Ordinance No. 120525

Council Bill No. 113795

The City of Seattl
Council Bill/Ordina

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") that adopted the 2000 Washington State Energy Code with Seattle amendments and amending the Energy Code Sections 1132.2, 1132.3, 1133, 1301, 1310.2, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1401, 1411.1, 1411.4, 1412.2, 1412.4, 1412.6, 1412.8, 1413, 1413.2, 1413.3, 1414.1, 1416, 1421.1, 1423, 1431.2, 1432.2, 1433, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530, 1532, and Tables 10-5B, 10-6, 13-1, 14-4, and 15-1, and the title to Chapter 15; adding new Sections 1413.4, 1436.2, 1436.3, 1540, and new Tables 14-1A, 14-1B, 14-1C, 14-1D, 14-1E, 14-1F, 14-1J, 14-1K, 14-1L, 14-1M, and new Section 3.6.5 to Reference Standard 29 of the Energy Code; and repealing Tables 14-1, 14-2, and 14-3 of the Energy Code.

CF No.

Date Introduced: AUG 13 2001	
Date 1st Referred: AUG 13 2001	To: (committee) Energy & Environmental Policy Committee
Date Re - Referred:	To: (committee)
Date Re - Referred:	To: (committee)
Date of Final Passage: 9/10/01	Full Council Vote: 9-0
Date Presented to Mayor:	Date Approved: 9/13/01
Date Returned to City Clerk: 9/14/01	Date Published: 5 3pg T.O. F.T. 2
Date Vetoed by Mayor:	Date Veto Published:
Date Passed Over Veto:	Veto Sustained:

9/13/01

9/10/01 Full C

This file is complete and ready

Law Departmen

Law Dept. Review

The City of Seattle - Legislative Department

WILLS

Council Bill/Ordinance sponsored by: WILLS
Councilmember

Committee Action:

9/13/01 PASSED AS AMENDED 3-0 CON, RC, KP

9/17/01 Full Council Vote 9-0

This file is complete and ready for presentation to Full Council. Committee: _____
(Initial/Date)

Law Department

Law Dept. Review	OMP Review	City Clerk Review	Electronic Copy Loaded	Indexed

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9/13/01
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ORDINANCE 120525

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") that adopted the 2000 Washington State Energy Code with Seattle amendments and amending the Energy Code Sections 1132.2, 1132.3, 1133, 1301, 1310.2, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1401, 1411.1, 1411.4, 1412.2, 1412.4, 1412.6, 1412.8, 1413, 1413.2, 1413.3, 1414.1, 1416, 1421.1, 1423, 1431.2, 1432.2, 1433, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530, 1532, and Tables 10-5B, 10-6, 13-1, and 15-1, and the title to Chapter 15; adding new Sections 1413.4, 1436.2, 1436.3, 1540, and new Tables 14-1A, 14-1B, 14-1C, 14-1D, 14-1E, 14-1F, 14-1J, 14-1K, 14-1L, 14-1M, and new Section 3.6.5 to Reference Standard 29 of the Energy Code; and repealing Tables 14-1, 14-2, and 14-3 of the Energy Code.

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Section 22.700.010, SMC, as last amended by Ordinance 120378 is further amended as follows:

22.700.010 Adoption of the 2000 Washington State Energy Code and local amendments.

The 2000 Washington State Energy Code (WAC 51-11) and the amendments thereto adopted by Ordinance 120378 incorporating the Seattle Amendments, and amendments made by the Washington State Building Code Council to the 2000 Washington State Energy Code filed January 5, 2001 (WSR 01-03-010), which is filed with the City Clerk in C.F. 304655, and further amendments made in Ordinance 120525 are hereby adopted and by this reference made a part of this subtitle and shall constitute the official Energy Code of the City. The 1997 Washington State Energy Code, and amendments thereto, are hereby repealed.

Section 2. Table 10-5B of the Energy Code is amended as follows:

TABLE 10-5B(1)
Group R Occupancy:
Default U-Factors for Concrete and Masonry Walls

8" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.40	0.23	0.24	0.43
R-5 Interior Insulation, Wood Furring	0.14	0.11	0.12	0.15

R-6 Interior Insulation, Wood Furring	0.14	0.11	0.11	0.14
R-10.5 Interior Insulation, Wood Furring	0.11	0.09	0.09	0.11
R-8 Interior Insulation, Metal Clips	0.11	0.09	0.09	0.11
R-6 Exterior Insulation	0.12	0.10	0.10	0.12
R-10 Exterior Insulation	0.08	0.07	0.07	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.09	0.09	0.12

12" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.35	0.17	0.18	0.33
R-5 Interior Insulation, Wood Furring	0.14	0.10	0.10	0.13
R-6 Interior Insulation, Wood Furring	0.13	0.09	0.10	0.13
R-10.5 Interior Insulation, Wood Furring	0.11	0.08	0.08	0.10
R-8 Interior Insulation, Metal Clips	0.10	0.08	0.08	0.09
R-6 Exterior Insulation	0.11	0.09	0.09	0.11
R-10 Exterior Insulation	0.08	0.06	0.06	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.08	0.09	0.12

8" CLAY BRICK

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.50	0.31	0.32	0.56
R-5 Interior Insulation, Wood Furring	0.15	0.13	0.13	0.16
R-6 Interior Insulation, Wood Furring	0.15	0.12	0.12	0.15
R-10.5 Interior Insulation, Wood Furring	0.12	0.10	0.10	0.12
R-8 Interior Insulation, Metal Clips	0.11	0.10	0.10	0.11
R-6 Exterior Insulation	0.12	0.11	0.11	0.13
R-10 Exterior Insulation	0.08	0.08	0.08	0.09

6" CONCRETE POURED OR PRECAST

WALL DESCRIPTION	CORE TREATMENT

	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	NA	NA	NA	0.61
R-5 Interior Insulation, Wood Furring	NA	NA	NA	0.16
R-6 Interior Insulation, Wood Furring	NA	NA	NA	0.15
R-10.5 Interior Insulation, Wood Furring	NA	NA	NA	0.12
R-8 Interior Insulation, Metal Clips	NA	NA	NA	0.12
R-6 Exterior Insulation	NA	NA	NA	0.13
R-10 Exterior Insulation	NA	NA	NA	0.09

Notes for Default Table 10-5B(1)

1. Grouted cores at 40" x 48" on center vertically and horizontally in partial grouted walls.
2. Interior insulation values include 1/2" gypsum board on the inner surface.
3. Furring and stud spacing is 16" on center. Insulation is assumed to fill furring space and is not compressed.
4. Intermediate values may be interpolated using this table. Values not contained in this table may be computed using the procedures listed in Standard RS-27.

TABLE 10-5B(2)
Other than Group R Occupancy:
Default U-Factors for Concrete and Masonry Walls

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (Cores uninsulated except where specified)
No Framing	R- 0	U- 0.740	U- 0.580	U- 0.480
	Ungrouted Cores Filled with Loose-Fill Insulation	N.A.	N.A.	U- 0.350
Continuous Wood Framing				
0.75 in.	R- 3.0	U- 0.247	U- 0.226	U- 0.210
1.5 in.	R- 6.0	U- 0.160	U- 0.151	U- 0.143
2.0 in.	R- 10.0	U- 0.116	U- 0.111	U- 0.107
3.5 in.	R- 11.0	U- 0.094	U- 0.091	U- 0.088
3.5 in.	R- 13.0	U- 0.085	U- 0.083	U- 0.080
3.5 in.	R- 15.0	U- 0.079	U- 0.077	U- 0.075
5.5 in.	R- 19.0	U- 0.060	U- 0.059	U- 0.058
5.5 in.	R- 21.0	U- 0.057	U- 0.055	U- 0.054
Continuous Metal Framing at 24 in. on center horizontally				
0.75 in.	R- 3.0	U- 0.364	U- 0.321	U- 0.288
1.5 in.	R- 6.0	U- 0.274	U- 0.249	U- 0.229
2.0 in.	R- 10.0	U- 0.225	U- 0.207	U- 0.193
3.5-4.0 in.	R- 11.0	U- 0.168	U- 0.158	U- 0.149
3.5-4.0 in.	R- 13.0	U- 0.161	U- 0.152	U- 0.144
3.5-4.0 in.	R- 15.0	U- 0.155	U- 0.147	U- 0.140
5.5-6.0 in.	R- 19.0	U- 0.118	U- 0.113	U- 0.109
5.5-6.0 in.	R- 21.0	U- 0.113	U- 0.109	U- 0.105
1 in. Metal Clips at 24 in. on center horizontally and 16 in. vertically				
1.0 in.	R- 3.8	U- 0.210	U- 0.195	U- 0.182
1.0 in.	R- 5.0	U- 0.184	U- 0.172	U- 0.162
1.0 in.	R- 5.6	U- 0.174	U- 0.163	U- 0.154
1.5 in.	R- 5.7	U- 0.160	U- 0.151	U- 0.143

1.5 in.	R- 7.5	U- 0.138	U- 0.131	U- 0.125
1.5 in.	R- 8.4	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 7.6	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 10.0	U- 0.110	U- 0.106	U- 0.102
2.0 in.	R- 11.2	U- 0.103	U- 0.099	U- 0.096
2.5 in.	R- 9.5	U- 0.109	U- 0.104	U- 0.101
2.5 in.	R- 12.5	U- 0.092	U- 0.089	U- 0.086
2.5 in.	R- 14.0	U- 0.086	U- 0.083	U- 0.080
3.0 in.	R- 11.4	U- 0.094	U- 0.090	U- 0.088
3.0 in.	R- 15.0	U- 0.078	U- 0.076	U- 0.074
3.0 in.	R- 16.8	U- 0.073	U- 0.071	U- 0.069
3.5 in.	R- 13.3	U- 0.082	U- 0.080	U- 0.077
3.5 in.	R- 17.5	U- 0.069	U- 0.067	U- 0.065
3.5 in.	R- 19.6	U- 0.064	U- 0.062	U- 0.061
4.0 in.	R- 15.2	U- 0.073	U- 0.071	U- 0.070
4.0 in.	R- 20.0	U- 0.061	U- 0.060	U- 0.058
4.0 in.	R- 22.4	U- 0.057	U- 0.056	U- 0.054
5.0 in.	R- 28.0	U- 0.046	U- 0.046	U- 0.045
Continuous Insulation Uninterrupted by Framing				
No Framing	R- 3.0	U- 0.230	U- 0.212	U- 0.197
	R- 4.0	U- 0.187	U- 0.175	U- 0.164
	R- 5.0	U- 0.157	U- 0.149	U- 0.141
No Framing	R- 6.0	U- 0.136	U- 0.129	U- 0.124
	R- 7.0	U- 0.120	U- 0.115	U- 0.110
	R- 8.0	U- 0.107	U- 0.103	U- 0.099
	R- 9.0	U- 0.097	U- 0.093	U- 0.090
	R- 10.0	U- 0.088	U- 0.085	U- 0.083
No Framing	R- 11.0	U- 0.081	U- 0.079	U- 0.076
	R- 12.0	U- 0.075	U- 0.073	U- 0.071
	R- 13.0	U- 0.070	U- 0.068	U- 0.066
	R- 14.0	U- 0.065	U- 0.064	U- 0.062
	R- 15.0	U- 0.061	U- 0.060	U- 0.059
No Framing	R- 16.0	U- 0.058	U- 0.056	U- 0.055
	R- 17.0	U- 0.054	U- 0.053	U- 0.052
	R- 18.0	U- 0.052	U- 0.051	U- 0.050
	R- 19.0	U- 0.049	U- 0.048	U- 0.047
	R- 20.0	U- 0.047	U- 0.046	U- 0.045

Notes for Default Table 10-5B(2)

1. It is acceptable to use the U-factors in Table 10-5B(2) for all concrete and masonry walls, provided that the grouting is equal to or less than that specified.
   – For ungrouted walls, use the partially-grouted column.
   – For metal studs and z-furring, use the continuous-metal-framing category.
   – For discontinuous metal clips 1 inch square or smaller, use the metal-clip category.
   – For insulation that is attached without any framing members (e.g. glued), use the continuous-insulation-uninterrupted-by-framing category. Continuous insulation may be installed on the interior or exterior of masonry walls, or between stand-alone walls in multi-layer masonry walls, or on the interior or exterior of the concrete.

2. For Table 10-5B(2), the U-factor includes R-0.17 for exterior air film and R-0.68 for interior air film - vertical surfaces. For insulated walls, the U-factor also includes R-0.45 for 0.5 in. gypsum board. U-factors are provided for the following configurations:
   (a) Concrete wall: 8-in. normal weight concrete wall with a density of 145 lb/ft^3.
   (b) Solid grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 and solid grouted cores.
   (c) Partially grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 having reinforcing steel every 32 in. vertically and every 48 in. horizontally, with cores grouted in those areas only. Other cores are filled with insulating material only if there is no other insulation.

3. For walls with insulation contained in a framing layer, the U-factors in Table 10-5B(2) assume contact (and thermal bridging) between the mass wall and other framing. For wall assemblies with multiple layers where the wood or metal framing layer does not contact the concrete or masonry layer (i.e. walls with an airspace between the stud wall layer and the mass wall layer), it is acceptable to use the appropriate wood or metal frame wall default U-factors in Tables 10-5 or 10-5A. Note, it is acceptable to use this approach where the insulation extends beyond the framing and is in contact with the mass wall layer (e.g. a nominal four-inch metal stud containing insulation that is nominally six inches thick and therefore extends two inches beyond the back of the metal stud).

4. Except for wall assemblies qualifying for note 3, if not taken from Table 10-5B(2), mass wall U-factors shall be determined in accordance with ASHRAE/IESNA Standard 90.1-1999, Appendix A, Section A3.1 and Tables A-5 to A-8, or Section A9.4. If not taken from Table 10-9, heat capacity for mass walls shall be taken from ASHRAE/IESNA Standard 90.1-1999, Appendix A, Table A-6 or A-7.

Section 3. Table 10-6 of the Energy Code is amended as follows:

TABLE 10-6
Other than Group R Occupancy:
Default U-Factors for Vertical Glazing, Overhead Glazing and Opaque Doors

Vertical Glazing (including frame)

	U-Factor		
	Any Frame	**Aluminum w/ thermal break**	**Vinyl/ Wood Frame**
Single	1.45	1.45	1.45
Double	0.90	0.85	0.75
½ Inch Air, Fixed	0.75	0.70	0.60
½ Inch Air, Low-e$^{(0.40)}$, Fixed	0.60	0.55	0.50
½ Inch Air, Low-e$^{(0.10)}$, Fixed	0.55	0.50	0.45
~~½ Inch Argon, Low-e$^{(0.30)}$, Fixed~~	~~0.55~~	~~0.50~~	~~0.45~~
½ Inch Argon, Low-e$^{(0.10)}$, Fixed	0.50	0.45	0.40

The category for aluminum frame with a thermal break is as defined in footnote 7 to Table 10-6A.

Overhead Glazing: Sloped Glazing (including frame)

	U-Factor		
	Any Frame	**Aluminum w/ thermal break**	**Vinyl/ Wood Frame**
Single	1.74	1.74	1.74
Double	1.08	1.02	0.90
½ Inch Air, Fixed	0.90	0.84	0.72

½ Inch Air, Low-e$^{(0.40)}$, Fixed	0.72	0.66	0.60
½ Inch Air, Low-e$^{(0.10)}$, Fixed	0.66	0.60	0.54
½ Inch Argon, Low-e$^{(0.10)}$, Fixed	0.60	0.54	0.48

This default table is applicable to sloped glazing only. (Sloped glazing is a multiple-lite glazed system (similar to a curtain wall) that is mounted at a slope greater than 15 degrees from the vertical plane.) Other overhead glazing shall use the defaults in Table 10-6E.

	~~U-Factor~~	
	~~Any Frame~~	~~Vinyl/Wood Frame~~
~~Single~~	~~2.15~~	~~2.15~~
~~Double~~	~~1.45~~	~~1.00~~
~~Low-e$^{(0.40)}$ or Argon~~	~~1.40~~	~~0.95~~
~~Low-e$^{(0.40)}$ + Argon~~	~~1.30~~	~~0.85~~
~~Low-e$^{(0.20)}$ Air~~	~~1.30~~	~~0.90~~
~~Low-e$^{(0.20)}$ + Argon~~	~~1.25~~	~~0.80~~
~~Triple~~	~~1.25~~	~~0.80~~

Opaque Doors

	U-Factor
Uninsulated Metal	1.20
Insulated Metal (Including Fire Door and Smoke Vent)	0.60
Wood	0.50

NOTES:
Where a gap width is listed (i.e.: 1/2 inch), that is the minimum allowed.
Where a low-emissivity emittance is listed (i.e.: 0.40, 0.20, 0.10), that is the maximum allowed.
Where a gas other than air is listed (i.e.: argon), the gas fill shall be a minimum of 90%.
Where an operator type is listed (i.e.: fixed), the default is only allowed for that operator type.
Where a frame type is listed (i.e.: wood/vinyl), the default is only allowed for that frame type. Wood/Vinyl frame includes reinforced vinyl and aluminum-clad wood.

Section 4. Section 1132.2 of the Energy Code is amended as follows:

1132.2 Building Mechanical Systems: Those parts of systems which are altered or replaced shall comply with Chapter 14 of this Code.

1132.2.1 Economizer Capability: Where the air-handling equipment (not including individual water source heat pumps) is being replaced or where 60% or more of the length of the trunk ductwork (not including diffuser runouts) on a floor or served by a system, whichever is smaller, is being moved or replaced,

a. the system shall comply with the economizer requirements in Section 1433, or

b. the system shall comply with a long-term plan that has been approved by DCLU and that will bring the mechanical system serving that floor into compliance with the

economizer requirements in Section 1433 through incremental changes. For projects using this option, the plan shall be updated whenever the Energy Code is revised.

EXCEPTIONS:

1. Where the floor-to-structure (bottom of beam if there is a beam) height is less than 10 feet and the replacement equipment is not installed outdoors or in a mechanical room adjacent to outdoors.
2. The Code Official may approve alternative designs not in full compliance with this Code when existing building or occupancy constraints make compliance impractical or where full compliance would place an unreasonable economic burden on the project.

1132.2.2 Economizer Capability for Water Source Heat Pump Systems: Where water-source heat pumps are being replaced, the individual heat pump being replaced shall have valves complying with Section 1432.2.2 and

a. the individual heat pump being replaced shall be equipped with economizer coil and operating controls. When the total capacity of all the heat pumps with economizer coil connected to a particular system exceeds 50% of the installed capacity of that system, then the condenser water system and cooling tower for the entire system shall be capable of providing economizer that complies with Section 1433. (This may necessitate changing the cooling tower and loop piping size.), or

b. the system shall comply with a long-term plan that has been approved by DCLU and that will bring the mechanical system serving that floor into compliance with the economizer requirements in Section 1433 through incremental changes. For projects using this option, the plan shall be updated whenever the Energy Code is revised.

EXCEPTIONS:

1. Systems that comply with the air economizer requirements.
2. The Code Official may approve alternative designs not in full compliance with this Code when existing building or occupancy constraints make compliance impractical or where full compliance would place an unreasonable economic burden on the project.

Section 5. Section 1132.3 of the Energy Code is amended as follows:

1132.3 Lighting and Motors: Where the use in a space changes from one use in Table 15-1 to another use in Table 15-1, the installed lighting wattage shall comply with Section 1521 or 1531.

Other ((~~T~~))tenant improvements, alterations or repairs where 60% or more of the fixtures in a space enclosed by walls or ceiling-height partitions ((~~use (as defined in Table 15-1) within a tenant space or in an entire floor (whichever is smaller)~~))are new shall comply with Sections 1531 and 1532. (Where this threshold is triggered, the areas of the affected spaces may be aggregated for code compliance calculations.)

Where less than 60% of the fixtures in a space enclosed by walls or ceiling-height partitions are new, the installed lighting wattage shall be maintained or reduced. Where 60% or more of the lighting fixtures in a suspended ceiling are new, and the existing insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according to the provisions of Chapter 13, Section 1311.2.

Where new wiring is being installed to serve added fixtures and/or fixtures are being relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5. Where a new lighting panel (or a moved lighting panel) with all new raceway and conductor

wiring from the panel to the fixtures is being installed, controls shall comply with Section 1513.6.

Those motors which are altered or replaced shall comply with Section 1511.

Section 6. Section 1133 of the Energy Code is amended as follows:

1133 Change of Occupancy or Use: Changes of occupancy or use shall comply with the following requirements:

a. Any unconditioned space that is altered to become semi-heated, cooled, or fully heated, or any semi-heated space that is altered to become cooled or fully heated space shall be required to be brought into full compliance with this Code. For spaces constructed prior to this Code, the installed heating output capacity shall not exceed 16 Btu/h per square foot unless the building envelope complies with Chapter 13. Existing warehouses and repair shops are considered unconditioned space unless they are indicated as conditioned space in DCLU records or they were built after 1980 and they comply with the building envelope requirements for conditioned space in effect at the time of construction. (See the Seattle Mechanical Code for requirements for combustion appliances.)

b. Any Group R occupancy which is converted to other than a Group R occupancy shall be required to comply with all of the provisions of Sections 1130 through 1132 of this Code.

Section 7. Section 1301 of the Energy Code is amended as follows:

1301 Scope: Conditioned buildings or portions thereof shall be constructed to provide the required thermal performance of the various components according to the requirements of this chapter. Unless otherwise approved by the building official, all spaces shall be assumed to be at least semi-heated.

EXCEPTIONS:

1. Greenhouses isolated from any conditioned space and not intended for occupancy.
2. As approved by the building official, spaces not assumed to be at least semi-heated.
3. Unconditioned Group ((~~M~~))U occupancy accessory to Group R occupancy.
4. Unstaffed equipment shelters or cabinets used solely for personal wireless service facilities.
5. Parking lot attendant booths no larger than 100 square feet, provided that the opaque components comply with the requirements for semi-heated spaces in Section 1310.2. The heating equipment limitations in Section 1310.2 do not apply.

Section 8. Section 1310.2 of the Energy Code is amended as follows:

1310.2 Semi-Heated Spaces: All spaces shall be considered conditioned spaces, and shall comply with the requirements in Section 1310.1 unless they meet the following criteria for semi-heated spaces. The installed heating equipment output, in Climate Zone 1, shall be 3 Btu/(h • ft^2) or greater but not greater than 8 Btu/(h • ft^2) and in Climate Zone 2, shall be 5 Btu/(h • ft^2) or greater but not greater than 12 Btu/(h • ft^2). Heating shall be controlled by a thermostat mounted not lower than the heating unit and capable of preventing heating above

44° space temperature. ((~~For semi-heated spaces, the only prescriptive, component performance or systems analysis building envelope requirement shall be that:~~

~~Climate Zone 1~~

~~a. U-0.10 maximum for the roof assembly or~~

~~b. continuous R-9 insulation installed entirely outside of the roof structure, or~~

~~c. R-11 insulation installed inside or within a wood roof structure, or~~

~~d. R-19 insulation installed inside or within a metal roof structure.~~

~~Climate Zone 2~~))

For semi-heated spaces with electric resistance space heat, (1) the building envelope for the semi-heated spaces shall comply with the Prescriptive Building Envelope Option in Section 1320 or (2) the entire building envelope for the semi-heated spaces plus the fully heated spaces shall comply with the Component Performance Building Envelope Option in Section 1330.

For semi-heated spaces with other space heat, (1) the building envelope for the semi-heated spaces shall comply with the following requirements or (2) the building envelope for the semi-heated spaces shall comply with the Prescriptive Building Envelope Option in Section 1320 or (3) the entire building envelope for the semi-heated spaces plus the fully heated spaces shall comply with the Component Performance Building Envelope Option in Section 1330 using the U-factors below for the semi-heated spaces.

a. U=0.07 maximum for the opaque roof assembly, or
b. continuous R-14 insulation installed entirely outside of the roof structure, or
c. R-19 insulation installed inside or within a wood roof structure, or
d. R-25 insulation installed inside or within a metal roof structure.
e. For opaque wall areas:
   i. U-0.25 maximum for the overall assembly (or R-3 minimum insulation only for continuous insulation or insulation between wood framing; or R-10 minimum insulation only for insulation between metal framing) for mass walls complying with the heat capacity requirements in Table 13-1, Footnote 2.
   ii. U-0.14 maximum for the overall assembly (or R-11 minimum insulation only) for metal frame walls.
   iii. U-0.088 maximum for the overall assembly (or R-11 minimum insulation only) for wood frame and other walls.
f. For floors over unconditioned space, U-0.088 maximum for the overall assembly (or R-11 minimum insulation only).
g. For fenestration, U-0.90 maximum and a maximum area equivalent to 10% of the gross wall area.

It is acceptable to combine semi-heated spaces and fully heated spaces in Target UA calculations.

Section 9. Section 1312.2 of the Energy Code is amended as follows:

1312.2 Solar Heat Gain Coefficient and Shading Coefficient: Solar Heat Gain Coefficient (SHGC), shall be determined, certified and labeled in accordance with the National Fenestration Rating Council (NFRC) Standard by a certified, independent agency, licensed by the NFRC.

EXCEPTION: Shading coefficients (SC) or solar heat gain coefficient for the center of glass shall be an acceptable alternate for compliance with solar heat gain coefficient requirements. Shading coefficients or solar heat gain coefficient for the center of glass for glazing shall be taken from Chapter ((~~29~~))30 of Standard RS-27 or from the manufacturer's ((~~test~~))data using a spectral data file determined in accordance with NFRC 300.

Note that using the exception for the SHGC for the center-of-glass does not give the full credit for the overall product (including the frame) that the NFRC-certified SHGC does. Though the SHGC for the frame is not zero (the ASHRAE Handbook of Fundamentals indicates that the SHGC can range from 0.11-0.14 for metal frames and from 0.02-0.07 for wood/vinyl/fiberglass frames), the SHGC for the frame is invariable lower than that for the glass. Consequently, an NFRC-certified SHGC will generally be lower.

Section 10. Section 1322 of the Energy Code is amended as follows:

1322 Opaque Envelope: Roof/ceilings, opaque exterior walls, opaque doors, floors over unconditioned space, below grade walls, slab on grade floors and radiant floors enclosing conditioned spaces shall be insulated according to Section 1311 and Tables 13-1or 13-2. Compliance with nominal R-values shall be demonstrated for the thermal resistance of the added insulation in framing cavities and/or insulated sheathing only. Nominal R-values shall not include the thermal transmittance of other building materials or air films.

For metal frame assemblies used in spaces with electric resistance space heat, compliance shall be demonstrated with the component U-factor for the overall assembly based on the assemblies in Chapter 10.

Area-weighted averaging of the R-value is not allowed. When showing compliance with R-values, the minimum insulation R-value for all areas of the component shall comply with Table 13-1. When calculating compliance using U-factors, area-weighted averaging is allowed. Where insulation is tapered (e.g. roofs), separate assembly U-factors shall be calculated for each four-foot section of tapered insulation.

EXCEPTIONS:

1. Opaque smoke vents are not required to meet insulation requirements.
2. For prescriptive compliance only,
   a. for glazing areas that are 30% and less of the gross wall area, the insulation of the perimeter edge of an above grade floor slab which penetrates the exterior wall may be reduced to R-5 provided that the glazing U-factor is reduced by U-0.05 below that required in Tables 13-1 and 13-2.
   b. for glazing areas that exceed 30% of the gross wall area, the perimeter edge of an above grade floor slab which penetrates the exterior wall may be left uninsulated provided that the glazing U-factor is reduced by U-0.10 below that required in Tables 13-1 and 13-2.((~~The perimeter edge of an above grade floor slab which penetrates the exterior wall may be left uninsulated provided that the wall insulation is increased by R-2 above that required in Tables 13-1 and 13-2.~~))

3. For roofs with continuous rigid insulation on the top of the roof, the insulation R-value may be averaged for compliance with minimum prescriptive R-values only, provided that both:
   a. the minimum insulation is no less than R-5 (but not including area within 6 inches of each roof drain), and
   b. the area-weighted average insulation is R-46 (in lieu of R-30) for electric resistance space heat and R-27 (in lieu of R-21) for other fuels.

Section 11. Section 1323 of the Energy Code is amended as follows:

1323 Glazing: Glazing shall comply with Section 1312 and Tables 13-1 or 13-2. All glazing shall be, at a minimum, double glazing. In addition, all glazing assemblies shall have at least one low-emissivity coating unless the glazing assembly has an overall U-factor that complies with the values in Table 13-1.

EXCEPTIONS:

1. Vertical glazing located on the display side of the street level story of a retail occupancy or where there is a street level transparency requirement in the Seattle Land Use Code provided the glazing
   a. (i) is double-glazed with a minimum 1/2 inch airspace and with a low-e coating having a maximum emittance of e-0.40 in any type of frame or
   (ii) has an area-weighted U-factor of 0.60 or less.
   (U-factor calculations shall use overall assembly U-factors. When this exception is used there are no SHGC requirements) and
   b. has a visible transmittance of (i) 0.60 or greater for the center of the glazing assembly in any type of frame or (ii) has an area-weighted visible transmittance for the overall assembly including the frame of 0.52 or greater for fixed glazing and 0.44 or greater for operable glazing. Visible transmittance shall be determined in accordance with Section 1312.2, and,
   ((~~b.~~))c. does not exceed 75% of the gross exterior wall area of the display side of the street level story. However, if the display side of the street level story exceeds 20 feet in height, then this exemption may only be used for the first 20 feet of that story.
   When this exception is utilized, separate calculations shall be performed for these sections of the building envelope and these values shall not be averaged with any others for compliance purposes. The 75% area may be exceeded on the street level, if the additional glass area is provided from allowances from other areas of the building.
2. Single glazing for ornamental, security, or architectural purposes shall be included in the percentage of total glazing area, U-factor calculation and SHGC as allowed in the Tables 13-1 or 13-2. The maximum area allowed for the total of all single glazing is 1% of the gross exterior wall area.

Section 12. Section 1323.3 of the Energy Code is amended as follows:

1323.3 Solar Heat Gain Coefficient: The area-weighted average solar heat gain coefficient of all glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and U-factor.

EXCEPTIONS:

1. Glazing separating conditioned space from semi-heated space or unconditioned space.
2. Vertical glazing which is oriented within 45 degrees of north shall be allowed to have a maximum solar heat gain coefficient SHGC-0.10 above that required in Table 13-1.
3. For demonstrating compliance for vertical glazing only, the SHGC in the proposed building shall be allowed to be reduced by using the multipliers in the table below for each glazing product shaded by permanent projections that will last as long as the building itself.

Projection Factor	SHGC Multiplier (All Orientations except North-oriented)	SHGC Multiplier (North-Oriented)
0 - 0.10	1.00	1.00
<0.10 - 0.20	0.91	0.95
<0.20 - 0.30	0.82	0.91
<0.30 - 0.40	0.74	0.87
<0.40 - 0.50	0.67	0.84
<0.50 - 0.60	0.61	0.81
<0.60 - 0.70	0.56	0.78
<0.70 - 0.80	0.51	0.76
<0.80 - 0.90	0.47	0.75
<0.90 - 1.00	0.44	0.73

Projection factor (PF) is the ratio of the horizontal depth of the external shading projection (A) divided by the sum of the height of the fenestration and the distance from the top of the fenestration to the bottom of the farthest point of the external shading projection (B), in consistent units. (See Exhibit 1323.3.)

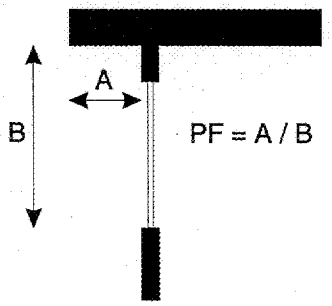


Exhibit 1323.3

Section 13. Section 1331 of the Energy Code is amended as follows:

1331 General: Buildings or structures whose design heat loss rate (UA_p) and solar heat gain coefficient rate (SHGC * A_p) are less than or equal to the target heat loss rate (UA_t) and solar heat gain coefficient rate (SHGC * A_t) shall be considered in compliance with this section. The stated U-factor, F-factor or allowable area of any component assembly, listed in Tables 13-1 or 13-2, such as roof/ceiling, opaque wall, opaque door, glazing, floor over conditioned space, slab on grade floor, radiant floor or opaque floor may be increased and the U-factor or F-factor for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-factors, F-factors or allowable areas specified in this section.

~~((**EXCEPTION:** For buildings or structures utilizing the other space heat type (including heat pumps and VAV) compliance path, for the gross opaque wall, opaque door and glazing (vertical and overhead) area only, compliance may also be shown using the ENVSTD diskette version 2.1 of~~

~~ASHRAE/IESNA Standard 90.1-1989, or an approved alternative, with the following additional requirements:~~

~~1. Only the Exterior Wall Requirements portion of the ENVSTD computer program may be used under this exception.~~

~~2. Overhead glazing shall be added to vertical glazing, and shall be input as 1/4 north, 1/4 east, 1/4 south and 1/4 west facing.~~

~~3. Lighting loads shall be determined according to Table 15-1.~~

~~4. Equipment loads shall be determined from Table 3-1 of Standard RS-29.~~))

Section 14. Section 1333 of the Energy Code is amended as follows:

1333 UA Calculations: The target UA_t and the proposed UA_p shall be calculated using Equations 13-1 and 13-2 and the corresponding areas and U-factors from Table 13-1 or 13-2. For the target UA_t calculation, the overhead glazing shall be located in roof/ceiling area and the remainder of the glazing allowed per Table 13-1 or 13-2 shall be located in the wall area. Where insulation is tapered, separate assembly U-factors shall be calculated in accordance with Section 1322.

Section 15. Table 13-1 of the Energy Code is amended as follows:

TABLE 13-1
BUILDING ENVELOPE REQUIREMENTS
FOR CLIMATE ZONE 1

MINIMUM INSULATION R-VALUES OR
MAXIMUM COMPONENT U-FACTORS FOR ZONE 1

Building Components

Space Heat Type	Components					
	Roofs Over Attic[3]	All Other Roofs[3]	Opaque Walls[1,2]	Opaque Doors	Floor Over Uncond Space	Slab On Grade[5]
1. Electric resistance heat**	R-38 or U=0.031	R-30 or U=0.034	R-19 or U=0.062	U=0.60	R-30 or U=0.029	R-10 or F=0.54
2. All others including heat pumps and VAV	R-30 or U=0.036	R-21 or U=0.050	((~~R-11 or U=0.14~~)) (a) Metal framing: R-13 cavity insul. + R-3.8 continuous insul. or U-0.084; (b) Wood framing & framing other than metal: R-19 or U-0.062	U=0.60	R-19 or U=0.056	R-10 or F=0.54

** Compliance with nominal prescriptive R-values requires wood framing.

MAXIMUM GLAZING AREAS AND U-FACTORS AND
MAXIMUM GLAZING SOLAR HEAT GAIN COEFFICIENTS FOR ZONE 1

Glazing

Space Heat Type	Maximum Glazing Area as % of Wall								
	0% to 20%			>20% to 30%			>30% to 45%		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG	
1. Electric resistance heat[7]	0.40	0.48	0.40	0.40	0.48	0.30	PRESCRIPTIVE PATH NOT ALLOWED		
				Prescriptive only, not for Target UA or annual energy analysis					
2. All others including heat pumps and VAV[6]	0.55	0.66	0.40	0.55	0.66	0.40	0.45	0.54	0.40

~~Maximum Glazing Area as % of Wall~~	~~0% to 15%~~			~~>15% to 20%~~			~~>20% to 30%~~			~~>30% to 40%~~		
	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~
	~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~	
~~1. Electric resistance heat~~	~~0.40~~	~~0.80~~	~~1.0~~	~~0.40~~	~~0.80~~	~~1.0~~	~~PRESCRIPTIVE PATH NOT ALLOWED~~					
~~2. All others including heat pumps and VAV~~	~~0.90~~	~~1.45~~	~~1.0~~	~~0.75~~	~~1.40~~	~~1.0~~	~~0.60~~	~~1.30~~	~~0.65~~	~~0.50~~	~~1.25~~	~~0.45~~

Footnotes

1. **Below Grade Walls:**
   When complying by the prescriptive approach, Section 1322:
   a) walls insulated on the interior shall use opaque wall values,
   b) walls insulated on the exterior shall use a minimum of R-10 insulation,
   c) walls shall be insulated for the first 10 feet below grade. (There shall be no credit for insulating those portions of below grade walls and footings that are more than 10 feet below grade, and those portions below 10 feet shall not be included in the gross exterior wall area((~~, may be left uninsulated~~)).)

   When complying by the component performance approach, Section 1331:
   a) walls insulated on the interior shall use the opaque wall values when determining U_{bgwt},
   b) walls insulated on the exterior shall use a target U-factor of U=0.070 for U_{bgwt},
   c) the calculations shall include the first 10 feet of walls below grade. (((~~t~~))Those portions of below grade walls and footings that are more than 10 feet below grade((~~, and~~)) shall not be included in the gross exterior wall area((~~, need~~)) and shall not be included when determining A_{bgwt} and A_{bgw}.)

2. **Concrete Masonry Walls:** If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft^2 • °F, then the U-factor may be increased to ((~~0.19~~))
   a) 0.11 for interior insulation
      i) minimum R-11 insulation between wood studs; or
      ii) minimum R-19 insulation between metal studs; or
      iii) minimum R-10 insulation held in place solely by 1 inch metal clips at 24 inches on center vertically and 16 inches on center horizontally; and ((~~0.25~~))

b) 0.12 for integral and exterior insulation for insulation position as defined in Chapter 2.

i) minimum additional R-7 continuous insulation uninterrupted by framing.

Individual walls with heat capacities less than 9.0 Btu/ft^2 • °F and below grade walls shall meet opaque wall requirements listed above.

Glazing shall comply with the glazing requirements listed above.((~~following:~~))

~~Maximum Glazing Area as % of Wall~~	~~0 to 10 %~~			~~>10 to 15 %~~			~~>15% to 20 %~~			~~>20% to 25 %~~		
	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~
	~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~	
~~1. Electric resistance heat~~	~~0.40~~	~~0.80~~	~~1.00~~	~~0.40~~	~~0.80~~	~~1.00~~	~~0.40~~	~~0.80~~	~~1.00~~	~~NOT ALLOWED~~		
~~2. All others including heat pumps and VAV~~	~~0.90~~	~~1.45~~	~~1.00~~	~~0.75~~	~~1.40~~	~~1.00~~	~~0.65~~	~~1.30~~	~~0.80~~	~~0.60~~	~~1.30~~	~~0.65~~

3. ((~~Reserved.~~)) **Roof Types:** A roof over attic is where the roof structure has at least 30 inches clear distance from the top of the bottom chord of a truss or ceiling joist to the underside of the sheathing at the roof ridge, and the ceiling is attached to the ceiling joist or the bottom of the truss or ceiling joist. Anything else is considered all other roofs.

4. **SHGC (Solar Heat Gain Coefficient per Section 1312.2):** May substitute Maximum Shading Coefficient (SC) for SHGC (See Chapter 2 for definition of Shading Coefficient).

5. **Radiant Floors:** Where insulation is required under the entire slab, radiant floors shall use a minimum of R-10 insulation or F=0.55 maximum. Where insulation is not required under the entire slab, radiant floors shall use R-10 perimeter insulation according to Section 1311.6 or F=0.78 maximum.

6. **Prescriptive Alternate** (not applicable to Target UA or annual energy analysis): For the prescriptive building envelope option only, for other than electric resistance heat only, glazing may comply with ((~~either of~~))the following:

Maximum Glazing Area as % of Wall ((~~>40% to 60%~~))	Maximum U-Factor VG	OG	Maximum SHGC[4]
>45% to 50%	0.40	0.48	0.35
((~~Alternate a~~	~~0.40~~	~~0.80~~	~~0.30~~
~~Alternate b~~	~~0.35~~	~~0.80~~	~~0.35~~))

7. **Prescriptive Alternate for Electric Resistance Space Heat** (not applicable to Target UA or annual energy analysis):

For glazed wall systems, assemblies with all of the following features are deemed to satisfy the vertical glazing U-factor requirement of U-0.40 and the overhead glazing U-factor of U-0.48:

a) Double glazing with a minimum 1/2 inch gap width, having a low-emissivity coating with e=0.10 maximum, with 90% minimum argon gas fill, and a non-aluminum spacer (as defined in footnote 1 to Table 10-6B), and

b) Frame that is thermal break aluminum (as defined in footnote ((~~9~~))7 to Table 10-6((~~B~~))A), wood, aluminum clad wood, vinyl, aluminum clad vinyl, or reinforced vinyl.

Section 16. Section 1401 of the Energy Code is amended as follows:

1401 Scope: This section covers the determination of requirements, system and component performance, control requirements and duct construction.

((~~**EXCEPTION:** Special applications, including but not limited to hospitals, laboratories, thermally sensitive equipment and rooms designed to comply with the special construction and fire protection requirements of NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment" may be exempt from the requirements of this section when approved by the building official. Exemptions shall be specific on a case-by-case basis and allowed only to the extent necessary to accommodate the special applications.~~))

Section 17. Section 1411.1 of the Energy Code is amended as follows:

1411.1 General: Equipment shall have a minimum performance at the specified rating conditions not less than the values shown in Tables 14-1A through 14-1F((~~14-1 through 14-3~~)). If a nationally recognized certification program exists for a product covered in Tables 14-1A through 14-1F((~~14-1 through 14-3~~)), and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program.

EXCEPTION: Water-cooled water-chilling packages that are not designed for operation at ARI Standard 550/590 test conditions (and thus cannot be tested to meet the requirements of Table 14-1C) of 44°F leaving chilled water temperature and 85°F entering condenser water temperature shall have a minimum NPLV rating as shown in Tables 14-1K, L, and M. The table values are only applicable over the following full load design ranges:

Leaving Chiller Water Temp.:	40 to 48°F
Entering Condenser Water Temp.:	75 to 85°F
Condensing Water Temp.Rise:	5 to 15°F

Chillers designed to operate outside of these ranges are not covered by this Code. Non-standard Part Load Value (NPLV) is defined as single number part-load efficiency figure of merit for chillers references to conditions other than IPLV conditions. Design condenser water flow rate shall not be less than 2.5 gpm/ton.

Gas-fired and oil-fired forced air furnaces with input ratings ≥ 225,000 Btu/h (65 kW) shall also have an intermittent ignition or interrupted device (IID), and have either mechanical draft (including power venting) or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. All furnaces with input ratings ≥225,000 Btu/h (65 kW), including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75% of the input rating.

Electric furnaces over 15 kW shall have a minimum of two stages of control for heating.

Cooling towers serving chilled water systems with airside economizer complying with Section 1433 without using the exceptions shall be selected to be able to maintain a return condenser water temperature to the tower of 86 F or less at peak design conditions.

Cooling towers serving chilled water systems with waterside economizer shall also comply with Section 1433, Exception 3.

Hydronic heat pump and other cooling and refrigeration equipment (e.g. icemakers, walk-in coolers) shall not use domestic water only one time before dumping it to waste. No single pass water cooling systems without heat recovery are allowed, except for medical and dental equipment, equipment using less than 1 gpm, and replacement of existing icemakers. However, single pass cooling is allowed during power outages and other emergencies.

Section 18. Section 1411.4 of the Energy Code is amended as follows:

1411.4 Packaged and Split System Electric Heating and Cooling Equipment: Packaged and split system electric equipment providing both heating and cooling with a total cooling capacity greater than 20,000 Btu/h shall be a heat pump.

EXCEPTION: Unstaffed equipment shelters or cabinets used solely for personal wireless service facilities.

Section 19. Section 1412.2 of the Energy Code is amended as follows:

1412.2 Deadband Controls: When used to control both comfort heating and cooling, zone thermostatic controls shall be capable of a deadband of at least 5 °F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

EXCEPTIONS:

1. Special occupancy, special usage or code requirements where deadband controls are not appropriate.
2. ((~~Buildings complying with Section 1141.4, if in the proposed building energy analysis, heating and cooling thermostat setpoints are set to the same temperature between 70°F and 75°F inclusive, and assumed to be constant throughout the year.~~))(Reserved.)
3. Thermostats that require manual changeover between heating and cooling modes.

Section 20. Section 1412.4 of the Energy Code is amended as follows:

1412.4 Setback and Shut-Off: HVAC systems shall be equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of non-use or alternate use of the spaces served by the system. The automatic controls shall

a. have a minimum seven-day clock and be capable of being set for seven different day types per week,
b. be capable of retaining programming and time setting during loss of power for a period of at least ten hours, and
c. include an accessible manual override, or equivalent function (e.g. telephone interface), that allows temporary operation of the system for up to two hours.

EXCEPTIONS:

1. Systems serving areas which require continuous operation at the same temperature setpoint.
2. Equipment with full load demands of 2 kW (6,826 Btu/h) or less may be controlled by readily accessible manual off-hour controls.
3. Systems controlled by an occupant sensor that is capable of shutting the system off when no occupant is sensed for a period of up to 30 minutes.
4. Systems controlled solely by a manually-operated timer capable of operating the system for no more than two hours.

1412.4.1 Dampers: Outside air intakes, exhaust outlets and relief outlets serving conditioned spaces shall be equipped with motorized dampers which close automatically when the system is off or upon power failure. Stair shaft and elevator shaft smoke relief openings shall be equipped with normally open (fails open upon loss of power) dampers. These dampers shall remain closed until activated by the fire alarm system or other approved smoke detection system.

EXCEPTIONS:

1. Systems serving areas which require continuous operation.
2. Combustion air intakes.
3. Gravity (non-motorized) dampers are acceptable in buildings less than 3 stories in height.

Dampers installed to comply with this section, including dampers integral to HVAC equipment, shall have a maximum leakage rate when tested in accordance with AMCA Standard 500 of:

a. Motorized dampers: 10 cfm/ft^2 of damper area at 1.0 in w.g.
b. Non-motorized dampers: 20 cfm/ft^2 of damper area at 1.0 in w.g., except that for non-motorized dampers smaller than 24 inches in either dimension: 40 cfm/ft^2 of damper area at 1.0 in w.g.

Dampers used as a component of packaged HVAC equipment shall comply with the damper leakage requirements, unless it is the lowest leakage available as a factory option. Drawings shall indicate compliance with this section.

1412.4.2 Optimum Start Controls: Heating and cooling systems with design supply air capacities exceeding 10,000 cfm shall have optimum start controls. Optimum start controls shall be designed to automatically adjust the start time of an HVAC system each day to bring the space to desired occupied temperature levels immediately before scheduled occupancy. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy.

Section 21. Section 1412.6 of the Energy Code is amended as follows:

1412.6 Combustion Heating Equipment Controls: Combustion heating equipment with a capacity over 225,000 Btu/h shall have modulat((~~ing~~))ed or staged combustion control. Boilers shall have proportionately-modulated or staged combustion control to control both the fuel and the air.

EXCEPTIONS:

1. Boilers under 1,000,000 Btu/h input capacity.
2. Radiant Heaters.
3. Systems with multiple boilers which are sequentially-staged.

Boilers shall comply with the reset requirements in Section 1432.2.

Section 22. Section 1412.8 of the Energy Code is amended as follows:

1412.8 Enclosed Parking Garage Ventilation: Garage ventilation fan systems with a total capacity greater than 30,000 cfm shall include the equipment specified in (a) and (b) below. Smaller systems shall include the equipment specified in either (a) or (b).((~~have at least one of the following:~~))

a. An automatic control that is capable of staging fans or modulating fan speed as required to maintain carbon monoxide (CO) concentration below a level of 50 ppm as stated in ASHRAE Standard 62. This ((~~option~~))provision only applies to garages used predominantly by gasoline powered vehicles.

b. An automatic control that is capable of shutting off fans or reducing fan speed during periods when the garage is not in use. The system shall be equipped with at least one of the following:

   i. An automatic timeclock that can start and stop the system under different schedules for seven different day-types per week, is capable of retaining programming and time setting during loss of power for a period of at least 10 hours, and includes an accessible manual override that allows temporary operation of the system for up to 2 hours.

   ii. An occupant sensor.

See the Seattle Building Code for sizing requirements for parking garage ventilation. See the Seattle Mechanical Code, Section 406.5, for other requirements for parking garage ventilation.

Section 23. Section 1413 of the Energy Code is amended as follows:

1413 Air and Water Economizers

Section 24. Section 1413.2 of the Energy Code is amended as follows:

1413.2 Control: Air and water economizers shall be controlled by a control system capable of determining if outside air can meet part or all of the building's cooling loads.

Section 25. Section 1413.3 of the Energy Code is amended as follows:

1413.3 Integrated Operation((~~—Building Heating Energy~~)): Air and water economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load. Controls shall not preclude the economizer operation when mechanical cooling is required simultaneously.

EXCEPTIONS:

1. ((~~Economizers on individual, direct expansion, cooling systems with capacities not greater than 75,000 Btu/h may include controls that limit simultaneous operation of the economizer and mechanical cooling for the purpose of preventing ice formation on cooling coils.~~))Individual direct expansion units that have a rated cooling capacity less than 65,000 Btu/h and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.
2. Water cooled chillers with waterside economizer.

Section 26. The Energy Code is amended by adding a new Section 1413.4 to read as follows:

1413.4 Economizer Heating System Impact: Any HVAC system that increases the building heating energy use during economizer operation is not allowed (e.g. single-fan/dual-duct systems and multizone systems).

EXCEPTIONS:
1. Where the heating is allowed by Section 1435.
2. Water source heat pump systems that comply with Section 1433, Exception 3.

Note that single-fan/dual-duct systems and multizone systems do not comply with this requirement. This is because economizer operation lowers the temperature of the air entering the hot deck heating coil, increasing its energy use. In order to use this type of system, a water economizer must be used, or the system must meet one of the economizer exceptions and have neither type of economizer. (Another resolution is to use a dual-fan/dual-duct system where the hot deck fan supplies only return air or return air plus minimum ventilation air.)

This requirement will not affect three-deck multizone since they cannot work with an air economizer in any case (it would make the neutral deck a cold deck).

An exception to the heating impact is provided for economizers on VAV systems that cause zone level heating to increase due to a reduction in supply air temperature. Reducing supply air temperatures on a cooling-VAV system will reduce fan energy (particularly if the system has a variable speed drive), offsetting the energy lost due to increased reheat energy.

See the discussion and diagrams of Section 6.3.1.4 of ASHRAE/IESNA Standard 90.1-1999 in the Users Manual.

Section 27. Section 1414.1 of the Energy Code is amended as follows:

1414.1 Sealing: Duct work which is designed to operate at pressures above 1/2 inch water column static pressure shall be sealed ((~~in accordance with Standard RS-18. Extent of sealing required is~~))as follows:

1. ((~~Static pressure: ½ inch to 2 inches; seal transverse joints.~~))(Reserved.)

2. Static pressure: ((~~2~~))½ inches to 3 inches; seal all transverse joints and longitudinal seams. Spiral lock seams in round and flat oval ductwork do not require sealing, however, other seams shall be sealed.
3. Static pressure: above 3 inches; seal all transverse joints, longitudinal seams and duct wall penetrations.

((~~Duct tape and other pressure sensitive tape shall not be used as the primary sealant where ducts are designed to operate at static pressures of 1 inch W.C. or greater.~~))

All low-pressure supply and return air systems not located entirely within the conditioned space, including the unconditioned side of enclosed stud bays or joist cavities/spaces used to transport air, shall be securely fastened and sealed. Ductwork shall be sealed using welds, gaskets, mastic, or mastic-plus-embedded-fabric tape. Enclosed stud bays or joist cavities/spaces used to transport air shall be sealed using mastic-plus-embedded-fabric tape or, when drywall is used to enclose the air system, drywall mud and tape. Duct tape is not permitted as a sealant on any ducts.

EXCEPTION: Fibrous glass duct systems installed in accordance with standard UL 181A and flexible duct systems installed in accordance with standard UL 181B may use tapes listed for these systems.

Note that longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod or wire. All other connections are considered transverse joints, including but not limited to spin-ins, taps and other branch connections, access door frames and jambs, duct connections to equipment.

Section 28. Section 1416 of the Energy Code is amended as follows:

1416 Mechanical Systems Commissioning and Completion Requirements

1416.1 General. Commissioning is a systematic process of verification and documentation that ensures that the selected building systems have been designed, installed, and function properly, efficiently, and can be maintained in accordance with the contract documents in order to satisfy the building owner's design intent and operational requirements. Drawing notes shall require commissioning and completion requirements in accordance with this section. Drawing notes may refer to specifications for further requirements.

1416.1.1 Simple Mechanical Systems. For simple mechanical systems, as defined in Section 1421, and for warehouses and semi-heated spaces, commissioning shall include, as a minimum:

a. A Commissioning Plan,
b. System Testing and Balancing,
c. Controls Functional Performance Testing,
d. A Preliminary Commissioning Report,

e. Post Construction Documentation in the form of O&M and Record Drawing Review, and
f. A Final Commissioning Report.

1416.1.2 All Other Mechanical Systems. For all other mechanical systems, commissioning shall include, as a minimum:

a. A Commissioning Plan,
b. System Testing and Balancing,
c. Equipment Functional Performance Testing,
d. Controls Functional Performance Testing,
e. A Preliminary Commissioning Report,
f. Post Construction Documentation (all), and
g. A Final Commissioning Report.

1416.2 Commissioning Requirements

1416.2.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.2 Commissioning Plan. The Plan shall require tests mandated by this section be performed and the results recorded. The Plan shall require preparation of preliminary and final reports of test procedures and results as described herein. At a minimum, the Plan shall identify the following for each test:

a. A detailed explanation of the original design intent.
b. Equipment and systems to be tested, including the extent of tests,
c. Functions to be tested (for example calibration, economizer control, etc.),
d. Conditions under which the test shall be performed (for example winter and summer design conditions, full outside air, etc.), and
e. Measurable criteria for acceptable performance.

1416.2.3 Systems Balancing

1416.2.3.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates, except variable flow distribution systems need not be balanced upstream of the controlling device (for example, VAV box or control valve). Construction documents shall require a written balance report be provided to the owner. Drawing notes may refer to specifications for further systems balancing requirements.

1416.2.3.2 Air Systems Balancing. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

1416.2.3.3 Hydronic Systems Balancing: Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic

system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.

EXCEPTIONS:

1. Pumps with pump motors of 10 hp or less.
2. When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller was trimmed.

1416.2.4 Functional Performance Testing

1416.2.4.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.4.2 Equipment/Systems Testing. Functional Performance Testing shall demonstrate the correct installation and operation of each component, system, and system-to-system intertie relationship in accordance with approved plans and specifications. This demonstration is to prove the operation, function, and maintenance serviceability for each of the Commissioned systems. Testing shall include all modes of operation, including:

a. All modes as described in the Sequence of Operation,
b. Redundant or automatic back-up mode,
c. Performance of alarms, and
d. Mode of operation upon a loss of power and restored power.

1416.2.4.3 Controls Testing: HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications.

1416.2.5 Post Construction Commissioning

1416.2.5.1 General: Construction documents shall require post construction commissioning be provided to the building owner prior to date of final acceptance. Drawing notes may refer to specifications for further commissioning requirements. Post construction commissioning shall include, as a minimum, review and approval of Operation and Maintenance Materials, Record Drawings, and Systems Operational Training.

1416.2.5.2 Operation and Maintenance Materials: The O&M Materials shall be in accordance with industry accepted standards and shall include, at a minimum, the following:

a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
b. Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
c. Names and addresses of at least one service agency.
d. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field

determined set points shall be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.

e. A complete written narrative of how each system and piece of equipment is intended to operate including:
   i. A detailed explanation of the original design intent.
   ii. The basis of design (how the design was selected to meet the design intent).
   iii. A detailed explanation of how new equipment is to interface with existing equipment or systems (where applicable).
   iv. Suggested control set points.
   NOTE: Sequence of Operation is not acceptable as a narrative for this requirement.

1416.2.5.3 Record Drawings: Record drawings shall include, as a minimum, the location and performance data on each piece of equipment, general configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates of the actual installation.

1416.2.5.4 Systems Operational Training: The training of the appropriate maintenance staff for each equipment type and or system shall include, as a minimum, the following:

a. System/Equipment overview (what it is, what it does and which other systems and or equipment does it interface with).
b. Review of the available O&M materials.
c. Review of the Record Drawings on the subject system/equipment.
d. Hands-on demonstration of all normal maintenance procedures, normal operating modes, and all emergency shutdown and start-up procedures.

1416.2.6 Commissioning Reports

1416.2.6.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.6.2 Preliminary Commissioning Report: A preliminary report of commissioning test procedures and results shall be completed and provided to the Owner. The Preliminary Commissioning Report shall identify:

a. Deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.
b. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.
c. Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.

1416.2.6.3 Final Commissioning Report: A complete report of test procedures and results shall be prepared and filed with the Owner. The Final Commissioning Report shall identify:

a. Results of all Functional Performance Tests.
b. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.
c. All Functional Performance Test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

EXCEPTION: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

1416.3 Acceptance Requirements

1416.3.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements. Buildings or portions thereof, required by this Code to comply with this section, shall not be issued the following certificates until such time that the building official determines that the appropriate commissioning requirements dictated by this section have been completed and provided.

1416.3.2 Acceptance: Buildings or portions thereof, required by this Code to comply with this section, shall not be issued a final certificate of occupancy until such time that the building official determines that the preliminary commissioning report required by this section has been completed.

~~((1416 Completion Requirements~~

~~**1416.1 Drawings:** Construction documents shall require that within 90 days after the date of system acceptance, record drawings of the actual installation be provided to the building owner. Record drawings shall include as a minimum the location and performance data on each piece of equipment, general configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates.~~

~~**1416.2 Manuals:** Construction documents shall require an operating manual and maintenance manual be provided to the building owner. The manual shall be in accordance with industry accepted standards and shall include, at a minimum, the following:~~

1. ~~Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.~~
2. ~~Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.~~
3. ~~Names and addresses of at least one service agency.~~
4. ~~HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field determined set points shall be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.~~
5. ~~A complete narrative of how each system is intended to operate including suggested set points.~~

~~**1416.3 System Balancing**~~

~~**1416.3.1 General:** Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates, except variable flow distribution systems need not be balanced upstream of the controlling~~

~~device (for example, VAV box or control valve). Construction documents shall require a written balance report be provided to the owner.~~

~~**1416.3.2 Air System Balancing:** Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.~~

~~**1416.3.3 Hydronic System Balancing:** Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.~~

~~**EXCEPTIONS:**~~

~~1. Pumps with pump motors of 10 hp or less.~~
~~2. When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller were trimmed.~~

~~**1416.4 Systems Commissioning**~~

~~**1416.4.1 Simple Systems:** For simple systems, as defined in Section 1421, and for warehouses and semiheated spaces, HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accord with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accord with approved plans and specifications. A complete report of test procedures and results shall be prepared and filed with the owner. Drawing notes shall require commissioning in accordance with this paragraph.~~

~~**1416.4.2 Other Systems:** All other HVAC control systems, and other automatically controlled systems for which energy consumption, performance, or mode of operation are regulated by this code, shall be tested to ensure that control devices, equipment and systems are calibrated, adjusted and operate in accord with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accord with approved plans and specifications.~~

~~**1416.4.2.1 Documentation:** Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements. Plans and specifications shall require tests mandated by this section be performed and the results recorded. Plans and specifications shall require preparation of preliminary and final reports of test procedures and results as described in 1416.4.2.2. Plans and specifications shall identify the following for each test:~~

~~1. Equipment and systems to be tested, including the extent of sampling tests,~~
~~2. Functions to be tested (for example calibration, economizer control, etc.),~~
~~3. Conditions under which the test shall be performed (for example winter design conditions, full outside air, etc.),~~
~~4. Measurable criteria for acceptable performance.~~

~~**1416.4.2.2 Commissioning Reports**~~

~~**1416.4.2.2.1 Preliminary Commissioning Report:** A preliminary commissioning report of test procedures and results shall be prepared. The preliminary report shall identify:~~

~~1. Deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.~~
~~2. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.~~
~~3. Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.~~

~~**1416.4.2.2.2 Final Commissioning Report:** A complete report of test procedures and results shall be prepared and filed with the owner.~~

~~**1416.4.2.3 Acceptance:** Buildings or portions thereof, required by this code to comply with this section, shall not be issued a final certificate of occupancy until such time that the building official determines that the preliminary commissioning report required by this section has been completed.~~))

Section 29. Section 1421.1 of the Energy Code is amended as follows:

1421.1 System Sizing Limits: Installed space heating equipment output shall not exceed ((~~30~~))16 Btu/h per square foot of gross conditioned floor area and installed space cooling equipment output shall not exceed ((~~30~~))25 Btu/h per square foot of gross conditioned floor area.

EXCEPTIONS:
1. For equipment which provides both heating and cooling in one package unit, compliance need only be demonstrated for either the space heating or space cooling system size.
2. Equipment sized in accordance with Section 1431.2.

Section 30. Section 1423 of the Energy Code is amended as follows:

1423 Economizers: Economizers meeting the requirements of Section 1413 shall be installed on single package unitary fan-cooling units having ((~~a supply capacity of greater than 1900efm or~~))a total cooling capacity greater than ((~~54,000~~))20,000 Btu/h, including those serving computer server rooms, electronic equipment, radio equipment, telephone switchgear. The total capacity of all units without economizers (i.e. these units with a total cooling capacity of 20,000 Btu/h and less) shall not exceed 240,000 Btu/h per building, or 10% of its aggregate cooling (economizer) capacity, whichever is greater. That portion of the equipment serving Group R occupancy is not included in determining the total capacity of all units without economizers in a building.

Section 31. Section 1431.2 of the Energy Code is amended as follows:

1431.2 System Sizing Limits: Heating and cooling design loads for the purpose of sizing systems shall be determined in accordance with one of the procedures described in Chapter ((~~28~~))29 of Standard RS-27 listed in Chapter 17 or an equivalent computation procedure. For interior temperatures, 70°F shall be used for heating and 75°F for cooling, except where different values are specified in the Washington Administrative Code (WAC). For exterior temperatures, 24°F shall be used for heating and 82°F dry bulb and 66°F for wet bulb for cooling.

Building mechanical systems for all buildings which provide space heating and/or space cooling shall be sized no greater than ((~~150%~~))125% of the design load as calculated above, except that cooling towers shall comply with the sizing requirements in Section 1411.1. No additional safety factor is allowed.

For buildings with a total equipment cooling capacity of 300 tons and above, equipment shall have multiple unloadings or no one unit shall have a capacity of more than 2/3 of the load.

EXCEPTIONS: The following limited exemptions from the sizing limit shall be allowed, however, in all cases heating and/or cooling design load calculations shall be submitted.

1. For a single piece of equipment which has both heating and cooling capability, only one function, either the heating or the cooling, need meet the requirements of this section. Capacity for the other function shall be, within available equipment options, the smallest size necessary to meet the load.
2. (((~~Reserved.~~)))

((~~3.~~)) Stand-by equipment may be installed if controls and devices are provided which allow redundant equipment to operate automatically only when the primary equipment is not operating.

((~~4.~~))3. Multiple units of the same equipment type, such as multiple chillers and boilers, with combined capacities exceeding the design load may be specified to operate concurrently only if controls are provided that sequence or otherwise optimally control the operation of each unit based on load.

4. A maximum sizing limit of 150% is allowed for fan systems which
   a. have both a capacity of 5,000 cfm or greater and which have a minimum outside air supply of 70% or greater of the total air circulation, and
   b. have a heat recovery system complying with Section 1436 without using any of the exceptions.

Section 32. Section 1432.2 of the Energy Code is amended as follows:

1432.2 Systems Temperature Reset Controls

1432.2.1 Air Systems for Multiple Zones: Systems supplying heated or cooled air to multiple zones shall include controls which automatically reset supply air temperatures by representative building loads or by outside air temperature. Temperature shall be reset by at least 25% of the design supply-air-to-room-air temperature difference.

EXCEPTION: Where specified humidity levels are required to satisfy process needs, such as computer rooms or museums.

1432.2.2 Hydronic Systems: Systems with a design capacity of ((~~600,000~~))300,000 Btu/h or greater supplying heated or mechanically refrigerated water ((~~to comfort conditioning systems~~))shall include controls which automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air

temperature. Temperature shall be reset by at least 25% of the design supply-to-return water temperature differences.

EXCEPTIONS:

1. Hydronic systems that use variable flow devices complying with Section 1438 to reduce pumping energy.
2. Steam boilers.
3. Systems that provide heating with 100°F or lower supply temperature (e.g. water source heat pump loops).

To limit the heat loss from the heat rejection device (cooling tower), for hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g., cooling tower),

a. If a closed-circuit tower (fluid cooler) is used, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower (for freeze protection), or low leakage positive closure dampers shall be provided.
b. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower.
c. If an open-circuit tower is used in conjunction with a separate heat exchanger to isolate the tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

For hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g., cooling tower) and having a total pump system power exceeding 10 hp, each hydronic heat pump shall have

a. a two-position two-way (but not three-way) valve, or
b. a variable head pressure two-way (water regulating) control valve or pump.

For the purposes of this section, pump system power is the sum of the nominal power demand (i.e. nameplate horsepower at nominal motor efficiency) of motors of all pumps that are required to operate at design conditions to supply fluid from the heating or cooling source to all heat transfer devices (e.g., coils, heat exchanger) and return it to the source. This converts the system into a variable flow system and, as such, the primary circulation pumps shall comply with the variable flow requirements in Section 1438.

Section 33. Section 1433 of the Energy Code is amended as follows:

1433 Economizers: Economizers meeting the requirements of Section 1413 shall be installed on the following systems, including those serving computer server rooms, electronic equipment, radio equipment, telephone switchgear:

a. Single package unitary fan-cooling units installed outdoors or in a mechanical room adjacent to outdoors with a total cooling capacity greater than 20,000 Btu/h. ((~~S~~))Other single package unitary fan-cooling units with a supply capacity of greater than 1,900 cfm or a total cooling capacity greater than 54,000 Btu/h.
b. Other individual fan-cooling units with ((~~a supply capacity of greater than 2,800 cfm or~~))a total cooling capacity greater than ((~~84,000~~))65,000 Btu/h.

The total capacity of all units without economizers (i.e. these units complying with a or b above) shall not exceed 240,000 Btu/h per building, or 10% of its aggregate cooling

(economizer) capacity, whichever is greater. That portion of the equipment serving Group R occupancy is not included in determining the total capacity of all units without economizers in a building.

EXCEPTIONS:

1. Systems with air or evaporatively cooled condensers and that either one of the following can be demonstrated to the satisfaction of the enforcing agency:
   a. Special outside air filtration and treatment, for the reduction and treatment of unusual outdoor contaminants, makes an air economizer infeasible.
   b. The use of outdoor air cooling affects the operation of other systems (such as humidification, dehumidification and supermarket refrigeration systems) so as to increase the overall building energy consumption.
2. Systems for which at least 75% of the annual energy used for mechanical cooling is provided from site-recovery or site-solar energy source.
3. ((~~A water economizer system, which is capable of cooling supply air by indirect evaporation. Such a system shall be designed and capable of being controlled to provide 100% of the expected system cooling load at outside air temperatures of 50°F dry-bulb / 45°F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside air temperatures.~~)) A water economizer system, which is capable of cooling supply air without the operation of mechanical refrigeration equipment. See Section 1413.3 for integration requirements. This exception shall not be used for RS-29 analysis. Such a system shall be designed and capable to be controlled to provide the following:
   a. Design economizer cooling capacity: The calculated system cooling load served by all terminal equipment without airside economizer at 45°F db/40°F wb, with solar and internal loads the same as those calculated for peak cooling load except for outside air temperature.
   b. Design economizer fluid supply temperature: The design fluid supply temperature delivered to the terminal cooling coils when in economizer operation at 45°F db/40°F wb.
   c. Equipment which rejects heat to outdoors shall be sized to provide design economizer cooling capacity and design economizer fluid supply temperature at an ambient temperature of 40°F wb. However, air cooled heat rejection equipment shall be sized to provide design economizer cooling capacity and design economizer fluid supply temperature at an ambient temperature of 35°F db. This allowance for air-cooled equipment is applicable only to existing buildings and limited to a maximum of 20 tons per building.
   d. Terminal cooling coils shall be sized for design economizer cooling capacity at the design economizer fluid supply temperature. However, hydronic heat pumps with terminal cooling coils shall be sized to provide 45% of design economizer capacity at design economizer fluid supply temperature.

Section 34. Section 1436 of the Energy Code is amended as follows:

1436 Heat Recovery

1436.1 Fan Systems: Fan systems which have both a capacity of 5,000 cfm or greater and which have a minimum outside air supply of 70% or greater of the total air circulation shall have a heat recovery system with at least 50% recovery effectiveness. Fifty percent heat recovery effectiveness shall mean an increase in the outside air supply temperature at design heating conditions of one half the difference between the outdoor design air temperature and 65°F. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by Section 1433. Heat recovery energy may be provided from any site-recovered or site-solar source.

EXCEPTIONS:

1. Laboratory systems equipped with both variable air volume supply and variable air volume or two-speed exhaust fume hoods, provided that an instruction label is placed on the face of the hood that matches Exhibit 14-1.

Exhibit 14-1

INSTRUCTIONS TO OPERATOR
To be in compliance with the Seattle Energy Code, this fume hood is designed to operate as variable air volume (VAV) by adjusting the sash or controller. Maintain sash in the minimum position during use and close totally when the fume hood is not in use.

2. Systems serving spaces heated to less than 60°F.
3. Systems which can be shown to use as much energy with the addition of heat recovery equipment as without it.
4. Systems exhausting toxic, flammable, paint exhaust or corrosive fumes making the installation of heat recovery equipment impractical.
5. Type I commercial kitchen hoods.

Section 35. The Energy Code is amended by adding a new Section 1436.2 to read as follows:

1436.2 Condensate Systems: On-site steam heating systems shall have condensate recovery.

Section 36. The Energy Code is amended by adding a new Section 1436.3 to read as follows:

1436.3 Heat Recovery for Service Water Heating: Condenser heat recovery systems shall be installed for heating or preheating of service hot water provided all of the following are true:

a. The facility operates 24 hours a day.
b. The total installed heat rejection capacity of the water-cooled systems exceeds 6,000,000 Btu/h of heat rejection.
c. The capacity of service water heating equipment exceeds 1,000,000 Btu/h.

The required heat recovery system shall have the capacity to provide the smaller of:

a. 60% of the peak heat rejection load at design conditions, or
b. preheat of the peak service hot water draw to 85°F.

EXCEPTIONS:

1. Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
2. Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.

Section 37. Section 1437 of the Energy Code is amended as follows:

1437 Electric Motor Efficiency: Design A & B squirrel-cage, T-frame induction permanently wired polyphase motors of 1 hp or more having synchronous speeds of 3,600,

1,800 and 1,200 rpm shall have a nominal full-load motor efficiency no less than the corresponding values for energy efficient motors provided in Table 14-4.

EXCEPTIONS:

1. Motors used in systems designed to use more than one speed of a multi-speed motor.
2. Motors used as a component of the equipment meeting the minimum equipment efficiency requirements of Section 1411 and Tables 14-1 and 14-2 provided that the motor input is included when determining the equipment efficiency.
3. Motors that are an integral part of specialized process equipment.
4. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.

Fan motors less than 1 hp in series terminal units shall

a. be electronically-commutated motors, or
b. have a minimum motor efficiency of 65% when rated in accordance with NEMA Standard MG-1 at full load rating conditions.

EXCEPTION: Until June 30, 2002, systems where the cooling design air temperature from the central fan is less than 48 F.

Section 38. Section 1438 of the Energy Code is amended as follows:

1438 Variable Flow Systems and System Criteria: For fans and pumps greater than 10 horsepower, where the application involves variable flow, and water source heat pump loops subject to the requirements of Section 1432.2.2, there shall be

((~~1.~~))a. variable speed drives or

((~~2.~~))b. other controls and devices that will result in fan and pump motor demand of no more than 30% of design wattage at 50% of design air volume for fans when static pressure set point equals 1/3 the total design static pressure, and 50% of design water flow for pumps, based on manufacturer's certified test data.

At the time this Code was adopted, very few technologies could be shown to meet the criteria in option 2.

Variable inlet vanes, throttling valves (dampers), scroll dampers or bypass circuits shall not be allowed.

Static pressure sensors used to control variable air volume fans shall be placed in a position such that the controller set point is no greater than 1/3 the total design fan static pressure.

For systems with direct digital control of individual zone boxes reporting to the central control panel, there shall be static pressure reset controls and the static pressure set point shall be reset based on the zone requiring the most pressure; i.e., the set point is reset lower until one zone damper is nearly wide open.

Section 39. Section 1440 of the Energy Code is amended as follows:

1440 Service Water Heating: Service water heating equipment shall comply with the applicable efficiencies in Tables 14-1A through 14-1M.

Effective January 1, 2004, commercial clothes washers installed in Seattle shall have a minimum modified energy factor (MEF) of 1.26. The MEF definition and test procedure set forth at 10 C.F.R. Part 430 (Energy Conservation Program For Consumer Products), as amended, is incorporated into this section by reference. Commercial clothes washers are defined as all clothes washers

a. installed for use on fee basis, e.g. coin- or card-operated;
b. not covered by federal residential clothes washer efficiency standards; and
c. having a capacity of 20 lbs. or less.

Section 40. Section 1452 of the Energy Code is amended as follows:

1452 Pool Water Heaters: Pool water heaters using electric resistance heating as the primary source of heat are prohibited for all pools. Heat pump pool heaters shall have a minimum COP of 4.0 determined in accordance with ASHRAE Standard 146, Method of Testing for Rating Pool Heaters. Other pool heating equipment shall comply with the applicable efficiencies in Tables 14-1A through 14-1M.

Section 41. The Energy Code is amended by adding a new Table 14-1A to read as follows:

Table 14-1A
Electrically Operated Unitary Air Conditioners and Condensing Units - Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Conditioners, Air Cooled	< 65,000 Btu/h	Split System	10.0 SEER	ARI 210/240
		Single Package	9.7 SEER	
	≥65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	10.3 EER[c]	
	≥135,000 Btu/h and < 240,000 Btu/h	Split System and Single Package	9.7 EER[c]	ARI 340/360
	≥ 240,000 Btu/h and <760,000 Btu/h	Split System and Single Package	9.5 EER[c] 9.7 IPLV[c]	
	≥760,000 Btu/h	Split System and Single Package	9.2 EER[c] 9.4 IPLV[c]	
Air Conditioners, Water and Evaporatively Cooled	< 65,000 Btu/h	Split System and Single Package	12.1 EER	ARI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	11.5 EER[c]	
	≥135,000 Btu/h and ≤240,000 Btu/h	Split System and Single Package	11.0 EER[c]	ARI 340/360
	> 240,000 Btu/h	Split System and Single Package	11.0 EER[c] 10.3 IPLV[c]	
Condensing Units, Air Cooled	≥135,000 Btu/h		10.1 EER 11.2 IPLV	ARI 365
Condensing Units, Water or Evaporatively Cooled	≥135,000 Btu/h		13.1 EER 13.1 IPLV	

[a] Reserved.
[b] IPLVs are only applicable to equipment with capacity modulation.
[c] Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat. No deduction for equipment with no heat.

Section 42. The Energy Code is amended by adding a new Table 14-1B to read as follows:

Table 14-1B
Electrically Operated Unitary and Applied Heat Pumps –
Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Cooled, (Cooling Mode)	< 65,000 Btu/h	Split System	10.0 SEER	ARI 210/240
		Single Package	9.7 SEER	
	≥65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	10.1 EER[c]	
	≥135,000 Btu/h and <240,000 Btu/h	Split System and Single Package	9.3 EER[c]	ARI 340/360
	≥240,000 Btu/h	Split System and Single Package	9.0 EER[c] 9.2 IPLV[c]	
Water-Source (Cooling Mode)	< 17,000 Btu/h	86°F Entering Water	11.2 EER	ARI/ISO-13256-1
	≥ 17,000 Btu/h and <65,000 Btu/h	86°F Entering Water	12.0 EER	ARI/ISO-13256-1
	≥65,000 Btu/h and < 135,000 Btu/h	86°F Entering Water	12.0 EER	ARI/ISO-13256-1
Groundwater-Source (Cooling Mode)	< 135,000 Btu/h	59°F Entering Water	16.2 EER	ARI/ISO-13256-1
Ground Source (Cooling Mode)	< 135,000 Btu/h	77°F Entering Water	13.4 EER	ARI/ISO-13256-1
Air Cooled (Heating Mode)	< 65,000 Btu/h[d] (Cooling Capacity)	Split System	6.8 HSPF	ARI 210/240
		Single Package	6.6 HSPF	
	≥65,000 Btu/h and < 135,000 Btu/h (Cooling Capacity)	47°F db/43°F wb Outdoor Air	3.2 COP	
		17°F db/15°F wb Outdoor Air	2.2 COP	
	≥135,000 Btu/h (Cooling Capacity)	47°F db/43°F wb Outdoor Air	3.1 COP	ARI 340/360
		17°F db/15°F wb Outdoor Air	2.0 COP	
Water-Source (Heating Mode)	< 135,000 Btu/h (Cooling Capacity)	68°F Entering Water	4.2 COP	ARI/ISO-13256-1
Groundwater-Source (Heating Mode)	< 135,000 Btu/h (Cooling Capacity)	50°F Entering Water	3.6 COP	ARI/ISO-13256-1
Ground Source	< 135,000 Btu/h	32°F Entering Water	3.1 COP	ARI/ISO-13256-1

[a] Reserved.
[b] IPLVs and Part load rating conditions are only applicable to equipment with capacity modulation.
[c] Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat. No deduction for equipment with no heat.

Section 43. The Energy Code is amended by adding a new Table 14-1C to read as follows:

Table 14-1C
Water Chilling Packages, Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Cooled, With Condenser, Electrically Operated	All Capacities		2.80 COP 3.05 IPLV	ARI 550/590
Air Cooled, Without Condenser, Electrically Operated	All Capacities		3.10 COP 3.45 IPLV	
Water Cooled, Electrically Operated	< 40 tons		4.20 COP 5.05 IPLV	ARI 550/590
	≥ 40 tons and < 150 Tons		4.45 COP 5.25 IPLV	
	≥150 Tons and < 300 Tons		5.55 COP[c] 5.90 IPLV	
	≥300 Tons		6.10 COP[c] 6.40 IPLV	
Air Cooled Absorption Single Effect	All Capacities		0.60 COP	ARI 560
Water Cooled Absorption Single Effect	All Capacities		0.70 COP	
Absorption Double Effect, Indirect-Fired	All Capacities		1.00 COP 1.05 IPLV	
Absorption Double Effect, Direct-Fired	All Capacities		1.00 COP 1.00 IPLV	

[a] Reserved.
[b] The chiller equipment requirements do not apply for chillers used in low temperature applications where the design leaving fluid temperature is less than or equal to 40°F.
[c] COP requirements do not apply to other than centrifugal equipment.

Section 44. The Energy Code is amended by adding a new Table 14-1D to read as follows:

Table 14-1D
Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps, Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category (Input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
PTAC (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.5 - (0.213 x Cap/1000)[b] EER	ARI 310/380

PTAC (Cooling Mode) Replacements[c]	All Capacities	95°F db Outdoor Air	10.9 - (0.213 x Cap/1000)[b] EER	
PTHP (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.3 - (0.213 x Cap/1000)[b] EER	
PTHP (Cooling Mode) Replacements[c]	All Capacities	95°F db Outdoor Air	10.8 - (0.213 x Cap/1000)[b] EER	
PTHP (Heating Mode) New Construction	All Capacities		3.2 - (0.026 x Cap/1000)[b] COP	
PTHP (Heating Mode) Replacements[c]	All Capacities		2.9 - (0.026 x Cap/1000)[b] COP	
Room Air Conditioners, with Louvered Sides	< 6,000 Btu/h		9.7 EER	ANSI/AHAM RAC-1
	≥6,000 Btu/h and < 8,000 Btu/h		9.7 EER	
	≥ 8,000 Btu/h and < 14,000 Btu/h		9.8 EER	
	≥14,000 Btu/h and < 20,000 Btu/h		9.7 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioners, without Louvered Sides	< 8,000 Btu/h		9.0 EER	
	≥8,000 Btu/h and < 20,000 Btu/h		8.5 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps with Louvered Sides	< 20,000 Btu/h		9.0 EER	
	≥ 20,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps without Louvered Sides	< 14,000 Btu/h		8.5 EER	
	≥ 14,000 Btu/h		8.0 EER	
Room Air Conditioner, Casement Only	All Capacities		8.7 EER	
Room Air Conditioner, Casement –Slider	All Capacities		9.5 EER	

[a] Reserved.
[b] Cap means the rated cooling capacity of the product in Btu/h. If the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.
[c] Replacement units must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16-in. high and less than 42-in. wide.

Section 45. The Energy Code is amended by adding a new Table 14-1E to read as follows:

Table 14-1E
Warm Air Furnaces and Combination Warm Air Furnaces/Air-Conditioning Units, Warm Air Duct Furnaces and Unit Heaters, Minimum Efficiency Requirements

Equipment Type	Size Category (Input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Warm Air Furnace, Gas-Fired	< 225,000 Btu/h (66 kW)		78% AFUE or 80% $E_{thermal}$[c]	DOE 10 CFR Part 430 or ANSI Z21.47
	≥225,000 Btu/h (66 kW)	Maximum Capacity[c]	80% $E_{combustion}$[f]	ANSI Z21.47
Warm Air Furnace, Oil-Fired	< 225,000 Btu/h (66 kW)		78% AFUE or 80% $E_{thermal}$[c]	DOE 10 CFR Part 430 or UL 727
	≥225,000 Btu/h (66 kW)	Maximum Capacity[b]	81% $E_{thermal}$[g]	UL 727

Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	ANSI Z83.9
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	ANSI Z83.8
Warm Air Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	UL 731

[a] Reserved.
[b] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[c] Combination units not covered by NAECA (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]) may comply with either rating.
[d] E_t = Thermal efficiency. See test procedure for detailed discussion.
[e] E_c = Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
[f] E_c = Combustion efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[g] E_t = Thermal efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

Section 46. The Energy Code is amended by adding a new Table 14-1F to read as follows:

Table 14-1F
Boilers, Gas- and Oil-Fired, Minimum Efficiency Requirements

Equipment Type[f]	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Boilers, Gas-Fired	< 300,000 Btu/h	Hot Water	80% AFUE	DOE 10 CFR Part 430
		Steam	75% AFUE	
	≥300,000 Btu/h and ≤ 2,500,000 Btu/h	Maximum Capacity[b]	75% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	80% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	80% $E_{combustion}$	
Boilers, Oil-Fired	< 300,000 Btu/h		80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h and ≤ 2,500,000 Btu/h	Maximum Capacity[b]	78% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	83% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	83% $E_{combustion}$	
Oil-Fired (Residual)	≥300,000 Btu/h and ≤2,500,000 Btu/h	Maximum Capacity[b]	78% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	83% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	83% $E_{combustion}$	

[a] Reserved.
[b] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[c] E_c = Combustion efficiency (100% less flue losses). See reference document for detailed information.
[d] E_t = Thermal efficiency. See reference document for detailed information.
[e] Alternate test procedures used at the manufacturer's option are ASME PTC-4.1 for units over 5,000,000 Btu/h input, or ANSI Z21.13 for units greater than or equal to 300,000 Btu/h and less than or equal to 2,500,000 Btu/h input.
[f] These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers, and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

Section 47. The Energy Code is amended by adding a new Table 14-1G to read as follows:

Table 14-1G Reserved

Section 48. The Energy Code is amended by adding a new Table 14-1H to read as follows:

Table 14-1H Reserved

Section 49. The Energy Code is amended by adding a new Table 14-1I to read as follows:

Table 14-1I Reserved

Section 50. The Energy Code is amended by adding a new Table 14-1J to read as follows:

Table 14-1J Reserved

Section 51. The Energy Code is amended by adding a new Table 14-1K to read as follows:

Table 14-1K
IPLV/NPLV for Water Cooled Chillers < 150 Tons

Water Cooled Chillers < 150 Tons $IPLV_{std}$ = 5.25								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	5.84	6.10	6.30	6.61	6.84	7.00
45	75	30	5.75	6.00	6.19	6.47	6.68	6.83
44	75	31	5.67	5.91	6.08	6.34	6.53	6.67
43	75	32	5.59	5.82	5.99	6.23	6.39	6.52
42	75	33	5.51	5.74	5.90	6.12	6.27	6.39
41	75	34	5.43	5.66	5.81	6.02	6.16	6.26
46	80	34	5.43	5.66	5.81	6.02	6.16	6.26
40	75	35	5.35	5.58	5.73	5.93	6.06	6.15

45	80	35	5.35	5.58	5.73	5.93	6.06	6.15
44	80	36	5.26	5.50	5.65	5.84	5.96	6.06
43	80	37	5.16	5.42	5.57	5.76	5.87	5.96
42	80	38	5.06	5.33	5.49	5.67	5.79	5.87
41	80	39	4.95	5.24	5.41	5.60	5.71	5.78
46	85	39	4.95	5.24	5.41	5.60	5.71	5.78
40	80	40	4.83	5.14	5.32	5.52	5.63	5.70
45	85	40	4.83	5.14	5.32	5.52	5.63	5.70
44	85	41	4.69	5.04	**5.25**[c]	5.43	5.55	5.62
43	85	42	4.55	4.93	5.13	5.35	5.47	5.54
42	85	43	4.38	4.80	5.03	5.26	5.38	5.46
41	85	44	4.21	4.67	4.91	5.17	5.30	5.38
40	85	45	4.01	4.52	4.79	5.06	5.20	5.29
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 52. The Energy Code is amended by adding a new Table 14-1L to read as follows:

Table 14-1L
IPLV/NPLV for Water Cooled Chillers
≥ 150 Tons, < 300 Tons

Water Cooled Chillers ≥ 150 Tons, < 300 Tons $IPLV_{std} = 5.90$								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	6.58	6.87	7.11	7.46	7.71	7.90
45	75	30	6.49	6.76	6.98	7.30	7.53	7.70
44	75	31	6.40	6.66	6.86	7.15	7.36	7.52
43	75	32	6.31	6.56	6.75	7.02	7.21	7.35
42	75	33	6.22	6.47	6.65	6.90	7.07	7.20
41	75	34	6.13	6.38	6.55	6.79	6.95	7.06
46	80	34	6.13	6.38	6.55	6.79	6.95	7.06
40	75	35	6.03	6.29	6.46	6.68	6.83	6.94
45	80	35	6.03	6.29	6.46	6.68	6.83	6.94
44	80	36	5.93	6.20	6.37	6.58	6.72	6.82
43	80	37	5.82	6.11	6.28	6.49	6.62	6.72
42	80	38	5.71	6.01	6.19	6.40	6.53	6.62
41	80	39	5.58	5.91	6.10	6.31	6.44	6.52

46	85	39	5.58	5.91	6.10	6.31	6.44	6.52
40	80	40	5.44	5.80	6.00	6.22	6.35	6.43
45	85	40	5.44	5.80	6.00	6.22	6.35	6.43
44	85	41	5.29	5.68	**5.90**[c]	6.13	6.26	6.34
43	85	42	5.13	5.55	5.79	6.03	6.16	6.25
42	85	43	4.94	5.41	5.67	5.93	6.07	6.16
41	85	44	4.74	5.26	5.54	5.82	5.97	6.07
40	85	45	4.52	5.09	5.40	5.71	5.87	5.97
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 53. The Energy Code is amended by adding a new Table 14-1M to read as follows:

Table 14-1M
IPLV/NPLV for Water Cooled Chillers ≥ 300 Tons

Water Cooled Chillers ≥ 300 Tons $IPLV_{std} = 6.40$								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	7.15	7.47	7.72	8.10	8.37	8.58
45	75	30	7.05	7.35	7.58	7.93	8.18	8.36
44	75	31	6.95	7.23	7.45	7.77	8.00	8.16
43	75	32	6.85	7.13	7.33	7.63	7.83	7.98
42	75	33	6.75	7.03	7.22	7.49	7.68	7.82
41	75	34	6.65	6.93	7.12	7.37	7.55	7.67
46	80	34	6.65	6.93	7.12	7.37	7.55	7.67
40	75	35	6.55	6.83	7.01	7.26	7.42	7.54
45	80	35	6.55	6.83	7.01	7.26	7.42	7.54
44	80	36	6.44	6.73	6.92	7.15	7.30	7.41
43	80	37	6.32	6.63	6.82	7.05	7.19	7.30
42	80	38	6.20	6.53	6.72	6.95	7.09	7.19
41	80	39	6.06	6.42	6.62	6.85	6.99	7.08
46	85	39	6.06	6.42	6.62	6.85	6.99	7.08
40	80	40	5.91	6.30	6.52	6.76	6.89	6.98
45	85	40	5.91	6.30	6.52	6.76	6.89	6.98
44	85	41	5.75	6.17	**6.40**[c]	6.66	6.79	6.89
43	85	42	5.57	6.03	6.28	6.55	6.70	6.79
42	85	43	5.37	5.88	6.16	6.44	6.59	6.69
41	85	44	5.15	5.71	6.01	6.33	6.49	6.59

40	85	45	4.91	5.53	5.86	6.20	6.37	6.48
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 54. Table 14-1 of the Energy Code is repealed.

Section 55. Table 14-2 of the Energy Code is repealed.

Section 56. Table 14-3 of the Energy Code is repealed.

Section 57. The title of Chapter 15 of the Energy Code is amended as follows:

CHAPTER 15 LIGHTING,((~~AND~~)) MOTORS, AND TRANSFORMERS

Section 58. Section 1501 of the Energy Code is amended as follows:

1501 Scope: Interior and exterior lighting,((~~and~~)) electric motors, and transformers shall comply with the requirements of this chapter.

Section 59. Section 1510 of the Energy Code is amended as follows:

Section 1510 General Requirements: Lighting and motors shall comply with Sections 1511 through 1513. Lighting systems shall comply with one of the following paths:

a. Prescriptive Lighting Option:
   Interior Section 1521, or
   Exterior Section 1522.
b. Lighting Power Allowance Option:
   Interior Section 1531, or
   Exterior Section 1532.
c. Systems Analysis. See Section 1141.4.

The compliance path selected for interior and exterior lighting need not be the same. However, interior and exterior lighting cannot be traded.

Transformers shall comply with Section 1540.

Figure 15A
Lighting,((~~and~~)) Motor, and Transformer Compliance Options

Section Number	Subject	Prescriptive Lighting Option	Lighting Power Allowance Option	Systems Analysis Option
1510	General Requirements	X	X	X
1511	Electric Motors	X	X	X
1512	Exempt Lighting	X	X	X
1513	Lighting Controls	X	X	X
1520	Prescriptive Lighting Option	X		
1521	Prescriptive Interior Lighting Requirements	X		
1522	Prescriptive Exterior Lighting Requirements	Sec. 1532		
1530	Lighting Power Allowance Option		X	
1531	Interior Lighting Power Allowance		X	
1532	Exterior Lighting Power Allowance		X	
1540	Transformers	X	X	X
RS-29	Systems Analysis			X

Section 60. Section 1512 of the Energy Code is amended as follows:

1512 Exempt Lighting: The use of these exemptions is at the applicant's option.

1512.1 Exempt Spaces: The following rooms, spaces and areas, are exempt from the lighting power requirements in Sections 1520 and 1530 but shall comply with all other requirements of this chapter.

1. ((~~Areas in which medical or dental tasks are performed.~~))Reserved.
2. High risk security areas or any area identified by building officials as requiring additional lighting.
3. Spaces designed for primary use by the visually impaired((~~,~~)) or hard of hearing (lip-reading)((~~ or by senior citizens~~)).
4. ((~~Food preparation areas.~~))Reserved.
5. Outdoor manufacturing, greenhouses and processing areas.
6. Electrical/mechanical equipment rooms.
7. Outdoor athletic facilities.
8. ((~~Inspection and restoration areas in galleries and museums.~~))Reserved.
9. The sanctuary portion of a house of worship, defined as the space or room where the worship service takes place. Classrooms, meeting rooms, offices and multipurpose rooms that are part of the same facility are not exempt.

1512.2 Exempt Lighting Equipment: The following lighting equipment and tasks are exempt from the lighting requirements of Section 1520 and need not be included when calculating the installed lighting power under Section 1530 but shall comply with all other requirements of this chapter. All other lighting in areas that are not exempted by Section 1512.2, where exempt tasks and equipment are used, shall comply with all of the requirements of this chapter.

1. Special lighting needs for research.
2. Emergency lighting that is automatically OFF during normal building operation.

3. Lighting integral to signs((~~, and permanently ballasted lighting fixtures for walkways and pathways~~)).
4. Lighting that is part of machines, equipment or furniture.
5. Lighting that is used solely for indoor plant growth during the hours of 10:00 p.m. to 6:00 a.m. However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
6. Lighting for theatrical productions, television broadcasting (including sports facilities), ((~~audio-visual presentations~~))and special effects lighting for stage areas and dance floors in entertainment facilities. However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
7. Lighting in galleries, museums and in main building entry lobbies for ((~~art~~))exhibits, inspection, and restoration((~~non-retail displays, portable plug in display fixtures and show case lighting~~)). However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
8. Exterior lighting for public monuments.
9. Lighting specifically designed for use only during medical or dental procedures and lighting integral to medical equipment. However, such lighting shall not be exempt unless it is in addition to general area lighting, designed specifically for medical lighting, and is controlled by an independent control device.
10. Lighting integral to or specifically for food warming and food preparation equipment. However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
11. Audio-visual and video-conferencing lighting in rooms with permanently installed audio-visual equipment or video-conferencing equipment which has multi-level or dimming controls.

Section 61. Section 1513.1 of the Energy Code is amended as follows:

1513.1 Local Control and Accessibility: Each space, enclosed by walls or ceiling-height partitions, shall be provided with lighting controls located within that space. The lighting controls, whether one or more, shall be capable of turning off all lights within the space. The controls shall be readily accessible, at the point of entry/exit, to personnel occupying or using the space.

EXCEPTIONS: The following lighting controls may be centralized in remote locations:
1. Lighting controls for spaces which must be used as a whole.
2. Automatic controls, when provided in addition to manual controls, need not be accessible to the users and may be centralized in a remote location.
3. Controls requiring trained operators.
4. Controls for safety hazards and security.

Section 62. Section 1513.3 of the Energy Code is amended as follows:

1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 2 (see Exhibits 1513.3a and 1513.3b), both under overhead glazing and adjacent to vertical glazing, shall be provided with ((~~individual controls, or daylight or occupant sensing~~))

a. automatic controls((~~,~~)) which control the lights independent of general area lighting, and

b. i. multi-level switching and with daylight-sensing automatic controls, which are capable of reducing the light level automatically and turning the lights off, or

ii. dimming ballasts and with daylight-sensing automatic controls, which are capable of dimming the lights continuously and turning the lights off.

Contiguous daylight zones adjacent to vertical glazing are allowed to be controlled by a single controlling device provided that they do not include zones facing more than two adjacent cardinal orientations (i.e. north, east, south, west). Daylight zones under overhead glazing more than 15 feet from the perimeter shall be controlled separately from daylight zones adjacent to vertical glazing.

EXCEPTIONS:

1. Daylight spaces enclosed by walls or ceiling height partitions and containing 2 or fewer lighting fixtures are not required to have a separate switch for general area lighting.
2. HID lamps with automatic controls that are capable of reducing the light level by at least 50% in lieu of continuous dimming controls.
3. HID lamps 150 watts or less are exempt from the dimming requirements.

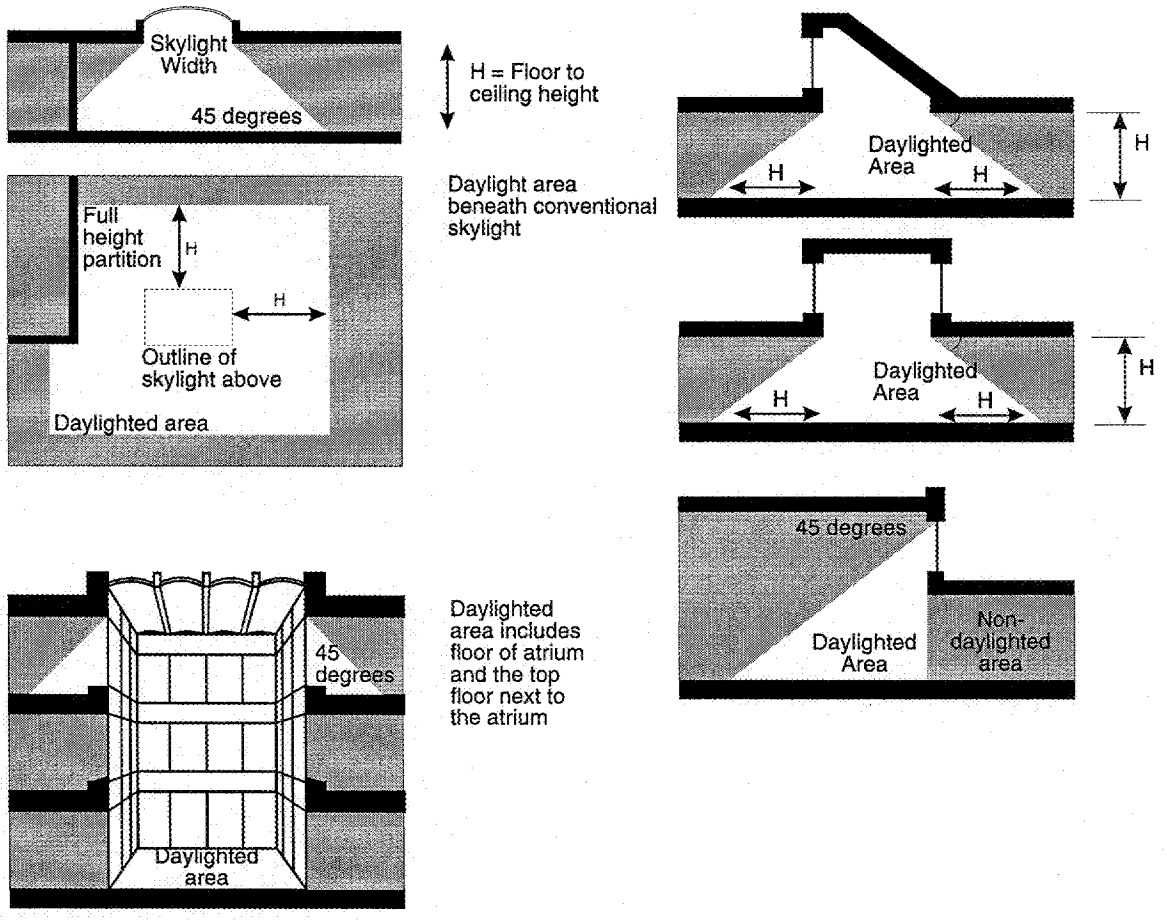


Exhibit 1513.3a

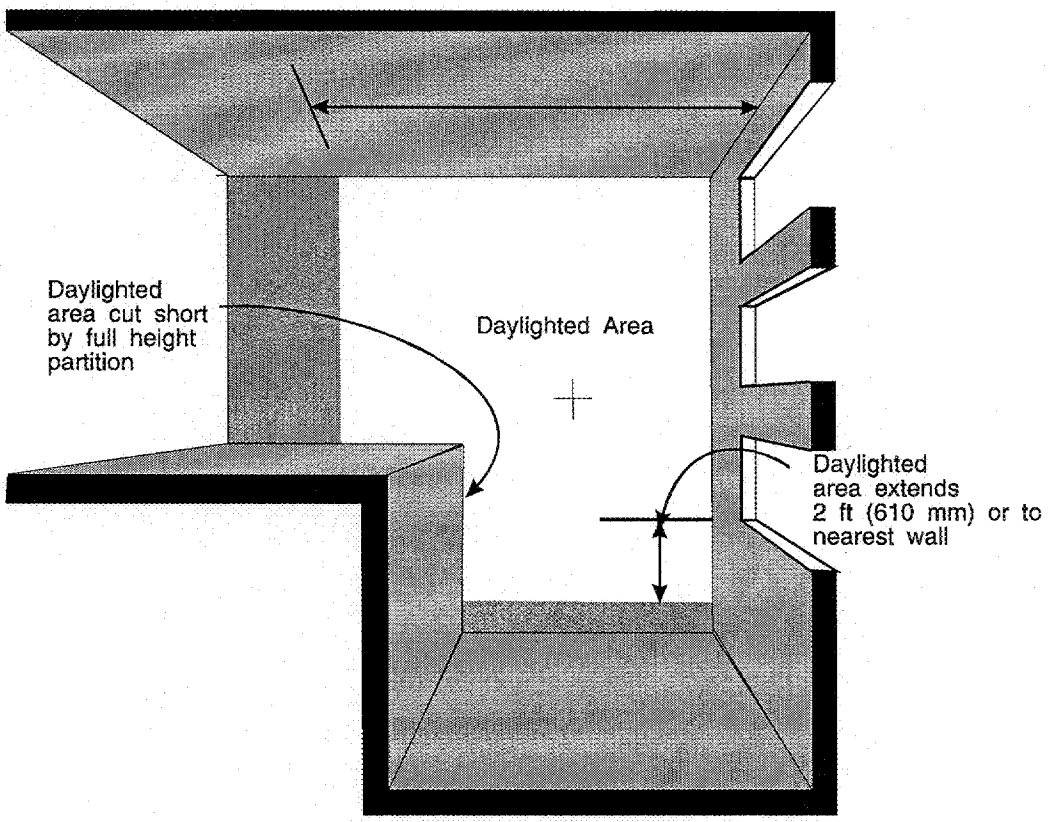


Exhibit 1513.3b

Section 63. Section 1513.5 of the Energy Code is amended as follows:

1513.5 Automatic Shut-off Controls, Exterior: Exterior lighting, including signs, ((~~not intended for 24-hour continuous use shall be automatically switched by timer, photocell or~~)) shall be capable of being automatically switched off during daylight hours by either a combination of timer and photocell, or a timer with astronomic control. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

EXCEPTION: Neon lighting in signs.

Section 64. Section 1513.6 of the Energy Code is amended as follows:

1513.6 Automatic Shut-Off Controls, Interior: ((~~Office b~~))Buildings greater than 5,000 ft^2 and all school classrooms shall be equipped with separate automatic controls to shut off the lighting during unoccupied hours. Within these buildings, all office areas less than 300 ft^2 enclosed by walls or ceiling-height partitions, and all meeting and conference rooms, and all school classrooms, shall be equipped with occupancy sensors that comply with Section 1513.6.1. For other spaces, ((~~A~~))automatic controls may be an occupancy sensor, time

switch or other device capable of automatically shutting off lighting that complies with Section 1513.6.1 or 1513.6.2.

EXCEPTIONS:

1. Areas that must be continuously illuminated (e.g. 24 hour convenience stores), or illuminated in a manner requiring manual operation of the lighting.
2. Emergency lighting systems.
3. Switching for industrial or manufacturing process facilities as may be required for production.
4. Hospitals and laboratory spaces.
5. Areas in which medical or dental tasks are performed are exempted from the occupancy sensor requirement.

1513.6.1 Occupancy Sensors: Occupancy sensors shall be capable of automatically turning off all the lights in an area, no more than 30 minutes after the area has been vacated. Light fixtures controlled by occupancy sensors shall have a wall-mounted, manual switch capable of turning off lights when the space is occupied.

1513.6.2 Automatic Time Switches: Automatic time switches shall have a minimum 7 day clock and be capable of being set for 7 different day types per week and incorporate an automatic holiday "shut-off" feature, which turns off all loads for at least 24 hours and then resumes normally scheduled operations. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

Automatic time switches shall incorporate an over-ride switching device which:

a. is readily accessible;
b. is located so that a person using the device can see the lights or the areas controlled by the switch, or so that the area being illuminated is annunciated;
c. is manually operated;
d. allows the lighting to remain on for no more than 2 hours when an over-ride is initiated; and
e. controls an area not exceeding 5,000 ft^2 or 5% of the building footprint for footprints over 100,000 ft^2, whichever is greater.

Section 65. Section 1521 of the Energy Code is amended as follows:

1521 Prescriptive Interior Lighting Requirements: Spaces for which the Unit Lighting Power Allowance in Table 15-1 is 0.80 W/ft^2 or greater may use unlimited numbers of lighting fixtures and lighting energy, provided that the installed lighting fixtures comply with all four of the following criteria:

a. one- or two-lamp (but not three- or more lamp);
b. ((~~non-lensed, fluorescent fixtures~~))luminaires have a reflector or louver assembly to direct the light (bare lamp strip or industrial fixtures do not comply with this section);
c. fitted with type T-1, T-2, T-4, T-5, ((~~T-6,~~))T-8 or compact fluorescent lamps from 5 to ((~~50~~))60 watts (but not T-10, or T-12 lamps); and
d. hard-wired fluorescent electronic dimming ballasts with photocell or programmable dimming control for all lamps in all zones (non-dimming electronic ballasts and

electronic ballasts that screw into medium base sockets do not comply with this section).

Track lighting is not allowed under this path.

EXCEPTIONS:

1. Up to a total of 5% of installed lighting fixtures ((~~need not be ballasted and~~))may use any type of ballasted lamp and do not require dimming controls.
2. Clear safety lenses are allowed in food prep and serving areas and patient care areas in otherwise compliant fixtures.
3. Exit lights are not included in the count of fixtures provided that they do not exceed 5 Watts per fixture and are light emitting diode (LED) type or T-1 fluorescent type only. (See the Uniform Fire Code for face illumination footcandle requirements and other requirements.)
4. LED lights other than exit lights addressed by exception 3.
5. Metal halide lighting which complies with all three of the following criteria:
   i. luminaires or lamps which have a reflector or louver assembly to direct the light;
   ii. fixtures are fitted with ceramic metal halide lamps not exceeding 150 watts; and
   iii. electronic ballasts.

Section 66. Section 1530 of the Energy Code is amended as follows:

1530 Lighting Power Allowance Option. The installed lighting wattage shall not exceed the lighting power allowance. Lighting wattage includes lamp and ballast wattage. Wattage for fluorescent lamps and ballasts shall be tested per ANSI Standard C82.2-1984.

The wattage used for any unballasted fixture shall be the maximum UL listed wattage for that fixture regardless of the lamp installed. The wattage used for track lighting shall be:

a. for line voltage track, ((~~50~~))70 watts per lineal foot of track or actual luminaire wattage, whichever is greater.
b. for low voltage track (i.e. with remote transformer) (less than 30 volts), ((~~25 watts per lineal foot of track or~~))the VA rating of the transformer((~~, whichever is greater~~)).

No credit towards compliance with the lighting power allowances shall be given for the use of any controls, automatic or otherwise.

Exit lights that are 5 watts or less per fixture shall not be included in the lighting power allowance calculations. Other exit lights shall be included in the lighting power allowance calculations.

Section 67. Section 1532 of the Energy Code is amended as follows:

1532 Exterior Lighting Power Allowance: The exterior lighting power allowance shall be ((~~the sum of the calculated allowances~~))calculated separately for (1) covered parking, and (2) outdoor parking, outdoor areas and building exteriors. The lighting in these two areas shall not be traded. The lighting allowance for covered parking, open parking and outdoor areas shall be 0.20 W/ft^2. The lighting allowance for building exteriors shall be calculated either by multiplying the building façade area by 0.25 W/ft^2 or multiplying the building perimeter in feet by 7.5 watts per lineal foot.

EXCEPTIONS:

1. Group U occupancy accessory to Group R-3 occupancy.

2. For covered parking, 0.30 W/ft^2 may be used for the lighting provided that the ceilings and walls are painted or stained with a reflectance value of 0.70 or higher.
3. The top level of a parking garage is allowed to be included with the covered parking garage category.

Section 68. The Energy Code is amended by adding a new Section 1540 to read as follows:

1540 Transformers: Internal building transformers that are single-phase and three-phase dry-type and liquid-filled distribution transformers with a primary voltage of 34.5 kV and below and a secondary voltage of 600 Volts and below shall have a minimum efficiency that complies with NEMA TP-1-1996.

Section 69. Table 15-1 of the Energy Code is amended as follows:

Table 15-1 Unit Lighting Power Allowance (LPA)

Use[1]	LPA[2] (W/ft^2)
Painting, welding, carpentry, machine shops	2.30
Barber shops, beauty shops	2.00
Hotel banquet/conference/exhibition hall[3,4]	2.00
Laboratories (see also office and other appropriate categories)	((~~2.00~~))1.80
Aircraft repair hangars	1.50
Cafeterias, fast food establishments[5]	1.50
Factories, workshops, handling areas	1.50
Gas stations, auto repair shops[6]	1.50
Institutions	1.50
Libraries[5]	1.50
Nursing homes and hotel/motel guest rooms	1.50
Retail[10], retail banking	1.50
Wholesale stores (pallet rack shelving)	1.50
Mall concourses	1.40
School buildings (Group E occupancy only, school classrooms, day care centers	((~~1.35~~))1.20
Laundries	((~~1.30~~))1.20
Medical office, clinics[12]	1.20
Office buildings, office/administrative areas in facilities of other use types (including but not limited to schools, hospitals, institutions, museums, banks, churches)[5,7,11]	((~~1.20~~))1.00
Police and fire stations[8]	((~~1.20~~))1.00
Atria (atriums)	1.00
Assembly spaces[9], auditoriums, gymnasia[9], theaters	1.00

Group R-1 common areas	1.00
Process plants	1.00
Restaurants/bars[5]	1.00
Locker and/or shower facilities	0.80
Warehouses[11], storage areas	0.50
Aircraft storage hangars	0.40
Parking garages	See Section 1532
Plans Submitted for Common Areas Only[7]	
Main floor building lobbies[3] (except mall concourses)	1.20
Common areas, corridors, toilet facilities and washrooms, elevator lobbies	0.80

Footnotes for Table 15-1

1. In cases in which a general use and a specific use are listed, the specific use shall apply. In cases in which a use is not mentioned specifically, the *Unit Power Allowance* shall be determined by the building official. This determination shall be based upon the most comparable use specified in the table. See Section 1512 for exempt areas.
2. The watts per square foot may be increased, by 2% per foot of ceiling height above 20 feet, unless specifically directed otherwise by subsequent footnotes.
3. The watts per square foot of room may be increased by 2% per foot of ceiling height above 12 feet.
4. For all other spaces, such as seating and common areas, use the *Unit Lighting Power Allowance* for assembly.
5. The watts per square foot of room may be increased by 2% per foot of ceiling height above 9 feet.
6. Includes pump area under canopy.
7. ((~~In cases in which a lighting plan is submitted for only a portion of a floor, a *Unit Lighting Power Allowance* of 1.35 may be used for usable office floor area and 0.80 W/ft^2 shall be used for the common areas, which may include elevator space, lobby area and rest rooms. Common areas, as herein defined do not include mall concourses.~~))
   For conference rooms and offices less than 150 square feet with full-height partitions, a Unit Lighting Power Allowance of 1.2 W/ft^2 may be used.
8. For the fire engine room, the *Unit Lighting Power Allowance* is 1.00 W/ft^2.
9. For indoor sport tournament courts with adjacent spectator seating, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft^2.
10. Display window illumination installed within 2 feet of the window provided that the display window is separated from the retail space by walls or at least three-quarter-height partitions (transparent or opaque), and lighting for free-standing display where the lighting moves with the display((~~, and building showcase illumination where the lighting is enclosed within the showcase~~)) are exempt.

    An additional 1.5 W/ft^2 of merchandise display luminaires are exempt provided that they comply with all three of the following:
    a. located on ceiling-mounted track or directly on or recessed into the ceiling itself (not on the wall),
    b. adjustable in both the horizontal and vertical axes (vertical axis only is acceptable for fluorescent and other fixtures with two points of track attachment).
    c. fitted with LED, tungsten halogen, fluorescent, or high intensity discharge lamps.

    This additional lighting power is allowed only if the lighting is actually installed.

11. Provided that a floor plan, indicating rack location and height, is submitted, the square footage for a warehouse may be defined, for computing the interior *Unit Lighting Power Allowance,* as the floor area not covered by racks plus the vertical face area (access side only) of the racks. The height allowance defined in footnote 2 applies only to the floor area not covered by racks.

12. Medical and clinical offices include those facilities which, although not providing overnight patient care, do provide medical, dental, or psychological examination and treatment. These spaces include, but are not limited to, laboratories and treatment centers.

Section 70. Reference Standard 29 (RS-29) of the 2000 Washington State Energy Code is amended by adding a new Section 3.6.5 to read as follows:

3.6.5: There shall be no credit in the proposed design for control of parking garage ventilation.

Section 71. The provisions of this ordinance are declared to be separate and severable. The invalidity of any clause, sentence, paragraph, subdivision, section or portion of this ordinance, or the invalidity of the application thereof to any person, owner, or circumstance shall not affect the validity of the remainder of this ordinance, or the validity of its application to other persons, owners, or circumstances.

Section 72. The Director of the Department of Design, Construction and Land Use shall, following the effective date of this ordinance and until February 28, 2002, approve applications that comply with either the requirements of this Ordinance or with the requirements of Ordinance 120378.

Section 73. As part of its ongoing efforts to develop and refine the Seattle Energy Code, DCLU shall:

a. Work with industry professionals and stakeholders to review the current provisions of RS-29, to determine whether the Energy Code can be revised to better achieve the joint goals of providing design flexibility, encouraging innovation and promoting energy conservation. As part of this review, DCLU will determine if it is possible to have those who would benefit from the use of any revised code provisions share in the costs associated with implementing these changes. No later than June 1, 2002, DCLU will provide to the Energy and Environmental Policy Committee a description of its review process, a summary of its findings and any resulting recommendations.

b. Provide to the Energy and Environmental Policy Committee by no later than April 1, 2002 a draft of either a Director's Rule or Client Assistance Memorandum (as appropriate) describing the application and appeals process and the timing of the administrative review that will be used to implement and administer the exceptions provided under Sections 1132.2.1 and 1132.2.2 of the Seattle Energy Code.

c. Review the existing Energy Code to determine if there are reasonable modifications that can be made to help increase the efficiency of exterior lighting on commercial buildings. Recommendations will be provided to the Energy and Environmental Policy Committee by no later than June 1, 2002.

Section 74. This ordinance shall take effect and be in force thirty (30) days from and after its approval by the Mayor, but if not approved and returned by the Mayor within ten (10) days after presentation, it shall take effect as provided by Municipal Code Section 1.04.020.

Passed by the City Council the 17th day of September, 2001, and signed by me in open session in authentication of its passage this 17th day of September, 2001.

President of the City Council

Approved by me this 24th day of SEPTEMBER, 2001.

Paul Schell, Mayor

Filed by me this 26th day of September, 2001.

City Clerk

(SEAL)

City of Seattle

Paul Schell, Mayor

Department of Design, Construction and Land Use

R. F. Krochalis, Director

MEMORANDUM

TO: Council President Margaret Pageler
Via Margaret Klockars, Law Department

FROM: Rick Krochalis, Director

DATE: August 1, 2001

SUBJECT: Adoption of the 2001 Seattle Energy Code

Transmittal

I am pleased to send to you the attached ordinance, which adopts the 2001 Seattle Energy Code (additional Seattle amendments to the nonresidential provisions).

Background

In response to the current energy situation, in February 2001 the City Council passed Resolution 30280 directing DCLU and Seattle City Light to propose Energy Code amendments by July 1, 2001. The Resolution specified that the amendments should achieve a 20% improvement in energy efficiency for nonresidential buildings compared to the national energy conservation standard. The Resolution 30280 goal is consistent with other City and national initiatives, as Seattle's Green Building Policy requires that all City buildings over 5,000 square feet achieve a 20% improvement in energy efficiency and the goal for the next edition of the national standard will also be to increase energy efficiency by 20%. The current Seattle Energy Code is above the national standard. Therefore, the net improvement over current Seattle practice is estimated to be less than 10%.

Public Review Process

DCLU and City Light have engaged in a vigorous public review of the proposal. DCLU published a first draft proposal in January 2001 and a second draft in April 2001. Information about the proposals was mailed and has been available on the Seattle Energy Code website (www.ci.seattle.wa.us/dclu/energy/2001update.htm). We have conducted a series of 22 weekly public review meetings. The meetings have been well-attended by a range of interested parties including architects, engineers, lighting designers, manufacturers, developers, building owners and energy consultants. In addition, one participant in the public review process held at least 5 meetings with contractors, developers, and property managers in order to galvanize broader interest in the energy code development process. DCLU staff has also reached out to professional organizations (AIA, ASHRAE, BOMA, Electric League) to discuss the proposals. We've received compliments on our extensive public process, and easy access to the materials. While there were a variety of viewpoints expressed, DCLU's Construction Codes Advisory Board (CCAB) made unanimous recommendations on the issues. City staff are supporting those recommendations with the two changes noted below.

Overview of Proposal

All of the proposed Energy Code amendments are to the nonresidential provisions. For the building envelope, key changes include: glazing to have low-e coatings and solar control coatings, better insulation for walls, increased insulation for semi-heated spaces; easy pre-calculated/prescriptive

credits for glass solar heat gain coefficient (SHGC) in lieu of shading coefficient (SC), overhangs/setbacks, north windows, slab edge and tapered roof insulation; more default tables for mass walls and overhead glazing. For the mechanical systems, key changes include: increasing minimum equipment efficiencies and motor efficiencies, more use of outside air for cooling in lieu of mechanical refrigeration, better motors (electronically-commutated) for fans in ceiling mixing boxes, limits on damper leakage, better duct sealing, clarification of the commissioning requirements, better controls for parking garage ventilation, and requirements to complement water conservation programs. For lighting, key changes include: more efficient lighting (1.0 W/sf for open offices), automatic controls for all buildings, offices less than 300 square feet to have occupancy sensors, daylight zones to have dimming controls, prescriptive lighting option to have continuous dimming controls.

DCLU and City Light convened a Public Forum on July 12, 2001 to discuss City staff recommendations, highlight issues, and take public comment. Council members Heidi Wills and Richard Conlin provided opening comments and moderated the discussion.

DCLU now proposes the adoption of the CCAB recommendations with the following two exceptions: (1) one pair of recommendations for the building envelope (where CCAB had offered two to choose from), and (2) a sunset on the lower-temperature system exception to the requirement for electronically-commutated motors (CCAB supported the motor requirements, but did not limit use of the exception).

In response to the public comments received, DCLU and City Light are providing additional energy saving and cost data to support the recommendations and trade-off software will be upgraded. In addition, another topic raised was the City Light incentive programs to complement the 2001 Energy Code. We understand that City Light is proposing to hold a public forum on this topic and bring forward some recommendations to the Energy and Environmental Policy Committee.

The proposed effective date of these revisions is the end of the year. DCLU is proposing further study of heating and cooling equipment efficiencies. Also, the State has entered rulemaking on the Washington State Energy Code. Previous changes have typically taken effect on the following July 1st. Consequently, DCLU would plan to report back next spring on heating and cooling equipment efficiencies in conjunction with an ordinance to incorporate the further Washington State Energy Code revisions. In addition, City Council Resolution 30280 also directs DCLU to evaluate its Energy Code plan review and inspection procedures and to report back to the City Council by December 31, 2001.

Financial Impacts

No additional funds are being requested in this package, but an additional 4.5 positions and appropriation authority will be requested by DCLU as part of its 2002 budget. Funding to support these positions is included in the 2002 City Light budget proposal. Costs for these positions will be shared between DCLU and Seattle City Light for 2002.

City Council Review

DCLU provided a preliminary briefing on this legislation for the City Council's Energy and Environmental Policy Committee in May. The Committee has asked for a briefing on August 2, 2001. The Committee is scheduled to consider this legislation at their meeting on Thursday, August 16, 2001.

If you have any technical questions about the proposed legislation or future work, please contact John Hogan of my staff by e-mail at john.hogan@ci.seattle.wa.us or by phone at (206) 386-9145.

Attachments: Ordinance
Summary of Changes for the 2001 Seattle Energy Code
Fiscal Note

Department:	Contact Person/Phone:	CBO Analyst/Phone:
Design, Construction and Land Use	Michael Aoki-Kramer, 4-7932 Warren Cheney, 5-1332	Stephen Land, 4-7920

Legislation Title:

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") that adopted the 2000 Washington State Energy Code with Seattle amendments and amending the Energy Code Sections 1132.2, 1132.3, 1133, 1301, 1310.2, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1401, 1411.1, 1411.4, 1412.2, 1412.4, 1412.6, 1412.8, 1413, 1413.2, 1413.3, 1414.1, 1416, 1421.1, 1423, 1431.2, 1432.2, 1433, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530, 1532, and Tables 10-5B, 10-6, 13-1, 14-4, and 15-1, and the title to Chapter 15; adding new Sections 1413.4, 1436.2, 1436.3, 1540, and new Tables 14-1A, 14-1B, 14-1C, 14-1D, 14-1E, 14-1F, 14-1J, 14-1K, 14-1L, 14-1M, and new Section 3.6.5 to Reference Standard 29 of the Energy Code; and repealing Tables 14-1, 14-2, and 14-3 of the Energy Code.

Summary of the Legislation:

All of the proposed Energy Code amendments are to the nonresidential provisions. For the building envelope, key changes include the following: glazing to have low-e coatings and solar control coatings, better insulation for walls, increased insulation for semi-heated spaces; easy pre-calculated/prescriptive credits for glass solar heat gain coefficient (SHGC) in lieu of shading coefficient (SC), overhangs/setbacks, north windows, slab edge and tapered roof insulation; more default tables for mass walls and overhead glazing. For the mechanical systems, key changes include the following: increasing minimum equipment efficiencies and motor efficiencies, more use of outside air for cooling in lieu of mechanical refrigeration, better motors (electronically-commutated) for fans in ceiling mixing boxes, limits on damper leakage, better duct sealing, clarification of the commissioning requirements, better controls for parking garage ventilation, and requirements to complement water conservation programs. For lighting, key changes include the following: more efficient lighting (1.0 W/sf for open offices), automatic controls for all buildings, offices less than 300 square feet to have occupancy sensors, daylight zones to have dimming controls, prescriptive lighting option to have continuous dimming controls.

Background (Include justification for the legislation and funding history, if applicable):

Over the years, Seattle has consistently adopted amendments to sections of the Washington State Energy Code (WSEC) that are more stringent than the WSEC's minimum requirements for nonresidential structures. These Seattle amendments, called the Seattle Energy Code, represent significant energy savings to Seattle City Light and are

credited with saving Seattle City Light 150 average megawatts over the last 20 years, a significant portion of City Light's project electric load growth over that time period. The Seattle Energy Code also represents a level of building plan review and inspection effort above that which would be required for the enforcement of the WSEC alone. In recognition of the fact that Seattle amendments to the WSEC represent increased code development and enforcement efforts and avoided energy procurement costs, Seattle City Light currently supports 3.8 FTEs within DCLU through a Memorandum of Agreement for Seattle Energy Code Development and Enforcement.

In response to the current energy situation, in February 2001 the City Council passed Resolution 30280 directing DCLU and Seattle City Light to propose Energy Code amendments by July 1, 2001. The Resolution specified that the amendments should achieve a 20% improvement in energy efficiency for nonresidential buildings compared to the national energy conservation standard. The Resolution 30280 goal is consistent with other City and national initiatives, as Seattle's Green Building Policy requires that all City buildings over 5,000 square feet achieve a 20% improvement in energy efficiency and the goal for the next edition of the national standard will also be to increase energy efficiency by 20%. Though the net improvement over current Seattle practice is estimated to be less than 10%, the proposed changes from the 2000 Washington State Energy Code (WSEC) are more significant than in the past. Consequently, education and enforcement of the many new proposed amendments are going to require a greater level of effort than in the past. The increased education, plan review and inspection efforts will directly affect DCLU's electrical and energy/mechanical plan review, inspection, and permitting functions.

It is anticipated that City Light will continue to support Seattle Energy Code education and enforcement of requirements exceeding the 2000 WSEC minimums through our memorandum of agreement, so the additional funding would be provided by a combination of City Light funds allocated towards Conservation Acceleration and DCLU permit fees.

Public Private Partnership Review Status:
Is the project referenced in the legislation subject to P4 review? If yes, identify P4 review to date.

Not applicable.

Is the legislation subject to public hearing requirements? If yes, what public hearings have been held to date?

DCLU and City Light have engaged in a vigorous public review of the proposal. DCLU published a first draft proposal in January 2001 and a second draft in April 2001. Information about the proposals was mailed and has been available on the Seattle Energy Code website (www.ci.seattle.wa.us/dclu/energy/2001update.htm). We have conducted a series of 22 weekly public review meetings. The meetings have been well-attended by a range of interested parties including architects, engineers, lighting designers,

manufacturers, developers, building owners and energy consultants. In addition, one participant in the public review process held at least 5 meetings with contractors, developers, and property managers in order to galvanize broader interest in the energy code development process. DCLU staff has also reached out to professional organizations (e.g., American Institute of Architects, American Society of Heating Refrigeration and Air-Conditioning Engineers, Building Operators and Managers Association, and Electric League) to discuss the proposals.

Additionally, DCLU and City Light convened a Public Forum on July 12, 2001 to discuss City staff recommendations, highlight issues, and take public comment. City Council will be holding public hearings to take public testimony on August 15 and 16, 2001, and September 6, 2001.

Fiscal Sustainability Issues:

In developing its budget for Conservation Acceleration, City Light anticipated the possible need for additional staff within DCLU to provide education and enforcement of the 2001 Seattle Energy Code; however, due to budget timelines, it was necessary for City Light to make their estimate before potential staffing impacts were analyzed. For 2002, City Light estimated approximately 2 additional FTEs to implement the 2001 Seattle Energy Code; the recently completed staffing analysis indicated a need of 4.5 FTEs. After analyzing revenues, DCLU will fund 50% of the FTEs needed to implement the 2001 Seattle Energy Code from existing development and electrical permit fee resources. The proposed code revisions are not expected to generate additional development or electrical permit fee revenue. New or revised permit fees are not proposed to fund the enhanced functions to be provided by DCLU in 2002. Based on City Light's current full support of positions within DCLU for Energy Code education and enforcement, it is anticipated that resources from City Light will be required to fully fund the on-going implementation of the proposed 2001 Seattle Energy Code beginning in 2003.

It should also be noted that DCLU and City Light will be undertaking a code enforcement study, the results of which are due to City Council by December 31, 2001. With the results of the code enforcement study, and with direction and input from Council, DCLU and City Light will be evaluating staffing needs for energy code education and enforcement in the first half of 2002. This discussion will ultimately inform the staffing levels and funding decisions for 2003 and beyond.

Estimated Expenditure Impacts:

FUND (List # and/or Account)	2000	2001	2002
DCLU (15700)			$493,924
TOTAL			$493,924

One-time $_____ On-going $_493,924_____

Estimated Revenue Impacts: Seattle City Light has committed to funding half the additional expenditures required to implement the energy code revisions in 2002. DCLU will fund the remaining 50% from existing development and electrical permit fee resources. The proposed code revisions are not expected to generate additional development or electrical permit fee revenue. New or revised permit fees are not proposed to fund the enhanced functions to be provided by DCLU in 2002. Beginning in 2003, DCLU expects additional resources from Seattle City Light will be required to fund fully the on-going implementation of the proposed code.

FUND (List # and/or Account)	2000	2001	2002
Seattle City Light Energy Code			$246,962
TOTAL			$246,962

One-time $_____ On-going $_493,924_____

Estimated FTE Impacts:

FUND	2000	2001	2002
Mechanical Plans Engineer			2.5
Mechanical Inspector			1.0
Building Inspector, Journey			0.5
Electrical Inspector, Senior			0.5
TOTAL FTEs			4.5

Full Time __3____ # Part Time ___3___ # TES _____

Do positions sunset in the future? If yes, identify sunset date?

The positions are not anticipated to sunset.

Other Issues (including long-term implications of the legislation):

The primary purpose of the proposed 2001 Seattle Energy Code is to secure electrical energy savings in nonresidential buildings at the time buildings are constructed or remodeled. Energy Code enforcement also has the effect of reducing electricity demand and therefore the reducing that amount of electricity purchased by City Light. These savings will accrue for the life of the building and its component systems, i.e., building envelope, mechanical system, or lighting system. The opportunity to secure electric energy savings and install energy efficiency measures or equipment varies greatly due to the typical lifespan of each component; opportunities that presents themselves only as often as every 5 years, or as little as every 50 years. Thus the long-term implications of the proposed 2001 Seattle Energy Code are significant in terms of the amount of energy that can be saved over a building's life. The current investment in staff education and enforcement will reap benefits for years to come on each project subject to the 2001 Seattle Energy Code.

This blue file needs:

2 copies of initialed memo. One should be paperclipped to outside of folder, the other 2 should be attached to the extra copies of entire package that are in the blue file and go to the Law Dept.

2 extra copies of entire package for John Hogan
1 extra copy of entire package for Maureen Traxler

Deliver to Margaret Klockars
Law Dept.
Muni Bldg.
10th floor

SUMMARY OF
2001 SEATTLE ENERGY CODE PROPOSAL

(1 August 2001)

DCLU has now forwarded recommendations for the **2001 Seattle Energy Code** to the Seattle City Council. The proposed effective date is the end of the year, 31 December 2001.

This document is a companion to the ordinance that contains additional Seattle amendments to the 2000 Washington State Energy Code. Within this document are

- An Overview with frequently asked questions (page 2),
- Summary of Key Changes Proposed (page 8),
- Costs and Energy Savings for Key Issues (page 9), and
- Discussion of Proposed Amendments (page 13).

These recommendations have been developed through a six-month public review process. Since January, DCLU has conducted weekly public review meetings (22 in total), as well as having review meetings with and providing briefings to professional organizations (Seattle Chapter AIA, Puget Sound ASHRAE, BOMA of Seattle and King County, Electric League of the Pacific Northwest), and finally getting recommendations from the DCLU Construction Codes Advisory Board (CCAB) to develop and refine this package of Energy Code amendments. City Councilmembers Heidi Wills and Richard Conlin participated in a Public Forum held on 12 July 2001 that provided an additional opportunity for discussion and public comment. DCLU thanks all the participants for their efforts and contributions to develop the most workable proposal.

In most cases, (1) there was consensus from the public review meetings and CCAB discussions on the proposed code language, and (2) DCLU and Seattle City Light staff concur with that consensus. Preliminary consultant analysis suggests that the improvement from current practice in Seattle to achieve the goal in Resolution 30280 would be less than 10%.

The Energy and Environmental Policy Committee of the Seattle City Council will hold three public hearings: (1) Wednesday, 15 August 2001, 5:30 pm, (2) Thursday, 16 August 2001, 9:30 am, and (3) Thursday, 6 September 2001, 9:30 am. All hearings will take place in the Council chambers in the Seattle Municipal Building, 600 4th Avenue, Seattle. For further information, see http://www.cityofseattle.net/council.

For questions, please contact John Hogan at (206) 386-9145 or john.hogan@ci.seattle.wa.us or Michael Aoki-Kramer at (206) 684-7932 or michael.aoki-kramer@ci.seattle.wa.us.

OVERVIEW

This section provides a context for the 2001 Seattle Energy Code proposal. The questions addressed are:

1. Does the City of Seattle have a comprehensive response to the energy situation that includes new generation and incentive programs?
2. How has the current energy situation affected Seattle in the last year?
3. What is the State of Washington doing and what are other jurisdictions doing in terms of their Energy Codes to respond to this situation?
4. What does Resolution 30280 require? What is the baseline and how does this compare with other work being done? What is the likely impact on current practice?
5. Do the changes in the Seattle Energy Code affect energy credits in the LEED green building program?
6. Why are changes being proposed for nonresidential buildings but not for residential buildings?
7. What has been done to provide for public participation in the development of these recommendations?
8. Do the DCLU recommendations differ substantially from the CCAB recommendations or those from the review group meetings?
9. Does the Energy Code contain any performance approaches or is there only a prescriptive compliance option?
10. What about existing buildings? Why are changes being proposed for the way that the Energy Code treats mechanical systems in existing buildings?
11. When would these Energy Code revisions take effect?
12. Will there be any other Energy Code changes?

Frequently Asked Questions

1. Does the City of Seattle have a comprehensive response to the energy situation that includes new generation and incentive programs?

Yes, during the summer and fall of 2000 the Mayor and City Council reviewed Seattle City Light's energy needs over the next ten-year period and adopted a Strategic Resource Plan. The Proposed Energy Code revisions are but one part of a much larger strategy and acknowledge the fact that more than 60% of the cost effective conservation investments in the commercial sector are in new buildings and/or major retrofits.

Key elements of that Strategic Resource Plan include:

- Meet base load growth consistent with the City Council's Earth Day Resolution. This directs Seattle City Light to meet load growth with cost-effective energy efficiency and renewable resources to the greatest extent possible, and mitigate any greenhouse gas emission that are a result of that load growth. More specifically, Seattle City Light will double the current conservation goal over the next ten year

period to acquire roughly 100 aMW of cost effective conservation, review and pilot new approaches to load management, and strive to acquire 100 aMW of renewable resources over the ten year period.
- Sign a new contract with the Bonneville Power Administration effective October 1, 2001 that increases the quantity of power purchased from 195 aMW at present to roughly 500 aMW.
-Contract for 100 aMW of the output of a combustion turbine as a hedge against adverse weather and water condition and extraordinary load growth and to meet peak demands.

2. How has the current energy situation affected Seattle in the last year?

In terms of electricity, Seattle City Light has incurred significantly increased costs to meet its purchased power needs over the past year. To cover these power cost increases the City Council has already implemented 3 power rate surcharges totaling more than 40% of customer rates. Another will go into effect on October 1st when the increased prices associated with the new Bonneville Power Administration contract hit the utility's rate base. These power cost surcharges have been structured to allow the utility's ratepayers to re-pay the exorbitant power purchase costs of the past year over a multi-year period. However, they are not the reason the City is pursuing changes in its Energy Code at this point in time. That was part of the longer term Strategic Resource Plan approved by the City before the current energy crisis hit.

In addition, natural gas prices have also increased substantially within the last year.

3. What is the State of Washington doing and what are other jurisdictions doing in terms of their Energy Codes to respond to this situation?

In May 2001, Governor Locke sent a letter to the Washington State Building Code Council (WSBCC) requesting further improvements to the Washington State Energy Code. In response, the WSBCC will be adopting further revisions to the Washington State Energy Code this year.

In April 2001, Tacoma adopted revisions to the nonresidential portions of the Energy Code. These provisions affect both new construction AND the OPERATION of existing buildings (such as exterior lighting). Tacoma considered the energy situation so pressing that they adopted the revisions as an emergency ordinance and it took effect two days later.

Seattle has received inquiries from other jurisdictions about our work. Seattle City officials are sharing our work on the Energy Code with other cities.

4. What does Resolution 30280 require? What is the baseline and how does this compare with other work being done? What is the likely impact on current practice?

In February 2001, the Seattle City Council passed by a vote of 9-0 Resolution 30280 directing DCLU and Seattle City Light to bring forward a package of Energy Code amendments that would achieve a 20% improvement in energy efficiency for nonresidential buildings over that achieved through ASHRAE/IESNA Standard 90.1-

1999. ASHRAE is the American Society of Heating, Refrigerating, and Air-Conditioning Engineers. IESNA is the Illuminating Engineering Society of North America. (There are no proposed changes for Group R occupancy.) This resolution was summarized in the Daily Journal of Commerce in their 13 February 2001 issue.

Resolution 30280 specifies ASHRAE/IESNA Standard 90.1 as the baseline (NOT the current Seattle Energy Code or current practice). While Standard 90.1 was published in 1999, most of the requirements were actually developed in the early- or mid-1990's. ASHRAE and IESNA have a committee that is working on revisions to Standard 90.1. The ASHRAE/IESNA Standard 90.1 Committee has adopted a goal to improve the energy efficiency of the 2004 version of Standard 90.1 by 20% compared to the 1999 version. In addition, Seattle is currently requiring that new City buildings achieve a 20% improvement over Standard 90.1 as part of their compliance with a Silver Rating in the LEED Green Building program.

While certainly a step forward, the change is not as significant as might first appear. Both the 2000 Washington State Energy Code and the 2000 Seattle Energy Code achieve greater energy efficiency than Standard 90.1. Indeed, preliminary consultant analysis indicates that improvement over Standard 90.1 called for in Resolution 30280 is likely to be less than a 10% change and might only entail a 6-8% improvement over current practice in Seattle.

5. Do the changes in the Seattle Energy Code affect energy credits in the LEED green building program?

No, the LEED energy credit uses ASHRAE/IESNA Standard 90.1 as the baseline for points.

6. Why are changes being proposed for nonresidential buildings but not for residential buildings?

Seattle is interested in the efficiency of residential buildings, but State law precludes amendments to the residential (Group R occupancy) portions of the Washington State Energy Code.

For nonresidential occupancies, however, the Washington State Energy Code is a minimum. The nonresidential provisions of the Washington State Energy Code have generally been written to address smaller, simpler commercial buildings that are typical in many areas throughout the State. Seattle has more complex buildings, but also more sophisticated designers and more knowledgeable plan review and inspection staff. Consequently, there is both the potential for energy-efficiency improvements and the capability to achieve them.

7. What has been done to provide for public participation in the development of these recommendations?

Seattle has an ongoing process for public participation in the development and revision of its codes. The Seattle Building Code, Section 105, provides for the establishment of a Construction Codes Advisory Board (CCAB) whose members are appointed by the Mayor and subject to confirmation by the Seattle City Council. CCAB examines proposals and makes recommendations for Seattle's technical codes including the Seattle Energy Code.

DCLU first briefed the Construction Codes Advisory Board (CCAB) in late 2000 about the upcoming Seattle Energy Code update process. This briefing included a

presentation from Seattle City Light staff about the current energy situation.

Seattle DCLU published a first draft of Seattle amendments to the 2000 Washington State Energy Code in January 2001. The availability of the draft was announced in a mailing to DCLU's Energy Code mailing list and to the Seattle Energy Code e-mail list. DCLU also provided a summary of key changes adopted for the Washington State Energy Code.

The Second Draft was published in April 2001, e-mailed to the Seattle Energy Code e-mail list, and a notice of availability mailed to DCLU's Energy Code mailing list.

Since the release of the first draft in January 2001, DCLU has been conducting a series of weekly meetings to review draft proposals. To date, 22 meetings have been held. Notices of the meetings, agendas, supplemental information for the meetings, and notes of the meetings have been posted on the Seattle Energy Code website at **www.ci.seattle.wa.us/dclu/energy**.

In addition, DCLU provided briefings to the Electric League of the Pacific Northwest Code Committee on 17 January 2001 and 18 April 2001, to the full Electric League of the Pacific Northwest on 1 May 2001, to the Seattle Chapter AIA Environment/Energy Committee on 8 February 2001 and 14 June 2001, to the Puget Sound ASHRAE TEGA Committee on 8 February 2001, 20 March 2001, and 21 May 2001, and to BOMA of Seattle and King County on 19 June 2001.

DCLU staff also participated in a series of informational meetings and roundtable discussion for architects, developers, and building owners. The first was hosted by Turner Construction and Holaday-Parks, Inc. and took place on 13 February 2001, a second was hosted by Lease Crutcher Lewis and Holaday-Parks, Inc. and took place on 5 March 2001, and a third was hosted by Mulvanny/G2 and Holaday-Parks, Inc. and took place on 6 March 2001.

DCLU staff provided a general briefing for the DCLU Construction Codes Advisory Board (CCAB) on 17 May 2001 on the recommendations from the weekly review meetings. CCAB discussed proposals and made recommendations on the lighting sections at their meeting on 7 June 2001, on the administrative sections and some of the building envelope sections on 18 June 2001, the remainder of the building envelope sections on 21 June 2001, and mechanical sections on 2 July 2001.

Please note that these recommendations have evolved significantly through the 22 review group meetings and discussions with professional organizations.

8. Do the DCLU recommendations differ substantially from the CCAB recommendations or those from the review group meetings?

In most cases, (1) there was consensus from the public review meetings and CCAB discussions on the proposed code language, and (2) DCLU and Seattle City Light staff concur with that consensus.

The DCLU proposal for Energy Code revisions contains two differences from the CCAB recommendations:

- one related to electronically-commutated motors (both CCAB and DCLU have recommended adopting a requirement for these motors, and both CCAB and DCLU have an exemption that allows an alternate system with a lower supply air temperature, however DCLU recommends that the exemption for the alternate have a sunset of June 2002);
- a second which involves DCLU recommending no change to the categorization of variable air volume systems linked with higher wall insulation, whereas CCAB had

also recommended an additional second linked pair (in this case, DCLU has recommended the least stringent of CCAB's two linked pairs).

Please see the detailed discussion of costs and energy savings for key issues that follows.

9. Does the Energy Code contain any performance approaches or is there only a prescriptive compliance option?

The Energy Code has more performance alternates than the Building, Mechanical, or other codes.

(1) Within the "prescriptive" approach, the proposed 2001 Energy Code amendments include performance credits that save designers the trouble of doing calculations and save review time. These pre-calculated/prescriptive credits include:
- allowing the use of glass Solar Heat Gain Coefficient (SHGC) in lieu of shading coefficient (this amounts to a 14% credit for products without NFRC ratings);
- credit for window overhangs and setbacks through a simple table of adjustment factors;
- allowing north-facing glazing to have an SHGC that is 0.10 higher than other orientations (for buildings with a glazing area that is 30-40% of the wall, this allowance means that the prescriptive requirements for north-glazing are actually less stringent than the current Energy Code); and
- pre-calculated options to reduce slab edge insulation and to taper roof insulation.

(2) In terms of tradeoffs with the building envelope, the Energy Code contains two options:
- (2a) the Target UA and Target SHGC procedures; and
- (2b) the ENVSTD software (given the proposed changes in the building envelope criteria, the current version of ENVSTD would need to be revised; DCLU has had discussions with the holder of the copyright for the software and they are prepared to make the changes once given the go-ahead; DCLU, with City Light funding, will arrange for that to happen once the code changes have been adopted).

(3) The Energy Code Reference Standard 29 (RS-29) provides yet another option - an allowance to do overall building tradeoffs between different building components (building envelope, mechanical, and lighting). When using this option, the Energy Code requires that the same systems be used in both the standard design (the baseline) and the proposed design. This is because the Energy Code assumes that there are many reasons other than energy for selecting building elements. For example, metal framing or masonry might be selected as the wall type (in lieu of wood) due to needs for fire-resistance. Consequently, once the designer has made those decisions, that becomes the baseline for tradeoffs. There is no penalty for choosing a less-efficient system type, but there also is no credit for a more efficient system type. Thus, a designer can not claim a metal frame wall as the baseline and get credit by "switching" to a wood frame wall. This same philosophy applies to mechanical systems. This prevents the use of an artificially low base case that would not reflect current practice. However, it also limits credits for systems that are substantially better than current practice. For truly innovative mechanical systems, where proposed design system cannot be modified to comply with standard requirements, RS-29 does allow the use of a prototype system.

10. What about existing buildings? Why are changes being proposed for the way that the Energy Code treats mechanical systems in existing buildings?

Existing buildings are significant factor in Seattle. Currently, the Energy Code has more detailed specifications for how to deal with common remodeling situations for the building envelope and lighting. For mechanical systems, there is only one sentence.

Comments during the Public Forum indicated some confusion about the proposals for existing buildings. There are no proposed modifications to the way that the Energy Code currently addresses alterations to the building envelope.

For mechanical systems, earlier draft proposals addressed the mechanical section more comprehensively. In response to discussions, DCLU has narrowed the scope of proposed revisions to economizer operation (cooling with outside air in lieu of mechanical refrigeration). This is the most important mechanical system issue in Seattle's mild climate.

DCLU has worked with the Building Owners and Managers Association (BOMA) and modified proposals so as to incorporate recommendations from BOMA.

The language now proposes compliance on either a (1) permit-by-permit basis or (2) through a long-term plan. The long-term plan approach is a new idea that is being offered. The language also provides exemptions for areas with low ceilings and where compliance is impractical.

11. When would these Energy Code revisions take effect?

There are competing interests in establishing an implementation date for these revisions. Seattle citizens and Seattle City Light would benefit from the ordinance taking effect as soon as possible so that Seattle City Light would not need to buy as much power and citizens and ratepayers' money wouldn't be lost to outside the region without providing any benefit to the local economy. On the other hand, designers and developers have some projects already in process.

The recommended effective date is the end of the year, 31 December 2001.

12. Will there be any other Energy Code changes?

There is the possibility of additional Energy Code changes both in Seattle and at the State level.

For Seattle, DCLU is recommending that there be further study of the minimum efficiencies for heating and cooling equipment. In the course of the review meetings, manufacturers representatives and others indicated that higher efficiency equipment was available. However, this was not the best year for comparison as manufacturers have been revising their product lines to meet revisions to national standards. That process should be mostly completed by November and new product directories ought to be available after the first of the year. Consequently, DCLU recommends revisiting this topic early next year.

SUMMARY OF KEY CHANGES PROPOSED FOR THE 2001 SEATTLE ENERGY CODE

A summary of key changes follows below. This summary does not list all the changes. The proposed revisions apply to nonresidential occupancies. (There are no proposed changes for Group R occupancy.) A section-by-section listing with text follows the discussion of key issues.

Building Envelope:

- Prescriptive glazing options revised to be based on glazing with low-e coatings and better solar control (Table 13-1). *Provides consistency with Standard 90.1 & addendum aj.*
- Overhead glazing U-factors revised to match actual products (Table 13-1), default U-factors for overhead glazing revised as companion change (Table 10-6).
- Allowance to use SHGC for center-of-glass (1312.2), prescriptive credits for overhangs and north-oriented glazing (1323.3), expanded table of default U-factors for masonry walls with metal studs (Table 10-5B). *Greater flexibility, ease of compliance.*
- Increased wall insulation for "other" space heat (Table 13-1).
- Increased insulation for semi-heated spaces (1310.2) and masonry walls (Table 13-1).

Mechanical Systems:

- Efficiencies for heating and cooling equipment revised (1411.1 and Tables 14-1A to M).
- More use of economizer, lower thresholds, clearer calculations for water economizer (1433).
- Higher motor efficiencies (1437 and Table 14-4).
- Requirement for electronically-commutated motors in series mixing boxes (1437).
- Maximum damper leakage established (1412.4.1).
- Duct sealing and commissioning requirements clarified (1414.1 and 1416).
- Single pass systems eliminated for water conservation purposes (1411.1).

Lighting and Power:

- Lighting power allowance revised to 1.0 W/sf for offices (but no change for small offices and medical offices), and to 1.2 W/sf for schools (Table 15-1). *Revise to reflect current practice.*
- Prescriptive option requires dimming ballasts (1521). *Companion change to Table 15-1.*
- Automatic shut-off controls required for all buildings, not only offices (1513.6). *Provides consistency with IESNA Standard 90.1. Primary energy savings are evenings and weekends.*
- Small offices, meeting and conference rooms, and school classrooms to have occupancy sensors (1513.6). *Additional energy savings during the daytime.*
- Daylighted zones to have automatic controls (1513.3). *Either stepped controls (on-off lamp-by-lamp) or continuous dimming controls are allowed.*
- Change of use to require compliance with lighting power allowance in Table 15-1.
- Certain internal building transformers to comply with NEMA TP-1-1996.

COSTS AND ENERGY SAVINGS FOR KEY ISSUES

KEY ISSUE #1:
SECTION 1437 MOTOR EFFICIENCY

Issue: Should there be a June 30, 2002 sunset on the lower-temperature supply systems exemption from the requirement that terminal units have electronically-commutated motors (ECM) or equivalent?

Background: In a typical nonresidential building, the fans run continuously to provide ventilation. Fan energy is as large or larger than the heating and cooling energy (based upon modeling and metering). Fan powered mixing boxes are used in most nonresidential buildings in Seattle. They incorporate a small motor that helps circulate the air. This motor is typically only 40-50% efficient (and can be as low as 15-20% efficiency when not operating at peak load) and has a primitive speed control that is also inefficient. Because of the number of boxes in a building, the total fan power in these little motors typically represents one-quarter of the total installed fan power. However, because these small motors run continuously while the central fan modulates on a VFD (variable frequency drive), and because they are very inefficient, they consume half of the energy used for fans in the typical building. Electronically-commutated motors provide significant energy savings.

If the Seattle Energy Code were to require that projects have electronically-commutated motors, then there would be greater energy savings compared to ASHRAE/IESNA Standard 90.1.

Discussion: Here are pros and cons for the DCLU recommendation and an estimate of energy savings and costs.

Pro: Allows designers to use a common system. Provides constant air movement which some view as improved air quality. Series boxes, which run continuously, help provide masking noise to hide unwanted noise between adjacent rooms. Electronically-commutated motors are an option offered by all the major mixing box manufacturers. This option would guarantee increased energy savings. Consultant estimate is that allowing the exemption reduces the real energy savings of this measure by over 80% since many buildings already are medium temperature systems, and because a medium temperature system saves one-third of the energy of the efficient fan option.

Con: CCAB supported the exemption so as to provide flexibility, an allowance to use an alternate system. Concern was expressed about a limited number of motor manufacturers. (However, while GE is the most well know manufacturer, FASCO has an equivalent motor, and Emerson is releasing what they are calling an ECM. As for international suppliers, EBM is believed to have a similar type of motor.)

Cost estimate: Consultant estimate of cost is $150-$230/mixing box. At one box per 1,000-2,000 square feet, the cost is roughly $0.15/square foot of building.

Energy savings estimate: Consultant estimate of site energy savings is 510-1,500 kWh per box per year ($36 to $105 at $0.07/kWh). The Carrier Company in their publication "ECM Motors in Series Flow Fan Powered Terminals and Unit Ventilators" provides a savings range of 861-1,215 kWh per box per year ($60 to $85 at $0.07/kWh).

Simple Payback: 3-4 years.

KEY ISSUE #2:
TABLE 13-1 BUILDING ENVELOPE REQUIREMENTS – WALL INSULATION FOR THE "OTHER" SPACE HEAT TYPE

Issue: Should the wall insulation requirements for metal framed walls be revised to require R-13 insulation plus a layer of R-3.8 continuous insulation?

Background: After windows, walls are responsible for the greatest heat flow through nonresidential buildings. The current Energy Code has a prescriptive requirement of R-11 minimum wall insulation for projects that are in the "other" space heat category. (R-19 minimum wall insulation in wood framing is the prescriptive requirement for the electric resistance space heat category.) However, the metal framing that is commonly used in nonresidential construction provides a serious thermal bridge that bypasses the insulation. Consequently, as shown in Table 10-5A in the Energy Code, an R-11 batt installed between metal studs only provides the equivalent of R-5.5 insulation – a 50% reduction in performance! Overall performance ratings for walls are expressed in terms of U-factor, with a lower number meaning that the heat flow through the wall is less. The overall performance for this metal framed wall in the current Energy Code is U-0.14 (which means that the heat flow is more than twice as high as the U-0.062 that is required for the electric resistance space heat path).

In terms of energy savings, the wall performance requirements in ASHRAE/IESNA Standard 90.1 for Seattle are U-0.113 maximum for metal framing and U-0.089 for wood framing. Consequently, the current Energy Code requirements do not comply with ASHRAE/IESNA Standard 90.1. In addition, if the Seattle Energy Code were to require that projects have better performing walls, then there would be greater energy savings compared to ASHRAE/IESNA Standard 90.1. This would assist in achieving the goal of Resolution 30280.

Discussion: Here are pros and cons for the DCLU recommendation and an estimate of energy savings and costs.

When ASHRAE was developing the revisions to Standard 90.1, they considered a range of insulation options to improve performance. An R-19 batt installed between metal studs only provides the equivalent of R-7.1 insulation – a 63% reduction in performance! When compared to the R-11 case, the apparent increase of R-8 (going from R-11 to R-19), really only amounts to an increase in R-1.6 (going from R-5.5 to R-7.1). Whereas continuous insulation added over the metal framing provides the full insulating R-value. Consequently, it is more effective to add continuous insulation over the metal studs to reduce the thermal bridging. The ASHRAE analysis found R-13 cavity insulation plus R-3.8 continuous insulation over the metal framing to be the next step for improving wall performance. For other large cities with high-rise construction, ASHRAE/IESNA Standard 90.1-1999 requires R-13 cavity insulation plus R-3.8 continuous insulation. This wall has a performance value of U-0.084.

Pro: Takes up less floor space compared to CCAB Option 2. Should allow reduction in costs for space heating equipment capacity. Would provide increased energy savings.

Con: May require changes in some standard details (though this assembly is used in Seattle). Results in less flexibility for trade off calculations.

Cost estimate: Consultant estimate of the cost to improve the fenestration, roof, wall, and floor insulation is $0.07 per square foot of floor area for a building that has a fenestration area that is 30% of the gross wall area and that has a ratio of wall area to floor area of 0.42.

Energy savings estimate: Savings estimated across all building types by consultant analysis is 0.5 kWh/ft^2•yr ($0.035/ft^2•yr).

KEY ISSUE #3:
SECTION 1302 SPACE HEAT TYPE

Issue: Should the "other space heat type" building envelope requirements should apply to buildings that have space heating systems that are VAV (variable air volume) with terminal electric resistance heating elements?

Background: For both residential and nonresidential occupancies, the current Energy Code has separate building envelope requirements that vary by space heat type. There are two categories: "electric resistance" and "other". The requirements for electric resistance space heat are more stringent. The residential (Group R occupancy) definition for electric resistance space heat in Section 502.2.2 includes all systems with electric resistance "as either the primary or secondary heating system" other than heat pumps. However, the nonresidential (other than Group R occupancy) definition, in addition to excluding heat pumps, also excludes "terminal electric resistance heating in variable air volume distribution systems". Consequently, VAV systems are allowed to comply with the less stringent building envelope requirements even though they have electric resistance space heat.

In terms of energy savings, the building envelope requirements in ASHRAE/IESNA Standard 90.1 do not vary by space heating type. Consequently, if the Seattle Energy Code were to require that more projects comply with the building envelope requirements for electric resistance space heat, then there would be greater energy savings compared to ASHRAE/IESNA Standard 90.1. This would assist in achieving the goal of Resolution 30280.

Discussion: Here are pros and cons for the DCLU recommendation and an estimate of energy savings and costs.

This recommendation would continue to allow VAV systems with terminal electric resistance space heat to comply with the building envelope requirements for the "other" space heat type, which are less stringent than the building envelope requirements for electric resistance space heat.

Pro: Does not alter current practice for mechanical system design. Understood by designers, developers, contractors, DCLU staff.

Con: Does not provide energy savings (with exception of CCAB link discussed below) and does not reduce Seattle City Light's peak electrical demand in the winter time.

Energy savings estimate: No energy savings.

Cost estimate: No change.

If this system was switched to the "electric resistance space heat type", the most cost-effective choice is probably the better envelope until glazing areas become large. Then the choice is to make a more substantial investment in a better envelope or to switch to another heating system type.

The change to a better building envelope system, would require a better fenestration system and more insulation. However, the prescriptive options for electric resistance space heat are limited to fenestration areas that do not exceed 30% of the gross wall area. An assessment of the North American Commercial Glazing Market (published in the April 2001 issue of Glass Magazine) indicates that the average fenestration for all buildings in the commercial glazing market is 26% of the wall area. (The Seattle sample found 29%.) However, the average fenestration area varies by building type (Seattle sample values in parentheses): 41% (37%) for office and bank, 34% (18%) for stores, 26% for

hospital/healthcare, 26% for hotel/motel/dormitory, 25% (19%) for educational, 24% (21%) for public/government, 18% for amusement/recreational, 18% for religious, 12% for warehouse, and 20% for miscellaneous. Consequently, this limitation would affect some building types more than others. For projects with fenestration areas that exceed 30% of the gross wall area, Energy Code compliance would need to be demonstrated using Target UA or systems analysis.

Cost estimate: Consultant estimate of the cost to improve the fenestration, roof and wall, and floor insulation is $0.40 per square foot of floor area for a building that has a fenestration area that is 30% of the gross wall area and that has a ratio of wall area to floor area of 0.42. (This estimate uses the wall insulation proposal in CCAB Option 2.).

Energy savings estimate: Savings estimates range from 0.3-0.9 kWh/ft^2•yr ($0.035/ft^2•yr).

Simple payback: 11 years.

For the change to the mechanical system, the assumption is that this option would require that a boiler be added and piping be provided to each of the terminal units so that heating could be provided by water heated by a fuel other than electricity.

Cost estimate: Consultant estimate of costs is $1.05/square foot of floor area for piping, boiler, and wiring costs for a building that has a heating density of 7 Btu/ft^2.

Energy savings estimate: Savings estimates were 0.83 kWh/ft^2•yr electricity reductions ($0.058/ft^2•yr) plus electrical demand reductions ($0.01/ft^2•yr), while gas consumption increased ($0.026/ft^2•yr). Net operating savings are $0.042/ft^2.

Simple payback: 25 years.

2001 SEATTLE ENERGY CODE: SECTION-BY-SECTION DISCUSSION OF PROPOSED CHANGES

The proposed amendments fall into five categories:

- review and fine-tuning of the existing 1997 Energy Code including Seattle amendments,
- other Washington State Energy Code proposals,
- ASHRAE/IESNA Standard 90.1-1999 and addenda,
- results of Seattle City Light funded research on the energy-efficiency of recently constructed Seattle buildings, and
- ideas for achieving the Resolution 30280 energy savings from public review meetings earlier this year.

As is the case with the current Seattle Energy Code, there are **NO** proposed Seattle residential amendments to the Washington State Energy Code (though the Washington State Building Code Council did adopt residential amendments that are in the 2000 WSEC). All of the Seattle amendments are to the nonresidential portions (Chapters 11-15, RS-29, and applicable material in Chapter 10).

All of the amendments are summarized below in section number order and include:

- **Section number and title.**
- *Discussion:* This contains a summary of the issues and the source of the language if it has been taken from another document, such as ASHRAE/IESNA Standard 90.1-1999. (Standard 90.1 is cited in the 1992 National Energy Policy Act as the basis for Energy Codes in all 50 states. Previous versions of the Seattle Energy Code have drawn substantially from this document and its predecessors.) Carryover of existing 1997 Seattle amendments was addressed in separate ordinance 120378 for the 2000 Seattle Energy Code and is indicated by "Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code."

Table 10-5B Default U-Factors for Concrete and Masonry Walls.

Discussion: For other than Group R occupancy, provide revised values
(a) to correspond with ASHRAE/IESNA Standard 90.1-1999, Section A3.1 and Tables A-5 to A-8.
(b) to expand options to assist with prescriptive compliance for revisions to Table 13-1.
(Note that this table was formerly Table 20-5B, but was renumbered when Chapters 10 and 20 were combined in the 2000 Washington State Energy Code.)

Table 10-6 Other than Group R Occupancy: Default U-Factors for Vertical Glazing, Overhead Glazing and Opaque Doors.

Discussion: (1) Additional values for vertical glazing incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Add values for sloped glazing to correspond with revisions to Table 13-1 to assist with prescriptive compliance.
(Note that this table was formerly Table 20-6, but was renumbered when Chapters 10 and 20 were combined in the 2000 Washington State Energy Code.)

1132.2 Building Mechanical Systems.

Discussion: Revise requirement with the goal of having all systems completely comply with the economizer requirements in 1433, or one of the exceptions, over time. Two options are provided: one is a permit-by-permit option, the other is for a long-term plan. Exceptions are provided for low ceiling heights and other instances where ductwork is impractical.

1132.3 Lighting and Motors.

Discussion: Revise requirement with the goal of having all systems completely comply with the lighting requirements over time.
(1) Require change of use per Table 15-1 to comply with lighting W/sf.
(2) Apply 60% threshold on a space-by-space basis.

1133 Change of Occupancy or Use.

Discussion: Clarify requirements for change of use from semi-heated to heated space for spaces constructed prior to 1980.

1144 Violations and Penalties.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1150 Conflicts With Other Codes.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1161 Severability.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1162 Liability.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1301 Scope.

Discussion: (1) Editorial correction
(2) Provide reduced requirements for parking lot attendant booths.

1310.2 Semi-Heated Spaces.

Discussion: (1) Provide increased requirements for roof insulation, and add minimum requirements for wall and floor insulation, and for fenestration U-factor and area.
(2) Require compliance with Section 1320 or 1330 for semi-heated spaces with electric resistance space heat.

1311.6 Radiant Floors.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1312.2 Solar Heat Gain Coefficient and Shading Coefficient.

Discussion: Allow SHGC (solar heat gain coefficient) for the center of the glass alone as an alternate to NFRC-certified SHGC for the overall fenestration assembly (including the frame), provided the center-of-glass SHGC is determined using acceptable base data. Add note indicating the differences between center-of-glass SHGC and overall fenestration assembly SHGC.

1322 Opaque Envelope.

Discussion: (1) Clarify that area-weighted averaging is not allowed for R-values and what the acceptable procedure is for U-factor calculations.
(2) Add exception with pre-calculated trade-off for edges of intermediate floor slabs which are uninsulated or that do not comply with the wall insulation requirements.
(3) Add exception with pre-calculated trade-off for roofs with tapered insulation that do not comply throughout with the minimum roof insulation requirements.

1323 Glazing.

Discussion: (1) Street level transparency requirements in the Seattle Land Use Code incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Specify a MINIMUM visible transmittance requirement so that the glazing complying with Exception 1 has the transparency required by the Seattle Land Use Code. (Section 23.47.050 of the Seattle Land Use Code defines transparent as "clear or lightly tinted".)
(3) Require a low-e coating or equivalent for all glazing. Companion change to Table 13-1.
(4) Provide exceptions to the solar heat gain coefficient requirement (i) for glazing inside buildings in walls separating conditioned space from semi-heated or unconditioned space (ii) with less stringent requirements for north-oriented glazing consistent with ASHRAE/IESNA Standard 90.1-1999 and (iii) with credit for shading by permanent projections that will last as long as the building itself consistent with ASHRAE/IESNA Standard 90.1-1999.

1331 General.

Discussion: Delete exception which references the use of the 1989 version of the ENVSTD program for consistency with changes to Table 13-1. Companion change to Table 13-1. However, also note that a Seattle version is proposed to be developed.

1333 UA Calculations.

Discussion: Clarify how to calculate U-factors for roofs with tapered roof insulation. Companion change to Section 1311.2.

Table 13-1 Building Envelope Requirements.

Discussion: (1) Revise prescriptive glazing paths to require better wall insulation.
(2) Revise "other space heat" prescriptive glazing paths to require better glazing comparable to ASHRAE/IESNA Standard 90.1-1999 and Addendum aj.
- For low-glazing and mid-glazing percentages, incorporate a requirement for low-e coatings (U-0.55 can be achieved by double-glazing with a low-e coating; for products without NFRC ratings, Table 10-6 has defaults that allow U-0.55 to be achieved by products that have, (i) double-glazing with a good low-e coating in a metal frame, (ii) double-glazing with any low-e coating and argon gas fill in a metal frame, and (iii) double-glazing with any low-e coating for products with a metal frame having a thermal break or a wood or vinyl frame).
- For large glazing percentages, require a better U-factor (U-0.45 can be achieved by double-glazing with a good low-e coating in a thermally improved frame; for products without NFRC ratings, Table 10-6 has defaults that allow U-0.45 to be achieved by products with wood or vinyl frames, or with the addition of argon to glazing installed in metal frames having a thermal break).
- For all glazing percentages, require a better solar heat gain coefficient (SHGC-0.40 can be achieved by double-glazing with a good low-e coating and green glass which has a high daylight transmittance).
- For mass walls, calculated using ENVSTD and having no higher total load than the 40% glazing metal frame path (which has an overall ENVSTD value for both heating and cooling that is 88% of the 2000 WSEC).
(3) Revise "electric resistance space heat" prescriptive glazing paths to require better SHGC and same relative stringency to "other space heat" as in the 2000 WSEC for metal frame walls,
- For metal frame walls, calculated using ENVSTD and having no higher total load than 88% of the 20% glazing metal frame path in the 2000 WSEC.
- For mass walls, calculated using ENVSTD and having no higher total load than the 20% glazing metal frame path in the 2001 SEC.
- Also, add a 30% glazing path for electric resistance space heat.
(4) Revise overhead glazing U-factor to correspond with current products.
(5) Revise footnote 1 to provide more consistency in code implementation. Do not give credit for insulation far below grade where there is little benefit.
(6) Add footnote to incorporate WSBCC Interpretation 94-32 with definition of roof types.
(7) Modify existing Seattle footnote 6 to provide equivalent energy savings to 40% glazing metal frame path in Table 13-1.

1401 Scope.

Discussion: Provide specific requirements for certain systems so as to achieve consistency in application of the code. Companion change to Section 1433.

1402 Mechanical Ventilation.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1411.1 General.

Discussion: (1) Minimize energy waste from standby losses for larger furnaces. Language is from ASHRAE/IESNA Standard 90.1-1999, Section 6.2.1.
(2) Require multiple stages for furnaces.
(3) Provide sizing ratios for cooling towers with air and water economizers.
(4) Prohibit use of single-pass systems for water conservation purposes.
(Note that there are companion changes to revise equipment efficiency Tables 14-1 to 14-3. Tables are located after Section 1452.)

1411.2 Rating Conditions.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1411.4 Packaged Electric Heating and Cooling Equipment.

Discussion: Clarify that heat pump requirements apply to both packaged and split systems.

1411.5 Heating Systems in Unenclosed Spaces.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1412.2 Deadband Controls.

Discussion: Do not allow deadband control to be traded off.

1412.4 Setback and Shut-Off.

Discussion: Add requirements for retention of programming and manual override, and allow exception for occupancy sensors and manual timers per ASHRAE/IESNA Standard 90.1-1999, Section 6.2.3.2.1.

1412.4.1 Dampers.

Discussion: (1) Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Add requirements for damper air leakage from Addendum ad-4 to ASHRAE/IESNA Standard 90.1-1999. The text accompanying that addendum refers to the 10 cfm/ft^2 damper leakage rate as "middle leakage" and cites a Ruskin CD-36 as a damper that would qualify, and refers to the 20 cfm/ft^2 damper leakage rate as "high leakage" and cites a Ruskin CD-35 with blade and jamb seals and BD2 backdraft dampers as a damper that would qualify. To obtain a copy of the AMCA (Air Movement and Control Association) 500 standard and for a listing of products with certified ratings, see http://www.amca.org.

1412.6 Combustion Heating Equipment Controls.

Discussion: (1) Delete existing Seattle amendment for larger equipment sized correctly.
(2) Modify exemption for boilers.

1412.8 Enclosed Parking Garage Ventilation.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code, but require both controls for larger systems and either control for smaller systems.

1413 Air and Water Economizers.

Discussion: (1) Clarify that economizer control requirements apply to both air and water systems per ASHRAE/IESNA Standard 90.1-1999, Section 6.3.1.2.
(2) Clarify the requirement for integrated economizer control and modify the exception per ASHRAE/IESNA Standard 90.1-1999, Section 6.3.1.3.
(3) Add limit on heating system impact from ASHRAE/IESNA Standard 90.1-1999, Section 6.3.1.4. Per the 90.1 Users Manual, the following system types would not comply with this requirement: single-fan dual duct systems and some multizone systems (Figure 6-R, pages 6-53 to 6-54), and some water economizer systems (Figure 6-O, page 6-50, and Example 6-OO, page 6-53). Add informative note from the 90.1 Users Manual.

1414.1 Sealing.

Discussion: (1) Require better sealing for ductwork.
(2) Provide greater consistency between residential and nonresidential specifications for sealing methods.
(3) Add note from ASHRAE/IESNA Standard 90.1-1999, Table 6.2.4.3B to clarify categories.

1416 Completion Requirements (includes commissioning).

Discussion: The 2000 Washington State Energy Code now includes the completion and commissioning requirements from the 1997 Seattle Energy Code. The following proposed revisions are intended to make these requirements work better by:
(a) establishing minimum commissioning requirements for all mechanical systems, and
(b) describing acceptable commissioning criteria.

1421 System Type.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1421.1 System Sizing Limits.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code, but change limits to 16 and 25 Btu per square foot to reflect changes in Chapter 13 and Section 1431.

1423 Economizers.

Discussion: Structure the code requirements so that more equipment has full economizer capability (other than small units in Group R occupancy). Companion change to Section 1433.

1431.2 System Sizing Limits.

Discussion: (1) Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code, but revise sizing limit to 125%,
(2) Require multi-stage capability for loads over 300 tons.
(3) Establish separate requirements systems with heat recovery (Exception 4).

1432.2.2 Hydronic Systems.

Discussion: (1) Application to mechanical refrigeration incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Threshold revised to 300,000 Btu/h per ASHRAE/IESNA Standard 90.1-1999, Section 6.3.4.3.
(3) Add requirements for valves per ASHRAE/IESNA Standard 90.1-1999, Section 6.3.2.2.3.

1433 Economizers.

Discussion: (1) Require economizer for most equipment and systems unless they comply with one of the exceptions. Companion change to Section 1423.
(2) Provide a simpler compliance path in Exception 3 for waterside economizer systems.

1435 Simultaneous Heating and Cooling.

Discussion: Reference to Seattle Mechanical Code incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1436 Heat Recovery.

Discussion: (1) Laboratory fume hood label incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Add provision for steam condensate recovery for energy and water conservation.
(3) Add provision for condenser heat recovery per ASHRAE/IESNA Standard 90.1-1999, Section 6.3.6.2.

1437 Electric Motor Efficiency.

Discussion: (1) Require that motors in HVAC equipment comply with minimum efficiency requirements.

(2) Add efficiency requirements for small motors in terminal units. To obtain a copy of the NEMA MG-1 standard, see http://www.nema.org/standards.

(Note that there are companion changes to revise motor efficiency Table 14-4. Tables are located after Section 1452.)

1438 Variable Flow Systems and System Criteria.

Discussion: Incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.

1440 Service Water Heating.

Discussion: (1) Add cross-reference to equipment efficiency requirements in Tables 14-1A through 14-1M.

(2) Establish minimum efficiency requirements for commercial clothes washers for energy conservation and water conservation purposes.

1452 Pool Water Heaters.

Discussion: (1) No changes (retain existing Seattle amendment), but eliminate allowance for electric resistance heat for pools under 2000 gallons.

(2) Add minimum efficiency for heat pump pool heaters consistent with proposed Addendum ad-14 to ASHRAE/IESNA Standard 90.1-1999.

(3) Add cross-reference to equipment efficiency requirements in Tables 14-1 to 14-3.

Tables 14-1 to 14-3 HVAC Equipment Efficiency.

Discussion: Replace equipment efficiencies in Tables 14-1 to 14-3 with new Tables 14-1A through 14-1M based on 29 October 2001 values in ASHRAE/IESNA Standard 90.1-1999 (these values include Addendum j to ASHRAE/IESNA Standard 90.1-1999 to address ARI Standard 550/590-1998). Leave blank table numbers to correspond with the Standard 90.1 numbering system.

Table 14-4 Motor Efficiency.

Discussion: Adopt the CEE (Consortium for Energy Efficiency) specifications for energy efficient motors. For additional information, see http://www.ceeformt.org/ind/mot-sys/mot-sy-main.php3.

1512 Exempt Lighting.

Discussion: (1) Clarify application of the code. Incorporate WSBCC Interpretations 94-22 and 96-07.

(2) Shift from exempt spaces to exempt lighting. Language for most modifications is from ASHRAE/IESNA Standard 90.1-1999, Section 9.3.1.

1513.1 Local Control and Accessibility.

Discussion: Companion change to Section 1513.6.1.

1513.3 Daylight Zone Controls.

Discussion: (1) Require automatic controls for all daylighted spaces.
(2) Provide graphics that clarify daylight zone area.

1513.5 Automatic Shut-off Controls, Exterior.

Discussion: (1) Require exterior lighting, including signs, to be capable of being turned off during daylight hours.
(2) Provide better control for exterior lighting.

1513.6 Automatic Shut-Off Controls, Interior.

Discussion: (1) Change application to all buildings over 5,000 ft^2 for consistency with IESNA Standard 90.1-1999, Section 9.2.1.1.
(2) Require occupancy sensors for small offices, meeting and conference rooms, and school classrooms.

1513.6.1 Occupancy Sensors.

Discussion: Require manual switch so that occupants have the ability to turn off part or all of the lights when not needed to avoid unnecessary wasting of energy. Having a manual switch serves two purposes:

(a) The occupant can switch off the light when they ENTER a space (after it has been automatically turned on by the sensor) if the light is not needed, such as in a perimeter daylight zone.
(b) The occupant can switch off the light when they LEAVE a space so the lighting energy is not wasted for 30 minutes each time they leave while waiting for the occupancy sensor to automatically turn off the lights.

1521 Prescriptive Interior Lighting Requirements.

Discussion: The intent of the prescriptive lighting option was to provide a mechanism to transform the market for lamps, while still achieving installed lighting wattages comparable to the Lighting Power Allowance option in Section 1530. When this option was first adopted, T-12 lamps were the predominant lamp. Initially, the goal was to shift the market to T-8 lamps and to two-lamp fixtures. Now that this has taken place, and the office Lighting Power Allowance is proposed to be reduced, the original intent is maintained by providing support for electronic dimming ballasts with photocell control for daylighting and lumen maintenance. Companion change to Table 15-1. Other options considered were to limit the prescriptive option to single-lamp fixtures or to not allow the use of T-8 lamps.

1530 Lighting Power Allowance Option.

Discussion: (1) Definition of low voltage track incorporated into separate ordinance to carry over previous Seattle amendments to the 1997 Washington State Energy Code.
(2) Revise default assumptions for track lighting to reflect current practice.

1532 Exterior Lighting Power Allowance.

Discussion: Ensure that exterior lighting is used in the area allotted for it.

Table 15-1 Unit Lighting Power Allowance (LPA).

Discussion: (1) Revise lighting power allowances to reflect current practice. Research on buildings that were constructed and occupied in Seattle during the last three years found lower installed lighting wattages, but with little additional task lighting. Part of this is in response to a need to minimize glare on computer monitors.
(2) Provide separate, higher lighting power allowance for medical office as a companion change to revisions to 1512.1 item 1 and 1512.2 item 9.

1540 Transformers.

Discussion: Provide increased efficiency requirements for internal building transformers. For additional information including a copy of the NEMA TP 1 standard, see http://www.ceeformt.org/ind/trnsfm/trnsfm-main.php3.

RS-29, Section 3.6.5, Parking Garage Ventilation.

Discussion: Clarify the baseline for RS-29 analysis.

ORDINANCE _____

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") that adopted the 2000 Washington State Energy Code with Seattle amendments and amending the Energy Code Sections 1132.2, 1132.3, 1133, 1301, 1310.2, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1401, 1411.1, 1411.4, 1412.2, 1412.4, 1412.6, 1412.8, 1413, 1413.2, 1413.3, 1414.1, 1416, 1421.1, 1423, 1431.2, 1432.2, 1433, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530, 1532, and Tables 10-5B, 10-6, 13-1, 14-4, and 15-1, and the title to Chapter 15; adding new Sections 1413.4, 1436.2, 1436.3, 1540, and new Tables 14-1A, 14-1B, 14-1C, 14-1D, 14-1E, 14-1F, 14-1J, 14-1K, 14-1L, 14-1M, and new Section 3.6.5 to Reference Standard 29 of the Energy Code; and repealing Tables 14-1, 14-2, and 14-3 of the Energy Code.

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Section 22.700.010, SMC, as last amended by Ordinance 120378 is further amended as follows:

22.700.010 Adoption of the 2000 Washington State Energy Code and local amendments.

The 2000 Washington State Energy Code (WAC 51-11) and the amendments thereto adopted by Ordinance 120378 incorporating the Seattle Amendments, and amendments made by the Washington State Building Code Council to the 2000 Washington State Energy Code filed January 5, 2001 (WSR 01-03-010), which is filed with the City Clerk in C.F. 304655, and further amendments made in Ordinance _____ are hereby adopted and by this reference made a part of this subtitle and shall constitute the official Energy Code of the City. The 1997 Washington State Energy Code, and amendments thereto, are hereby repealed.

Section 2. Effective December 31, 2001, Table 10-5B of the Energy Code is amended as follows:

TABLE 10-5B(1)
Group R Occupancy:
Default U-Factors for Concrete and Masonry Walls

8" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.40	0.23	0.24	0.43

R-5 Interior Insulation, Wood Furring	0.14	0.11	0.12	0.15
R-6 Interior Insulation, Wood Furring	0.14	0.11	0.11	0.14
R-10.5 Interior Insulation, Wood Furring	0.11	0.09	0.09	0.11
R-8 Interior Insulation, Metal Clips	0.11	0.09	0.09	0.11
R-6 Exterior Insulation	0.12	0.10	0.10	0.12
R-10 Exterior Insulation	0.08	0.07	0.07	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.09	0.09	0.12

12" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.35	0.17	0.18	0.33
R-5 Interior Insulation, Wood Furring	0.14	0.10	0.10	0.13
R-6 Interior Insulation, Wood Furring	0.13	0.09	0.10	0.13
R-10.5 Interior Insulation, Wood Furring	0.11	0.08	0.08	0.10
R-8 Interior Insulation, Metal Clips	0.10	0.08	0.08	0.09
R-6 Exterior Insulation	0.11	0.09	0.09	0.11
R-10 Exterior Insulation	0.08	0.06	0.06	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.08	0.09	0.12

8" CLAY BRICK

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.50	0.31	0.32	0.56
R-5 Interior Insulation, Wood Furring	0.15	0.13	0.13	0.16
R-6 Interior Insulation, Wood Furring	0.15	0.12	0.12	0.15
R-10.5 Interior Insulation, Wood Furring	0.12	0.10	0.10	0.12
R-8 Interior Insulation, Metal Clips	0.11	0.10	0.10	0.11
R-6 Exterior Insulation	0.12	0.11	0.11	0.13
R-10 Exterior Insulation	0.08	0.08	0.08	0.09

6" CONCRETE POURED OR PRECAST

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	NA	NA	NA	0.61
R-5 Interior Insulation, Wood Furring	NA	NA	NA	0.16
R-6 Interior Insulation, Wood Furring	NA	NA	NA	0.15
R-10.5 Interior Insulation, Wood Furring	NA	NA	NA	0.12
R-8 Interior Insulation, Metal Clips	NA	NA	NA	0.12
R-6 Exterior Insulation	NA	NA	NA	0.13
R-10 Exterior Insulation	NA	NA	NA	0.09

Notes for Default Table 10-5B(1)

1. Grouted cores at 40" x 48" on center vertically and horizontally in partial grouted walls.
2. Interior insulation values include 1/2" gypsum board on the inner surface.
3. Furring and stud spacing is 16" on center. Insulation is assumed to fill furring space and is not compressed.
4. Intermediate values may be interpolated using this table. Values not contained in this table may be computed using the procedures listed in Standard RS-27.

TABLE 10-5B(2)
Other than Group R Occupancy:
Default U-Factors for Concrete and Masonry Walls

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (Cores uninsulated except where specified)
No Framing	R- 0	U- 0.740	U- 0.580	U- 0.480
	Ungrouted Cores Filled with Loose-Fill Insulation	N.A.	N.A.	U- 0.350
Continuous Wood Framing				
0.75 in.	R- 3.0	U- 0.247	U- 0.226	U- 0.210
1.5 in.	R- 6.0	U- 0.160	U- 0.151	U- 0.143
2.0 in.	R- 10.0	U- 0.116	U- 0.111	U- 0.107
3.5 in.	R- 11.0	U- 0.094	U- 0.091	U- 0.088
3.5 in.	R- 13.0	U- 0.085	U- 0.083	U- 0.080
3.5 in.	R- 15.0	U- 0.079	U- 0.077	U- 0.075
5.5 in.	R- 19.0	U- 0.060	U- 0.059	U- 0.058
5.5 in.	R- 21.0	U- 0.057	U- 0.055	U- 0.054
Continuous Metal Framing at 24 in. on center horizontally				
0.75 in.	R- 3.0	U- 0.364	U- 0.321	U- 0.288
1.5 in.	R- 6.0	U- 0.274	U- 0.249	U- 0.229
2.0 in.	R- 10.0	U- 0.225	U- 0.207	U- 0.193
3.5-4.0 in.	R- 11.0	U- 0.168	U- 0.158	U- 0.149
3.5-4.0 in.	R- 13.0	U- 0.161	U- 0.152	U- 0.144
3.5-4.0 in.	R- 15.0	U- 0.155	U- 0.147	U- 0.140
5.5-6.0 in.	R- 19.0	U- 0.118	U- 0.113	U- 0.109
5.5-6.0 in.	R- 21.0	U- 0.113	U- 0.109	U- 0.105
1 in. Metal Clips at 24 in. on center horizontally and 16 in. vertically				
1.0 in.	R- 3.8	U- 0.210	U- 0.195	U- 0.182
1.0 in.	R- 5.0	U- 0.184	U- 0.172	U- 0.162

1.0 in.	R- 5.6	U- 0.174	U- 0.163	U- 0.154
1.5 in.	R- 5.7	U- 0.160	U- 0.151	U- 0.143
1.5 in.	R- 7.5	U- 0.138	U- 0.131	U- 0.125
1.5 in.	R- 8.4	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 7.6	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 10.0	U- 0.110	U- 0.106	U- 0.102
2.0 in.	R- 11.2	U- 0.103	U- 0.099	U- 0.096
2.5 in.	R- 9.5	U- 0.109	U- 0.104	U- 0.101
2.5 in.	R- 12.5	U- 0.092	U- 0.089	U- 0.086
2.5 in.	R- 14.0	U- 0.086	U- 0.083	U- 0.080
3.0 in.	R- 11.4	U- 0.094	U- 0.090	U- 0.088
3.0 in.	R- 15.0	U- 0.078	U- 0.076	U- 0.074
3.0 in.	R- 16.8	U- 0.073	U- 0.071	U- 0.069
3.5 in.	R- 13.3	U- 0.082	U- 0.080	U- 0.077
3.5 in.	R- 17.5	U- 0.069	U- 0.067	U- 0.065
3.5 in.	R- 19.6	U- 0.064	U- 0.062	U- 0.061
4.0 in.	R- 15.2	U- 0.073	U- 0.071	U- 0.070
4.0 in.	R- 20.0	U- 0.061	U- 0.060	U- 0.058
4.0 in.	R- 22.4	U- 0.057	U- 0.056	U- 0.054
5.0 in.	R- 28.0	U- 0.046	U- 0.046	U- 0.045
Continuous Insulation Uninterrupted by Framing				
No Framing	R- 3.0	U- 0.230	U- 0.212	U- 0.197
	R- 4.0	U- 0.187	U- 0.175	U- 0.164
	R- 5.0	U- 0.157	U- 0.149	U- 0.141
No Framing	R- 6.0	U- 0.136	U- 0.129	U- 0.124
	R- 7.0	U- 0.120	U- 0.115	U- 0.110
	R- 8.0	U- 0.107	U- 0.103	U- 0.099
	R- 9.0	U- 0.097	U- 0.093	U- 0.090
	R- 10.0	U- 0.088	U- 0.085	U- 0.083
No Framing	R- 11.0	U- 0.081	U- 0.079	U- 0.076
	R- 12.0	U- 0.075	U- 0.073	U- 0.071
	R- 13.0	U- 0.070	U- 0.068	U- 0.066
	R- 14.0	U- 0.065	U- 0.064	U- 0.062
	R- 15.0	U- 0.061	U- 0.060	U- 0.059
No Framing	R- 16.0	U- 0.058	U- 0.056	U- 0.055
	R- 17.0	U- 0.054	U- 0.053	U- 0.052
	R- 18.0	U- 0.052	U- 0.051	U- 0.050
	R- 19.0	U- 0.049	U- 0.048	U- 0.047
	R- 20.0	U- 0.047	U- 0.046	U- 0.045

Notes for Default Table 10-5B(2)

1. It is acceptable to use the U-factors in Table 10-5B(2) for all concrete and masonry walls, provided that the grouting is equal to or less than that specified.
   – For ungrouted walls, use the partially-grouted column.
   – For metal studs and z-furring, use the continuous-metal-framing category.
   – For discontinuous metal clips 1 inch square or smaller, use the metal-clip category.
   – For insulation that is attached without any framing members (e.g. glued), use the continuous-insulation-uninterrupted-by-framing category. Continuous insulation may be installed on the interior or exterior of masonry walls, or between stand-alone walls in multi-layer masonry walls, or on the interior or exterior of the concrete.

2. For Table 10-5B(2), the U-factor includes R-0.17 for exterior air film and R-0.68 for interior air film - vertical surfaces. For insulated walls, the U-factor also includes R-0.45 for 0.5 in. gypsum board. U-factors are provided for the following configurations:
   (a) Concrete wall: 8-in. normal weight concrete wall with a density of 145 lb/ft^3.
   (b) Solid grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 and solid grouted cores.
   (c) Partially grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 having reinforcing steel every 32 in. vertically and

every 48 in. horizontally, with cores grouted in those areas only. Other cores are filled with insulating material only if there is no other insulation.

3. For walls with insulation contained in a framing layer, the U-factors in Table 10-5B(2) assume contact (and thermal bridging) between the mass wall and other framing. For wall assemblies with multiple layers where the wood or metal framing layer does not contact the concrete or masonry layer (i.e. walls with an airspace between the stud wall layer and the mass wall layer), it is acceptable to use the appropriate wood or metal frame wall default U-factors in Tables 10-5 or 10-5A. Note, it is acceptable to use this approach where the insulation extends beyond the framing and is in contact with the mass wall layer (e.g. a nominal four-inch metal stud containing insulation that is nominally six inches thick and therefore extends two inches beyond the back of the metal stud).

4. Except for wall assemblies qualifying for note 3, if not taken from Table 10-5B(2), mass wall U-factors shall be determined in accordance with ASHRAE/IESNA Standard 90.1-1999, Appendix A, Section A3.1 and Tables A-5 to A-8, or Section A9.4. If not taken from Table 10-9, heat capacity for mass walls shall be taken from ASHRAE/IESNA Standard 90.1-1999, Appendix A, Table A-6 or A-7.

Section 3. Effective December 31, 2001, Table 10-6 of the Energy Code is amended as follows:

TABLE 10-6
Other than Group R Occupancy:
Default U-Factors for Vertical Glazing, Overhead Glazing and Opaque Doors

Vertical Glazing (including frame)

	U-Factor		
	Any Frame	**Aluminum w/ thermal break**	**Vinyl/ Wood Frame**
Single	1.45	1.45	1.45
Double	0.90	0.85	0.75
½ Inch Air, Fixed	0.75	0.70	0.60
½ Inch Air, Low-e$^{(0.40)}$, Fixed	0.60	0.55	0.50
½ Inch Air, Low-e$^{(0.10)}$, Fixed	0.55	0.50	0.45
~~½ Inch Argon, Low-e$^{(0.30)}$, Fixed~~	~~0.55~~	~~0.50~~	~~0.45~~
½ Inch Argon, Low-e$^{(0.10)}$, Fixed	0.50	0.45	0.40

The category for aluminum frame with a thermal break is as defined in footnote 7 to Table 10-6A.

Overhead Glazing: Sloped Glazing (including frame)

	U-Factor		
	Any Frame	**Aluminum w/ thermal break**	**Vinyl/ Wood Frame**

Single	1.74	1.74	1.74
Double	1.08	1.02	0.90
½ Inch Air, Fixed	0.90	0.84	0.72
½ Inch Air, Low-$e^{(0.40)}$, Fixed	0.72	0.66	0.60
½ Inch Air, Low-$e^{(0.10)}$, Fixed	0.66	0.60	0.54
½ Inch Argon, Low-$e^{(0.10)}$, Fixed	0.60	0.54	0.48

This default table is applicable to sloped glazing only. (Sloped glazing is a multiple-lite glazed system (similar to a curtain wall) that is mounted at a slope greater than 15 degrees from the vertical plane.) Other overhead glazing shall use the defaults in Table 10-6E.

	~~U-Factor~~	
	~~Any Frame~~	~~Vinyl/Wood Frame~~
~~Single~~	~~2.15~~	~~2.15~~
~~Double~~	~~1.45~~	~~1.00~~
~~Low-$e^{(0.40)}$ or Argon~~	~~1.40~~	~~0.95~~
~~Low-$e^{(0.40)}$ + Argon~~	~~1.30~~	~~0.85~~
~~Low-$e^{(0.20)}$ Air~~	~~1.30~~	~~0.90~~
~~Low-$e^{(0.20)}$ + Argon~~	~~1.25~~	~~0.80~~
~~Triple~~	~~1.25~~	~~0.80~~

Opaque Doors

	U-Factor
Uninsulated Metal	1.20
Insulated Metal (Including Fire Door and Smoke Vent)	0.60
Wood	0.50

NOTES:
Where a gap width is listed (i.e.: 1/2 inch), that is the minimum allowed.
Where a low-emissivity emittance is listed (i.e.: 0.40, 0.20, 0.10), that is the maximum allowed.
Where a gas other than air is listed (i.e.: argon), the gas fill shall be a minimum of 90%.
Where an operator type is listed (i.e.: fixed), the default is only allowed for that operator type.
Where a frame type is listed (i.e.: wood/vinyl), the default is only allowed for that frame type.
Wood/Vinyl frame includes reinforced vinyl and aluminum-clad wood.

Section 4. Effective December 31, 2001, Section 1132.2 of the Energy Code is amended as follows:

1132.2 Building Mechanical Systems: Those parts of systems which are altered or replaced shall comply with Chapter 14 of this Code.

1132.2.1 Economizer Capability: Where the air-handling equipment (not including individual water source heat pumps) is being replaced or where 60% or more of the length of the trunk ductwork (not including diffuser runouts) on a floor or served by a system, whichever is smaller, is being moved or replaced,

a. the system shall comply with the economizer requirements in Section 1433, or

b. the system shall comply with a long-term plan that has been approved by DCLU and that will bring the mechanical system serving that floor into compliance with the economizer requirements in Section 1433 through incremental changes. For projects using this option, the plan shall be updated whenever the Energy Code is revised.

EXCEPTIONS:

1. Where the floor-to-structure (bottom of beam if there is a beam) height is less than 10 feet and the replacement equipment is not installed outdoors or in a mechanical room adjacent to outdoors.
2. The Code Official may approve alternative designs not in full compliance with this Code when existing building or occupancy constraints make compliance impractical.

1132.2.2 Economizer Capability for Water Source Heat Pump Systems: Where water-source heat pumps are being replaced, the individual heat pump being replaced shall have valves complying with Section 1432.2.2 and

a. the individual heat pump being replaced shall be equipped with economizer coil and operating controls. When the total capacity of all the heat pumps with economizer coil connected to a particular system exceeds 50% of the installed capacity of that system, then the condenser water system and cooling tower for the entire system shall be capable of providing economizer that complies with Section 1433. (This may necessitate changing the cooling tower and loop piping size.), or

b. the system shall comply with a long-term plan that has been approved by DCLU and that will bring the mechanical system serving that floor into compliance with the economizer requirements in Section 1433 through incremental changes. For projects using this option, the plan shall be updated whenever the Energy Code is revised.

EXCEPTIONS:

1. Systems that comply with the air economizer requirements.
2. The Code Official may approve alternative designs not in full compliance with this Code when existing building or occupancy constraints make compliance impractical.

Section 5. Effective December 31, 2001, Section 1132.3 of the Energy Code is amended as follows:

1132.3 Lighting and Motors: Where the use in a space changes from one use in Table 15-1 to another use in Table 15-1, the installed lighting wattage shall comply with Section 1521 or 1531.

Other ((~~T~~))tenant improvements, alterations or repairs where 60% or more of the fixtures in a space enclosed by walls or ceiling-height partitions ((~~use (as defined in Table 15-1) within a tenant space or in an entire floor (whichever is smaller)~~))are new shall comply with Sections 1531 and 1532. (Where this threshold is triggered, the areas of the affected spaces may be aggregated for code compliance calculations.)

Where less than 60% of the fixtures in a space enclosed by walls or ceiling-height partitions are new, the installed lighting wattage shall be maintained or reduced. Where 60% or more of the lighting fixtures in a suspended ceiling are new, and the existing insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according to the provisions of Chapter 13, Section 1311.2.

Where new wiring is being installed to serve added fixtures and/or fixtures are being relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5. Where a new lighting panel (or a moved lighting panel) with all new raceway and conductor wiring from the panel to the fixtures is being installed, controls shall comply with Section 1513.6.

Those motors which are altered or replaced shall comply with Section 1511.

Section 6. Effective December 31, 2001, Section 1133 of the Energy Code is amended as follows:

1133 Change of Occupancy or Use: Changes of occupancy or use shall comply with the following requirements:

a. Any unconditioned space that is altered to become semi-heated, cooled, or fully heated, or any semi-heated space that is altered to become cooled or fully heated space shall be required to be brought into full compliance with this Code. For spaces constructed prior to this Code, the installed heating output capacity shall not exceed 16 Btu/h per square foot unless the building envelope complies with Chapter 13. Existing warehouses and repair shops are considered unconditioned space unless they are indicated as conditioned space in DCLU records or they were built after 1980 and they comply with the building envelope requirements for conditioned space in effect at the time of construction. (See the Seattle Mechanical Code for requirements for combustion appliances.)

b. Any Group R occupancy which is converted to other than a Group R occupancy shall be required to comply with all of the provisions of Sections 1130 through 1132 of this Code.

Section 7. Effective December 31, 2001, Section 1301 of the Energy Code is amended as follows:

1301 Scope: Conditioned buildings or portions thereof shall be constructed to provide the required thermal performance of the various components according to the requirements of this chapter. Unless otherwise approved by the building official, all spaces shall be assumed to be at least semi-heated.

EXCEPTIONS:

1. Greenhouses isolated from any conditioned space and not intended for occupancy.
2. As approved by the building official, spaces not assumed to be at least semi-heated.
3. Unconditioned Group ((M))U occupancy accessory to Group R occupancy.
4. Unstaffed equipment shelters or cabinets used solely for personal wireless service facilities.
5. Parking lot attendant booths no larger than 100 square feet, provided that the opaque components comply with the requirements for semi-heated spaces in Section 1310.2. The heating equipment limitations in Section 1310.2 do not apply.

Section 8. Effective December 31, 2001, Section 1310.2 of the Energy Code is amended as follows:

1310.2 Semi-Heated Spaces: All spaces shall be considered conditioned spaces, and shall comply with the requirements in Section 1310.1 unless they meet the following criteria for semi-heated spaces. The installed heating equipment output, in Climate Zone 1, shall be 3 Btu/(h • ft^2) or greater but not greater than 8 Btu/(h • ft^2) and in Climate Zone 2, shall be 5 Btu/(h • ft^2) or greater but not greater than 12 Btu/(h • ft^2). Heating shall be controlled by a thermostat mounted not lower than the heating unit and capable of preventing heating above 44° space temperature. ((~~For semi-heated spaces, the only prescriptive, component performance or systems analysis building envelope requirement shall be that:~~

~~Climate Zone 1~~

~~a. U-0.10 maximum for the roof assembly or~~

~~b. continuous R-9 insulation installed entirely outside of the roof structure, or~~

~~c. R-11 insulation installed inside or within a wood roof structure, or~~

~~d. R-19 insulation installed inside or within a metal roof structure.~~

~~Climate Zone 2~~))

For semi-heated spaces with electric resistance space heat, (1) the building envelope for the semi-heated spaces shall comply with the Prescriptive Building Envelope Option in Section 1320 or (2) the entire building envelope for the semi-heated spaces plus the fully heated spaces shall comply with the Component Performance Building Envelope Option in Section 1330.

For semi-heated spaces with other space heat, (1) the building envelope for the semi-heated spaces shall comply with the following requirements or (2) the building envelope for the semi-heated spaces shall comply with the Prescriptive Building Envelope Option in Section 1320 or (3) the entire building envelope for the semi-heated spaces plus the fully heated spaces shall comply with the Component Performance Building Envelope Option in Section 1330 using the U-factors below for the semi-heated spaces.

a. U=0.07 maximum for the opaque roof assembly, or
b. continuous R-14 insulation installed entirely outside of the roof structure, or
c. R-19 insulation installed inside or within a wood roof structure, or
d. R-25 insulation installed inside or within a metal roof structure.
e. For opaque wall areas:
    i. U-0.25 maximum for the overall assembly (or R-3 minimum insulation only for continuous insulation or insulation between wood framing; or R-10 minimum insulation only for insulation between metal framing) for mass walls complying with the heat capacity requirements in Table 13-1, Footnote 2.
    ii. U-0.14 maximum for the overall assembly (or R-11 minimum insulation only) for metal frame walls.
    iii. U-0.088 maximum for the overall assembly (or R-11 minimum insulation only) for wood frame and other walls.
f. For floors over unconditioned space, U-0.088 maximum for the overall assembly (or R-11 minimum insulation only).
g. For fenestration, U-0.90 maximum and a maximum area equivalent to 10% of the gross wall area.

It is acceptable to combine semi-heated spaces and fully heated spaces in Target UA calculations.

Section 9. Effective December 31, 2001, Section 1312.2 of the Energy Code is amended as follows:

1312.2 Solar Heat Gain Coefficient and Shading Coefficient: Solar Heat Gain Coefficient (SHGC), shall be determined, certified and labeled in accordance with the National Fenestration Rating Council (NFRC) Standard by a certified, independent agency, licensed by the NFRC.

EXCEPTION: Shading coefficients (SC) or solar heat gain coefficient for the center of glass shall be an acceptable alternate for compliance with solar heat gain coefficient requirements. Shading coefficients or solar heat gain coefficient for the center of glass for glazing shall be taken from Chapter ((~~29~~))30 of Standard RS-27 or from the manufacturer's ((~~test~~))data using a spectral data file determined in accordance with NFRC 300.

Note that using the exception for the SHGC for the center-of-glass does not give the full credit for the overall product (including the frame) that the NFRC-certified SHGC does. Though the SHGC for the frame is not zero (the ASHRAE Handbook of Fundamentals indicates that the SHGC can range from 0.11-0.14 for metal frames and from 0.02-0.07 for wood/vinyl/fiberglass frames), the SHGC for the frame is invariable lower than that for the glass. Consequently, an NFRC-certified SHGC will generally be lower.

Section 10. Effective December 31, 2001, Section 1322 of the Energy Code is amended as follows:

1322 Opaque Envelope: Roof/ceilings, opaque exterior walls, opaque doors, floors over unconditioned space, below grade walls, slab on grade floors and radiant floors enclosing conditioned spaces shall be insulated according to Section 1311 and Tables 13-1or 13-2. Compliance with nominal R-values shall be demonstrated for the thermal resistance of the added insulation in framing cavities and/or insulated sheathing only. Nominal R-values shall not include the thermal transmittance of other building materials or air films.

For metal frame assemblies used in spaces with electric resistance space heat, compliance shall be demonstrated with the component U-factor for the overall assembly based on the assemblies in Chapter 10.

Area-weighted averaging of the R-value is not allowed. When showing compliance with R-values, the minimum insulation R-value for all areas of the component shall comply with Table 13-1. When calculating compliance using U-factors, area-weighted averaging is allowed. Where insulation is tapered (e.g. roofs), separate assembly U-factors shall be calculated for each four-foot section of tapered insulation.

EXCEPTIONS:

1. Opaque smoke vents are not required to meet insulation requirements.
2. For prescriptive compliance only.

a. for glazing areas that are 30% and less of the gross wall area, the insulation of the perimeter edge of an above grade floor slab which penetrates the exterior wall may be reduced to R-5 provided that the glazing U-factor is reduced by U-0.05 below that required in Tables 13-1 and 13-2.

b. for glazing areas that exceed 30% of the gross wall area, the perimeter edge of an above grade floor slab which penetrates the exterior wall may be left uninsulated provided that the glazing U-factor is reduced by U-0.10 below that required in Tables 13-1 and 13-2.((~~The perimeter edge of an above grade floor slab which penetrates the exterior wall may be left uninsulated provided that the wall insulation is increased by R-2 above that required in Tables 13-1 and 13-2.~~))

3. For roofs with continuous rigid insulation on the top of the roof, the insulation R-value may be averaged for compliance with minimum prescriptive R-values only, provided that both:
   a. the minimum insulation is no less than R-5 (but not including area within 6 inches of each roof drain), and
   b. the area-weighted average insulation is R-46 (in lieu of R-30) for electric resistance space heat and R-27 (in lieu of R-21) for other fuels.

Section 11. Effective December 31, 2001, Section 1323 of the Energy Code is amended as follows:

1323 Glazing: Glazing shall comply with Section 1312 and Tables 13-1 or 13-2. All glazing shall be, at a minimum, double glazing. In addition, all glazing assemblies shall have at least one low-emissivity coating unless the glazing assembly has an overall U-factor that complies with the values in Table 13-1.

EXCEPTIONS:

1. Vertical glazing located on the display side of the street level story of a retail occupancy or where there is a street level transparency requirement in the Seattle Land Use Code provided the glazing
   a. (i) is double-glazed with a minimum 1/2 inch airspace and with a low-e coating having a maximum emittance of e-0.40 in any type of frame or
   (ii) has an area-weighted U-factor of 0.60 or less.
   (U-factor calculations shall use overall assembly U-factors. When this exception is used there are no SHGC requirements) and
   b. has a visible transmittance of (i) 0.60 or greater for the center of the glazing assembly in any type of frame or (ii) has an area-weighted visible transmittance for the overall assembly including the frame of 0.52 or greater for fixed glazing and 0.44 or greater for operable glazing. Visible transmittance shall be determined in accordance with Section 1312.2, and,
   ((~~b.~~))c. does not exceed 75% of the gross exterior wall area of the display side of the street level story. However, if the display side of the street level story exceeds 20 feet in height, then this exemption may only be used for the first 20 feet of that story.

   When this exception is utilized, separate calculations shall be performed for these sections of the building envelope and these values shall not be averaged with any others for compliance purposes. The 75% area may be exceeded on the street level, if the additional glass area is provided from allowances from other areas of the building.
2. Single glazing for ornamental, security, or architectural purposes shall be included in the percentage of total glazing area, U-factor calculation and SHGC as allowed in the Tables 13-1 or 13-2. The maximum area allowed for the total of all single glazing is 1% of the gross exterior wall area.

Section 12. Effective December 31, 2001, Section 1323.3 of the Energy Code is amended as follows:

1323.3 Solar Heat Gain Coefficient: The area-weighted average solar heat gain coefficient of all glazing shall not be greater than that specified in Tables 13-1 or 13-2 for the appropriate area and U-factor.

EXCEPTIONS:

1. Glazing separating conditioned space from semi-heated space or unconditioned space.
2. Vertical glazing which is oriented within 45 degrees of north shall be allowed to have a maximum solar heat gain coefficient SHGC-0.10 above that required in Table 13-1.
3. For demonstrating compliance for vertical glazing only, the SHGC in the proposed building shall be allowed to be reduced by using the multipliers in the table below for each glazing product shaded by permanent projections that will last as long as the building itself.

Projection Factor	SHGC Multiplier (All Orientations except North-oriented)	SHGC Multiplier (North-Oriented)
0 - 0.10	1.00	1.00
<0.10 - 0.20	0.91	0.95
<0.20 - 0.30	0.82	0.91
<0.30 - 0.40	0.74	0.87
<0.40 - 0.50	0.67	0.84
<0.50 - 0.60	0.61	0.81
<0.60 - 0.70	0.56	0.78
<0.70 - 0.80	0.51	0.76
<0.80 - 0.90	0.47	0.75
<0.90 - 1.00	0.44	0.73

Projection factor (PF) is the ratio of the horizontal depth of the external shading projection (A) divided by the sum of the height of the fenestration and the distance from the top of the fenestration to the bottom of the farthest point of the external shading projection (B), in consistent units. (See Exhibit 1323.3.)

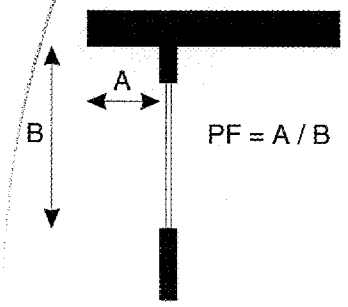


Exhibit 1323.3

Section 13. Effective December 31, 2001, Section 1331 of the Energy Code is amended as follows:

1331 General: Buildings or structures whose design heat loss rate (UA_p) and solar heat gain coefficient rate (SHGC * A_p) are less than or equal to the target heat loss rate (UA_t)

and solar heat gain coefficient rate (SHGC * A_t) shall be considered in compliance with this section. The stated U-factor, F-factor or allowable area of any component assembly, listed in Tables 13-1 or 13-2, such as roof/ceiling, opaque wall, opaque door, glazing, floor over conditioned space, slab on grade floor, radiant floor or opaque floor may be increased and the U-factor or F-factor for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-factors, F-factors or allowable areas specified in this section.

~~((EXCEPTION: For buildings or structures utilizing the other space heat type (including heat pumps and VAV) compliance path, for the gross opaque wall, opaque door and glazing (vertical and overhead) area only, compliance may also be shown using the ENVSTD diskette version 2.1 of ASHRAE/IESNA Standard 90.1-1989, or an approved alternative, with the following additional requirements:~~

~~1. Only the Exterior Wall Requirements portion of the ENVSTD computer program may be used under this exception.~~

~~2. Overhead glazing shall be added to vertical glazing, and shall be input as 1/4 north, 1/4 east, 1/4 south and 1/4 west facing.~~

~~3. Lighting loads shall be determined according to Table 15-1.~~

~~4. Equipment loads shall be determined from Table 3-1 of Standard RS-29.~~))

Section 14. Effective December 31, 2001, Section 1333 of the Energy Code is amended as follows:

1333 UA Calculations: The target UA_t and the proposed UA_p shall be calculated using Equations 13-1 and 13-2 and the corresponding areas and U-factors from Table 13-1 or 13-2. For the target UA_t calculation, the overhead glazing shall be located in roof/ceiling area and the remainder of the glazing allowed per Table 13-1 or 13-2 shall be located in the wall area. Where insulation is tapered, separate assembly U-factors shall be calculated in accordance with Section 1322.

Section 15. Effective December 31, 2001, Table 13-1 of the Energy Code is amended as follows:

TABLE 13-1
BUILDING ENVELOPE REQUIREMENTS
FOR CLIMATE ZONE 1

MINIMUM INSULATION R-VALUES OR
MAXIMUM COMPONENT U-FACTORS FOR ZONE 1

Building Components

Space Heat Type	Components					
	Roofs Over Attic[3]	All Other Roofs[3]	Opaque Walls[1,2]	Opaque Doors	Floor Over Uncond Space	Slab On Grade[5]
1. Electric resistance heat**	R-38 or U=0.031	R-30 or U=0.034	R-19 or U=0.062	U=0.60	R-30 or U=0.029	R-10 or F=0.54

2. All others including heat pumps and VAV	R-30 or U=0.036	R-21 or U=0.050	((~~R-11 or U=0.14~~)) (a) Metal framing: R-13 cavity insul. + R-3.8 continuous insul. or U-0.084; (b) Wood framing & framing other than metal: R-19 or U-0.062	U=0.60	R-19 or U=0.056	R-10 or F=0.54

** Compliance with nominal prescriptive R-values requires wood framing.

MAXIMUM GLAZING AREAS AND U-FACTORS AND MAXIMUM GLAZING SOLAR HEAT GAIN COEFFICIENTS FOR ZONE 1

Glazing

Space Heat Type	Maximum Glazing Area as % of Wall								
	0% to 20%			>20% to 30%			>30% to 40%		
	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]	Maximum U-Factor		Max. SHGC[4]
	VG	OG		VG	OG		VG	OG	
1. Electric resistance heat[7]	0.40	0.48	0.40	0.40	0.48	0.30	PRESCRIPTIVE PATH NOT ALLOWED		
				Prescriptive only, not for Target UA or annual energy analysis					
2. All others including heat pumps	0.55	0.66	0.40	0.55	0.66	0.40	0.45	0.54	0.40

~~Maximum Glazing Area as % of Wall~~	~~0% to 15%~~			~~>15% to 20%~~			~~>20% to 30%~~			~~>30% to 40%~~		
	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~
	~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~	
~~1. Electric resistance heat~~	~~0.40~~	~~0.80~~	~~1.0~~	~~0.40~~	~~0.80~~	~~1.0~~	~~PRESCRIPTIVE PATH NOT ALLOWED~~					
~~2. All others including heat pumps and VAV~~	~~0.90~~	~~1.45~~	~~1.0~~	~~0.75~~	~~1.40~~	~~1.0~~	~~0.60~~	~~1.30~~	~~0.65~~	~~0.50~~	~~1.25~~	~~0.45~~

Footnotes

1. **Below Grade Walls:**
   When complying by the prescriptive approach, Section 1322:
   a) walls insulated on the interior shall use opaque wall values,
   b) walls insulated on the exterior shall use a minimum of R-10 insulation,
   c) walls shall be insulated for the first 10 feet below grade. (There shall be no credit for insulating those portions of below grade walls and footings that are more than 10 feet below grade, and those portions below 10 feet shall not be included in the gross exterior wall area((~~, may be left uninsulated~~)).)

   When complying by the component performance approach, Section 1331:
   a) walls insulated on the interior shall use the opaque wall values when determining U_{bgwt},
   b) walls insulated on the exterior shall use a target U-factor of U=0.070 for U_{bgwt},
   c) the calculations shall include the first 10 feet of walls below grade. (((t))Those portions of below grade walls and footings that are more than 10 feet below grade((,

~~and~~)) shall not be included in the gross exterior wall area((~~, need~~)) and shall not be included when determining A_{bgwt} and A_{bgw}.)

2. **Concrete Masonry Walls:** If the area weighted heat capacity of the total opaque above grade wall is a minimum of 9.0 Btu/ft^2 • °F, then the U-factor may be increased to ((~~0.19~~))

   a) 0.11 for interior insulation
      i) minimum R-11 insulation between wood studs; or
      ii) minimum R-19 insulation between metal studs; or
      iii) minimum R-10 insulation held in place solely by 1 inch metal clips at 24 inches on center vertically and 16 inches on center horizontally; and ((~~0.25~~))

   b) 0.12 for integral and exterior insulation for insulation position as defined in Chapter 2.
      i) minimum additional R-7 continuous insulation uninterrupted by framing.

   Individual walls with heat capacities less than 9.0 Btu/ft^2 • °F and below grade walls shall meet opaque wall requirements listed above.

   Glazing shall comply with the glazing requirements listed above.((~~following:~~))

~~Maximum Glazing Area as % of Wall~~	~~0 to 10 %~~			~~>10 to 15 %~~			~~>15% to 20 %~~			~~>20% to 25 %~~		
	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~	~~Maximum U-Factor~~		~~Max. SHGC[4]~~
	~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~		~~VG~~	~~OG~~	
~~1. Electric resistance heat~~	~~0.40~~	~~0.80~~	~~1.00~~	~~0.40~~	~~0.80~~	~~1.00~~	~~0.40~~	~~0.80~~	~~1.00~~	~~NOT ALLOWED~~		
~~2. All others including heat pumps and VAV~~	~~0.90~~	~~1.45~~	~~1.00~~	~~0.75~~	~~1.40~~	~~1.00~~	~~0.65~~	~~1.30~~	~~0.80~~	~~0.60~~	~~1.30~~	~~0.65~~

3. ((~~Reserved.~~)) **Roof Types:** A roof over attic is where the roof structure has at least 30 inches clear distance from the top of the bottom chord of a truss or ceiling joist to the underside of the sheathing at the roof ridge, and the ceiling is attached to the ceiling joist or the bottom of the truss or ceiling joist. Anything else is considered all other roofs.

4. **SHGC (Solar Heat Gain Coefficient per Section 1312.2):** May substitute Maximum Shading Coefficient (SC) for SHGC (See Chapter 2 for definition of Shading Coefficient).

5. **Radiant Floors:** Where insulation is required under the entire slab, radiant floors shall use a minimum of R-10 insulation or F=0.55 maximum. Where insulation is not required under the entire slab, radiant floors shall use R-10 perimeter insulation according to Section 1311.6 or F=0.78 maximum.

6. **Prescriptive Alternate** (not applicable to Target UA or annual energy analysis)**:** For the prescriptive building envelope option only, for other than electric resistance heat only, glazing may comply with ((~~either of~~))the following:

Maximum Glazing Area as % of Wall ((~~>40% to 60%~~))	Maximum U-Factor VG	OG	Maximum SHGC[4]

>40% to 50%	0.35	0.42	0.35
((Alternate a	0.40	0.80	0.30
Alternate b	0.35	0.80	0.35))

7. Prescriptive Alternate for Electric Resistance Space Heat (not applicable to Target UA or annual energy analysis):

For glazed wall systems, assemblies with all of the following features are deemed to satisfy the vertical glazing U-factor requirement of U-0.40 and the overhead glazing U-factor of U-0.48:

a) Double glazing with a minimum 1/2 inch gap width, having a low-emissivity coating with e=0.10 maximum, with 90% minimum argon gas fill, and a non-aluminum spacer (as defined in footnote 1 to Table 10-6B), and

b) Frame that is thermal break aluminum (as defined in footnote ((9))7 to Table 10-6((B))A), wood, aluminum clad wood, vinyl, aluminum clad vinyl, or reinforced vinyl.

Section 16. Effective December 31, 2001, Section 1401 of the Energy Code is amended as follows:

1401 Scope: This section covers the determination of requirements, system and component performance, control requirements and duct construction.

((**EXCEPTION:** Special applications, including but not limited to hospitals, laboratories, thermally sensitive equipment and rooms designed to comply with the special construction and fire protection requirements of NFPA 75, "Standard for the Protection of Electronic Computer/Data Processing Equipment" may be exempt from the requirements of this section when approved by the building official. Exemptions shall be specific on a case-by-case basis and allowed only to the extent necessary to accommodate the special applications.))

Section 17. Effective December 31, 2001, Section 1411.1 of the Energy Code is amended as follows:

1411.1 General: Equipment shall have a minimum performance at the specified rating conditions not less than the values shown in Tables 14-1A through 14-1F((14-1 through 14-3)). If a nationally recognized certification program exists for a product covered in Tables 14-1A through 14-1F((14-1 through 14-3)), and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program.

EXCEPTION: Water-cooled water-chilling packages that are not designed for operation at ARI Standard 550/590 test conditions (and thus cannot be tested to meet the requirements of Table 14-1C) of 44°F leaving chilled water temperature and 85°F entering condenser water temperature shall have a minimum NPLV rating as shown in Tables 14-1K, L, and M. The table values are only applicable over the following full load design ranges:

Leaving Chiller Water Temp.:	40 to 48°F
Entering Condenser Water Temp.:	75 to 85°F
Condensing Water Temp.Rise:	5 to 15°F

Chillers designed to operate outside of these ranges are not covered by this Code. Non-standard Part Load Value (NPLV) is defined as single number part-load efficiency figure of merit for chillers references to conditions other than IPLV conditions. Design condenser water flow rate shall not be less than 2.5 gpm/ton.

In addition to complying with the minimum equipment efficiency requirements of this section, fan motors and other motors used as a component of the equipment shall comply with the motor efficiency requirements of Section 1437, unless it is the highest efficiency available as a factory option.

Gas-fired and oil-fired forced air furnaces with input ratings ≥ 225,000 Btu/h (65 kW) shall also have an intermittent ignition or interrupted device (IID), and have either mechanical draft (including power venting) or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. All furnaces with input ratings ≥225,000 Btu/h (65 kW), including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75% of the input rating.

Electric furnaces over 15 kW shall have a minimum of two stages of control for heating.

Cooling towers serving chilled water systems with airside economizer complying with Section 1433 without using the exceptions shall be selected to be able to maintain a return condenser water temperature to the tower of 86 F or less at peak design conditions.

Cooling towers serving chilled water systems with waterside economizer shall also comply with Section 1433, Exception 3.

Hydronic heat pump and other cooling and refrigeration equipment (e.g. icemakers, walk-in coolers) shall not use domestic water only one time before dumping it to waste. No single pass water cooling systems without heat recovery are allowed, except for medical and dental equipment, equipment using less than 1 gpm, and replacement of existing icemakers. However, single pass cooling is allowed during power outages and other emergencies.

Section 18. Effective December 31, 2001, Section 1411.4 of the Energy Code is amended as follows:

1411.4 Packaged and Split System Electric Heating and Cooling Equipment: Packaged and split system electric equipment providing both heating and cooling with a total cooling capacity greater than 20,000 Btu/h shall be a heat pump.

EXCEPTION: Unstaffed equipment shelters or cabinets used solely for personal wireless service facilities.

Section 19. Effective December 31, 2001, Section 1412.2 of the Energy Code is amended as follows:

1412.2 Deadband Controls: When used to control both comfort heating and cooling, zone thermostatic controls shall be capable of a deadband of at least 5 °F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

EXCEPTIONS:

1. Special occupancy, special usage or code requirements where deadband controls are not appropriate.

2. ((~~Buildings complying with Section 1141.4, if in the proposed building energy analysis, heating and cooling thermostat setpoints are set to the same temperature between 70°F and 75°F inclusive, and assumed to be constant throughout the year.~~))(Reserved.)
3. Thermostats that require manual changeover between heating and cooling modes.

Section 20. Effective December 31, 2001, Section 1412.4 of the Energy Code is amended as follows:

1412.4 Setback and Shut-Off: HVAC systems shall be equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of non-use or alternate use of the spaces served by the system. The automatic controls shall

a. have a minimum seven-day clock and be capable of being set for seven different day types per week,
b. be capable of retaining programming and time setting during loss of power for a period of at least ten hours, and
c. include an accessible manual override, or equivalent function (e.g. telephone interface), that allows temporary operation of the system for up to two hours.

EXCEPTIONS:

1. Systems serving areas which require continuous operation at the same temperature setpoint.
2. Equipment with full load demands of 2 kW (6,826 Btu/h) or less may be controlled by readily accessible manual off-hour controls.
3. Systems controlled by an occupant sensor that is capable of shutting the system off when no occupant is sensed for a period of up to 30 minutes.
4. Systems controlled solely by a manually-operated timer capable of operating the system for no more than two hours.

1412.4.1 Dampers: Outside air intakes, exhaust outlets and relief outlets serving conditioned spaces shall be equipped with motorized dampers which close automatically when the system is off or upon power failure. Stair shaft and elevator shaft smoke relief openings shall be equipped with normally open (fails open upon loss of power) dampers. These dampers shall remain closed until activated by the fire alarm system or other approved smoke detection system.

EXCEPTIONS:

1. Systems serving areas which require continuous operation.
2. Combustion air intakes.
3. Gravity (non-motorized) dampers are acceptable in buildings less than 3 stories in height.

Dampers installed to comply with this section, including dampers integral to HVAC equipment, shall have a maximum leakage rate when tested in accordance with AMCA Standard 500 of:

a. Motorized dampers: 10 cfm/ft^2 of damper area at 1.0 in w.g.
b. Non-motorized dampers: 20 cfm/ft^2 of damper area at 1.0 in w.g., except that for non-motorized dampers smaller than 24 inches in either dimension: 40 cfm/ft^2 of damper area at 1.0 in w.g.

Dampers used as a component of packaged HVAC equipment shall comply with the damper leakage requirements, unless it is the lowest leakage available as a factory option. Drawings shall indicate compliance with this section.

1412.4.2 Optimum Start Controls: Heating and cooling systems with design supply air capacities exceeding 10,000 cfm shall have optimum start controls. Optimum start controls shall be designed to automatically adjust the start time of an HVAC system each day to bring the space to desired occupied temperature levels immediately before scheduled occupancy. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy.

Section 21. Effective December 31, 2001, Section 1412.6 of the Energy Code is amended as follows:

1412.6 Combustion Heating Equipment Controls: Combustion heating equipment with a capacity over 225,000 Btu/h shall have modulat((~~ing~~))ed or staged combustion control. Boilers shall have proportionately-modulated or staged combustion control to control both the fuel and the air.

EXCEPTIONS:

1. Boilers under 1,000,000 Btu/h input capacity.
2. Radiant Heaters.
3. Systems with multiple boilers which are sequentially-staged.

Boilers shall comply with the reset requirements in Section 1432.2.

Section 22. Effective December 31, 2001, Section 1412.8 of the Energy Code is amended as follows:

1412.8 Enclosed Parking Garage Ventilation: Garage ventilation fan systems with a total capacity greater than 30,000 cfm shall include the equipment specified in (a) and (b) below. Smaller systems shall include the equipment specified in either (a) or (b).((~~have at least one of the following:~~))

a. An automatic control that is capable of staging fans or modulating fan speed as required to maintain carbon monoxide (CO) concentration below a level of 50 ppm as stated in ASHRAE Standard 62. This ((~~option~~))provision only applies to garages used predominantly by gasoline powered vehicles.

b. An automatic control that is capable of shutting off fans or reducing fan speed during periods when the garage is not in use. The system shall be equipped with at least one of the following:

   i. An automatic timeclock that can start and stop the system under different schedules for seven different day-types per week, is capable of retaining programming and time setting during loss of power for a period of at least 10 hours, and includes an accessible manual override that allows temporary operation of the system for up to 2 hours.

   ii. An occupant sensor.

See the Seattle Building Code for sizing requirements for parking garage ventilation. See the Seattle Mechanical Code, Section 406.5, for other requirements for parking garage ventilation.

Section 23. Effective December 31, 2001, Section 1413 of the Energy Code is amended as follows:

1413 Air and Water Economizers

Section 24. Effective December 31, 2001, Section 1413.2 of the Energy Code is amended as follows:

1413.2 Control: Air and water economizers shall be controlled by a control system capable of determining if outside air can meet part or all of the building's cooling loads.

Section 25. Effective December 31, 2001, Section 1413.3 of the Energy Code is amended as follows:

1413.3 Integrated Operation((~~—Building Heating Energy~~)): Air and water economizers shall be capable of providing partial cooling even when additional mechanical cooling is required to meet the remainder of the cooling load. Controls shall not preclude the economizer operation when mechanical cooling is required simultaneously.

EXCEPTIONS:

1. ((~~Economizers on individual, direct expansion, cooling systems with capacities not greater than 75,000 Btu/h may include controls that limit simultaneous operation of the economizer and mechanical cooling for the purpose of preventing ice formation on cooling coils.~~))Individual direct expansion units that have a rated cooling capacity less than 65,000 Btu/h and use nonintegrated economizer controls that preclude simultaneous operation of the economizer and mechanical cooling.
2. Water cooled chillers with waterside economizer.

Section 26. Effective December 31, 2001, the Energy Code is amended by adding a new Section 1413.4 to read as follows:

1413.4 Economizer Heating System Impact: Any HVAC system that increases the building heating energy use during economizer operation is not allowed (e.g. single-fan/dual-duct systems and multizone systems).

EXCEPTIONS:

1. Where the heating is allowed by Section 1435.
2. Water source heat pump systems that comply with Section 1433, Exception 3.

Note that single-fan/dual-duct systems and multizone systems do not comply with this requirement. This is because economizer operation lowers the temperature of the air entering the hot deck heating coil, increasing its energy use. In order to use this type of system, a water economizer must be used, or the system

must meet one of the economizer exceptions and have neither type of economizer. (Another resolution is to use a dual-fan/dual-duct system where the hot deck fan supplies only return air or return air plus minimum ventilation air.)

This requirement will not affect three-deck multizone since they cannot work with an air economizer in any case (it would make the neutral deck a cold deck).

An exception to the heating impact is provided for economizers on VAV systems that cause zone level heating to increase due to a reduction in supply air temperature. Reducing supply air temperatures on a cooling-VAV system will reduce fan energy (particularly if the system has a variable speed drive), offsetting the energy lost due to increased reheat energy.

See the discussion and diagrams of Section 6.3.1.4 of ASHRAE/IESNA Standard 90.1-1999 in the Users Manual.

Section 27. Effective December 31, 2001, Section 1414.1 of the Energy Code is amended as follows:

1414.1 Sealing: Duct work which is designed to operate at pressures above 1/2 inch water column static pressure shall be sealed ((~~in accordance with Standard RS-18. Extent of sealing required is~~))as follows:

1. ((~~Static pressure: ½ inch to 2 inches; seal transverse joints.~~))(Reserved.)
2. Static pressure: ((~~2~~))½ inches to 3 inches; seal all transverse joints and longitudinal seams. Spiral lock seams in round and flat oval ductwork do not require sealing, however, other seams shall be sealed.
3. Static pressure: above 3 inches; seal all transverse joints, longitudinal seams and duct wall penetrations.

((~~Duct tape and other pressure sensitive tape shall not be used as the primary sealant where ducts are designed to operate at static pressures of 1 inch W.C. or greater.~~))

All low-pressure supply and return air systems not located entirely within the conditioned space, including the unconditioned side of enclosed stud bays or joist cavities/spaces used to transport air, shall be securely fastened and sealed. Ductwork shall be sealed using welds, gaskets, mastic, or mastic-plus-embedded-fabric tape. Enclosed stud bays or joist cavities/spaces used to transport air shall be sealed using mastic-plus-embedded-fabric tape or, when drywall is used to enclose the air system, drywall mud and tape. Duct tape is not permitted as a sealant on any ducts.

EXCEPTION: Fibrous glass duct systems installed in accordance with standard UL 181A and flexible duct systems installed in accordance with standard UL 181B may use tapes listed for these systems.

Note that longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod or wire. All

other connections are considered transverse joints, including but not limited to spin-ins, taps and other branch connections, access door frames and jambs, duct connections to equipment.

Section 28. Effective December 31, 2001, Section 1416 of the Energy Code is amended as follows:

1416 Mechanical Systems Commissioning and Completion Requirements

1416.1 General. Commissioning is a systematic process of verification and documentation that ensures that the selected building systems have been designed, installed, and function properly, efficiently, and can be maintained in accordance with the contract documents in order to satisfy the building owner's design intent and operational requirements. Drawing notes shall require commissioning and completion requirements in accordance with this section. Drawing notes may refer to specifications for further requirements.

1416.1.1 Simple Mechanical Systems. For simple mechanical systems, as defined in Section 1421, and for warehouses and semi-heated spaces, commissioning shall include, as a minimum:

a. A Commissioning Plan,
b. System Testing and Balancing,
c. Controls Functional Performance Testing,
d. A Preliminary Commissioning Report,
e. Post Construction Documentation in the form of O&M and Record Drawing Review, and
f. A Final Commissioning Report.

1416.1.2 All Other Mechanical Systems. For all other mechanical systems, commissioning shall include, as a minimum:

a. A Commissioning Plan,
b. System Testing and Balancing,
c. Equipment Functional Performance Testing,
d. Controls Functional Performance Testing,
e. A Preliminary Commissioning Report,
f. Post Construction Documentation (all), and
g. A Final Commissioning Report.

1416.2 Commissioning Requirements

1416.2.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.2 Commissioning Plan. The Plan shall require tests mandated by this section be performed and the results recorded. The Plan shall require preparation of preliminary and final reports of test procedures and results as described herein. At a minimum, the Plan shall identify the following for each test:

a. A detailed explanation of the original design intent.
b. Equipment and systems to be tested, including the extent of tests,
c. Functions to be tested (for example calibration, economizer control, etc.),
d. Conditions under which the test shall be performed (for example winter and summer design conditions, full outside air, etc.), and
e. Measurable criteria for acceptable performance.

1416.2.3 Systems Balancing

1416.2.3.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates, except variable flow distribution systems need not be balanced upstream of the controlling device (for example, VAV box or control valve). Construction documents shall require a written balance report be provided to the owner. Drawing notes may refer to specifications for further systems balancing requirements.

1416.2.3.2 Air Systems Balancing. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

1416.2.3.3 Hydronic Systems Balancing: Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.

EXCEPTIONS:
1. Pumps with pump motors of 10 hp or less.
2. When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller was trimmed.

1416.2.4 Functional Performance Testing

1416.2.4.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.4.2 Equipment/Systems Testing. Functional Performance Testing shall demonstrate the correct installation and operation of each component, system, and system-to-system intertie relationship in accordance with approved plans and specifications. This demonstration is to prove the operation, function, and maintenance serviceability for each of the Commissioned systems. Testing shall include all modes of operation, including:

a. All modes as described in the Sequence of Operation,
b. Redundant or automatic back-up mode,
c. Performance of alarms, and
d. Mode of operation upon a loss of power and restored power.

1416.2.4.3 Controls Testing: HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications.

1416.2.5 Post Construction Commissioning

1416.2.5.1 General: Construction documents shall require post construction commissioning be provided to the building owner prior to date of final acceptance. Drawing notes may refer to specifications for further commissioning requirements. Post construction commissioning shall include, as a minimum, review and approval of Operation and Maintenance Materials, Record Drawings, and Systems Operational Training.

1416.2.5.2 Operation and Maintenance Materials: The O&M Materials shall be in accordance with industry accepted standards and shall include, at a minimum, the following:

a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
b. Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
c. Names and addresses of at least one service agency.
d. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field determined set points shall be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.
e. A complete written narrative of how each system and piece of equipment is intended to operate including:
    i. A detailed explanation of the original design intent.
    ii. The basis of design (how the design was selected to meet the design intent).
    iii. A detailed explanation of how new equipment is to interface with existing equipment or systems (where applicable).
    iv. Suggested control set points.
    NOTE: Sequence of Operation is not acceptable as a narrative for this requirement.

1416.2.5.3 Record Drawings: Record drawings shall include, as a minimum, the location and performance data on each piece of equipment, general configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates of the actual installation.

1416.2.5.4 Systems Operational Training: The training of the appropriate maintenance staff for each equipment type and or system shall include, as a minimum, the following:

a. System/Equipment overview (what it is, what it does and which other systems and or equipment does it interface with).
b. Review of the available O&M materials.
c. Review of the Record Drawings on the subject system/equipment.

d. Hands-on demonstration of all normal maintenance procedures, normal operating modes, and all emergency shutdown and start-up procedures.

1416.2.6 Commissioning Reports

1416.2.6.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

1416.2.6.2 Preliminary Commissioning Report: A preliminary report of commissioning test procedures and results shall be completed and provided to the Owner. The Preliminary Commissioning Report shall identify:

a. Deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.
b. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.
c. Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.

1416.2.6.3 Final Commissioning Report: A complete report of test procedures and results shall be prepared and filed with the Owner. The Final Commissioning Report shall identify:

a. Results of all Functional Performance Tests.
b. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.
c. All Functional Performance Test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

EXCEPTION: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

1416.3 Acceptance Requirements

1416.3.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements. Buildings or portions thereof, required by this Code to comply with this section, shall not be issued the following certificates until such time that the building official determines that the appropriate commissioning requirements dictated by this section have been completed and provided.

1416.3.2 Acceptance: Buildings or portions thereof, required by this Code to comply with this section, shall not be issued a final certificate of occupancy until such time that the building official determines that the preliminary commissioning report required by this section has been completed.

~~((1416 Completion Requirements~~

~~1416.1 Drawings: Construction documents shall require that within 90 days after the date of system acceptance, record drawings of the actual installation be provided to the building owner. Record drawings shall include as a minimum the location and performance data on~~

~~each piece of equipment, general configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates.~~

~~**1416.2 Manuals:** Construction documents shall require an operating manual and maintenance manual be provided to the building owner. The manual shall be in accordance with industry accepted standards and shall include, at a minimum, the following:~~

1. ~~Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.~~
2. ~~Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.~~
3. ~~Names and addresses of at least one service agency.~~
4. ~~HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field determined set points shall be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.~~
5. ~~A complete narrative of how each system is intended to operate including suggested set points.~~

~~**1416.3 System Balancing**~~

~~**1416.3.1 General:** Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates, except variable flow distribution systems need not be balanced upstream of the controlling device (for example, VAV box or control valve). Construction documents shall require a written balance report be provided to the owner.~~

~~**1416.3.2 Air System Balancing:** Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.~~

~~**1416.3.3 Hydronic System Balancing:** Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.~~

~~**EXCEPTIONS:**~~
1. ~~Pumps with pump motors of 10 hp or less.~~
2. ~~When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller were trimmed.~~

~~**1416.4 Systems Commissioning**~~

~~**1416.4.1 Simple Systems:** For simple systems, as defined in Section 1421, and for warehouses and semiheated spaces, HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in~~

~~accord with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accord with approved plans and specifications. A complete report of test procedures and results shall be prepared and filed with the owner. Drawing notes shall require commissioning in accordance with this paragraph.~~

~~**1416.4.2 Other Systems:** All other HVAC control systems, and other automatically controlled systems for which energy consumption, performance, or mode of operation are regulated by this code, shall be tested to ensure that control devices, equipment and systems are calibrated, adjusted and operate in accord with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accord with approved plans and specifications.~~

~~**1416.4.2.1 Documentation:** Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements. Plans and specifications shall require tests mandated by this section be performed and the results recorded. Plans and specifications shall require preparation of preliminary and final reports of test procedures and results as described in 1416.4.2.2. Plans and specifications shall identify the following for each test:~~

1. ~~Equipment and systems to be tested, including the extent of sampling tests,~~
2. ~~Functions to be tested (for example calibration, economizer control, etc.),~~
3. ~~Conditions under which the test shall be performed (for example winter design conditions, full outside air, etc.),~~
4. ~~Measurable criteria for acceptable performance.~~

~~**1416.4.2.2 Commissioning Reports**~~

~~**1416.4.2.2.1 Preliminary Commissioning Report:** A preliminary commissioning report of test procedures and results shall be prepared. The preliminary report shall identify:~~

1. ~~Deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.~~
2. ~~Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.~~
3. ~~Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.~~

~~**1416.4.2.2.2 Final Commissioning Report:** A complete report of test procedures and results shall be prepared and filed with the owner.~~

~~**1416.4.2.3 Acceptance:** Buildings or portions thereof, required by this code to comply with this section, shall not be issued a final certificate of occupancy until such time that the building official determines that the preliminary commissioning report required by this section has been completed.~~))

Section 29. Effective December 31, 2001, Section 1421.1 of the Energy Code is amended as follows:

1421.1 System Sizing Limits: Installed space heating equipment output shall not exceed ((~~30~~))16 Btu/h per square foot of gross conditioned floor area and installed space cooling equipment output shall not exceed ((~~30~~))25 Btu/h per square foot of gross conditioned floor area.

EXCEPTIONS:

1. For equipment which provides both heating and cooling in one package unit, compliance need only be demonstrated for either the space heating or space cooling system size.
2. Equipment sized in accordance with Section 1431.2.

Section 30. Effective December 31, 2001, Section 1423 of the Energy Code is amended as follows:

1423 Economizers: Economizers meeting the requirements of Section 1413 shall be installed on single package unitary fan-cooling units having ((~~a supply capacity of greater than 1900cfm or~~))a total cooling capacity greater than ((~~54,000~~))20,000 Btu/h, including those serving computer server rooms, electronic equipment, radio equipment, telephone switchgear. The total capacity of all units without economizers (i.e. these units with a total cooling capacity of 20,000 Btu/h and less) shall not exceed 240,000 Btu/h per building, or 10% of its aggregate cooling (economizer) capacity, whichever is greater. That portion of the equipment serving Group R occupancy is not included in determining the total capacity of all units without economizers in a building.

Section 31. Effective December 31, 2001, Section 1431.2 of the Energy Code is amended as follows:

1431.2 System Sizing Limits: Heating and cooling design loads for the purpose of sizing systems shall be determined in accordance with one of the procedures described in Chapter ((~~28~~))29 of Standard RS-27 listed in Chapter 17 or an equivalent computation procedure. For interior temperatures, 70°F shall be used for heating and 75°F for cooling, except where different values are specified in the Washington Administrative Code (WAC). For exterior temperatures, 24°F shall be used for heating and 82°F dry bulb and 66°F for wet bulb for cooling.

Building mechanical systems for all buildings which provide space heating and/or space cooling shall be sized no greater than ((~~150%~~))125% of the design load as calculated above, except that cooling towers shall comply with the sizing requirements in Section 1411.1. No additional safety factor is allowed.

For buildings with a total equipment cooling capacity of 300 tons and above, equipment shall have multiple unloadings or no one unit shall have a capacity of more than 2/3 of the load.

EXCEPTIONS: The following limited exemptions from the sizing limit shall be allowed, however, in all cases heating and/or cooling design load calculations shall be submitted.

1. For a single piece of equipment which has both heating and cooling capability, only one function, either the heating or the cooling, need meet the requirements of this section. Capacity for the other function shall be, within available equipment options, the smallest size necessary to meet the load.
2. (((~~Reserved.~~)))

((~~3.~~)) Stand-by equipment may be installed if controls and devices are provided which allow redundant equipment to operate automatically only when the primary equipment is not operating.

((~~4.~~))3. Multiple units of the same equipment type, such as multiple chillers and boilers, with combined capacities exceeding the design load may be specified to operate concurrently only if controls are provided that sequence or otherwise optimally control the operation of each unit based on load.

4. A maximum sizing limit of 150% is allowed for fan systems which
   a. have both a capacity of 5,000 cfm or greater and which have a minimum outside air supply of 70% or greater of the total air circulation, and
   b. have a heat recovery system complying with Section 1436 without using any of the exceptions.

Section 32. Effective December 31, 2001, Section 1432.2 of the Energy Code is amended as follows:

1432.2 Systems Temperature Reset Controls

1432.2.1 Air Systems for Multiple Zones: Systems supplying heated or cooled air to multiple zones shall include controls which automatically reset supply air temperatures by representative building loads or by outside air temperature. Temperature shall be reset by at least 25% of the design supply-air-to-room-air temperature difference.

EXCEPTION: Where specified humidity levels are required to satisfy process needs, such as computer rooms or museums.

1432.2.2 Hydronic Systems: Systems with a design capacity of ((~~600,000~~))300,000 Btu/h or greater supplying heated or mechanically refrigerated water ((~~to comfort conditioning systems~~))shall include controls which automatically reset supply water temperatures by representative building loads (including return water temperature) or by outside air temperature. Temperature shall be reset by at least 25% of the design supply-to-return water temperature differences.

EXCEPTIONS:

1. Hydronic systems that use variable flow devices complying with Section 1438 to reduce pumping energy.
2. Steam boilers.
3. Systems that provide heating with 100°F or lower supply temperature (e.g. water source heat pump loops).

To limit the heat loss from the heat rejection device (cooling tower), for hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g., cooling tower),

a. If a closed-circuit tower (fluid cooler) is used, either an automatic valve shall be installed to bypass all but a minimal flow of water around the tower (for freeze protection), or low leakage positive closure dampers shall be provided.
b. If an open-circuit tower is used directly in the heat pump loop, an automatic valve shall be installed to bypass all heat pump water flow around the tower.
c. If an open-circuit tower is used in conjunction with a separate heat exchanger to isolate the tower from the heat pump loop, then heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop.

For hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection (e.g., cooling tower) and having a total pump system power exceeding 10 hp, each hydronic heat pump shall have

a. a two-position two-way (but not three-way) valve, or

b. a variable head pressure two-way (water regulating) control valve or pump.

For the purposes of this section, pump system power is the sum of the nominal power demand (i.e. nameplate horsepower at nominal motor efficiency) of motors of all pumps that are required to operate at design conditions to supply fluid from the heating or cooling source to all heat transfer devices (e.g., coils, heat exchanger) and return it to the source. This converts the system into a variable flow system and, as such, the primary circulation pumps shall comply with the variable flow requirements in Section 1438.

Section 33. Effective December 31, 2001, Section 1433 of the Energy Code is amended as follows:

1433 Economizers: Economizers meeting the requirements of Section 1413 shall be installed on the following systems, including those serving computer server rooms, electronic equipment, radio equipment, telephone switchgear:

a. Single package unitary fan-cooling units installed outdoors or in a mechanical room adjacent to outdoors with a total cooling capacity greater than 20,000 Btu/h. ((S))Other single package unitary fan-cooling units with a supply capacity of greater than 1,900 cfm or a total cooling capacity greater than 54,000 Btu/h.

b. Other individual fan-cooling units with ((~~a supply capacity of greater than 2,800 cfm or~~))a total cooling capacity greater than ((~~84,000~~))65,000 Btu/h.

The total capacity of all units without economizers (i.e. these units complying with a or b above) shall not exceed 240,000 Btu/h per building, or 10% of its aggregate cooling (economizer) capacity, whichever is greater. That portion of the equipment serving Group R occupancy is not included in determining the total capacity of all units without economizers in a building.

EXCEPTIONS:

1. Systems with air or evaporatively cooled condensers and that either one of the following can be demonstrated to the satisfaction of the enforcing agency:
   a. Special outside air filtration and treatment, for the reduction and treatment of unusual outdoor contaminants, makes an air economizer infeasible.
   b. The use of outdoor air cooling affects the operation of other systems (such as humidification, dehumidification and supermarket refrigeration systems) so as to increase the overall building energy consumption.
2. Systems for which at least 75% of the annual energy used for mechanical cooling is provided from site-recovery or site-solar energy source.
3. ((~~A water economizer system, which is capable of cooling supply air by indirect evaporation. Such a system shall be designed and capable of being controlled to provide 100% of the expected system cooling load at outside air temperatures of 50°F dry-bulb / 45°F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside air temperatures.~~)) A water economizer system, which is capable of cooling supply air without the operation of mechanical refrigeration equipment. See Section 1413.3 for integration requirements. This exception shall not be used for RS-29 analysis. Such a system shall be designed and capable to be controlled to provide the following:

a. Design economizer cooling capacity: The calculated system cooling load served by all terminal equipment without airside economizer at 45°F db/40°F wb, with solar and internal loads the same as those calculated for peak cooling load except for outside air temperature.
b. Design economizer fluid supply temperature: The design fluid supply temperature delivered to the terminal cooling coils when in economizer operation at 45°F db/40°F wb.
c. Equipment which rejects heat to outdoors shall be sized to provide design economizer cooling capacity and design economizer fluid supply temperature at an ambient temperature of 40°F wb. However, air cooled heat rejection equipment shall be sized to provide design economizer cooling capacity and design economizer fluid supply temperature at an ambient temperature of 35°F db. This allowance for air-cooled equipment is applicable only to existing buildings and limited to a maximum of 20 tons per building.
d. Terminal cooling coils shall be sized for design economizer cooling capacity at the design economizer fluid supply temperature. However, hydronic heat pumps with terminal cooling coils shall be sized to provide 45% of design economizer capacity at design economizer fluid supply temperature.

Section 34. Effective December 31, 2001, Section 1436 of the Energy Code is amended as follows:

1436 Heat Recovery

1436.1 Fan Systems: Fan systems which have both a capacity of 5,000 cfm or greater and which have a minimum outside air supply of 70% or greater of the total air circulation shall have a heat recovery system with at least 50% recovery effectiveness. Fifty percent heat recovery effectiveness shall mean an increase in the outside air supply temperature at design heating conditions of one half the difference between the outdoor design air temperature and 65°F. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by Section 1433. Heat recovery energy may be provided from any site-recovered or site-solar source.

EXCEPTIONS:

1. Laboratory systems equipped with both variable air volume supply and variable air volume or two-speed exhaust fume hoods, provided that an instruction label is placed on the face of the hood that matches Exhibit 14-1.

Exhibit 14-1

INSTRUCTIONS TO OPERATOR
To be in compliance with the Seattle Energy Code, this fume hood is designed to operate as variable air volume (VAV) by adjusting the sash or controller.
Maintain sash in the minimum position during use and
close totally when the fume hood is not in use.

2. Systems serving spaces heated to less than 60°F.
3. Systems which can be shown to use as much energy with the addition of heat recovery equipment as without it.
4. Systems exhausting toxic, flammable, paint exhaust or corrosive fumes making the installation of heat recovery equipment impractical.
5. Type I commercial kitchen hoods.

Section 35. Effective December 31, 2001, the Energy Code is amended by adding a new Section 1436.2 to read as follows:

1436.2 Condensate Systems: On-site steam heating systems shall have condensate recovery.

Section 36. Effective December 31, 2001, the Energy Code is amended by adding a new Section 1436.3 to read as follows:

1436.3 Heat Recovery for Service Water Heating: Condenser heat recovery systems shall be installed for heating or preheating of service hot water provided all of the following are true:

a. The facility operates 24 hours a day.
b. The total installed heat rejection capacity of the water-cooled systems exceeds 6,000,000 Btu/h of heat rejection.
c. The capacity of service water heating equipment exceeds 1,000,000 Btu/h.

The required heat recovery system shall have the capacity to provide the smaller of:

a. 60% of the peak heat rejection load at design conditions, or
b. preheat of the peak service hot water draw to 85°F.

EXCEPTIONS:

1. Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
2. Facilities that provide 60% of their service water heating from site solar or site recovered energy or from other sources.

Section 37. Effective December 31, 2001, Section 1437 of the Energy Code is amended as follows:

1437 Electric Motor Efficiency: Design A & B squirrel-cage, T-frame induction permanently wired polyphase motors of 1 hp or more having synchronous speeds of 3,600, 1,800 and 1,200 rpm shall have a nominal full-load motor efficiency no less than the corresponding values for energy efficient motors provided in Table 14-4.

EXCEPTIONS:

1. Motors used in systems designed to use more than one speed of a multi-speed motor.
2. ((~~Motors used as a component of the equipment meeting the minimum equipment efficiency requirements of Section 1411 and Tables 14-1 and 14-2 provided that the motor input is included when determining the equipment efficiency.~~))(Reserved.)
3. Motors that are an integral part of specialized process equipment.
4. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.

Fan motors less than 1 hp in series terminal units shall

a. be electronically-commutated motors, or
b. have a minimum motor efficiency of 65% when rated in accordance with NEMA Standard MG-1 at full load rating conditions.

EXCEPTION: Until June 30, 2002, systems where the cooling design air temperature from the central fan is less than 48 F.

Section 38. Effective December 31, 2001, Section 1438 of the Energy Code is amended as follows:

1438 Variable Flow Systems and System Criteria: For fans and pumps greater than 10 horsepower, where the application involves variable flow, and water source heat pump loops subject to the requirements of Section 1432.2.2, there shall be

((~~1.~~))a. variable speed drives or

((~~2.~~))b. other controls and devices that will result in fan and pump motor demand of no more than 30% of design wattage at 50% of design air volume for fans when static pressure set point equals 1/3 the total design static pressure, and 50% of design water flow for pumps, based on manufacturer's certified test data.

At the time this Code was adopted, very few technologies could be shown to meet the criteria in option 2.

Variable inlet vanes, throttling valves (dampers), scroll dampers or bypass circuits shall not be allowed.

Static pressure sensors used to control variable air volume fans shall be placed in a position such that the controller set point is no greater than 1/3 the total design fan static pressure.

For systems with direct digital control of individual zone boxes reporting to the central control panel, there shall be static pressure reset controls and the static pressure set point shall be reset based on the zone requiring the most pressure; i.e., the set point is reset lower until one zone damper is nearly wide open.

Section 39. Effective December 31, 2001, Section 1440 of the Energy Code is amended as follows:

1440 Service Water Heating: Service water heating equipment shall comply with the applicable efficiencies in Tables 14-1A through 14-1M.

Effective January 1, 2004, commercial clothes washers installed in Seattle shall have a minimum modified energy factor (MEF) of 1.26. The MEF definition and test procedure set forth at 10 C.F.R. Part 430 (Energy Conservation Program For Consumer Products), as amended, is incorporated into this section by reference. Commercial clothes washers are defined as all clothes washers

a. installed for use on fee basis, e.g. coin- or card-operated;

b. not covered by federal residential clothes washer efficiency standards; and

c. having a capacity of 20 lbs. or less.

Section 40. Effective December 31, 2001, Section 1452 of the Energy Code is amended as follows:

1452 Pool Water Heaters: Pool water heaters using electric resistance heating as the primary source of heat are prohibited for all pools. Heat pump pool heaters shall have a minimum COP of 4.0 determined in accordance with ASHRAE Standard 146, Method of

Testing for Rating Pool Heaters. Other pool heating equipment shall comply with the applicable efficiencies in Tables 14-1A through 14-1M.

Section 41. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1A to read as follows:

Table 14-1A
Electrically Operated Unitary Air Conditioners and Condensing Units - Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Conditioners, Air Cooled	< 65,000 Btu/h	Split System	10.0 SEER	ARI 210/240
		Single Package	9.7 SEER	
	≥65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	10.3 EER[c]	
	≥135,000 Btu/h and < 240,000 Btu/h	Split System and Single Package	9.7 EER[c]	ARI 340/360
	≥ 240,000 Btu/h and <760,000 Btu/h	Split System and Single Package	9.5 EER[c] 9.7 IPLV[c]	
	≥760,000 Btu/h	Split System and Single Package	9.2 EER[c] 9.4 IPLV[c]	
Air Conditioners, Water and Evaporatively Cooled	< 65,000 Btu/h	Split System and Single Package	12.1 EER	ARI 210/240
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	11.5 EER[c]	
	≥135,000 Btu/h and ≤240,000 Btu/h	Split System and Single Package	11.0 EER[c]	ARI 340/360
	> 240,000 Btu/h	Split System and Single Package	11.0 EER[c] 10.3 IPLV[c]	
Condensing Units, Air Cooled	≥135,000 Btu/h		10.1 EER 11.2 IPLV	ARI 365
Condensing Units, Water or Evaporatively Cooled	≥135,000 Btu/h		13.1 EER 13.1 IPLV	

[a] Reserved.
[b] IPLVs are only applicable to equipment with capacity modulation.
[c] Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat. No deduction for equipment with no heat.

Section 42. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1B to read as follows:

Table 14-1B
Electrically Operated Unitary and Applied Heat Pumps – Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Cooled, (Cooling Mode)	< 65,000 Btu/h	Split System	10.0 SEER	ARI 210/240

		Single Package	9.7 SEER	
	≥65,000 Btu/h and < 135,000 Btu/h	Split System and Single Package	10.1 EER[c]	
	≥135,000 Btu/h and <240,000 Btu/h	Split System and Single Package	9.3 EER[c]	ARI 340/360
	≥240,000 Btu/h	Split System and Single Package	9.0 EER[c] 9.2 IPLV[c]	
Water-Source (Cooling Mode)	< 17,000 Btu/h	86°F Entering Water	11.2 EER	ARI/ISO-13256-1
	≥ 17,000 Btu/h and <65,000 Btu/h	86°F Entering Water	12.0 EER	ARI/ISO-13256-1
	≥65,000 Btu/h and < 135,000 Btu/h	86°F Entering Water	12.0 EER	ARI/ISO-13256-1
Groundwater-Source (Cooling Mode)	< 135,000 Btu/h	59°F Entering Water	16.2 EER	ARI/ISO-13256-1
Ground Source (Cooling Mode)	< 135,000 Btu/h	77°F Entering Water	13.4 EER	ARI/ISO-13256-1
Air Cooled (Heating Mode)	< 65,000 Btu/h[d] (Cooling Capacity)	Split System	6.8 HSPF	ARI 210/240
		Single Package	6.6 HSPF	
	≥65,000 Btu/h and < 135,000 Btu/h (Cooling Capacity)	47°F db/43°F wb Outdoor Air	3.2 COP	
		17°F db/15°F wb Outdoor Air	2.2 COP	
	≥135,000 Btu/h (Cooling Capacity)	47°F db/43°F wb Outdoor Air	3.1 COP	ARI 340/360
		17°F db/15°F wb Outdoor Air	2.0 COP	
Water-Source (Heating Mode)	< 135,000 Btu/h (Cooling Capacity)	68°F Entering Water	4.2 COP	ARI/ISO-13256-1
Groundwater-Source (Heating Mode)	< 135,000 Btu/h (Cooling Capacity)	50°F Entering Water	3.6 COP	ARI/ISO-13256-1
Ground Source	< 135,000 Btu/h	32°F Entering Water	3.1 COP	ARI/ISO-13256-1

[a] Reserved.
[b] IPLVs and Part load rating conditions are only applicable to equipment with capacity modulation.
[c] Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat. No deduction for equipment with no heat.

Section 43. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1C to read as follows:

Table 14-1C
Water Chilling Packages, Minimum Efficiency Requirements

Equipment Type	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Air Cooled, With Condenser, Electrically Operated	All Capacities		2.80 COP 3.05 IPLV	ARI 550/590
Air Cooled, Without Condenser, Electrically Operated	All Capacities		3.10 COP 3.45 IPLV	
Water Cooled, Electrically Operated	< 40 tons		4.20 COP 5.05 IPLV	ARI 550/590

	≥ 40 tons and < 150 Tons		4.45 COP 5.25 IPLV	
	≥150 Tons and < 300 Tons		5.55 COP[c] 5.90 IPLV	
	≥300 Tons		6.10 COP[c] 6.40 IPLV	
Air Cooled Absorption Single Effect	All Capacities		0.60 COP	ARI 560
Water Cooled Absorption Single Effect	All Capacities		0.70 COP	
Absorption Double Effect, Indirect-Fired	All Capacities		1.00 COP 1.05 IPLV	
Absorption Double Effect, Direct-Fired	All Capacities		1.00 COP 1.00 IPLV	

[a] Reserved.
[b] The chiller equipment requirements do not apply for chillers used in low temperature applications where the design leaving fluid temperature is less than or equal to 40°F.
[c] COP requirements do not apply to other than centrifugal equipment.

Section 44. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1D to read as follows:

Table 14-1D
Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps, Electrically Operated, Minimum Efficiency Requirements

Equipment Type	Size Category (Input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
PTAC (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.5 - (0.213 x Cap/1000)[b] EER	ARI 310/380
PTAC (Cooling Mode) Replacements[c]	All Capacities	95°F db Outdoor Air	10.9 - (0.213 x Cap/1000)[b] EER	
PTHP (Cooling Mode) New Construction	All Capacities	95°F db Outdoor Air	12.3 - (0.213 x Cap/1000)[b] EER	
PTHP (Cooling Mode) Replacements[c]	All Capacities	95°F db Outdoor Air	10.8 - (0.213 x Cap/1000)[b] EER	
PTHP (Heating Mode) New Construction	All Capacities		3.2 - (0.026 x Cap/1000)[b] COP	
PTHP (Heating Mode) Replacements[c]	All Capacities		2.9 - (0.026 x Cap/1000)[b] COP	
Room Air Conditioners, with Louvered Sides	< 6,000 Btu/h		9.7 EER	ANSI/AHAM RAC-1
	≥6,000 Btu/h and < 8,000 Btu/h		9.7 EER	
	≥ 8,000 Btu/h and < 14,000 Btu/h		9.8 EER	
	≥14,000 Btu/h and < 20,000 Btu/h		9.7 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioners, without Louvered Sides	< 8,000 Btu/h		9.0 EER	
	≥8,000 Btu/h and < 20,000 Btu/h		8.5 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps with Louvered Sides	< 20,000 Btu/h		9.0 EER	
	≥ 20,000 Btu/h		8.5 EER	

Room Air Conditioner Heat Pumps without Louvered Sides	< 14,000 Btu/h		8.5 EER
	≥ 14,000 Btu/h		8.0 EER
Room Air Conditioner, Casement Only	All Capacities		8.7 EER
Room Air Conditioner, Casement –Slider	All Capacities		9.5 EER

[a] Reserved.
[b] Cap means the rated cooling capacity of the product in Btu/h. If the unit's capacity is less than 7000 Btu/h, use 7000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.
[c] Replacement units must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16-in. high and less than 42-in. wide.

Section 45. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1E to read as follows:

Table 14-1E
Warm Air Furnaces and Combination Warm Air Furnaces/Air-Conditioning Units, Warm Air Duct Furnaces and Unit Heaters, Minimum Efficiency Requirements

Equipment Type	Size Category (Input)	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Warm Air Furnace, Gas-Fired	< 225,000 Btu/h (66 kW)		78% AFUE or 80% $E_{thermal}$[c]	DOE 10 CFR Part 430 or ANSI Z21.47
	≥225,000 Btu/h (66 kW)	Maximum Capacity[c]	80% $E_{combustion}$[f]	ANSI Z21.47
Warm Air Furnace, Oil-Fired	< 225,000 Btu/h (66 kW)		78% AFUE or 80% $E_{thermal}$[c]	DOE 10 CFR Part 430 or UL 727
	≥225,000 Btu/h (66 kW)	Maximum Capacity[b]	81% $E_{thermal}$[g]	UL 727
Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	ANSI Z83.9
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	ANSI Z83.8
Warm Air Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity[b]	80% $E_{combustion}$[e]	UL 731

[a] Reserved.
[b] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[c] Combination units not covered by NAECA (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]) may comply with either rating.
[d] E_t = Thermal efficiency. See test procedure for detailed discussion.
[e] E_c = Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
[f] E_c = Combustion efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[g] E_t = Thermal efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.

Section 46. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1F to read as follows:

Table 14-1F
Boilers, Gas- and Oil-Fired, Minimum Efficiency Requirements

Equipment Type[f]	Size Category	Sub-Category or Rating Condition	Minimum Efficiency	Test Procedure
Boilers, Gas-Fired	< 300,000 Btu/h	Hot Water	80% AFUE	DOE 10 CFR Part 430
		Steam	75% AFUE	
	≥300,000 Btu/h and ≤ 2,500,000 Btu/h	Maximum Capacity[b]	75% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	80% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	80% $E_{combustion}$	
Boilers, Oil-Fired	< 300,000 Btu/h		80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h and ≤ 2,500,000 Btu/h	Maximum Capacity[b]	78% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	83% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	83% $E_{combustion}$	
Oil-Fired (Residual)	≥300,000 Btu/h and ≤2,500,000 Btu/h	Maximum Capacity[b]	78% $E_{thermal}$	H.I. Htg Boiler Std
	> 2,500,000 Btu/h[f]	Hot Water	83% $E_{combustion}$	
	> 2,500,000 Btu/h[f]	Steam	83% $E_{combustion}$	

[a] Reserved.
[b] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[c] E_c = Combustion efficiency (100% less flue losses). See reference document for detailed information.
[d] E_t = Thermal efficiency. See reference document for detailed information.
[e] Alternate test procedures used at the manufacturer's option are ASME PTC-4.1 for units over 5,000,000 Btu/h input, or ANSI Z21.13 for units greater than or equal to 300,000 Btu/h and less than or equal to 2,500,000 Btu/h input.
[f] These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers, and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

Section 47. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1G to read as follows:

Table 14-1G Reserved

Section 48. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1H to read as follows:

Table 14-1H Reserved

Section 49. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1I to read as follows:

Table 14-1I Reserved

Section 50. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1J to read as follows:

Table 14-1J Reserved

Section 51. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1K to read as follows:

Table 14-1K
IPLV/NPLV for Water Cooled Chillers < 150 Tons

Water Cooled Chillers < 150 Tons $IPLV_{std}$ = 5.25								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	5.84	6.10	6.30	6.61	6.84	7.00
45	75	30	5.75	6.00	6.19	6.47	6.68	6.83
44	75	31	5.67	5.91	6.08	6.34	6.53	6.67
43	75	32	5.59	5.82	5.99	6.23	6.39	6.52
42	75	33	5.51	5.74	5.90	6.12	6.27	6.39
41	75	34	5.43	5.66	5.81	6.02	6.16	6.26
46	80	34	5.43	5.66	5.81	6.02	6.16	6.26
40	75	35	5.35	5.58	5.73	5.93	6.06	6.15
45	80	35	5.35	5.58	5.73	5.93	6.06	6.15
44	80	36	5.26	5.50	5.65	5.84	5.96	6.06
43	80	37	5.16	5.42	5.57	5.76	5.87	5.96
42	80	38	5.06	5.33	5.49	5.67	5.79	5.87
41	80	39	4.95	5.24	5.41	5.60	5.71	5.78
46	85	39	4.95	5.24	5.41	5.60	5.71	5.78
40	80	40	4.83	5.14	5.32	5.52	5.63	5.70
45	85	40	4.83	5.14	5.32	5.52	5.63	5.70
44	85	41	4.69	5.04	**5.25**[c]	5.43	5.55	5.62
43	85	42	4.55	4.93	5.13	5.35	5.47	5.54
42	85	43	4.38	4.80	5.03	5.26	5.38	5.46
41	85	44	4.21	4.67	4.91	5.17	5.30	5.38
40	85	45	4.01	4.52	4.79	5.06	5.20	5.29
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 52. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1L to read as follows:

Table 14-1L
IPLV/NPLV for Water Cooled Chillers
≥ 150 Tons, < 300 Tons

Water Cooled Chillers ≥ 150 Tons, < 300 Tons $IPLV_{std}$ = 5.90								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	6.58	6.87	7.11	7.46	7.71	7.90
45	75	30	6.49	6.76	6.98	7.30	7.53	7.70
44	75	31	6.40	6.66	6.86	7.15	7.36	7.52
43	75	32	6.31	6.56	6.75	7.02	7.21	7.35
42	75	33	6.22	6.47	6.65	6.90	7.07	7.20
41	75	34	6.13	6.38	6.55	6.79	6.95	7.06
46	80	34	6.13	6.38	6.55	6.79	6.95	7.06
40	75	35	6.03	6.29	6.46	6.68	6.83	6.94
45	80	35	6.03	6.29	6.46	6.68	6.83	6.94
44	80	36	5.93	6.20	6.37	6.58	6.72	6.82
43	80	37	5.82	6.11	6.28	6.49	6.62	6.72
42	80	38	5.71	6.01	6.19	6.40	6.53	6.62
41	80	39	5.58	5.91	6.10	6.31	6.44	6.52
46	85	39	5.58	5.91	6.10	6.31	6.44	6.52
40	80	40	5.44	5.80	6.00	6.22	6.35	6.43
45	85	40	5.44	5.80	6.00	6.22	6.35	6.43
44	85	41	5.29	5.68	**5.90**[c]	6.13	6.26	6.34
43	85	42	5.13	5.55	5.79	6.03	6.16	6.25
42	85	43	4.94	5.41	5.67	5.93	6.07	6.16
41	85	44	4.74	5.26	5.54	5.82	5.97	6.07
40	85	45	4.52	5.09	5.40	5.71	5.87	5.97
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 53. Effective December 31, 2001, the Energy Code is amended by adding a new Table 14-1M to read as follows:

Table 14-1M

IPLV/NPLV for Water Cooled Chillers ≥ 300 Tons

Water Cooled Chillers ≥ 300 Tons $IPLV_{std}$ = 6.40								
			Condenser Flow Rate					
			2 gpm/ton[d]	2.5 gpm/ton	3 gpm/ton	4 gpm/ton	5 gpm/ton	6 gpm/ton
Leaving Chilled Water Temperature (°F)	Entering Condenser Water Temperature (°F)	LIFT[a] (°F)	Required IPLV/NPLV					
46	75	29	7.15	7.47	7.72	8.10	8.37	8.58
45	75	30	7.05	7.35	7.58	7.93	8.18	8.36
44	75	31	6.95	7.23	7.45	7.77	8.00	8.16
43	75	32	6.85	7.13	7.33	7.68	7.83	7.98
42	75	33	6.75	7.03	7.22	7.49	7.68	7.82
41	75	34	6.65	6.93	7.12	7.37	7.55	7.67
46	80	34	6.65	6.93	7.12	7.37	7.55	7.67
40	75	35	6.55	6.83	7.01	7.26	7.42	7.54
45	80	35	6.55	6.83	7.01	7.26	7.42	7.54
44	80	36	6.44	6.73	6.92	7.15	7.30	7.41
43	80	37	6.32	6.63	6.82	7.05	7.19	7.30
42	80	38	6.20	6.53	6.72	6.95	7.09	7.19
41	80	39	6.06	6.42	6.62	6.85	6.99	7.08
46	85	39	6.06	6.42	6.62	6.85	6.99	7.08
40	80	40	5.91	6.30	6.52	6.76	6.89	6.98
45	85	40	5.91	6.30	6.52	6.76	6.89	6.98
44	85	41	5.75	6.17	**6.40**[c]	6.66	6.79	6.89
43	85	42	5.57	6.03	6.28	6.55	6.70	6.79
42	85	43	5.37	5.88	6.16	6.44	6.59	6.69
41	85	44	5.15	5.71	6.01	6.33	6.49	6.59
40	85	45	4.91	5.53	5.86	6.20	6.37	6.48
Condenser DT[b]			14.04	11.23	9.36	7.02	5.62	4.68

[a] LIFT = Entering Condenser Water Temperature – Leaving Chilled Water Temperature
[b] Condenser DT = Leaving Condenser Water Temperature (F) – Entering Condenser Water Temperature (F)
[c] All values shown are NPLV except at conditions of 3 gpm/ton and 41 F LIFT which is IPLV.
$K_{adj} = 6.1507 - 0.30244(X) + 0.0062692(X)^2 - 0.000045595(X)^3$
where X = Condenser DT + LIFT
$COP_{adj} = K_{adj} * COP_{std}$
[d] Retrofit applications only.

Section 54. Effective December 31, 2001, Table 14-1 of the Energy Code is repealed.

Section 55. Effective December 31, 2001, Table 14-2 of the Energy Code is repealed.

Section 56. Effective December 31, 2001, Table 14-3 of the Energy Code is repealed.

Section 57. Effective December 31, 2001, Table 14-4 of the Energy Code is amended as follows:

TABLE 14-4
Energy Efficient Electric Motors
Minimum Nominal Full-Load Efficiency

	Open Motors			Closed Motors		
Synchronous Speed (RPM)	3,600	1,800	1,200	3,600	1,800	1,200
HP	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency
1.0	80.0	85.5	82.5	78.5	85.5	82.5
1.5	85.5	86.5	86.5	85.5	86.5	87.5
2.0	86.5	86.5	87.5	86.5	86.5	88.5
3.0	86.5	89.5	89.5	88.5	89.5	89.5
5.0	89.5	89.5	89.5	89.5	89.5	89.5
7.5	89.5	91.0	91.7	91.0	91.7	91.7
10.0	90.2	91.7	91.7	91.7	91.7	91.7
15.0	91.0	93.0	92.4	91.7	92.4	92.4
20.0	92.4	93.0	92.4	92.4	93.0	92.4
25.0	93.0	93.6	93.0	93.0	93.6	93.0
30.0	93.0	94.1	93.6	93.0	93.6	93.6
40.0	93.6	94.1	94.1	93.6	94.1	94.1
50.0	93.6	94.5	94.1	94.1	94.5	94.1
60.0	94.1	95.0	95.0	94.1	95.0	94.5
75.0	94.5	95.0	95.0	94.5	95.4	95.0
100.0	94.5	95.4	95.0	95.0	95.4	95.4
125.0	95.0	95.4	95.4	95.4	95.4	95.4
150.0	95.4	95.8	95.8	95.4	95.8	95.8
200.0	95.4	95.8	95.4	95.4	96.2	95.8
~~1.0~~	-	~~82.5~~	~~80.0~~	~~75.5~~	~~82.5~~	~~80.0~~
~~1.5~~	~~82.5~~	~~84.0~~	~~84.0~~	~~82.5~~	~~84.0~~	~~85.5~~
~~2.0~~	~~84.0~~	~~84.0~~	~~85.5~~	~~84.0~~	~~84.0~~	~~86.5~~
~~3.0~~	~~84.0~~	~~86.5~~	~~86.5~~	~~85.5~~	~~87.5~~	~~87.5~~
~~5.0~~	~~85.5~~	~~87.5~~	~~87.5~~	~~87.5~~	~~87.5~~	~~87.5~~
~~7.5~~	~~87.5~~	~~88.5~~	~~88.5~~	~~88.5~~	~~89.5~~	~~89.5~~
~~10.0~~	~~88.5~~	~~89.5~~	~~90.2~~	~~89.5~~	~~89.5~~	~~89.5~~
~~15.0~~	~~89.5~~	~~91.0~~	~~90.2~~	~~90.2~~	~~91.0~~	~~90.2~~
~~20.0~~	~~90.2~~	~~91.0~~	~~91.0~~	~~90.2~~	~~91.0~~	~~90.2~~
~~25.0~~	~~91.0~~	~~91.7~~	~~91.7~~	~~91.0~~	~~92.4~~	~~91.7~~
~~30.0~~	~~91.0~~	~~92.4~~	~~92.4~~	~~91.0~~	~~92.4~~	~~91.7~~
~~40.0~~	~~91.7~~	~~93.0~~	~~93.0~~	~~91.7~~	~~93.0~~	~~93.0~~
~~50.0~~	~~92.4~~	~~93.0~~	~~93.0~~	~~92.4~~	~~93.0~~	~~93.0~~
~~60.0~~	~~93.0~~	~~93.6~~	~~93.6~~	~~93.0~~	~~93.6~~	~~93.6~~

~~75.0~~	~~93.0~~	~~94.1~~	~~93.6~~	~~93.0~~	~~94.1~~	~~93.6~~
~~100.0~~	~~93.0~~	~~94.1~~	~~94.1~~	~~93.6~~	~~94.5~~	~~94.1~~
~~125.0~~	~~93.6~~	~~94.5~~	~~94.1~~	~~94.5~~	~~94.5~~	~~94.1~~
~~150.0~~	~~93.6~~	~~95.0~~	~~94.5~~	~~94.5~~	~~95.0~~	~~95.0~~
~~200.0~~	~~94.5~~	~~95.0~~	~~94.5~~	~~95.0~~	~~95.0~~	~~95.0~~

Section 58. Effective December 31, 2001, the title of Chapter 15 of the Energy Code is amended as follows:

CHAPTER 15 LIGHTING,((~~AND~~)) MOTORS, AND TRANSFORMERS

Section 59. Effective December 31, 2001, Section 1501 of the Energy Code is amended as follows:

1501 Scope: Interior and exterior lighting,((~~and~~)) electric motors, and transformers shall comply with the requirements of this chapter.

Section 60. Effective December 31, 2001, Section 1510 of the Energy Code is amended as follows:

Section 1510 General Requirements: Lighting and motors shall comply with Sections 1511 through 1513. Lighting systems shall comply with one of the following paths:

a. Prescriptive Lighting Option:
   Interior Section 1521, or
   Exterior Section 1522.
b. Lighting Power Allowance Option:
   Interior Section 1531, or
   Exterior Section 1532.
c. Systems Analysis. See Section 1141.4.

The compliance path selected for interior and exterior lighting need not be the same. However, interior and exterior lighting cannot be traded.

Transformers shall comply with Section 1540.

Figure 15A
Lighting,((~~and~~)) Motor, and Transformer Compliance Options

Section Number	Subject	Prescriptive Lighting Option	Lighting Power Allowance Option	Systems Analysis Option
1510	General Requirements	X	X	X
1511	Electric Motors	X	X	X

1512	Exempt Lighting	X	X	X
1513	Lighting Controls	X	X	X
1520	Prescriptive Lighting Option	X		
1521	Prescriptive Interior Lighting Requirements	X		
1522	Prescriptive Exterior Lighting Requirements	Sec. 1532		
1530	Lighting Power Allowance Option		X	
1531	Interior Lighting Power Allowance		X	
1532	Exterior Lighting Power Allowance		X	
1540	Transformers	X	X	X
RS-29	Systems Analysis			X

Section 61. Effective December 31, 2001, Section 1512 of the Energy Code is amended as follows:

1512 Exempt Lighting: The use of these exemptions is at the applicant's option.

1512.1 Exempt Spaces: The following rooms, spaces and areas, are exempt from the lighting power requirements in Sections 1520 and 1530 but shall comply with all other requirements of this chapter.

1. ((~~Areas in which medical or dental tasks are performed.~~))Reserved.
2. High risk security areas or any area identified by building officials as requiring additional lighting.
3. Spaces designed for primary use by the visually impaired((~~,~~)) or hard of hearing (lip-reading)((~~ or by senior citizens~~)).
4. ((~~Food preparation areas.~~))Reserved.
5. Outdoor manufacturing, greenhouses and processing areas.
6. Electrical/mechanical equipment rooms.
7. Outdoor athletic facilities.
8. ((~~Inspection and restoration areas in galleries and museums.~~))Reserved.
9. The sanctuary portion of a house of worship, defined as the space or room where the worship service takes place. Classrooms, meeting rooms, offices and multipurpose rooms that are part of the same facility are not exempt.

1512.2 Exempt Lighting Equipment: The following lighting equipment and tasks are exempt from the lighting requirements of Section 1520 and need not be included when calculating the installed lighting power under Section 1530 but shall comply with all other requirements of this chapter. All other lighting in areas that are not exempted by Section 1512.2, where exempt tasks and equipment are used, shall comply with all of the requirements of this chapter.

1. Special lighting needs for research.
2. Emergency lighting that is automatically OFF during normal building operation.
3. Lighting integral to signs((~~, and permanently ballasted lighting fixtures for walkways and pathways~~)).
4. Lighting that is part of machines, equipment or furniture.
5. Lighting that is used solely for indoor plant growth during the hours of 10:00 p.m. to 6:00 a.m. However, such lighting shall not be exempt unless it is in addition to

general area lighting, is located in a separate fixture, and is controlled by an independent control device.

6. Lighting for theatrical productions, television broadcasting (including sports facilities), ((~~audio-visual presentations~~))and special effects lighting for stage areas and dance floors in entertainment facilities. However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
7. Lighting in galleries, museums and in main building entry lobbies for ((~~art~~))exhibits, inspection, and restoration((~~non-retail displays, portable plug in display fixtures and show case lighting~~)). However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
8. Exterior lighting for public monuments.
9. Lighting specifically designed for use only during medical or dental procedures and lighting integral to medical equipment. However, such lighting shall not be exempt unless it is in addition to general area lighting, designed specifically for medical lighting, and is controlled by an independent control device.
10. Lighting integral to or specifically for food warming and food preparation equipment. However, such lighting shall not be exempt unless it is in addition to general area lighting, is located in a separate fixture, and is controlled by an independent control device.
11. Audio-visual and video-conferencing lighting in rooms with permanently installed audio-visual equipment or video-conferencing equipment which has multi-level or dimming controls.

Section 62. Effective December 31, 2001, Section 1513.1 of the Energy Code is amended as follows:

1513.1 Local Control and Accessibility: Each space, enclosed by walls or ceiling-height partitions, shall be provided with lighting controls located within that space. The lighting controls, whether one or more, shall be capable of turning off all lights within the space. The controls shall be readily accessible, at the point of entry/exit, to personnel occupying or using the space.

EXCEPTIONS: The following lighting controls may be centralized in remote locations:
1. Lighting controls for spaces which must be used as a whole.
2. Automatic controls, when provided in addition to manual controls, need not be accessible to the users and may be centralized in a remote location.
3. Controls requiring trained operators.
4. Controls for safety hazards and security.

Section 63. Effective December 31, 2001, Section 1513.3 of the Energy Code is amended as follows:

1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 2 (see Exhibits 1513.3a and 1513.3b), both under overhead glazing and adjacent to vertical glazing, shall be provided with ((~~individual controls, or daylight or occupant sensing~~))

a. automatic controls((,)) which control the lights independent of general area lighting, and

b. i. multi-level switching and with daylight-sensing automatic controls, which are capable of reducing the light level automatically and turning the lights off, or

ii. dimming ballasts and with daylight-sensing automatic controls, which are capable of dimming the lights continuously and turning the lights off.

Contiguous daylight zones adjacent to vertical glazing are allowed to be controlled by a single controlling device provided that they do not include zones facing more than two adjacent cardinal orientations (i.e. north, east, south, west). Daylight zones under overhead glazing more than 15 feet from the perimeter shall be controlled separately from daylight zones adjacent to vertical glazing.

EXCEPTIONS:

1. Daylight spaces enclosed by walls or ceiling height partitions and containing 2 or fewer lighting fixtures are not required to have a separate switch for general area lighting.
2. HID lamps with automatic controls that are capable of reducing the light level by at least 50% in lieu of continuous dimming controls.
3. HID lamps 150 watts or less are exempt from the dimming requirements.

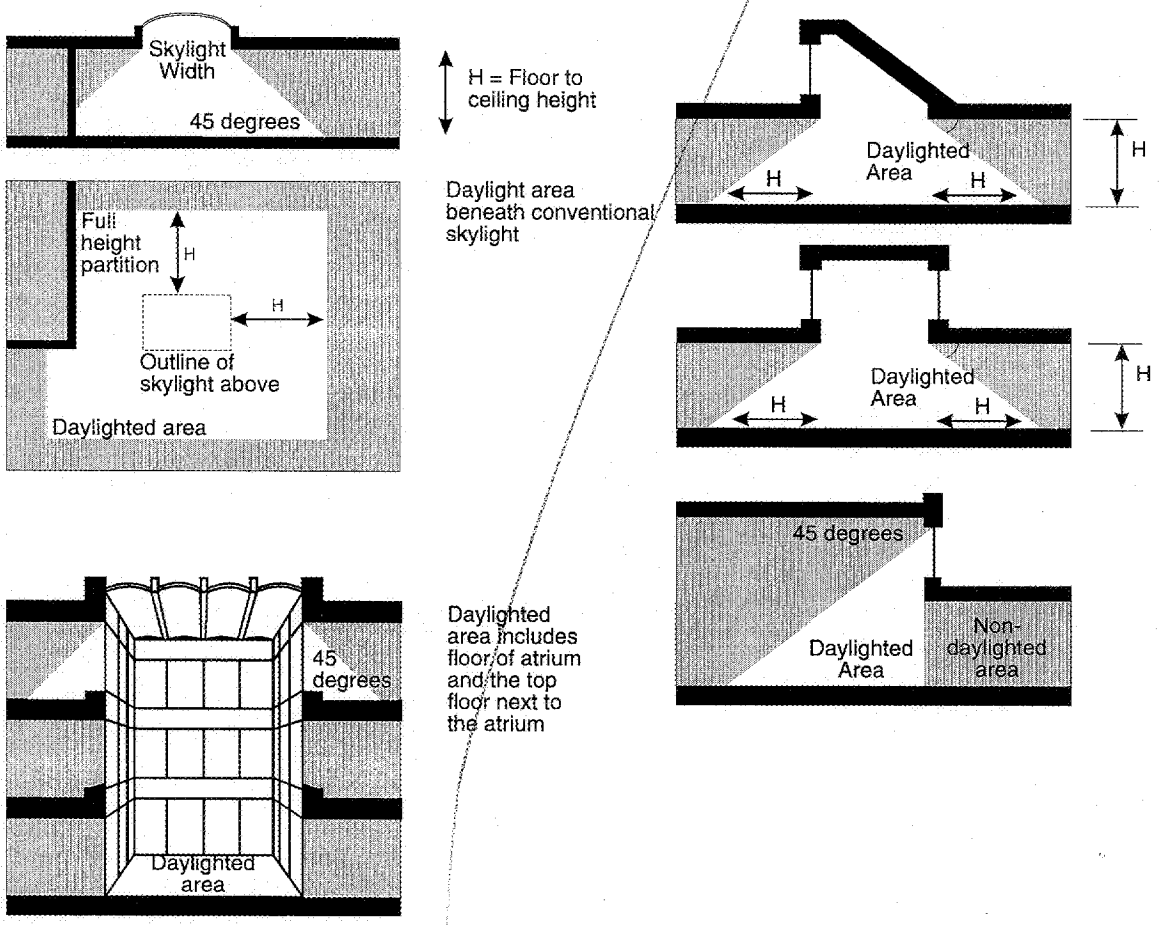


Exhibit 1513.3a

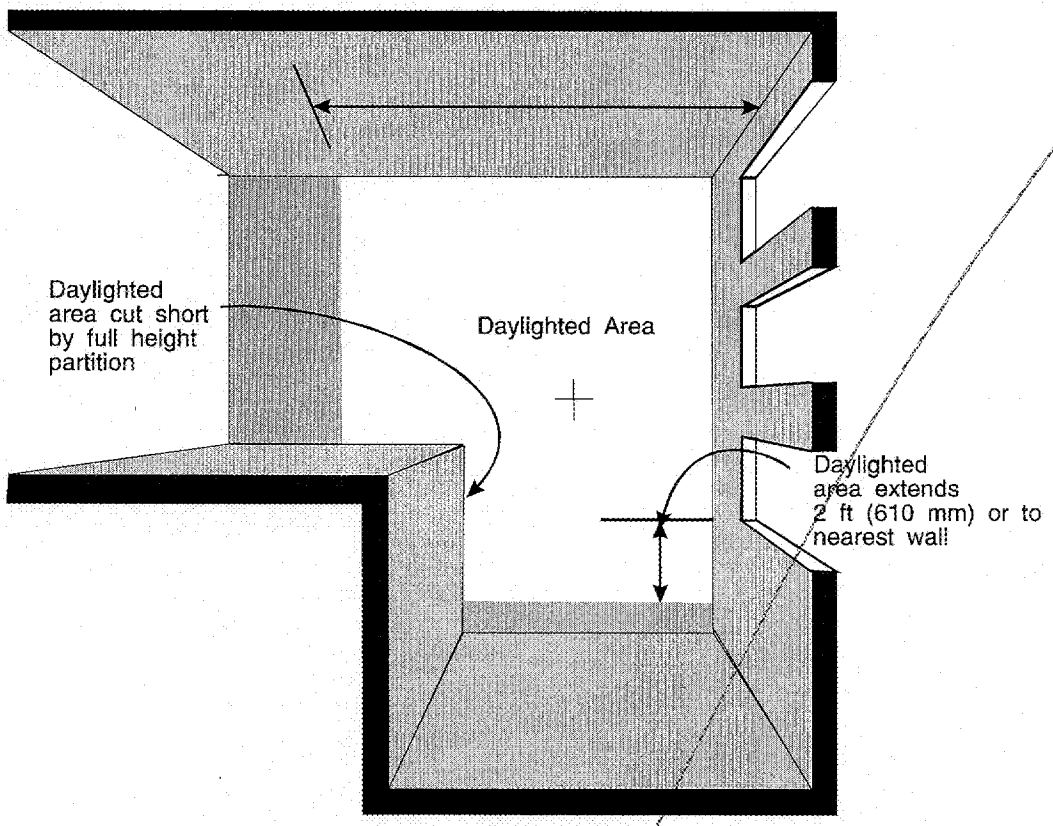


Exhibit 1513.3b

Section 64. Effective December 31, 2001, Section 1513.5 of the Energy Code is amended as follows:

1513.5 Automatic Shut-off Controls, Exterior: Exterior lighting, including signs, ((~~not intended for 24-hour continuous use shall be automatically switched by timer, photocell or~~)) shall be capable of being automatically switched off during daylight hours by either a combination of timer and photocell, or a timer with astronomic control. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

EXCEPTION: Neon lighting in signs.

Section 65. Effective December 31, 2001, Section 1513.6 of the Energy Code is amended as follows:

1513.6 Automatic Shut-Off Controls, Interior: ((~~Office b~~))Buildings greater than 5,000 ft^2 and all school classrooms shall be equipped with separate automatic controls to shut off the lighting during unoccupied hours. Within these buildings, all office areas less than 300 ft^2 enclosed by walls or ceiling-height partitions, and all meeting and conference rooms, and all school classrooms, shall be equipped with occupancy sensors that comply with Section 1513.6.1. For other spaces, ((~~A~~))automatic controls may be an occupancy sensor, time

switch or other device capable of automatically shutting off lighting that complies with Section 1513.6.1 or 1513.6.2.

EXCEPTIONS:

1. Areas that must be continuously illuminated (e.g. 24 hour convenience stores), or illuminated in a manner requiring manual operation of the lighting.
2. Emergency lighting systems.
3. Switching for industrial or manufacturing process facilities as may be required for production.
4. Hospitals and laboratory spaces.
5. Areas in which medical or dental tasks are performed are exempted from the occupancy sensor requirement.

1513.6.1 Occupancy Sensors: Occupancy sensors shall be capable of automatically turning off all the lights in an area, no more than 30 minutes after the area has been vacated. Light fixtures controlled by occupancy sensors shall have a wall-mounted, manual switch capable of turning off lights when the space is occupied.

1513.6.2 Automatic Time Switches: Automatic time switches shall have a minimum 7 day clock and be capable of being set for 7 different day types per week and incorporate an automatic holiday "shut-off" feature, which turns off all loads for at least 24 hours and then resumes normally scheduled operations. Automatic time switches shall also have program back-up capabilities, which prevent the loss of program and time settings for at least 10 hours, if power is interrupted.

Automatic time switches shall incorporate an over-ride switching device which:

a. is readily accessible;
b. is located so that a person using the device can see the lights or the areas controlled by the switch, or so that the area being illuminated is annunciated;
c. is manually operated;
d. allows the lighting to remain on for no more than 2 hours when an over-ride is initiated; and
e. controls an area not exceeding 5,000 ft^2 or 5% of the building footprint for footprints over 100,000 ft^2, whichever is greater.

Section 66. Effective December 31, 2001, Section 1521 of the Energy Code is amended as follows:

1521 Prescriptive Interior Lighting Requirements: Spaces for which the Unit Lighting Power Allowance in Table 15-1 is 0.80 W/ft^2 or greater may use unlimited numbers of lighting fixtures and lighting energy, provided that the installed lighting fixtures comply with all four of the following criteria:

a. one- or two-lamp (but not three- or more lamp);
b. ((~~non-lensed, fluorescent fixtures~~))luminaires have a reflector or louver assembly to direct the light (bare lamp strip or industrial fixtures do not comply with this section);
c. fitted with type T-1, T-2, T-4, T-5, ((~~T-6,~~))T-8 or compact fluorescent lamps from 5 to ((~~50~~))60 watts (but not T-10, or T-12 lamps); and
d. hard-wired fluorescent electronic dimming ballasts with photocell or programmable dimming control for all lamps in all zones (non-dimming electronic ballasts and

electronic ballasts that screw into medium base sockets do not comply with this section).

Track lighting is not allowed under this path.

EXCEPTIONS:

1. Up to a total of 5% of installed lighting fixtures ((~~need not be ballasted and~~))may use any type of ballasted lamp and do not require dimming controls.
2. Clear safety lenses are allowed in food prep and serving areas and patient care areas in otherwise compliant fixtures.
3. Exit lights are not included in the count of fixtures provided that they do not exceed 5 Watts per fixture and are light emitting diode (LED) type or T-1 fluorescent type only. (See the Uniform Fire Code for face illumination footcandle requirements and other requirements.)
4. LED lights other than exit lights addressed by exception 3.
5. Metal halide lighting which complies with all three of the following criteria:
   i. luminaires or lamps which have a reflector or louver assembly to direct the light;
   ii. fixtures are fitted with ceramic metal halide lamps not exceeding 150 watts; and
   iii. electronic ballasts.

Section 67. Effective December 31, 2001, Section 1530 of the Energy Code is amended as follows:

1530 Lighting Power Allowance Option. The installed lighting wattage shall not exceed the lighting power allowance. Lighting wattage includes lamp and ballast wattage. Wattage for fluorescent lamps and ballasts shall be tested per ANSI Standard C82.2-1984.

The wattage used for any unballasted fixture shall be the maximum UL listed wattage for that fixture regardless of the lamp installed. The wattage used for track lighting shall be:

a. for line voltage track, ((~~50~~))70 watts per lineal foot of track or actual luminaire wattage, whichever is greater.
b. for low voltage track (i.e. with remote transformer) (less than 30 volts), ((~~25 watts per lineal foot of track or~~))the VA rating of the transformer((~~, whichever is greater~~)).

No credit towards compliance with the lighting power allowances shall be given for the use of any controls, automatic or otherwise.

Exit lights that are 5 watts or less per fixture shall not be included in the lighting power allowance calculations. Other exit lights shall be included in the lighting power allowance calculations.

Section 68. Effective December 31, 2001, Section 1532 of the Energy Code is amended as follows:

1532 Exterior Lighting Power Allowance: The exterior lighting power allowance shall be ((~~the sum of the calculated allowances~~))calculated separately for (1) covered parking, and (2) outdoor parking, outdoor areas and building exteriors. The lighting in these two areas shall not be traded. The lighting allowance for covered parking, open parking and outdoor areas shall be 0.20 W/ft^2. The lighting allowance for building exteriors shall be calculated either by multiplying the building façade area by 0.25 W/ft^2 or multiplying the building perimeter in feet by 7.5 watts per lineal foot.

EXCEPTIONS:

1. Group U occupancy accessory to Group R-3 occupancy.
2. For covered parking, 0.30 W/ft^2 may be used for the lighting provided that the ceilings and walls are painted or stained with a reflectance value of 0.70 or higher.
3. The top level of a parking garage is allowed to be included with the covered parking garage category.

Section 69. Effective December 31, 2001, the Energy Code is amended by adding a new Section 1540 to read as follows:

1540 Transformers: Internal building transformers that are single-phase and three-phase dry-type and liquid-filled distribution transformers with a primary voltage of 34.5 kV and below and a secondary voltage of 600 Volts and below shall have a minimum efficiency that complies with NEMA TP-1-1996.

Section 70. Effective December 31, 2001, Table 15-1 of the Energy Code is amended as follows:

Table 15-1 Unit Lighting Power Allowance (LPA)

Use[1]	LPA[2] (W/ft^2)
Painting, welding, carpentry, machine shops	2.30
Barber shops, beauty shops	2.00
Hotel banquet/conference/exhibition hall[3,4]	2.00
Laboratories (see also office and other appropriate categories)	((~~2.00~~))1.80
Aircraft repair hangars	1.50
Cafeterias, fast food establishments[5]	1.50
Factories, workshops, handling areas	1.50
Gas stations, auto repair shops[6]	1.50
Institutions	1.50
Libraries[5]	1.50
Nursing homes and hotel/motel guest rooms	1.50
Retail[10], retail banking	1.50
Wholesale stores (pallet rack shelving)	1.50
Mall concourses	1.40
School buildings (Group E occupancy only, school classrooms, day care centers	((~~1.35~~))1.20
Laundries	((~~1.30~~))1.20
Medical office, clinics[12]	1.20
Office buildings, office/administrative areas in facilities of other use types (including but not limited to schools, hospitals, institutions, museums, banks, churches)[5,7,11]	((~~1.20~~))1.00
Police and fire stations[8]	((~~1.20~~))1.00

Atria (atriums)	1.00
Assembly spaces[9], auditoriums, gymnasia[9], theaters	1.00
Group R-1 common areas	1.00
Process plants	1.00
Restaurants/bars[5]	1.00
Locker and/or shower facilities	0.80
Warehouses[11], storage areas	0.50
Aircraft storage hangars	0.40
Parking garages	See Section 1532
Plans Submitted for Common Areas Only[7]	
Main floor building lobbies[3] (except mall concourses)	1.20
Common areas, corridors, toilet facilities and washrooms, elevator lobbies	0.80

Footnotes for Table 15-1

1. In cases in which a general use and a specific use are listed, the specific use shall apply. In cases in which a use is not mentioned specifically, the *Unit Power Allowance* shall be determined by the building official. This determination shall be based upon the most comparable use specified in the table. See Section 1512 for exempt areas.
2. The watts per square foot may be increased, by 2% per foot of ceiling height above 20 feet, unless specifically directed otherwise by subsequent footnotes.
3. The watts per square foot of room may be increased by 2% per foot of ceiling height above 12 feet.
4. For all other spaces, such as seating and common areas, use the *Unit Lighting Power Allowance* for assembly.
5. The watts per square foot of room may be increased by 2% per foot of ceiling height above 9 feet.
6. Includes pump area under canopy.
7. ((~~In cases in which a lighting plan is submitted for only a portion of a floor, a *Unit Lighting Power Allowance* of 1.35 may be used for usable office floor area and 0.80 W/ft^2 shall be used for the common areas, which may include elevator space, lobby area and rest rooms. Common areas, as herein defined do not include mall concourses.~~))
   For conference rooms and offices less than 150 square feet with full-height partitions, a Unit Lighting Power Allowance of 1.2 W/ft^2 may be used.
8. For the fire engine room, the *Unit Lighting Power Allowance* is 1.00 W/ft^2.
9. For indoor sport tournament courts with adjacent spectator seating, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft^2.
10. Display window illumination installed within 2 feet of the window provided that the display window is separated from the retail space by walls or at least three-quarter-height partitions (transparent or opaque), and lighting for free-standing display where the lighting moves with the display((~~, and building showcase illumination where the lighting is enclosed within the showcase~~)) are exempt.

    An additional 1.5 W/ft^2 of merchandise display luminaires are exempt provided that they comply with all three of the following:
    a. located on ceiling-mounted track or directly on or recessed into the ceiling itself (not on the wall),
    b. adjustable in both the horizontal and vertical axes (vertical axis only is acceptable for fluorescent and other fixtures with two points of track attachment).

c. fitted with LED, tungsten halogen, fluorescent, or high intensity discharge lamps.

This additional lighting power is allowed only if the lighting is actually installed.

11. Provided that a floor plan, indicating rack location and height, is submitted, the square footage for a warehouse may be defined, for computing the interior *Unit Lighting Power Allowance,* as the floor area not covered by racks plus the vertical face area (access side only) of the racks. The height allowance defined in footnote 2 applies only to the floor area not covered by racks.

12. Medical and clinical offices include those facilities which, although not providing overnight patient care, do provide medical, dental, or psychological examination and treatment. These spaces include, but are not limited to, laboratories and treatment centers.

Section 71. Effective December 31, 2001, Reference Standard 29 (RS-29) of the 2000 Washington State Energy Code is amended by adding a new Section 3.6.5 to read as follows:

3.6.5: There shall be no credit in the proposed design for control of parking garage ventilation.

Section 72. The provisions of this ordinance are declared to be separate and severable. The invalidity of any clause, sentence, paragraph, subdivision, section or portion of this ordinance, or the invalidity of the application thereof to any person, owner, or circumstance shall not affect the validity of the remainder of this ordinance, or the validity of its application to other persons, owners, or circumstances.

Section 73. This ordinance shall take effect and be in force thirty (30) days from and after its approval by the Mayor, but if not approved and returned by the Mayor within ten (10) days after presentation, it shall take effect as provided by Municipal Code Section 1.04.020.

Passed by the City Council the _____ day of _____, 2001, and signed by me in open session in authentication of its passage this _____ day of _____, 2001.

_____
President of the City Council

Approved by me this _____ day of _____, 2001.

_____
Paul Schell, Mayor

Filed by me this _____ day of _____, 20____.

_____
City Clerk

(**SEAL**)

STATE OF WASHINGTON – KING COUNTY

--ss.

136739 No. ORDINANCE IN FULL
City of Seattle,Clerk's Office

Affidavit of Publication

The undersigned, on oath states that he is an authorized representative of The Daily Journal of Commerce, a daily newspaper, which newspaper is a legal newspaper of general circulation and it is now and has been for more than six months prior to the date of publication hereinafter referred to, published in the English language continuously as a daily newspaper in Seattle, King County, Washington, and it is now and during all of said time was printed in an office maintained at the aforesaid place of publication of this newspaper. The Daily Journal of Commerce was on the 12th day of June, 1941, approved as a legal newspaper by the Superior Court of King County.

The notice in the exact form annexed, was published in regular issues of The Daily Journal of Commerce, which was regularly distributed to its subscribers during the below stated period. The annexed notice, a

CT:120525 ORD. IN FULL

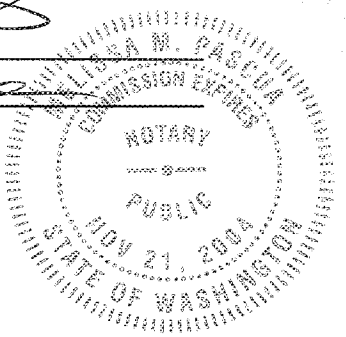
was published on

10/05/01

Subscribed and sworn to before me on

10/08/01

Notary public for the State of Washington,
residing in Seattle



Affidavit of Publication

Clerk File 120525

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1 sheets

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Section 47. The Energy Code is amended by adding a new Table 14-1G to read as

~~2. Overhead glazing shall be added to vertical glazing, and shall be input as 1/4 north, 1/4 south and 1/4 west facing~~

City of Seattle

ORDINANCE 120525

AN ORDINANCE relating to energy efficiency and energy conservation; amending Section 22.700.010 of the Seattle Municipal Code ("SMC") that adopted the 2000 Washington State Energy Code with Seattle amendments and amending the Energy Code Sections 1132.2, 1132.5, 1133, 1301, 1310.2, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1401, 1411.1, 1411.4, 1412.2, 1412.4, 1412.6, 1412.8, 1413, 1413.2, 1413.3, 1414.1, 1416, 1421.1, 1423, 1431.2, 1432.2, 1433, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530, 1532, and Tables 10-5B, 10-6, 13-1, and 15-1, and the title to Chapter 15; adding new Sections 1413.4, 1436.2, 1436.3, 1540, and new Tables 14-1A, 14-1B, 14-1C, 14-1D, 14-1E, 14-1F, 14-1J, 14-1K, 14-1L, 14-1M, and new Section 3.6.5 to Reference Standard 29 of the Energy Code; and repealing Tables 14-1, 14-2, and 14-3 of the Energy Code.

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Section 22.700.010, SMC, as last amended by Ordinance 120378 is further amended as follows:

22.700.010 Adoption of the 2000 Washington State Energy Code and local amendments.

The 2000 Washington State Energy Code (WAC 51-11) and the amendments thereto adopted by Ordinance 120378 incorporating the Seattle Amendments, and amendments made by the Washington State Building Code Council to the 2000 Washington State Energy Code filed January 5, 2001 (WSR 01-03-010), which is filed with the City Clerk in C.F. 304655, and further amendments made in Ordinance 120525 are hereby adopted and by this reference made a part of this subtitle and shall constitute the official Energy Code of the City. The 1997 Washington State Energy Code, and amendments thereto, are hereby repealed.

Section 2. Table 10-5B of the Energy Code is amended as follows:

TABLE 10-5B(1)
Group R Occupancy:
Default U-Factors for Concrete and Masonry Walls

8" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.40	0.25	0.24	0.43
R-5 Interior Insulation, Wood Furring	0.14	0.11	0.12	0.13
R-6 Interior Insulation, Wood Furring	0.14	0.11	0.11	0.14
R-10.5 Interior Insulation, Wood Furring	0.11	0.09	0.09	0.11
R-8 Interior Insulation, Metal Clips	0.11	0.09	0.09	0.11
R-6 Exterior Insulation	0.12	0.10	0.10	0.12
R-10 Exterior Insulation	0.08	0.07	0.07	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.09	0.09	0.12

12" CONCRETE MASONRY

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.35	0.17	0.18	0.33
R-5 Interior Insulation, Wood Furring	0.14	0.10	0.10	0.13
R-6 Interior Insulation, Wood Furring	0.13	0.09	0.10	0.13
R-10.5 Interior Insulation, Wood Furring	0.11	0.08	0.08	0.10
R-8 Interior Insulation, Metal Clips	0.10	0.08	0.08	0.09
R-6 Exterior Insulation	0.11	0.09	0.09	0.11
R-10 Exterior Insulation	0.08	0.06	0.06	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.08	0.09	0.12

8" CLAY BRICK

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.50	0.31	0.32	0.56
R-5 Interior Insulation, Wood Furring	0.15	0.13	0.13	0.16
R-6 Interior Insulation, Wood Furring	0.15	0.12	0.12	0.15
R-10.5 Interior Insulation, Wood Furring	0.12	0.10	0.10	0.12
R-8 Interior Insulation, Metal Clips	0.11	0.10	0.10	0.11
R-6 Exterior Insulation	0.13	0.11	0.11	0.13
R-10 Exterior Insulation	0.08	0.08	0.08	0.09

for 0.5 in. gypsum board. U-factors are provid
(a) Concrete wall: 8-in. normal weight concre
(b) Solid grouted concrete block wall: 8-in. mo
with a density of 115 lb/ft³ and solid grout
(c) Partially grouted concrete block wall: 8-in.
block with a density of 115 lb/ft³ having re
every 48 in. horizontally, with cores grout
filled with insulating material only if there

3. For walls with insulation contained in a frami
assume contact (and thermal bridging) betwee
wall assemblies with multiple layers where th
contact the concrete or masonry layer (i.e. wal
layer and the mass wall layer), it is acceptable
frame wall default U-factors in Tables 10-5 or
approach where the insulation extends beyon
mass wall layer (e.g. a nominal four-inch met
nominally six inches thick and therefore exte
metal stud).

4. Except for wall assemblies qualifying for not
wall U-factors shall be determined in accorda
1999, Appendix A, Section A3.1 and Tables
from Table 10-9, heat capacity for mass walls
Standard 90.1-1999, Appendix A, Table A-6)

Section 3. Table 10-6 of the Energy Code is

TABLE
Other than Group
Default U-Factors for Vertical Glazing, 0

Vertical Glazing (including frame)

Single
Double
½ Inch Air, Fixed
½ Inch Air, Low-e$^{(0.40)}$, Fixed
½ Inch Air, Low-e$^{(0.10)}$, Fixed
~~½ Inch Argon, Low-e$^{(0.40)}$, Fixed~~
½ Inch Argon, Low-e$^{(0.10)}$, Fixed

The category for aluminum frame with a thermal bre

Overhead Glazing: Sloped Glazing (

Single
Double
½ Inch Air, Fixed
~~½ Inch Air, Low-e$^{(0.40)}$, Fixed~~
~~½ Inch Air, Low-e$^{(0.10)}$, Fixed~~
½ Inch Argon, Low-e$^{(0.10)}$, Fixed

This default table is applicable to sloped glazin
glazed system (similar to a curtain wall) that is
from the vertical plane.) Other overhead glazi

~~Single~~
~~Double~~
~~Low-e$^{(0.40)}$ or Argon~~
~~Low-e$^{(0.40)}$ + Argon~~
~~Low-e$^{(0.20)}$ Air~~
~~Low-e$^{(0.20)}$ + Argon~~
~~Triple~~

Opaque Doors

Uninsulated Metal
Insulated Metal (including Fire Do and Smoke Vent)
Wood

NOTES:
Where a gap width is listed (i.e.: 1/2 inch), that is
Where a low-emissivity emittance is listed (i.e.: 0
Where a gas other than air is listed (i.e.: argon), th
Where an operator type is listed (i.e.: fixed), the
Where a frame type is listed (i.e.: wood/vinyl), th
Wood/Vinyl frame includes reinforced vinyl

Section 4. Section 1132.2 of the Energy C

1132.2 Building Mechanical Systems: Thos
replaced shall comply with Chapter 14 of this

1132.2.1 Economizer Capability: Where th
individual water source heat pumps) is being
of the trunk ductwork (not including diffuser)
whichever is smaller, is being moved or repla

State of Washington, King County

RS-29, to determine whether the Energy Code can be revise[d] better achieve the joint goals of providing design flexibility, encouraging innovatio[n], promoting energy conservation. As part of this review, DCLU will determine if it is possible to have those who would benefit from the use of any revised code provisions share in the costs associated with implementing these changes. No later than June 1, 2002, DCLU will provide to the Energy and Environmental Policy Committee a description of its review process, a summary of its findings and any resulting recommendations.

b. Provide to the Energy and Environmental Policy Committee by no later than April 1, 2002 a draft of either a Director's Rule or Client Assistance Memorandum (as appropriate) describing the application and appeals process and the timing of the administrative review that will be used to implement and administer the exceptions provided under Sections 1132.2.1 and 1132.2.2 of the Seattle Energy Code.

c. Review the existing Energy Code to determine if there are reasonable modifications that can be made to help increase the efficiency of exterior lighting on commercial buildings. Recommendations will be provided to the Energy and Environmental Policy Committee by no later than June 1, 2002.

Section 74. This ordinance shall take effect and be in force thirty (30) days from and after its approval by the Mayor, but if not approved and returned by the Mayor within ten (10) days after presentation, it shall take effect as provided by Municipal Code Section 1.04.020.

Passed by the City Council the 17th day of September, 2001, and signed by me in open session in authentication of its passage this 17th day of September, 2001.

MARGARET PAGELER,
President of the City Council.
Approved by me this 24th day of September, 2001.
PAUL SCHELL,
Mayor.
Filed by me this 26th day of September, 2001.
(Seal) JUDITH E. PIPPIN,
City Clerk.
Publication ordered by JUDITH E. PIPPIN, City Clerk.

Date of official publication in Daily Journal of Commerce, Seattle, October 5, 2001.

10/5(136739CI)