TABLE 14-3 ((~~RESERVED~~))

PIPING SYSTEM DESIGN MAXIMUM FLOW RATE IN GPM[1]

	<=2000 hours/yr		>2000 and <=4400 hours/year		> 4400 hours/year	
Pipe Size (in)	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed
2 ½	120	180	85	130	68	110
3	180	270	140	210	110	170
4	350	530	260	400	210	320
5	410	620	310	470	250	370
6	740	1100	570	860	440	680
8	1200	1800	900	1400	700	1100
10	1800	2700	1300	2000	1000	1600
12	2500	3800	1900	2900	1500	2300

1. There are no requirements for pipe sizes smaller than the minimum shown in the table or larger than the maximum shown in the table.

***

TABLE 14-6

MINIMUM PIPE INSULATION THICKNESS[1]

Fluid Design Operating Temp. Range (°F)	Insulation Conductivity		Nominal Pipe or Tube Size (in.)				
	Conductivity Btu·in./(h·ft^2·°F)	Mean Rating Temp. °F	<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≥8
Heating and Hot Water Systems (Steam, Steam Condensate, ((and)) Hot Water Heating and Domestic Water Systems)[2]							
>350	0.32-0.34	250	4.5 ((3.0))	5.0 ((3.5))	5.0 ((3.5))	5.0 ((4.5))	5.0 ((4.5))
251-350	0.29-0.32	200	3.0 ((2.0))	4.0 ((3.0))	4.5 ((3.5))	4.5 ((3.5))	4.5 ((3.5))
201-250	0.27-0.30	150	2.5 ((2.0))	2.5 ((2.0))	2.5	3.0 ((2.5))	3.0 ((2.5))
141-200	0.25-0.29	125	1.5	1.5	2.0 ((1.5))	2.0	2.0
105-140	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
((Domestic and Service Hot Water Systems							
105+	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5))
Cooling Systems (Chilled Water, Brine, and Refrigerant)							
40-60	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
<40	0.22-0.28	100	1.0	1.5	1.5	1.5	2.0

[1] For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:

$T = r\{(1 + t/r)^{K/k} - 1\}$

where

T = minimum insulation thickness (in.),

r = actual outside radius of pipe (in.),

t = insulation thickness listed in this table for applicable fluid temperature and pipe size,

K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature, Btu·in./(h·ft^2·°F); and

k= the upper value of the conductivity range listed in this table for the applicable fluid temperature.

[2] Piping insulation is not required between the control valve and coil on runouts when the control valve is located within 4 feet of the coil and the pipe size is 1 inch or less.

Section 14. The following sections of Chapter 15 of the 2009 Washington State Energy Code are amended, and new sections are added to that Chapter, as follows:

***

Section 1510 General Requirements: Lighting and motors shall comply with Sections 1511 through 1514. 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. In addition, parking garage lighting cannot be

traded with other interior lighting or with exterior lighting. See the Seattle Building Code, Section 3016.15, for energy efficiency requirements for lighting in elevators.

Transformers shall comply with Section 1540.

1511 Electric Motors: All permanently wired polyphase motors of 1 hp or more, which are not part of an HVAC system, shall comply with Section 1437.

EXCEPTIONS: 1. Motors that are an integral part of specialized process equipment.

2. Where the motor is integral to a listed piece of equipment for which no complying motor has been approved.

Informative Note: As indicated in Section 1120, the Energy Code applies to industrial facilities, as well as commercial and industrial processes. Thus, the motor efficiency requirements apply to industrial facilities, as well as systems and equipment used in commercial and industrial processes, unless a motor qualifies for one of the exceptions.

***

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.

3. Controls requiring trained operators.

4. Controls for safety hazards and security.

***

1513.3 Daylight Zone Control: All daylighted zones, as defined in Chapter 2, both under skylights((~~overhead glazing~~)) and adjacent to vertical fenestration((~~glazing~~)), shall be provided with individual controls, or daylight-or occupant-sensing automatic controls, which control the lights independent of general area lighting.

In all areas with skylights, monitors or other fenestration at or above ceiling level and in all areas with windows and all areas in parking garages with façade openings, all permanent luminaires in the daylighted zone shall be controlled by automatic daylight sensing controls. The primary daylighted zone shall be controlled separately from the secondary daylighted zone.

Automatic daylight sensing controls shall:

a. Be capable of reducing the light output of the controlled luminaires while maintaining a uniform level of illuminance by either:

   1. Continuous dimming to at least 20% light output; or

   2. Step switching of each lamp in individual luminaires (noncontinuous dimming devices shall have adjustable separation (deadband) of on and off points to prevent short cycling) and provide an automatic OFF control, switching alternate luminaires is not permitted except with single lamp luminaires; or

   3. Step dimming by reducing the output of all of the lamps in individual luminaires by at least 50% and provide an automatic OFF control.

b. Control only luminaires within the daylighted area.

c. Incorporate time-delay circuits to prevent cycling of light level changes of less than three minutes.

Any switching devices installed to override the automatic daylighting control shall comply with the criteria in Section 1513.6.2 items a through e.

Contiguous daylight zones adjacent to vertical fenestration((~~glazing~~))are allowed to be controlled by a single controlling device serving no more than eight fixtures or 60 linear feet of façade whichever is less provided that they do not include zones facing more than two adjacent cardinal orientations (i.e., north, east, south, west). Daylight zones under skylights((~~overhead glazing~~)) shall be controlled separately from daylight zones adjacent to vertical fenestration((~~glazing~~)).

EXCEPTION: The following are exempt from the requirements for automatic daylighting controls in Section 1513.3, if they have separate control of the lights in the daylight zone, which control is independent of general area lighting:

1. Retail and restaurant spaces adjacent to vertical fenestration((~~glazing~~)) (retail and restaurant spaces under skylights ((~~overhead glazing~~)) are not exempt).
2. Lighting exempted by Section 1512.
3. Display, exhibition and specialty lighting complying with Section 1513.4.
4. The following spaces are exempt from the requirements for automatic daylighting controls in Section 1513.3 provided that they have occupancy sensor controls that comply with Section 1513.6.1:
   a. Small spaces in the daylighted zone that are normally unoccupied (such as a storage room with a window or restrooms);
   b. Rooms less than 300 square feet; and

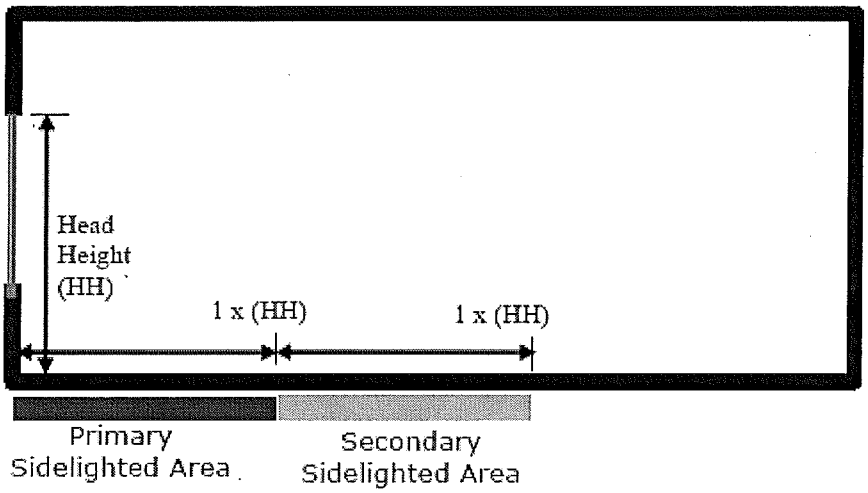
c. Conference rooms 300 square feet and larger that have a lighting control system with at least four scene options and an occupancy sensor control that complies with Section 1513.6.1.

5. HID lamps with automatic controls that are capable of reducing the power consumption by at least 50%.

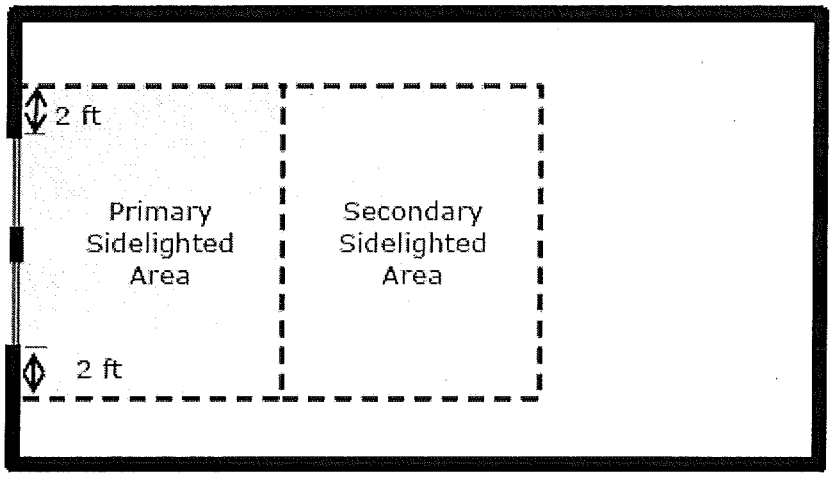
6. HID lamps 100 watts or less.

Informative Note: The following graphics from addendum ac to RS-9 provide a visual representation of the primary and secondary daylighting zones adjacent to vertical fenestration.

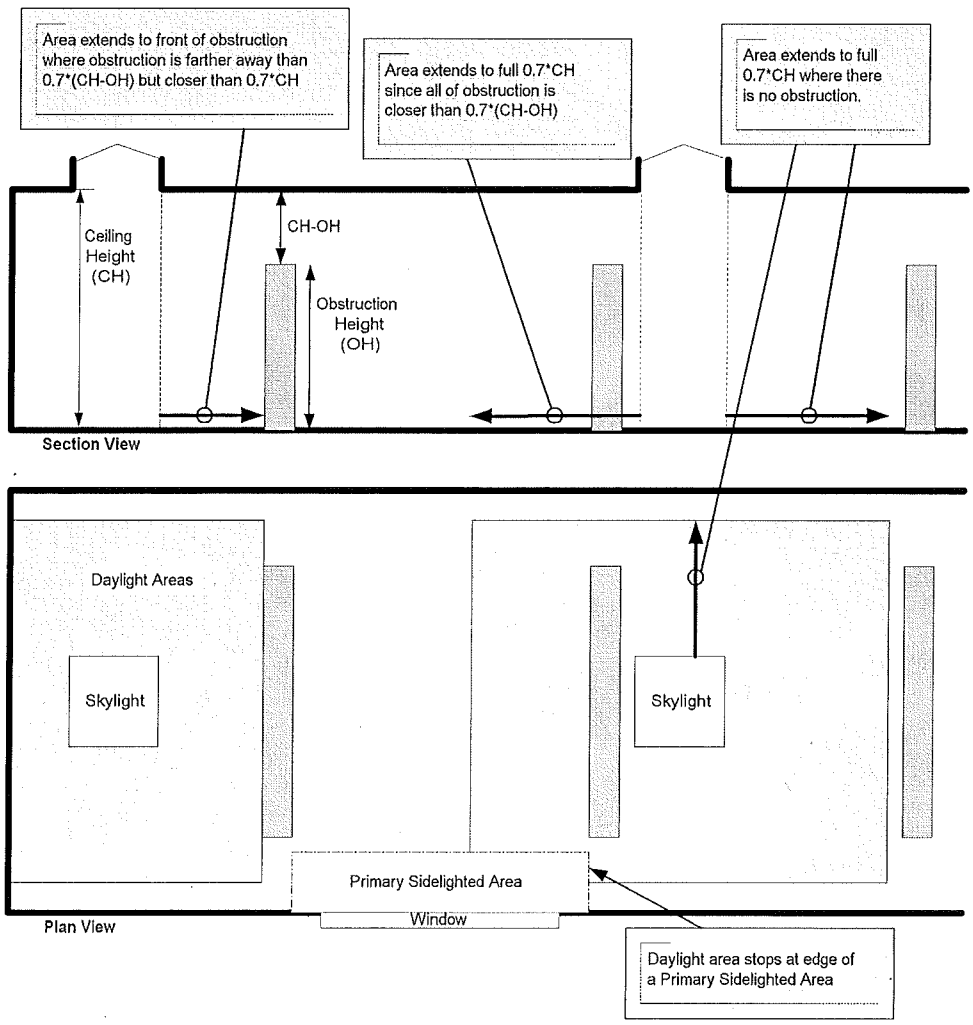
a) Section View

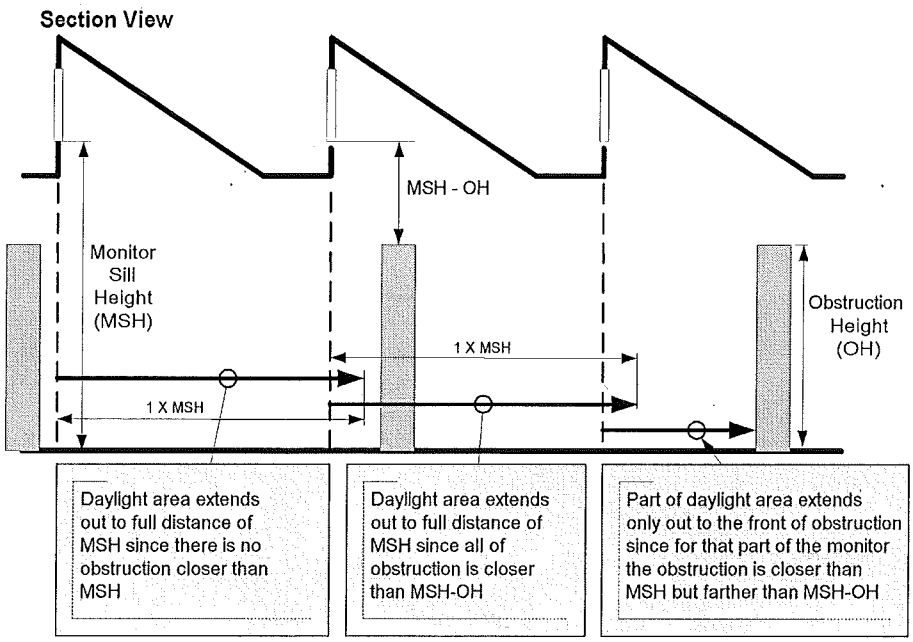


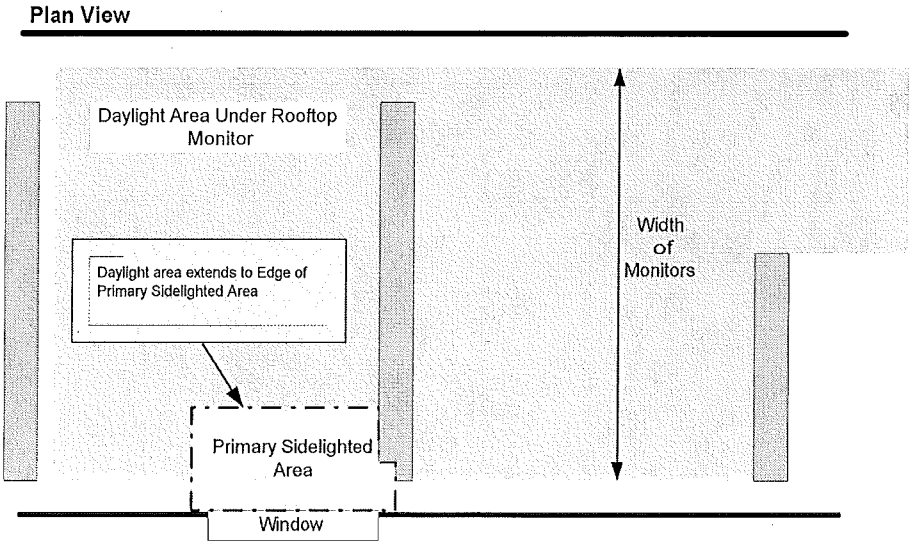
b) Plan View



Informative Note: The following graphics from addendum ab to RS-9 provide a visual representation of daylighting zones under skylights and under high vertical fenestration.







***

1513.5 Automatic <u>Reduction and</u> Shut-off Controls, Exterior: <u>Lighting for exterior applications not exempted in Section 1512 shall comply with the following requirements:</u>

a. Lighting shall be controlled by a device that automatically turns off the lighting when sufficient daylight is available by either:

i. A combination of a photosensor and a time switch; or

ii. An astronomical time switch.

b. All building façade lighting shall be automatically shut off between midnight or business/facility closing, whichever is later, and 6 am or business/facility opening, whichever comes first.

c. Lighting not specified in paragraph b above, including advertising signage, shall be controlled by a device that automatically reduces the connected lighting power, on a system-wide basis, by at least 30% for at least one of the following conditions:

1. from 12 midnight or one hour after the end of business/facility operations, if any, whichever is later, until 6am or business/facility opening, whichever is earlier; or

2. during any period when no activity has been detected for a time of no longer than 15 minutes.

((~~Lighting for all exterior applications shall have automatic controls capable of turning off exterior lighting when sufficient daylight is available or when the lighting is not required during nighttime hours. Lighting not designated for dusk-to-dawn operation shall be controlled by either:~~

~~a. A combination of a photosensor and a time switch; or~~

~~b. An astronomical time switch.~~

~~Lighting designated for dusk-to-dawn operation shall be controlled by an astronomical time switch or photosensor.~~)) All time switches shall be capable of retaining programming and the time setting during loss of power for a period of at least 10 hours.

EXCEPTION: Lighting for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation.

1513.6 Automatic Reduction and Shut-Off Controls, Interior: All buildings shall be equipped with separate automatic controls to shut off the lighting in all spaces during unoccupied hours, including lighting with dual functionality as normal and emergency lighting.

Within these buildings, the following spaces shall be equipped with occupancy sensors that comply with Section 1513.6.1:

a. all office areas less than 300 ft^2 enclosed by walls or ceiling-height partitions, and

b. all meeting and conference rooms, and training rooms,

c. all ((~~school~~)) classrooms and lecture halls,

d. all employee lunch and break rooms,

e. all rooms used for document copying and printing,

f. all restrooms,

g. all dressing, locker, and fitting rooms, and

h. warehouse and storage spaces greater than 50 ft^2((~~shall be equipped with occupancy sensors that comply with Section 1513.6.1~~)).

In addition, lighting in stairwells and parking garages shall have one or more control devices to automatically reduce lighting power in any one controlled zone by at least 50% within 30 minutes of all occupants leaving that controlled zone. Lighting zones for occupancy sensors in parking garages shall be no larger than 3,600 ft^2.

For all other spaces not specifically mentioned above, automatic controls may be an occupancy sensor, time switch, or other device capable of automatically shutting off lighting. (For hotel and motel guestrooms, see Section 1513.7.)

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 and means of egress illumination as required by code that are automatically OFF during normal building operation.
3. Switching for industrial or manufacturing process facilities as may be required for production.
4. 24-hour occupancy areas in hospitals and laboratory spaces.
5. Areas in which medical or dental tasks are performed are exempt from the occupancy sensor requirement.
6. Dwelling units.

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. Occupancy sensors either shall be manual ON or shall be controlled to automatically turn the lighting on to no more than 50% power.

EXCEPTIONS:

1. Occupancy sensors in stairwells are allowed to have two step lighting (high-light and low-light) provided the control fails in the high-light position.

2. Stairwells and parking garages are not permitted to have a wall-mounted manual switch.

3. Restrooms, warehouses, stairwells, and parking garages are allowed to use automatic ON to bring the lighting to 100% power.

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; and

c. Is manually operated;

d. Allows the lighting to remain on for no more than two hours when an over-ride is initiated; and

e. Controls an area not exceeding ((~~5,000~~)) 2,500 square feet or 5 percent of footprint for footprints over 100,000 square feet, whichever is greater.

***

1513.8 Commissioning Requirements: For lighting controls which include daylight or occupant sensing automatic controls, automatic shut-off controls, occupancy sensors, or automatic time switches, the lighting controls 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.

When occupant sensors, time switches, or photosensors are used, the following functionality testing shall be performed:

a. Confirm that the sensitivity and time-out adjustments for occupant sensors yield acceptable performance (i.e. lights turn off only after space is vacated). At initial installation, occupancy sensor controls shall be set to turn lights off at 15 minutes unless other thresholds are specifically mentioned in the approved permit.

b. Confirm that the time switches are programmed to turn the lights off.

c. Confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified. At initial installation, automatic daylighting sensor setpoints shall be set at 30 footcandles or not more than 110% of the footcandle level specified on the drawings in the approved permit.

The construction documents for the electrical permit shall state the party who will conduct and certify the functional testing. The party responsible for the functional testing shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria. Certification shall be specific enough to verify conformance.

See Section 1416 for complete requirements. Optional examples of test methods and forms are provided in Reference Standard 34.

1521 Prescriptive Interior Lighting Requirements: Spaces for which the Unit Lighting Power Allowance in Table 15-1 is 0.80 W/ft^2 or greater may use unlimited numbers of lighting

fixtures and lighting energy, provided that the installed lighting fixtures comply with all ((~~four~~)) three of the following criteria:

a. one-lamp ((~~or two-lamp (but not three-~~)) (but not two- or more lamp);

((~~b. luminaires have a reflector or louver assembly to direct the light (bare lamp strip or industrial fixtures do not comply with this section);~~))

b. ((~~c.~~)) fitted with type T-1, T-2, T-4, T-5, T-8 or compact fluorescent lamps from 5 to 60 watts (but not T-10 or T-12 lamps); and

c. ((~~d.~~)) hard-wired fluorescent electronic dimming ballasts with photocell or programmable dimming control for all lamps in all zones (nondimming electronic ballasts and electronic ballasts that screw into medium base sockets do not comply with this section).

Track lighting ((~~is~~)) and bare lamp strip or industrial fixtures are not allowed under this path.

EXCEPTIONS:

1. Up to a total of 5% of installed lighting fixtures 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. LED lights.
4. 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.

1531 Interior Lighting Power Allowance: The interior lighting power allowance shall be calculated by multiplying the gross interior floor area, in square feet, by the appropriate unit lighting power allowance, in watts per square foot, for the use as specified in Table 15-1. Accessory uses, including corridors, lobbies and toilet facilities shall be included with the primary use.

The lighting power allowance for each use shall be separately calculated and summed to obtain the interior lighting power allowance.

In cases where a lighting plan for only a portion of a building is submitted, the interior lighting power allowance shall be based on the gross interior floor area covered by the plan. Plans submitted for common areas only, including corridors, lobbies and toilet facilities shall use the lighting power allowance for common areas in Table 15-1.

When insufficient information is known about the specific use of the space, the allowance shall be based on the apparent intended use of the space.

Compliance shall be demonstrated separately for covered parking.

Informative Note: Section 1510 prohibits trading between interior and exterior lighting, and prohibits trading between parking garage lighting and other interior lighting or exterior lighting.

1532 Exterior lighting power allowance. All exterior building grounds luminaires that operate at greater than 100 watts shall contain lamps having a minimum efficacy of 60 lm/W unless the luminaire is controlled by a motion sensor or qualifies for one of the following exceptions.

The total exterior lighting power allowance for all exterior building applications is the sum of the base site allowance plus the individual allowances for areas that are designated on the buildings plans to be illuminated and are permitted in Table 15-2B for the applicable lighting zone. Trade-offs are allowed only among exterior lighting applications listed in the Table 15-2B "Tradable Surfaces" section. The lighting zone for building exterior is determined from Table 15-2A((~~unless otherwise specified by the local jurisdiction~~)).

EXCEPTION: Lighting used for the following exterior applications is exempt when equipped with a control device independent of the control of the nonexempt lighting:

a. Specialized signal, directional, and marker lighting associated with transportation.

b. ((~~Lighting integral to~~)) Internally-illuminated signs.

c. Lighting integral to equipment or instrumentation and installed by its manufacturer.

d. Lighting for theatrical purposes, including performance, stage, film production, and video production.

e. Lighting for athletic playing areas.

f. Temporary lighting.

g. Lighting for industrial production.

h. Theme elements in theme/amusement parks.

i. Lighting used to highlight features of public monuments.

j. Group U Occupancy accessory to Group R-3 or R-4 Occupancy.

For open parking and outdoor areas and roadways, luminaires mounted more than 15 feet above the ground shall be 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.)

Section 1540 Transformers: ((~~The minimum efficiency of a low voltage dry-type distribution transformer shall be the Class I Efficiency Levels for distribution transformers specified in Table 4-2 of the "Guide for Determining Energy Efficiency for Distribution Transformers" published by the National Electrical Manufacturers Association (NEMA TP-1-2002).~~)) Low voltage dry-type transformers shall comply with the provisions of the Energy Policy Act of 2005 where applicable, as shown in Table 15-3. Transformers that are not included in the scope of the Energy Policy Act of 2005 have no performance requirements in this section, and are listed for ease of reference below as exceptions.

Exceptions: Transformers that meet the Energy Policy Act of 2005 exclusions based on NEMA TP-1 definition:

1. special purpose applications.

2. not likely to be used in general purpose applications.

3. transformers with multiple voltage taps where the highest tap is at least 20% more than the lowest tap.

Products meeting these criteria and exempted from Section 1540 include the following: drive transformer, rectifier transformer, auto-transformer, uninterruptible power system transformer, impedance transformer, regulating transformer, sealed and nonventilating transformer, machine tool transformer, welding transformer, grounding transformer, or testing transformer.

TABLE 15-1
UNIT LIGHTING POWER ALLOWANCE (LPA)

Use[1]	LPA[2] (W/ft^2)
Automotive facility and aircraft maintenance	((~~0.85~~)) 0.82
Convention center	((~~1.10~~)) 1.08
Courthouse	((~~1.10~~)) 1.05
Cafeterias, fast food establishments[5], restaurants/bars[5]	((~~1.20~~)) 0.99

Dormitory	((~~0.85~~)) 0.61
Dwelling unit	1.00
Exercise center	((~~0.95~~)) 0.88
Gymnasia((~~9~~)), assembly spaces((~~9~~))	0.95
Health care clinic	((~~1.00~~)) 0.87
Hospital, pharmacies, nursing homes, and other Group I-1 and I-2 Occupancies	1.20
Hotel/motel	1.00
Laboratory spaces (all spaces not classified "laboratory" shall meet office and other appropriate categories)	1.62
Laundries	1.20
Libraries[5]	((~~1.20~~)) 1.18
Manufacturing facility	((~~1.20~~)) 1.11
Museum	1.00
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~~))	((~~0.91~~)) 0.90
Parking garages	0.20
Penitentiary and other Group I-3 Occupancies	0.90
Police and fire stations	0.90

Post office	((~~1.00~~) 0.87
Retail[10], retail banking, mall concourses, wholesale stores (pallet rack shelving)	1.33
School buildings (Group E Occupancy only), school classrooms, day care centers	((~~1.00~~)) 0.99
Theater, motion picture	((~~0.97~~)) 0.83
Theater, performing arts	1.25
Transportation	((~~0.80~~)) 0.77
Warehouses	0.50
Workshop	1.20
Plans Submitted for Common Areas Only((7))	
Main floor building lobbies[3] (except mall concourses)	1.10
All building common areas, corridors, toilet facilities and washrooms, elevator lobbies, including Group R-1 and R-2 Occupancies	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 Lighting 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.~~)) Reserved.

5. The watts per square foot of room may be increased by 2% per foot of ceiling height above 9 feet.

6. Reserved.

7. ((~~For conference rooms and offices less than 150 ft^2 with full-height partitions, a Unit Lighting Power Allowance of 1.1 w/ft^2 may be used.~~)) Reserved.

8. Reserved.

9. ((~~For indoor sport tournament courts with adjacent spectator seating over 5,000, the *Unit Lighting Power Allowance* for the court area is 2.60 W/ft^2.~~)) Reserved.

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 are exempt.

An additional lighting power allowance is allowed for merchandise display luminaires installed in retail sales area that are specifically designed and directed to highlight merchandise. The following additional wattages apply:

i. ((~~0.6~~)) 0.4 watts per square foot of sales floor area not listed in ii or iii below,

ii. ((~~1.4~~)) 0.9 watts per square foot of furniture, clothing, cosmetics or artwork floor area, or

iii. ((~~2.5~~)) 1.5 watts per square foot of jewelry, crystal, or china floor area.

The specified floor area for i, ii, or iii above, and the adjoining circulation paths shall be identified and specified on building plans. Calculate the additional power allowance by multiplying the above LPDs by the sales floor area for each department excluding major circulation paths. The total additional lighting power allowance is the sum of allowances for sales categories i, ii, or iii plus an additional 1,000 watts for each separate tenant larger than 250 square feet in area.

The additional wattage is allowed only if the merchandise display luminaires comply with all 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),

This additional lighting power is allowed only if the specified lighting is actually installed and automatically controlled, separately from the general lighting, to be turned off during nonbusiness hours. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose.

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.~~)) Reserved.

TABLE 15-2A

EXTERIOR LIGHTING ZONES

Lighting Zone	Description
1	Developed areas of national parks, state and city parks, forest
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed areas
3	All other areas
4	High activity commercial districts in major metropolitan areas as designated by the local jurisdiction

TABLE 15-2B

LIGHTING POWER DENSITIES FOR BUILDING EXTERIORS

Specific area description		Zone 1	Zone 2	Zone 3 and Zone 4	((~~Zone 4~~))
Base site allowance[1]		500 W	600 W	750 W	((~~1300 W~~))
Tradable Surfaces [2]					
Uncovered Parking Areas	Parking areas and drives	0.04 W/ft^2	0.06 W/ft^2	0.10 W/ft^2	((~~0.13 W/ft^2~~))

Building Grounds	Walkways less than 10 ft wide	0.70 W/linear foot	0.70 W/linear foot	0.80 W/linear foot	((~~1.0 W/linear foot~~))
	Walkways 10 ft wide or greater, Plaza areas, Special feature areas	0.14 W/ft^2	0.14 W/ft^2	0.16 W/ft^2	((~~0.2 W/ft^2~~))
	Exterior stairways	0.75 W/ft^2	1.00 W/ft^2	1.00 W/ft^2	((~~1.0 W/ft^2~~))
	Pedestrian tunnel	0.15 W/ft^2	0.15 W/ft^2	0.20 W/ft^2	((~~0.3 W/ft^2~~))
	Landscaping	0.04 W/ft^2	0.05 W/ft^2	0.05 W/ft^2	((~~0.05 W/ft^2~~))
Building Entrances and Exits	Main entries	20 W/linear foot of door width	20 W/linear foot of door width	30 W/linear foot of door width	((~~30 W/linear foot of door width~~))
	Other doors	20 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width	((~~20 W/linear foot of door width~~))
	Entry canopies	0.25 W/ft^2	0.25 W/ft^2	0.40 W/ft^2	((~~0.4 W/ft^2~~))
Sales Canopies	Free standing and attached	0.60 W/ft^2	0.60 W/ft^2	0.80 W/ft^2	((~~1.0 W/ft^2~~))
Outdoor Sales	Open areas[3]	0.25 W/ft^2	0.25 W/ft^2	0.50 W/ft^2	((~~0.7 W/ft^2~~))

	Street frontage for vehicle sales lots in addition to "open area" allowance	No Allowance	10 W/linear foot	10 W/linear foot	((~~30 W/linear foot~~))
Nontradable Surfaces[4]					
Building Facades and Signs		No Allowance	0.10 W/ft^2 for each illuminated wall or surface[5]	0.15 W/ft^2 for each illuminated wall or surface[6]	((~~0.2 W/ft^2 for each illuminated wall or surface~~[7]))
Automated Teller Machines and Night Depositories		270 W per location[8]	270 W per location[8]	270 W per location[8]	((~~270 W per location~~[8]))
Entrances and Gatehouse Inspection Stations at Guarded Facilities		0.75 W/ft^2 of covered and uncovered area	0.75 W/ft^2 of covered and uncovered area	0.75 W/ft^2 of covered and uncovered area	((~~0.75 W/ft^2 of covered and uncovered~~ , ~~area~~))
Loading Areas for Law Enforcement, Fire, Ambulance and Other Emergency Service Vehicles		0.50 W/ft^2 of covered and uncovered area	0.50 W/ft^2 of covered and uncovered area	0.50 W/ft^2 of covered and uncovered area	((~~0.5 W/ft^2 of covered and uncovered area~~))
Material Handling and Associated Storage		No Allowance	No Allowance	0.50 W/ft^2	((~~0.5 W/ft^2~~))

Drive-up Windows and Doors	400 W per drive-through	400 W per drive-through	400 W per drive-through	((~~400 W per drive-through~~))
Parking Near 24-hour Retail Entrances	800 W per main entry	800 W per main entry	800 W per main entry	((~~800 W per main entry~~))

FOOTNOTES FOR TABLE 15-2B:

1. Base site allowance may be used in tradable or nontradable surfaces.

2. Lighting power densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs and outdoor sales areas may be traded.

3. Including vehicle sales lots.

4. Lighting power density calculations for the following applications can be used only for the specific application and cannot be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the "Tradable Surfaces" section of this table.

5. May alternately use 2.5 watts per linear foot for each wall or surface length.

6. May alternately use 3.75 watts per linear foot for each wall or surface length.

7. May alternately use 5 watts per linear foot for each wall or surface length.

8. An additional 90 watts is allowed per additional ATM location.

TABLE 15-3

MINIMUM NOMINAL EFFICIENCY LEVELS FOR NEMA CLASS I LOW VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMERS[a]

Single Phase Transformers		Three Phase Transformers	
KVA[b]	Efficiency (%)[c]	KVA[b]	Efficiency (%)[c]
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

a. A low voltage distribution transformer is a transformer that is air-cooled, does not use oil as a coolant, has an input voltage <= 600 Volts, and is rated for operation at a frequency of 60 Hertz.

b. kiloVolt-Amp rating.

c. Nominal efficiencies shall be established in accordance with the NEMA TP-1 2002 test procedure for low voltage dry-type transformers. Class I Low Voltage Dry-Type is a National Electrical Manufacturers Association (NEMA) design class designation.

Section 15. A new Chapter 16 of the Seattle Energy Code is enacted, as follows:

CHAPTER 16
ON-SITE RENEWABLE ENERGY SYSTEMS

1601 Scope, Effective Date: This chapter covers the requirements for on-site renewable energy systems or additional energy savings by other means. This chapter applies to new buildings and additions of more than 5,000 ft^2 to existing buildings.

This Chapter 16 shall take effect on the effective date of a rule adopted under Section 1631 that provides alternate means of compliance. Prior to that date, references in this Code to Chapter 16 are not effective.

1610 General Requirements: The building shall include on-site renewable energy systems or shall comply with another option as indicated in Figure 16A:

a. Prescriptive. See Section 1621.

b. Alternate Means of Compliance. See Section 1631.

c. Systems Analysis. See Section 1141.4.

FIGURE 16A
ON-SITE RENEWABLE ENERGY SYSTEMS COMPLIANCE OPTIONS

Section Number	Subject	Prescriptive Option	DR with Alternate Means of Compliance	Systems Analysis Option
1610	General Requirements	X	X	X
1620	Prescriptive Option	X		
1621	Annual Production	X		
1630	Alternate Means of Compliance		X	
1631	Director's Rule		X	
RS-29	Systems Analysis			X

1620 Prescriptive Option for On-Site Renewable Energy Systems.

1621 Annual Production of On-site Renewable Energy Systems. Building projects shall contain on-site renewable energy systems that provide the annual energy production equivalent of 500 Btu/ft^2 of gross conditioned floor area. The annual energy production shall be the combined sum of all on-site renewable energy systems.

1630 Alternate Means of Compliance.

1631 Development by Director's Rule. The Director of DPD shall develop and adopt by rule one or more alternate means of compliance for this Chapter. Each alternate means of compliance shall be designed to achieve energy savings that are at least as great as the energy production achieved over the expected life of the building through compliance with Section 1621. Alternate means allowed by rule may include, without limitation, payments or contributions related to off-site renewable energy production.

On-site renewable energy systems are preferred. This section is intended to ensure that a feasible alternative is available when the nature of a site or project makes on-site renewable energy systems impracticable, without requiring a determination as to practicality in each case. This section is not intended to authorize any financially more attractive means of compliance for a typical project than compliance with Section 1621, taking into account expected costs and benefits of each option over the expected life of the building, and without regard to any subsidies that may be available for on-site renewable energy systems.

Informative Note: The 2030 Challenge specifies a set of total building energy consumption thresholds that gradually reduce over time to reach net-zero energy consumption in new buildings by 2030. (A rough rule-of-thumb from those working on net-zero energy buildings in the Northwest is that net-zero energy buildings would be achieved by a combination of a 75%

reduction in building energy load with the remaining 25% being provided by on-site renewable energy.)

The 2010 threshold is for new buildings to use at least 60% less energy than the average existing building. Taking office buildings as an example, the maximum energy use for new office buildings in Seattle is approximately 32,400 Btu/ft^2·yr (as the baseline for the average existing office building is 81,000 Btu/ft^2·yr).

The value of 500 Btu/ft^2 of gross conditioned floor area is approximately 1.5 % of the total energy consumption of a new office building complying with the 2030 Challenge and consuming 32,400 Btu/ft^2·yr. As service water heating loads in office buildings are often in the range of 3-5% of total energy consumption, this means that a solar water heating system could be an option for complying with the prescriptive on-site renewable energy system option (as an alternative to photovoltaics).

For photovoltaic (PV) systems, local conservative rules of thumb are 1000 kWh and 100 ft^2 per kW of DC rated PV capacity. In practice, performance in any given year may be 1200 kWh/kW or higher, based on metered data from customer systems in the Seattle City Light service area (approximately 235 systems as of early 2010). Some newer crystalline modules are rated at 12 - 14 W/ft^2.

See DPD's Client Assistance Memo 420, Solar Energy Systems, for discussion of permit requirements, land use requirements, design and installation considerations, interconnection and net metering requirements, financial incentives, and sources for further information.

Section 16. The following sections or subsections of Reference Standard 29 of the 2009 Washington State Energy Code are amended as follows:

((~~APPENDIX~~))

REFERENCE STANDARD 29

(RS-29)

NONRESIDENTIAL AND MULTIFAMILY RESIDENTIAL BUILDING DESIGN BY SYSTEMS ANALYSIS

***

REFERENCE STANDARD-29

NONRESIDENTIAL AND MULTIFAMILY RESIDENTIAL BUILDING DESIGN BY SYSTEMS ANALYSIS

NOTE: ((~~Washington State~~))Seattle Energy Code Reference Standard 29 (RS-29) is a modified version of Appendix G from ASHRAE/IESNA Standard 90.1-2007.

RS-29 has been completely rewritten from the 2006 Edition.

***

1.1 General: This Standard establishes design criteria in terms of total energy consumption of a building, including all of its systems.

The building permit application for projects utilizing this Standard shall include in one submittal all building and mechanical drawings and all information necessary to verify that the building envelope and mechanical design for the project corresponds with the annual energy analysis. If credit is proposed to be taken for lighting energy savings, then an electrical permit application shall also be submitted and approved prior to the issuance of the building permit. If credit is proposed to be taken for energy savings from other components, then the corresponding permit application (e.g., plumbing, boiler, etc.) shall also be submitted and approved prior to the

building permit application. Otherwise, components of the project that would not be approved as part of a building permit application shall be modeled the same in both the proposed building and the baseline
building and shall comply with the requirements of the ((~~Washington State~~)) Seattle Energy Code.

1.2 Performance Rating. This performance rating method requires conformance with the following provisions:

All requirements of Sections 1201 through ((~~1202~~)) 1204, 1310 through 1314, 1410 through 1416, 1440 through 1446, 1450 through 1455, 1460 through 1465, 1510 through 1514, and 1540 are met. These sections contain the mandatory provisions of the standard and are prerequisites for this rating method. The proposed design shall not vary from those requirements in Sections 1320 through 1334, 1420 through 1439, 1470, 1475, 1520 through 1532, and 1620 through 1621 except to the extent those variations have been accurately and completely modeled. Where variations are not specifically analyzed, the proposed design shall comply with the requirements of the sections referred to in the preceding sentence.

The improved performance of the proposed building design is calculated in accordance with provisions of this ((~~appendix~~))standard using the following formula:

Percentage improvement = 100 x (Baseline building performance - Proposed building performance) / Baseline building performance

A "proposed building" designed in accordance with this standard will be deemed as complying with this Code, if the calculated annual energy consumption is 5% LESS than that of a corresponding "baseline building."

Notes: 1. Both the proposed building performance and the baseline building performance shall include all end-use load components, such as receptacle and process loads.

2. Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

1.3 Trade-Off Limits. When the proposed modifications apply to less than the whole building, only parameters related to the systems to be modified shall be allowed to vary. Parameters relating to unmodified existing conditions or to future building components shall be identical for determining both the baseline building performance and the proposed building performance. Future building components shall meet the requirements of Sections 1320 through 1334, 1420 through 1439, 1470, 1475, ((~~and~~)) 1530 through 1532, and 1620 through 1631.

1.4 Documentation Requirements: Simulated performance shall be documented, and documentation shall be submitted to the building official in accordance with the Reporting Format in Section 5 of RS-29. The information submitted shall include the material specified in Section 5 of RS-29 as well as the following:

a. Calculated values for the baseline building performance, the proposed building performance, and the percentage improvement.

b. A list of the energy-related features that are included in the design and on which the performance rating is based. This list shall document all energy features that differ between the models used in the baseline building performance and proposed building performance calculations.

c. Input and output report(s) from the simulation program or compliance software including a breakdown of energy usage by at least the following components: Lights, internal equipment loads, service water heating equipment, space heating equipment, space cooling and heat rejection equipment, fans, and other HVAC equipment (such as pumps). The output reports shall also show the amount of time any loads are not met by the HVAC system for both the proposed design and baseline building design.

d. An explanation of any error messages noted in the simulation program output.

***

2.3 Climatic Data: The simulation program shall perform the simulation using hourly values of climatic data, such as temperature and humidity from representative climatic data, for the site in which the proposed design is to be located. For cities or urban regions with several climatic data entries, and for locations where weather data are not available, the designer shall select available weather data that best represent the climate at the construction site. The selected weather data shall be approved by the building official.

Exterior design conditions are 24°F dry bulb for heating and 82°F dry bulb/66°F wet bulb for cooling.

For ground temperatures for below-grade wall and basement floor heat loss calculations, it is acceptable to use an annual average ground temperature of 53°F. If monthly temperatures are desired, the following values are acceptable: J - 49°F, F - 48°F, M - 49°F, A - 51°F, M - 53°F, J - 55°F, J - 57°F, A - 58°F, S - 57°F, O - 55°F, N - 53°F, D - 51°F.

For water main temperatures, it is acceptable to use an annual water main supply temperature of 53°F. If monthly temperatures are desired, the following values are acceptable: J

- 44°F, F - 44°F, M - 46°F, A - 51°F, M - 56°F, J - 61°F, J - 65°F, A - 66°F, S - 59°F, O - 50°F, N - 49°F, D - 45°F (based on 14-year average from Seattle Water Department).

2.4 Energy Conversion: The comparison between the baseline building and proposed design shall be expressed as kBtu input per square foot of conditioned floor area per year at the building site. Buildings which use electricity as the only fuel source, comparisons may be expressed in kWh. When converting electricity in kWh to kBtu a multiplier of 3.413 kWh/kBtu shall be used.

EXCEPTION: On-site renewable energy sources or site recovered energy shall not be considered to be consumed energy and shall not be included in the proposed building performance. When Chapter 16 of this Code applies, baseline building performance shall exclude from consumed energy the amount that is or would be provided by on-site renewable energy sources to comply with the prescriptive option in Section 1621. ((~~Where~~)) To the extent that on-site renewable or site-recovered sources are used and would not be required to satisfy Section 1621, the baseline building performance shall be based on the energy source used as the backup energy source or on the use of electricity if no backup energy source has been specified.

2.5 Exceptional Calculation Methods. Where no simulation program is available that adequately models a design, material, or device, the building official may approve an exceptional calculation method to demonstrate above-standard performance using this method.

Applications for approval of an exceptional method shall include documentation of the calculations performed and theoretical and/or empirical information supporting the accuracy of the method.

If there are multiple designs, materials or devices that the simulation program does not model, each shall be calculated separately and energy savings from the exceptional method determined for each. Unless otherwise approved by the building official, at no time shall the total energy savings from the exceptional method constitute more than one-half of the difference

between the baseline building performance and the proposed building performance. All applications for approval of an exceptional method shall include:

a. step-by-step documentation of the exceptional calculation method performed detailed enough to enable the reader to reproduce the results;

b. copies of all spreadsheets used to perform the calculations;

c. a sensitivity analysis of energy consumption when each of the input parameters is varied from half to double the value assumed;

d. calculations performed on a time step basis consistent with the simulation program used;

e. the percentage improvement calculated with and without the exceptional calculation method.

***

3.1 Building Performance Calculations. The simulation model for calculating the proposed and baseline building performance shall be developed in accordance with the requirements in Table 3.1. The specifications of the proposed design used in the analysis shall be as similar as is reasonably practical to those in the plans submitted for a permit. In all cases, the baseline building shall comply with Sections 1320 through 1334, 1420 through 1439, 1470, 1475, 1520 through 1532, and 1620 through 1631. Where this Code does not contain requirements, the specifications and operations of the standard design and of the proposed design shall be identical. Where assumptions are not specified in this Code, the values shall be based on accepted engineering practice and are subject to the review and approval of the building official.

For the baseline building and the proposed building, shading by permanent structures and terrain shall be taken into account for computing energy consumption whether or not these

features are located on the building site. A permanent fixture is one that is likely to remain for the life of the proposed design.

***

3.1.2.2 Equipment Capacities. The equipment capacities for the baseline building design shall be based on sizing runs for each orientation (per Table 3.1, No. 5a) and shall be oversized by 15% for cooling and 25% for heating, i.e., the ratio between the capacities used in the annual simulations and the capacities determined by the sizing runs shall be 1.15 for cooling and 1.25 for heating. Unmet load hours for the proposed design or baseline building designs shall not exceed 300 (of the 8760 hours simulated), and unmet load hours for the proposed design shall not exceed the number of unmet load hours for the baseline building design ((~~by more than 50~~)). ((~~If unmet load hours in the proposed design exceed the unmet load hours in the baseline building by more than 50, simulated capacities in the baseline building shall be decreased incrementally and the building resimulated until the unmet load hours are within 50 of the unmet load hours of the proposed design.~~)) If unmet load hours for the proposed design or baseline building design exceed 300, simulated capacities shall be increased incrementally, and the building with unmet loads resimulated until unmet load hours are reduced to 300 or less. Alternatively, unmet load hours exceeding these limits may be accepted at the discretion of the building official provided that sufficient justification is given indicating that the accuracy of the simulation is not significantly compromised by these unmet loads.

***

3.1.2.9 System Fan Power. System fan electrical power for supply, return, exhaust, and relief (excluding power to fan-powered VAV boxes) shall be calculated using the following formulas:

For Systems 1 and 2,

$P_{fan} = CFMS \times 0.3.$

For Systems 3 through 8,

$P_{fan} = bhp \times 746/\text{Fan Motor Efficiency}.$

Where:

P_{fan} = Electric power to fan motor (watts) and

bhp = Brake horsepower of baseline fan motor from Table 3.1.2.9. Single zone variable-air-volume systems shall comply with the constant volume fan power limitation.

Fan Motor Efficiency = The efficiency from Table 14-4 for the next motor size greater than the bhp using the enclosed motor at 1800 rpm.

CFMS = The baseline system maximum design supply fan airflow rate in cfm.

***

TABLE 3.1

Modeling Requirements for Calculating Proposed and Baseline Building Performance

No. Proposed Building Performance	Baseline Building Performance
1. Design Model	
a. The simulation model of the proposed design shall be consistent with the design documents, including proper accounting of fenestration and opaque envelope types and areas; interior lighting power and controls; HVAC system types, sizes, and controls; and service water heating systems and controls. All end-use load components within and associated with the building shall be modeled, including, but not limited to, exhaust fans, parking garage ventilation fans, snow-melt and freeze-protection equipment, facade lighting, swimming pool heaters and pumps, elevators and escalators, refrigeration, and cooking. Where the simulation program does not specifically model the functionality of the installed system, spreadsheets or other documentation of the assumptions shall be used to generate the power demand and operating schedule of the systems.	The baseline building design shall be modeled with the same number of floors and identical conditioned floor area as the proposed design.
b. All conditioned spaces in the proposed design shall be simulated as being both heated and cooled even if no heating or cooling system is to be installed, and temperature and humidity control setpoints and schedules shall be the same for proposed and baseline building designs. Unless otherwise expressly permitted by the building official based on the needs of a particular use, space temperature controls shall be set at 70°F for space heating and 75°F for space cooling, with a deadband in accordance with Section 1412.2.	

No. Proposed Building Performance	Baseline Building Performance
The system shall be OFF during off-hours according to the appropriate schedule in Table 3.3, except that the heating system shall cycle ON if any space should drop below the setback temperature of 55°F and the cooling system shall cycle ON if any space should rise above the setup temperature of 99°F. c. When the performance rating method is applied to buildings in which energy-related features have not yet been designed (e.g., a lighting system), those yet-to-be-designed features shall be described in the proposed design exactly as they are defined in the baseline building design. Where the space classification for a space is not known, the space shall be categorized as an office space.	
2. Additions and Alterations	

No. Proposed Building Performance	Baseline Building Performance
It is acceptable to predict performance using building models that exclude parts of the existing building provided that all of the following conditions are met: a. Work to be performed in excluded parts of the building shall meet the requirements of Chapters 11 through ((~~15~~)) 16. b. Excluded parts of the building are served by HVAC systems that are entirely separate from those serving parts of the building that are included in the building model. c. Design space temperature and HVAC system operating setpoints and schedules on either side of the boundary between included and excluded parts of the building are essentially the same. d. If a declining block or similar utility rate is being used in the analysis and the excluded and included parts of the building are on the same utility meter, the rate shall reflect the utility block or rate for the building plus the addition.	Same as Proposed Design
3. Space Use Classification	

No. Proposed Building Performance	Baseline Building Performance
Usage for each space shall be specified using the ((~~building type or space type~~)) lighting classifications in accordance with Sections 1530 through 1531. ((~~The user shall specify the space use classifications using either the building type or space type categories but shall not combine the two types of categories. More than one building type category may be used in a building if it is a mixed-use facility. If space type categories are used, the user may simplify the placement of the various space types within the building model, provided that building total areas for each space type are accurate.~~))	Same as Proposed Design
4. Schedules	

No. Proposed Building Performance	Baseline Building Performance
Schedules capable of modeling hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation shall be used. The schedules shall be typical of the proposed building type as determined by the designer and approved by the building official. Default schedules are included in Tables 3.3A through 3.3J. HVAC Fan Schedules. Schedules for HVAC fans that provide outdoor air for ventilation shall run continuously whenever spaces are occupied and shall be cycled on and off to meet heating and cooling loads during unoccupied hours. **Exceptions:** a. Where no heating and/or cooling system is to be installed and a heating or cooling system is being simulated only to meet the requirements described in this table, heating and/or cooling system fans shall not be simulated as running continuously during occupied hours but shall be cycled on and off to meet heating and cooling loads during all hours. b. HVAC fans shall remain on during occupied and unoccupied hours in spaces that have health and safety mandated minimum ventilation requirements during unoccupied hours.	Same as Proposed Design **Exception:** Schedules may be allowed to differ between proposed design and baseline building design when necessary to model nonstandard efficiency measures, provided that the revised schedules have the approval of the building official. Measures that may warrant use of different schedules include, but are not limited to, lighting controls, ((~~natural ventilation,~~)) demand control ventilation, and measures that reduce service water heating loads.
5. Building Envelope	

No. Proposed Building Performance	Baseline Building Performance
All components of the building envelope in the proposed design shall be modeled as shown on architectural drawings or as built for existing building envelopes. For infiltration, the air leakage rate as determined below shall be modeled at 100% when the building fan system is off, and at 25% when the building fan system is on, unless otherwise approved by the building official for unusually pressurized buildings. Per PNNL Report 18898, Infiltration Modeling Guidelines for Commercial Building Energy Analysis, the building air leakage rates as determined in accordance with Section 1314.6.2 at 0.30 in. w.g. (75 Pa) shall be converted for modeling in annual energy analysis programs by being multiplied by 0.112 unless other multipliers are approved by the building official (e.g. a tested air leakage of 0.40 cfm/ft^2 of building envelope area at 0.30 in. w.g. (75 Pa) would be modeled at 0.045 cfm/ft^2 of building envelope area). The Proposed Building air leakage rate shall be the same as the Standard Design. The Proposed Building shall comply with Section 1314.6.3. **Exceptions:** The following building elements are permitted to differ from architectural drawings. a. All uninsulated assemblies (e.g., projecting balconies, perimeter edges of intermediate floor slabs, concrete floor beams over parking garages, roof parapet) shall be separately modeled ((~~using either of the following techniques:~~ ~~1. Separate model of each of these assemblies within the energy simulation model.~~ ~~2. Separate calculation of the U-factor for each of these assemblies. The U-factors of these assemblies are then averaged with larger adjacent surfaces using an area-weighted average method. This average U-factor is modeled within the energy simulation model~~)). Any other envelope assembly that covers less than 5% of the total area of that assembly	Equivalent dimensions shall be assumed for each exterior envelope component type as in the proposed design; i.e., the total gross area of exterior walls shall be the same in the proposed and baseline building designs. The same shall be true for the areas of roofs, floors, and doors, and the exposed perimeters of concrete slabs on grade shall also be the same in the proposed and baseline building designs. The following additional requirements shall apply to the modeling of the baseline building design: a. **Orientation.** The baseline building performance shall be generated by simulating the building with its actual orientation and again after rotating the entire building 90, 180, and 270 degrees, then averaging the results. The building shall be modeled so that it does not shade itself. b. **Opaque Assemblies.** Opaque assemblies used for new buildings or additions shall conform with the following common, lightweight assembly types and shall match the appropriate

No. Proposed Building Performance	Baseline Building Performance
	c. **Vertical Fenestration.** Vertical fenestration areas for new buildings and additions shall equal that in the proposed design or 40%-of gross above-grade wall area, whichever is smaller, and shall be distributed on each face of the building in the same proportions in the proposed design. Fenestration U-factors and SHGC shall match the appropriate requirements in Tables 13-1 and 13-2. All vertical glazing shall be assumed to be flush with the exterior wall, and no shading projections shall be modeled. Manual window shading devices such as blinds or shades shall not be modeled. The fenestration areas for envelope alterations shall reflect the limitations on area, U-factor, and SHGC as described in Section 1132.1.

No. Proposed Building Performance	Baseline Building Performance
	d. **Skylights and Glazed Smoke Vents.** Skylight area shall be equal to that in the proposed building design or 5% of the gross roof area that is part of the building envelope, whichever is smaller. If the skylight area of the proposed building design is greater than 5% of the gross roof area, baseline skylight area shall be decreased by an identical percentage in all roof components in which skylights are located to reach the 5% skylight-to-roof ratio. Skylight orientation and tilt shall be the same as in the proposed building design. Skylight U-factor and SHGC properties shall match the appropriate requirements in Tables 13-1 and 13-2. e. **Roof albedo.** All roof surfaces shall be modeled with a reflectivity of 0.30.

No. Proposed Building Performance	Baseline Building Performance
	f. **Existing Buildings.** For existing building envelopes, the baseline building design shall reflect existing conditions prior to any revisions that are part of the scope of work being evaluated. g. **Air leakage.** The Baseline Building air leakage rate shall match the value determined according to Section 1314.6.2. The air leakage rates at standard test conditions shall be converted for energy modeling purposes as described under "Proposed Building Performance" in this table. The air leakage percentage modeled for hours when the fan system is off and the air leakage percentage modeled for hours when the fan system is on shall be the same as the Proposed Building.
6. Lighting	

No. Proposed Building Performance	Baseline Building Performance
Lighting power in the proposed design shall be determined as follows: a. Where a complete lighting system exists, the actual lighting power for each thermal block shall be used in the model. b. Where a lighting system has been designed, lighting power shall be determined in accordance with Chapter 15. c. Where lighting neither exists nor is specified, lighting power shall be determined in accordance with the building area method for the appropriate building type. d. Lighting system power shall include all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures). **Exception:** For multifamily dwelling units, hotel/motel guest rooms, and other spaces in	Lighting power in the baseline building design shall be determined using the same categorization procedure and categories as the proposed design with lighting power set equal to the maximum allowed for the corresponding method and category in Chapter 15. Automatic lighting controls (e.g., programmable controls or automatic controls for daylight utilization) shall be modeled in the baseline building design as required by Section 1513.

No. Proposed Building Performance	Baseline Building Performance
which lighting systems are connected via receptacles and are not shown or provided for on building plans, assume identical lighting power for the proposed and baseline building designs in the simulations. e. Lighting power for parking garages and building facades shall be modeled. f. Credit may be taken for the use of automatic controls for daylight utilization not otherwise required by Section 1513 but only if their operation is either modeled directly in the building simulation or modeled in the building simulation through schedule adjustments determined by a separate daylighting analysis approved by the building official. g. For automatic lighting controls in addition to those required for minimum code compliance under Section 1513, credit may be taken for automatically controlled systems by reducing the connected lighting power by the applicable percentages listed in Table 3.2. Alternatively, credit may be taken for these devices by modifying the lighting schedules used for the proposed design, provided that credible technical documentation for the modifications are provided to the building official.	
Informative Note: Per Section 1510, interior and exterior lighting cannot be traded. In addition, parking garage lighting cannot be traded with other interior lighting or with exterior lighting.	

No. Proposed Building Performance	Baseline Building Performance
7. Thermal Blocks--HVAC Zones Designed	
Where HVAC zones are defined on HVAC design drawings, each HVAC zone shall be modeled as a separate thermal block. Exception: Different HVAC zones may be combined to create a single thermal block or identical thermal blocks to which multipliers are applied, provided that all of the following conditions are met: a. The space use classification is the same throughout the thermal block. b. All HVAC zones in the thermal block that are adjacent to glazed exterior walls face the same orientation or their orientations vary by less than 45 degrees. c. All of the zones are served by the same HVAC system or by the same kind of HVAC system.	Same as Proposed Design
8. Thermal Blocks--HVAC Zones Not Designed	
Where the HVAC zones and systems have not yet been designed, thermal blocks shall be defined based on similar internal load densities, occupancy, lighting, thermal and space temperature schedules, and in combination with the following guidelines:	Same as Proposed Design.

No. Proposed Building Performance	Baseline Building Performance
a. Separate thermal blocks shall be assumed for interior and perimeter spaces. Interior spaces shall be those located greater than 15 ft from an exterior wall. Perimeter spaces shall be those located within 15 ft of an exterior wall. b. Separate thermal blocks shall be assumed for spaces adjacent to glazed exterior walls; a separate zone shall be provided for each orientation, except that orientations that differ by less than 45 degrees may be considered to be the same orientation. Each zone shall include all floor area that is 15 ft or less from a glazed perimeter wall, except that floor area within 15 ft of glazed perimeter walls having more than one orientation shall be divided proportionately between zones. c. Separate thermal blocks shall be assumed for spaces having floors that are in contact with the ground or exposed to ambient conditions from zones that do not share these features. d. Separate thermal blocks shall be assumed for spaces having exterior ceiling or roof assemblies from zones that do not share these features.	
9. Thermal Blocks--Multifamily Residential Buildings	
Residential spaces shall be modeled using at least one thermal block per dwelling unit, except that those units facing the same orientations may be combined into one thermal block. Corner units and units with roof or floor loads shall only be combined with units sharing these features.	Same as Proposed Design.

No. Proposed Building Performance	Baseline Building Performance
10. HVAC Systems	
The HVAC system type and all related performance parameters in the proposed design, such as equipment capacities and efficiencies, shall be determined as follows: a. Where a complete HVAC system exists, the model shall reflect the actual system type using actual component capacities and efficiencies. b. Where an HVAC system has been designed, the HVAC model shall be consistent with design documents. Mechanical equipment efficiencies shall be adjusted from actual design conditions to the standard rating conditions specified in Section 1411 if required by the simulation model. c. Where no heating system exists or no heating system has been specified, the heating system classification shall be assumed to be electric, and the system characteristics shall be identical to the system modeled in the baseline building design. d. Where no cooling system exists or no cooling system has been specified, the cooling system shall be identical to the system modeled in the baseline building design.	The HVAC system(s) in the baseline building design shall be of the type and description specified in Section 3.1.1, shall meet the general HVAC system requirements specified in Section 3.1.2, and shall meet any system-specific requirements in Section 3.1.3 that are applicable to the baseline HVAC system type(s).
11. Service Hot-Water Systems	

No. Proposed Building Performance	Baseline Building Performance
The service hot-water system type and all related performance parameters, such as equipment capacities and efficiencies, in the proposed design shall be determined as follows:	The service hot-water system in the baseline building design shall use the same energy source as the corresponding system in the proposed design and shall conform with the following conditions:
a. Where a complete service hot-water system exists, the proposed design shall reflect the actual system type using actual component capacities and efficiencies.	a. Where the complete service hot-water system exists, the baseline building design shall reflect the actual system type using the actual component capacities and efficiencies.
b. Where a service hot-water system has been specified, the service hot-water model shall be consistent with design documents.	b. Where a new service hot-water system has been specified, the system shall be sized using the same methods and values as the proposed design and the equipment shall match the minimum efficiency requirements in Chapter 14. Where the energy source is electricity, the heating method shall be electrical resistance.

No. Proposed Building Performance	Baseline Building Performance
c. Where no service hot-water system exists or has been specified but the building will have service hot-water loads, a service hot-water system shall be modeled that matches the system in the baseline building design and serves the same hot-water loads.	c. Where no service hot-water system exists or has been specified but the building will have service hot-water loads, a service water system(s) using electrical-resistance heat and matching minimum efficiency requirements of Chapter 14 shall be assumed and modeled identically in the proposed and baseline building designs.
d. For buildings that will have no service hot-water loads, no service hot-water system shall be modeled.	d. For buildings that will have no service hot-water loads, no service hot-water heating shall be modeled.
	e. Where a combined system has been specified to meet both space heating and service water heating loads, the baseline building system shall use separate systems meeting the minimum efficiency requirements applicable to each system individually.

No. Proposed Building Performance	Baseline Building Performance
	f. For large, 24-hour-per-day facilities that meet the prescriptive criteria for use of condenser heat recovery systems described in Section 1436.3, a system meeting the requirements of that section shall be included in the baseline building design regardless of the exceptions to Section 1436.3. Exception: If a condenser heat recovery system meeting the requirements described in Section 1436.3 cannot be modeled, the requirement for including such a system in the actual building shall be met as a prescriptive requirement in accordance with Section 1436.3, and no heat-recovery system shall be included in the proposed or baseline building designs.

No. Proposed Building Performance	Baseline Building Performance
	g. Service hot-water energy consumption shall be calculated explicitly based upon the volume of service hot water required and the entering makeup water and the leaving service hot-water temperatures. Entering water temperatures shall be estimated based upon the location. Leaving temperatures shall be based upon the end-use requirements. h. Where recirculation pumps are used to ensure prompt availability of service hot water at the end use, the energy consumption of such pumps shall be calculated explicitly. i. Service water loads and usage shall be the same for both the baseline building design and the proposed design and shall be documented by the calculation procedures recommended by the manufacturer's specifications or generally accepted engineering methods.

No.	Proposed Building Performance	Baseline Building Performance
		Exceptions: 1. Appliances that are not built-in (e.g., washing machines) and plumbing fixtures (e.g., faucets and low-flow showerheads) shall be modeled the same for both the baseline building design and the proposed design. Other service hot-water usage can be demonstrated to be reduced by documented water conservation measures that reduce the physical volume of service water required. Such reduction shall be demonstrated by calculations.

No. Proposed Building Performance	Baseline Building Performance
	2. Service hot-water energy consumption can be demonstrated to be reduced by reducing the required temperature of service mixed water, by increasing the temperature, or by increasing the temperature of the entering makeup water. Examples include alternative sanitizing technologies for dishwashing and heat recovery to entering makeup water. Such reduction shall be demonstrated by calculations. 3. Service hot-water usage can be demonstrated to be reduced by reducing the hot fraction of mixed water to achieve required operational temperature. Examples include shower or laundry heat recovery to incoming cold-water supply, reducing the hot-water fraction required to meet required mixed-water temperature. Such reduction shall be demonstrated by calculations.
12. Receptacle and Other Loads	

No. Proposed Building Performance	Baseline Building Performance
Receptacle and process loads where not otherwise covered by this Code, such as those for office and other equipment, shall be estimated based on the building type or space type category and shall be assumed to be identical in the proposed and baseline building designs. These loads shall be included in simulations of the building and shall be included when calculating the baseline building performance and proposed building performance. Default process loads are included in Table 3.4.1.	Other systems, such as motors covered by Sections 1437, 1438 and 1511, and miscellaneous loads shall be modeled as identical to those in the proposed design including schedules of operation and control of the equipment. Where there are specific efficiency requirements in Sections 1437, 1438 and 1511, these systems or components shall be modeled as having the lowest efficiency allowed by those requirements. Where no efficiency requirements exist, power and energy rating or capacity of the equipment shall be identical between the baseline building and the proposed design with the following exception: Variations of the power requirements, schedules, or control sequences of the equipment modeled in the baseline building from those in the proposed design may be allowed by the building official based upon documentation that the equipment installed in the proposed design represents a significant verifiable departure from documented conventional practice. The burden of this documentation is to demonstrate that accepted conventional

No. Proposed Building Performance	Baseline Building Performance
13. Modeling Limitations to the Simulation Program	
If the simulation program cannot model a component or system included in the proposed design explicitly, substitute a thermodynamically similar component model that can approximate the expected performance of the component that cannot be modeled explicitly.	Same as Proposed Design.

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TABLE 3.3A

Assembly Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
3 (2-3 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0

4	(3-4 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
5	(4-5 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
6	(5-6 am)	0	0	0	5	5	5	On	Off	Off	0	0	0	0	0	0
7	(6-7 am)	0	0	0	35/40	5	5	On	On	On	0	0	0	0	0	0
8	(7-8 am)	0	0	0	35/40	30	30	On	On	On	0	0	0	0	0	0
9	(8-9 am)	20	20	10	35/40	30	30	On	On	On	0	0	0	0	0	0
10	(9-10 am)	20	20	10	65/75	40/50	30	On	On	On	5	5	5	0	0	0
11	(10-11 am)	20	20	10	65/75	40/50	30	On	On	On	5	5	5	0	0	0
12	(11-12 pm)	80	60	10	65/75	40/50	30	On	On	On	35	20	10	0	0	0
13	(12-1 pm)	80	60	10	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
14	(1-2 pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
15	(2-3 pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
16	(3-4 pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
17	(4-5 pm)	80	60	70	65/75	40/50	55/65	On	On	On	5	0	0	0	0	0
18	(5-6 pm)	80	60	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
19	(6-7 pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
20	(7-8 pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	65	65	0	0	0
21	(8-9 pm)	20	60	70	65/75	40/50	55/65	On	On	On	0	30	30	0	0	0
22	(9-10 pm)	20	80	70	65/75	40/50	55/65	On	On	On	0	0	0	0	0	0
23	(10-11 pm)	10	10	20	25	40/50	5	On	On	On	0	0	0	0	0	0
24	(11-12 am)	0	0	0	5	5	5	Off	Off	Off	0	0	0	0	0	0
25	Total/Day	710	750	700	1010/ 1155	660/ 800	745/ 845	1800	1700	1700	70	125	115	0	0	0
26	Total/Week		50.50 hours			64.55/74.20 hours			124 hours			5.9 hours			0 hours	

Total/Year	2633 hours	3357/3869 hours	6465 hours	308 hours	0 hours

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3B

Health Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
2 (1-2 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
3 (2-3 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
4 (3-4 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
5 (4-5 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
6 (5-6 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0

7	(6-7 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
8	(7-8 am)	10	10	0	45/50	20	5	On	On	On	17	1	1	2	2	0
9	(8-9 am)	50	30	5	80/90	35/40	10	On	On	On	58	20	1	75	46	2
10	(9-10 am)	80	40	5	80/90	35/40	10	On	On	On	66	28	1	100	70	2
11	(10-11 am)	80	40	5	80/90	35/40	10	On	On	On	78	30	1	100	70	2
12	(11-12 pm)	80	40	5	80/90	35/40	10	On	On	On	82	30	1	100	70	2
13	(12-1 pm)	80	40	5	80/90	35/40	10	On	On	On	71	24	1	75	51	2
14	(1-2 pm)	80	40	5	80/90	35/40	10	On	On	On	82	24	1	100	51	2
15	(2-3 pm)	80	40	5	80/90	35/40	10	On	On	On	78	23	1	100	51	2
16	(3-4 pm)	80	40	5	80/90	35/40	10	On	On	On	74	23	1	100	51	2
17	(4-5 pm)	80	40	0	30	35/40	5	On	On	On	63	23	1	100	51	0
18	(5-6 pm)	50	10	0	30	35/40	5	On	On	On	41	10	1	100	25	0
19	(6-7 pm)	30	10	0	30	10	5	On	On	On	18	1	1	52	2	0
20	(7-8 pm)	30	0	0	30	10	5	On	On	On	18	1	1	52	0	0
21	(8-9 pm)	20	0	0	30	10	5	On	On	On	18	1	1	52	0	0
22	(9-10 pm)	20	0	0	30	10	5	On	On	On	10	1	1	28	0	0
23	(10-11 pm)	0	0	0	30	10	5	On	On	On	1	1	1	0	0	0
24	(11-12 am)	0	0	0	10	10	5	On	On	On	1	1	1	0	0	0
25																
26	Total/Day	850	380	40	975/	500/	160	2400	2400	2400	783	249	24	1136	540	16
27					1060	550										
28	Total/Week		46.70 hours			55.35/60.10 hours			168 hours			41.88 hours			62.36 hours	
	Total/Year		2435 hours			2878/3134 hours			8760 hours			2148 hours			3251 hours	

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3C

Hotel/Motel Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	90	90	70	20	20	30	On	On	On	20	20	25	40	44	55
2 (1-2 am)	90	90	70	15	20	30	On	On	On	15	15	20	33	35	55
3 (2-3 am)	90	90	70	10	10	20	On	On	On	15	15	20	33	35	43
4 (3-4 am)	90	90	70	10	10	20	On	On	On	15	15	20	33	35	43
5 (4-5 am)	90	90	70	10	10	20	On	On	On	20	20	20	33	35	43
6 (5-6 am)	90	90	70	20	10	20	On	On	On	25	25	30	33	35	43
7 (6-7 am)	70	70	70	40	30	30	On	On	On	50	40	50	42	40	52
8 (7-8 am)	40	50	70	50	30	40	On	On	On	60	50	50	42	32	52
9 (8-9 am)	40	50	50	40	40	40	On	On	On	55	50	50	52	45	65
10 (9-10 am)	20	30	50	40	40	30	On	On	On	45	50	55	52	45	65

11 (10-11 am)	20	30	50	25	30	30	On	On	On	40	45	50	40	42	53
12 (11-12 pm)	20	30	30	25	25	30	On	On	On	45	50	50	51	60	60
13 (12-1 pm)	20	30	30	25	25	30	On	On	On	40	50	40	51	65	53
14 (1-2 pm)	20	30	20	25	25	20	On	On	On	35	45	40	51	65	51
15 (2-3 pm)	20	30	20	25	25	20	On	On	On	30	40	30	51	65	50
16 (3-4 pm)	30	30	20	25	25	20	On	On	On	30	40	30	51	65	44
17 (4-5 pm)	50	30	30	25	25	20	On	On	On	30	35	30	63	65	64
18 (5-6 pm)	50	50	40	25	25	20	On	On	On	40	40	40	80	75	62
19 (6-7 pm)	50	60	40	60	60	50	On	On	On	55	55	50	86	80	65
20 (7-8 pm)	70	60	60	80	70	70	On	On	On	60	55	50	70	80	63
21 (8-9 pm)	70	60	60	90	70	80	On	On	On	50	50	40	70	75	63
22 (9-10 pm)	80	70	80	80	70	60	On	On	On	55	55	50	70	75	63
23 (10-11 pm)	90	70	80	60	60	50	On	On	On	45	40	40	45	55	40
24 (11-12 am)	90	70	80	30	30	30	On	On	On	25	30	20	45	55	40
Total/Day	1390	1390	1300	855	785	810	2400	2400	2400	915	930	900	1217	1303	1287
Total/Week		96.40 hours			58.70 hours			168.0 hours			64.05 hours			86.75 hours	
Total/Year		5026 hours			3061 hours			8760 hours			3340 hours			4523 hours	

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

TABLE 3.3D

Light Manufacturing Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
3 (2-3 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
4 (3-4 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
5 (4-5 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
6 (5-6 am)	0	0	0	10	5	5	Off	Off	Off	8	8	7	0	0	0
7 (6-7 am)	10	10	5	10	10	5	On	On	Off	7	7	4	0	0	0
8 (7-8 am)	20	10	5	30	10	5	On	On	Off	19	11	4	35	16	0
9 (8-9 am)	95	30	5	85/90	30	5	On	On	Off	35	15	4	69	14	0
10 (9-10 am)	95	30	5	85/90	30	5	On	On	Off	38	21	4	43	21	0
11 (10-11 am)	95	30	5	85/90	30	5	On	On	Off	39	19	4	37	18	0
12 (11-12 pm)	95	30	5	85/90	30	5	On	On	Off	47	23	6	43	25	0
13 (12-1 pm)	50	10	5	75/80	15	5	On	On	Off	57	20	6	58	21	0
14 (1-2 pm)	95	10	5	85/90	15	5	On	On	Off	54	19	9	48	13	0
15 (2-3 pm)	95	10	5	85/90	15	5	On	On	Off	34	15	6	37	8	0
16 (3-4 pm)	95	10	5	85/90	15	5	On	On	Off	33	12	4	37	4	0

17 (4-5 pm)	95	10	5	85/90	15	5	On	On	Off	44	14	4	46	5	0
18 (5-6 pm)	30	5	5	50	5	5	On	On	Off	26	7	4	62	6	0
19 (6-7 pm)	10	5	0	30	5	5	On	Off	Off	21	7	4	20	0	0
20 (7-8 pm)	10	0	0	30	5	5	On	Off	Off	15	7	4	12	0	0
21 (8-9 pm)	10	0	0	20	5	5	On	Off	Off	17	7	4	4	0	0
22 (9-10 pm)	10	0	0	20	5	5	On	Off	Off	8	9	7	4	0	0
23 (10-11 pm)	5	0	0	10	5	5	Off	Off	Off	5	5	4	0	0	0
24 (11-12 am)	5	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
Total/Day	920	200	60	995/ 1040	280	120	1600	1200	0	537	256	113	555	151	0
Total/Week		48.60 hours			53.75/56.00 hours			92.00 hours			30.54 hours			29.26 hours	
Total/Year		2534 hours			2795/2920 hours			4797 hours			1592 hours			1526 hours	

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3E

Office Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
3 (2-3 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
4 (3-4 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
5 (4-5 am)	0	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
6 (5-6 am)	0	0	0	10	5	5	Off	Off	Off	8	8	7	0	0	0
7 (6-7 am)	10	10	5	10	10	5	On	On	Off	7	7	4	0	0	0
8 (7-8 am)	20	10	5	30	10	5	On	On	Off	19	11	4	35	16	0
9 (8-9 am)	95	30	5	65/90	30	5	On	On	Off	35	15	4	69	14	0
10 (9-10 am)	95	30	5	65/90	30	5	On	On	Off	38	21	4	43	21	0
11 (10-11 am)	95	30	5	65/90	30	5	On	On	Off	39	19	4	37	18	0
12 (11-12 pm)	95	30	5	65/90	30	5	On	On	Off	47	23	6	43	25	0
13 (12-1 pm)	50	10	5	55/80	15	5	On	On	Off	57	20	6	58	21	0
14 (1-2 pm)	95	10	5	65/90	15	5	On	On	Off	54	19	9	48	13	0
15 (2-3 pm)	95	10	5	65/90	15	5	On	On	Off	34	15	6	37	8	0
16 (3-4 pm)	95	10	5	65/90	15	5	On	On	Off	33	12	4	37	4	0
17 (4-5 pm)	95	10	5	65/90	15	5	On	On	Off	44	14	4	46	5	0
18 (5-6 pm)	30	5	5	35/50	5	5	On	On	Off	26	7	4	62	6	0
19 (6-7 pm)	10	5	0	30	5	5	On	Off	Off	21	7	4	20	0	0
20 (7-8 pm)	10	0	0	30	5	5	On	Off	Off	15	7	4	12	0	0

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
21 (8-9 pm)	10	0	0	20	5	5	On	Off	Off	17	7	4	4	0	0
22 (9-10 pm)	10	0	0	20	5	5	On	Off	Off	8	9	7	4	0	0
23 (10-11 pm)	5	0	0	10	5	5	Off	Off	Off	5	5	4	0	0	0
24 (11-12 am)	5	0	0	5	5	5	Off	Off	Off	5	5	4	0	0	0
Total/Day	920	200	60	800/1040	280	120	1600	1200	0	537	256	113	555	151	0
Total/Week	48.60 hours			44.00/56.00 hours			92.00 hours			30.54 hours			29.26 hours		
Total/Year	2534 hours			2288/2920 hours			4797 hours			1592 hours			1526 hours		

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3F

Parking Garage Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)				50/100	50/100	50/100									
2 (1-2 am)				50/100	50/100	50/100									
3 (2-3 am)				50/100	50/100	50/100									
4 (3-4 am)				50/100	50/100	50/100									
5 (4-5 am)				50/100	50/100	50/100									
6 (5-6 am)				50/100	50/100	50/100									
7 (6-7 am)				100	100	50/100									
8 (7-8 am)				100	100	50/100									
9 (8-9 am)				100	100	50/100									
10 (9-10 am)				100	100	50/100									
11 (10-11 am)				100	100	50/100	Based on						Included with		
12 (11-12 pm)	NA			100	100	50/100	likely use			NA			other occupancies		
13 (12-1 pm)				100	100	50/100									
14 (1-2 pm)				100	100	50/100									
15 (2-3 pm)				100	100	50/100									
16 (3-4 pm)				100	100	50/100									
17 (4-5 pm)				100	100	50/100									
18 (5-6 pm)				100	50/100	50/100									

19 (6-7 pm)		100	50/100	50/100			
20 (7-8 pm)		100	50/100	50/100			
21 (8-9 pm)		100	50/100	50/100			
22 (9-10 pm)		100	50/100	50/100			
23 (10-11 pm)		50/100	50/100	50/100			
24 (11-12 am)		50/100	50/100	50/100			
Total/Day		2000/ 2400	1750/ 2400	1200/ 2400			
Total/Week			129.50/168 hours				
Total/Year			6734/8760 hours				

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6. For parking garage lighting, the schedule has been revised to accompany the office schedule: the lighting in the parking garage is set to be on at 100% for all hours when the building occupancy is 10% or greater, but reduced to 50% (per Section 1513.6) for all hours when the building occupancy is less than 10%. For a parking garage serving a use other than office, it is acceptable to modify the parking garage schedule to parallel that use.

TABLE 3.3G

Restaurant Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	15	30	20	15	20	20	On	On	On	20	20	25	0	0	0
2 (1-2 am)	15	25	20	15	15	15	On	On	On	15	15	20	0	0	0
3 (2-3 am)	5	5	5	15	15	15	On	On	On	15	15	20	0	0	0
4 (3-4 am)	0	0	0	15	15	15	Off	Off	Off	0	0	0	0	0	0
5 (4-5 am)	0	0	0	15	15	15	Off	Off	Off	0	0	0	0	0	0
6 (5-6 am)	0	0	0	20	15	15	Off	Off	Off	0	0	0	0	0	0
7 (6-7 am)	0	0	0	35/40	30	30	Off	Off	Off	0	0	0	0	0	0
8 (7-8 am)	5	0	0	35/40	30	30	On	Off	Off	60	0	0	0	0	0
9 (8-9 am)	5	0	0	55/60	55/60	45/50	On	Off	Off	55	0	0	0	0	0
10 (9-10 am)	5	5	0	55/60	55/60	45/50	On	On	Off	45	50	0	0	0	0
11 (10-11 am)	20	20	10	85/90	75/80	65/70	On	On	On	40	45	50	0	0	0
12 (11-12 pm)	50	45	20	85/90	75/80	65/70	On	On	On	45	50	50	0	0	0
13 (12-1 pm)	80	50	25	85/90	75/80	65/70	On	On	On	40	50	40	0	0	0
14 (1-2 pm)	70	50	25	85/90	75/80	65/70	On	On	On	35	45	40	0	0	0
15 (2-3 pm)	40	35	15	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0
16 (3-4 pm)	20	30	20	85/90	75/80	65/70	On	On	On	30	40	30	0	0	0

17 (4-5 pm)	25	30	25	85/90	75/80	55/60	On	On	On	30	35	30	0	0	0
18 (5-6 pm)	50	30	35	85/90	85/90	55/60	On	On	On	40	40	40	0	0	0
19 (6-7 pm)	80	70	55	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
20 (7-8 pm)	80	90	65	85/90	85/90	55/60	On	On	On	60	55	50	0	0	0
21 (8-9 pm)	80	70	70	85/90	85/90	55/60	On	On	On	50	50	40	0	0	0
22 (9-10 pm)	50	65	35	85/90	85/90	55/60	On	On	On	55	55	50	0	0	0
23 (10-11 pm)	35	55	20	45/50	45/50	45/50	On	On	On	45	40	40	0	0	0
24 (11-12 am)	20	35	20	30	30	30	On	On	On	25	30	20	0	0	0
Total/Day	750	740	485	1370/	1290/	1040/	2000	1800	1700	790	730	625	0	0	0
				1455	1365	1115									
Total/Week		49.75 hours			91.80/97.55 hours			135 hours			53.05 hours			0 hours	
Total/Year		2594 hours			4774/5086 hours			7039 hours			2766 hours			0 hours	

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3H

Retail Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	4	11	7	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	5	10	7	0	0	0
3 (2-3 am)	0	0	0	5	5	5	Off	Off	Off	5	8	7	0	0	0
4 (3-4 am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
5 (4-5 am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
6 (5-6 am)	0	0	0	5	5	5	Off	Off	Off	4	6	6	0	0	0
7 (6-7 am)	0	0	0	5	5	5	On	On	Off	4	7	7	0	0	0
8 (7-8 am)	10	10	0	20	10	5	On	On	Off	15	20	10	12	9	0
9 (8-9 am)	20	20	0	50	30	10	On	On	On	23	24	12	22	21	0
10 (9-10 am)	50	50	10	85/90	55/60	10	On	On	On	32	27	14	64	56	11
11 (10-11 am)	50	60	20	85/90	85/90	40	On	On	On	41	42	29	74	66	13
12 (11-12 pm)	70	80	20	85/90	85/90	40	On	On	On	57	54	31	68	68	35
13 (12-1 pm)	70	80	40	85/90	85/90	55/60	On	On	On	62	59	36	68	68	37
14 (1-2 pm)	70	80	40	85/90	85/90	55/60	On	On	On	61	60	36	71	69	37
15 (2-3 pm)	70	80	40	85/90	85/90	55/60	On	On	On	50	49	34	72	70	39
16 (3-4 pm)	80	80	40	85/90	85/90	55/60	On	On	On	45	48	35	72	69	41
17 (4-5 pm)	70	80	40	85/90	85/90	55/60	On	On	On	46	47	37	73	66	38
18 (5-6 pm)	50	60	20	85/90	85/90	40	On	On	Off	47	46	34	68	58	34
19 (6-7 pm)	50	20	10	55/60	50	20	On	On	Off	42	44	25	68	47	3

20	(7-8 pm)	30	20	0	55/60	30	5	On	On	Off	34	36	27	58	43	0
21	(8-9 pm)	30	20	0	50	30	5	On	On	Off	33	29	21	54	43	0
22	(9-10 pm)	0	10	0	20	10	5	Off	On	Off	23	22	16	0	8	0
23	(10-11 pm)	0	0	0	5	5	5	Off	Off	Off	13	16	10	0	0	0
24	(11-12 am)	0	0	0	5	5	5	Off	Off	Off	8	13	6	0	0	0
Total/Day		720	750	280	1060/ 1115	940/ 985	500/ 525	1500	1600	900	662	690	459	844	761	288
Total/Week			46.30 hours		67.40/70.85 hours				100 hours			44.59 hours			52.69 hours	
Total/Year			2414 hours		3505/3694 hours				5214 hours			2325 hours			2747 hours	

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3I

School Occupancy[1]

Hour of Day	Schedule for Occupancy	Schedule for Lighting[2]/Receptacle	Schedule for HVAC System	Schedule for Service Hot Water	Schedule for Elevator

(Time)	Percent of Maximum Load			Percent of Maximum Load						Percent of Maximum Load			Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
3 (2-3 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
4 (3-4 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
5 (4-5 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
6 (5-6 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
7 (6-7 am)	0	0	0	5	5	5	Off	Off	Off	5	3	3	0	0	0
8 (7-8 am)	5	0	0	30	5	5	On	Off	Off	10	3	3	0	0	0
9 (8-9 am)	75	10	0	60/85	15	5	On	On	Off	34	3	5	30	0	0
10 (9-10 am)	90	10	0	65/95	15	5	On	On	Off	60	5	5	30	0	0
11 (10-11 am)	90	10	0	65/95	15	5	On	On	Off	63	5	5	30	0	0
12 (11-12 pm)	80	10	0	65/95	15	5	On	On	Off	72	5	5	30	0	0
13 (12-1 pm)	80	10	0	55/80	15	5	On	On	Off	79	5	5	30	0	0
14 (1-2 pm)	80	0	0	55/80	5	5	On	Off	Off	83	3	5	30	0	0
15 (2-3 pm)	80	0	0	55/80	5	5	On	Off	Off	61	3	3	30	0	0
16 (3-4 pm)	45	0	0	50/70	5	5	On	Off	Off	65	3	3	15	0	0
17 (4-5 pm)	15	0	0	35/50	5	5	On	Off	Off	10	3	3	0	0	0
18 (5-6 pm)	5	0	0	35/50	5	5	On	Off	Off	10	3	3	0	0	0
19 (6-7 pm)	15	0	0	35	5	5	On	Off	Off	19	3	3	0	0	0
20 (7-8 pm)	20	0	0	35	5	5	On	Off	Off	25	3	3	0	0	0
21 (8-9 pm)	20	0	0	35	5	5	On	Off	Off	22	3	3	0	0	0
22 (9-10 pm)	10	0	0	30	5	5	On	Off	Off	22	3	3	0	0	0
23 (10-11 pm)	0	0	0	5	5	5	Off	Off	Off	12	3	3	0	0	0

24	(11-12 am)	0	0	0	5	5	5	Off	Off	Off	9	3	3	0	0	0
Total/Day		710	50	0	750/ 990	170	120	1500	500	0	691	80	84	285	0	0
Total/Week		36.00 hours			40.40/52.40 hours			80.00 hours			36.19 hours			14.25 hours		
Total/Year		1877 hours			2101/2732 hours			4171 hours			1887 hours			743 hours		

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

TABLE 3.3J

Warehouse Occupancy[1]

Hour of Day (Time)	Schedule for Occupancy Percent of Maximum Load			Schedule for Lighting[2]/Receptacle Percent of Maximum Load			Schedule for HVAC System			Schedule for Service Hot Water Percent of Maximum Load			Schedule for Elevator Percent of Maximum Load		
	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun	Wk	Sat	Sun
1 (12-1 am)	0	0	0	5	5	5	Off	Off	Off	2	2	2	0	0	0
2 (1-2 am)	0	0	0	5	5	5	Off	Off	Off	2	2	2	0	0	0

3	(2-3 am)	0	0	0	5	5	5	Off	Off	Off	2	2	2	0	0	0
4	(3-4 am)	0	0	0	5	5	5	Off	Off	Off	2	2	2	0	0	0
5	(4-5 am)	0	0	0	5	5	5	Off	Off	Off	5	2	2	0	0	0
6	(5-6 am)	0	0	0	5	5	5	Off	Off	Off	7	2	2	0	0	0
7	(6-7 am)	0	0	0	5	5	5	Off	Off	Off	7	2	2	0	0	0
8	(7-8 am)	15	0	0	25/40	5	5	On	Off	Off	10	2	2	0	0	0
9	(8-9 am)	70	20	0	45/70	8	5	On	On	Off	30	6	2	0	0	0
10	(9-10 am)	90	20	0	55/90	24	5	On	On	Off	36	12	2	0	0	0
11	(10-11 am)	90	20	0	55/90	24	5	On	On	Off	36	12	2	30	0	0
12	(11-12 pm)	90	20	0	55/90	24	5	On	On	Off	46	17	2	0	0	0
13	(12-1 pm)	50	10	0	50/80	5	5	On	On	Off	57	4	4	0	0	0
14	(1-2 pm)	85	10	0	55/90	5	5	On	On	Off	43	4	4	0	0	0
15	(2-3 pm)	85	10	0	55/90	5	5	On	On	Off	38	2	2	0	0	0
16	(3-4 pm)	85	10	0	55/90	5	5	On	On	Off	40	2	2	40	0	0
17	(4-5 pm)	20	0	0	55/90	5	5	On	Off	Off	30	2	2	0	0	0
18	(5-6 pm)	0	0	0	30	5	5	Off	Off	Off	18	2	2	0	0	0
19	(6-7 pm)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
20	(7-8 pm)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
21	(8-9 pm)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
22	(9-10 pm)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
23	(10-11 pm)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
24	(11-12 am)	0	0	0	5	5	5	Off	Off	Off	3	2	2	0	0	0
25																
26	Total/Day	680	120	0	600/915	180	120	1000	800	0	429	91	52	70	0	0
27																
28																

Total/Week	35.20 hours	33.00/48.75 hours	58.00 hours	22.88 hours	3.50 hours
Total/Year	1835 hours	1716/2542 hours	3024 hours	1193 hours	182 hours

Wk = Weekday

1. Schedules for occupancy, lighting, receptacle, HVAC system, and service hot water are from ASHRAE Standard 90.1-1989 and addendums, except that 5% emergency lighting has been added for all off hours. Elevator schedules, except for restaurants, are from the U.S. Department of Energy Standard Evaluation Techniques except changed to 0% when occupancy is 0%. **These values may be used only if actual schedules are not known.**

2. Lighting profiles are modified to reflect the requirement for occupancy sensors in Section 1513.6.

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Section 5 – Reporting Format.

The reporting format has been developed to guide both staff and applicants through the energy analysis process. The report (three copies are to be submitted) begins with a text summary including project description, methodology description, and a discussion of the estimated energy consumption differences. These are accompanied by an appendix which has summary forms, calculations to support the inputs, and copies of the computer inputs and outputs (all with numbered pages).

The text and summary forms are among the most important parts of the submittal. This information is read prior to any review of the computer inputs and outputs to give an overall orientation to the project. The first evaluation of the project is based on a review of the text and summary forms. These indicate what the key energy-efficiency strategies are and form the basis

for a more-detailed review of the drawings and of the computer analysis. Information for statistical summaries or other evaluations is drawn from the text and summary forms. While these may be the last items completed by the applicant prior to submittal, the importance of having them complete and accurate cannot be overemphasized.

REPORTING FORMAT OUTLINE

I. Executive Summary

II. Project Description

III. Methodology Description

IV. Discussion of Estimated Energy Consumption Differences

Appendices (Supporting Material)

A. Energy Analysis Summary Form

1. Energy Consumption by End-use portion

2. Design Parameter Comparison portion

B. General Information

1. Site Plan

2. HVAC Zoning Diagram

C. Building Envelope

1. Fenestration: NFRC Certification Authorization Report (CAR) or Simulation Report for U-factor and SHGC or Manufacturer's Specifications for Shading Coefficient

2. Opaque Elements: Cross-sections and U-factor Calculations

3. Shading Diagrams

D. Lighting System

1. Lighting for Interior

2. Lighting for Parking and Outdoor Areas

3. Lighting for Façade

E. Space Heating and Space Cooling

1. Equipment Efficiency – Manufacturer's Specifications

F. Ventilation

G. Interior Exhaust Fans

H. Parking Ventilation Fans

I. Service Water Heating

J. Other End-uses

1. Office Equipment

2. Elevators and Escalators

3. Refrigeration

4. Cooking

5. Other

K. Computer Printout of Inputs and Outputs

I. Executive Summary

The executive summary is the condensed version of the text. This is usually several paragraphs long, never more than one page, and includes:

1. A brief description of the project with name, address, number of stories, and total square footage, as well as a listing of the various uses and the square footage of each use.
2. An explanation about why the systems analysis compliance option was chosen (i.e. what elements of the Proposed Design do not comply with the prescriptive option).
3. A listing of the key energy efficiency features that are being used to compensate for the elements that do not comply.
4. The total energy consumption on a Btu-per-conditioned-square-foot-per-year basis for both the Standard Design and the Proposed Design, and the percentage ratio of the Proposed Design to the Standard Design (i.e. what the energy efficiency improvement has been).

II. Project Description

The project description is a detailed summary of the project. First is the name and the street address as well as adjacent cross-streets or streets on all four sides of the building if it is a full-block development. Indicate the number of stories and total square footage. A listing of the various uses and square footage of each use should be done on a floor-by-floor or a

system-by-system basis. Thus, for mixed-use floors, specify how much is office and how much is retail, or how much is office and how much is lab. Include parking garage number of floors and area in the listing.

The description should also include information on the energy efficiency of the Proposed Design systems.

1. For the building envelope: indicate the glazing area, and how the fenestration U-factor and SHGC compare with the Standard Design requirements; and point out any opaque component U-factors or R-values which are better than the Standard Design requirements.
2. For each HVAC system: provide an explanation of the system including area served, key features, economizer percentage, control strategies, etc. Indicate any differences between the Standard Design and the Proposed Design, such as equipment efficiency.
3. For the lighting: indicate whether any tradeoffs are included in this analysis, and, if so, what they are.
4. For other end-uses: indicate any differences between the Standard Design and the Proposed Design.

It is intended that the material in this section be descriptive, supporting calculations are to be included in the appendices.

III. Methodology Description

The methodology description is an explanation of any aspects of the modeling which are unusual or not perfectly clear. (The algorithms in approved analysis programs are generally acceptable and do not need to be explained.) For example:

1. Explain what shading by adjacent buildings has been included in the analysis and how it has been modeled (e.g. either using the program capabilities or as a north-facing wall, etc.).
2. If there are below-grade walls and floors, explain how the heat loss has been modeled for these (e.g. either as an exterior wall with a limited ground temperature variation or as a constant negative load to a zone, etc.)
3. If a program cannot model a system exactly, explain why the modeling assumptions used are the best representation of that system.

It is intended that the material in this section provide a heads-up for anything unusual. Again, it is intended that the material in this section be descriptive, supporting calculations are to be included in the appendices.

IV. Discussion of Estimated Energy Consumption Differences

The discussion of estimated energy consumption differences is a summary and explanation of the energy savings.

1. First, list the total energy consumption on a Btu-per-conditioned-square-foot-per-year basis for both the Standard Design and the Proposed Design, and the percentage ratio of the Proposed Design to the Standard Design (i.e. what the energy efficiency improvement would be).
2. Then, review the energy savings by end-use, starting with the end-use which has the largest difference as a percent of the Standard Design total. Attempt to correlate the differences by end-use with the strategies used. While some changes will have a simple, direct correlation with consumption, other end-use differences may have a more complex explanation due to interactive effects. For example:
   - Changes in exterior lighting will have a simple, direct correlation with consumption.
   - Differences in space heating and space cooling are likely due to a combination of building envelope and HVAC system strategies. (Lacking any better information, the following procedure can provide a rough-cut disaggregation. First, determine the ratio of the design heating load of the Proposed Design to the design heating load of the Standard Design. Multiply the space heating energy consumption of the Standard Design by this ratio and assume that the resulting figure is what the space heating energy consumption would have been for the Proposed Design if only the building envelope had changed. This difference is what could be attributed to the building envelope. Second, determine the ratio of the average equipment efficiency of the

Proposed Design to the average equipment efficiency of the Standard Design. Multiply the space heating energy consumption from the first step by this ratio and assume that the resulting figure is what the space heating energy consumption would have been for the Proposed Design if only the building envelope and equipment efficiency had changed. This second difference is what could be attributed to changes in equipment efficiency. Finally, assume that whatever energy consumption differences remain are due to other HVAC system strategies. Follow this same process for space cooling, starting with a comparison of loads, then equipment efficiency, then system type. Differences in economizer cycle, however, add another layer of complexity.)

This section should, at a minimum, provide confirmation that the results of the analysis are reasonable.

Appendices (Supporting Materials)

A. Energy Analysis Summary Form (required)

1. Complete the Energy Consumption by End-use portion of the form for each project. Where a project has multiple buildings which are individually analyzed, complete the form for each building as well as for the overall project. (An automated electronic

spreadsheet version of this page is on the DPD Seattle Energy Code website at: www.seattle.gov/dpd/energy.)

2. Complete the Design Parameter Comparison portion of the form for each project. Where a project has multiple HVAC systems, complete the HVAC information for each system. (An electronic version of these pages is on the DPD Seattle Energy Code website at: www.seattle.gov/dpd/energy.)

B. General Information

1. Site Plan (required) – provide site plan (8½ x 11 preferred) showing location and height, in feet or stories, of all adjacent buildings and also any other buildings and topography which would provide significant shading of the proposed building.
2. HVAC zoning diagram used in the modeling process (required) – provide zoning diagram indicating zone lines and with zones labeled to match the modeling. (Providing takeoff sheets with area inputs will simplify review.)

C. Building Envelope

1. Glazing and opaque doors, including windows, skylights, sliding/swinging/rollup doors, glass block (required):
   a. for U-factor,
      i. provide NFRC Certification Authorization Report (CAR) from NFRC-licensed Inspection Agency for the overall fenestration product including the frame OR

ii. copy of simulation by NFRC-accredited simulation laboratory for the overall fenestration product including the frame OR

iii. manufacturer's specifications where default U-factors from Chapter 10 have been used;

b. for Solar Heat Gain Coefficient (SHGC),

i. provide NFRC Certification Authorization Report (CAR) from NFRC-licensed Inspection Agency for the overall fenestration product including the frame OR

ii. copy of simulation by NFRC-accredited simulation laboratory for the overall fenestration product including the frame OR

iii. manufacturer's specifications where shading coefficient of the glass alone has been used.

(Note products claiming NFRC values shall be labeled. For site-assembled products, the NFRC Label Certificate shall be on job site prior to installation of first fenestration product. See CAM 403 for more information.)

2. Opaque roof, wall, floor (required):

a. provide cross-sections and U-factor calculations for each different assembly where default U-factors from Chapter 10 have not been used;

b. if multiple elements (e.g.. three wall types) are combined into one value for modeling purposes, provide calculations used to determine weighted-average value.

3. Shading diagrams (required):

a. provide information on how shading by adjacent buildings and topography has been modeled,

b. provide wall and roof sections showing overhangs and setbacks for glazing to justify the shading modeled.

4. Building air leakage:

a. provide specific statement of the proposed building air leakage test rate when tested in accordance with the procedure in Section 1314.6.2,

b. provide calculation showing how the building air leakage test rate at the standard rating conditions in Section 1314.6.2 has been converted to an air leakage test rate appropriate for the energy modeling using the conversion factors as specified in RS-29, Table 3.1, #5 Building Envelope, Proposed Design,

c. for modeling, as specified in RS-29, Table 3.1, #5 Building Envelope, Proposed Design, indicate:

i. what percentage of air leakage is modeled for the hours when the building fan system is off and

ii. what percentage of air leakage is modeled for the hours when the building fan system is on.

D. Lighting

1. Interior lighting (as applicable):

a. explain any special assumptions about interior lighting,

b. discuss lighting inputs to account for any exempt lighting (e.g. retail, kitchen).

2. Parking/outdoor areas lighting (as applicable):

a. provide calculation of areas for parking garages, then multiply by allowed Watts/square foot; provide calculation of areas for surface parking, and other lighted outdoor areas, then multiply by allowed Watts/square foot to obtain Standard Design;

b. provide supporting information for Proposed only if different from Standard Design;

c. if program does not list parking/outdoor area lighting energy consumption separately, then provide calculation of annual energy consumption for this end-use.

3. Façade lighting (required):

a. provide calculation of building façade, then multiply by allowed Watts/square foot to obtain Standard Design;

b. provide supporting information for Proposed only if different from Standard Design;

c. if program does not list facade lighting energy consumption separately, then provide calculation of annual energy consumption for this end-use.

E. Space Heating and Space Cooling Equipment and Plant

1. provide manufacturer's specifications for equipment efficiency,

2. provide calculations per AHRI standards for COP, EER, IPLV,

3. provide list of equipment and size and calculations to justify if Proposed Design includes multiple pieces of equipment and a weighted average equipment efficiency is used in the energy analysis,

4. provide calculations to justify the equipment size for the Standard Design

a. provide calculations of ratio of Proposed Design equipment size to Proposed Design design heating load and design cooling load,

b. provide calculations of ratio of Standard Design equipment size to Standard Design design heating load and design cooling load.

F. Ventilation - interior (required):

1. provide W/CFM calculations for the ventilation system for the Proposed Design and for the Standard Design to justify inputs for the Standard Design,

2. if program does not list energy consumption for interior ventilation separately in the output, then provide calculation of annual energy consumption for this end-use.

G. Interior Exhaust Fans (as applicable):

1. where multiple toilet exhaust and relief fans are to be installed, provide listing of capacity for each and total for the interior exhaust fans,

2. if program does not list energy consumption for interior exhaust fans separately in the output, then provide calculation of annual energy consumption for this end-use.

H. Parking Garage Fans (as applicable):

1. where multiple parking garage fans are to be installed, provide listing of capacity for each and total for the parking garage fans,

2. if program does not list energy consumption for parking garage fans separately in the output, then provide calculation of annual energy consumption for this end-use.

I. Service Water Heating (required):

1. provide calculations used to size equipment (see RS-29 Table 3.1.4 for default assumptions for service hot water quantities in Btuh per person),

2. if program does not list energy consumption for service water heating separately in the output, then provide calculation of annual energy consumption for this end-use.

J. Other End-uses

1. Office/miscellaneous equipment (as applicable):

a. if program requires an input of total equipment capacity rather than capacity on a square foot basis, then provide calculations used to size equipment (see RS-29 Table 3.1.4 for default assumptions for service hot water quantities in Watts/square foot),

b. if program does not list energy consumption for office/miscellaneous equipment separately in the output, then provide calculation of annual energy consumption for this end-use.

2. Elevators and escalators (as applicable):

a. where multiple elevators and escalators are to be installed, provide listing of capacity for each and total for the system,

b. if program does not list energy consumption for elevators and escalators separately in the output, then provide calculation of annual energy consumption for this end-use.

3. Refrigeration - food, etc. (as applicable):

a. where multiple units are to be installed for refrigeration other than for comfort cooling, provide listing of capacity for each and total for the system,

b. if program does not list energy consumption for refrigeration other than for comfort cooling separately in the output, then provide calculation of annual energy consumption for this end-use.

4. Cooking (as applicable):

a. where multiple units are to be installed for cooking, provide listing of capacity for each and total for the system,

b. if program does not list energy consumption for cooking separately in the output, then provide calculation of annual energy consumption for this end-use.

5. Other (as applicable):

a. provide supporting data for other end-uses (e.g. commercial washers and dryers, etc.),

b. if program does not list energy consumption for other end-uses separately in the output, then provide calculation of annual energy consumption for these end-uses.

K. Computer Printout of Inputs and Outputs

Provide inputs and outputs with pages numbered so cross-references can be made to the Energy Analysis Summary Form.

ENERGY ANALYSIS SUMMARY FORM

PROJECT INFORMATION

DPD Project Address: _____	DPD Project Number: _____
Project Name: _____	Date of this _____

submittal:

Building Uses: Area (sq.ft.):	Conditioned Space						Unconditioned Space			
	Office	Retail	Group R	_____	_____	Subtotal	Parking	_____	Subtotal	Total
	____	_____	_____	_____	_____	_____	_____	_____	_____	_____

ENERGY CONSUMPTION BY END-USE

END-USE	FUEL SOURCE	STANDARD DESIGN			PROPOSED DESIGN			DIFFERENCES		
		Total Energy Use Estimate	BTU/ Cond. Sq.Ft.-Year	% of Standard Design Total	Total Energy Use Estimate	BTU/ Cond. Sq.Ft.-Year	% of Proposed Design Total	Total Energy Use Estimate	BTU/ Cond. Sq.Ft.-Year	% of Standard Design Total
Lighting - interior		____	_____	____%	____	_____	____%	____	_____	____%
Lighting - parking		____	_____	____%	____	_____	____%	____	_____	____%
Lighting - façade		____	_____	____%	____	_____	____%	____	_____	____%
Space Heating (1)		____	_____	____%	____	_____	____%	____	_____	____%
Space Heating		____	_____	____%	____	_____	____%	____	_____	____%

(2) Space Cooling	____	____	____%	____	____	____%	____	____	____%
Fans - interior ventilation	____	____	____%	____	____	____%	____	____	____%
Fans - interior exhaust	____	____	____%	____	____	____%	____	____	____%
Fans - parking garage	____	____	____%	____	____	____%	____	____	____%
Service water heating	____	____	____%	____	____	____%	____	____	____%
Office equipment	____	____	____%	____	____	____%	____	____	____%
Elevators & escalators	____	____	____%	____	____	____%	____	____	____%
Refrigeration (food, etc.)	____	____	____%	____	____	____%	____	____	____%
Cooking (commercia	____	____	____%	____	____	____%	____	____	____%

l)									
_____	___	____	____%	___	____	____%	___	____	____%
_____	___	____	____%	___	____	____%	___	____	____%
						100.0			
Total	___	____	100.0%	____	____	%	____	____	

Percent of Standard Design:	100.0	%	=	_____	%	+	_____ %

INSTRUCTIONS:

Electronic Version:

A spreadsheet version is available on the Seattle Energy Code website @ www.seattle.gov/dpd/energy

Project Information:

Enter DPD address, project number, and date of this Energy End-use Summary Form.

Enter the space uses in the building and the gross square footage of each.

(Add/revise headings as necessary.) Spreadsheet automatically calculates subtotals and total.

Energy Consumption by End-use:

Enter fuel source for each end-use (e.g. electric, gas, oil, steam, etc.).

Enter total energy consumption in **BTU** for each end-use for both the Standard Design and Proposed Design.

(Spreadsheet calculates the BTU/conditioned-square-foot-year, percentages, and differences.)

DESIGN PARAMETER COMPARISON

Element	Standard Design Value	(Page)	Proposed Design Value	(Page)
Building Envelope				
Space heat type (electric resistance vs. other):				
Glazing: total vertical + overhead area (sq. feet):				
Glazing area as a percentage of gross wall (%):				
Overhead: total area (square feet):				
Overhead U-factor (weighted-average):				
Overhead SHGC (weighted-average):				
Vertical: total area (square feet):				
Vertical U-factor (weighted-average):				
Vertical SHGC (weighted-average):				
Roof: total area (square feet):				
Opaque roof: net area (square feet):				
Opaque roof U-factor (weighted-average):				
Wall: total above-grade area (square feet):				
Opaque above-grade wall: net area (square feet):				
Above-grade wall U-factor (weighted-average):				
Below-grade wall: net area (square feet):				
Below-grade wall U-factor (weighted-average):				
Opaque door: area (sq. feet):				

Element	Standard Design Value	(Page)	Proposed Design Value	(Page)
Opaque door U-factor (weighted-average):				
Floor over unconditioned space: area (sq. feet):				
Floor U-factor (weighted-average):				
Slab-on-grade floor: perimeter (lineal feet):				
Slab-on-grade F-factor (weighted-average):				
Below-grade slab floor: net area (square feet):				
Below-grade floor U-factor (weighted-average):				
Infiltration rate:				
Design heating load:				
Design cooling load:				
Lighting				
Interior				
Watts/sq.ft.: Office				
Watts/sq.ft.: Retail				
Watts/sq.ft.:				
Watts/sq.ft.:				
Parking/outdoor: total area (square feet)				
Watts/square foot				
Façade: total area (square feet)				
Watts/square foot				

Element	Standard Design Value	(Page)	Proposed Design Value	(Page)

DESIGN PARAMETER COMPARISON (cont.)

Element	Standard Design Value	(Page)	Proposed Design Value	(Page)
Space Heating and Space Cooling System				
Space Heating: system type:				
Peak equipment efficiency:				
Output capacity:				
Percent of design heating load:				
Other features:				
Space Cooling: system type:				
Peak equipment efficiency:				
Output capacity:				
Percent of design cooling load:				
Other features:				
Ventilation				
Interior ventilation fans				
Economizer type (air or water):				
Economizer percentage:				
Supply fan: total CFM:				
Fan KW:				

Element	Standard Design Value	(Page)	Proposed Design Value	(Page)
Return fan: total CFM:				
_____ Fan KW:				
Exhaust fan: total CFM:				
_____ Fan KW:				
System Watts/CFM:				
Other features:				
Other features:				
Service Water Heating				
Capacity:				
Other End-uses				
Fans – toilet and other exhaust: capacity (KW)				
Fans – parking garage: capacity (KW)				
Elevator and escalator: capacity				
Refrigeration: capacity				
Cooking: capacity				
_____: capacity				
_____: capacity				
_____: capacity				

Section 17. A new Reference Standard 35 to the Seattle Energy Code is adopted, as follows:

REFERENCE STANDARD - 35

ADVANCED CRITERIA FOR OTHER PROGRAMS

Reference Standard (RS)-35 contains advanced criteria for energy efficiency and energy conservation beyond the requirements of the Seattle Energy Code. The goal of these criteria is to achieve compliance with the 2030 Challenge. This RS-35 is adopted for incorporation in programs, agreements, or initiatives toward that goal.

PRESCRIPTIVE COMPLIANCE OPTION

Comply with the 2009 Seattle Energy Code with the following modifications and additions:

Section 901, Additional Residential Energy Efficiency Requirements: Achieve a minimum of five credits (instead of one credit) from Table 9-1 or, if using the exception, achieve 30 percent less (instead of 16 percent less) than the target building energy use in Chapter 4.

Section 1314.6.2.1, Testing of Overall Building Air Leakage: Tested air leakage of 0.25 cfm/ft^2 maximum for all buildings (instead of 0.40 cfm/ft^2).

Sections 1320-1323, Prescriptive Building Envelope Option: Compliance to be based on Table A13-1 Advanced Criteria (instead of Table 13-1). See below.

Sections 1330-1334, Component Performance Building Envelope Option: Compliance to be based on Table A13-1 Advanced Criteria (instead of Table 13-1).

Table 13-1: Opaque envelope and fenestration to comply with Table A13-1 Advanced Criteria (instead of Table 13-1):

Table A13-1
Advanced Criteria

	Nonresidential		Residential, Other than Single-Family	
Opaque Elements	**Assembly Max. U-factor**	**Insulation Min. R-Value**	**Assembly Max. U-factor**	**Insulation Min. R-Value**
Roofs				
Insulation entirely above deck	U-0.025	R-40 c.i.	U-0.025	R-40 c.i.
Metal building	U-0.024	R-30 + R-11 + R-11 Ls	U-0.024	R-30 + R-11 + R-11 Ls
Single-rafter	U-0.025	R-42	U-0.025	R-42
Attic and other	U-0.025	R-49 adv or R-60	U-0.025	R-49 adv or R-60

Walls, Above Grade

Mass	U-0.051 for exterior and integral insulation U-0.050 for interior insulation;	Exterior and integral insulation: a. R-18 c.i. Interior insulation: b. R-13 cavity insulation + R-8 c.i. wood studs; or c. R-13 cavity insulation + R-12 c.i. metal studs; or d. R-25.2 insulation held solely by 1-in metal clips	U-0.046 for exterior and integral insulation U-0.045 for interior insulation;	Exterior and integral insulation: a. R-20 c.i. Interior insulation: b. R-13 cavity insulation + R-10 c.i. wood studs; or c. R-13 cavity insulation + R-14 c.i. metal studs; or d. R-28 insulation held solely by 1-in metal clips
Metal building	U-0.046	R-13 + R-15.8 c.i.	U-0.040	R-13 + R-19 c.i.
Steel framed	U-0.049	R-13 + R-12.5 c.i.	U-0.043	R-13 + R-15 c.i.
Wood framed and other	U-0.045	R-13 + R-10 c.i.	U-0.040	R-13 + R-12.5 c.i.

Walls, Below Grade

Below grade wall	U-0.070	Exterior insulation: a. R-10 c.i. Interior insulation: b. R-19 cavity insulation wood studs; or c. R-13 cavity insulation + R-6 c.i. metal studs; or d. R-16.8 insulation held solely by 1-in metal clips.	U-0.070	Exterior insulation: a. R-10 c.i. Interior insulation: b. R-19 cavity insulation wood studs; or c. R-13 cavity insulation + R-6 c.i. metal studs; or d. R-16.8 insulation held solely by 1-in metal clips.
Floors				
Mass	U-0.027	R-35 c.i.	U-0.027	R-35 c.i.
Steel joist	U-0.027	R-38 + R-6 c.i.	U-0.027	R-38 + R-6 c.i.
Wood framed and other	U-0.025	R-38	U-0.025	R-38
Slab-on-Grade Floors				
Unheated	F-0.520	R-15 for 24 in. (with thermal break)	F-0.520	R-15 for 24 in. (with thermal break)
Heated	F-0.360	R-15 c.i. (with thermal break)	F-0.360	R-15 c.i. (with thermal break)
Opaque Doors				
Swinging	U-0.470		U-0.400	

Nonswinging	U-0.390		U-0.400	

Fenestration	Assembly Max. U-Factor NFRC-certified or per 1006	Assembly Max. SHGC NFRC-certified or per 1312.1	Assembly Max. U-Factor NFRC-certified or per 1006	Assembly Max. SHGC NFRC-certified or per 1312.1
Total fenestration (vertical and overhead) area relative to the gross exterior wall area	**0-30% of wall**			
Vertical Fenestration				
Nonmetal framing: All	U-0.27	For all frame types: SHGC-0.35 all OR SHGC-0.45 all PLUS permanent PF>0.50 on west, south and east	U-0.27	
Metal framing: Fixed/operable	U-0.34		U-0.34	
Entrance doors (revolving doors & vestibules)	U-0.60 (U-0.65)		U-0.60 (U-0.65)	
Skylights				
Without curb (i.e., sloped glazing)	U-0.40	SHGC-0.30 all	U-0.40	SHGC-0.35 all

With curb (i.e., individual unit skylights)	U-0.50		U-0.50		
Total fenestration (vertical and overhead) area relative to the gross exterior wall area	**<30-40% of wall**				
Vertical Fenestration					
Nonmetal framing: All	U-0.25	For all frame types: SHGC-0.33 all OR SHGC-0.45 all PLUS permanent PF>0.50 on west, south and east	U-0.25		
Metal framing: Fixed/operable	U-0.31		U-0.31		
Entrance doors (revolving doors & vestibules)	U-0.60 (U-0.65)		U-0.60 (U-0.65)		
Skylights					
Without curb (i.e., sloped glazing)	U-0.36	SHGC-0.30 all	U-0.36	SHGC-0.35 all	
With curb (i.e., individual unit skylights)	U-0.45		U-0.45		

c.i. = continuous insulation, Ls = liner system (see definitions).

Section 1411.1, HVAC Equipment Performance Requirements, General: Building projects to have high-efficiency mechanical equipment, meaning that 90% of the equipment from each table (same category) has an efficiency that is 1.10 times the corresponding minimum efficiency in Tables 14-1A through 14-1G. The absolute gain in minimum efficiency shall be in addition to that required elsewhere in the code such as for Section 1433 and Section 1132.2.

Section 1521, Prescriptive Interior Lighting Requirements: This section is not allowed to be used.

Section 1531, Interior Lighting Power Allowance: The interior lighting power allowance shall be no greater than 0.90 times the lighting power allowance in Table 15-1.

Section 1532, Exterior Lighting Power Allowance: The exterior lighting power allowance shall be no greater than 0.90 times the lighting power allowance in Table 15-2.

Section 18. A new Reference Standard 36 to the Seattle Energy Code is adopted, as follows:

REFERENCE STANDARD - 36
ILLUSTRATIVE GOALS FOR THE 2030 CHALLENGE IN SEATTLE

Note that these tables are only a reference point, not prescriptive standards nor a means of compliance.

How to use these tables:

The building types listed in bold define a broad building activity category. Some of the broader building type categories are broken down into more specific building activities. The building types in regular type are regional numbers calculated by Target Finder for zip code 98104 using default project parameters. For building types available in Target Finder, use Target Finder and input project specific parameters in order to establish an accurate target.

When identifying your building within this table, first identify where your building's function falls within the broader blue categories. Then determine if you are able to identify your building's function more specifically by the white categories underneath. Matching your building's main use activities most closely with the building use descriptions below will give you the most accurate energy performance target. Please note all site EUI values displayed below are annual figures.

Targets can be calculated for mixed use buildings by multiplying site EUI for each type by the square footage for that type, summing the totals of energy use by type and dividing by total square footage.

Secondary Space/Building Types – Ambulatory Surgical Center, Computer Data Center, Garage, Open Parking Lot and Swimming Pool – available in Target Finder, are not presented here. More complex projects containing these secondary uses are advised to use Target Finder to establish a target.

Table B-1. Seattle 2030 Challenge Targets for Nonresidential buildings based on U.S. National Averages and Regional Averages calculated with Energy Star Target Finder based on CBECS (2003)

Building Use Description	Available in Target Finder	Average Site EUI kBtu/ ft^2·yr	Average Percent Electric	60% Target for 2010	70% Target for 2015	Energy Star Rating @ 60% Target

Table B-1. Seattle 2030 Challenge Targets for Nonresidential buildings based on U.S. National Averages and Regional Averages calculated with Energy Star Target Finder based on CBECS (2003)

Building Use Description	Available in Target Finder	Average Site EUI kBtu/ ft^2·yr	Average Percent Electric	60% Target for 2010	70% Target for 2015	Energy Star Rating @ 60% Target
Education		76	63%	30	23	
K-12 School[1]	X	76	45%	31	24	99
College/University (Campus)		120	63%	48	36	
Food Sales		225	86%	90	68	
Grocery Store/Food Market[2]	X	218	52%	87	65	100
Convenience Store (w/or w/o gas station)		241	90%	96	72	
Food Service						
Restaurant/Cafeteria		302	54%	121	91	
Fast Food		534	64%	214	160	
Health Care: Inpatient (Specialty Hospitals, Excluding Children')		227	47%	91	68	
Hospital (Acute Care, Children's)[3]	X	356	36%	142	107	100
Health Care: Long Term Care (Nursing Home, Assisted Living)		124	54%	50	37	
Health Care: Outpatient		73	76%	29	22	

Table B-1. Seattle 2030 Challenge Targets for Nonresidential buildings based on U.S. National Averages and Regional Averages calculated with Energy Star Target Finder based on CBECS (2003)

Building Use Description	Available in Target Finder	Average Site EUI kBtu/ft²·yr	Average Percent Electric	60% Target for 2010	70% Target for 2015	Energy Star Rating @ 60% Target
Clinic/Other Outpatient Health		84	76%	34	25	
Medical Office[4]	X	85	62%	34	26	91
Lodging		87	61%	35	26	
Dormitory/Fraternity/Sorority[5]	X	83	48%	33	25	95
Hotel, Motel or Inn[6]	X	97	48%	39	29	99
Mall (Strip Mall or Enclosed)		107	71%	43	32	
Office[7]		105	70%	42	32	97
Bank/Financial Institution[8]	X	90	70%	36	27	97
Public Assembly		66	57%	26	20	
Entertainment/Culture		95	63%	38	29	
Library		104	59%	42	31	
Recreation		65	55%	26	20	
Social/Meeting		52	57%	21	16	
Public Order and Safety		90	57%	36	27	
Fire Station/Police Station		78	56%	31	23	
Courthouse[9]	X	86	70%	34	28	97

Table B-1. Seattle 2030 Challenge Targets for Nonresidential buildings based on U.S. National Averages and Regional Averages calculated with Energy Star Target Finder based on CBECS (2003)

Building Use Description	Available in Target Finder	Average Site EUI kBtu/ ft²·yr	Average Percent Electric	60% Target for 2010	70% Target for 2015	Energy Star Rating @ 60% Target
Service (Vehicle Repair/Service, Postal Service)		77	63%	31	23	
Storage/Shipping/Nonrefrigerated Warehouse		25	56%	10	8	
Self-storage		4	44%	2	1	
Non-Refrigerated Warehouse[10]	X	45	61%	18	14	92
Refrigerated Warehouse[11]	X	63	62%	25	19	92
Distribution/Shipping Center		44	61%	18	13	
Refrigerated Warehouse[12]		63	62%	25	19	92
Religious Worship		46	52%	18	14	
House of Worship[13]	X	34	49%	13	10	96
Retail (Non-mall Stores, Vehicle Dealerships)		82	67%	33	25	
Retail Stores[14]	X	56	78%	22	17	95
Other[15]		104	56%	42	31	

[1] 100,000 ft², open weekends, 200 PCs, 2 walk-in refrigeration/freezer units, cooking facilities, high school
[2] 100,000 ft², 140 operating hours, 50 workers on main shift, 5 walk-in refrigerator/freezer units, cooking facilities
[3] 100,000 ft², 400 licensed beds, 4 floors, tertiary care
[4] 100,000 ft², 100 workers, 72 operating hours
[5] 100,000 ft², 220 rooms
[6] 100,000 ft², 220 rooms, 12 workers on Main Shift, 2 Commercial Refrigeration/Freezer Units, cooking facilities
[7] 100,000 ft², 72 weekly operating hours, 400 workers on main shift, 375 PCs
[8] 100,000 ft², 66 weekly operating hours, 200 workers on main shift, 200 PCs
[9] 100,000 ft², 60 weekly operating hours, 200 workers on main shift, 150 PCs
[10] 100,000 ft², 12 workers on main shift, 100 weekly operating hours, 2 walk-in refrigeration/freezer units
[11] 100,000 ft², 12 workers on main shift, 100 weekly operating hours
[12] 100,000 ft², 12 workers on main shift, 100 weekly operating hours
[13] 100,000 ft², seating capacity 300, 5 weekday operation, 12 PCs, cooking, 2 commercial refrigeration/freezer units
[14] 100,000 ft², 84 weekly operating hours, 3 open or closed refrigeration/freezer cases, 1 walk-in refrigeration/freezer unit, 15 workers on main shift, 4 PCs, 12 cash registers, exterior entrance to the public
[15] For all building types not defined by the list above, the applicant may choose to use the performance benchmark categorized by "other". Note that this category is not well defined therefore source energy use varies greatly with source EUI ranging over 1500 kBtu/ft²·yr. As categorized by EIA, "other" may include airplane hangars, laboratory, crematorium, data center, etc.

Table B-2. Seattle 2030 Challenge Targets by Residential Space/Building Type based on U.S. West Regional Averages (RECS 2001)

Building Use Description	Average Site EUI kBtu/ft²·yr	Average Percent Electric	60% Target for 2010	70% Target for 2015	Energy Star Rating @ 60% Target
Single-Family Detached	38		15	12	
Single-Family Attached	39		16	12	
Multi-Family, 2 to 4 units	48		19	14	
Multi-Family, 5 or more units	40		16	12	
Mobile Homes	66		26	20	

Section 19. Sections 2-10 of Ordinance 122530 are repealed, effective on the effective date of the 2009 Washington State Energy Code.

Section 20. 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. The repeal of provisions by this ordinance or the amendment of the Seattle Municipal Code to remove provisions incorporating any code, or provision thereof, shall not relieve any person of the obligation to comply with the terms and conditions of any permit issued pursuant to the provisions as in effect prior to the effectiveness of such repeal or amendment, nor shall it relieve any person or property of any obligations, conditions or restrictions in any agreement or instrument made or granted pursuant to, or with reference to, the provisions in effect prior to the effectiveness of such repeal or amendment.

Section 21. If a complete building permit application is submitted before the earlier of (1) the date 60 days after the effective date of the ordinance introduced as Council Bill 116934 (Seattle Building Code), or (2) the effective date of the 2009 Washington State Energy Code, the applicant may elect to comply with either the requirements of the Seattle Energy Code as enacted by this Ordinance or with the Washington State Energy Code with Seattle amendments as enacted by Ordinance 122530, and the Director may approve the application based upon either of those codes.

Section 22. Except as otherwise expressly provided in this ordinance, (a) this ordinance shall take effect and be in force 30 days from and after its approval by the Mayor, or (b) if not approved and returned by the Mayor within ten days after presentation, it shall take effect as provided by Seattle Municipal Code Section 1.04.020.

Passed by the City Council the 18th day of October, 2010, and signed by me in open session in authentication of its passage this 18th day of October, 2010.

President _____ of the City Council

Approved by me this 22nd day of October, 2010.

Michael McGinn, Mayor

Filed by me this 22nd day of October, 2010.

City Clerk

(Seal)