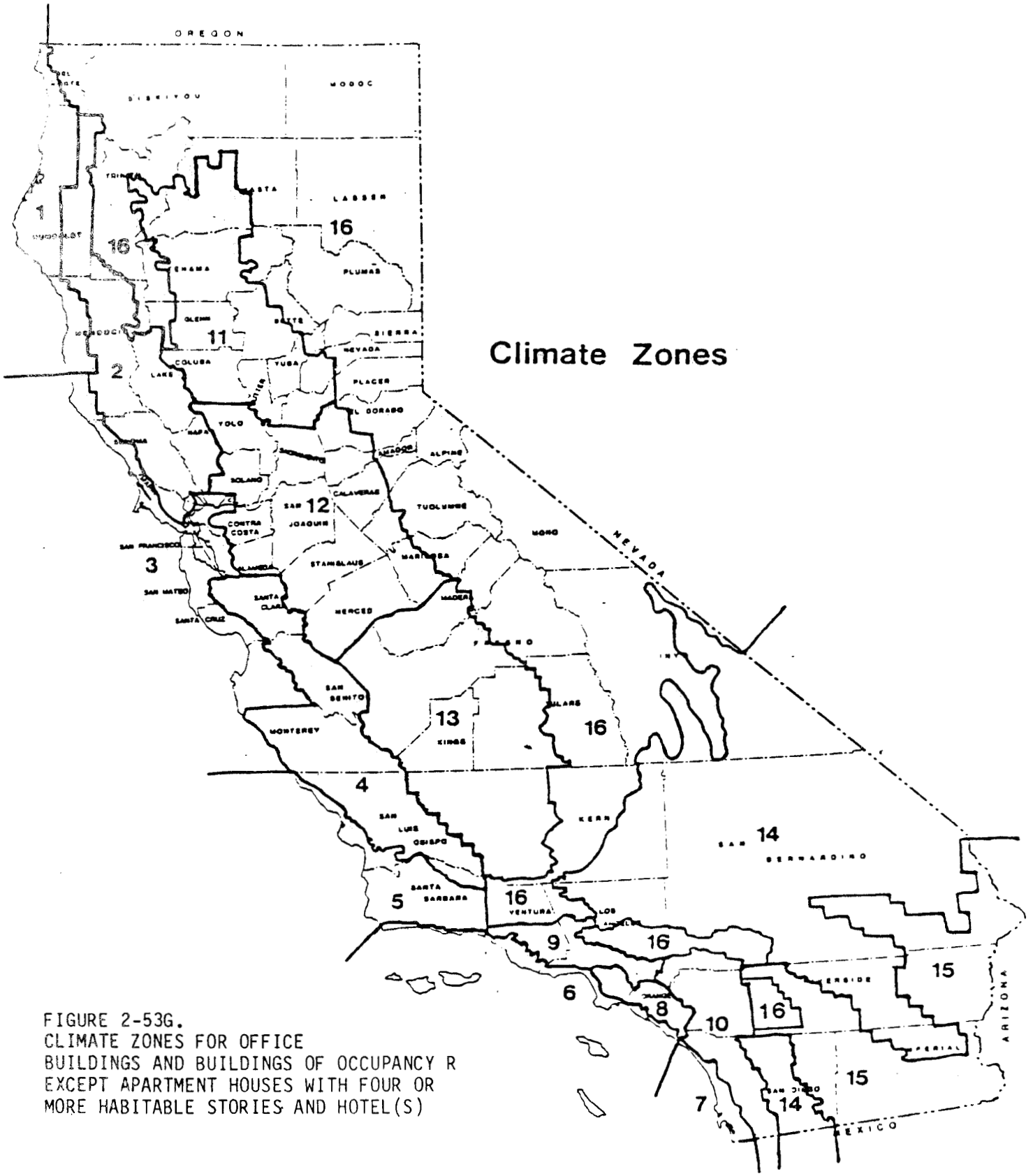

FIGURE 2-53G.
CLIMATE ZONES FOR OFFICE
BUILDINGS AND BUILDINGS OF OCCUPANCY R
EXCEPT APARTMENT HOUSES WITH FOUR OR
MORE HABITABLE STORIES AND HOTEL(S)

TABLE 2-53X. ANNUAL SPACE CONDITIONING BUDGETS[1]

Climate Zone	Single Family[2] Dwellings and Lodging Houses			Multi-Family Buildings: With Common Walls[3] but No Common Floor/Ceilings			Multi-Family Buildings: All Others[4]		
	Heating	Cooling	Total	Heating	Cooling	Total	Heating	Cooling	Total
1	11.1	0.1	11.2	12.2	0	12.2	12.2	0	12.2
2	14.5	8.7	23.2	15.7	5.8	21.5	15.7	5.8	21.5
3	12.3	2.8	15.1	13.7	1.6	15.3	13.7	1.6	15.3
4	9.9	5.7	15.6	11.1	3.9	15.0	11.1	3.9	15.0
5	10.3	3.5	13.8	11.8	2.4	14.2	11.8	2.4	14.2
6	5.2	11.5	16.7	5.7	7.7	13.4	5.7	7.7	13.4
7	2.7	3.9	6.6	3.2	1.8	5.0	3.2	1.8	5.0
8	3.5	13.6	17.1	4.2	8.3	12.5	4.2	8.3	12.5
9	6.9	17.8	24.7	7.4	14.3	21.7	7.4	14.3	21.7
10	5.6	20.9	26.5	6.9	13.9	20.8	6.9	13.9	20.8
11	16.5	22.0	38.5	16.7	14.9	31.6	16.7	14.9	31.6
12	15.8	14.2	30.0	15.0	9.0	24.0	15.0	9.0	24.0
13	12.4	23.0	35.4	11.3	14.9	26.2	11.3	14.9	26.2
14	10.7	27.0	37.7	11.5	19.7	31.2	11.5	19.7	31.2
15	1.4	38.9	40.3	1.8	27.2	29.0	1.8	27.2	29.0
16	20.8	8.9	29.7	19.8	5.9	25.7	19.8	5.9	25.7

1. Thousands of Btu per square foot of conditioned floor space per year.

2. The heating (cooling) budgets may be increased by 15 percent if the installed heating (installed cooling) system has all its distribution ducts and plenums in conditioned space. The heating (cooling) budgets may be increased by multiplying the budget values by $[1 + (0.15)\ (R_d - 2.1)/(R_d + 1.3)]$ when the installed heating (installed cooling) system has ducts in unconditioned space and duct insulation R-value (R_d) is greater than 2.1.

3. The heating (cooling) budgets may be increased by 10 percent if the installed heating (installed cooling) system has all its distribution ducts and plenums in conditioned space. The heating (cooling) budgets may be increased by multiplying the budget values by $[1 + (0.10)\ (R_d - 2.1)/(R_d + 1.3)]$ when the installed heating (installed cooling) system has ducts in unconditioned space and duct insulation R-value (R_d) is greater than 2.1.

4. The heating (cooling) budgets may be increased by 5 percent if the installed heating (installed cooling) system has all its distribution ducts and plenums in conditioned space. The heating (cooling) budgets may be increased by multiplying the budget values by $[1 + (0.05)\ (R_d - 2.1)/(R_d + 1.3)]$ when the installed heating (installed cooling) system has ducts in unconditioned space and duct insulation R-value (R_d) is greater than 2.1.

TABLE 2-53Y. ANNUAL WATER HEATING BUDGETS[1/]

Climate Zone	Single Family Dwellings and Lodging Houses	Multi-Family Buildings With Common Walls but No Common Floor/Ceilings	Multi-Family Buildings All Others
1	22,200	22,200	13,000
2	20,800	20,800	12,300
3	20,800	20,800	12,300
4	20,600	20,600	12,300
5	20,600	20,600	12,300
6	19,400	19,400	11,500
7	19,400	19,400	11,500
8	19,400	19,400	11,500
9	19,400	19,400	11,500
10	19,400	19,400	11,500
11	20,400	20,400	12,200
12	20,600	20,600	12,300
13	20,400	20,400	12,200
14	20,900	20,900	12,300
15	18,700	18,700	11,400
16	22,900	22,900	13,100

1. Thousands of Btu per dwelling unit per year.

(c) Alternative Component Packages. The energy budget requirements of 2-5351 (a) may be met by installing one of the alternative packages of components shown in Tables 2-53Z1 through 2-53Z16 for the appropriate climate zone shown in Figure 2-53G. Installed components shall meet the following requirements.

1. Insulation.

A. Ceiling, wall, slab floor perimeter, and raised floor insulation shall be installed which has an R-value equal to or higher than that shown in Tables 2-53Z1 through 2-53Z16. The minimum ceiling, wall (including heated basements and crawlspaces), and raised floor R-values shown are for insulation installed between wood framing members. Insulation in other wall systems may meet equivalent minimum R-values that consider the effects of all elements of the wall system.

EXCEPTION: Raised floor insulation may be omitted if the foundation walls are insulated to meet the wall insulation minimums shown in Tables 2-53Z1 through 2-53Z16, a vapor barrier is placed over the entire floor of the crawlspace, and the vents are fitted with operable louvers.

B. The minimum depth of concrete-slab floor perimeter insulation shall be 16 inches or the depth of the footing of the building, whichever is less.

EXCEPTION: Perimeter insulation is not required along the slab edge between conditioned space and the concrete slab of an attached unconditioned enclosed space.

2. Glazing.

A. Glazing shall be installed which has U-values equal to or lower than those shown in Tables 2-53Z1 through 2-53Z16. The types of glazing which meet the maximum U-value requirements are shown in the Winter column in Table 8 on page 23.28 of the 1981 ASHRAE Handbook of Fundamentals, without adjustment for the effects of the glazing framing.

B. Total glazing area shall not exceed the percentage of conditioned floor area specified in Tables 2-53Z1 through 2-53Z16.

C. South-facing glazing area shall not be less than the percentage of conditioned floor area in Tables 2-53Z1 through 2-53Z16. South-facing glazing includes glazing in ceilings which is horizontal or tilted to the south. East and west-facing glazing includes glazing in ceilings which is tilted to the east and west, respectively.

3. Shading.

A. Shading of south-facing glazing required in Tables 2-53Z1 through 2-53Z16 shall be installed so that the south-facing glazing is fully shaded at solar noon on August 21 and fully exposed to direct sunlight at solar noon on December 21. South shading requirements may be met by an optimally designed overhang if one is listed in Tables 2-53U1 through 2-53U16 or alternatively, a movable shading device described in C. below.

B. Shading of west-facing glazing required in Tables 2-53Z1 through 2-53Z16 shall be installed so that the west-facing glazing is fully shaded at 5:00 p.m. (Solar time) on August 21 and fully exposed to direct sunlight at 3:00 p.m. (Solar time) on December 21. Shading requirements for west-facing glazing may be met by a movable shading device described in C. below.

NOTE: Permanently tinted glazing may not be used to meet the shading requirements for section 2-5351(c)3.A. and B.

C. Movable shading devices include but are not limited to operable louvers, movable external shading devices, and internal shades which meet the shading coefficient (SC) requirements in Tables 2-53Z1 through 2-53Z16.

4. Thermal Mass. Thermal mass required in Tables 2-53Z1 through 2-53Z16 shall be installed to meet or exceed the minimum heat capacity and surface area ratio shown in Table 2-53AA. Distributed mass in floors, walls, and ceilings which is directly exposed to the conditioned space may be considered in meeting this requirement. Thermal mass includes but is not limited to hard-surfaced slab floors, masonry walls and fireplaces, and gypsum board or plaster in excess of 1/2 inch thickness on ceilings and walls. Thermal mass shall not include carpeted slab floors and heavy weight exterior walls which are installed to meet the alternative wall insulation minimums shown in parentheses in Tables 2-53Z1 through 2-53Z16.

TABLE 2-53AA. MINIMUM THERMAL MASS REQUIREMENTS

Building Type	Surface Area Ratio[1]	Minimum Heat Capacity[2]
Single Family Dwellings and Lodging Houses	7.8	36.5
Multi-family Buildings with Common Walls but with no Common Floors/Ceilings	5.0	23.1
All other Multi-Family Buildings	4.0	18.4

NOTES: 1. Surface Area Ratio = $\frac{A_{mass}}{A_{glazing}}$

2. Minimum Heat Capacity = $\frac{A_{mass} \times D \times C \times t}{A_{glazing}}$

Where A_{mass} = the surface area of exposed mass, ft^2;
D = the density of the mass, lb/ft^3;
C = the specific heat of the mass, Btu/lb/°F;
t = the thickness of the mass, ft, up to a maximum thickness of 1/6 foot (2 inches); and
$A_{glazing}$ = the surface area of the south facing glazing, ft^2.

5. Continuous Infiltration Barrier. Continuous infiltration barriers required in Tables 2-53Z1 through 2-53Z16 shall be installed over the inside face of framing in ceilings and over the inside or outside face of framing in exterior walls. Where ceilings are plank and beam construction exposed to the conditioned space, the barrier shall be placed on top of the planking, and the wall/ceiling joints shall be sealed with caulking or sealant. All openings in the continuous infiltration barrier, including spaces around plumbing, electrical conduits and boxes, gas lines and valves, luminaires, ducts, flues and other elements which penetrate the infiltration barrier, shall be sealed with permanent tape or sealant.

6. Electrical Outlet Plate Gaskets. Electrical outlet plate gaskets required in Tables 2-53Z1 through 2-53Z16 shall be installed on all receptacle, switch or other electrical boxes in exterior and interior walls.

7. Heating System Type. Heating system types shall be installed as required in Tables 2-53Z1 through 2-53Z16. A gas heating system is a natural or liqeufied petroleum gas heating system.

8. Air-to-Air Heat Exchanger. The air-to-air heat exchanger required in Tables 2-53Z1 through 2-53Z16 shall be capable of ventilating the dwelling unit at a rate equal to at least 0.7 times the volume of the conditioned space per hour. An air-to-air heat exchanger is a device which will reduce the heat losses or gains which occur when a building is mechanically ventilated, by transferring heat between the conditioned air being exhausted and the unconditioned air being supplied.

   This requirement may be met by a central mechanical ventilation system with an integral air-to-air heat exchanger or by one or more single package room mechanical ventilators with an integral air-to-air heat exchanger.

9. Solar Domestic Water Heating System. Solar domestic water heating systems with electric resistance backup heating installed to meet the requirements for Alternative Component Package A or B and solar domestic water heating systems with gas backup heating installed to meet the requirements for Alternative Component Package C in Tables 2-53Z1 through 2-53Z16 shall be designed as follows: The solar collectors must be sized so that the net output from the solar system provides at least 60 percent of the annual water heating budget in Table 2-53Y. Net output from the solar system is the energy absorbed by the collectors less system pumping energy, pipe loss, and solar storage tank loss. Documentation specified by the Executive Director shall be submitted with the building permit application which demonstrates that this requirement is met.

(d) Other Compliance Options. The energy budget requirements of 2-5351(a) may be met by installing any alternative package of components certified by the Energy Resources Conservation and Development Commission, by using a point system approved by the Commission, or by using any other calculation method approved by the Commission for use in complying with Section 2-5351(a).

(e) Compliance by Averaging. The energy budget requirements of 2-5351(a) may be met by using a method approved by the Commission that averages the energy performance of a group of buildings, or by installing any alternative package of components certified by the commission as meeting the energy budgets when averaged in the four cardinal directions.

   If the energy budget requirements are met by averaging a group of residential buildings, the permit applicant must show that a simple arithmetic average of the estimated energy budget for all the buildings in the group is equal to or less than the prescribed maximum energy budget. To be eligible for this averaging approach, all buildings shall meet the following requirements:

   1. All buildings in the group shall be of a particular model type, provided that each reverse plan and elevation of a specific model type shall be eligible for averaging in the same group of buildings.

2. All buildings in the group shall be located in the same contiguous subdivision, as defined in Section 66424 of the Government Code.

3. Applications for permits for all buildings in the group shall be filed on the same day and shall each indicate the group of buildings to which the averaging approach is to be applied.

4. The permit applicant for each building in the group shall provide to potential buyers of the building a notice indicating that it is part of a group of buildings for which compliance with energy conservation standards was made by averaging the performance of all the buildings in the group and that the performance of that building relative to the performance standard will be made available upon request.

(f) The energy budget requirements of 2-5351(a) may be met by installing any combination of building designs and measures whose calculated energy performance is equal to or better than that calculated for the same building and floor plan using either package D or E. Builders who use this approach must use the point system or any other calculation method approved by the Commission and must follow these steps:

1. Calculate the energy consumption or point system total of the proposed building, assuming the building includes all of the measures in either package D or E. Assume the building has the maximum amount of glazing allowed in either package for that climate zone and that this glazing is equally distributed in each of the four cardinal directions. Use this calculated energy consumption or point system total as the standard that the proposed building must meet.

2. Perform the same type of calculation, using the proposed building's actual glazing area, orientation, and distribution, and its actual energy conservation features. The building design complies with the energy consumption or point system total calculated in this step is equal to or better than the standard established in Step 1.

Note: The performance method in subdivision (f) has been authorized by statute and may be used in lieu of the performance methods authorized by subdivision (d). When using the performance methods in section 2-535(d), the standard that the proposed building must meet is the energy budget set forth in Table 2-53R or, if the point system is used, zero points. When using the performance method authorized by statute, the standard that must be met will be whatever the calculation in Step 1 indicates, which will not necessarily be the energy budget in Table 2-53R or zero points.

(g) The annual water heating budgets specified in Table 2-53S may be met by installing any gas water heating system that meets the minimum standards for efficiency and stand-by losses specified in Section 2-5307 and the requirements of Section 2-5352(i).

NOTE: Authority cited: Public Resources Code, Sections 25402, 25402.1, 25402.3 and 25402.5
Reference: Public Resources Code, Sections 25402, 25402.3, 25402.5

TABLE 2-53Z1. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 1

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 38	R 38
Wall[1]	R 19	R 19	R 19	R 19	R 19
"Heavy" Walls	(R 8.5)	(R 5.0)	(R 5.5)	N/A	N/A
"Light Mass" Walls	[R 8.5]	[R 6.0]	[R 6.5]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 19	R 19	R 19	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	14%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	REQ	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	REQ	NR	REQ	REQ
Air-to-Air Heat Exchanger	NR	REQ	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	72%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	8.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z2. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 2

Component	Package A	B	C	D	E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 19	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.5]	[R 4.5]	[R 4.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	8.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z3. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 3

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 4.5)	(R 3.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 5.0]	[R 5.0]	[R 4.5]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	1.10	0.65	0.65
Maximum Total Area	NR	16%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	REQ
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	79%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.8
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z4. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 4.

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 3.5)	(R 3.5)	(R 3.0)	N/A	N/A
"Light Mass" Walls	[R 5.0]	[R 5.0]	[R 4.5]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.0	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z5. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 5

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 19	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.5]	[R 4.5]	[R 4.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	79%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.8
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	9.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-5326. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 6

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 19	R 30	R 19	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.0]	[R 4.5]	[R 3.5]	N/A	N/A
Slab Floor Perimeter	NR	R 7	NR	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	1.10	0.65	0.65
Maximum Total Area	NR	16%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	0.36	0.36
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	8.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z7. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 7

Component	Package A	B	C	D	E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 19	R 30	R 19	R 30	R 30
Wall[1]	R 11	R 11	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.0]	[R 3.5]	[R 3.5]	N/A	N/A
Slab Floor Perimeter	NR	R 7	NR	NR	N/A
Raised Floor	R 11	R 11	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	1.10	0.65	0.65
Maximum Total Area	NR	14%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	0.36
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	8.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-5378. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 8

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.0]	[R 4.5]	[R 3.5]	N/A	N/A
Slab Floor Perimeter	NR	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	1.10	0.65	0.65
Maximum Total Area	NR	14%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36	0.36
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z9. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 9

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.0]	[R 4.0]	[R 4.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	NR	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	14%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36	0.36
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	10%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	74%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.6
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.5	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z10. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 10

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 2.5)	(R 2.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 4.5]	[R 4.5]	[R 4.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	1.10	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	16%	20%	20%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36	0.36
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.5	8.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z11. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 11

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 5.0)	(R 5.5)	(R 4.0)	N/A	N/A
"Light Mass" Walls	[R 6.0]	[R 6.5]	[R 5.5]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	NR	NR
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.5	9.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z12. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 12

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 3.5)	(R 3.5)	(R 2.5)	N/A	N/A
"Light Mass" Walls	[R 5.0]	[R 5.5]	[R 4.5]	N/A	N/A
Slab Floor Perimeter	NR	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36	0.36
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	79%	79%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.8	2.8
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.5	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z13. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 13

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 30	R 30	R 30	R 30
Wall[1]	R 11	R 19	R 11	R 11	R 11
"Heavy" Walls	(R 4.0)	(R 4.0)	(R 3.0)	N/A	N/A
"Light Mass" Walls	[R 5.5]	[R 6.0]	[R 5.0]	N/A	N/A
Slab Floor Perimeter	NR	R 7	R 7	NR	N/A
Raised Floor	R 11	R 19	R 11	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	14%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36 or Opt.Ov.	0.36	0.36
West Facing Glazing	0.36	0.36	0.36	0.36	0.36
East Facing Glazing	NR	NR	NR	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	NR	NR	NR	NR
Air-to-Air Heat Exchanger	NR	NR	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.0	8.0
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z14. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 14

Component	Package A	B	C	D	E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 38	R 38	R 30	R 38	R 38
Wall[1]	R 19	R 19	R 19	R 11	R 19
"Heavy" Walls	(R 7.0)	(R 5.5)	(R 5.5)	N/A	N/A
"Light Mass" Walls	[R 8.0]	[R 6.5]	[R 7.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 19	R 19	R 19	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	14%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.15	0.15	0.15	0.36	0.36
West Facing Glazing	0.15	0.15	0.15	0.36	0.36
East Facing Glazing	0.15	0.15	0.15	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	NR	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	REQ	NR	REQ	NR
Air-to-Air Heat Exchanger	NR	REQ	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.5	8.8
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z15. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 15

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 30	R 38	R 30	R 38	R 38
Wall[1]	R 19	R 19	R 19	R 11	R 11
"Heavy" Walls	(R 5.5)	(R 4.5)	(R 4.0)	N/A	N/A
"Light Mass" Walls	[R 7.0]	[R 6.0]	[R 6.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	NR	N/A
Raised Floor	R 19	R 19	R 19	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	16%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	0.15	0.15	0.15	0.36	0.36
West Facing Glazing	0.15	0.15	0.15	0.36	0.36
East Facing Glazing	0.15	0.15	0.15	0.36	0.36
North Facing Glazing	NR	NR	NR	0.36	0.36
THERMAL MASS[3]	REQ	NR	NR	25%	5%
INFILTRATION CONTROL					
Continuous	NR	REQ	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	REQ	NR	REQ	REQ
Air-to-Air Heat Exchanger	NR	REQ	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	71%	71%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.5	2.5
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	9.5	9.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

   Package E (an option for buildings with raised floors) requires thermal mass with an area exposed to the conditioned space equal to the percentage of the ground floor area specified in the Table. To qualify for thermal mass, the material used must have a performance equivalent to masonry two inches thick, with a volumetric heat capacity of 28 Btu per cubic foot per degree Fahrenheit per hour, a thermal conductivity of 1 Btu per foot per degree Fahrenheit per hour, and a surface area directly exposed to the room air of the required percentage of the ground floor.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

TABLE 2-53Z16. ALTERNATIVE COMPONENT PACKAGES FOR CLIMATE ZONE 16

Component	Package A	Package B	Package C	Package D	Package E
BUILDING ENVELOPE					
Insulation Minimums					
Ceiling	R 38	R 38	R 30	R 38	R 38
Wall[1]	R 19	R 19	R 19	R 11	R 19
"Heavy" Walls	(R 9.5)	(R 7.0)	(R 7.5)	N/A	N/A
"Light Mass" Walls	[R 9.5]	[R 7.5]	[R 8.0]	N/A	N/A
Slab Floor Perimeter	R 7	R 7	R 7	R7	N/A
Raised Floor	R 19	R 19	R 19	N/A	R 19
Attic[2]	NR	NR	NR	REQ	REQ
GLAZING					
Maximum U Value	0.65	0.65	0.65	0.65	0.65
Maximum Total Area	NR	16%	14%	16%	16%
Maximum Total Nonsouth Facing Area	9.6%	N/A	N/A	N/A	N/A
Minimum South Facing Area	6.4%	NR	NR	NR	NR
SHADING COEFFICIENT					
South Facing Glazing	NR	NR	NR	NR	NR
West Facing Glazing	NR	NR	NR	NR	NR
East Facing Glazing	NR	NR	NR	NR	NR
North Facing Glazing	NR	NR	NR	NR	NR
THERMAL MASS[3]	REQ	NR	NR	25%	NR
INFILTRATION CONTROL					
Continuous	NR	REQ	NR	NR	NR
Electrical Outlet Plate Gaskets	NR	REQ	NR	NR	NR
Air-to-Air Heat Exchanger	NR	REQ	NR	NR	NR
SPACE HEATING SYSTEM					
If Gas, Seasonal Efficiency=	71%	71%	71%	79%	79%
If Heat Pump[4], ACOP=	MIN	MIN	MIN	2.8	2.8
SPACE COOLING SYSTEMS					
If Air Conditioner, SEER=	MIN	MIN	MIN	8.5	8.5
DOMESTIC WATER HEATING TYPE					
Gas, heat pump, or solar with any type backup	YES	YES	Solar w/ Gas Backup	YES	YES

LEGEND: NR = Not Required; N/A = Not Applicable; REQ = Required; ACOP = Adjusted Coefficient of Performance; MIN = minimum efficiencies required by Section 2-5314.

1. The value in parentheses is the minimum R-value for the entire wall assembly if the wall weight exceeds 40 pounds per square foot. The value in brackets is the minimum R-value for the entire assembly if the heat capacity of the wall meets or exceeds the result of multiplying the bracketed minimum R-value by 0.65. The insulation must be integral with or installed on the outside of the exterior mass. The inside surface of the thermal mass, including plaster or gypsum board in direct contact with the masonry wall, shall be exposed to the room air. The exterior wall used to meet the R-value in parentheses cannot also be used to meet the above thermal mass requirement.

2. Where an attic is required, it must be installed under not less than 75 percent of the roof that is over any conditioned space.

3. To calculate the amount of thermal mass required for Package A (an option with passive solar design), use the method set forth in Section 2-5351(c)4.

   Package D (an option for buildings with concrete slab floors) requires 25 percent of the floor area directly exposed to the conditioned space. To determine the floor area, count only the first floor in conditioned areas. Uncarpeted (e.g., linoleum or tiled) first floor areas, such as entry ways, kitchens, bathrooms, and conditioned utility rooms or closets may all be counted towards this requirement.

4. If the building permit is applied for on or after August 1, 1983, an automatic setback thermostat must be installed in conjunction with a heat pump.

Sec. 2-5352. Mandatory Features and Devices

Any new building of occupancy R (except apartment houses with four or more habitable stories and hotels) shall have all of the following features and devices:

(a) Ceiling Insulation. The opaque portions of ceilings separating conditioned spaces from unconditioned spaces shall meet the requirements of either 1. or 2. below.

1. Ceilings shall be insulated between framing members with insulation having an installed thermal resistance of R-19 or greater.

   Insulation which is not penetrated by framing members may meet an equivalent minimum R-value which includes the effects of framing members on the above R-19 insulated ceiling.

2. The weighted average U-value of ceilings shall not exceed that which would result from using the insulation indicated in Section 2-5352 (a)1., including the effects of framing members.

(b) Loose Fill Insulation. When loose fill insulation is installed, the minimum installed weight per square foot shall conform with the insulation manufacturer's installed design density per square foot at the manufacturer's labeled R-value.

(c) Wall Insulation. The opaque portions of frame walls separating conditioned spaces from unconditioned spaces shall meet the requirements of either 1. or 2. below.

(1) Framed walls shall be insulated between framing members with insulation having an installed thermal resistance of R-11 or greater. Framed foundation walls of heated basements or heated crawl spaces shall be insulated above the adjacent outside ground line with insulation having an installed thermal resistance of at least R-7.

   EXCEPTION: Insulation which is not penetrated by framing members may meet an equivalent minimum R-value which includes the effects of framing members on the above R-values.

2. The weighted average U-value of walls shall not exceed that which would result from using the insulation indicated in Section 2-5352 (c)(1), including the effects of framing members.

(d) Installation of Fireplaces.

1. If a masonry or factory-built fireplace is installed, it shall have the following:

   A. Closeable metal or glass doors covering the entire opening of the firebox;

EXCEPTION: A door is not required if it would interfere with any device, permanently installed in the fireplace, that is designed to increase the circulation of heat.

B. A combustion air intake to draw air from the outside of the building directly into the firebox, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight fitting damper; and

EXCEPTION 1: An outside combustion air intake is not required if the fireplace will be installed over concrete slab flooring and the fireplace will not be located on an exterior wall.

EXCEPTION 2: An outside combustion air intake is not required in climate zones 5, 6, 7, 8, 9, 10, 14, or 15 if the fireplace will not be located near an exterior wall.

C. A flue damper with a readily accessible control.

2. Continuous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.

(e) Special Infiltration Barrier.

If an infiltration barrier is installed to meet the requirements of Section 2-5351, it must have an air porosity of less than 5 cubic feet per hour per square foot per inch of mercury pressure difference when tested in accordance with the requirements of ASTM E-283 (1973). If a vapor barrier functions as an infiltration barrier it shall be located on the inside of the wall framing.

(f) Vapor Barriers. In Climate Zones 14 and 16 shown in Figure 2-53G, a vapor barrier shall be installed on the conditioned space side of all insulation in all exterior walls, unvented attics, and unvented crawl spaces to protect insulation from condensation.

(g) Space Conditioning Equipment Sizing.

1. Natural gas and liquefied petroleum gas central furnaces shall be sized to meet at least one of the following requirements:

A. The total output heating capacity of furnaces in the building shall be less than 45,000 Btu/hr; or

B. Output heating capacity shall be less than 1.3 times the sum of the design heat loss rate for the heating zone being serviced by the furnace and 10 Btu per hour per square foot of conditioned floor area in the zone; or

C. Seasonal efficiency shall be greater than 1 percent above 71 percent for every 7,000 Btu/hr the output heating capacity exceeds either the building design heat loss rate or 45,000 Btu/hr, whichever is greater.

The furnace output heating capacity shall be determined using the method described in the Department of Energy test procedures for measures of energy consumption in 42 Federal Register 20147-20181 (May 10, 1978).

2. Heating and cooling equipment shall be sized in accordance with the building design heat loss rate and heat gain rate, using a method set forth by the Executive Director, based on the ASHRAE Handbook and Product Directory, 1979 Equipment Volume, 1980 Systems Volume and 1981 Fundamentals Volume.

(h) Setback Thermostats. All heating systems shall have an automatic thermostat with a clock mechanism which the building occupant can manually program to automatically set back the thermostat set points for at least 2 periods within 24 hours.

EXCEPTION: Gravity wall heaters, floor heaters, and room heaters that are installed in additions, need not comply with this requirement.

(i) Water Heating System Insulation. Storage type water heaters and storage and backup tanks for solar water heating systems shall be externally wrapped with insulation having an installed thermal resistance of R-12 or greater. Alternatively, such tanks may be insulated to a combined level of R-16, when both internal insulation and external wrap insulation are considered. Internal insulation can be included in the combined insulation level only where the R-value of such insulation has been labelled on the tank exterior by the manufacturer.

(j) Lighting. Lamps used in luminaires for general lighting in kitchens and bathrooms shall have an efficacy of not less than 25 lumens per watt. Luminaires which are the only lighting in a kitchen or bathroom will be considered general lighting.

EXCEPTION: Luminaires which are the only lighting in a bathroom and lighting to be used only for specific visual tasks or decorative effect are exempt from this requirement. Such exempt lighting includes luminaires that are meant to light only a specific task area such as a kitchen counter or sink, a dining table, or a bathroom mirror.

(k) Slab Edge Insulation. Material used for slab edge insulation shall meet the following minimum specifications: (1) water absorption rate no greater than 0.3 percent when tested in accordance with ASTM-C-272-33, (2) water vapor transmission rate no greater than 2.0 per/inch when tested in accordance with ASTM-C-355-64. Concrete slab perimeter insulation must be protected from physical damage and ultra violet light deterioration.

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

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

Sec. 2-5361. Alternate Materials, Method of Construction, Design or Insulating System.

Sections 2-5361 through 2-5364 do not 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.

Sec. 2-5362. Building Enveloe.

(a) Insulation.

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

TABLE 2-53BB. MAXIMUM U-VALUES FOR WALLS

Degree Days	Building Type	Wall Density (pounds/square foot)	Maximum U-Value [1]	Maximum U-Value [2]
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

NOTES: [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] Hotels with less than four habitable stories.

[4] Buildings of occupancy R with four or more habitable stories.

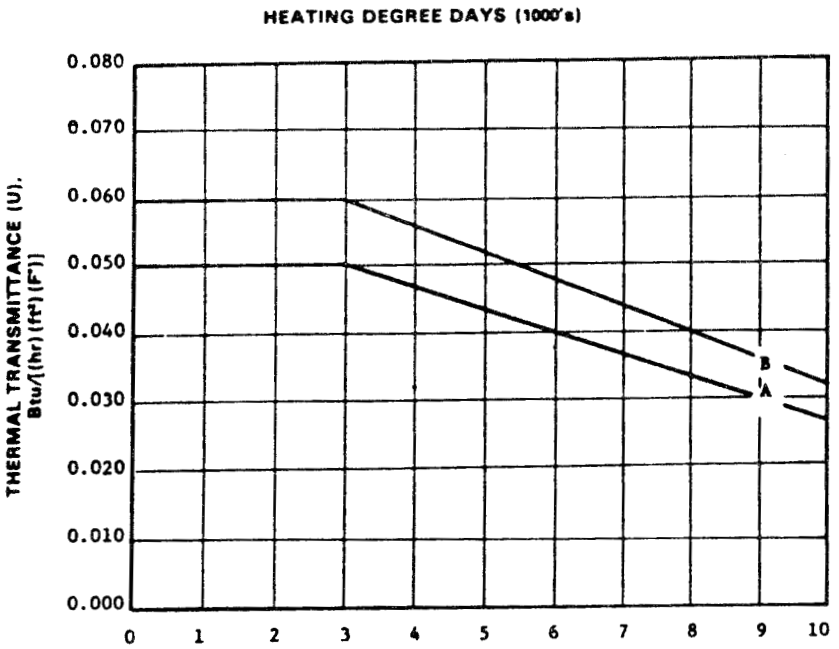
2. Ceilings.

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

B. The maximum allowable U-value for ceilings in buildings of occupancy R with four or more habitable stores 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 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 2 1/2 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 Spaces, 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 2-53CC.

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

Heating Degree Days	Maximum U Value
3000 or less	No requirement
over 3000	0.08

In lieu of the requirements of Table 2-53CC, floor insulation may be omitted from hotels 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 2-53CC.

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 2-53DD. Insulation may be omitted from floors over heated basement areas or crawl spaces if foundation walls are insulated.

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

Heating Degree Days	Maximum U-Values
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.

(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. Hotels with Less Than Four Habitable Stories.

A. For heated hotels 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 hotels 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 shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area special glazed.

2. Buildings of Occupancy R with Four or More Habitable Stories.

A. For heated buildings of occupancy R 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 of occupancy R 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 hotels with less than four habitable stories, special glazing oriented within 22 1/2° 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 x 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) x (weight). In the case of a concrete slab floor, the maximum thermal mass shall be no more than 5 Btu/°F per square foot of slab.

4. Cooled Buildings. Cooled buildings of occupancy R shall utilize tinted glazing when the total glazing area exceeds the basic glazing area. The glazing area on walls oriented within 22 1/2 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 1/2 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.

Sec. 2-5363. Climate Control Systems.

(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 shown in the Energy Conservation Manual.

(c) Heating Equipment Sizing. Natural gas and liquified petroleum gas central furnaces shall be sized to meet the requirements of Subsection 2-5352(f).

Sec. 2-5364. Water Heating.

(a) Service Water Heating. Electric resistance water heating systems shall not be used unless the life cycle cost or 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 Manual.

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STATE MECHANICAL CODE

Title 24, Part 4, Chapter 4 - 10

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CHAPTER 4-10

DUCTS

Sec. 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 identies 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	
Entire Chapter, except as noted in this table	
1002	X[5]
1005	X[5]

Adopted by reference for Occupancies A, B, E, H, and R; see Section 2-5316(a).

APPENDIX 2-53A

STANDARDS REFERENCED IN ENERGY CONSERVATION REGULATIONS

STATE OF CALIFORNIA

Appliance Efficiency Regulations
Standards for Insulating Material
Nonresidential Energy Conservation Manual
Residential Energy Conservation Manual
Various Directories for Certified Appliances
Directory of Certified Insulating Materials
Available from: California Energy Commission
Publications Office
1516 Ninth Street, MS 13
Sacramento, CA 95814
(916) 324-3014

INTERNATIONAL CONFERENCE ON BUILDING OFFICIALS

Uniform Building Code, 1982 Edition
Uniform Mechanical Code, 1979 Edition
Available from: International Conference of Building Officials
5360 South Workman Mill Road
Whittier, CA 90601
(213) 699-0541

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 320-81	Standard for Water-Source Heat Pumps
ARI 340-82	Standard for Commercial and Industrial Unitary Heat Pump Equipment
ARI 360-81	Standard for Commercial and Industrial Unitary Air-Conditioning Equipment
ARI 520-78	Standard for Positive Displacement Refrigerant Compressors, Compressor Units, and Condensing Units
ARI 550-83	Standard for Centrifugal and Rotary Water-Chilling Packages
ARI 560-82	Standard for Absorption Water-Chilling Packages
ANSI/ARI 590-1981	Standard for Reciprocating Water-Chilling Packages

Available from: Air-Conditioning and Refrigeration Institute
1815 North Fort Myer Drive
Arlington, VA 22209
(703) 524-8800

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 22-78	Methods of Testing for Rating Water Cooled Refrigerant Condensers
ASHRAE 24-78	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
ASHRAE 62-1981	Ventilation for Acceptable Indoor Air Quality

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
370 Brannan Street
San Francisco, CA 94107
(415) 495-4552

Climatic Data for Region X, Arizona, California, Hawaii, and Nevada, Publication SPCDX, 1982

Available from: ASHRAE - Climatic Data
Southern California Chapter
P.O. Box 6306
Alhambra, CA 91802

AMERICAN NATIONAL STANDARDS--Z21 SERIES

ANSI Z21.10.3-1981	Standard for Gas Water Heaters, Volume III Circulating Tank, Instantaneous and Large Automatic Storage Type Water Heaters
ANSI Z21.11.1-1981	Standard for Gas-Fired Room Heaters, Volume I, Vented Room Heaters
ANSI Z21.40.1-1981	Standard for Gas-Fired Absorption Summer Air Conditioning Appliances
ANSI Z21.44-1981	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

AMERICAN NATIONAL STANDARDS--Z21 SERIES (Continued)

ANSI Z21.49-1982	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
8501 East Pleasant Valley Road
Cleveland, OH 44131
(216) 524-4990

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM E283-73	Standard Method of Test for Air Leakage Through Exterior Windows, Curtain Walls, and Doors

Available from: American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103
(215) 299-5400