

Technical Corrections to 2012 Seattle Energy Code Draft

Jonlin –September 3rd, 2013

The following 24 proposed changes to the draft 2012 energy code each address minor errors or inconsistencies discovered since the publication of the draft, and are included in Version 2 of the ordinance.

The changed text is shown here using **highlighter** background with **underline** and **strikeout** text.

A number of these corrections have also been made to the text of the Washington State Energy Code, on which the Seattle code is based.

1. Coordination of code provisions

C101.4.3: delete exception 8, because it conflicts with another Seattle amendment in the following paragraph (also shown highlighted)

C101.4.3 Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations or repairs shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. Substantial alterations and repairs shall comply with the provisions of Section C101.4.7.

EXCEPTION: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Glass only replacements in an existing sash and frame.
3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are insulated to full depth with insulation having a minimum nominal value of R-3.0 per inch installed per Section C402.
4. Construction where the existing roof, wall or floor cavity is not exposed.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate *conditioned space* from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a *conditioned space* from the exterior shall not be removed.
7. Alterations to lighting systems only that replace less than ~~((60))~~ 20 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the *alteration* does not increase the installed interior lighting power.

C101.4.3.1 Lighting and motors. Alterations that add, alter or replace ~~((60))~~ 20 percent or more of the luminaires or of the lamps plus ballasts alone in a space enclosed by walls or ceiling-height partitions, or on the exterior of the building, shall comply with Sections C405.5 and C405.6. Where less than ~~((60))~~ 20 percent of the fixtures in a space enclosed by walls or ceiling-height partitions, or on the exterior of the building, are new or altered, the installed lighting wattage shall be maintained or reduced.

2. Move code requirement to more logical place in code. This change moves a code provision from the new construction section to the existing construction section, since it only applies to alterations. Delete the exception from Section C403.3.1 and replace same text as footnote to Table C101.4.3.2.

**Table ((C101.4.3.1)) C101.4.3.2
Economizer Compliance Options for Mechanical Alterations**

(Add new footnote 17 to Table C101.4.3.2 as follows)

¹⁷ Economizers are not required for the following qualifying small equipment: This exception shall not be used for unitary cooling equipment installed outdoors or in a mechanical room adjacent to the outdoors. This exception is allowed to be used for other cooling units and split systems with a total cooling capacity rated in accordance with Section C403.2.3 of less than 33,000 Btu/h (hereafter referred to as qualifying small systems) provided that these are high-efficiency cooling equipment with SEER and EER values more than 15 percent higher than minimum efficiencies listed in Tables C403.2.3 (1) through (3), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. The total capacity of all qualifying small equipment without economizers shall not exceed 72,000 Btu/h per building, or 5 percent of its air economizer capacity, whichever is greater. That portion of the equipment serving residential occupancies is not included in determining the total capacity of all units without economizers in a building. Redundant units are not counted in the capacity limitations. This exception shall not be used for the shell-and-core permit or for the initial tenant improvement or for Total Building Performance.

C403.3.1 Economizers. Each cooling system that has a fan shall include an air economizer meeting the requirements of Sections C403.3.1.1 through C403.3.1.1.4.

EXCEPTION: Economizers are not required for the systems listed below:

1. (Reserved. See Table C101.4.3.2, footnote 17.) ((Qualifying small equipment: This exception shall not be used for unitary cooling equipment installed outdoors or in a mechanical room adjacent to the outdoors. This exception is allowed to be used for other cooling units and split systems with a total cooling capacity rated in accordance with Section C403.2.3 of less than 33,000 Btu/h (hereafter referred to as qualifying small systems) provided that these are high-efficiency cooling equipment with SEER and EER values more than 15 percent higher than minimum efficiencies listed in Tables C403.2.3 (1) through (3), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. The total capacity of all qualifying small equipment without economizers shall not exceed 72,000 Btu/h per building, or 5 percent of its air economizer capacity, whichever is greater. That portion of the equipment serving residential occupancies is not included in determining the total capacity of all units without economizers in a building. Redundant units are not counted in the capacity limitations. This exception shall not be used for the shell and core permit or for the initial tenant improvement or for Total Building Performance.))

3. Correct arithmetic. This change corrects the performance target for one of the substantial alterations compliance paths. The baseline “Total Building Performance” requirement for new construction in Section C401.2 is 93% of the standard reference design, so 15% above that standard would be 108%.

C101.4.7.3 Energy Efficiency. Buildings undergoing substantial alterations shall comply with one of the following:

1. Full code compliance. Fully comply with the requirements of this code for new construction.

2. Envelope thermal performance within 20 percent of code. Demonstrate that heat loss through the altered building envelope is no more than 20 percent greater than allowed by the Seattle Energy Code, using the Component Performance Building Envelope Option in Section C402.1.3, and meet all other prescriptive requirements of the Seattle Energy Code for new construction.

2.1. Default U-values. The values listed in Appendix A and Section C303 shall be used as the default U-values for existing building envelope components. For buildings with permits issued after January 1, 1992, existing building envelope components are deemed to meet the minimum U-values required by the edition of the Seattle Energy Code in effect at the time of permit application, where visual inspection by the *code official* reveals that those components appear to be equal to or better than code-compliant components.

3. Total building performance within 15 percent of code. Demonstrate that the building energy consumption will be less than ~~105~~ 108 percent of the standard reference design using the Total Building Performance methodology in Section C407 of the Seattle Energy Code.

4. Clarification of code scope

C401.2: Add C410 (solar-ready roof) to each compliance path, and show the Target Performance Path (Section C402.1.5) as a third compliance path.

C401.2 Application. Commercial buildings shall comply with one of the following:

1. The requirements of Sections C402, C403, C404, C405, C408, ~~((and))~~ C409 and C410.
2. The requirements of Sections C407, C408, C409, C410, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7. The building energy consumption shall be equal to or less than 93 percent of the standard reference design building.
3. The requirements of C402.1.5.

5. Delete incorrect footnote. Footnote b to Table C402.1.2 requires an F-factor to be applied to a basement wall, but F-factors are only used for slabs, and basement walls are already required to be insulated by other provisions of the code.

**Table C402.1.2
Opaque Thermal Envelope Assembly Requirements^a
(Partial view of table)**

CLIMATE ZONE	5 AND MARINE 4		6	
	All Other	Group R	All Other	Group R
Walls, Below Grade				
Below-grade wall ^b	((Same as above grade)) <u>Exterior</u> <u>R-10 ci</u> <u>Interior:</u> <u>R-19 wood stud,</u> <u>or</u> <u>R-13 + R-6 ci</u> <u>metal stud</u>	((Same as above grade)) <u>Exterior</u> <u>R-10 ci</u> <u>Interior:</u> <u>R-19 wood stud,</u> <u>or</u> <u>R-13 + R-6 ci</u> <u>metal stud</u>	Same as above grade	Same as above grade

- a Use of opaque assembly U-factors, C-factors, and F-factors from Appendix A is required unless otherwise allowed by Section C402.1.2.
- b (Reserved) ((Where heated slabs are below grade, below grade walls shall comply with the F factor requirements for heated slabs.))
- c Heated slab F-factors shall be determined specifically for heated slabs. Unheated slab factors shall not be used.

6. Correct reference

C402.1.3.4 – correct one reference number as follows:

For buildings utilizing ~~((C402.3.1.3))~~ C402.3.1.2, vertical fenestration area as a percent of gross exterior above-grade wall may not exceed the amount allowed by that section. For all other buildings, if the vertical fenestration area as a percent of gross exterior above-grade wall area exceeds the maximum allowed in Section C402.3.1, the area of each vertical fenestration element shall be reduced in the base envelope design by the same percentage and the net area of each above-grade wall type increased proportionately by the same percentage so that the total vertical fenestration area is exactly equal to the allowed percentage per Section C402.3.1 of the gross above-grade wall area. The target wall area of a given wall type shall be the sum of the proposed below grade area and the increased above-grade area.

7. Correct reference

C402.3.1.2 – Clarify compliance procedure as follows:

C402.3.1.2 Increased vertical fenestration area with high-performance fenestration.

The vertical fenestration area (not including opaque doors and opaque spandrel panels) is permitted to exceed 30% but shall not exceed 40% of the gross above grade wall area, for the purpose of prescriptive compliance with Section C402.1.2 or for the Target UA calculation in Equations C402-1 or C402-5, provided that each of the following conditions are met:

1. The vertical fenestration shall have the following **maximum** U-factors:

a. Non-metal framing (all) = 0.28

b. Metal framing (fixed) = 0.34

c. Metal framing (operable) = 0.39

d. Metal framing (entrance doors) = 0.60

An area-weighted average shall be permitted to satisfy the U-factor requirements for each fenestration product category listed above. Individual fenestration products from different fenestration product categories shall not be combined in calculating the area-weighted average U-factor.

8. Coordination of code provisions

C402.4.5.2 and C403.2.4.4 (both concerning damper controls): Modify as follows, to coordinate requirements of the two sections:

C402.4.5.2 Outdoor air intakes and exhausts. *Outdoor air* supply, exhaust openings and relief outlets shall be provided with Class IA motorized dampers which close automatically when the system is off. Return air dampers shall be equipped with motorized dampers. Dampers shall have a maximum leakage rate of 4 cfm/ft² (20.3 L/s · m²) at 1.0 inch water gauge (w.g.) (249 Pa) when tested in accordance with AMCA 500D. Gravity (nonmotorized) dampers for ventilation air intakes shall be protected from direct exposure to wind.

- EXCEPTIONS:**
1. Gravity (nonmotorized) dampers having a maximum leakage rate of 20 cfm/ft² (101.6 L/s · m²) at 1.0 inch water gauge (w.g.) (249 Pa) when tested in accordance with AMCA 500D are permitted to be used for relief, outside air and exhaust openings in buildings ((less than three stories in height above grade)) if equipment has less than ~~((5,000))~~ 300 cfm total supply flow.
 2. ~~(Reserved) ((Gravity (nonmotorized) dampers for ventilation air intakes shall be protected from direct exposure to wind.))~~
 3. Gravity dampers smaller than 24 inches (610 mm) in either dimension shall be permitted to have a leakage of 40 cfm/ft² (203.2 L/s · m²) at 1.0 inch water gauge (w.g.) (249 Pa) when tested in accordance with AMCA 500D.
 4. Gravity (nonmotorized) dampers in Group R occupancies where the design outdoor air intake, relief or exhaust capacity does not exceed ~~((400))~~ 300 cfm (189 L/s).
 5. Systems serving areas which require continuous operation.
 6. Combustion air intakes.
 7. Type I kitchen exhaust hoods.

C403.2.4.4 Shutoff damper controls. ~~((Both e))~~ Outdoor air supply, relief and exhaust ducts shall be equipped with motorized dampers complying with Section C402.4.5.2 that will automatically shut when the systems or spaces served are not in use or during building warm-up, cooldown, and setback.

EXCEPTIONS:

1. Gravity relief dampers complying with exception 1 to Section C402.4.5.2 serving systems with a design outdoor air intake, relief or exhaust capacity of less than ~~((5,000))~~ 300 cfm total supply shall be permitted ~~((in buildings less than three stories in height)).~~
2. Gravity dampers shall be permitted for buildings of any height located in Climate Zones 1, 2 and 3.
3. Gravity (nonmotorized) dampers in Group R occupancies where the design outdoor air intake or exhaust capacity does not exceed ~~((400))~~ 300 cfm (189 L/s).
4. Systems serving areas which require continuous operation.
5. Combustion air intakes.
6. Operation of dampers shall be allowed during ventilation prepurge one hour before expected occupancy and for unoccupied period precooling during the cooling season.
7. Dampers are not required in systems where specifically prohibited by the *International Mechanical Code*.

9. Provision for easier code compliance

C403.2.2 – Add exception as follows, to allow realistic mechanical equipment sizing (this amendment is also in the 2009 code):

C403.2.2 Equipment and system sizing. The output capacity of heating and cooling equipment and systems shall not exceed the loads calculated in accordance with Section C403.2.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

EXCEPTIONS:

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load.
3. The output capacity of heating and cooling equipment and systems may exceed the loads calculated in accordance with Section C403.2.1, provided that the smallest-capacity equipment available from a selected manufacturer that is capable of serving the heating and cooling loads is utilized and that the equipment capacity does not exceed 150 percent of the calculated loads.

10. Clarification of code application

Table C403.2.6: Add boxed “Explanatory Note” as follows, to clarify use of table:

For Climate Zones 4C and 5B (Washington State), Table C403.2.6 requires energy recovery for HVAC systems that have a design supply fan airflow rate greater than 5000 CFM and have a minimum requirement for 70% or more outside air. Thus a system with a 5000 CFM fan and an 80% outside air requirement for ventilation, providing just 4000 CFM of outside air, would require energy recovery.

In addition, the first sentence of Section C403.2.6.1 states that any system requiring more than 5000 CFM of outside air, no matter what percentage of the total supply air that represents, also requires energy recovery. Thus a 12,000 CFM fan with a 50% outside air requirement would require energy recovery.

11. Coordination with mechanical code & fire code

C403.2.6.1: Add exception #10 to heat recovery requirement for kitchen exhaust hoods. This exception is in the 2009 Seattle code and also in the 2010 ASHRAE 90.1 standard.

C403.2.6.1 Energy recovery ventilation systems. Any system with minimum outside air requirements at design conditions greater than 5,000 CFM or any system required by Table C403.2.6 shall include an energy recovery system. The energy recovery system shall have the capability to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies, at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass or controls which permit operation of the economizer as required by Section C403.4. Where a single room or space is supplied by multiple units, the aggregate ventilation (cfm) of those units shall be used in applying this requirement. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C).

EXCEPTION: An energy recovery ventilation system shall not be required in any of the following conditions:

1. Where energy recovery systems are prohibited by the *International Mechanical Code*.
2. Laboratory fume hood systems that include at least one of the following features, and also comply with Section 403.2.5.4.2:
 - 2.1. Variable-air-volume hood exhaust and room supply systems capable of reducing exhaust and makeup air volume to 50 percent or less of design values.
 - 2.2. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) above room setpoint, cooled to no cooler than 3°F (1.7°C) below room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and are not cooled.
4. Where more than 60 percent of the outdoor heating energy is provided from site-recovered or site solar energy.
5. Heating energy recovery in Climate Zones 1 and 2.
6. Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Multi-zone systems with cold deck supply air and zone reheat where the minimum outdoor air is less than 70 percent of total supply air.
9. Systems serving residential multifamily spaces where the largest source of air exhausted at a single location at the building exterior is less than 25 percent of the design outdoor air flow rate.

10. Type I kitchen exhaust hoods

12. Continuity with existing code provisions

C403.2.12: Correct motor size threshold to match 2009 Seattle code as follows:

C403.2.12 System criteria. For fan and pump motors ~~((7.5))~~ 5 hp and greater including motors in or serving custom and packaged air handlers serving variable air volume fan systems, constant volume fans, parking garage ventilation fans, heating and cooling hydronic pumping systems, pool and service water pumping systems, domestic water pressure boosting systems, cooling tower fan, and other pump or fan motors where variable flows are required, there shall be:

1. Variable speed drives; or
2. Other controls and devices that will result in fan and pump motor demand of no more than 30 percent of design wattage at 50 percent of design air volume for fans when static pressure set point equals 1/3 the total design static pressure, and 50 percent of design water flow for pumps, based on manufacturer's certified test data. Variable inlet vanes, throttling valves (dampers), scroll dampers or bypass circuits shall not be allowed.

EXCEPTION: Variable speed devices are not required for motors that serve:

1. Fans or pumps in packaged equipment where variable speed drives are not available as a factory option from the equipment manufacturer.
2. Fans or pumps that are required to operate only for emergency fire-life-safety events (e.g., stairwell pressurization fans, elevator pressurization fans, fire pumps, etc.).

13. Correct text error

C403.2.6.2– Correct error in condensate system text:

C403.2.6.2 Condensate systems. On-site steam heating systems shall have condensate water ((~~heat~~)) recovery. On-site includes a system that is located within or adjacent to one or more buildings within the boundary of a contiguous area or campus under one ownership and which serves one or more of those buildings.

Buildings using steam generated off-site with steam heating systems which do not have condensate water recovery shall have condensate water heat recovery.

14. Continuity with existing code provisions

C403.3.1(2): Add economizer exception for Climate Zone 4C (Seattle) for very high performance equipment. This exception in the 2009 code typically has been utilized for very small equipment sizes.

4. Where the cooling *efficiency* meets or exceeds the *efficiency* requirements in Table C403.3.1(2).

**Table C403.3.1(2)
Equipment Efficiency Performance
Exception for Economizers**

Climate Zones	Cooling Equipment Performance Improvement (EER OR IPLV)
2B	10% Efficiency Improvement
3B	15% Efficiency Improvement
4B	20% Efficiency Improvement
4C	64% Efficiency Improvement

15. Continuity with existing code provisions

C403.4.1, change values in exception #3 to match 2009 code as follows:

C403.4.1 Economizers. Air economizers shall be provided on all new systems including those serving computer server rooms, electronic equipment, radio equipment, and telephone switchgear. Economizers shall comply with Sections C403.4.1.1 through C403.4.1.4.

EXCEPTIONS:

1. Water-cooled refrigeration equipment serving chilled beams and chilled ceiling space cooling systems only which are provided with a water economizer meeting the requirements of Sections C403.4.1.1 through C403.4.1.4. Water economizer capacity per building shall not exceed 500 tons. This exception shall not be used for Total Building Performance.
2. Systems complying with all of the following criteria:
 - 2.1. Consist of multiple water source heat pumps connected to a common water loop;
 - 2.2. Have a minimum of 60 percent air economizer;
 - 2.3. Have water source heat pumps with an EER at least 15 percent higher for cooling and a COP at least 15 percent higher for heating than that specified in Section C403.2.3;
 - 2.4. Where provided with a dedicated boiler or furnace for that building, have a central boiler or furnace efficiency of 90 percent minimum for units up to 199,000 Btu/h; and
 - 2.5. Provide heat recovery with a minimum 50 percent heat recovery effectiveness as defined in Section C403.2.6 to preheat the outside air supply.
3. Chilled water terminal units connected to systems with chilled water generation equipment with IPLV values more than 25 percent higher than minimum part load efficiencies listed in Table C403.2.3(7), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. The total capacity of all systems without economizers shall not exceed ~~((480,000))~~ 72,000 Btu/h per building, or ~~((20))~~ 5 percent of its air economizer capacity, whichever is greater. That portion of the equipment serving Group R Occupancy is not included in determining the total capacity of all units without economizers in a building. This exception shall not be used for the initial permit (this includes any initial permit for the space including, but not limited to, the shell-and-core permit, built-to-suit permit, and tenant improvement permit) or for Total Building Performance Method.

16. Correct reference

The referenced “Section C403.4.9” does not exist, and should be C403.2.12

C403.4.3.6 Variable flow controls. Individual pumps requiring variable speed control per Section ~~(C403.4.9)~~ **C403.2.12** shall be controlled in one of the following manners:

1. For systems having a combined pump motor horsepower less than or equal to 20 hp (15 kW) and without direct digital control of individual coils, pump speed shall be a function of either:

- 1.1. Required differential pressure; or
- 1.2. Reset directly based on zone hydronic demand, or other zone load indicators; or
- 1.3. Reset directly based on pump power and pump differential pressure.

2. For systems having a combined pump motor horsepower that exceeds 20 hp (15 kW) or smaller systems with direct digital control, pump speed shall be a function of either:

- 2.1. The static pressure set point as reset based on the valve requiring the most pressure;

or

- 2.2. Directly controlled based on zone hydronic demand.

17. Correction of garbled paragraphs

C403.6 & C403.9, revise as follows, to correct garbled text in the draft code:

C403.6 Refrigerated warehouse coolers and refrigerated warehouse freezers. Refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with all of the following:

1. Evaporator fan motors that are less than 1 horsepower and less than 460 volts shall use electronically commutated motors (brushless direct current motors) or 3-phase motors.

2. Condenser fan motors that are less than 1 horsepower shall use electronically commutated motors, permanent split capacitor-type motors or 3-phase motors.

3. Evaporator fans shall be variable speed, and the speed shall be controlled in response to space conditions.

EXCEPTION. Evaporators served by a single compressor without unloading capability.

4. Compressor systems utilized in refrigerated warehouses shall conform to the following:

4.1. Compressors shall be designed to operate at a minimum condensing temperature of 70°F or less.

4.2. The compressor speed of a screw compressor greater than 50 hp shall be controllable in response to the refrigeration load or the input power to the compressor shall be controlled to be less than or equal to 60 percent of full load input power when operated at 50 percent of full refrigeration capacity.

EXCEPTION. Refrigeration plants with more than one dedicated compressor per suction group.

C403.9 Refrigerated Warehouse Cooling.

Cooling systems that supply cold storage spaces and frozen storage spaces in refrigerated warehouses shall meet the requirements of this section.

C403.9.1 Evaporators. Fan-powered evaporators used in coolers and freezers shall conform to the following:

1. Single phase fan motors less than 1 hp and less than 460 volts shall be electronically commutated motors.

2. Evaporator fans shall be variable speed, and the speed shall be controlled in response to space conditions.

EXCEPTION. Evaporators served by a single compressor without unloading capability.

C403.9.3 Compressors. Compressor systems utilized in refrigerated warehouses shall conform to the following:

1. Compressors shall be designed to operate at a minimum condensing temperature of 70°F or less.

2. The compressor speed of a screw compressor greater than 50 hp shall be controllable in response to the refrigeration load or the input power to the compressor shall be controlled to be less than or equal to 60 percent of full load input power when operated at 50 percent of full refrigeration capacity.

EXCEPTION. Refrigeration plants with more than one dedicated compressor per suction group.

18. Clarification of code application scope

Section C407.2: Add section references as follows, to include Seattle amendments in the mandatory requirements for buildings using the Total Building Performance calculation method:

C407.2 Mandatory requirements. Compliance with this section requires that the criteria of Sections C402.4, C403.2, C404, ~~((and))~~ C405, C408, C409 and C410 be met.

The building permit application for projects utilizing this method 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 *standard reference design* and shall comply with the requirements of this code.

19. Coordination of code provisions

Section C407.3: Add 93% factor to coordinate with values in the charging paragraphs in C401.2.

C407.3 Performance-based compliance. Compliance based on total building performance requires that a proposed building (*proposed design*) be shown to have an annual energy consumption based on site energy expressed in Btu and Btu per square foot of *conditioned floor area* that is less than or equal to **93 percent of** the annual energy consumption of the *standard reference design*.

20. Coordination of code provisions

Table C407.5.1(1): Correct Standard Reference Design values in the table as follows, to coordinate with values elsewhere in the code text:

Skylights	Area	As proposed
	<ol style="list-style-type: none"><li data-bbox="570 436 1016 583">1. The proposed skylight area; where the proposed skylight area is less than (3) 5 percent of gross area of roof assembly.<li data-bbox="570 617 1024 764">2. (3) 5 percent of gross area of roof assembly; where the proposed skylight area is (3) 5 percent or more of gross area of roof assembly.	

21. Coordination and reduction of submittal requirements

C408.1.2.1 and C408.1.3: The Preliminary and Final Commissioning Reports have been consolidated into a single Commissioning Report, and the number of documents required to be submitted to DPD has been reduced. The Commissioning Checklist has been updated to reflect these changes.

Section C408--System commissioning.

C408.1 General. This section covers the commissioning of the building mechanical systems in Section C403, service water heating systems in Section C404, electrical power and lighting systems in Section C405 and energy metering in Section C409. Prior to passing the final mechanical and electrical inspections or obtaining a certificate of occupancy, the *registered design professional* or ~~((approved agency))~~ *qualified commissioning authority* shall provide evidence of systems *commissioning* and completion in accordance with the provisions of this section.

Copies of all documentation shall be given to the owner and made available to the *code official* upon request in accordance with Sections C408.1.2 and C408.1.3.

C408.1.1 Commissioning plan. A commissioning plan shall be developed by a registered design professional or qualified commissioning authority and shall include the items listed in this section. Items 1 – 4 shall be included with the construction documents, and items 5 – 8 shall be submitted prior to the first mechanical inspection. For projects where no mechanical inspection is required, items 5 – 8 shall be submitted prior to the first electrical inspection. ~~((A commissioning plan shall be developed by a registered design professional or approved agency and shall include the following items:))~~

1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.

2. Roles and responsibilities of the commissioning team, including statement of qualifications of the commissioning authority in accordance with Section C408.1.

3. A schedule of activities including systems testing and balancing, functional testing, and supporting documentation.

4. Where the *qualified commissioning authority* is an employee of one of the *registered design professionals* of record or an employee or subcontractor of the project contractor, an In-House Commissioning Disclosure and Conflict Management Plan shall be submitted with the commissioning plan. This Plan shall disclose the *qualified commissioning authority's* contractual relationship with other team members and provide a conflict management plan demonstrating that the *qualified commissioning authority* is free to identify any issues discovered and report directly to the owner.

~~((4))~~ 5. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.

~~((5))~~ 6. Functions to be tested.

~~((6))~~ 7. Conditions under which the test will be performed.

~~((7))~~ 8. Measurable criteria for performance.

C408.1.2 Preliminary commissioning report. A preliminary report of commissioning test procedures and results shall be completed and certified by the *registered design professional* or

approved agency and provided to the building owner. The report shall be identified as "Preliminary Commissioning Report" and shall identify:

1. Itemization of deficiencies found during testing required by this section that have not been corrected at the time of report preparation.
2. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions, with anticipated date of completion.
3. Climatic conditions required for performance of the deferred tests.
4. Record of progress and completion of operator training.

EXCEPTION: The preliminary commissioning report is not required if all of the items listed above are included in the commissioning report described in Section C408.1.3.4.

C408.1.2.1 Acceptance of report. Buildings, or portions thereof, shall not pass the final mechanical and electrical inspections or obtain a certificate of occupancy, until such time as the *code official* has received a letter of transmittal from the *building owner* acknowledging that the *building owner* has received the Preliminary Commissioning Report required by Section C408.1.3.4 and the completed. Completion of the Commissioning Compliance Checklist (Figure C408.1.2.1) is deemed to satisfy this requirement.

C408.1.2.2 Copy of report. The *code official* shall be permitted to require that a copy of the Preliminary Commissioning Report be made available for review by the *code official*.

C408.1.3 Documentation requirements. The *construction documents* shall specify that the manuals and system balancing report required by Sections C408.1.3.2 and C408.1.3.3 be provided to the *building owner* prior to issuance of the certificate of occupancy, the record documents required by Section C408.1.3.1 ((described in this section)) be provided to the *building owner* within 90 days of the date of receipt of the *certificate of occupancy*, and that all other the Commissioning Report documents described under Section C408.1.3.4 be provided to the *building owner* and the *code official* prior to issuance of the certificate of occupancy.

C408.1.3.1 Record documents. Construction documents shall be updated to convey a record of the alterations to the original design. The updates shall be provided to the *building owner*. Such updates shall include updated mechanical, electrical and control drawings red-lined, or redrawn if specified, that show all changes to size, type and locations of components, equipment and assemblies.

C408.1.3.2 Manuals. An operating and maintenance manual shall be provided and include all of the following:

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Name and address of at least one service agency.
4. Controls system maintenance and calibration information, including wiring diagrams, schematics, record documents, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in system programming instructions.
5. A narrative of how each system is intended to operate, including recommended

setpoints. Sequence of operation is not acceptable for this requirement.

C408.1.3.3 System balancing report. A written report describing the activities and measurements completed in accordance with Section C408.2.2.

C408.1.3.4 ((Final-ε)) Commissioning report. A report of test procedures and results identified as the "~~((Final))~~ Commissioning Report" shall be completed and certified by the *registered design professional or qualified commissioning authority* and delivered to the building owner and *code official* and shall include:

1. Results of functional performance tests.
2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance (~~((, provided herein for repeatability.))~~)
4. List and description of any deferred tests which cannot be completed at the time of report preparation because of climatic conditions, including anticipated date of completion, climatic conditions required for performance of the deferred tests, and parties to be involved, in checklist format.
5. List and description of any unresolved deficiencies or incomplete tasks, in checklist format.
6. A copy of a Commissioning Permit issued for the completion and resolution of items identified in the lists required by items 4 and 5 above. The permit shall stipulate that all such work shall be completed within one year of issuance of the *certificate of occupancy*.

~~((Exception: If there are no deferred test, unresolved deficiencies or incomplete tasks to be listed under items 4 and 5, the Commissioning Permit is not required. —Deferred tests which cannot be performed at the time of report preparation due to climatic conditions—))~~

7. Completed Commissioning Compliance Checklist (Figure C408.1.2.1)

8. Record of progress and completion of systems operation training.

C408.1.4 Systems operation training. Training of the maintenance staff for equipment included in the manuals required by Section C408.1.3.2 shall include at a minimum:

1. Review of systems documentation.
2. Hands-on demonstration of all normal maintenance procedures, normal operating modes, and all emergency shutdown and start-up procedures.
3. Training completion report.

**Figure C408.1.2.1
Commissioning Compliance Checklist**

Project Information	Project Name:
	Project Address:
	Commissioning Authority:
<u>Qualifications</u> (Section C408.1) Commissioning Plan (Section C408.1.1)	<u>Statement of commissioning authority’s formal training, experience and certification.</u> <input type="checkbox"/> Commissioning Plan was used during construction and included items below <input type="checkbox"/> A narrative description of activities and the personnel intended to accomplish each one <input type="checkbox"/> Measurable criteria for performance <input type="checkbox"/> Functions to be tested
	<input type="checkbox"/> <u>In-House Commissioning Disclosure and Conflict Management Plan, where applicable</u>
Systems Balancing (Section C408.2.2)	<input type="checkbox"/> Systems Balancing has been completed <input type="checkbox"/> Air and Hydronic systems are proportionately balanced in a manner to first minimize throttling losses. <input type="checkbox"/> Test ports are provided on each pump for measuring pressure across the pump.
Functional Testing (Section C408.2.3, C408.3.1, C408.4.1, C408.4.1.3 and C408.5.1)	<input type="checkbox"/> HVAC Systems Equipment Testing has been completed (Section C408.2.3.1) <input type="checkbox"/> HVAC equipment has been tested to demonstrate the installation and operation of components, systems and system-to-system interfacing relationships in accordance with approved plans and specifications <input type="checkbox"/> HVAC Controls Functional Testing has been completed (Section C408.2.3.2) <input type="checkbox"/> HVAC controls have been tested to ensure that control devices are calibrated, adjusted and operate properly. Sequences of operation have been functionally tested to ensure they operate in accordance with approved plans and specifications <input type="checkbox"/> Economizers Functional Testing has been completed (Section C408.2.3.3) <input type="checkbox"/> Economizers operate in accordance with manufacturer's specifications

	<ul style="list-style-type: none"> <input type="checkbox"/> Lighting Controls Functional Testing has been completed (Section C408.3.1) <input type="checkbox"/> Lighting controls have been tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications <input type="checkbox"/> Service Water Heating System Functional Testing has been completed (Section C408.4.1) <input type="checkbox"/> Service water heating equipment has been tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications <input type="checkbox"/> Pool and Spa Functional Testing has been completed (Section C408.4.1.3) <input type="checkbox"/> Pools and spas have been tested to ensure that service water heating equipment, time switches and heat recovery equipment are calibrated, adjusted and operate in accordance with approved plans and specifications <input type="checkbox"/> Metering System Functional Testing has been completed (Section C408.5.1) <input type="checkbox"/> Energy source meters, energy end-use meters, the energy metering data acquisition system and required display are calibrated adjusted and operate in accordance with approved plans and specifications
Supporting Documents (Section 408.1.3.2)	<ul style="list-style-type: none"> <input type="checkbox"/> Manuals, record documents and training have been completed or are scheduled <ul style="list-style-type: none"> <input type="checkbox"/> System documentation has been provided to the owner or scheduled date: <input type="checkbox"/> Record documents have been submitted to owner or scheduled date: <input type="checkbox"/> Training has been completed or scheduled date:
Commissioning Report (Section C408.1.2)	<ul style="list-style-type: none"> <input type="checkbox"/> Preliminary Commissioning Report submitted to Owner and includes items below <ul style="list-style-type: none"> <input type="checkbox"/> Deficiencies found during testing required by this section which have not been corrected at the time of report preparation <input type="checkbox"/> Deferred tests, which cannot be performed at the time of report preparation due to climatic conditions
(Section C408.1.3.4)	<ul style="list-style-type: none"> <input type="checkbox"/> <u>Commissioning Report submitted to Owner and code official and includes items below</u>
	<ul style="list-style-type: none"> <input type="checkbox"/> <u>1. Results of functional performance tests.</u>
	<ul style="list-style-type: none"> <input type="checkbox"/> <u>2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.</u>
	<ul style="list-style-type: none"> <input type="checkbox"/> <u>3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance.</u>

	<input type="checkbox"/> <u>4. List and description of any deferred tests which cannot be completed at the time of report preparation because of climatic conditions, including anticipated date of completion, climatic conditions required for performance of the deferred tests, and parties to be involved, in checklist format.</u>
	<input type="checkbox"/> <u>5. List and description of any unresolved deficiencies or incomplete tasks</u>
	<input type="checkbox"/> <u>6. A copy of a Commissioning Permit issued for the completion and resolution of items identified in the lists required by items 4 and 5 above.</u>
	<input type="checkbox"/> <u>7. Completed Commissioning Compliance Checklist (Figure C408.1.2.1)</u>
	<input type="checkbox"/> <u>8. Record of progress and completion of systems operation training.</u>
Certification	<p>I hereby certify that all requirements for Commissioning have been completed in accordance with the <u>Washington State Seattle</u> Energy Code, including all items above</p> <p style="text-align: center;">Building Owner or Owner's Representative Date</p>

22. Correction of typographical error and coordination with other code provisions

C409.3: Re-number exceptions to read 4.1, 4.2, 4.3, and add new exception 5 as follows (exception 5 applies the same logic to hotel rooms that is currently provided for multi-family dwelling units):

C409.3 End-use metering. Meters shall be provided to collect energy use data for each end-use category listed in Sections C409.3.1 through ~~((C409.3.2))~~ C409.3.6. These meters shall collect data for the whole building or for each separately metered portion of the building where not exempted by the exceptions to Section C409.1. Not more than 10 percent of the total connected load of any of the end-use metering categories C409.3.1 through C409.3.5 is permitted to be excluded from that end-use data collection. Not more than 10 percent of the total connected load of any of the end-use metering categories C409.3.1 through C409.3.5 is permitted to consist of loads not part of that category. Multiple meters may be used for any end-use category, provided that the data acquisition system totals all of the energy used by that category. Full-floor tenant space sub-metering data shall be provided to the tenant in accordance with Section C409.3.5, and the data shall not be required to be included in other end-use categories.

EXCEPTIONS:

1. HVAC and water heating equipment serving only an individual dwelling unit does not require end-use metering.
2. Separate metering is not required for fire pumps, stairwell pressurization fans or other life safety systems that operate only during testing or emergency.
3. End use metering is not required for individual tenant spaces not exceeding 2,500 square feet in floor area when a dedicated source meter meeting the requirements of Section C409.4.1 is provided for the tenant space.
4. Healthcare facilities with loads in excess of 150 kVA are permitted to have submetering that measures electrical energy usage in accordance with the normal and essential electrical systems identified in Article 517 of the Seattle Electrical Code, except that submetering is required for the following load categories:
 - 6.1 4.1 HVAC system energy use per the requirements of section C409.3.1
 - 6.2 4.2 Water heating energy use per the requirements of section C409.3.2
 - 6.3 4.3 Process load system energy per the requirements of section C409.3.5 for each significant facility not used in direct patient care, including but not limited to food service, laundry and sterile processing facilities, where the total connected load of that facility exceeds 100 kVA.
5. End-use metering is not required for electrical circuits serving only sleeping rooms and guest suites within R-1 occupancies. This exception does not apply to common areas or to equipment serving multiple sleeping rooms.

23. Clarification of code interpretation

Section C409.5 (Metering for existing buildings): Add new section as follows (note that this is an existing DPD interpretation that is regularly enforced, but not shown in the energy code text):

C409.5.4 Metering for complete electrical system replacement. If all, or substantially all, of the existing electrical system is replaced under a single electrical permit or within a 12-month period, all of the provisions of Section C409 shall be met.

24. Clarification of code application methodology

Section C410.1: Correct typographical error in threshold area to match current 2009 threshold (5,000 SF, rather than 25,000 SF). Add sentence to exception 1 to clarify how the equipment efficiency factor will be applied (which otherwise would have needed a Director's Rule) as follows:

C410.1 On-site renewable energy systems. Each new building or addition larger than 25,000 square feet of gross conditioned floor area shall include a renewable energy generation system consisting of at least 70 Watts rated peak PV (photovoltaic) energy production, or 240 kBTU of annual SWH (solar water heating) energy production, per 1,000 square feet of conditioned space or fraction thereof. For buildings over 5 stories in height, the conditioned area for this calculation shall be based on the conditioned area of the largest 5 above-grade stories in the building. This system is permitted to be mounted either within the allocated *solar zone* required by Section C410.2.3, or elsewhere on the building or site.

Exceptions.

1. Higher-efficiency mechanical equipment is permitted to be provided in lieu of on-site renewable energy systems, where the capacity-weighted equipment efficiency for the total capacity of the space heating and space cooling equipment is a minimum of 1.10 times the corresponding minimum efficiency in Tables C403.2.3(1) through C403.2.3(8). The minimum efficiency for this exception shall be in excess of that required elsewhere in the Energy Code, including Section C403.4.1 (economizers). **The Standard Reference Design determination from Section C407 shall be used to establish the baseline case for determination of the 1.10 factor.**
2. Additional heat recovery systems beyond those required by this code are permitted to be provided in lieu of on-site renewable energy systems, where the calculated net annual energy savings from the heat recovery systems exceed the calculated net annual energy production of the required on-site renewable energy systems. Acceptable heat recovery systems include but are not limited to: exhaust air heat recovery in excess of that required by this code, waste water or sewer heat recovery, ground source heating and cooling, or heat recovered from other on-site or off-site sources that would otherwise be lost into the sewer or atmosphere.