

Ordinance No. 120804

Council Bill No. 114180

The City of Seattle

Council Bill/Ordinance

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") to adopt by reference the 2001 Washington State Energy Code (WAC 51-11) and to repeal the 2000 Washington State Energy Code and amendments thereto; amending 2001 Washington State Energy Code Sections 1132.2, 1132.3, 1133, 1144, 1150, 1161, 1162, 1301, 1310.2, 1311.6, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1402, 1411.1, 1411.2, 1411.4, 1412.2, 1412.4, 1412.6, 1413.3, 1414.1, 1414.2, 1416, 1421, 1423, 1432.2, 1435, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530 and 1532 and Tables 10-5A, 10-5B, 10-6, 13-1, 14-1C and 15-1 and the title to Chapter 15; adding to the 2001 Washington State Energy Code new Sections 1144.1, 1144.2, 1144.3, 1144.4, 1144.5, 1144.6, 1144.7, 1411.5, 1412.8, 1413.5, 1421.1, 1431.2, 1436.2, 1436.3, 1438.1 and 1540 and new Tables 14-1H, 14-1I, 14-1J, 14-1K, 14-1L and 14-1M; amending Sections 3.4 and 3.4.4 and Table 3-3 of Reference Standard 29 of the Energy Code; and adding new Section 3.6.5 to Reference Standard 29 of the Energy Code.

5/16/02

5-28-02 Pass

CEC

Date Introduced:		
Date 1st Referred:	To: (committee)	
5-13-02	Energy	
Date Re- Referred:	To: (committee)	
Date Re - Referred:	To: (committee)	
Date of Final Passage:	Full Council Vote:	
5-28-02	8-0	
Date Presented to Mayor:	Date Approved:	
5-28-02	5/31/02	
Date Returned to City Clerk:	Date Published:	T.O.
6/3/02	5980	F.T. Z
Date Vetted by Mayor:	Date Veto Published:	
Date Passed Over Veto:	Veto Sustained:	

This file is complete and ready

Law Department

Law Dept. Review

The City of Seattle - Legislative Department

WILLS

Council Bill/Ordinance sponsored by: _____

Councilmember

Committee Action:

5/16/02 PASSED 2-0 HUG, HP
AS Amended

5-28-02 PASSED 8-0

(Excused: Melver)

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

ORDINANCE 120804

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") to adopt by reference the 2001 Washington State Energy Code (WAC 51-11) and to repeal the 2000 Washington State Energy Code and amendments thereto; amending 2001 Washington State Energy Code Sections 1132.2, 1132.3, 1133, 1144, 1150, 1161, 1162, 1301, 1310.2, 1311.6, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1402, 1411.1, 1411.2, 1411.4, 1412.2, 1412.4, 1412.6, 1413.3, 1414.1, 1414.2, 1416, 1421, 1423, 1432.2, 1435, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530 and 1532 and Tables 10-5A, 10-5B, 10-6, 13-1, 14-1C and 15-1 and the title to Chapter 15; adding to the 2001 Washington State Energy Code new Sections 1144.1, 1144.2, 1144.3, 1144.4, 1144.5, 1144.6, 1144.7, 1411.5, 1412.8, 1413.5, 1421.1, 1431.2, 1436.2, 1436.3, 1438.1 and 1540 and new Tables 14-1H, 14-1I, 14-1J, 14-1K, 14-1L and 14-1M; amending Sections 3.4 and 3.4.4 and Table 3-3 of Reference Standard 29 of the Energy Code; and adding new Section 3.6.5 to Reference Standard 29 of the Energy Code.

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Effective July 1, 2002, Section 22.700.010, SMC, as last amended by Ordinance 120525 is further amended as follows:

22.700.010 Adoption of the ~~((2000))~~ 2001 Washington State Energy Code and local amendments.

The ~~((2000))~~ 2001 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))~~ 305104, ~~((and further amendments made in Ordinance 120525))~~ and the amendments thereto adopted by Ordinance 120804 that incorporate the Seattle Amendments, 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))~~ 2000 Washington State Energy Code, and amendments thereto, are hereby repealed.

Section 2. Effective July 1, 2002, Table 10-5A of the Energy Code is amended as follows:

TABLE 10-5A
DEFAULT U-FACTORS FOR OVERALL ASSEMBLY METAL STUD WALLS,
EFFECTIVE R-VALUES FOR METAL FRAMING AND CAVITY ONLY,
AND DEFAULT METAL BUILDING U-FACTORS

Group R Occupancy:

Overall Assembly U-Factors for Metal Stud Walls



John Hogan
114180 - amended
5/03/02
V #2

Metal Framing	R-Value of Continuous Foam Board Insulation	Cavity Insulation					
		R-11	R-13	R-15	R-19	R-21	R-25
16" o.c.	R-0 (none)	U-0.14	U-0.13	U-0.12	U-0.10	U-0.097	U-0.091
	R-1	U-0.12	U-0.12	U-0.11	U-0.094	U-0.089	U-0.083
	R-2	U-0.11	U-0.10	U-0.099	U-0.086	U-0.081	U-0.077
	R-3	U-0.10	U-0.095	U-0.090	U-0.079	U-0.075	U-0.071
	R-4	U-0.091	U-0.087	U-0.082	U-0.073	U-0.070	U-0.067
	R-5	U-0.083	U-0.080	U-0.076	U-0.068	U-0.065	U-0.062
	R-6	U-0.077	U-0.074	U-0.071	U-0.064	U-0.061	U-0.059
	R-7	U-0.071	U-0.069	U-0.066	U-0.060	U-0.058	U-0.055
	R-8	U-0.067	U-0.064	U-0.062	U-0.057	U-0.055	U-0.053
	R-9	U-0.062	U-0.060	U-0.058	U-0.054	U-0.052	U-0.050
	R-10	U-0.059	U-0.057	U-0.055	U-0.051	U-0.049	U-0.048

24" o.c.	R-0 (none)	U-0.13	U-0.12	U-0.11	U-0.091	U-0.085	U-0.079
	R-1	U-0.11	U-0.10	U-0.098	U-0.084	U-0.078	U-0.073
	R-2	U-0.10	U-0.091	U-0.089	U-0.077	U-0.073	U-0.068
	R-3	U-0.092	U-0.083	U-0.082	U-0.072	U-0.068	U-0.064
	R-4	U-0.084	U-0.077	U-0.076	U-0.067	U-0.063	U-0.060
	R-5	U-0.078	U-0.071	U-0.070	U-0.063	U-0.060	U-0.057
	R-6	U-0.072	U-0.067	U-0.066	U-0.059	U-0.056	U-0.054
	R-7	U-0.067	U-0.063	U-0.062	U-0.056	U-0.053	U-0.051
	R-8	U-0.063	U-0.059	U-0.058	U-0.053	U-0.051	U-0.048
	R-9	U-0.059	U-0.056	U-0.055	U-0.050	U-0.048	U-0.046
	R-10	U-0.056	U-0.053	U-0.052	U-0.048	U-0.046	U-0.044

Other than Group R Occupancy:
Overall Assembly U-Factors for Metal Stud Walls

Metal Framing	R-Value of Continuous Foam Board Insulation	Cavity Insulation					
		R-0	R-11	R-13	R-15	R-19	R-21
16" o.c.	R-0 (none)	U-0.352	U-0.132	U-0.124	U-0.118	U-0.109	U-0.106
	R-1	U-0.260	U-0.117	U-0.111	U-0.106	U-0.099	U-0.096
	R-2	U-0.207	U-0.105	U-0.100	U-0.096	U-0.090	U-0.087
	R-3	U-0.171	U-0.095	U-0.091	U-0.087	U-0.082	U-0.080
	R-4	U-0.146	U-0.087	U-0.083	U-0.080	U-0.076	U-0.074
	R-5	U-0.128	U-0.080	U-0.077	U-0.074	U-0.071	U-0.069
	R-6	U-0.113	U-0.074	U-0.071	U-0.069	U-0.066	U-0.065
	R-7	U-0.102	U-0.069	U-0.066	U-0.065	U-0.062	U-0.061
	R-8	U-0.092	U-0.064	U-0.062	U-0.061	U-0.058	U-0.057
	R-9	U-0.084	U-0.060	U-0.059	U-0.057	U-0.055	U-0.054
	R-10	U-0.078	U-0.057	U-0.055	U-0.054	U-0.052	U-0.051

24" o.c.	R-0 (none)	U-0.338	U-0.116	U-0.108	U-0.102	U-0.094	U-0.090
	R-1	U-0.253	U-0.104	U-0.098	U-0.092	U-0.086	U-0.083
	R-2	U-0.202	U-0.094	U-0.089	U-0.084	U-0.079	U-0.077

R-3	U-0.168	U-0.086	U-0.082	U-0.078	U-0.073	U-0.071
R-4	U-0.144	U-0.079	U-0.075	U-0.072	U-0.068	U-0.066
R-5	U-0.126	U-0.073	U-0.070	U-0.067	U-0.064	U-0.062
R-6	U-0.112	U-0.068	U-0.066	U-0.063	U-0.060	U-0.059
R-7	U-0.100	U-0.064	U-0.062	U-0.059	U-0.057	U-0.055
R-8	U-0.091	U-0.060	U-0.058	U-0.056	U-0.054	U-0.052
R-9	U-0.084	U-0.057	U-0.055	U-0.053	U-0.051	U-0.050
R-10	U-0.077	U-0.054	U-0.052	U-0.050	U-0.048	U-0.048

Effective R-Values for Metal Framing and Cavity Only

	Cavity		Insulation		
	Nominal Depth, Inches	Actual Depth, Inches	Nominal R-Value	Effective R-Value	
				16" O.C.	24" O.C.
Air Cavity	Any	Any	R-0.91 (air)	0.79	0.91
Wall	4	3-1/2	R-11	5.5	6.6
	4	3-1/2	R-13	6.0	7.2
	4	3-1/2	R-15	6.4	7.8
	6	5-1/2	R-19	7.1	8.6
	6	5-1/2	R-21	7.4	9.0
	8	7-1/4	R-25	7.8	9.6
Roof		Insulation is uncompressed	R-11	5.5	6.1
			R-19	7.0	9.1
			R-30	9.3	11.4

Default Metal Building U-Factors

	R-10	R-11	R-13	R-19	R-24	R-30
Faced fiber glass blanket insulation rolled over and perpendicular to structural frame. Metal covering sheets fastened to the frame, holding insulation in place.	0.133	0.127	0.114	0.091	na	na
Faced fiber glass batt insulation suspended between structural frame. Metal covering sheets fastened directly to frame.	0.131	0.123	0.107	0.079	0.065	0.057
Faced fiber glass blanket insulation rolled over and perpendicular to structural frame. Rigid insulation blocks placed over insulation to align with structural frame.	0.102	0.096	0.084	0.065	na	na
Faced fiber glass batt insulation suspended between structural frame. Rigid insulation blocks placed over insulation to align with structural frame.	0.099	0.093	0.080	0.059	0.048	0.041

Section 3. Effective July 1, 2002, 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

John Hogan
114180 - amended
5/03/02
V #2

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)

- 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/ft³.
 - (b) Solid grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft³ and solid grouted cores.
 - (c) Partially grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft³ 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 90.1-2001, 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 90.1-2001, Appendix A, Table A-6 or A-7.

Section 4. Effective July 1, 2002, 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)

	Any Frame	U-Factor	
		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 ^(0.10) , 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
1/2 Inch Air, Fixed	0.90	0.84	0.72
1/2 Inch Air, Low-e ^(0.40) , Fixed	0.72	0.66	0.60
1/2 Inch Air, Low-e ^(0.10) , Fixed	0.66	0.60	0.54
1/2 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 5. Effective July 1, 2002, 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 an 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 6. Effective July 1, 2002, 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 ((F))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

1 comply with Sections 1531 and 1532. (Where this threshold is triggered, the areas of the
2 affected spaces may be aggregated for code compliance calculations.)

3 Where less than 60% of the fixtures in a space enclosed by walls or ceiling-height
4 partitions are new, the installed lighting wattage shall be maintained or reduced. Where
5 60% or more of the lighting fixtures in a suspended ceiling are new, and the existing
6 insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according
7 to the provisions of Chapter 13, Section 1311.2.

8 Where new wiring is being installed to serve added fixtures and/or fixtures are being
9 relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5. In
10 addition, office areas less than 300 ft² enclosed by walls or ceiling-height partitions, and all
11 meeting and conference rooms, and all school classrooms, shall be equipped with occupancy
12 sensors that comply with Section 1513.6. Where a new lighting panel (or a moved lighting
13 panel) with all new raceway and conductor wiring from the panel to the fixtures is being
14 installed, controls shall also comply with the other requirements in Section 1513.6.

15 Where new walls or ceiling height partitions are added to an existing space and
16 create a new enclosed space, but the lighting fixtures are not being changed, other than being
17 relocated, the new enclosed space shall have controls that comply with Sections 1513.1
18 through 1513.2 and 1513.4 through 1513.6.

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

20
21
22 **Section 7.** Effective July 1, 2002, Section 1133 of the Energy Code is amended as
23 follows:
24

25 **1133 Change of Occupancy or Use:** Changes of occupancy or use shall comply with the
26 following requirements:

- 27 a. Any unconditioned space that is altered to become semi-heated, cooled, or fully
28 heated, or any semi-heated space that is altered to become cooled or fully heated
29 space shall be required to be brought into full compliance with this Code. For spaces
30 constructed prior to this Code, the installed heating output capacity shall not exceed
31 16 Btu/h per square foot unless the building envelope complies with the
32 requirements of Chapter 13. Existing warehouses and repair shops are considered
33 unconditioned space unless they are indicated as conditioned space in DCLU records
34 or they were built after 1980 and they comply with the building envelope
35 requirements for conditioned space in effect at the time of construction. (See the
36 Seattle Mechanical Code for requirements for combustion appliances.)
37 b. Any Group R occupancy which is converted to other than a Group R occupancy shall
38 be required to comply with all of the provisions of Sections 1130 through 1132 of
39 this Code.
40
41

42 **Section 8.** Effective July 1, 2002, Section 1144 of the Energy Code is amended as
43 follows:
44

45 **1144 Violations and Penalties** ~~((It shall be a violation of this Code for any person, firm,~~
46 ~~or corporation to erect or construct any building, or remodel or rehabilitate any existing~~
47 ~~building or structure in the state, or allow the same to be done, contrary to any of the~~
48 ~~provisions of this Code.))~~

Section 9. Effective July 1, 2002, the Energy Code is amended by adding new Sections 1144.1, 1144.2, 1144.3, 1144.4, 1144.5, 1144.6, and 1144.7 to read as follows:

1144.1 Violations: It shall be a violation of this Code for any person, firm or corporation to erect, construct, enlarge, repair, move, improve, remove, convert or demolish, equip, occupy, inspect or maintain any building or structure in the City, contrary to or in violation of any of the provisions of this Code.

It shall be a violation of this Code for any person, firm or corporation to knowingly aid, abet, counsel, encourage, hire, commend, induce or otherwise procure another to violate or fail to comply with this Code.

It shall be a violation of this Code to for any person, firm, or corporation to use any material or to install any device, appliance or equipment which does not comply with the applicable standards of this Code or which has not been approved by the building official.

1144.2 Notice of Violation: If after investigation the building official determines that standards or requirements of this code have been violated, the building official may serve a notice of violation upon the owner or other person responsible for the action or condition. The notice of violation shall state the standards or requirements violated, shall state what corrective action, if any, is necessary to comply with the standards or requirements, and shall set a reasonable time for compliance. The notice shall be served upon the owner or other responsible person by personal service, certified mail with return receipt requested or registered mail with return receipt requested or registered mail addressed to the last known address of such person. In addition, a copy of the notice may be posted at a conspicuous place on the property. The notice of violation shall be considered an order of the building official. Nothing in this subsection shall be deemed to limit or preclude any action or proceeding pursuant to Sections 102, 103 or 104 of the Seattle Building Code, and nothing in this section shall be deemed to obligate or require the building official to issue a notice of violation prior to the imposition of civil or criminal penalties in this section.

1144.3 Civil Penalties: Any person, firm or corporation failing to comply with the provisions of this code shall be subject to a cumulative civil penalty in an amount not to exceed \$500 per day for each violation from the date the violation occurs or begins until compliance is achieved. In cases where the building official has issued a notice of violation, the violation will be deemed to begin, for purposes of determining the number of days of violation, on the date compliance is required by notice of violation. In any civil action for a penalty, the City has the burden of proving by a preponderance of the evidence that a violation exists or existed; the issuance of the notice of violation or of an order following a review by the Director is not itself evidence that a violation exists.

1144.4 Criminal Penalty: Anyone who violates or fails to comply with any order issued by the building official pursuant to this code or who removes, mutilates, destroys or conceals a notice issued or posted (i.e., affixed to the structure in a conspicuous place) by the building official shall, upon conviction thereof, be punished by a fine of not more than \$1,000 or by imprisonment for not more than 360 days, or by both such fine and imprisonment. Each day's violation or failure to comply shall constitute a separate offense.

Anyone violating or failing to comply with any of the provisions of this code and who within the past five years has had a judgment against them for civil penalties arising from a violation of the building code, shall upon conviction thereof, be fined in a sum not to



1 exceed \$500 or by imprisonment for not more than 180 days, or by both such fine and
2 imprisonment. Each day's violation or failure to comply shall constitute a separate offense.

3 **1144.5 Additional Relief:** The building official may seek legal or equitable relief to enjoin
4 any acts or practices and abate any condition which constitutes a violation of this code when
5 civil or criminal penalties are inadequate to effect compliance.

6 **1144.6 Notices:** It shall be unlawful for any person to remove, mutilate, destroy or conceal
7 any notice issued or posted by the building official pursuant to the provisions of this code, or
8 any notice issued or posted by the building official in response to a natural disaster or other
9 emergency.

10 The building official may record a copy of any order or notice with the Department
11 of Records and Elections of King County.

12 The building official may record with the Department of Records and Elections of
13 King County a notification that a permit has expired without a final inspection after
14 reasonable efforts have been made to provide a final inspection.

15 **1144.7 Review by the Director**

16 **1144.7.1.** Any party affected by a notice of violation issued by the Director pursuant to
17 Section 1144.2 may obtain a review of the notice by requesting such review in writing
18 within fifteen days after service of the notice. When the last day of the period computed is a
19 Saturday, Sunday, federal or City holiday, the period shall run until 5:00 p.m. of the next
20 business day. The request shall be in writing, and upon receipt of the request, the Director
21 shall notify any persons served the notice of violation and the complainant, if any, of the
22 request for review, which shall be within twenty days after the request is received, unless
23 otherwise agreed by all persons served with the notice of violation. Before the deadline for
24 submission of information, any person significantly affected by or interested in the notice of
25 violation (including any persons served the notice of violation and the complainant) may
26 submit any additional information in the form of written material or oral comments to the
27 Director for consideration as part of the review.

28 **1144.7.2.** The review will be made by a representative of the Director who is familiar with
29 the case and the applicable ordinances. The Director's representative will review all
30 additional information received by the deadline for submission of information. The
31 reviewer may also request clarification of information received and a site visit. After review
32 of the additional information, the Director may:

- 33 1. Sustain the notice of violation; or
34 2. Withdraw the notice of violation; or
35 3. Continue the review to a date certain for receipt of additional information; or
36 4. Modify the notice of violation, which may include an extension of the compliance date.

37 **1144.7.3.** The Director shall issue an Order of the Director containing the decision within
38 seven days of the date of the completion of the review, and shall cause the same to be mailed
39 by regular first-class mail to the person or persons named in the notice of violation, mailed
40 to the complainant, if possible, and filed with the Department of Records and Elections of
41 King County.

42
43
44 **Section 10.** Effective July 1, 2002, Section 1150 of the Energy Code is amended
45 as follows:

46
47 **1150 Conflicts with Other Codes:** In case of conflicts among Codes enumerated in RCW
48 19.27.031 subsections (1), (2), (3) and (4) and this Code, the first named Code shall govern.

The duct insulation requirements in this Code or a local jurisdiction's energy code, whichever is more stringent, supersede the requirements in the Uniform Mechanical Code.

This Code is intended to supplement the provisions of the Seattle Building Code, the Seattle Mechanical Code, and the Seattle Electrical Code, and in cases of conflict between this Code and any of those codes, the provisions of those codes shall apply.

Additional efficiency standards for electrical energy use may also appear in Seattle City Light service requirements, which should be consulted.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

Section 11. Effective July 1, 2002, Section 1161 of the Energy Code is amended as follows:

1161 Severability: If any provision of this Code or its application to any person or circumstance is held invalid, the remainder of this Code or the application of the provision to other persons or circumstances is not affected.

The legislative body hereby declares that it would have passed this Code, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

Section 12. Effective July 1, 2002, Section 1162 of the Energy Code is amended as follows:

1162 Liability: Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of ~~((any city or county))~~ the City or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code, or by reason of or in consequence of any inspection, notice, order, certificate, permission of approval authorized or issued or done in connection with the implementation or enforcement of this Code, or by reason of any action or inaction on the part of the City related in any manner to the enforcement of this Code or by its officers or agents. The building official or any employee charged with the enforcement of this Code, acting in good faith and without malice for the City in the discharge of his/her duties, shall not thereby render himself/herself liable personally and he/she is hereby relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or by reason of any act or omission in the discharge of his/her duties.

Section 13. Effective July 1, 2002, 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 14. Effective July 1, 2002, 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 • ft²) or greater but not greater than 8 Btu/(h • ft²) and in Climate Zone 2, shall be 5 Btu/(h • ft²) or greater but not greater than 12 Btu/(h • ft²). 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 for vertical glazing and U-1.08 maximum for overhead glazing and a maximum total (vertical and overhead) 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 15. Effective July 1, 2002, Section 1311.6 of the Energy Code is amended as follows:

1311.6 Radiant Floors (on or below grade): Slab on grade insulation shall extend downward from the top of the slab a minimum distance of 36 inches or downward to the top of the footing and horizontal for an aggregate of not less than 36 inches.

~~((If required by the building official where soil conditions warrant such insulation, t))~~
The entire area of radiant floor shall be thermally isolated from the soil. Where a soil gas control system is provided below the radiant floor, which results in increased convective flow below the radiant floor, the radiant floor shall be thermally isolated from the sub-floor gravel layer.

Section 16. Effective July 1, 2002, Section 1312.2 of the Energy Code is amended as follows:

1312.2 Solar Heat Gain Coefficient and ~~((Shading Coefficient))~~ Visible Transmittance: Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT), 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.

EXCEPTIONS: 1. 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.

2. For the purposes of 1323, Exception 1, visible transmittance for the center of the glazing assembly shall be taken from Chapter 30 of Standard RS-27 or from the



1 manufacturer's data using a spectral data file determined in accordance with NFRC
2 300.
3

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.

Conversely, the VT for the center-of-glass overstates the VT for the overall product (including the frame). The VT for the frame is zero. Consequently, an NFRC-certified VT will always be lower. For this reason, Exception 2 to Section 1312.2 is only applicable to Exception 1 in Section 1323. It is not applicable to other sections.

4
5
6 **Section 17.** Effective July 1, 2002, Section 1322 of the Energy Code is amended as
7 follows:
8

9 **1322 Opaque Envelope:** Roof/ceilings, opaque exterior walls, opaque doors, floors over
10 unconditioned space, below grade walls, slab on grade floors and radiant floors enclosing
11 conditioned spaces shall be insulated according to Section 1311 and Tables 13-1 or 13-2.
12 Compliance with nominal R-values shall be demonstrated for the thermal resistance of the
13 added insulation in framing cavities and/or insulated sheathing only. Nominal R-values
14 shall not include the thermal transmittance of other building materials or air films.

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

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

23 **EXCEPTIONS:**

- 24 1. Opaque smoke vents are not required to meet insulation requirements.
25 2. For prescriptive compliance only.
26 a. for glazing areas that are 30% and less of the gross wall area, the insulation of the perimeter
27 edge of an above grade floor slab which penetrates the exterior wall may be reduced to R-5
28 provided that the glazing U-factor is reduced by U-0.05 below that required in Tables 13-1
29 and 13-2.
30 b. for glazing areas that exceed 30% of the gross wall area, the perimeter edge of an above
31 grade floor slab which penetrates the exterior wall may be left uninsulated provided that the
32 glazing U-factor is reduced by U-0.10 below that required in Tables 13-1 and 13-2. (The
33 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 18. Effective July 1, 2002, 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 19. Effective July 1, 2002, 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.)

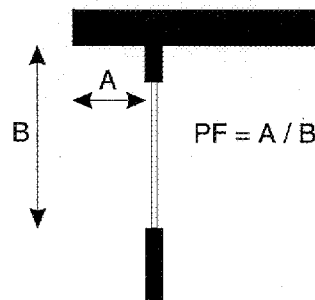


Exhibit 1323.3

Section 20. Effective July 1, 2002, 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 21. Effective July 1, 2002, 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 22. Effective July 1, 2002, 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:

- walls insulated on the interior shall use opaque wall values,
- walls insulated on the exterior shall use a minimum of R-10 insulation,
- 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:

- walls insulated on the interior shall use the opaque wall values when determining U_{bgwt} ,
- walls insulated on the exterior shall use a target U-factor of $U=0.070$ for U_{bgwt} ,
- 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 $9.0 \text{ Btu/ft}^2 \cdot ^\circ\text{F}$, then the U-factor may be increased to ((0.19))

- 0.11 for interior insulation
 - 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 $9.0 \text{ Btu/ft}^2 \cdot ^\circ\text{F}$ 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 the following:

Maximum Glazing Area as % of Wall	Maximum U-Factor		Maximum SHGC ⁴
	VG	OG	
>45% to 50%	0.40	0.48	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:

- 1 a) Double glazing with a minimum 1/2 inch gap width, having a low-emissivity coating
2 with $e=0.10$ maximum, with 90% minimum argon gas fill, and a non-aluminum
3 spacer (as defined in footnote 1 to Table 10-6B), and
4 b) Frame that is thermal break aluminum (as defined in footnote 7 to Table 10-6A),
5 wood, aluminum clad wood, vinyl, aluminum clad vinyl, or reinforced vinyl.
6

7
8 **Section 23.** Effective July 1, 2002, Section 1402 of the Energy Code is amended as
9 follows:

10
11 **1402 Mechanical Ventilation:** The minimum requirements for ventilation shall comply
12 with the ~~((Washington State Ventilation and Indoor Air Quality Code (WAC51-13)))~~ Seattle
13 Mechanical Code.
14

15
16 **Section 24.** Effective July 1, 2002, Section 1411.1 of the Energy Code is amended as
17 follows:

18
19 **1411.1 General:** Equipment shall have a minimum performance at the specified rating
20 conditions not less than the values shown in Tables 14-1A through 14-1G. If a nationally
21 recognized certification program exists for a product covered in Tables 14-1A through 14-
22 1G, and it includes provisions for verification and challenge of equipment efficiency ratings,
23 then the product shall be listed in the certification program.

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

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

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

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

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

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

1 Cooling towers serving chilled water systems with waterside economizer shall also
2 comply with Section 1433, Exception 2.

3 Hydronic heat pump and other cooling and refrigeration equipment (e.g. icemakers,
4 walk-in coolers) shall not use domestic water only one time before dumping it to waste. No
5 single pass water cooling systems without heat recovery are allowed, except for medical and
6 dental equipment, equipment using less than 1 gpm, and replacement of existing icemakers.
7 However, single pass cooling is allowed during power outages and other emergencies.
8

9
10 **Section 25.** Effective July 1, 2002, Section 1411.2 of the Energy Code is amended as
11 follows:

12
13 **1411.2 Rating Conditions:** Cooling equipment shall be rated at ARI test conditions and
14 procedures when available. Where no applicable procedures exist, data shall be furnished
15 by the equipment manufacturer.
16

If equipment is rated in accordance with an ARI Standard,
it shall be rated at Standard (not "design") ARI Rating Conditions.

17
18
19 **Section 26.** Effective July 1, 2002, Section 1411.4 of the Energy Code is amended as
20 follows:

21
22 **1411.4 Packaged and Split System Electric Heating and Cooling Equipment:** Packaged
23 and split system electric equipment providing both heating and cooling with a total cooling
24 capacity greater than 20,000 Btu/h shall be a heat pump.

25 **EXCEPTION:** Unstaffed equipment shelters or cabinets used solely for personal wireless service
26 facilities.
27

28 **Section 27.** Effective July 1, 2002, the Energy Code is amended by adding a new
29 Section 1411.5 to read as follows:

30
31 **1411.5 Heating Systems in Unenclosed Spaces.** Where heating is provided to unenclosed
32 spaces, only radiant heating systems shall be used unless otherwise approved by the building
33 official. An unenclosed space is one that is not substantially surrounded by solid surfaces
34 such as walls, floors, roofs, and openable devices such as doors and operable windows.
35 Warehouses and repair garages are considered enclosed spaces.
36

37
38 **Section 28.** Effective July 1, 2002, Section 1412.2 of the Energy Code is amended as
39 follows:

40
41 **1412.2 Deadband Controls:** When used to control both comfort heating and cooling, zone
42 thermostatic controls shall be capable of a deadband of at least 5 °F within which the supply
43 of heating and cooling energy to the zone is shut off or reduced to a minimum.
44

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 29. Effective July 1, 2002, 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.
4. Gravity (non-motorized) dampers are acceptable in exhaust and relief outlets in the first story and levels below the first story of buildings three or more 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/ft² of damper area at 1.0 in w.g.
- b. Non-motorized dampers: 20 cfm/ft² of damper area at 1.0 in w.g., except that for non-motorized dampers smaller than 24 inches in either dimension: 40 cfm/ft² 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 30. Effective July 1, 2002, 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 modulated 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 31. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1412.8 to read 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).

- 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 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 32. Effective July 1, 2002, Section 1413.3 of the Energy Code is amended as follows:

1413.3 Integrated Operation: The HVAC system and its controls shall allow economizer operation when mechanical cooling is required simultaneously. 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.

EXCEPTIONS:

1. 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 water chillers with waterside economizer.

Section 33. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1413.5 to read as follows:

1413.5 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 2.

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 in the Users Manual.

Section 34. Effective July 1, 2002, 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: 1/2 inch to 2 inches; seal transverse joints.))~~ (Reserved.)
2. Static pressure: ~~((2))~~ 1/2 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 35. Effective July 1, 2002, Section 1414.2 of the Energy Code is amended as follows:

1414.2 Insulation: Ducts and plenums that are constructed and function as part of the building envelope, by separating interior space from exterior space, shall meet all applicable requirements of Chapter 13. These requirements include insulation installation, moisture control, air leakage, and building envelope insulation levels. ~~((Unheated equipment rooms with combustion air louvers shall be isolated from the conditioned space by insulating~~



interior surfaces to a minimum of R-11 and any exterior envelope surfaces per Chapter 13.))
Outside air ducts serving individual supply air units with less than 2,800 cfm of total supply
air capacity shall be insulated to a minimum of R-7 and are not considered building
envelope. Other outside air duct runs are considered building envelope until they,
1. connect to the heating or cooling equipment, or
2. are isolated from the exterior with an automatic shut-off damper complying with Section
1412.4.1.

Once outside air ducts meet the above listed requirements, any runs within
conditioned space shall comply with Table 14-5 requirements.

Other ducts and plenums shall be thermally insulated per Table 14-5.

- EXCEPTIONS:** 1. Within the HVAC equipment.
2. Exhaust air ducts not subject to condensation.
3. Exposed ductwork within a zone that serves that zone.

Section 36. Effective July 1, 2002, 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 (O & M) 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.



1 **1416.2.5.3 Record Drawings:** Record drawings shall include, as a minimum, the location
2 and performance data on each piece of equipment, general configuration of duct and pipe
3 distribution system, including sizes, and the terminal air and water design flow rates of the
4 actual installation.

5
6 **1416.2.5.4 Systems Operational Training:** The training of the appropriate maintenance
7 staff for each equipment type and or system shall include, as a minimum, the following:

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

14
15 **1416.2.6 Commissioning Reports**

16
17 **1416.2.6.1 General.** Drawing notes shall require commissioning in accordance with this
18 section. Drawing notes may refer to specifications for further commissioning requirements.

19
20 **1416.2.6.2 Preliminary Commissioning Report:** A preliminary report of commissioning
21 test procedures and results shall be completed and provided to the Owner. The Preliminary
22 Commissioning Report shall identify:

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

29
30 **1416.2.6.3 Final Commissioning Report:** A complete report of test procedures and results
31 shall be prepared and filed with the Owner. The Final Commissioning Report shall identify:

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

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

39
40 **1416.3 Acceptance Requirements**

41
42 **1416.3.1 General.** Drawing notes shall require commissioning in accordance with this
43 section. Drawing notes may refer to specifications for further commissioning requirements.

44
45 **1416.3.2 Acceptance:** Buildings or portions thereof, required by this Code to comply with
46 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 Section 1416.2.6.2 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 37. Effective July 1, 2002, Section 1421 of the Energy Code is amended as follows:

1421 System Type: To qualify as a simple system, systems shall be one of the following:

- a. Air cooled, constant volume packaged equipment, which provide heating, cooling or both, and require only external connection to duct work and energy services with cooling capacity of 135,000 Btu/h or less.
- b. Air cooled, constant volume split systems, which provide heating, cooling or both, with cooling capacity of 84,000 Btu/h or less.
- c. Heating only systems which have a capacity of less than 5,000 cfm or which have a minimum outside air supply of less than 70% of the total air circulation.

All other systems shall comply with Sections 1430 through 1439.

Section 38. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1421.1 to read as follows:

1421.1 System Sizing Limits: Installed space heating equipment output shall not exceed 16 Btu/h per square foot of gross conditioned floor area and installed space cooling equipment output shall not exceed 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 39. Effective July 1, 2002, 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 1900 cfm 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 air 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 40. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1431.2 to read 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 29 of Standard RS-27 listed in Chapter 7 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 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. 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.
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 41. Effective July 1, 2002, 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 42. Effective July 1, 2002, Section 1435 of the Energy Code is amended as follows:

1435 Simultaneous Heating and Cooling: Systems which provide heating and cooling simultaneously to a zone are prohibited. Zone thermostatic and humidistatic controls shall be capable of operating in sequence the supply of heating and cooling energy to the zone. Such controls shall prevent:

- a. Reheating for temperature control.
- b. Recooling for temperature control.
- c. Mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by economizer systems or by mechanical refrigeration.
- d. Other simultaneous operation of heating and cooling systems to the same zone.

e. Reheating for humidity control.

EXCEPTIONS: 1. Zones for which the volume of air that is reheated, recooled, or mixed is no greater than the larger of the following:

a. The volume of air required to meet the minimum required to meet the ventilation requirements of the ((Washington State Ventilation and Indoor Air Quality Code)) Seattle Mechanical Code for the zone.

b. 0.4 cfm/ft² of the zone conditioned floor area, provided that the temperature of the primary system air is, by design or through reset controls, 0-12°F below the design space heating temperature when outside air temperatures are below 60°F for reheat systems and cold deck of mixing systems and 0-12°F above design space temperature when outside air temperatures are above 60°F for recooling systems and hot deck of mixing systems. For multiple zone systems, each zone need not comply with this exception provided the average of all zones served by the system that have both heating and cooling ability comply.

c. 300 cfm. This exception is for zones whose peak flow rate totals no more than 10% of the total fan system flow rate.

d. Any higher rate that can be demonstrated, to the satisfaction of the building official, to reduce overall system annual energy usage by offsetting reheat/recool energy losses through a reduction in outdoor air intake in accordance with the multiple space requirements defined in ASHRAE Standard 62.

2. Zones where special pressurization relationships, cross-contamination requirements, or code required minimum circulation rates are such that variable air volume systems are impractical.

3. Zones where at least 75% of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered (including condenser heat) or site-solar energy source.

4. Zones where specific humidity levels are required to satisfy process needs, such as computer rooms, museums, surgical suites, and buildings with refrigerating systems, such as supermarkets, refrigerated warehouses, and ice arenas.

Section 43. Effective July 1, 2002, 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 44. Effective July 1, 2002, 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 45. Effective July 1, 2002, 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 46. Effective July 1, 2002, 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 14-1A through 14-1G 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.

Section 47. Effective July 1, 2002, 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

- a. variable speed drives or
- 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 b.

~~((variable flow devices installed. Acceptable variable flow devices include variable inlet vanes, variable blade pitch and variable fan geometry. T))~~ 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 48. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1438.1 to read as follows:

1438.1 Cooling Towers: All cooling towers with a total fan motor horsepower greater than 10 hp shall be equipped with a pony motor of a rated hp no greater than 1/3 of the hp of the primary motor or with a two-speed motor. The cooling tower control shall provide two-stage operation of fans and shall bring on the pony motor to operate without the primary motor or for a two-speed motor run at the lower speed when possible while meeting the condenser water return setpoint.

EXCEPTION: Cooling towers with variable frequency drive.

Section 49. Effective July 1, 2002, 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 50. Effective July 1, 2002, 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 pools over 2,000 gallons. 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 ((14-1G))14-1M.

Section 51. Effective July 1, 2002, Table 14-1C is amended 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	
Water Cooled, Electrically Operated, Positive Displacement (Reciprocating)	All Capacities		4.20 COP 5.05 IPLV	ARI 550/590
Water Cooled, Electrically Operated, Positive Displacement (Rotary, Screw and Scroll)	<150 Tons		4.45 COP 5.20 IPLV	ARI 550/590
	≥150 Tons and <300 Tons		4.90 COP 5.60 IPLV	



	≥300-Tons		5.50 COP 6.15 IPLV	
Water-Cooled, Electrically Operated, Centrifugal	<150-Tons		5.00 COP 5.25 IPLV	ARI-550/590
	≥150-Tons and <300-Tons		5.55 COP 5.90 IPLV	
	≥300-Tons		6.10 COP 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 52. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1H to read as follows:

Table 14-1H Reserved

Section 53. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1I to read as follows:

Table 14-1I Reserved

Section 54. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1J to read as follows:

Table 14-1J Reserved

Section 55. Effective July 1, 2002, 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



John Hogan
114180 - amended
5/03/02
V #2

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 56. Effective July 1, 2002, 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

John Hogan
114180 - amended
5/03/02
V #2

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 57. Effective July 1, 2002, 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 58. Effective July 1, 2002, the title of Chapter 15 of the Energy Code is amended as follows:

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

Section 59. Effective July 1, 2002, 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 July 1, 2002, 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 July 1, 2002, Section 1512 of the Energy Code is amended as follows:

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

Section 62. Effective July 1, 2002, Section 1512.1 of the Energy Code is amended as follows:

1512.1 Exempt Spaces: The following rooms, spaces and areas, are exempt from the ~~((lighting power))~~ requirements in Sections 1520 through 1522 and 1530 through 1532 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.



Section 63. Effective July 1, 2002, Section 1512.2 of the Energy Code is amended as follows:

1512.2 Exempt Lighting Equipment: The following lighting equipment and tasks are exempt from the lighting requirements of Section 1520 through 1522 and need not be included when calculating the installed lighting power under Section 1530 through 1532 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 with multi-level or dimming controls in rooms with permanently installed audio-visual equipment or video-conferencing equipment.

Section 64. Effective July 1, 2002, 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 65. Effective July 1, 2002, Section 1513.3 of the Energy Code is amended as follows:

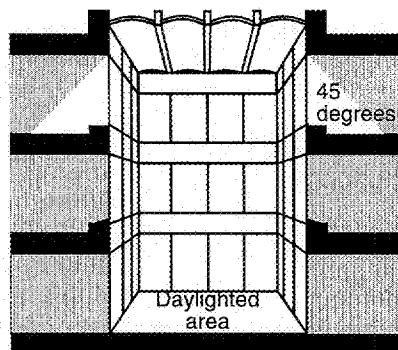
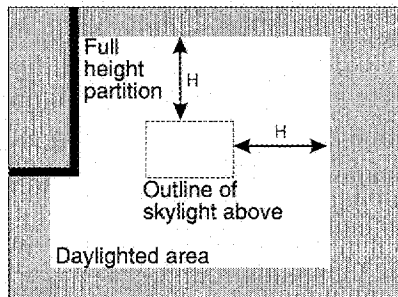
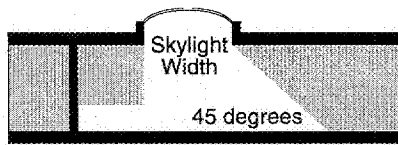
1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 2 (see Exhibits 1513.3a and 1513.3b), both under overhead glazing and adjacent to vertical glazing, shall be provided with ((individual controls, or daylight or occupant-sensing automatic))controls, which

- a. control the lights independent of general area lighting, and
- b. automatically reduce lighting power in response to available daylight by either
 - i. a combination of multi-level switching and daylight-sensing automatic controls, which are capable of reducing the light level automatically and turning the lights off (where single lamp luminaires are installed, automatically switching 50% of the luminaires off is an acceptable means of reducing the light level), or
 - ii. a combination of dimming ballasts and daylight-sensing automatic controls, which are capable of dimming the lights continuously.

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.

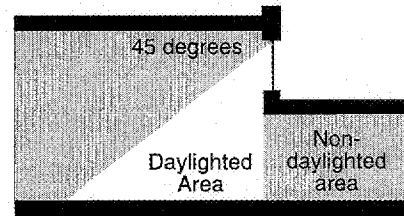
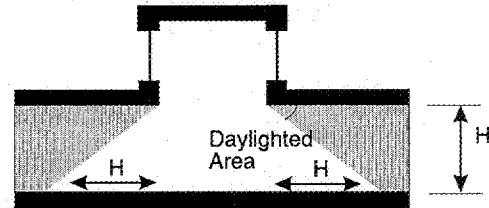
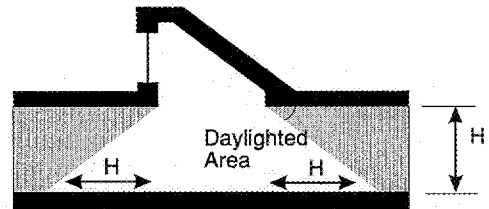
EXCEPTIONS:

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 in 1513.3b.
3. HID lamps 150 watts or less are exempt from the dimming requirements in 1513.3b.



H = Floor to ceiling height

Daylight area beneath conventional skylight



Daylighted area includes floor of atrium and the top floor next to the atrium

Exhibit 1513.3a

1
 2
 3
 4



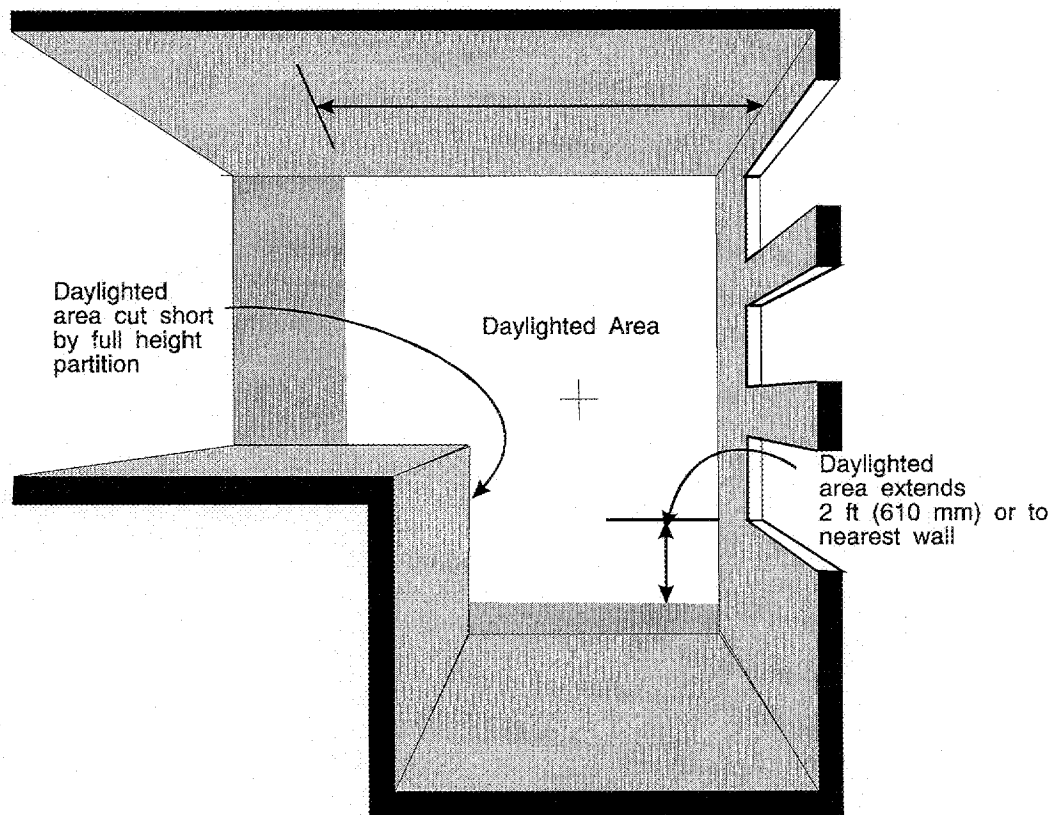


Exhibit 1513.3b

Section 66. Effective July 1, 2002, 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 and non-use nighttime 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.

Section 67. Effective July 1, 2002, 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 ft² 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 ft² 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 ft² or 5% of the building footprint for footprints over 100,000 ft², whichever is greater.

Section 68. Effective July 1, 2002, 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/ft² 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 69. Effective July 1, 2002, 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 70. Effective July 1, 2002, 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 shall be 0.20 W/ft², and the allowance for open parking and outdoor areas shall be ~~((0.20))~~ 0.15 W/ft². For open parking and outdoor areas and roadways, luminaires mounted above 15 feet shall meet IESNA requirements for Full Cutoff Luminaires. (Full



Cutoff means a luminaire light distribution where zero candela intensity occurs at an angle of 90 degrees above nadir, and all greater angles from nadir.)

The lighting allowance for building exteriors and externally-illuminated signs (including billboards) shall be calculated either by multiplying the building façade area that is illuminated or sign area by $((0.25-))0.15 \text{ W/ft}^2$ or multiplying the building perimeter in feet by 7.5 watts per lineal foot. Any building exterior lighting that exceeds 7.5 watts per lineal foot of total building perimeter is not allowed to be traded with other lighting areas.

EXCEPTIONS:

1. Group U occupancy accessory to Group R-3 occupancy.
2. ~~((For covered parking, 0.30 W/ft² 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.))Reserved.~~
3. The top level of a parking garage is allowed to be included with the covered parking garage category provided that the luminaires on the top level meet IESNA requirements for Full Cutoff Luminaires.
4. For the gas station pump area under canopy only, 1.00 W/ft² may be used. For automobile sales area only, and for other exterior retail sales, including but not limited to gardening supplies, 0.50 W/ft² may be used.

INFORMATIVE GUIDE TO SECTION 1532: NOTE THAT THIS GUIDE DOES NOT SUPERCEDE THE REQUIREMENTS IN THE TEXT.

CATEGORY	LIGHTING POWER ALLOWANCE	TRADEOFF LIMITATIONS
PARKING AND OUTDOOR AREAS		
Covered Parking	0.20 Watts/square foot	Calculated separately. Trade offs not allowed with other categories.
Open parking and outdoor areas	0.15 Watts/square foot of area that is illuminated	Calculated separately, but see allowance below for use of façade lighting credit
FAÇADE LIGHTING		
Perimeter option	7.5 Watts/lineal foot of building perimeter	Calculated separately, but any wattage allowance not used for façade lighting may be used for open parking and outdoor areas that are illuminated
Surface area option	0.15 Watts/square foot of wall surface area that is illuminated	Calculated separately, but any wattage allowance up to 7.5 Watts/lineal foot of building perimeter that is not used for façade lighting may be used for open parking and outdoor areas that are illuminated

Section 71. Effective July 1, 2002, 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 72. Effective July 1, 2002, 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, gymnasias 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 Only⁷	
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.))~~ See Section 1532 for exterior lighting.
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/ft² 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/ft² may be used.
8. For the fire engine room, the *Unit Lighting Power Allowance* is 1.00 W/ft².
9. For indoor sport tournament courts with adjacent spectator seating, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft².
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/ft² 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 73. Effective July 1, 2002, Section 3.4 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

3.4 HVAC Systems and Equipment: For the standard building, the HVAC system used shall be the system type used in the proposed design. If the proposed HVAC system type does not comply with Sections 1432 through 1439 the standard design system shall comply in all respects with those sections.

EXCEPTION: ~~((When approved by the building official, a))~~ A prototype HVAC system may be used ~~((, if the proposed design system cannot be modified to comply with Sections 1422 and 1432 through 1439,))~~ as a standard design. Use of prototype HVAC systems shall only be permitted for the building types listed below. For mixed-use buildings, the floor space of each building type is allocated within the floor space of the standard building. The specifications and requirements for the HVAC systems of prototype buildings shall be those in Table 3-3.

1. assembly
2. health/institutional
3. hotel/motel
4. light manufacturing
5. office (business)
6. restaurant
7. retail (mercantile)
8. school (educational)
9. warehouse (storage)

Section 74. Effective July 1, 2002, Section 3.4.4 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

3.4.4 Fans: The power of the combined fan system per air volume at design conditions (w/cfm) of the proposed design shall be equal to that of the standard design.

EXCEPTION: For underfloor systems, a 25 percent reduction is allowed for the proposed design.
Variable air volume fan systems in the standard building shall be variable speed.

Section 75. Effective July 1, 2002, Reference Standard 29 (RS-29) of the 2001 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 76. Effective July 1, 2002, Table 3-3 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

TABLE 3-3
HVAC Systems of Prototype Buildings³

Use	System #	Remarks
1. Assembly		
a. Churches (any size)	1	
b. $\leq 50,000 \text{ ft}^2$ or ≤ 3 floors	1 or 3	Note 2
c. $> 50,000 \text{ ft}^2$ or > 3 floors	3	
2. Health		
a. Nursing Home (any size)	2	



b. $\leq 15,000 \text{ ft}^2$	1	
c. $> 15,000 \text{ ft}^2$ and $\leq 50,000 \text{ ft}^2$	4	Note 3
d. $> 50,000 \text{ ft}^2$	5	Note 3,4
3. Hotel/Motel		
a. $\leq ((3))6$ Stories	2	Note 6
b. $> ((3))6$ Stories	6	Note 7
4. Light Manufacturing	1 or 3	
5. Office		
a. $\leq 20,000 \text{ ft}^2$	1	
b. $> 20,000 \text{ ft}^2$ and ((either)) $\leq ((3))7$ floors ((or $\leq 75,000$ ft^2))	4	
c. $> ((75,000 \text{ or } > 3))7$ floors	5	
6. Restaurant	1 or 3	Note 2
7. Retail		
a. $\leq 50,000 \text{ ft}^2$	1 or 3	Note 2
b. $> 50,000 \text{ ft}^2$	4 or 5	Note 2
8. Schools		
a. $\leq 75,000 \text{ ft}^2$ or ≤ 3 floors	1	
b. $> 75,000 \text{ ft}^2$ or > 3 floors	3	
9. Warehouse		Note 5

Footnote to Table 3-3: The systems and energy types presented in this table are not intended as requirements or recommendations for the proposed design. Floor areas in the table are the total conditioned floor areas for the listed use in the building. The number of floors indicated in the table is the total number of occupied floors for the listed use.

TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #1	System #2
System Description	Packaged rooftop single zone, one unit per zone	Packaged terminal air conditioner with space heater or heat pump, heating or cooling unit per zone
Fan system		
Design Supply Circulation Rate	Note 10	Note 11
Supply Fan Control	Constant volume	Fan cycles with call for heating or cooling
Return Fan Control	NA	NA
Cooling System	Direct expansion air cooled	Direct expansion air cooled
Heating System	Furnace, heat pump or electric resistance	Heat pump with electric resistance auxiliary or air conditioner with space heater
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	No economizer, if not required by Section 1433



TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #3	System #4
System Description	Air handler per zone with central plant	Packaged rooftop VAV with perimeter reheat and fan-powered terminal units
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	Constant volume	<u>Variable Air Volume systems</u> with controls per Section 1438 ((forward-curved centrifugal fan and variable inlet fans))
Return Fan Control	Constant volume	<u>Variable Air Volume systems</u> with controls per Section 1438 ((forward-curved centrifugal fan and variable inlet fans))
Cooling System	Chilled water (Note 12)	Direct expansion air cooled
Heating System	Hot water (Note 13)	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436

TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #5	System #6
System Description	Built-up central VAV with perimeter reheat and fan-powered terminal units	Four-pipe fan coil per zone with central plant
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	Fan cycles with call for heating or cooling
Return Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	NA
Cooling System	Chilled water (Note 12)	Chilled water (Note 12)
Heating System	Hot water (Note 13) or electric resistance	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436	No economizer, if not required by Section 1433



Numbered Footnotes for Table 3-3 HVAC System Descriptions for Prototype Buildings

1. The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design.
2. For occupancies such as restaurants, assembly and retail that are part of a mixed use building which, according to Table 3-3, includes a central chilled water plant (systems 3, 5, or 6), chilled water system type 3 or 5 shall be used as indicated in the table.
3. Constant volume may be used in zones where pressurization relationships must be maintained by code. Where constant volume is used, the system shall have heat recovery if required by Section 1436. VAV shall be used in all other areas, in accordance with Sections 1432 through 1439.
4. Provide run-around heat recovery systems for all fan systems with a minimum outside air intake greater than 70%. Recovery effectiveness shall be 0.50.
5. If a warehouse is not intended to be mechanically cooled, both the standard and proposed designs shall be calculated assuming no mechanical cooling.
6. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 4. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
7. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 5. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
8. Reserved.
9. Reserved.
10. Design supply air circulation rate shall be based on a supply-air to room-air temperature difference of 20°F. A higher supply-air temperature may be used if required to maintain a minimum circulation rate of 4.5 air changes per hour or 15 cfm per person to each zone served by the system, at design conditions. If return fans are specified, they shall be sized for the supply fan capacity less the required minimum ventilation with outside air, or 75% of the supply fan capacity, whichever is larger. Except where noted, supply and return fans shall be operated continuously during occupied hours.
11. Fan energy when included in the efficiency rating of the unit as defined in Section 1411, need not be modeled explicitly for this system. The fan shall cycle with calls for heating or cooling.
12. Chilled water systems shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling capacities of 600 tons or more, the standard design energy consumption shall be calculated using two centrifugal chillers, lead/lag controlled. Chilled water shall be assumed to be controlled at a constant 44°F. Chiller water pumps shall be sized using a 12°F temperature rise, from 44°F to 56°F, operating at 65% combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10°F temperature rise, operating at 60% combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85°F leaving water temperature or 10°F approach to design wetbulb temperature. The tower shall be controlled to provide a 65°F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperatures at design conditions. Chilled water supply temperature shall be reset in accordance with Section 1432.2.2.

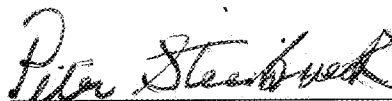
13. Hot water system shall include a natural draft fossil fuel or electric boiler. The hot water pump shall be sized based on a 30°F temperature drop, from 180°F to 150°F, operating at a combined impeller and motor efficiency of 60%. Hot water supply temperature shall be reset in accordance with Section 1432.2.2.

Section 77. As part of the regular code review cycle that is expected to be completed in 2004, staff from the Department of Design, Construction and Land Use and City Light will work in a timely manner with industry stakeholders and other interested parties to determine whether the changes to RS-29 implemented in this legislation have had their intended consequences. And further, whether there are additional modifications to the Energy Code that could achieve the joint goals of providing design flexibility, encouraging innovation and promoting energy conservation, or whether innovation is better promoted through other mechanisms.

Section 78 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 79 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 28th day of May, 2002, and signed by me in open session in authentication of its passage this 28th day of May, 2002.



President of the City Council

Approved by me this 31 day of May, 2002.



Greg Nickels, Mayor

Filed by me this 30th day of June, 2002.



City Clerk

(SEAL)



City of Seattle

Gregory J. Nickels, Mayor

Office of the Mayor

April 26, 2002

Honorable Peter Steinbrueck
President
Seattle City Council
Municipal Building, 11th Floor

Dear Council President Steinbrueck:

I am transmitting the attached ordinance for Council consideration.

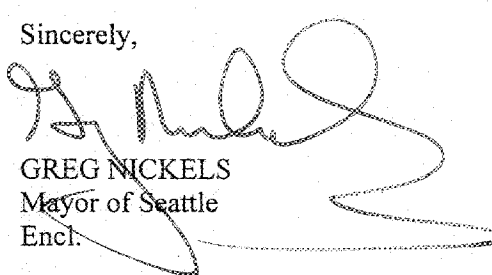
This legislation would adopt the 2002 Seattle Energy Code, which is composed of the 2001 Washington State Energy Code (WSEC), plus Seattle amendments. Late last year, the State adopted the 2001 WSEC, which will take effect on July 1, 2002. As has been the practice for years, last year Seattle adopted the State regulations as Seattle amendments, prior to the State effective date. Thus, most of the present ordinance carries forward existing 2001 Seattle amendments into the new 2001 WSEC. In addition, the ordinance includes revisions to the exterior lighting section and to the annual energy analysis compliance option in RS-29, pursuant to tasks required by Ordinance 120525.

The Department of Design, Construction and Land Use (DCLU) held 11 public meetings to develop and review draft proposals. The DCLU Construction Codes Advisory Board (CCAB) discussed this topic at four meetings this year and completed their recommendations on April 4, 2002. DCLU and Seattle City Light concur with the CCAB recommendations. The proposal for exterior lighting achieves some additional increases in energy efficiency and limits light pollution in certain cases, an issue raised by the International Dark-Sky Association. The proposal for RS-29, the annual energy analysis/computer modeling Energy Code compliance path, includes an additional tradeoff option to promote innovation, an issue raised by developers. In addition to the ordinance, DCLU has developed a draft Director's Rule to implement the provisions for alterations to existing buildings, an issue raised by the Building Owners and Managers Association.

There are no fiscal impacts associated with this ordinance. A SEPA determination will be published in early May 2002.

Thank you for your consideration of this legislation. Should you have questions please contact John Hogan at 386-9145.

Sincerely,


GREG NICKELS
Mayor of Seattle
Encl.



ORDINANCE

AN ORDINANCE relating to energy efficiency and energy conservation: amending Section 22.700.010 of the Seattle Municipal Code ("SMC") to adopt by reference the 2001 Washington State Energy Code (WAC 51-11) and to repeal the 2000 Washington State Energy Code and amendments thereto; amending 2001 Washington State Energy Code Sections 1132.2, 1132.3, 1133, 1144, 1150, 1161, 1162, 1301, 1310.2, 1311.6, 1312.2, 1322, 1323, 1323.3, 1331, 1333, 1402, 1411.1, 1411.2, 1411.4, 1412.2, 1412.4, 1412.6, 1413.3, 1414.1, 1414.2, 1416, 1421, 1423, 1432.2, 1435, 1436, 1437, 1438, 1440, 1452, 1501, 1510, 1512, 1512.1, 1512.2, 1513.1, 1513.3, 1513.5, 1513.6, 1521, 1530 and 1532 and Tables 10-5A, 10-5B, 10-6, 13-1, 14-1C and 15-1 and the title to Chapter 15; adding to the 2001 Washington State Energy Code new Sections 1144.1, 1144.2, 1144.3, 1144.4, 1144.5, 1144.6, 1144.7, 1411.5, 1412.8, 1413.5, 1421.1, 1431.2, 1436.2, 1436.3, 1438.1 and 1540 and new Tables 14-1H, 14-1I, 14-1J, 14-1K, 14-1L and 14-1M; amending Sections 3.4 and 3.4.4 and Table 3-3 of Reference Standard 29 of the Energy Code; and adding new Section 3.6.5 to Reference Standard 29 of the Energy Code.

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Effective July 1, 2002, Section 22.700.010, SMC, as last amended by Ordinance 120525 is further amended as follows:

22.700.010 Adoption of the ~~((2000))~~ 2001 Washington State Energy Code and local amendments.

The ~~((2000))~~ 2001 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))~~ and the amendments thereto adopted by Ordinance that incorporate the Seattle Amendments, 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))2000~~ Washington State Energy Code, and amendments thereto, are hereby repealed.

Section 2. Effective July 1, 2002, Table 10-5A of the Energy Code is amended as follows:

TABLE 10-5A DEFAULT U-FACTORS FOR OVERALL ASSEMBLY METAL STUD WALLS, EFFECTIVE R-VALUES FOR METAL FRAMING AND CAVITY ONLY, AND DEFAULT METAL BUILDING U-FACTORS

Group R Occupancy:
Overall Assembly U-Factors for Metal Stud Walls



Metal Framing	R-Value of Continuous Foam Board Insulation	Cavity Insulation					
		R-11	R-13	R-15	R-19	R-21	R-25
16" o.c.	R-0 (none)	U-0.14	U-0.13	U-0.12	U-0.10	U-0.097	U-0.091
	R-1	U-0.12	U-0.12	U-0.11	U-0.094	U-0.089	U-0.083
	R-2	U-0.11	U-0.10	U-0.099	U-0.086	U-0.081	U-0.077
	R-3	U-0.10	U-0.095	U-0.090	U-0.079	U-0.075	U-0.071
	R-4	U-0.091	U-0.087	U-0.082	U-0.073	U-0.070	U-0.067
	R-5	U-0.083	U-0.080	U-0.076	U-0.068	U-0.065	U-0.062
	R-6	U-0.077	U-0.074	U-0.071	U-0.064	U-0.061	U-0.059
	R-7	U-0.071	U-0.069	U-0.066	U-0.060	U-0.058	U-0.055
	R-8	U-0.067	U-0.064	U-0.062	U-0.057	U-0.055	U-0.053
	R-9	U-0.062	U-0.060	U-0.058	U-0.054	U-0.052	U-0.050
	R-10	U-0.059	U-0.057	U-0.055	U-0.051	U-0.049	U-0.048

24" o.c.	R-0 (none)	U-0.13	U-0.12	U-0.11	U-0.091	U-0.085	U-0.079
	R-1	U-0.11	U-0.10	U-0.098	U-0.084	U-0.078	U-0.073
	R-2	U-0.10	U-0.091	U-0.089	U-0.077	U-0.073	U-0.068
	R-3	U-0.092	U-0.083	U-0.082	U-0.072	U-0.068	U-0.064
	R-4	U-0.084	U-0.077	U-0.076	U-0.067	U-0.063	U-0.060
	R-5	U-0.078	U-0.071	U-0.070	U-0.063	U-0.060	U-0.057
	R-6	U-0.072	U-0.067	U-0.066	U-0.059	U-0.056	U-0.054
	R-7	U-0.067	U-0.063	U-0.062	U-0.056	U-0.053	U-0.051
	R-8	U-0.063	U-0.059	U-0.058	U-0.053	U-0.051	U-0.048
	R-9	U-0.059	U-0.056	U-0.055	U-0.050	U-0.048	U-0.046
	R-10	U-0.056	U-0.053	U-0.052	U-0.048	U-0.046	U-0.044

Other than Group R Occupancy:
Overall Assembly U-Factors for Metal Stud Walls

Metal Framing	R-Value of Continuous Foam Board Insulation	Cavity Insulation					
		R-0	R-11	R-13	R-15	R-19	R-21
16" o.c.	R-0 (none)	U-0.352	U-0.132	U-0.124	U-0.118	U-0.109	U-0.106
	R-1	U-0.260	U-0.117	U-0.111	U-0.106	U-0.099	U-0.096
	R-2	U-0.207	U-0.105	U-0.100	U-0.096	U-0.090	U-0.087
	R-3	U-0.171	U-0.095	U-0.091	U-0.087	U-0.082	U-0.080
	R-4	U-0.146	U-0.087	U-0.083	U-0.080	U-0.076	U-0.074
	R-5	U-0.128	U-0.080	U-0.077	U-0.074	U-0.071	U-0.069
	R-6	U-0.113	U-0.074	U-0.071	U-0.069	U-0.066	U-0.065
	R-7	U-0.102	U-0.069	U-0.066	U-0.065	U-0.062	U-0.061
	R-8	U-0.092	U-0.064	U-0.062	U-0.061	U-0.058	U-0.057
	R-9	U-0.084	U-0.060	U-0.059	U-0.057	U-0.055	U-0.054
	R-10	U-0.078	U-0.057	U-0.055	U-0.054	U-0.052	U-0.051

24" o.c.	R-0 (none)	U-0.338	U-0.116	U-0.108	U-0.102	U-0.094	U-0.090
	R-1	U-0.253	U-0.104	U-0.098	U-0.092	U-0.086	U-0.083
	R-2	U-0.202	U-0.094	U-0.089	U-0.084	U-0.079	U-0.077

R-3	U-0.168	U-0.086	U-0.082	U-0.078	U-0.073	U-0.071
R-4	U-0.144	U-0.079	U-0.075	U-0.072	U-0.068	U-0.066
R-5	U-0.126	U-0.073	U-0.070	U-0.067	U-0.064	U-0.062
R-6	U-0.112	U-0.068	U-0.066	U-0.063	U-0.060	U-0.059
R-7	U-0.100	U-0.064	U-0.062	U-0.059	U-0.057	U-0.055
R-8	U-0.091	U-0.060	U-0.058	U-0.056	U-0.054	U-0.052
R-9	U-0.084	U-0.057	U-0.055	U-0.053	U-0.051	U-0.050
R-10	U-0.077	U-0.054	U-0.052	U-0.050	U-0.048	U-0.048

Effective R-Values for Metal Framing and Cavity Only

	Cavity		Insulation		
	Nominal Depth, Inches	Actual Depth, Inches	Nominal R-Value	Effective R-Value	
				16" O.C.	24" O.C.
Air Cavity	Any	Any	R-0.91 (air)	0.79	0.91
Wall	4	3-1/2	R-11	5.5	6.6
	4	3-1/2	R-13	6.0	7.2
	4	3-1/2	R-15	6.4	7.8
	6	5-1/2	R-19	7.1	8.6
	6	5-1/2	R-21	7.4	9.0
	8	7-1/4	R-25	7.8	9.6
Roof		Insulation is uncompressed	R-11	5.5	6.1
			R-19	7.0	9.1
			R-30	9.3	11.4

Default Metal Building U-Factors

	R-10	R-11	R-13	R-19	R-24	R-30
Faced fiber glass blanket insulation rolled over and perpendicular to structural frame. Metal covering sheets fastened to the frame, holding insulation in place.	0.133	0.127	0.114	0.091	na	na
Faced fiber glass batt insulation suspended between structural frame. Metal covering sheets fastened directly to frame.	0.131	0.123	0.107	0.079	0.065	0.057
Faced fiber glass blanket insulation rolled over and perpendicular to structural frame. Rigid insulation blocks placed over insulation to align with structural frame.	0.102	0.096	0.084	0.065	na	na
Faced fiber glass batt insulation suspended between structural frame. Rigid insulation blocks placed over insulation to align with structural frame.	0.099	0.093	0.080	0.059	0.048	0.041

Section 3. Effective July 1, 2002, 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)

- 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/ft³.
 - (b) Solid grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft³ and solid grouted cores.
 - (c) Partially grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft³ 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 90.1-2001, 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 90.1-2001, Appendix A, Table A-6 or A-7.

Section 4. Effective July 1, 2002, 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)

	Any Frame	U-Factor	
		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 ^(0.10) , 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
1/2 Inch Air, Fixed	0.90	0.84	0.72
1/2 Inch Air, Low-e ^(0.40) , Fixed	0.72	0.66	0.60
1/2 Inch Air, Low-e ^(0.10) , Fixed	0.66	0.60	0.54
1/2 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 5. Effective July 1, 2002, 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 an 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 6. Effective July 1, 2002, 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 ((~~¶~~))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



1 comply with Sections 1531 and 1532. (Where this threshold is triggered, the areas of the
2 affected spaces may be aggregated for code compliance calculations.)

3 Where less than 60% of the fixtures in a space enclosed by walls or ceiling-height
4 partitions are new, the installed lighting wattage shall be maintained or reduced. Where
5 60% or more of the lighting fixtures in a suspended ceiling are new, and the existing
6 insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according
7 to the provisions of Chapter 13, Section 1311.2.

8 Where new wiring is being installed to serve added fixtures and/or fixtures are being
9 relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5. In
10 addition, office areas less than 300 ft² enclosed by walls or ceiling-height partitions, and all
11 meeting and conference rooms, and all school classrooms, shall be equipped with occupancy
12 sensors that comply with Section 1513.6. Where a new lighting panel (or a moved lighting
13 panel) with all new raceway and conductor wiring from the panel to the fixtures is being
14 installed, controls shall also comply with the other requirements in Section 1513.6.

15 Where new walls or ceiling height partitions are added to an existing space and
16 create a new enclosed space, but the lighting fixtures are not being changed, other than being
17 relocated, the new enclosed space shall have controls that comply with Sections 1513.1
18 through 1513.2 and 1513.4 through 1513.6.

19 Those motors which are altered or replaced shall comply with Section 1511.
20
21

22 **Section 7.** Effective July 1, 2002, Section 1133 of the Energy Code is amended as
23 follows:
24

25 **1133 Change of Occupancy or Use:** Changes of occupancy or use shall comply with the
26 following requirements:

- 27 a. Any unconditioned space that is altered to become semi-heated, cooled, or fully
28 heated, or any semi-heated space that is altered to become cooled or fully heated
29 space shall be required to be brought into full compliance with this Code. For spaces
30 constructed prior to this Code, the installed heating output capacity shall not exceed
31 16 Btu/h per square foot unless the building envelope complies with the
32 requirements of Chapter 13. Existing warehouses and repair shops are considered
33 unconditioned space unless they are indicated as conditioned space in DCLU records
34 or they were built after 1980 and they comply with the building envelope
35 requirements for conditioned space in effect at the time of construction. (See the
36 Seattle Mechanical Code for requirements for combustion appliances.)
37 b. Any Group R occupancy which is converted to other than a Group R occupancy shall
38 be required to comply with all of the provisions of Sections 1130 through 1132 of
39 this Code.
40
41

42 **Section 8.** Effective July 1, 2002, Section 1144 of the Energy Code is amended as
43 follows:
44

45 **1144 Violations and Penalties** ~~((It shall be a violation of this Code for any person, firm,~~
46 ~~or corporation to erect or construct any building, or remodel or rehabilitate any existing~~
47 ~~building or structure in the state, or allow the same to be done, contrary to any of the~~
48 ~~provisions of this Code.))~~



Section 9. Effective July 1, 2002, the Energy Code is amended by adding new Sections 1144.1, 1144.2, 1144.3, 1144.4, 1144.5, 1144.6, and 1144.7 to read as follows:

1144.1 Violations: It shall be a violation of this Code for any person, firm or corporation to erect, construct, enlarge, repair, move, improve, remove, convert or demolish, equip, occupy, inspect or maintain any building or structure in the City, contrary to or in violation of any of the provisions of this Code.

It shall be a violation of this Code for any person, firm or corporation to knowingly aid, abet, counsel, encourage, hire, commend, induce or otherwise procure another to violate or fail to comply with this Code.

It shall be a violation of this Code to for any person, firm, or corporation to use any material or to install any device, appliance or equipment which does not comply with the applicable standards of this Code or which has not been approved by the building official.

1144.2 Notice of Violation: If after investigation the building official determines that standards or requirements of this code have been violated, the building official may serve a notice of violation upon the owner or other person responsible for the action or condition. The notice of violation shall state the standards or requirements violated, shall state what corrective action, if any, is necessary to comply with the standards or requirements, and shall set a reasonable time for compliance. The notice shall be served upon the owner or other responsible person by personal service, certified mail with return receipt requested or registered mail with return receipt requested or registered mail addressed to the last known address of such person. In addition, a copy of the notice may be posted at a conspicuous place on the property. The notice of violation shall be considered an order of the building official. Nothing in this subsection shall be deemed to limit or preclude any action or proceeding pursuant to Sections 102, 103 or 104 of the Seattle Building Code, and nothing in this section shall be deemed to obligate or require the building official to issue a notice of violation prior to the imposition of civil or criminal penalties in this section.

1144.3 Civil Penalties: Any person, firm or corporation failing to comply with the provisions of this code shall be subject to a cumulative civil penalty in an amount not to exceed \$500 per day for each violation from the date the violation occurs or begins until compliance is achieved. In cases where the building official has issued a notice of violation, the violation will be deemed to begin, for purposes of determining the number of days of violation, on the date compliance is required by notice of violation. In any civil action for a penalty, the City has the burden of proving by a preponderance of the evidence that a violation exists or existed; the issuance of the notice of violation or of an order following a review by the Director is not itself evidence that a violation exists.

1144.4 Criminal Penalty: Anyone who violates or fails to comply with any order issued by the building official pursuant to this code or who removes, mutilates, destroys or conceals a notice issued or posted (i.e., affixed to the structure in a conspicuous place) by the building official shall, upon conviction thereof, be punished by a fine of not more than \$1,000 or by imprisonment for not more than 360 days, or by both such fine and imprisonment. Each day's violation or failure to comply shall constitute a separate offense.

Anyone violating or failing to comply with any of the provisions of this code and who within the past five years has had a judgment against them for civil penalties arising from a violation of the building code, shall upon conviction thereof, be fined in a sum not to



exceed \$500 or by imprisonment for not more than 180 days, or by both such fine and imprisonment. Each day's violation or failure to comply shall constitute a separate offense.

1144.5 Additional Relief: The building official may seek legal or equitable relief to enjoin any acts or practices and abate any condition which constitutes a violation of this code when civil or criminal penalties are inadequate to effect compliance.

1144.6 Notices: It shall be unlawful for any person to remove, mutilate, destroy or conceal any notice issued or posted by the building official pursuant to the provisions of this code, or any notice issued or posted by the building official in response to a natural disaster or other emergency.

The building official may record a copy of any order or notice with the Department of Records and Elections of King County.

The building official may record with the Department of Records and Elections of King County a notification that a permit has expired without a final inspection after reasonable efforts have been made to provide a final inspection.

1144.7 Review by the Director

1144.7.1. Any party affected by a notice of violation issued by the Director pursuant to Section 1144.2 may obtain a review of the notice by requesting such review in writing within fifteen days after service of the notice. When the last day of the period computed is a Saturday, Sunday, federal or City holiday, the period shall run until 5:00 p.m. of the next business day. The request shall be in writing, and upon receipt of the request, the Director shall notify any persons served the notice of violation and the complainant, if any, of the request for review, which shall be within twenty days after the request is received, unless otherwise agreed by all persons served with the notice of violation. Before the deadline for submission of information, any person significantly affected by or interested in the notice of violation (including any persons served the notice of violation and the complainant) may submit any additional information in the form of written material or oral comments to the Director for consideration as part of the review.

1144.7.2. The review will be made by a representative of the Director who is familiar with the case and the applicable ordinances. The Director's representative will review all additional information received by the deadline for submission of information. The reviewer may also request clarification of information received and a site visit. After review of the additional information, the Director may:

1. Sustain the notice of violation; or
2. Withdraw the notice of violation; or
3. Continue the review to a date certain for receipt of additional information; or
4. Modify the notice of violation, which may include an extension of the compliance date.

1144.7.3. The Director shall issue an Order of the Director containing the decision within seven days of the date of the completion of the review, and shall cause the same to be mailed by regular first-class mail to the person or persons named in the notice of violation, mailed to the complainant, if possible, and filed with the Department of Records and Elections of King County.

Section 10. Effective July 1, 2002, Section 1150 of the Energy Code is amended as follows:

1150 Conflicts with Other Codes: In case of conflicts among Codes enumerated in RCW 19.27.031 subsections (1), (2), (3) and (4) and this Code, the first named Code shall govern.



The duct insulation requirements in this Code or a local jurisdiction's energy code, whichever is more stringent, supersede the requirements in the Uniform Mechanical Code.

This Code is intended to supplement the provisions of the Seattle Building Code, the Seattle Mechanical Code, and the Seattle Electrical Code, and in cases of conflict between this Code and any of those codes, the provisions of those codes shall apply.

Additional efficiency standards for electrical energy use may also appear in Seattle City Light service requirements, which should be consulted.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

Section 11. Effective July 1, 2002, Section 1161 of the Energy Code is amended as follows:

1161 Severability: If any provision of this Code or its application to any person or circumstance is held invalid, the remainder of this Code or the application of the provision to other persons or circumstances is not affected.

The legislative body hereby declares that it would have passed this Code, and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, and phrases be declared unconstitutional.

Section 12. Effective July 1, 2002, Section 1162 of the Energy Code is amended as follows:

1162 Liability: Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of ~~((any city or county))~~ the City or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code, or by reason of or in consequence of any inspection, notice, order, certificate, permission of approval authorized or issued or done in connection with the implementation or enforcement of this Code, or by reason of any action or inaction on the part of the City related in any manner to the enforcement of this Code or by its officers or agents. The building official or any employee charged with the enforcement of this Code, acting in good faith and without malice for the City in the discharge of his/her duties, shall not thereby render himself/herself liable personally and he/she is hereby relieved from all personal liability for any damage that may accrue to persons or property as a result of any act required or by reason of any act or omission in the discharge of his/her duties.

Section 13. Effective July 1, 2002, 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 14. Effective July 1, 2002, 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 • ft²) or greater but not greater than 8 Btu/(h • ft²) and in Climate Zone 2, shall be 5 Btu/(h • ft²) or greater but not greater than 12 Btu/(h • ft²). 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 for vertical glazing and U-1.08 maximum for overhead glazing and a maximum total (vertical and overhead) 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 15. Effective July 1, 2002, Section 1311.6 of the Energy Code is amended as follows:

1311.6 Radiant Floors (on or below grade): Slab on grade insulation shall extend downward from the top of the slab a minimum distance of 36 inches or downward to the top of the footing and horizontal for an aggregate of not less than 36 inches.

~~((If required by the building official where soil conditions warrant such insulation, t))~~
The entire area of radiant floor shall be thermally isolated from the soil. Where a soil gas control system is provided below the radiant floor, which results in increased convective flow below the radiant floor, the radiant floor shall be thermally isolated from the sub-floor gravel layer.

Section 16. Effective July 1, 2002, Section 1312.2 of the Energy Code is amended as follows:

1312.2 Solar Heat Gain Coefficient and ~~((Shading Coefficient))~~ Visible Transmittance: Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT), 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.

EXCEPTIONS: 1. 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.

2. For the purposes of 1323, Exception 1, visible transmittance for the center of the glazing assembly shall be taken from Chapter 30 of Standard RS-27 or from the



1 manufacturer's data using a spectral data file determined in accordance with NFRC
2 300.
3

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.

Conversely, the VT for the center-of-glass overstates the VT for the overall product (including the frame). The VT for the frame is zero. Consequently, an NFRC-certified VT will always be lower. For this reason, Exception 2 to Section 1312.2 is only applicable to Exception 1 in Section 1323. It is not applicable to other sections.

4
5
6 **Section 17.** Effective July 1, 2002, Section 1322 of the Energy Code is amended as
7 follows:
8

9 **1322 Opaque Envelope:** Roof/ceilings, opaque exterior walls, opaque doors, floors over
10 unconditioned space, below grade walls, slab on grade floors and radiant floors enclosing
11 conditioned spaces shall be insulated according to Section 1311 and Tables 13-1 or 13-2.
12 Compliance with nominal R-values shall be demonstrated for the thermal resistance of the
13 added insulation in framing cavities and/or insulated sheathing only. Nominal R-values
14 shall not include the thermal transmittance of other building materials or air films.

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

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

23 **EXCEPTIONS:**

- 24 1. Opaque smoke vents are not required to meet insulation requirements.
25 2. For prescriptive compliance only.
26 a. for glazing areas that are 30% and less of the gross wall area, the insulation of the perimeter
27 edge of an above grade floor slab which penetrates the exterior wall may be reduced to R-5
28 provided that the glazing U-factor is reduced by U-0.05 below that required in Tables 13-1
29 and 13-2.
30 b. for glazing areas that exceed 30% of the gross wall area, the perimeter edge of an above
31 grade floor slab which penetrates the exterior wall may be left uninsulated provided that the
32 glazing U-factor is reduced by U-0.10 below that required in Tables 13-1 and 13-2. (The
33 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 18. Effective July 1, 2002, 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 19. Effective July 1, 2002, 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.)

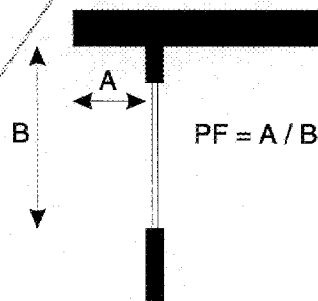


Exhibit 1323.3

Section 20. Effective July 1, 2002, 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 21. Effective July 1, 2002, 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 22. Effective July 1, 2002, 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 ²	All Other Roofs ²	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	
	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:

- walls insulated on the interior shall use opaque wall values,
- walls insulated on the exterior shall use a minimum of R-10 insulation,
- 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:

- walls insulated on the interior shall use the opaque wall values when determining U_{bgwt} ,
- walls insulated on the exterior shall use a target U-factor of $U=0.070$ for U_{bgwt} ,
- 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 $9.0 \text{ Btu/ft}^2 \cdot ^\circ\text{F}$, then the U-factor may be increased to ((0.19))

- 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 $9.0 \text{ Btu/ft}^2 \cdot ^\circ\text{F}$ 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 the following:

Maximum Glazing Area as % of Wall	Maximum U-Factor		Maximum
	VG	OG	SHGC ⁴
>45% to 50%	0.40	0.48	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:



- 1 a) Double glazing with a minimum 1/2 inch gap width, having a low-emissivity coating
2 with e=0.10 maximum, with 90% minimum argon gas fill, and a non-aluminum
3 spacer (as defined in footnote 1 to Table 10-6B), and
4 b) Frame that is thermal break aluminum (as defined in footnote 7 to Table 10-6A),
5 wood, aluminum clad wood, vinyl, aluminum clad vinyl, or reinforced vinyl.
6

7
8 **Section 23.** Effective July 1, 2002, Section 1402 of the Energy Code is amended as
9 follows:

10
11 **1402 Mechanical Ventilation:** The minimum requirements for ventilation shall comply
12 with the ~~((Washington State Ventilation and Indoor Air Quality Code (WAC51-13)))~~ Seattle
13 Mechanical Code.
14

15
16 **Section 24.** Effective July 1, 2002, Section 1411.1 of the Energy Code is amended as
17 follows:

18
19 **1411.1 General:** Equipment shall have a minimum performance at the specified rating
20 conditions not less than the values shown in Tables 14-1A through 14-1G. If a nationally
21 recognized certification program exists for a product covered in Tables 14-1A through 14-
22 1G, and it includes provisions for verification and challenge of equipment efficiency ratings,
23 then the product shall be listed in the certification program.

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

29 Leaving Chiller Water Temp.: 40 to 48°F

30 Entering Condenser Water Temp.: 75 to 85°F

31 Condensing Water Temp. Rise: 5 to 15°F

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

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

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

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

1 Cooling towers serving chilled water systems with waterside economizer shall also
2 comply with Section 1433, Exception 2.

3 Hydronic heat pump and other cooling and refrigeration equipment (e.g. icemakers,
4 walk-in coolers) shall not use domestic water only one time before dumping it to waste. No
5 single pass water cooling systems without heat recovery are allowed, except for medical and
6 dental equipment, equipment using less than 1 gpm, and replacement of existing icemakers.
7 However, single pass cooling is allowed during power outages and other emergencies.
8

9
10 **Section 25.** Effective July 1, 2002, Section 1411.2 of the Energy Code is amended as
11 follows:

12
13 **1411.2 Rating Conditions:** Cooling equipment shall be rated at ARI test conditions and
14 procedures when available. Where no applicable procedures exist, data shall be furnished
15 by the equipment manufacturer.
16

If equipment is rated in accordance with an ARI Standard,
it shall be rated at Standard (not "design") ARI Rating Conditions.

17
18
19 **Section 26.** Effective July 1, 2002, Section 1411.4 of the Energy Code is amended as
20 follows:
21

22 **1411.4 Packaged and Split System Electric Heating and Cooling Equipment:** Packaged
23 and split system electric equipment providing both heating and cooling with a total cooling
24 capacity greater than 20,000 Btu/h shall be a heat pump.

25 **EXCEPTION:** Unstaffed equipment shelters or cabinets used solely for personal wireless service
26 facilities.
27

28 **Section 27.** Effective July 1, 2002, the Energy Code is amended by adding a new
29 Section 1411.5 to read as follows:
30

31 **1411.5 Heating Systems in Unenclosed Spaces.** Where heating is provided to unenclosed
32 spaces, only radiant heating systems shall be used unless otherwise approved by the building
33 official. An unenclosed space is one that is not substantially surrounded by solid surfaces
34 such as walls, floors, roofs, and operable devices such as doors and operable windows.
35 Warehouses and repair garages are considered enclosed spaces.
36

37
38 **Section 28.** Effective July 1, 2002, Section 1412.2 of the Energy Code is amended as
39 follows:
40

41 **1412.2 Deadband Controls:** When used to control both comfort heating and cooling, zone
42 thermostatic controls shall be capable of a deadband of at least 5 °F within which the supply
43 of heating and cooling energy to the zone is shut off or reduced to a minimum.
44

EXCEPTIONS:



1. Special occupancy, special usage or code requirements where deadband controls are not appropriate.
2. ~~((Buildings complying with Section 141.4, 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 29. Effective July 1, 2002, 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.
4. Gravity (non-motorized) dampers are acceptable in exhaust and relief outlets in the first story and levels below the first story of buildings three or more 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/ft² of damper area at 1.0 in w.g.
- b. Non-motorized dampers: 20 cfm/ft² of damper area at 1.0 in w.g., except that for non-motorized dampers smaller than 24 inches in either dimension: 40 cfm/ft² 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 30. Effective July 1, 2002, 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 modulated 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 31. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1412.8 to read 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).

- 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 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 32. Effective July 1, 2002, Section 1413.3 of the Energy Code is amended as follows:

1413.3 Integrated Operation: The HVAC system and its controls shall allow economizer operation when mechanical cooling is required simultaneously. 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.

EXCEPTIONS:

1. 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 water chillers with waterside economizer.

Section 33. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1413.5 to read as follows:

1413.5 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 2.

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 in the Users Manual.

Section 34. Effective July 1, 2002, 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: 1/2 inch to 2 inches; seal transverse joints.))~~ (Reserved.)
2. Static pressure: ~~((2))~~ 1/2 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 35. Effective July 1, 2002, Section 1414.2 of the Energy Code is amended as follows:

1414.2 Insulation: Ducts and plenums that are constructed and function as part of the building envelope, by separating interior space from exterior space, shall meet all applicable requirements of Chapter 13. These requirements include insulation installation, moisture control, air leakage, and building envelope insulation levels. ~~((Unheated equipment rooms with combustion air louvers shall be isolated from the conditioned space by insulating~~

interior surfaces to a minimum of R-11 and any exterior envelope surfaces per Chapter 13.)
Outside air ducts serving individual supply air units with less than 2,800 cfm of total supply air capacity shall be insulated to a minimum of R-7 and are not considered building envelope. Other outside air duct runs are considered building envelope until they,
1. connect to the heating or cooling equipment, or
2. are isolated from the exterior with an automatic shut-off damper complying with Section 1412.4.1.

Once outside air ducts meet the above listed requirements, any runs within conditioned space shall comply with Table 14-5 requirements.

Other ducts and plenums shall be thermally insulated per Table 14-5.

- EXCEPTIONS:** 1. Within the HVAC equipment.
2. Exhaust air ducts not subject to condensation.
3. Exposed ductwork within a zone that serves that zone.

Section 36. Effective July 1, 2002, 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 (O & M) 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.



1 **1416.2.5.3 Record Drawings:** Record drawings shall include, as a minimum, the location
2 and performance data on each piece of equipment, general configuration of duct and pipe
3 distribution system, including sizes, and the terminal air and water design flow rates of the
4 actual installation.

5
6 **1416.2.5.4 Systems Operational Training:** The training of the appropriate maintenance
7 staff for each equipment type and or system shall include, as a minimum, the following:

- 8 a. System/Equipment overview (what it is, what it does and which other systems and or
9 equipment does it interface with).
10 b. Review of the available O&M materials.
11 c. Review of the Record Drawings on the subject system/equipment.
12 d. Hands-on demonstration of all normal maintenance procedures, normal operating
13 modes, and all emergency shutdown and start-up procedures.
14

15 **1416.2.6 Commissioning Reports**

16
17 **1416.2.6.1 General.** Drawing notes shall require commissioning in accordance with this
18 section. Drawing notes may refer to specifications for further commissioning requirements.
19

20 **1416.2.6.2 Preliminary Commissioning Report:** A preliminary report of commissioning
21 test procedures and results shall be completed and provided to the Owner. The Preliminary
22 Commissioning Report shall identify:

- 23 a. Deficiencies found during testing required by this section which have not been
24 corrected at the time of report preparation and the anticipated date of correction.
25 b. Deferred tests which cannot be performed at the time of report preparation due to
26 climatic conditions.
27 c. Climatic conditions required for performance of the deferred tests, and the
28 anticipated date of each deferred test.
29

30 **1416.2.6.3 Final Commissioning Report:** A complete report of test procedures and results
31 shall be prepared and filed with the Owner. The Final Commissioning Report shall identify:

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

37 **EXCEPTION:** Deferred tests which cannot be performed at the time of report preparation due to
38 climatic conditions.
39

40 **1416.3 Acceptance Requirements**

41
42 **1416.3.1 General.** Drawing notes shall require commissioning in accordance with this
43 section. Drawing notes may refer to specifications for further commissioning requirements.
44

45 **1416.3.2 Acceptance:** Buildings or portions thereof, required by this Code to comply with
46 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 Section 1416.2.6.2 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 37. Effective July 1, 2002, Section 1421 of the Energy Code is amended as follows:

1421 System Type: To qualify as a simple system, systems shall be one of the following:

- a. Air cooled, constant volume packaged equipment, which provide heating, cooling or both, and require only external connection to duct work and energy services with cooling capacity of 135,000 Btu/h or less.
- b. Air cooled, constant volume split systems, which provide heating, cooling or both, with cooling capacity of 84,000 Btu/h or less.
- c. Heating only systems which have a capacity of less than 5,000 cfm or which have a minimum outside air supply of less than 70% of the total air circulation.

All other systems shall comply with Sections 1430 through 1439.

Section 38. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1421.1 to read as follows:

1421.1 System Sizing Limits: Installed space heating equipment output shall not exceed 16 Btu/h per square foot of gross conditioned floor area and installed space cooling equipment output shall not exceed 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 39. Effective July 1, 2002, 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 1900 cfm 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 air 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 40. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1431.2 to read 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 29 of Standard RS-27 listed in Chapter 7 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 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. 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.
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 41. Effective July 1, 2002, 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 42. Effective July 1, 2002, Section 1435 of the Energy Code is amended as follows:

1435 Simultaneous Heating and Cooling: Systems which provide heating and cooling simultaneously to a zone are prohibited. Zone thermostatic and humidistatic controls shall be capable of operating in sequence the supply of heating and cooling energy to the zone. Such controls shall prevent:

- a. Reheating for temperature control.
- b. Recooling for temperature control.
- c. Mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by economizer systems or by mechanical refrigeration.
- d. Other simultaneous operation of heating and cooling systems to the same zone.

e. Reheating for humidity control.

EXCEPTIONS: 1. Zones for which the volume of air that is reheated, recooled, or mixed is no greater than the larger of the following:

a. The volume of air required to meet the minimum required to meet the ventilation requirements of the ((Washington State Ventilation and Indoor Air Quality Code)) Seattle Mechanical Code for the zone.

b. 0.4 cfm/ft² of the zone conditioned floor area, provided that the temperature of the primary system air is, by design or through reset controls, 0-12°F below the design space heating temperature when outside air temperatures are below 60°F for reheat systems and cold deck of mixing systems and 0-12°F above design space temperature when outside air temperatures are above 60°F for recooling systems and hot deck of mixing systems. For multiple zone systems, each zone need not comply with this exception provided the average of all zones served by the system that have both heating and cooling ability comply.

c. 300 cfm. This exception is for zones whose peak flow rate totals no more than 10% of the total fan system flow rate.

d. Any higher rate that can be demonstrated, to the satisfaction of the building official, to reduce overall system annual energy usage by offsetting reheat/recool energy losses through a reduction in outdoor air intake in accordance with the multiple space requirements defined in ASHRAE Standard 62.

2. Zones where special pressurization relationships, cross-contamination requirements, or code required minimum circulation rates are such that variable air volume systems are impractical.

3. Zones where at least 75% of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered (including condenser heat) or site-solar energy source.

4. Zones where specific humidity levels are required to satisfy process needs, such as computer rooms, museums, surgical suites, and buildings with refrigerating systems, such as supermarkets, refrigerated warehouses, and ice arenas.

Section 43. Effective July 1, 2002, 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 44. Effective July 1, 2002, 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 45. Effective July 1, 2002, 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 46. Effective July 1, 2002, 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 14-1A through 14-1G 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.

Section 47. Effective July 1, 2002, 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

- a. variable speed drives or
- 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 b.

~~((variable flow devices installed. Acceptable variable flow devices include variable inlet vanes, variable blade pitch and variable fan geometry. F))~~ 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 48. Effective July 1, 2002, the Energy Code is amended by adding a new Section 1438.1 to read as follows:

1438.1 Cooling Towers: All cooling towers with a total fan motor horsepower greater than 10 hp shall be equipped with a pony motor of a rated hp no greater than 1/3 of the hp of the primary motor or with a two-speed motor. The cooling tower control shall provide two-stage operation of fans and shall bring on the pony motor to operate without the primary motor or for a two-speed motor run at the lower speed when possible while meeting the condenser water return setpoint.

EXCEPTION: Cooling towers with variable frequency drive.



Section 49. Effective July 1, 2002, 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 50. Effective July 1, 2002, 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 pools over 2,000 gallons. 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 ((14-1G))14-1M.

Section 51. Effective July 1, 2002, Table 14-1C is amended 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 ² 5.90 IPLV	
	≥300 Tons		6.10 COP ² 6.40 IPLV	
Water Cooled, Electrically Operated, Positive Displacement (Reciprocating)	All Capacities		4.20 COP 5.05 IPLV	ARI 550/590
Water Cooled, Electrically Operated, Positive Displacement (Rotary, Screw and Scroll)	<150 Tons		4.45 COP 5.20 IPLV	ARI 550/590
	≥150 Tons and < 300 Tons		4.90 COP 5.60 IPLV	



	≥300 Tons		5.50 COP 6.15 IPLV	
Water Cooled, Electrically Operated, Centrifugal	< 150 Tons		5.00 COP 5.25 IPLV	ARI 550/590
	≥150 Tons and <300 Tons		5.55 COP 5.90 IPLV	
	≥300 Tons		6.10 COP 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 52. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1H to read as follows:

Table 14-1H Reserved

Section 53. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1I to read as follows:

Table 14-1I Reserved

Section 54. Effective July 1, 2002, the Energy Code is amended by adding a new Table 14-1J to read as follows:

Table 14-1J Reserved

Section 55. Effective July 1, 2002, 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 56. Effective July 1, 2002, 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	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 57. Effective July 1, 2002, 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 58. Effective July 1, 2002, the title of Chapter 15 of the Energy Code is amended as follows:

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

Section 59. Effective July 1, 2002, 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 July 1, 2002, 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	<u>Transformers</u>	X	X	X
RS-29	Systems Analysis			X

Section 61. Effective July 1, 2002, Section 1512 of the Energy Code is amended as follows:

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

Section 62. Effective July 1, 2002, Section 1512.1 of the Energy Code is amended as follows:

1512.1 Exempt Spaces: The following rooms, spaces and areas, are exempt from the ~~((lighting power))~~ requirements in Sections 1520 through 1522 and 1530 through 1532 but shall comply with all other requirements of this chapter.

- ~~((Areas in which medical or dental tasks are performed.))~~ Reserved.
- High risk security areas or any area identified by building officials as requiring additional lighting.
- Spaces designed for primary use by the visually impaired ~~((;))~~ or hard of hearing (lip-reading) ~~((or by senior citizens))~~.
- ~~((Food preparation areas.))~~ Reserved.
- Outdoor manufacturing, greenhouses and processing areas.
- Electrical/mechanical equipment rooms.
- Outdoor athletic facilities.
- ~~((Inspection and restoration areas in galleries and museums.))~~ Reserved.
- 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.



Section 63. Effective July 1, 2002, Section 1512.2 of the Energy Code is amended as follows:

1512.2 Exempt Lighting Equipment: The following lighting equipment and tasks are exempt from the lighting requirements of Section 1520 through 1522 and need not be included when calculating the installed lighting power under Section 1530 through 1532 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 with multi-level or dimming controls in rooms with permanently installed audio-visual equipment or video-conferencing equipment.

Section 64. Effective July 1, 2002, 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 65. Effective July 1, 2002, Section 1513.3 of the Energy Code is amended as follows:

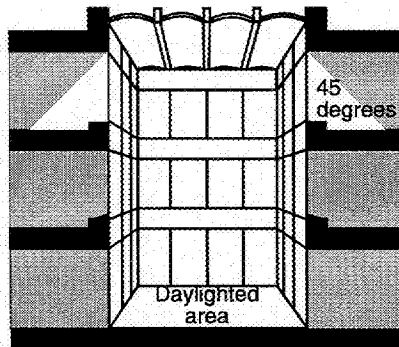
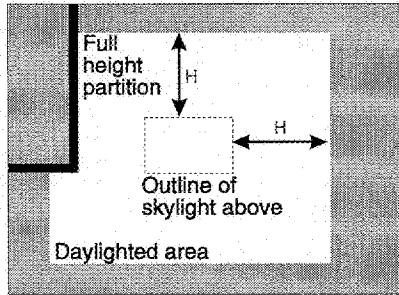
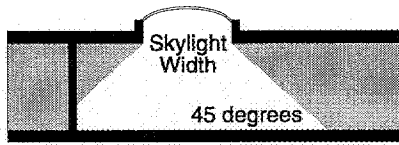
1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 2 (see Exhibits 1513.3a and 1513.3b), both under overhead glazing and adjacent to vertical glazing, shall be provided with ~~((individual controls, or daylight or occupant-sensing automatic))~~ controls, which

- a. control the lights independent of general area lighting, and
- b. automatically reduce lighting power in response to available daylight by either
 - i. a combination of multi-level switching and daylight-sensing automatic controls, which are capable of reducing the light level automatically and turning the lights off (where single lamp luminaires are installed, automatically switching 50% of the luminaires off is an acceptable means of reducing the light level), or
 - ii. a combination of dimming ballasts and daylight-sensing automatic controls, which are capable of dimming the lights continuously.

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.

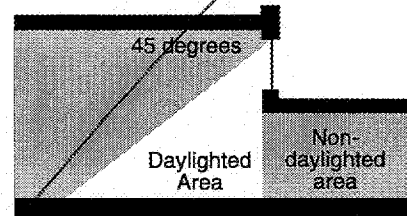
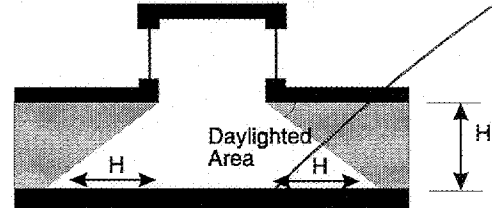
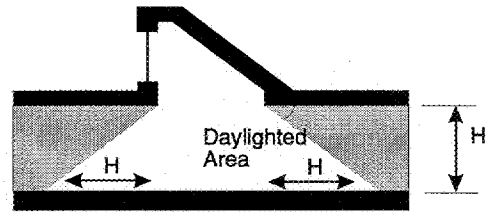
EXCEPTIONS:

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 in 1513.3b.
3. HID lamps 150 watts or less are exempt from the dimming requirements in 1513.3b.



H = Floor to ceiling height

Daylight area beneath conventional skylight



Daylighted area includes floor of atrium and the top floor next to the atrium

Exhibit 1513.3a

1
 2
 3
 4



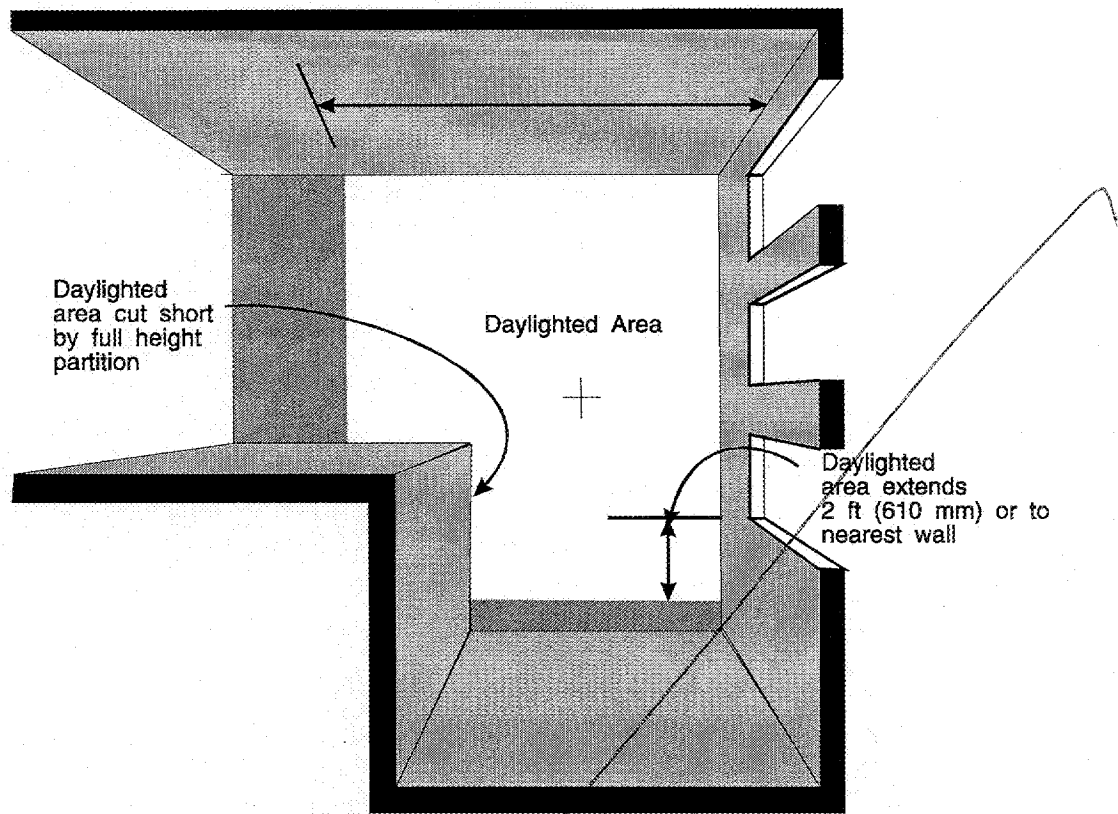


Exhibit 1513.3b

Section 66. Effective July 1, 2002, 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 and non-use nighttime 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.

Section 67. Effective July 1, 2002, 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 ft² 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 ft² 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 ft² or 5% of the building footprint for footprints over 100,000 ft², whichever is greater.

Section 68. Effective July 1, 2002, 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/ft² 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 69. Effective July 1, 2002, 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 70. Effective July 1, 2002, 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 shall be 0.20 W/ft², and the allowance for open parking and outdoor areas shall be ((0.20))0.15 W/ft². For open parking and outdoor areas and roadways, luminaires mounted above 15 feet shall meet IESNA requirements for Full Cutoff Luminaires. (Full



Cutoff means a luminaire light distribution where zero candela intensity occurs at an angle of 90 degrees above nadir, and all greater angles from nadir.)

The lighting allowance for building exteriors and externally-illuminated signs (including billboards) shall be calculated either by multiplying the building façade area that is illuminated or sign area by ~~((0.25-))~~ 0.15 W/ft² or multiplying the building perimeter in feet by 7.5 watts per lineal foot. Any building exterior lighting that exceeds 7.5 watts per lineal foot of total building perimeter is not allowed to be traded with other lighting areas.

EXCEPTIONS:

1. Group U occupancy accessory to Group R-3 occupancy.
2. ~~((For covered parking, 0.30 W/ft² 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.))~~ Reserved.
3. The top level of a parking garage is allowed to be included with the covered parking garage category provided that the luminaires on the top level meet IESNA requirements for Full Cutoff Luminaires.
4. For the gas station pump area under canopy only, 1.00 W/ft² may be used. For automobile sales area only, and for other exterior retail sales, including but not limited to gardening supplies, 0.50 W/ft² may be used.

INFORMATIVE GUIDE TO SECTION 1532: NOTE THAT THIS GUIDE DOES NOT SUPERCEDE THE REQUIREMENTS IN THE TEXT.

CATEGORY	LIGHTING POWER ALLOWANCE	TRADEOFF LIMITATIONS
PARKING AND OUTDOOR AREAS		
Covered Parking	0.20 Watts/square foot	Calculated separately. Trade offs not allowed with other categories.
Open parking and outdoor areas	0.15 Watts/square foot of area that is illuminated	Calculated separately, but see allowance below for use of façade lighting credit
FAÇADE LIGHTING		
Perimeter option	7.5 Watts/lineal foot of building perimeter	Calculated separately, but any wattage allowance not used for façade lighting may be used for open parking and outdoor areas that are illuminated
Surface area option	0.15 Watts/square foot of wall surface area that is illuminated	Calculated separately, but any wattage allowance up to 7.5 Watts/lineal foot of building perimeter that is not used for façade lighting may be used for open parking and outdoor areas that are illuminated

Section 71. Effective July 1, 2002, 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 72. Effective July 1, 2002, 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, gymnasias 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 Only⁷	
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.))~~ See Section 1532 for exterior lighting.
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/ft² 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/ft² may be used.
8. For the fire engine room, the *Unit Lighting Power Allowance* is 1.00 W/ft².
9. For indoor sport tournament courts with adjacent spectator seating, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft².
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/ft² 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 73. Effective July 1, 2002, Section 3.4 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

3.4 HVAC Systems and Equipment: For the standard building, the HVAC system used shall be the system type used in the proposed design. If the proposed HVAC system type does not comply with Sections 1432 through 1439 the standard design system shall comply in all respects with those sections.

EXCEPTION: ~~((When approved by the building official, a))~~ A prototype HVAC system may be used ~~((, if the proposed design system cannot be modified to comply with Sections 1432 and 1432 through 1439,))~~ as a standard design. Use of prototype HVAC systems shall only be permitted for the building types listed below. For mixed-use buildings, the floor space of each building type is allocated within the floor space of the standard building. The specifications and requirements for the HVAC systems of prototype buildings shall be those in Table 3-3.

1. assembly
2. health/institutional
3. hotel/motel
4. light manufacturing
5. office (business)
6. restaurant
7. retail (mercantile)
8. school (educational)
9. warehouse (storage)

Section 74. Effective July 1, 2002, Section 3.4.4 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

3.4.4 Fans: The power of the combined fan system per air volume at design conditions (w/cfm) of the proposed design shall be equal to that of the standard design.

EXCEPTION: For underfloor systems, a 25 percent reduction is allowed for the proposed design.
Variable air volume fan systems in the standard building shall be variable speed.

Section 75. Effective July 1, 2002, Reference Standard 29 (RS-29) of the 2001 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 76. Effective July 1, 2002, Table 3-3 of Reference Standard 29 (RS-29) of the 2001 Washington State Energy Code is amended as follows:

TABLE 3-3
HVAC Systems of Prototype Buildings³

Use	System #	Remarks
1. Assembly		
a. Churches (any size)	1	
b. $\leq 50,000$ ft ² or ≤ 3 floors	1 or 3	Note 2
c. $> 50,000$ ft ² or > 3 floors	3	
2. Health		



a. Nursing Home (any size)	2	
b. $\leq 15,000 \text{ ft}^2$	1	
c. $> 15,000 \text{ ft}^2$ and $\leq 50,000 \text{ ft}^2$	4	Note 3
d. $> 50,000 \text{ ft}^2$	5	Note 3,4
3. Hotel/Motel		
a. $\leq ((3))6$ Stories	2	Note 6
b. $> ((3))6$ Stories	6	Note 7
4. Light Manufacturing	1 or 3	
5. Office		
a. $\leq 20,000 \text{ ft}^2$	1	
b. $> 20,000 \text{ ft}^2$ and $((\text{either}))$ $\leq ((3))7$ floors $((\text{or } \leq 75,000 \text{ ft}^2))$	4	
c. $> ((75,000 \text{ or } > 3))7$ floors	5	
6. Restaurant	1 or 3	Note 2
7. Retail		
a. $\leq 50,000 \text{ ft}^2$	1 or 3	Note 2
b. $> 50,000 \text{ ft}^2$	4 or 5	Note 2
8. Schools		
a. $\leq 75,000 \text{ ft}^2$ or ≤ 3 floors	1	
b. $> 75,000 \text{ ft}^2$ or > 3 floors	3	
9. Warehouse		Note 5

Footnote to Table 3-3: The systems and energy types presented in this table are not intended as requirements or recommendations for the proposed design. Floor areas in the table are the total conditioned floor areas for the listed use in the building. The number of floors indicated in the table is the total number of occupied floors for the listed use.

TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #1	System #2
System Description	Packaged rooftop single zone, one unit per zone	Packaged terminal air conditioner with space heater or heat pump, heating or cooling unit per zone
Fan system		
Design Supply	Note 10	Note 11
Circulation Rate		
Supply Fan Control	Constant volume	Fan cycles with call for heating or cooling
Return Fan Control	NA	NA
Cooling System	Direct expansion air cooled	Direct expansion air cooled
Heating System	Furnace, heat pump or electric resistance	Heat pump with electric resistance auxiliary or air conditioner with space heater
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	No economizer, if not required by Section 1433



TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #3	System #4
System Description	Air handler per zone with central plant	Packaged rooftop VAV with perimeter reheat and fan-powered terminal units
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	Constant volume	Variable Air Volume systems with controls per Section 1438 ((forward curved centrifugal fan and variable inlet fans))
Return Fan Control	Constant volume	Variable Air Volume systems with controls per Section 1438 ((forward curved centrifugal fan and variable inlet fans))
Cooling System	Chilled water (Note 12)	Direct expansion air cooled
Heating System	Hot water (Note 13)	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433, heat recovery if required by Section 1436	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436

TABLE 3-3 (Continued)
HVAC System Descriptions for Prototype Buildings¹

HVAC Component	System #5	System #6
System Description	Built-up central VAV with perimeter reheat and fan-powered terminal units	Four-pipe fan coil per zone with central plant
Fan system Design Supply Circulation Rate	Note 10	Note 10
Supply Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	Fan cycles with call for heating or cooling
Return Fan Control	VAV with air-foil centrifugal fan and AC frequency variable speed drive	NA
Cooling System	Chilled water (Note 12)	Chilled water (Note 12)
Heating System	Hot water (Note 13) or electric resistance	Hot water (Note 13) or electric resistance
Remarks	Drybulb economizer per Section 1433. Minimum VAV setting per Section 1435 Exception 1, Supply air reset by zone of greatest cooling demand, heat recovery if required by Section 1436	No economizer, if not required by Section 1433



Numbered Footnotes for Table 3-3 HVAC System Descriptions for Prototype Buildings

1. The systems and energy types presented in this Table are not intended as requirements or recommendations for the proposed design.
2. For occupancies such as restaurants, assembly and retail that are part of a mixed use building which, according to Table 3-3, includes a central chilled water plant (systems 3, 5, or 6), chilled water system type 3 or 5 shall be used as indicated in the table.
3. Constant volume may be used in zones where pressurization relationships must be maintained by code. Where constant volume is used, the system shall have heat recovery if required by Section 1436. VAV shall be used in all other areas, in accordance with Sections 1432 through 1439.
4. Provide run-around heat recovery systems for all fan systems with a minimum outside air intake greater than 70%. Recovery effectiveness shall be 0.50.
5. If a warehouse is not intended to be mechanically cooled, both the standard and proposed designs shall be calculated assuming no mechanical cooling.
6. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 4. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
7. The system listed is for guest rooms only. Areas such as public areas and back-of-house areas shall be served by system 5. Other areas such as offices and retail shall be served by systems listed in Table 3-3 for these occupancy types.
8. Reserved.
9. Reserved.
10. Design supply air circulation rate shall be based on a supply-air to room-air temperature difference of 20°F. A higher supply-air temperature may be used if required to maintain a minimum circulation rate of 4.5 air changes per hour or 15 cfm per person to each zone served by the system, at design conditions. If return fans are specified, they shall be sized for the supply fan capacity less the required minimum ventilation with outside air, or 75% of the supply fan capacity, whichever is larger. Except where noted, supply and return fans shall be operated continuously during occupied hours.
11. Fan energy when included in the efficiency rating of the unit as defined in Section 1411, need not be modeled explicitly for this system. The fan shall cycle with calls for heating or cooling.
12. Chilled water systems shall be modeled using a reciprocating chiller for systems with total cooling capacities less than 175 tons, and centrifugal chillers for systems with cooling capacities of 175 tons or greater. For systems with cooling capacities of 600 tons or more, the standard design energy consumption shall be calculated using two centrifugal chillers, lead/lag controlled. Chilled water shall be assumed to be controlled at a constant 44°F. Chiller water pumps shall be sized using a 12°F temperature rise, from 44°F to 56°F, operating at 65% combined impeller and motor efficiency. Condenser water pumps shall be sized using a 10°F temperature rise, operating at 60% combined impeller and motor efficiency. The cooling tower shall be an open circuit, centrifugal blower type sized for the larger of 85°F leaving water temperature or 10°F approach to design wetbulb temperature. The tower shall be controlled to provide a 65°F leaving water temperature whenever weather conditions permit, floating up to design leaving water temperatures at design conditions. Chilled water supply temperature shall be reset in accordance with Section 1432.2.2.



13. Hot water system shall include a natural draft fossil fuel or electric boiler. The hot water pump shall be sized based on a 30°F temperature drop, from 180°F to 150°F, operating at a combined impeller and motor efficiency of 60%. Hot water supply temperature shall be reset in accordance with Section 1432.2.2.

Section 77. 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 78. 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 _____, 2002, and signed by me in open session in authentication of its passage this _____ day of _____, 2002.

President of the City Council

Approved by me this _____ day of _____, 2002.

Greg Nickels, Mayor

Filed by me this _____ day of _____, 20____.

City Clerk

(SEAL)



STATE OF WASHINGTON – KING COUNTY

--SS.

145938
City of Seattle, Clerk's Office

No. ORDINANCE IN FULL

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:ORD# 120804

was published on

6/11/2002



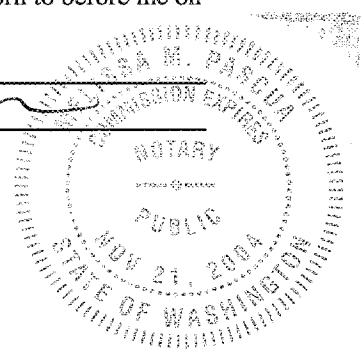
Subscribed and sworn to before me on

6/11/2002



Notary public for the State of Washington,
residing in Seattle

Affidavit of Publication



entitled
RECAST
SUMMONS BY
PUBLICATION
for Court

Notes for Default Tail

- TABLE 18-5B**
Other than Group R Occupancies
Default U-Factors for Concrete and Masonry

0.75 in.	R: 3.0	LC: 0.264	LC: 0.6
1.5 in.	R: 4.0	LC: 0.278	LC: 0.6
1.5 in.	R: 10.0	LC: 0.277	LC: 0.6
3.5 in.	R: 11.0	LC: 0.168	LC: 0.6
3.5 in.	R: 13.0	LC: 0.161	LC: 0.6
3.5 in.	R: 14.0	LC: 0.155	LC: 0.6
3.5 in.	R: 19.2	LC: 0.118	LC: 0.6
3.5 in.	R: 21.0	LC: 0.113	LC: 0.6
1 in. Metal Chips at 24 in. on center horizontally and 3 in. vertically			
1.0 in.	R: 3.8	LC: 0.145	LC: 0.6
1.0 in.	R: 4.0	LC: 0.143	LC: 0.6
1.0 in.	R: 4.8	LC: 0.141	LC: 0.6
1.5 in.	R: 5.2	LC: 0.174	LC: 0.6
1.5 in.	R: 7.5	LC: 0.160	LC: 0.6
2.0 in.	R: 8.4	LC: 0.139	LC: 0.6
2.0 in.	R: 10.0	LC: 0.129	LC: 0.6
2.0 in.	R: 11.7	LC: 0.128	LC: 0.6
2.5 in.	R: 9.5	LC: 0.103	LC: 0.6
2.5 in.	R: 13.5	LC: 0.109	LC: 0.6
2.5 in.	R: 14.0	LC: 0.097	LC: 0.6
3.0 in.	R: 15.0	LC: 0.093	LC: 0.6
3.0 in.	R: 12.0	LC: 0.092	LC: 0.6
3.0 in.	R: 18.4	LC: 0.078	LC: 0.6
3.5 in.	R: 13.3	LC: 0.077	LC: 0.6
3.5 in.	R: 17.5	LC: 0.066	LC: 0.6
3.5 in.	R: 30.0	LC: 0.060	LC: 0.6
4.0 in.	R: 10.0	LC: 0.073	LC: 0.6
4.0 in.	R: 14.5	LC: 0.061	LC: 0.6
4.0 in.	R: 24.0	LC: 0.047	LC: 0.6
4.0 in.	R: 28.0	LC: 0.044	LC: 0.6

Notes for Default Table 10.5b

- It is acceptable to use the U-factors in Table 10-5B(2) for walls, provided that the grouting is equal to or less than that for ungrouted walls, use the partially-grouted column.
- For metal studs and z-furring, use the continuous-metal.
- For discontinuous metal clips 1 inch square or smaller, z.
- For insulation that is attached without any framing member contiguous insulation uninterrupted by framing category.
- installed on the interior or exterior of masonry walls, or be multi-layer masonry walls, or on the interior or exterior of

24" o.e.	R-0 (none)	U-0.338	U-0.115	U-0.188	U-0.102	U-0.094	U-0.092
R-1	U-0.253	U-0.104	U-0.098	U-0.092	U-0.094	U-0.092	
R-2	U-0.202	U-0.094	U-0.082	U-0.082	U-0.085	U-0.083	
R-3	U-0.168	U-0.086	U-0.082	U-0.082	U-0.073	U-0.077	
R-4	U-0.144	U-0.072	U-0.075	U-0.072	U-0.068	U-0.071	
R-5	U-0.126	U-0.073	U-0.070	U-0.067	U-0.068	U-0.066	
R-6	U-0.113	U-0.068	U-0.064	U-0.063	U-0.064	U-0.062	
R-7	U-0.100	U-0.064	U-0.063	U-0.063	U-0.060	U-0.059	
R-8	U-0.086	U-0.061	U-0.063	U-0.061	U-0.060	U-0.062	