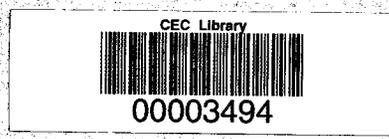


AOR 6



**California Energy Commission**

**Conservation Division**

**Regulations**

**Establishing**

**Energy Conservation Standards**

**for**

**New Residential Buildings**

**September 1, 1980 Issue**

For historical reference.  
Current Title 24 Standards are available at:  
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CALIFORNIA ADMINISTRATIVE CODE  
TITLE 24, PART 6  
ARTICLE 1

ENERGY CONSERVATION STANDARDS FOR NEW RESIDENTIAL BUILDINGS

T20-1401. General Provisions. (a) Scope. (1) This article applies to all new hotels, motels, apartment houses, lodging houses, dwellings, and other residential buildings which are heated or mechanically cooled. Notwithstanding the above, this article shall not apply to residential buildings in which 100 percent of the required energy for heating and cooling is derived from a nondepletable energy source. Section T20-1414 applies to residential buildings for which application for a building permit is made after December 23, 1976, but no building permit was issued before July 1, 1978.

(2) No building permit for any such residential building or renewal of an already issued building permit shall be issued by a city, county, city and county, or state agency on or after July 1, 1978, unless a review by the enforcement agency of the plans for the proposed building containing detailed energy system specifications confirms that the building satisfies the minimum requirements established in this article.

(3) On or after July 1, 1978, no governmental agency shall commence construction on any new residential building which has 10,000 gross square feet of conditioned floor area or less or which is designed to provide lighting for 1,000 hours per year or less or which is designed to provide space conditioning 1,000 hours per year or less unless it complies with the requirements of this article. On or after January 1, 1979, no governmental agency shall commence construction of any new residential building regardless of its size or hours of use unless it complies with the requirements of this article.

(4) Notwithstanding any of the above, this article, except Section T20-1414, shall not apply to any building for which a building permit was issued prior to July 1, 1978, nor to any building excluded by reason of Section T20-1410 of this article.

(b) Mixed Occupancy. (1) When a building contains both residential and nonresidential occupancies, the residential occupancy portion of the building shall comply with these regulations and the nonresidential occupancy portion of the building shall comply with the Energy Conservation Standards for New Nonresidential Buildings as set forth in Title 24, Part 6, Division T20, Article 2, of the California Administrative Code.

(2) Notwithstanding the provisions of subsection (b)(1), the entire building may, at the designers option, be treated for purposes of these regulations as a nonresidential building if the residential portion of the building is both less than 1000 square feet and less than 30 percent of the gross square feet of conditioned floor area.

(3) Notwithstanding the provisions of subsection (b)(1), the entire building may, at the designer's option, be treated for purposes of these regulations as a residential building if the nonresidential portion of the building is both less than 1000 square feet and less than 30 percent of the gross square feet of conditioned floor area.

(c) Additions to Existing Buildings. All heated or cooled additions to existing residential buildings shall be constructed to comply with this Article,

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

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

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

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

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

The enforcement agency may approve any alternative design, including designs using nondepletable energy sources, provided he finds that the proposed design complies with the provisions of this Article 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 Article.

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.

(e) Design Conditions. Inside winter design temperature shall be 70°F and inside summer design temperature shall be 78°F. Outdoor design temperatures for specific localities shall be those listed in Appendix T20-A. For localities not listed in Appendix T20-A, the outdoor design temperature shall be those listed in the columns of the Summer dry bulb, Summer wet bulb and Winter heating temperature from "Recommended Design Temperatures," published by ASHRAE Golden Gate and Southern California Chapters as follows:

	<u>Edition</u>	<u>Cooling</u>	<u>Heating</u>
Northern California	1965	1%	Median of Extremes
Southern California	1972	0.1%	Median of Extremes

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

T20-1402. Definitions. For the purpose of this Article, the following definitions shall apply:

"Accessible" means having access thereto, but which first may require the removal of an access panel, door or similar obstruction.

"Actual Site Preparation and Construction" means any construction activity undertaken in reliance upon a foundation or building permit.

"Air Conditioner" means one or more factory made assemblies which include an evaporator or cooling coil and an electrically driven compressor and condenser combination, and may include a heating function.

"ANSI" means the American National Standards Institute.

"Appliance Efficiency Regulations" means the California Administrative Code, Title 20, Chapter 2, Subchapter 4, Article 4.

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

"ASTM" means the American Society for Testing and Materials.

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

"Basic Glazing Area" means an area of glazing equal to 16 percent of the gross floor area for buildings with less than four stories, excluding basements, parking areas and nonhabitable areas and 40 percent of the exterior wall area for all other buildings.

"Building Envelope" means the elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior.

"Central Air Conditioner" means an air conditioner which is not a room air conditioner.

"Claimant" means any person who files a claim of exemption under this Article.

"Climate Control System" means 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" means 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.

"Coefficient of Performance (COP) - Heat Pump, Heating " means the ratio of the rate of useful heat output delivered by the complete heat pump unit (exclusive of supplementary heating) to the corresponding rate of energy input, 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.

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

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

"Degree Day, Heating" means 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 Appendix T20-A. For those localities not listed in Appendix T20-A the number of degree days shall be determined by the local enforcement agency having jurisdiction.

"Design Heat Loss" means the total calculated heat loss through the building envelope under design conditions.

"Energy Efficiency Ratio (EER)" means the ratio of net cooling capacity in Btu/hr to total rate of electric input in watts under designated operating conditions.

"Enforcement Agency" means the designated city, county, or state official responsible for issuing the building permit.

"Exterior Wall Area" means the gross area of wall surface adjacent to heated or cooled spaces, including glazing and doors, exposed to ambient climatic temperatures, measured for a dwelling unit or group of units served by a climate control system.

"Glazing" means all transparent or translucent materials in exterior openings.

"Glazing Area" means the area of glazing in exterior openings including the sash area.

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

"Gross Floor Area" means the sum of the areas of the several floors of the building, including basements, mezzanine and intermediate-floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the centerline of walls separating buildings. Covered walkways, open roofed-over areas, porches and similar spaces shall be excluded. The gross floor area does not include such features as pipe trenches, exterior terraces or steps, chimneys, roof overhangs, parking garages, and unheated basements.

"Gross Square Feet of Conditioned Floor Area" means the sum of the enclosed areas of conditioned space on all floors of the building, including basements, mezzanines, and intermediate floor tiers and penthouses, measured from the exterior faces of exterior walls and the centerline of walls separating conditioned and unconditioned spaces of the building.

"Heat Pump" means an air conditioner which is capable of heating by refrigeration, and which may or may not include a capability for cooling.

"Infiltration" means the uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building, caused by the pressure effect of wind and/or the effect of differences in the indoor and outdoor air density.

"Nondepletable Energy Source" means an energy source which cannot be exhausted by use, such as wind and solar energy. Energy sources which are renewable, such as wood can be considered to be nondepletable if, and only if, it can be shown that sufficient quantities of the resource are available at the site so that the rate at which the resource regenerates exceeds the anticipated rate of consumption.

"Packaged Terminal Air Conditioner" means a room air conditioner consisting of a factory-selected combination of heating and cooling components, assemblies or sections, intended to serve an individual room or zone and constructed in a manner which complies with the definition contained in the Standard for packaged Terminal Air Conditioners approved by the Air-Conditioning and Refrigeration Institute in 1976, known as ARI-76.

"Residential Building" means a building which is heated or cooled and is of an occupancy type R-1 or R-3, as defined in the 1976 edition of the Uniform Building Code, as adopted by the International Conference of Building Officials.

"Residential Energy Conservation Manual" means the manual developed by the Commission to aid designers, builders, and contractors of buildings in meeting energy conservation standards.

"Room Air Conditioner" means a factory encased air conditioner designed as a unit for mounting in a window or through a wall, or as a console. It is designed for delivery of conditioned air to an enclosed space without ducts. "Room air conditioner" includes packaged terminal air conditioners.

"Shaded" means externally protected from direct solar radiation by use of devices permanently affixed to the structure or by an adjacent building.

"Shading Coefficient" means 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.

"Special Glazing" means glazing which has a maximum U value of 0.65 for all glazed surfaces.

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

"Thermal Resistance (R)" means the measure of the resistance of a material or building component to the passage of heat in  $\frac{^{\circ}\text{F} - \text{sq ft.}}{\text{Btu/hr}}$ . The resistance value (R) of mass type insulations shall not include any value for reflective facing.

"Tinted Glazing" means glazing material which is permanently tinted or permanently surface coated by the manufacturer and provides a maximum shading coefficient as hereinafter specified.

"U Value (Overall Coefficient of Heat Transfer)" means the heat flow rate through a given construction assembly, air to air, expressed in Btu/hr per sq ft  $^{\circ}\text{F}$  temperature difference.

$$U = \frac{1}{R_t}$$

Where  $R_t$  equals the sum of the thermal resistances (R) for the individual components of the assembly. U values shall be calculated according to ASHRAE methods.

T20-1403. Building Envelope. (a) Insulation.

(1) Walls. The U value of the opaque surfaces between conditioned and unconditioned spaces shall not exceed the values shown in Table A for the building types, wall densities and degree day ranges listed.

TABLE A

Degree Days	Building Type	Wall Density (pounds/square foot)	Maximum U Value	
			[1]	[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

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

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

[3] Buildings with less than four stories (excluding basements, parking areas and nonhabitable areas).

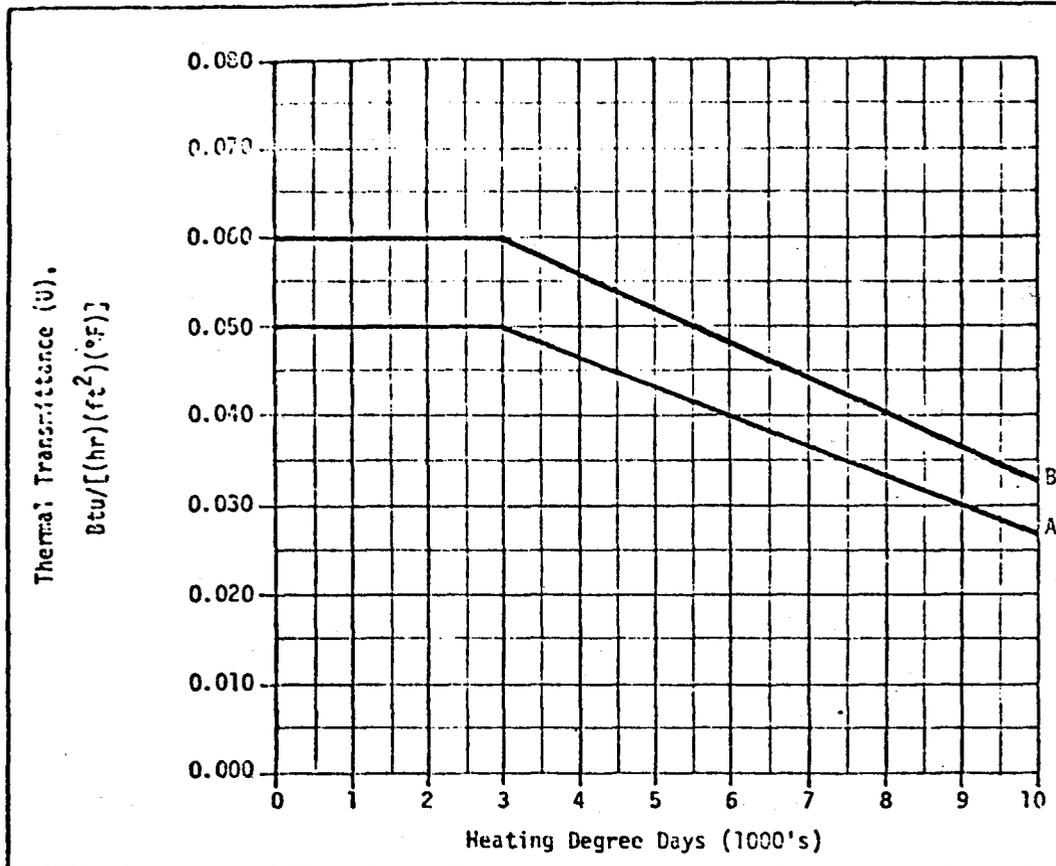
[4] Buildings with four or more stories (excluding basements parking areas and nonhabitable areas).

(2) Ceilings.

(A) The maximum allowable U value for ceilings in low rise buildings shall be as shown in Figure 1.

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

Figure 1



- 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 Space Plenum Walls and Slab-on-Ground Floors.

(A) Floors over Unheated Spaces. For floors over unheated spaces, unheated basements, unheated garages, or ventilated crawl spaces, the U values of floor section shall not exceed the value shown in Table B.

TABLE B

Maximum U values of floor sections over unheated basements, unheated garages or crawl spaces.

Heating Degree Days	Maximum U Value
3000 or less	No requirement
over 3000	0.08

In lieu of the requirements of Table B, floor insulation may be omitted from buildings with less than four stories (excluding basement, parking areas and nonhabitable areas) 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 B.

(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 C. Insulation may be omitted from floors over heated basement areas or crawl spaces if foundation walls are insulated.

TABLE C

Maximum U values of foundation wall sections of heated basement or 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.

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

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

(c) Glazing.

(1) Low-Rise Buildings

(A) For heated low-rise buildings 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 low-rise buildings located in areas over 3500 degree days shall be provided with special glazing for all exterior glazing. Where the total glazing area exceeds the basic glazing area, treatment, as specified in Section T20-1401(d) of these regulations, shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area special glazed.

(2) High-Rise Buildings

(A) For heated buildings 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 located in areas over 4500 degree days shall be provided with special glazing for all exterior glazing. Where the total glazing area exceeds the basic glazing area, treatment shall be required to limit the conducted design heat loss to that which would occur with the basic glazing area in special glazing.

(3) Passive Solar.

In buildings with less than four stories, excluding basements, parking areas and nonhabitable areas, 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 allowable thermal mass shall be no more than 5 Btu/°F per square foot of slab.

(4) Cooled Buildings.

Cooled buildings shall utilize tinted glazing when the total glazing area exceeds the basic glazing area. The glazing area on walls oriented within 22-1/2 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.

(d) Infiltration.

(1) Doors and Windows. All swinging doors and windows exposed to ambient conditions or to unconditioned areas such as garages shall be fully weatherstripped, gasketed or otherwise treated to limit infiltration. All manufactured windows and sliding glass doors shall meet the air infiltration standards of the 1972 American National Standards Institute (A134.1, A134.2, A134.3 and A134.4), when tested in accordance with ASTM E282-73 with a pressure differential of 1.57 lbs/ft<sup>2</sup> and shall be certified and labeled.

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

T20-1404. 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% 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% 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% 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% of the annual heating energy requirement is met by a heat pump.

(C) A system in which at least 60% of the annual heating energy requirement is met by a solar collecting device or other device using a non-depletable source of energy.

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

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

(c) Heating Equipment Sizing. The bonnet capacity of gas central furnaces in buildings for which the building permit is issued before January 1, 1979 shall not exceed the building design heat loss by more than 30 percent. If the building designer or contractor demonstrates that there is no equipment that has been tested by an accepted laboratory or that no equipment has been certified by the Commission pursuant to the Appliance Efficiency Regulations which meets this requirement, then installation of a gas central furnace whose bonnet capacity is not more than 30,000 British thermal units per hour greater than the building design heat loss shall be allowed.

Notwithstanding the above requirements, central gas furnaces whose bonnet capacity does not exceed 48,000 British thermal units per hour may be installed in buildings.

The building design heat loss shall be calculated using methods described in the Residential Energy Design Manual. The bonnet capacity shall be calculated using the method described in American National Standard ANSI Z21.47-1973.

(d) Ducts.

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

(2) Insulation. Insulation of ducts shall conform to the provisions of Section 1005 of the Uniform Mechanical Code, 1976 edition.

T20-1405 Climate Control Equipment

(a) Electrically Operated Air Cooling Systems. No air conditioner of the types described in Section 1601 of the Appliance Efficiency Regulations which was manufactured on or after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations shall be installed in a building for which a building permit is issued on or after such effective date unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of air conditioner. No air conditioner of the types described in Section 1601 of the Appliance Efficiency Regulations, regardless of the date of manufacture, may be installed in a building for which a building permit is issued more than one year after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations, unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of air conditioner.

The energy efficiency ratio of all air conditioners, whose energy input in the cooling mode is entirely electric, and whose standard rated capacity is equal to or greater than 65,000 Btu/hour, installed in buildings for which the building permit is issued on or after the effective date specified, shall be not less than the values shown in Tables 6-1, 6-2, 6-3 based on one of the test procedures specified in Table 6-4.

Table 6-1

Minimum EER for Air Conditioners  
65,000 Btu Per Hour and Over  
(Classification A in Table 6-4)

Effective Date	EER
October 1, 1978	6.8
January 1, 1980	7.5

Table 6-2

Minimum COP of Electrically  
Driven Refrigerant and Condensing  
Units 65,000 Btu/hour and Over  
(Classification B in Table 6-4)

Effective Date	Condensing Means	
	Air	Evaporator or Water
October 1, 1978	2.3	3.3
January 1, 1980	2.5	3.5

Table 6-3

Minimum COP of Electrically  
Driven Water Chilling Packages  
(Classification C in Table 6-4)

Condensing Means	Air	Water
Effective October 1, 1978	C 2.2	3.8
	R 2.1	3.2
Effective January 1, 1980	C 2.3	4.0
	R 2.2	3.4

where C = Centrifugal,  
R = Reciprocating or Rotary

Table 6-4

Test Procedures for Electrically Operated  
Air Cooling Systems

<u>Classification</u>	<u>Type</u>	<u>Test Procedure</u>
A	Unitary Air Conditioning Equipment Commercial and Industrial Unitary Air Conditioning Equipment Air Source Unitary Heat Pump Equipment Water Source Unitary Heat Pump Equipment Commercial and Industrial Heat Pump Equipment	ARI 210-75 ARI 360-75  ARI 240-77  ARI 320-76  ARI 340-76
B	Positive Displacement Refrigerant Condensing Units	ARI 520-74
C	Centrifugal or Rotary Water-Chilling Packages Reciprocating Water-Chilling Packages	ARI 550-77  ANSI/ARI 590-1976

(b) Heat Operated Cooling Equipment. The coefficient of performance of heat-operated cooling equipment installed in buildings for which the building permit is issued on or after the effective date specified shall be not less than the values shown in Table 6-5 when tested at standard rating conditions established in ANSI Standard Z21.40.1-1973, ARI Standard 560-75, ASHRAE Standard 22-71 or ASHRAE Standard 24-71 as applicable. These requirements apply to, but are not limited to, absorption equipment, engine-driven equipment, and turbine driven equipment.

The performance of heat operated (absorption) water chilling equipment shall be based not only on the components included in the unit, but shall include cooling tower fans, pumps, and other parts of the complete system which may be supplied separately. Absorption water chilling units, employing steam or hot water as the energy source, and water cooled absorbers and condensers shall comply with the requirements of ARI Standard for Absorption Water Chilling Packages, 560-75. Direct-Fired, absorption water chillers and air conditioners shall comply with ANSI Standard for Gas-Fired Absorption Summer Air Conditioning Appliances, Z21.40.1-73, with Addenda Z21.40.1a - 1974 and the provisions of the Boiler and Fired Pressure Vessel Safety Orders, Title 8, Chapter 4, California Administrative Code.

Table 6-5

## Minimum COP of Heat-Operated Cooling Equipment

Effective Date	Heat Source	
	Direct Fired (Gas, Oil)	Indirect Fired (Steam, Hot Water)
July 1, 1978	0.40	0.65
January 1, 1980	0.48	0.68

(c) Combustion Type Heating Equipment. (1) No gas-fired comfort heating equipment of the types described in Section 1601 of the Appliance Efficiency Regulations shall be installed in a building for which the building permit was issued on or after the applicable effective date shown in Section 1604 of the Appliance Efficiency Regulations unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of heating equipment.

No gas-fired comfort heating equipment of the types described in Section 1601 of the Appliance Efficiency Regulations, regardless of the date of manufacture, may be installed in a building for which a building permit is issued more than one year after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations, unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of heating equipment.

(2) No gas-fired fan type central furnace or gas-fired fan type wall furnace (except those designed to burn only liquefied petroleum gases) shall be installed in a building for which the building permit is issued on or after the applicable effective date shown in Section 1605 of the Appliance Efficiency Regulations unless it complies with the intermittent ignition device requirements of Section 1603 of the Appliance Efficiency Regulations.

(d) Heat Pumps - Heating Mode. (1) Heat pumps whose energy input is entirely electric, installed in buildings for which the building permit is issued before December 22, 1978, shall, have a Coefficient of Performance (COP) - heating of not less than the values shown in Table 6-7, based on one of the test procedures specified in Table 6-8.

Table 6-7

Minimum COP - Heating  
of Heat Pumps

Air Source		Water Source
47°F outdoor temperature	17°F outdoor temperature	
2.2	1.2	2.2

Test Procedures for  
Heat Pumps - Heating Mode

<u>Type</u>	<u>Test Procedure</u>
Room Air Conditioners	ANSI/AHAM RAC-1
Packaged Terminal Heat Pumps	ARI 380-78
Air Source Unitary Heat Pump Equipment	ARI 240-77
Water Source Unitary Heat Pump Equipment	ARI 320-76
Commercial and Industrial Unitary Heat Pump Equipment	ARI 340-76

(2) No heat pumps of the types described in Section 1601 of the Appliance Efficiency Regulations shall be installed in a building for which the building permit is issued on or after December 22, 1978 unless samples have been tested in accordance with the test procedures described in Section 1603 of the Appliance Efficiency Regulations and the manufacturer has certified to the Commission, pursuant to the requirements of Section 1605 of the Appliance Efficiency Regulations, that the adjusted coefficient of performance, is not less than the values shown in Section 1604 of the Appliance Efficiency Regulations.

(3) The heat pump shall be installed with a control to prevent supplementary heater operation when the heating load can be met by the heat pump alone. Supplementary heater operation is permitted during transient periods, such as start-ups, following room thermostat set-point advance, and during defrost.

A two-stage room thermostat, which controls the supplementary heat on its second stage, shall be accepted as meeting this requirement. The cut-on

temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Supplementary heat may be derived from any source of electric resistance heating or combustion heating.

(e) Identification of Complying Equipment. The energy efficiency ratio, coefficient of performance, adjusted coefficient of performance, thermal efficiency and/or combustion efficiency of equipment described in Subsections T20-1405(a) through T20-1405(d) shall be shown on the documents submitted to the building official for approval and on the equipment.

(f) Electric Resistance Comfort Heating Equipment. The manufacturer of electric resistance comfort heating equipment shall make available to prospective purchasers, designers, or contractors, upon request, full-load energy input, over the range of voltages at which the equipment is intended to operate.

(g) Maintenance. Equipment which requires preventive maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions shall be clearly stated and incorporated on an accessible label, which may be limited to identifying, by title and/or publication number, the operation and maintenance manual for that particular model and type of product.

At least one copy of this information shall be furnished by the manufacturer for the original owner upon request.

(h) Responsibility of Equipment Suppliers. Suppliers of HVAC equipment shall furnish, upon request by prospective purchasers, designers, or contractors, the full and partial capacity and standby input(s) and output(s) of all equipment and components of applied systems, based on equipment in new condition, to enable determination of their compliance with these standards. This includes performance data under modes of operation and ambient conditions necessary to make the analysis outlined in these standards.

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

(i) Intermittent Ignition Devices on Gas Cooking Appliances

No gas-fired household cooking appliance, except those designed to burn only liquefied petroleum gases, or those which do not have an electrical line voltage supply connection and have three or less continuously burning pilot lights, shall be installed unless it has been certified by the Commission as complying with the intermittent ignition device requirements of Section 1604 of the Appliance Efficiency Regulations. No gas-fired, household cooking appliance, except those designed to burn only liquefied petroleum gases and those which do not have an electrical line voltage supply connection and have only one continuously burning pilot light consuming less than 150 Btus per hour, shall be installed in buildings for which a building permit is issued on or after January 1, 1979, unless it has been certified by the Commission.

T20-1406 Water Heating.

(a) Equipment Efficiency. (1) No water heaters of the types described in Section 1601 of the Appliance Efficiency Regulations which was manufactured on or after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations shall be installed in a building for which a building permit is issued on or after such effective date unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of water heater. No water heater of the types described in Section 1601 of the Appliance Efficiency Regulations, regardless of the date of manufacture, may be installed in a building for which a building permit is issued more than one year after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations, unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model water heater.

(2) Gas- and oil-fired automatic, storage heaters shall have a recovery efficiency ( $E_r$ ) of not less than 75 percent and a standby loss percentage (S) not exceeding

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

where: CAP = storage capacity in gallons

The method of test of  $E_r$  and S shall be as described in Section 2.8 of ANSI Z21.10.3 1975-Gas Water Heaters, Vol. III, Circulating Tank, Instantaneous and Large Automatic Storage-Type Water Heaters. For oil-fired units, CF = 1.0; Q = total gallons of oil consumed; and H = total heating value of oil in Btu/gallon.

If the building designer demonstrates that no storage type water heater, whose capacity is within 50 gallons of the required capacity, has been certified by any manufacturer pursuant to the Appliance Efficiency Regulations as meeting the requirement for standby loss, installation in buildings for which the building permit is issued before January 1, 1979, of a storage type water heater whose standby loss exceeds

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

shall be allowed.

(3) Automatic electric storage water heaters installed in buildings for which the building permit is issued before December 22, 1978 shall have a standby loss not exceeding 4 watts per square foot of tank surface area. The method of test of stand-by loss shall be as described in Section 4.3.1 of ANSI C72-1-1972 Household Automatic Electric Storage-Type Water Heaters.

(b) Service Water Heating. Electric resistance water heating systems shall not be used unless the life cycle cost of equivalent natural gas and solar systems exceeds the life cycle cost of the electric resistance system. The procedure for determining life cycle costs is shown in the Residential Energy Conservation Manual.

(c) Swimming Pool Heating.

(1) Any new or replacement fossil fueled swimming pool heater system 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 weatherproof plate or card, easily readable giving instructions for the energy efficient operation of the swimming pool and for the proper care of swimming pool water when a swimming pool cover is used. This subsection shall apply after January 1, 1980.

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

(2) Any new or replacement fossil fueled swimming pool heater installed after January 1, 1982 shall have a thermal efficiency of at least 75 percent when tested in accordance with ANSI Z21.56-1975.

(3) Outdoor pools equipped with a fossil fuel heater shall also be equipped with a pool cover.

(4) Time clocks shall be installed on any new or replacement pool circulation pump not already so equipped so that the pump can be set to run in the off-peak electric demand period (unless required to operate an active solar pool heating system) and for the minimum time necessary to maintain the water in a clear and sanitary condition in keeping with applicable public health standards. Where public health standards require twenty-four hour operation, time clocks shall not be required.

(5) All new pools shall be equipped with directional inlets for good mixing of the pool water.

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

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

(f) Showerheads and Faucets. No showerhead, lavatory faucet or sink faucet of the types described in Section 1601 of the Appliance Efficiency Regulations which was manufactured on or after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations shall be installed in a building for which a building permit is issued on or after such effective date unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards for that model of showerhead, lavatory faucet or sink faucet. No showerhead, lavatory faucet or sink faucet of the types described in Section 1601 of the Appliance Efficiency Regulations, regardless of the date of manufacture may be installed in a building for which a building permit is issued more than one year after the applicable effective date listed in Section 1604 of the Appliance Efficiency Regulations, unless the manufacturer has lawfully certified to the Commission compliance with the appliance efficiency standards of that model of showerhead, lavatory faucet or sink faucet.

1407. Enforcement by the Commission. (a) All plans and energy system specifications for proposed residential buildings in areas where there is no local building department and for proposed public buildings shall be reviewed by the executive director of the Commission or his designee to confirm by written certification that the building satisfies the requirements of this Article.

(b) If a local building department fails to enforce these regulations, the executive director or his designee may, after furnishing ten days written notice to the local building department, review all plans and energy system specifications for proposed residential buildings to confirm by written certification that the building satisfies the requirements of this Article.

(c) The executive director may promulgate such procedures for the submission of plans and specifications as are necessary and reasonable to carry out the purposes of these regulations.

1408. Interpretations by the Commission. The Commission or its designee may make a determination as to the application or interpretation of Sections 25402(a) and (b) of the Public Resources Code or these regulations if a dispute arises between an applicant for a building permit and the building department. Either party may request such a determination and shall submit the request in writing. The Commission or its designee shall make written replies to such requests which shall be binding on the parties except for replies made by a designee which may be appealed to the full Commission for final determination. Those interpretations which have wide application or interest shall be broadly published.

1409. Enforcement of State and Local Energy Conservation Standards.

(a) Nothing in this Article or Sections 25402(a), 25402(b), and 25402.1 of the Public Resources Code shall prohibit the enforcement of state or local energy conservation or energy insulation standards adopted prior to July 1, 1978, with regard to any residential buildings on which actual site preparation and construction have commenced prior to July 1, 1978.

(b) Nothing in this Article or Sections 25402(a), 25402(b) and 25402.1 of the Public Resources Code shall prohibit the enforcement of local energy conservation or energy insulation standards, whenever adopted, with regard to any residential building on which actual site preparation and construction have not commenced prior to July 1, 1978, provided the Commission finds that such local standards will require the diminution of energy consumption levels permitted by this Article for residential buildings.

(1) Any local agency requesting such a finding shall submit the following to the Commission: (A) a copy of its local energy conservation or energy insulation standards, (B) any supplementary materials needed for determination of energy savings and (C) a short statement describing how its local standards will require the diminution of energy consumption levels permitted by these regulations. Twelve copies of the above materials shall be submitted unless the executive director indicates otherwise. Any additional material that is needed for a complete staff analysis may be requested from the local agency by the executive director, general counsel or their designees.

(2) The executive director shall distribute copies of the material to each member and ex officio member, the general counsel, the public adviser, and all persons who have requested in writing that a copy of the materials be provided.

(3) As soon as practicable, the executive director or his designee shall analyze the submitted materials. No later than 45 days after submission of the materials, the executive director, or his designee, in consultation with the general counsel, shall issue a recommendation on whether the local agency's standards will require the diminution of energy consumption levels permitted by these regulations. Such recommendation shall be considered at the next regularly scheduled Commission business meeting, but in no event shall it be considered before ten days notice has been given to the local agency.

(4) The executive director shall notify each local agency whose request has been filed and for which a recommended decision has been prepared, of the receipt of the filing, the number assigned to the filing, the date, time, and place at which the filing will be considered by the Commission, the recommended decision, and the general procedure of the Commission concerning hearings. Notice shall also be sent to any person requesting notice in writing.

(5) At the hearing, the executive director shall enter into the record all evidence relating to the local agency's filing. Notice of the Commission's decision shall be sent to the local agency and to any person who has requested such notice.

1410. Claims of Exemption. Any person who has not begun actual site preparation and construction and who wishes to claim an exemption for any proposed building from the requirements of Sections 25402 and 25402.1 of the Public Resources Code and the regulations adopted pursuant thereto must file a claim of exemption and obtain approval in accordance with the provisions of this Article. The claimant in all proceedings under this Article shall assume the burden of proof.

1411. Filing and Distribution of Claims of Exemption. (a) All claims of exemption shall be made on forms published by the executive director. The forms shall be revised as necessary to assist claimants in providing the information necessary to substantiate a claim. The claim shall be verified by the claimant under penalty of perjury.

(b) The claimant shall also furnish the following supporting documentation where relevant:

- (1) Contracts entered into by the claimant pertaining to the project.
- (2) Internal financial reports relative to the project accounts.
- (3) Dated schedules of design activities.
- (4) A progress report on project completion.
- (5) Any additional evidence in support of the claim.

(c) The claimant shall submit twelve copies of the claim of exemption to the executive director. Only one copy of supporting documentation need be included unless the executive director requests otherwise.

(d) At any time after submission of a claim, the executive director, general counsel or their designees may request from the claimant such information as is needed for a complete staff analysis of the claim.

(e) The executive director shall distribute copies of the claim to each member and ex officio member, the general counsel, the public adviser, and all persons who have requested in writing that a copy of the claim be provided.

1412. Initial Review and Recommendation on Claims of Exemption.

(a) As soon as practicable after filing of a claim, the executive director shall review and prepare a summary of the claim. No later than 45 days after filing of a claim, the executive director, in consultation with the general counsel, shall submit a written recommendation for action on the claim and reasons therefor to the Commission. Such recommendation shall be considered at the next regularly scheduled Commission business meeting, but in no event shall it be considered before ten days notice has been given to the claimant.

(b) Notice. The executive director shall notify each claimant whose claim has been filed, and for which a recommended decision has been prepared, of the receipt of the filing, the number assigned to the claim, the date, time, and place at which the claim will be considered by the Commission, the recommended decision, and the general procedure of the Commission concerning hearings and action on claims. Notice shall also be sent to any person requesting notice in writing.

(c) The meeting agenda need only specify that claims for exemption pursuant to Sections 25402 and 25402.1 of the Public Resources Code will be considered. Notice of the specific claims that will be considered each week need be sent only to the claimant, the members and ex officio members, the general counsel, the public adviser, and those persons who have requested in writing such notice.

1413. Hearing Procedure for Claims of Exemption. (a) All claims shall be placed on the consent calendar for public hearing and processed in the manner provided by Title 20, Section 1104(e). Upon the request of any interested person with the concurrence of a commissioner, a claim shall be removed from the consent calendar and shall be considered at the same meeting or continued to a later meeting as a separate item of business. Such requests may be made orally at the hearing or in writing prior to the hearing at which a claim is scheduled to be considered.

(b) At the hearing, the executive director shall enter into the record all evidence relating to the claim.

(c) No claim shall be approved unless the Commission finds that:

(1) Substantial funds have been expended in good faith on planning, designing, architecture or engineering prior to March 23, 1977;

(2) Compliance with Sections 25402 and 25402.1 of the Public Resources Code and regulations adopted pursuant thereto would be impossible without substantial delays in construction; and

(3) Compliance with Sections 25402 and 25402.1 of the Public Resources Code and regulations adopted pursuant thereto would be impossible without substantial increases in cost of construction.

(d) A proposed building shall be presumed to be one for which compliance would be impossible without substantial delays and increases in cost of construction, and for which substantial funds have been expended in good faith on planning, designing, architecture, or engineering prior to the date of adoption of this Article if all of the following conditions are satisfied:

(1) The building has an occupant load greater than 299, as determined from Table 2-2 of Article 2 of this subchapter.

(2) By January 1, 1978, (i) a legally enforceable written lease had been executed; or binding financing commitment had been made, or an application submitted to a governmental agency for a permit or approval, and (ii) where such lease, financing commitment, permit, or approval would be lost if design changes to the building were necessary in order to comply with the energy conservation standards; and

(3) By January 1, 1978, all of the following documents had been completed and at least one of them submitted to a governmental entity in support of an application for a permit or approval: site plan, floor plan, building elevations, schematic drawings, outline specification, and tentative budget.

(e) The decision on the claim shall either approve or disapprove the claim in whole or in part, and shall include a statement of reasons supporting the decision. A certificate of exemption shall be issued for those claims which the Commission approves. Unless otherwise decided by the Commission, the executive director's report and recommended decision shall be deemed adopted as the statement of reasons supporting the decision. The Commission's decision shall be final.

(f) Notice of the decision shall be sent to the claimant and to any person who has requested such notice.

T20-1414. Energy Insulation Standards for Buildings For which a Building Permit is Issued before July 1, 1978. (a) Scope. The requirement of this section shall apply to all applications for building permits made subsequent to December 23, 1976 but shall not apply to any building for which a building permit is issued on or after July 1, 1978. Additions to existing hotels, motels, apartment houses, lodging houses, dwellings and other residential buildings shall be constructed to comply with this section if the existing building was required to be constructed in conformance with this section.

(b) Alternate Materials, Method of Construction, Design or Insulation System. The requirements of subsection T20-1401(d) shall apply to this section.

(c) Definitions. The definitions in subsection T20-1401(e) shall apply to this section.

(d) Thermal Design Standards For Ceiling and Walls. The design of the opaque surfaces of the structure, exposed to ambient conditions, shall provide a maximum U factor of 0.05 for ceilings and 0.08 for walls and spandrels, when the effects of occasional framing members such as studs and joists are not considered. In lieu of the above, when the effects of all elements of the wall or ceiling construction, including occasional framing members such as studs and joists, are considered or when all of the thermal insulation is installed so that it is not penetrated by framing members, the U factor shall not exceed 0.095 for walls and 0.06 for ceilings.

For buildings located in areas of 3500 degree days or less and the effects of all elements of the wall construction are considered, the U factor shall not exceed 0.12 for walls with a construction weight of 26 through 40 pounds per square foot or a U factor not exceeding 0.16 for walls with a construction weight greater than 40 pounds per square foot.

(e) Thermal Design Standards For Glazing.

(1) For heating buildings 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.

(2) Heated buildings 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) Cooled buildings shall utilize tinted glazing when the total glazing area exceed the basic glazing area. The glazing area on walls oriented within 22 1/2 degrees of true North need not be included in 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.

(4) Tinted glazing shall have a maximum shading coefficient of 0.55.

(f) Floor Section, Foundation Walls, Crawl Space Plenum Walls and Slabs-On-Grade. For floors over unheated spaces, unheated basements, unheated garages, or ventilated crawl spaced with operable louvers, the "U" values of floor section shall not exceed the value shown in Table D.

Table D

Maximum "U" Values of Floor Sections Over Unheated Basements, Unheated Garage or Crawl Spaces

Heating Degree Days	Maximum "U" Value
3000 or less . . . . .	No requirement
3001 to 4500 . . . . .	0.10
Over 4500 . . . . .	0.08

Note: A basement or garage shall be considered unheated unless it is provided with a positive heat supply to maintain a minimum temperature of 50°F.

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 C. Insulation may be omitted from floors over heated basement areas or heated crawl spaces if foundation walls are insulated. A crawl space is considered heated when it has a positive heat supply to maintain a minimum temperature of 50°F.

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.

For slab-on-ground floors, the edge heat loss around the perimeter of heated spaces shall not exceed a maximum value per linear foot of exposed edge of 42 Btuh for heated slabs. Calculations of heat loss around slab edges shall be made using the following formula:

$$H = F \times P$$

WHERE

H = Heat loss of the slab edge in Btuh

F = Heat loss coefficient from Table E in Btuh per linear foot of exposed edge.

P = Perimeter of exposed slab edge (linear feet)

Table E

## Slab Edge Heat Loss Coefficients (Btuh per Linear Foot)

Winter Design Temperature	Total Width of Insulation (Inches)	F for Unheated Slab			F for Heated Slab		
		R=5.00	R=3.75	R=2.50	R=5.00	R=3.75	R=2.50
-30 or colder	24	34			46		
-25 to -29	24	32			44		
-20 to -24	24	30			41		
-15 to -19	24	28			39		
-10 to -15	24	27	40		37		
- 5 to - 9	24	25	38		35		
Zero to -4	24	24	36		32	48	
+ 5 to + 1	24	22	33		30	45	
+10 to + 6 <sup>1</sup>	18	21	31	42	25	38	50
+15 to +11 <sup>1</sup>	12	21	31	42	25	38	50

<sup>1</sup>Where winter design temperatures are warmer than +15F, perimeter insulation is not required. If installed in these areas (edge only) use values shown for +15F to +11F above. If not installed, use value of F = 45 for unheated and F = 60 for heated slabs.

(g) Doors and Windows. All swinging doors and windows opening to the exterior to unconditioned areas such as garages shall be fully weather-stripped, gasketed or otherwise treated to limit infiltration. All manufactured windows and sliding glass doors shall meet the air infiltration standards of the 1972 American National Standards Institute (A134.1, A134.2, A134.3 and A134.4), when tested in accordance with ASTM E283-73 with a pressure difference of 1.5 lb/ft<sup>2</sup> and shall be certified and labeled.

(h) Loose Fill. Blown or poured type loose fill may be used in attic spaces where the slope of the roof is not less than 2 1/2 feet in 12 feet and there is at least 30 inches of clear headroom at the roof ridge. ("Clear Headroom" is defined as the distance from the top of the bottom chord of the truss or ceiling joists to the underside of the roof sheathing.) 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. When loose fill insulation is proposed, the R value of the material required to meet these regulations shall be shown on the building plans.

(i) Design Temperature. Inside winter design temperature shall not be less than 70°F., and summer design temperature not greater than 78°F. Heat loss and heat gain calculations shall be made using the winter design dry bulb

at 99 percent and summer design dry bulb at 2 1/2 percent shown in the current ASHRAE. Handbook of Fundamentals.

(j) Pipe Insulation. All steam and steam condensate return piping and all continuously circulating domestic or heating hot water piping which is located in attics, garages, crawl spaces or unheated spaces other than between floors or in interior walls shall be insulated to provide a maximum heat loss of 50 Btu/hr, per linear foot for piping up to and including 2" and 100 Btu/hr, per linear foot for larger sizes.

(k) Compliance. Upon completion of the installation of insulation, a card certifying that the insulation has been installed in conformance with the requirements of these regulations shall be completed and executed by the insulation applicator and by the builder. This insulation compliance card shall be posted at a conspicuous location within the dwelling.



## APPENDIX T20-A

Climate Design Data

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
Alameda Naval Air Station	2,900	35 °F	78 °F
Alderpoint	3,290		
Alpine	2,104	32	98
Alturas	6,785	-1	90
Anaheim	1,490	35	91
Antioch	2,627	30	93
Arcata	4,800	32	65
Auburn	3,047	31	96
Bakersfield	2,122	30	101
Barrett Dam	2,363	26	97
Barstow	2,496	24	102
Beale AFB	2,400	28	100
Beaumont	2,790	28	96
Benicia	2,600	33	90
Berkeley	2,850	39	84
Bishop	4,275	16	98
Blythe AP	1,076	31	109
Bolinas	2,800	36	75
Bonita	1,897	32	91
Borrego Springs	1,262	28	106
Brawley	1,161	32	110
Brisbane	3,060	36	78
Burbank AP	1,800	36	96
Burlingame	2,650	34	79
Burney	6,249	5	90
Buttonwillow	2,010	23	102
Cabrillo NM	1,653	43	85
Calaveras Big Trees	5,736		
Calabasas	1,800	31	98
Campo	3,247	21	96
Capitola	2,900	34	82
Carmel	2,900	35	78
Carmichael	2,800	31	98
Carpinteria	2,290	34	85
Castle AFB	2,550	30	99
Castroville	2,900	32	82
Central Valley	3,010	29	99
Ceres	2,750	30	99
Chico	2,795	29	100
China Lake	2,570	22	106

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
Chowchilla	2,400	30	99
Chula Vista	2,229	36	80
Claremont	1,600	33	98
Cloverdale	2,666	31	96
Clovis	2,600	28	101
Colfax	3,441	25	89
Colusa	2,788	30	100
Concord	2,766	32	92
Corning	2,790	30	101
Corona	1,875	33	95
Corte Madera	2,600	33	88
Crescent City	4,545	33	69
Culver City	1,711	38	88
Cuyamaca	4,649	16	86
Daggett AP	2,203	24	103
Daly City	3,100	37	76
Danville	2,700	28	94
Davis	2,819	30	99
Death Valley	1,205	35	116
Deep Spr. Clg.	4,300	28	95
Delano	2,220	31	103
Dixon	2,800	30	98
Dunsmuir	5,300	16	94
Edwards AFB	3,123	21	102
El Cajon	1,920	30	96
El Capitan Dam	1,397	32	100
El Centro	1,216	31	110
Elk Valley	5,404		
Elsinore	2,101	28	102
Encinitas	1,952	39	83
Escondido	2,052	31	93
Eureka	4,679	35	65
Fairfield	2,434	30	95
Fairmont	3,327	28	94
Fair Oaks	2,900	29	99
Fillmore	2,377	33	90
Folsom	2,899	30	99
Fort Bidwell	6,365		
Fort Bragg	4,424	34	67
Fort Jones	5,614		

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
Fortuna	4,700	34	72
Fremont	2,906	30	89
Fresno	2,611	29	99
Galt	2,780	30	97
Garberville	3,510	30	85
Gardena	1,700	37	86
Gilroy	2,808	28	94
Grass Valley	4,400	26	93
Gridley	2,600	30	100
Gustine	2,360	30	100
Half Moon Bay	2,700	35	73
Hamilton Air Force Base	2,600	33	85
Hanford	2,642	28	100
Hawthorne	1,800	37	88
Hayward	2,850	30	85
Healdsburg	2,700	30	94
Henshaw Dam	3,652	20	96
Hetch Hetchy	4,797	18	90
Hillsdale	2,650	35	83
Hollister	2,725	30	91
Huntington Beach	2,361	40	81
Imperial Airport	1,060	33	109
Independence	2,995	19	96
Inyokern	2,570	23	102
Lone	2,728	28	96
Jackson	2,760	31	91
Julian Wynola	4,085	21	91
King City	2,655	25	93
Lafayette	2,700	29	92
Laguna Beach	2,262	37	80
La Jolla	1,750	40	84
Lake Arrowhead	5,200	20	86
Lakeport	3,716	25	89
Lakewood	1,800	38	90
La Mesa	1,492	37	91
Lancaster	3,100	17	102
Laytonville	4,160	25	90
Lemoore	2,960	29	100
Lincoln	2,890	30	100
Lindsay	2,619	30	100

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
Live Oak	2,370	30	100
Livermore	2,781	28	97
Lodi	2,785	30	97
Lompoc	2,900	30	78
Long Beach Airport	1,803	38	84
Los Angeles Airport	2,061	41	85
Los Banos	2,267	28	100
Los Gatos	2,794	32	89
McCloud	6,007	11	86
Madera	2,485	30	100
Manteca	2,600	30	98
Maricopa	2,165	32	101
Mariposa	3,116	27	96
Markleeville	7,884	8	83
Martinez	2,650	32	91
Marysville	2,377	32	100
Mecca	1,117	29	108
Mendota	2,555	29	100
Merced	2,697	29	99
Mineral	7,192		
Mitchell Cavern	2,510	26	99
Modesto	2,767	32	98
Moffett Naval Air Station	2,800	34	85
Mojave	2,590	25	100
Monterey	2,985	34	82
Morro Bay	1,600	36	83
Mount Shasta	5,800	14	87
Napa	2,690	31	92
Needles Airport	1,072	33	110
Nellie	4,745		
Nevada City	4,488	20	93
Newport Beach	2,350	37	80
Novato	2,815	30	89
Oakdale	2,832	28	99
Oak Grove	3,516	26	95
Oakland	2,906	35	85
Oceanside	2,092	37	82
Orland	2,830	30	101
Oroville	2,597	30	100
Oxnard	2,352	35	86

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
Palmdale Airport	3,088	24	101
Palm Springs	1,232	31	110
Palo Alto	2,869	34	88
Palomar, Mt. Observatory	3,868	21	84
Paradise	4,010	28	97
Pasadena	1,694	35	93
Paso Robles Airport	2,890	26	100
Patterson	2,368	30	100
Perris	2,100	27	101
Petaluma	2,966	29	91
Pismo Beach	2,800	34	85
Pittsburg	2,633	32	93
Placerville	4,161	25	96
Point Loma	1,860	44	83
Pomona	2,166	31	96
Porterville	2,563	30	100
Portola	7,055	-1	88
Quincy	5,852	10	93
Ramona Spaulding	2,223	26	99
Red Bluff	2,688	31	101
Redding	2,610	31	101
Redlands	2,052	34	96
Redwood City	2,596	32	86
Richmond	2,644	35	85
Ripon	2,700	30	99
Riverside	2,089	32	100
Roseville	2,899	30	100
Sacramento Executive Airport	2,782	29	97
St. Helena	2,833	28	95
Salinas	2,959	32	85
San Bernardino	2,018	31	101
San Clemente	1,877	38	81
San Diego	1,439	42	84
San Fernando	1,800	34	97
San Francisco Airport	3,080	42	80
San Jacinto	2,376	25	105
San Jose	2,656	34	88
San Juan Capistrano	1,646	39	82
San Luis Obispo	2,582	35	90

<u>City</u>	<u>Annual Heating Degree Days</u>	<u>Winter Design - 1%</u>	<u>Summer Design - 2 1/2%</u>
San Mateo	2,655	36	87
San Rafael	2,619	34	90
Santa Ana	1,496	33	91
Santa Barbara	2,290	34	84
Santa Clara	2,566	31	88
Santa Cruz	2,900	32	84
Santa Maria	2,985	32	82
Santa Paula	2,400	32	93
Santa Rosa	2,980	29	93
Scotia	3,954	34	78
Sierraville	6,953		
Sonora	3,086	29	96
South San Francisco	3,061	36	79
South San Gabriel	1,600	34	95
Squaw Valley	8,200	-2	84
Stockton	2,690	30	98
Stony Gorge Reservoir	3,124	29	99
Susanville	6,248	4	89
Tahoe City	8,162	7	77
Tahoe Valley	8,198	2	84
Thousand Oaks	2,425	32	93
Tracy	2,616	30	98
Truckee	8,208	-4	84
Twentynine Palms	2,006	28	104
Ukiah	3,030	27	96
Vacaville	2,812	29	98
Vallejo	2,598	33	88
Vincent	3,510	21	99
Visalia	2,526	32	100
Vista	2,546	35	87
Warner Springs	3,470	24	96
Weaverville	4,935	16	96
Weed	5,870	8	86
Willits	4,160	17	89
Willows	2,807	30	100
Woodland	2,447	30	100
Yosemite Energy Resources Conservation and Development Commission	4,800	18	90
Yreka	5,393	13	94
Yuba City	2,386	31	100

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