John Hogan/jh
DPD 2009 Seattle Energy Code ORD
August 19, 2010
Version #3

ORDINANCE 123430

AN ORDINANCE relating to energy efficiency and energy conservation, amending Section 22.700.010 of the Seattle Municipal Code; enacting a new Seattle Energy Code by adopting by reference the 2009 Washington State Energy Code, with certain amendments applicable to nonresidential spaces and revisions to administrative and procedural provisions; repealing Sections 2-10 of Ordinance 122530; and providing for a deferred effective date for such repeal and for application of the new Seattle Energy Code to residential spaces.

WHEREAS, the Washington State Building Code Council has adopted the 2009 Washington Energy Code, has deferred its effective date to October 29, 2010, and has proposed a further deferral of its effective date; NOW, THEREFORE,

BE IT ORDAINED BY THE CITY OF SEATTLE AS FOLLOWS:

Section 1. Section 22.700.010 of the Seattle Municipal Code is amended as follows:

22.700.010 ((~~Adoption of the 2006 Washington State Energy Code and local amendments~~)) Seattle Energy Code.

A. The ((~~2006~~)) 2009 Washington State Energy Code (WAC 51-11), which is filed with the City Clerk in C.F. ((~~308938~~))311044, and the amendments thereto adopted by Council Bill ((~~116033 that incorporate~~)) 116967, which are the Seattle Amendments, are hereby adopted and by this reference made a part of this subtitle((~~ and constitute the Washington State Energy Code with Seattle amendments~~)). The Seattle Amendments include amendments to Reference Standard 29 and add Reference Standards 35 and 36. The 2009 Washington State Energy Code, with all Seattle Amendments, constitutes the Seattle Energy Code for all purposes other than application to residential spaces.

B. For purposes of this Section 22.700.010:

1. Prior to the effective date of the 2009 Washington State Energy Code, "residential spaces" are defined as spaces within the definition of "Group R" occupancy in Chapter 3 of the 2006 Seattle Building Code, as adopted by Ordinance **122528,** or within the exception in Section 101.2 of that code, and

2. effective upon the date when the 2009 Washington State Energy Code takes effect, "residential spaces" are defined as set forth in Chapter 2 of the 2009 Washington State Energy Code under "RESIDENTIAL".

C. Effective upon the date when the 2009 Washington State Energy Code takes effect, the 2009 Washington State Energy Code, with the Seattle Amendments only to Chapter 1 and to Sections 1144 and 1162 of Chapter 11, and the provisions for procedure, administration and enforcement described in Section 1105 of the Seattle Amendments, shall constitute the Seattle Energy Code for residential spaces, to the extent that the provisions thereof apply to residential spaces. Until the effective date of the 2009 Washington State Energy Code, the 2006 Washington State Energy Code, as filed in C.F. 308938, and the amendments thereto adopted by Ordinance 122530, constitute the Seattle Energy Code for residential spaces, except as provided in Section 101.1.2 of the Seattle Amendments regarding procedure, administration and enforcement provisions.

D. It is the City's intent that the Seattle Energy Code constitute part of a local building code, and that any provisions that would be superseded by federal standards but for the application of 42 USC Section 6316(b)(2)(B) or of any other exception to federal preemption shall be applicable to the full extent authorized by any such exception. Any other provision

notwithstanding, any requirement of the Seattle Energy Code shall be applicable at any time only to the maximum extent that its application is not prohibited by United States law as then in effect. If any provision of the Seattle Amendments shall be determined to be invalid or unenforceable for any reason, and if the such invalidity or unenforceability would otherwise result in application of any standard below that required by the Washington State Energy Code as then in effect, then the standard of the Washington State Energy Code as then in effect shall apply unless such application is prohibited by applicable federal law.

Section 2. The following sections or subsections of Chapter 1 of the 2009 Washington State Energy Code are amended, and new subsections are added, as follows:

SECTION 101 — SCOPE AND GENERAL REQUIREMENTS

101.1 Title and Applicability

101.1.1 Title: This Code, including provisions of the 2009 Washington Energy Code as they apply without Seattle Amendments, may be referred to as the "Seattle Energy Code" or the "2009 Seattle Energy Code". References herein to "this Code" mean the entire Seattle Energy Code or the provisions thereof that are applicable to the type of structure or space involved, as the context may require.

Chapters 1 through 10 of this Code, as they apply to single-family residential spaces, shall be known as the "((~~Washington State~~)) Seattle Single-Family Residential Energy Code" and may be cited as such. Any reference to the "Seattle Energy Code" in the Seattle Municipal Code or

any Seattle ordinance, to the extent applicable to those spaces, shall include the Seattle Single-Family Residential Energy Code. ((~~; and will be referred to herein as "this Code."~~))

101.1.2 Applicability to Single-Family Residential Spaces: Until the effective date of the 2009 Washington State Energy Code, the 2006 Washington State Energy Code, as filed in Seattle City Clerk's File 308938, and the amendments thereto adopted by Ordinance 122530, constitute the Seattle Energy Code for single-family residential spaces. Effective upon the date when the 2009 Washington State Energy Code takes effect, Chapters 1 through 10 of the 2009 Washington State Energy Code, with the Seattle Amendments only to Chapter 1, constitute the Seattle Energy Code for single-family residential spaces.

EXCEPTION: Sections 1133, 1140, 1141.1, 1141.2, 1144, and 1162 of Chapter 11 of this Code, which relate to procedure, administration and enforcement, including Seattle Amendments to those sections, and the procedural requirements in all chapters, apply to all spaces and occupancies both before and after effectiveness of the 2009 Washington State Energy Code.

101.2 Purpose and Intent: The purpose of the Seattle Single-Family Residential Energy Code((~~this Code~~)) is to provide minimum standards for new or altered buildings and structures or portions thereof to achieve efficient use and conservation of energy.

The purpose of the Seattle Single-Family Residential Energy Code((~~this Code~~)) is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by its terms((~~the terms of this Code~~)). It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve efficient use and conservation of energy. These provisions are structured to

permit compliance with the intent of the Seattle Single-Family Residential Energy Code((~~this Code~~)) by any one of the following three paths of design:

1. A systems analysis approach for the entire building and its energy-using sub-systems which may utilize renewable energy sources; Chapters 4 and 9.

2. A component performance approach for various building elements and mechanical systems and components; Chapters 5 and 9.

3. A prescriptive requirements approach; Chapters 6 and 9.

Compliance with any one of these approaches meets the intent of the Seattle Single-Family Residential Energy Code((~~this Code~~)). The Seattle Single-Family Residential Energy Code((~~This Code~~)) is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances. The provisions of the Seattle Single-Family Residential Energy Code((~~this Code~~)) do not consider the efficiency of various energy forms as they are delivered to the building envelope. A determination of delivered energy efficiencies in conjunction with the Seattle Single-Family Residential Energy Code((~~this Code~~)) will provide the most efficient use of available energy in new building construction.

101.3 Scope: The Seattle Single-Family Residential Energy Code((~~This Code~~)) sets forth, among other things, minimum requirements for the design of new buildings and structures that provide facilities or shelter for residential occupancies by regulating their exterior envelopes and the selection of their mechanical systems, domestic water systems, electrical distribution and illuminating systems, and equipment for efficient use and conservation of energy. Buildings that

are subject to the Seattle Single-Family Residential Energy Code shall be designed to comply with the requirements of((~~either~~)) Chapter 4, 5 or 6 of this Code and the additional energy efficiency requirements included in Chapter 9 of this Code.

Spaces within the scope of Section R101.2 of the ((~~International~~))Seattle Residential Code shall comply with Chapters 1 through 10 of this Code. All other spaces, including other Group R Occupancies, shall comply with Chapters 11 through 16((~~20~~)) of this Code as specified in Section 1105. Chapter 2 (Definitions), Chapter 3 (Design Conditions), Chapter 7 (Standards) and Chapter 10 (Default heat loss coefficients) are applicable to all building types.

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105.2.1 Required Inspections: The building official, upon notification, shall make the following inspection in addition to those inspections required in ((~~Section 109.3 of the International~~))the Seattle Building Code or Seattle Residential Code:

1. **Wall Insulation Inspection:** To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

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SECTION 106 — VIOLATIONS AND PENALTIES

It shall be unlawful for any person, firm, or corporation to erect or construct any building, or remodel or rehabilitate any existing building or structure in the ((~~state~~))city of Seattle, or allow the same to be done, contrary to or in violation of any of the provisions of this Code. Other violations are set forth in Section 1144 of this Code. Provisions for notices, enforcement

proceedings and penalties specified in Section 103 of the Seattle Building Code apply to violations of this Code, as set forth in Section 1144 of this Code.

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SECTION 107 — LIABILITY

Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of ((~~any city or county~~))the City of Seattle or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this Code.

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SECTION 108 — CONFLICTS WITH OTHER CODES

In addition to the requirements of this Code, all occupancies shall conform to the provisions included in the Seattle Building Code or Seattle Residential Code, as applicable, and other applicable codes((~~State Building Code (Chapter 19.27 RCW)~~)). In case of conflicts among Codes enumerated in RCW 19.27.031 subsections (1), (2), (3) and (4) and this Code, an earlier named Code shall govern over those following. In the case of conflict between the duct sealing and insulation requirements of this Code and the duct insulation requirements of Sections 603 and 604 of the ((~~State~~))Seattle Mechanical Code (((~~Chapter 51-52 WAC~~))), the duct insulation requirements of this Code((~~code, or where applicable, a local jurisdiction's energy code~~)) shall govern.

Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is

a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. ((~~Wherever in this Code reference is made to the appendix, the provisions in the appendix shall not apply unless specifically adopted.~~))

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Section 3. The following subsections of Section 201 of Chapter 2 of the 2009 Washington State Energy Code are amended, and new subsections are added to that Section, as follows:

SECTION 201 – GENERAL DEFINITIONS

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ADDITION: See the ((~~Washington State~~))Seattle Building Code.

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AHRI STANDARD 1160: AHRI's Standard 1160, Performance Rating of Heat Pump Pool Heaters, 2008.

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AMCA: Air Movement and Control Association.

AMCA STANDARD 500: AMCA's Standard 500, Laboratory Methods of Testing Dampers for Rating, 1997.

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ASHRAE STANDARD 127: ASHRAE's Standard 127, Method of Testing for Rating Computer and Data Processing Room Unitary Air Conditioners, 2007.

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BUILDING, EXISTING: An existing structure, as defined in the Seattle Building Code. (See **Existing Structure** in the ((~~Washington State~~))Seattle Building Code.)

BUILDING ENTRANCE: Any doorway, set of doors (including elevator doors such as in parking garages), turnstile, vestibule, or other form of portal that is ordinarily used to gain access to the building by its users and occupants. Where buildings have separate one-way doors to enter and to leave, this also includes any doors ordinarily used to leave the building.

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BUILDING OFFICIAL: The ((~~official authorized to act in behalf of a jurisdiction code enforcement agency or its~~))Director of the Seattle Department of Planning and Development, or his or her authorized representative.

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COMPUTER ROOM: a room whose primary function is to house electronic equipment for the processing and storage of electronic data and that has a design electronic data equipment power density exceeding 20 watts/ft^2 of conditioned floor area (215 watts/m^2).

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CONTINUOUS INSULATION (c.i.): Insulation that is continuous across all structural members without thermal bridges other than fasteners (i.e. screws and nails) and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope. For the purposes of this definition of continuous insulation, only screws and nails are considered fasteners. Insulation installed between metal studs, z-girts, z-channels, shelf angles, or insulation with penetrations by brick ties and offset brackets, or any other similar framing is not considered continuous insulation, regardless of whether the metal is continuous or occasionally discontinuous or has thermal break material. (See Section 1332 for determination of U-factors for assemblies that include metal other than screws and nails.)

Informative Note: Even small clips degrade the performance of insulation. For mass walls, Table 13-1 contains a prescriptive compliance option for mass walls with 1-inch clips. This

corresponds with the category of "1 in Metal Clips at 24 in. on center horizontally and 16 in. vertically" in Table 10-5B(3), Default U-factor for Concrete and Masonry. However, note that this is not considered continuous insulation. There is a separate listing in Table 10-5B(3) for insulation that qualifies as continuous insulation.

Metal studs, z-girts or any other repetitive continuous metal framing can decrease the effective R-value of insulation by more than 50%. However, occasional continuous metal framing members such as shelf angles are also significant thermal bridges around the insulation. Discontinuous metal elements, such as stand-off brackets are better, but still are a thermal bridging element. Calculations on a stand-off system utilizing 6-inch brackets showed that the brackets mounted at 24 inches on center vertically and 16 inches on center horizontally decreased the effective R-value of the assembly by 25% and the brackets mounted at 48 inches on center vertically and 16 inches on center horizontally decreased the effective R-value of the assembly by 14%. Even isolated discontinuous metal elements such as brick ties have a thermal impact that is too large to be ignored.

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DAYLIGHTED ZONE:

a. **Under skylights**((~~overhead glazing~~)): the area under a skylight((~~overhead glazing~~)) whose horizontal dimension, in each direction, is equal to the skylight's((~~overhead glazing~~)) dimension in that direction plus either 70 percent of the floor to ceiling height or the dimension to a ceiling height opaque partition or to a partition which is more than 50% opaque, or one-half the distance to an adjacent skylight((~~overhead~~)) or vertical fenestration((~~glazing~~)), whichever is least.

b. **At vertical fenestration**((~~glazing~~)): the area adjacent to vertical fenestration ((~~glazing~~)) which receives daylighting from the glazing. For purposes of this definition and unless more detailed daylighting analysis is provided, the primary daylighted zone depth extends

into the space a distance equal to the window head height and the secondary daylighted zone extends from the edge of the primary zone to a distance equal to two times the window head height, or to the nearest ceiling height opaque partition or to a partition which is more than 50% opaque, whichever is least((~~less~~)). The daylighting zone width is assumed to be the width of the window plus either two feet on each side (or the lesser distance to an opaque partition) or one-half the distance to adjacent skylights((~~overhead~~)) or vertical fenestration((~~glazing~~)), whichever is least.

c. **In parking garages**: the area within 20 feet of any portion of a perimeter wall that has a net opening to wall ratio of at least 40% and no exterior obstructions within 20 feet.

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DOMESTIC WATER SYSTEM: Supply of hot water and cold water for domestic, ((~~or~~)) commercial, or industrial purposes, including commercial and industrial processes, other than comfort heating and cooling.

Informative Note: As indicated in Section 1120, the Energy Code applies to industrial facilities, as well as commercial and industrial processes. Thus, the domestic water requirements apply to industrial facilities, as well as systems and equipment used in commercial and industrial processes.

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DPD: the Seattle Department of Planning and Development and any successor department responsible for administration of this Code.

DWELLING UNIT: See the ((~~Washington State~~))Seattle Building Code.

DYNAMIC GLAZING: any fenestration product that has the fully reversible ability to change its performance properties, including U-factor, SHGC, or VT.

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EAST: (See **Orientation.**)

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ENERGY STAR PROGRAM REQUIREMENTS FOR COMMERCIAL DISHWASHERS: Energy Star Program Requirements for Commercial Dishwashers, Version 1.1, October 11, 2007.

ENERGY STAR PROGRAM REQUIREMENTS FOR COMMERCIAL FRYERS: Energy Star Program Requirements for Commercial Fryers, Version 1.0, August 15, 2003.

ENERGY STAR PROGRAM REQUIREMENTS FOR COMMERCIAL STEAM COOKERS: Energy Star Program Requirements for Commercial Steam Cookers, Version 1.0, August 1, 2003.

ENERGY STAR PROGRAM REQUIREMENTS FOR HOT FOOD HOLDING CABINETS: Energy Star Program Requirements for Hot Food Holding Cabinets, Version 1.0, August 15, 2003.

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FENESTRATION AREA: Total area of the fenestration measured using the rough opening, and including the glazing, sash and frame. For doors where the daylight opening area is less than 50 percent of the door area, the fenestration area is the daylight opening area. For all other doors, the fenestration area is the door area.

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GEOTHERMAL ENERGY: heat extracted from the Earth's interior and used to produce electricity or mechanical power or provide thermal energy for heating buildings, water, or processes. Geothermal energy does not include systems that use energy independent of the geothermal source to raise the temperature of the extracted heat, such as heat pumps.

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GLAZING: For residential spaces, ((~~All~~))all areas, including the frames, in the shell of a conditioned space that let in natural light including windows, clerestories, skylights, sliding or swinging glass doors and glass block walls. For other spaces, that portion of the fenestration that lets in natural light. (See **Fenestration**.)

Informative Note: The terminology used for single-family residential in Chapters 1-10 differs from that used for other spaces in Chapters 2 and 10-16. For single-family residential, the term "glazing" is used to apply to the overall product including the frame. However, for other spaces (nonresidential and multifamily residential), the term "fenestration" is used for the overall product including the frame, and "glazing" means only the portion of the product that lets in natural light.

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GUEST ROOM: See the ((~~Washington State~~))Seattle Building Code.

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INDIRECTLY CONDITIONED SPACE: an enclosed space within a building that is not a heated or cooled space, whose area weighted heat transfer coefficient to heated or cooled spaces exceeds that to the outdoors or to unconditioned spaces; or through which air from heated or cooled spaces is transferred at a rate exceeding three air changes per hour. Enclosed corridors between conditioned spaces shall be considered as indirectly conditioned space. Unless demonstrated otherwise, all portions of elevator shafts and stair enclosures located in the interior of the building are considered indirectly conditioned space, including those portions of elevator shafts and stair enclosures that extend above the roof and those portions that extend down below the floor into the parking garage. (See **Conditioned Space, Heated Space, Cooled Space,** and **Unconditioned Space**.)

Informative Note: For elevator shafts and stair enclosures, unless the space they enclose is demonstrated not to be conditioned space, the walls and roofs of elevator shafts and stair enclosures that extend above the roof are subject to the building envelope requirements for conditioned space, and the walls of elevator shafts and stair enclosures that extend down below the floor into the parking garage are subject to the building envelope requirements for conditioned space.

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INTERNATIONAL BUILDING CODE (IBC): (See ((~~Washington State~~))Seattle Building Code.)

INTERNATIONAL MECHANICAL CODE (IMC): (See ((~~Washington State Building~~))Seattle Mechanical Code.)

INTEGRATED ENERGY EFFICIENCY RATIO (IEER): a single-number figure of merit expressing cooling part-load EER efficiency for commercial unitary air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment.

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MECHANICAL SYSTEM: equipment and components that provide heating, cooling, and ventilation for any purpose, including commercial and industrial processes, other than domestic water systems.

Informative Note: As indicated in Section 1120, the Energy Code applies to industrial facilities, as well as commercial and industrial processes. Thus, the mechanical system requirements apply

to industrial facilities, as well as systems and equipment used in commercial and industrial processes.

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NOMINAL R-VALUE: the thermal resistance of insulation alone as determined in accordance with the U.S. Federal Trade Commission R-value rule (CFR Title 16, Part 460) in units of $h \cdot ft^2 \cdot °F/Btu$ at a mean temperature of 75°F. Nominal R-value refers to the thermal resistance of the added insulation in framing cavities or insulated sheathing only and does not include the thermal resistance of other building materials or air films.

Procedural Requirement: For products not labeled in accordance with the FTC rule, the R-value is to be determined by a report from the ICC Evaluation Service (ICC-ES).

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NORTH: (See **Orientation.**)

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OCCUPANCY: See the ((~~Washington State~~))Seattle Building Code.

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ON-SITE RENEWABLE ((~~ENERGY~~))ELECTRIC POWER SYSTEM: a photovoltaic, solar thermal, geothermal energy, ((~~and~~))or wind system((s)), used to generate electrical power and located on the building site. (See **Geothermal Energy.**)

ON-SITE RENEWABLE ENERGY SYSTEM: an on-site renewable electric power system or on-site renewable thermal energy system. (See **On-Site Renewable Electric Power System** and **On-Site Renewable Thermal Energy System.**)

ON-SITE RENEWABLE THERMAL ENERGY SYSTEM: a solar water-heating, geothermal energy, ground-source heat pump, or groundwater-source heat pump system, used to generate thermal energy and located on the building site. (See **Geothermal Energy**.)

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ORIENTATION:

East: oriented less than 45 degrees of true east.

North: oriented less than or equal to 45 degrees of true north.

South: oriented less than or equal to 45 degrees of true south.

West: oriented less than 45 degrees of true west.

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PERSON: Any individual, receiver, administrator, executor, assignee, trustee in bankruptcy, trust, estate, firm, partnership, joint venture, club, company, joint stock company, business trust, municipal or quasi-municipal corporation, state or instrumentality thereof, political subdivision of the State of Washington, corporation, limited liability company, association, society or any group of individuals acting as a unit, whether mutual, cooperative, fraternal, nonprofit or otherwise, and the United States or any instrumentality thereof.

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READILY ACCESSIBLE: See the ((~~Washington State~~))Seattle Mechanical Code.

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RESIDENTIAL: The following two categories comprise all residential spaces for the purposes of this Code:

a. Single-family: All spaces within the scope of Section R101.2 of the ((~~International~~))Seattle Residential Code.

b. Multifamily:

i. All Group R Occupancy not falling under the scope of Section 101.2 of the ((~~International~~))Seattle Residential Code including, but not limited to, dwelling units, hotel/motel guest rooms, dormitories, fraternity/sorority houses, hostels, prisons, and fire stations;

ii. All sleeping areas in Group I Occupancy including, but not limited to, assisted living facilities, nursing homes, patient rooms in hospitals, prisons, and fire stations; and

iii. All sleeping areas in other occupancies including, but not limited to, fire stations.

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SENSIBLE COOLING PANEL: a panel designed for sensible cooling of an indoor space through heat transfer to the thermally effective panel surfaces from the occupants and/or indoor space by thermal radiation and natural convection.

SENSIBLE HEATING PANEL: a panel designed for sensible heating of an indoor space through heat transfer from the thermally effective panel surfaces to the occupants and/or indoor space by thermal radiation and natural convection.

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SERVICE WATER HEATING: Supply of hot water for domestic or commercial or industrial purposes other than comfort heating.

Informative Note: As indicated in Section 1120, the Energy Code applies to industrial facilities, as well as commercial and industrial processes. Thus, the service water heating requirements apply to industrial facilities, as well as systems and equipment used in commercial and industrial processes.

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SOUTH: (See **Orientation.**)

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STORY: (See the Seattle Building Code.)

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THERMALLY EFFECTIVE PANEL SURFACE: any exterior surface of a panel that is intended to transfer heat between the panel and the occupants and/or the indoor space.

THERMALLY INEFFECTIVE PANEL SURFACE: any exterior surface of a panel that is not intended to transfer heat between the panel and the occupants and/or the indoor space.

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VISIBLE TRANSMITTANCE (VT): The ratio of visible radiation entering the space through the fenestration product to the incident visible radiation, determined as the spectral transmittance of the total fenestration system, weighted by the photopic response of the eye and integrated into a single dimensionless value.

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WEST: (See **Orientation.**)

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Section 4. The following sections or subsections of Chapter 3 of the 2009 Washington State Energy Code are amended as follows:

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TABLE 3-1

OUTDOOR DESIGN TEMPERATURES

Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)
Aberdeen 20 NNE	25	83	Hoquiam AP	26	79	Rainier, Longmire	15	85
Anacortes	24	72	Inchelium 2 NW	0	92	Paradise RS	8	71
Anatone	-4	89	John Day Dam	19	100	Raymond	28	81
Auburn	25	84	Kent	21	85	Redmond	17	83
Battlegroun d	19	91	Kirkland	17	83	Republic	-9	87
Bellevue	24	83	La Grande	23	88	Richland	11	101
Bellingham 2 N	19	78	Leavenworth	-3	93	Ritzville	6	99
Blaine	17	73	Little Goose Dam	22	101	Satus Pass	10	90
Bremerton	29	83	Long Beach 3 NNE	25	77	Seattle	24	82 db/ 66 wb
Burlington	19	77	Longview	24	87	Seattle: Sea-Tac AP	24	83
Chehalis	21	87	Lower	14	98	Sedro	19	78

Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)
			Granite Dam			Woolley 1 E		
Chelan	10	89	Lower Monument Dam	18	103	Sequim	23	78
Cheney	4	94	Marysville	23	79	Shelton	23	85
Chesaw	-11	81	Metaline Falls	-1	89	Smyrna	8	102
Clarkston	10	94	Methow 2 W	1	89	Snohomish	21	81
Cle Elum	1	91	Nespelem 2 S	-4	93	Snoqualmie Pass	6	80
Colfax 1 NW	2	94	Newhalem	19	89	Spokane AP	4	92
Colville AP	-2	92	Newport	-5	92	Spokane CO	10	96
Concrete	19	83	Northport	2	92	Stampede Pass	7	76
Connell 4 NNW	6	100	Oak Harbor	16	74	Stehekin 3 NW	12	85
Cougar 5 E	25	93	Odessa	7	100	Stevens	6	77

Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)
						Pass		
Dallesport AP	14	99	Olga 2 SE	24	71	Tacoma CO	29	82
Darrington RS	13	85	Olympia, AP	17	85	Tatoosh Island	31	63
Davenport	5	92	Omak 2 NW	3	90	Toledo AP	17	84
Edmonds	24	82	Oroville	5	93	Vancouver	22	88
Ellensburg AP	2	90	Othello	9	98	Vashon Island	28	78
Elma	24	88	Packwood	16	90	Walla Walla AP	6	96
Ephrata AP	7	97	Plain	-3	89	Waterville	1	88
Everett Paine AFB	21	79	Pleasant View	16	98	Wellpinit	1	93
Forks 1 E	23	81	Pomeroy	3	95	Wenatchee CO	10	92
Glacier RS	13	82	Port Angeles	28	75	Whidbey Island	11	71
Glenoma (Kosmos)	18	89	Port Townsend	25	76	Willapa Harbor	26	81

Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)	Location	Outdoor Design Temp Heating (°F)	Outdoor Design Temp Cooling (°F)
Goldendale	7	94	Prosser	12	97	Wilson Creek	3	96
Grays River Hatchery	24	86	Puyallup	19	86	Winthrop 1 WSW	-12	91
Greenwater	1.4	84	Quilcene 2 SW	23	83	Yakima AP	11	94
Grotto	21	84	Quinault RS	25	84			

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SECTION 303 — MECHANICAL VENTILATION

For single-family residential spaces, the((~~The~~)) minimum requirements for ventilation shall comply with Section M1508 of the ((~~Washington State Residential Code (WAC 51-51)~~)) Seattle Residential Code. For other spaces, see Section 1402.

Section 5. The following sections or subsections of Chapter 5 of the 2009 Washington State Energy Code are amended as follows:

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502.1.1: The stated U- or F-factor of any component assembly, listed in Table 5-1, such as roof/ceiling, opaque wall or opaque floor may be increased and the U-factor for other

components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-factors specified in this section.

The U-factors for typical construction assemblies are included in Chapter 10. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Chapter 10, values shall be calculated in accordance with Chapters 16 through 18 and 25 through 27 in Standard RS-1 listed in Chapter 7, using the framing factors listed in Chapter 10 where applicable.

For envelope assemblies containing metal framing, the U-factor shall be determined by one of the following methods:

1. Results of laboratory measurements according to acceptable methods of test.
2. Standard RS-1, listed in Chapter 7, where the metal framing is bonded on one or both sides to a metal skin or covering.
3. The zone method as provided in Chapter 27 of Standard RS-1, listed in Chapter 7.
4. Results of parallel path correction factors for effective framing/cavity R-values as provided in Table 10-5A: Effective R-Values for Metal Framing and Cavity Only for metal stud walls and roof/ceilings.

Informative Note: Effective framing/cavity R-values are provided in Table 10-5A(2).

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502.1.4.1 General: All insulating materials shall comply with Sections 2603 and/or 719 of the ((~~International~~))Seattle Building Code. Substantial contact of the insulation with the surface being insulated is required. All insulation materials shall be installed according to the

manufacturer's instructions to achieve proper densities and maintain uniform R-values and shall be installed in a manner which will permit inspection of the manufacturer's R-value identification mark. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value.

The thickness of roof/ceiling insulation that is either blown in or spray-applied shall be identified by inches of thickness, density and R-value markers installed at least one for every 300 square feet (28 m2) through the attic and/or ceiling space. In attics, the markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum 1.0 inch (25 mm) in height. Each marker shall face the attic access. The thickness of installed attic insulation shall meet or exceed the minimum initial installed thickness shown by the marker.

502.1.4.2 Insulation Materials: All insulation materials including facings such as vapor barriers or breather papers installed within floor/ceiling assemblies, roof/ceiling assemblies, walls, crawl spaces, or attics shall have a flame spread rating of less than 25 and a smoke density not to exceed 450 when tested in accordance with ASTM E84-01.

EXCEPTIONS:

1. Foam plastic insulation shall comply with Section 2603 of the ((~~International~~))Seattle Building Code.
2. When such materials are installed in concealed spaces of Types III, IV and V construction, the flame spread and smoke developed limitations do not apply to facing, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor or wall finish.
3. Cellulose insulation shall comply with Section 719 of the ((~~International~~))Seattle Building Code.

***

502.1.4.5 Roof/Ceiling Insulation: Where two or more layers of rigid board insulation are used in a roof assembly, the vertical joints between each layer shall be staggered. Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge. When eave vents are installed, baffling of the vent openings shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be rigid material, resistant to wind driven moisture. Requirements for baffles for ceiling insulation shall meet the ((~~International~~))Seattle Building Code Section 1203.2 for minimum ventilation requirements. When feasible, the baffles shall be installed from the top of the outside of the exterior wall, extending inward, to a point 6 inches vertically above the height of noncompressed insulation, and 12 inches vertically above loose fill insulation.

***

502.2.1 UA Calculations: The proposed UA as calculated using Equations 2 and 3 shall not exceed the target UA as calculated using Equation 1. For the purpose of determining equivalent thermal performance, the glazing area for the target UA shall be calculated using values in Table 5-1. The opaque door area shall be the same in the target UA and the proposed UA. When showing compliance with Table 9-1 using options 3a, 3b or 3c, the proposed design shall be less than the target UA by the fraction noted in the table.

EXCEPTION: Log and solid timber walls that have a minimum average thickness of 3.5" and with space heat type other than electric resistance, are exempt from wall target UA and proposed UA calculations.

Procedural Requirement: The plans shall contain a glazing and opaque door schedule.

The glazing schedule shall include all vertical glazing and overhead glazing (windows, sliding and swinging glass doors and glazed roll-up doors, glass block, plastic panels, clerestories, skylights, etc.), as well as all opaque doors.

For all projects, the glazing and opaque door schedule shall include the manufacturer and model number for all products regardless of U-factor.

The glazing and opaque door schedules shall include the product type, size, number of each type, the U-factor and whether the U-factor is NFRC-certified or default.

If the product is claimed to be NFRC-certified, the NFRC Certified Products Directory (CPD) number shall be provided. A specification sheet that states "determined in accordance with NFRC 100" does not suffice.

If a default U-factor from Chapter 10 is used for unrated products in lieu of NFRC certification, the glazing and opaque door schedule shall include a description of the key energy-efficiency features that are necessary to achieve that default U-factor (indicating whether the glazing product is fixed or operable, frame material type, thermal break description, number of glazing layers, emissivity of low-e coatings, gap width, gas fill, spacer type, etc.).

***

503.10.3 Sealing: All ducts, air handlers, filter boxes, and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.3 of the ((~~International~~))Seattle Residential Code or Section 603.9 of the ((~~International~~))Seattle Mechanical Code. Duct tightness testing shall be conducted to verify that the ducts are sealed. A signed affidavit documenting the test results shall be provided to the jurisdiction having authority by the testing agent. When required by the building official, the test shall be conducted in the presence of department staff. Duct tightness shall be verified by either of the following:

1. Post-construction test: Leakage to outdoors shall be less than or equal to 6 cfm per 100 square feet of conditioned floor area or a total leakage less than or equal to 8 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascals) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

2. Rough-in test: Total leakage shall be less than or equal to 6 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pascals) across the roughed-in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area.

EXCEPTIONS:

1. Duct tightness test is not required if the air handler and all ducts are located within conditioned space.
2. Duct tightness test is not required if the furnace is a nondirect vent type combustion appliance installed in an unconditioned space. A maximum of six feet of connected ductwork in the unconditioned space is allowed. All additional supply and return ducts shall be within the conditioned space. Ducts outside the conditioned space shall be sealed with a mastic type duct sealant and insulated on the exterior with R-8 insulation for above grade ducts and R-5 water resistant insulation when within a slab or earth.

503.10.4 Dampers: Requirements for automatic or manual dampers are found in Chapter 15 of the ((~~Washington State Residential Code (WAC 51-51)~~)) Seattle Residential Code.

***

Section 6. The following section of Chapter 6 of the 2009 Washington State Energy Code is amended as follows:

***

602.7.2 Glazing U-Factor: The total glazing area as defined in Chapter 2 shall have an area weighted average U-factor not to exceed that specified in Table 6-1 or 6-2. U-factors for glazing shall be determined in accordance with Section 502.1.5. These areas and U-factors shall also include any doors using the exception of Section 602.6.

If the U-factors for all vertical and overhead glazing products are below the appropriate U-factor specified, then no calculations are required. If compliance is to be achieved through an area weighted calculation, then the areas and U-factors shall be included in the plans submitted with a building permit application.

EXCEPTION: Double glazed garden windows with a wood or vinyl frame shall be exempt from the U-factor calculations but shall have its area tripled and shall be included in the percentage of the total glazing area as allowed for in Table 6-1 or 6-2. The maximum area (before tripling) allowed for the total of all garden windows is one percent of the floor area or 20 square feet, whichever is less.

Procedural Requirement: The plans shall contain a glazing and opaque door schedule.

The glazing schedule shall include all vertical glazing and overhead glazing (windows, sliding and swinging glass doors and glazed roll-up doors, glass block, plastic panels, clerestories, skylights, etc.), as well as all opaque doors.

For all projects, the glazing and opaque door schedule shall include the manufacturer and model number for all products regardless of U-factor.

The glazing and opaque door schedules shall include the product type, size, number of each type, the U-factor and whether the U-factor is NFRC-certified or default.

If the product is claimed to be NFRC-certified, the NFRC Certified Products Directory (CPD) number shall be provided. A specification sheet that states "determined in accordance with NFRC 100" does not suffice.

If a default U-factor from Chapter 10 is used for unrated products in lieu of NFRC certification, the glazing and opaque door schedule shall include a description of the key energy-efficiency features that are necessary to achieve that default U-factor (indicating whether the glazing product is fixed or operable, frame material type, thermal break description, number of glazing layers, emissivity of low-e coatings, gap width, gas fill, spacer type, etc.).

***

Section 7. The following section of Chapter 7 of the 2009 Washington State Energy Code is amended as follows:

***

701 Scope. The following standards shall apply to Chapters 1 through 16((~~20~~)). The standards and portions thereof, which are referred to in various parts of this Code ((~~shall be part of the Washington State Energy Code and~~)) are hereby declared to be a part of this Code.

CODE STANDARD NO.	**TITLE AND SOURCE**
RS-1	((~~2005~~))2009 ASHRAE Fundamentals Handbook.
RS-2	Super Good Cents Technical Reference (Builder's Field Guide)
RS-3:	(Reserved.)

RS-4 ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy.

RS-5 2006 ASHRAE Refrigeration Handbook.

RS-6 (Reserved.)

RS-7 SMACNA, HVAC Duct Construction Standards, Metal and Flexible, 2005.

RS-8: (Reserved.)

RS-9 ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except Low-Rise Residential Buildings.

RS-10 2008 ASHRAE Systems and Equipment Handbook.

RS-11 2007 ASHRAE HVAC Applications Handbook.

RS-12 – RS-28: (Reserved.)

RS-29 Nonresidential Building Design by Systems Analysis (included in compilation of this Code).

RS-30 Title 10, Code of Federal Regulations (CFR), Part 430 (March 14, 1988).

RS-31 National Fenestration Rating Council (NFRC) Standard 100-2004.

RS-32 Seattle EnvStd ((~~2006~~)) 2009.*

RS-33 Duct Testing Standard for New and Existing Construction, Washington State University Extension Energy Program Publication #WSUEEP 09-008.

RS-34 Optional Acceptance Requirements for Nonresidential Buildings, SBCC 2009.

RS-35 Advanced Criteria for Other Programs (included in Seattle Amendments).

RS-36 Illustrative Goals for the 2030 Challenge in Seattle (included in Seattle Amendments).

* The Director of DPD is authorized to develop and adopt by rule a 2009 version of the Seattle EnvStd software, which in substance shall consist of Seattle EnvStd 2006 with a baseline updated to correspond with Table 13-1 of this Code and having a minimum VT/SHGC ratio of 1.50 for vertical fenestration and skylights with glazing made of glass and 1.42 for skylights with glazing made of plastic. That 2009 version shall constitute RS-32 from and after the effective date of the rule adopting it. Prior to that date references in this Code to the RS-32 option are not effective.

ACCREDITED AUTHORITATIVE AGENCIES

AHRI refers to the Air-Conditioning, Heating and Refrigeration Institute, ((~~4301 N. Fairfax Dr., Suite 425~~)) 2111 Wilson Blvd, Suite 500, Arlington, VA 22203
Phone (703) 524-8800 fax (703) 528-3816, internet ((~~www.ari.org~~)) www.ahrinet.org

ANSI refers to the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036
Phone (212) 642-4900 fax (212) 398-0023, internet www.ansi.org

ASHRAE refers to the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329
Phone (404) 636-8400 fax (404) 321-5478, internet www.ashrae.org

ASTM refers to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
Phone (610) 832-9585 fax (610) 832-9555, internet www.astm.org

CTI refers to the Cooling Tower Institute, 530 Wells Fargo Drive, Suite 218, Houston, TX 77090

Phone (281) 583-4087 fax (281) 537-1721, internet www.cti.org

IESNA refers to the Illuminating Engineering Society of North America, 120 Wall Street, Floor 17, New York, NY 10005-4001

Phone (212) 248-5000 fax (212) 248-5017, internet www.iesna.org

NFRC refers to the National Fenestration Rating Council, Inc., 8484 Georgia Avenue, Suite 320, Silver Spring, Maryland 20910

Phone (301) 589-1776 fax (301) 589-3884, internet www.nfrc.org

SBCC refers to the Washington State Building Code Council, P.O. Box 42525, Olympia, WA 98504-2525

Phone 360-725-2990 fax 360-586-9383, internet www.sbcc.wa.gov

SMACNA refers to the Sheet Metal and Air Conditioning Contractors National Association, Inc., 4201 Lafayette Center Drive, P.O. Box 221230, Chantilly, VA 20153-1230

Phone (703) 803-2980 fax (703) 803-3732, internet www.smacna.org

WSU refers to the Washington State University Extension Energy Program, 905 Plum Street S.E., Building #3, P.O. Box 43165, Olympia, WA 98506-3166

Phone 360-956-2000 fax 360-956-2217, internet www.energy.wsu.edu

Section 8. The following section of Chapter 9 of the 2009 Washington State Energy Code is amended as follows:

***

901 Additional Residential Energy Efficiency Requirements. Dwelling units permitted under this Code shall comply with all provisions of Chapter 5 of this Code and develop one credit from Table 9-1.

EXCEPTION: Buildings complying using Chapter 4 Building Design by Systems Analysis shall meet this provision of this section by demonstrating that the proposed building energy use is 16 percent less than the target building energy use.

Informative Note: Per "option" 7, all dwelling units exceeding 5000 square feet of gross floor area are assigned a negative 1.0 points and therefore need to achieve a positive 2.0 points in other options in order to comply.

TABLE 9-1

ENERGY CREDITS (DEBITS)

OPTION	DESCRIPTION	CREDIT(S)

OPTION	DESCRIPTION	CREDIT(S)
1a	HIGH EFFICIENCY HVAC EQUIPMENT 1: Gas, propane or oil-fired furnace or boiler with minimum AFUE of 92%, **or** Air-source heat pump with minimum HSPF of 8.5. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency. It is recommended that projects apply for a mechanical permit prior to the building permit application and paste a copy of the mechanical permit on the building permit drawings.]	1.0

OPTION	DESCRIPTION	CREDIT(S)
1b	HIGH EFFICIENCY HVAC EQUIPMENT 2: Closed-loop ground source heat pump; with a minimum COP of 3.3. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency. It is recommended that projects apply for a mechanical permit prior to the building permit application and paste a copy of the mechanical permit on the building permit drawings.]	2.0

OPTION	DESCRIPTION	CREDIT(S)
1c	HIGH EFFICIENCY HVAC EQUIPMENT 3: DUCTLESS SPLIT SYSTEM HEAT PUMPS, ZONAL CONTROL: In home where the primary space heating system is zonal electric heating, a ductless heat pump system shall be installed and provide heating to at least one zone of the housing unit. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency. It is recommended that projects apply for an electrical permit prior to the building permit application and paste a copy of the electrical permit on the building permit drawings.]	1.0

OPTION	DESCRIPTION	CREDIT(S)
2	HIGH EFFICIENCY HVAC DISTRIBUTION SYSTEM:[1] All heating and cooling system components installed inside the conditioned space. All combustion equipment shall be direct vent or sealed combustion. Locating system components in conditioned crawl spaces is not permitted under this option. Electric resistance heat is not permitted under this option. Direct combustion heating equipment with AFUE less than 80% is not permitted under this option. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and shall show the location of the heating and cooling equipment and all the ductwork. It is recommended that projects apply for a mechanical permit prior to the building permit application and paste a copy of the mechanical permit on the building permit drawings.]	1.0

OPTION	DESCRIPTION	CREDIT(S)
3a	EFFICIENT BUILDING ENVELOPE 1: Prescriptive compliance is based on Table 6-1, Option III with the following modifications: Window U = 0.28 floor R-38, slab on grade R-10 full, below grade slab R-10 full. **or** Component performance compliance: Reduce the Target UA from Table 5-1 by 5%, as determined using EQUATION 1.[1] [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the location and R-value of all insulation. For glazing U-factors - for Prescriptive compliance, see procedural requirement under Section 602.7.2. - for Component performance compliance, see procedural requirement under Section 502.2.1.]	0.5

OPTION	DESCRIPTION	CREDIT(S)
3b	EFFICIENT BUILDING ENVELOPE 2: Prescriptive compliance is based on Table 6-1, Option III with the following modifications: Window U = 0.25 and wall R-21 plus R-4 and R-38 floor, slab on grade R-10 full, below grade slab R-10 full, and R-21 plus R-5 below grade basement walls. **or** Component performance compliance: Reduce the Target UA from Table 5.1 by 15%, as determined using EQUATION 1.[1] [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the location and R-value of all insulation. For glazing U-factors - for Prescriptive compliance, see procedural requirement under Section 602.7.2. - for Component performance compliance, see procedural requirement under Section 502.2.1.]	1.0

OPTION	DESCRIPTION	CREDIT(S)
3c	SUPER-EFFICIENT BUILDING ENVELOPE 3: Prescriptive compliance is based on Table 6-1, Option III with the following modifications: Window U = 0.22 and wall R-21 plus R-12 and R-38 floor, slab on grade R-10 full, below grade slab R-10 full and R-21 plus R-12 below grade basement walls and R-49 advanced ceiling and vault. **or** Component performance compliance: Reduce the Target UA from Table 5.1 by 30%, as determined using EQUATION 1.[1] [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the location and R-value of all insulation. For glazing U-factors - for Prescriptive compliance, see procedural requirement under Section 602.7.2. - for Component performance compliance, see procedural requirement under Section 502.2.1.]	2.0

OPTION	DESCRIPTION	CREDIT(S)
4a	AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION: Envelope leakage reduced to SLA of 0.00020 building envelope tightness shall be considered acceptable when tested air leakage is less than specific leakage area of 0.00020 when tested with a blower door at a pressure difference of 50 PA. Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances. **and** All whole house ventilation requirements as determined by Section M1508 of the ((~~Washington State~~))Seattle Residential Code shall be met with a heat recovery ventilation system in accordance with Section M1508.7 of that Code. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.]	0.5

OPTION	DESCRIPTION	CREDIT(S)
4b	ADDITIONAL AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION: Envelope leakage reduced to SLA of 0.00015 building envelope tightness shall be considered acceptable when tested air leakage is less than specific leakage area of 0.00015 when tested with a blower door at a pressure difference of 50 PA. Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation, and combustion appliances. **and** All whole house ventilation requirements as determined by Section M1508 of the ((~~Washington State~~))Seattle Residential Code shall be met with a heat recovery ventilation system in accordance with Section M1508.7 of that Code. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.]	1.0

OPTION	DESCRIPTION	CREDIT(S)
5a	EFFICIENT WATER HEATING:[1] Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.62. **or** Electric Water Heater with a minimum EF of .93. **and for both cases** All showerhead and kitchen sink faucets installed in the house shall meet be rated at 1.75 GPM or less. All other lavatory faucets shall be rated at 1.0 GPM or less.[2] [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and shall specify the maximum flow rates for all showerheads, kitchen sink faucets, and other lavatory faucets. It is recommended that projects apply for a plumbing permit prior to the building permit application and paste a copy of the plumbing permit on the building permit drawings.]	0.5

OPTION	DESCRIPTION	CREDIT(S)
5b	HIGH EFFICIENCY WATER HEATING:[1] Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.82. **or** Solar water heating supplementing a minimum standard water heater. Solar water heating will provide a rated minimum savings of 85 therms or 2000 kWh based on the Solar Rating and Certification Corporation (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems. **or** Electric heat pump water heater with a minimum EF of 2.0. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and, for solar water heating systems, the calculation of the minimum energy savings. It is recommended that projects apply for a plumbing permit prior to the building permit application and paste a copy of the plumbing permit on the building permit drawings.]	1.5

OPTION	DESCRIPTION	CREDIT(S)
6	SMALL DWELLING UNIT 1:[1] Dwelling units less than 1500 square feet in floor area with less than 300 square feet of window + door area. Additions to existing building that are less than 750 square feet of heated floor area. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall include a calculation of the gross floor area and a calculation of the window plus door area.]	1.0
7	LARGE DWELLING UNIT 1:[1] Dwelling units exceeding 5000 square feet of floor area shall be assessed a deduction for purposes of complying with Section 901 of this Code.	-1.0

OPTION	DESCRIPTION	CREDIT(S)
8	RENEWABLE ELECTRIC ENERGY: For each 1200 kWh of electrical generation provided annually by on-site wind or solar equipment a 0.5 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows: For solar electric systems, the design shall be demonstrated to meet this requirement using the National Renewable Energy Laboratory calculator PVWATTs. Documentation noting solar access shall be included on the plans. For wind generation projects designs shall document annual power generation based on the following factors: The wind turbine power curve; average annual wind speed at the site; frequency distribution of the wind speed at the site and height of the tower. [Procedural Requirement: To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the photovoltaic or wind turbine equipment type, provide documentation of solar and wind access, and include a calculation of the minimum annual energy power production. It is recommended that projects apply for an electrical permit prior to the building permit application and paste a copy of the electrical permit on the building permit drawings.]	0.5

Footnotes:

1. Interior Duct Placement: Ducts included as Option 2 of Table 9-1 shall be placed wholly within the heated envelope of the housing unit. The placement shall be inspected and certified to receive the credits associated with this option.

EXCEPTION: Ducts complying with this section may have up to 5% of the total linear feet of ducts located in the exterior cavities or buffer spaces of the dwelling. If this exception is used the ducts will be tested to the following standards:

Post-construction test: Leakage to outdoors shall be less than or equal to 1 CFM per 100 ft^2 of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

2. Plumbing Fixtures Flow Ratings. Low flow plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following requirements:

(a) Residential bathroom lavatory sink faucets: Maximum flow rate - 3.8 L/min (1.0 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.

(b) Residential kitchen faucets: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.

(c) Residential showerheads: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.

***

Section 9. The following sections or subsections of Chapter 10 of the 2009 Washington State Energy Code are amended, and new sections are added to that Chapter, as follows:

***

SECTION 1001 — GENERAL

1001.1 Scope: The following defaults shall apply to Chapters 1 through 16((~~20~~)). This chapter includes tables of seasonal average heat loss coefficients for specified nominal insulation. The heat loss coefficients may also be used for heating system sizing.

1001.2 Description: These coefficients were developed primarily from data and procedures from Standard RS-1, and taken specifically from Standard RS-2, listed in Chapter 7.

Coefficients not contained in this chapter may be computed using the procedures listed in these references if the assumptions in the following sections and Standard RS-2, listed in Chapter 7, are used, along with data from the sources referenced above.

1001.3 ((~~Air Films: Default R-values used for air films shall be as follows:~~

~~R-Value Condition~~

~~0.17 All exterior surfaces~~

~~0.61 Interior horizontal surfaces, heat flow up~~

~~0.92 Interior horizontal surfaces, heat flow down~~

~~0.68 Interior vertical surfaces~~)) Reserved.

1001.4 Compression of Insulation: Insulation which is compressed shall be rated in accordance with Table 10-A or reduction in value may be calculated in accordance with the procedures in Standard RS-1, listed in Chapter 7.

1001.5 Building Materials: Default R-values used for building materials shall be as shown in Table 10-B.

***

TABLE 10-A

R-VALUE OF FIBERGLASS BATTS COMPRESSED WITHIN VARIOUS DEPTH CAVITIES

Insulation R-Values at Standard Thickness

Insulation R-Value at Standard Thickness														
Rated R-Value		**82**	**71**	**60**	**49**	**38**	**30**	**25**	**22**	**21**	**19**	**15**	**13**	**11**
Standard Thickness, in.		**26.0**	**22.5**	**19.0**	**15.5**	**12**	**9.5**	**7.25**	**6.5**	**5.5**	**6**	**3.5**	**3.5**	**3.5**
Nominal Lumber Size, in.	**Actual Depth of Cavity, in.**	**Effective Insulation R-Values when Installed in a Confined Cavity**												
Truss	26.0	82	—	—	—	—	—	—	—	—	—	—	—	—
Truss	22.5	—	71	—	—	—	—	—	—	—	—	—	—	—
Truss	19.0	—	—	60	—	—	—	—	—	—	—	—	—	—
Truss	15.5	—	—	—	49	—	—	—	—	—	—	—	—	—
Truss	12.0	—	—	—	—	38	—	—	—	—	—	—	—	—
2 x 12	11.25	—	—	—	—	37	—	—	—	—	—	—	—	—
2 x 10	9.25	—	—	—	—	32	30	—	—	—	—	—	—	—
2 x 8	7.25	—	—	—	—	27	26	25	22	21	19	—	—	—
2 x 6	5.5	—	—	—	—	—	21	20	20	21	18	—	—	—
2 x 4	3.5	—	—	—	—	—	—	—	14	—	13	15	13	11
	2.5	—	—	—	—	—	—	—	—	—	—	—	9.8	—
	1.5	—	—	—	—	—	—	—	—	—	—	—	6.3	6

***

TABLE 10-B DEFAULT R-VALUES FOR BUILDING MATERIALS

Material	Nominal Size (in.)	Actual Size (in.)	R-Value (Heat Capacity[3])
Air cavity (unventilated), between metal studs at 16 inches on center[1]	-	-	0.79
Air cavity (unventilated), all other depths and framing materials[1]	-	-	0.91
Air film, exterior surfaces[2]	-	-	0.17
Air film, interior horizontal surfaces, heat flow up[2]	-	-	0.61
Air film, interior horizontal surfaces, heat flow down[2]	-	-	0.92
Air film, interior vertical surfaces[2]	-	-	0.68
Brick at R-0.12/in. (face brick, 75% solid/25% core area, 130 lbs/ft^3)	4	3.5	0.32 (5.9)
Carpet and rubber pad	-	-	1.23
Concrete at R-0.0625/in., heavyweight (144 lbs/ft^3)	-	2	0.13 (HC-4.8)
	-	4	0.25 (HC-9.6)
	-	6	0.38 (HC-14.4)
	-	8	0.50 (HC-19.2)
	-	10	0.63 (HC-24.0)
	-	12	0.75 (HC-28.8)
Concrete masonry units, solid grouted, lightweight (95 lbs/ft^3)	6	-	0.80 (HC-11.4)
Concrete masonry units, solid grouted, normal weight (135 lbs/ft^3)	6	-	0.51 (HC-13.2)
Concrete masonry units, partly grouted, lightweight (95 lbs/ft^3)	6	-	1.33 (HC-6.7)
Concrete masonry units, partly grouted, normal weight (135 lbs/ft^3)	6	-	0.82 (HC-9.0)
Concrete masonry units, solid grouted, lightweight (95 lbs/ft^3)	8	-	1.05 (HC-15.5)
Concrete masonry units, solid grouted, normal weight (135 lbs/ft^3)	8	-	0.69 (HC-17.9)
Concrete masonry units, partly grouted, lightweight (95 lbs/ft^3)	8	-	1.44 (HC-9.6)
Concrete masonry units, partly grouted, normal weight (135 lbs/ft^3)	8	-	0.98 (HC-12.0)

Material	Nominal Size (in.)	Actual Size (in.)	R-Value (Heat Capacity[3])
Concrete masonry units, solid grouted, lightweight (95 lbs/ft^3)	10	-	1.30 (HC-19.7)
Concrete masonry units, solid grouted, normal weight (135 lbs/ft^3)	10	-	0.87 (HC-22.6)
Concrete masonry units, partly grouted, lightweight (95 lbs/ft^3)	10	-	1.61 (HC-11.9)
Concrete masonry units, partly grouted, normal weight (135 lbs/ft^3)	10	-	1.11 (HC-14.8)
Concrete masonry units, solid grouted, lightweight (95 lbs/ft^3)	12	-	1.53 (HC-23.9)
Concrete masonry units, solid grouted, normal weight (135 lbs/ft^3)	12	-	1.06 (HC-27.2)
Concrete masonry units, partly grouted, lightweight (95 lbs/ft^3)	12	-	1.75 (HC-14.2)
Concrete masonry units, partly grouted, normal weight (135 lbs/ft^3)	12	-	1.23 (HC-17.5)
Flooring, wood subfloor	-	0.75	0.94
Gypsum board	-	0.5	0.45
	-	0.625	0.56
Metal deck	-	-	0
Roofing, built-up	-	0.375	0.33
Sheathing, vegetable fiber board, 0.78 in.	-	0.78	2.06
Soil at R-0.104/in.	-	12	1.25
Steel, mild		1	0.0031807
Stucco	-	0.75	0.08

[1] Air cavities, within building assemblies, that are open to outside air are assigned an R-value of 0.

[2] The R-values for air films do not apply to air cavities within an assembly.

[3] For heat capacity for concrete and concrete masonry materials with densities other than the values listed in Table 10-B, see Tables A3.1B and A3.1C in RS-9.

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1005.3 Component Description: Default coefficients for the following types of walls are listed: Single-stud walls, strap walls, double-stud walls, log walls, stress-skin panels, metal stud walls, and metal building walls.

Single-Stud Wall, Tables 10-5(1) through 10-5(8): Assumes either 2x4 or 2x6 studs framed on sixteen or twenty-four inch centers. Headers are solid for 2x4 walls and double 2x for 2x6 walls, with either dead-air or rigid-board insulation in the remaining space.

Strap Wall, Table 10-5(9): Assumes 2x6 studs framed on sixteen or twenty-four inch centers. 2x3 or 2x4 strapping is run horizontally along the interior surface of the wall to provide additional space for insulation.

Double-Stud Wall, Tables 10-5(10) and 10-5(11): Assumes an exterior structural wall and a separate interior, nonstructural wall. Insulation is placed in both wall cavities and in the space between the 2 walls. Stud spacing is assumed to be on 24 inch centers for both walls.

Log Wall, Table 10-5(12).

Stress-Skin Panel, Table 10-5(13).

Metal Stud Wall, Overall Assembly U-Factors, Table 10-5A(1): Assumes metal studs spaced on 16- or 24-inch centers with insulation installed to fill wall cavities. Continuous rigid board insulation is applied without creating uninsulated voids in the wall assembly.

Metal Stud Wall, Effective R-Values for Metal Framing and Cavity Only, Table 10-5A(2): These values may be used for the metal-framing/cavity layers in walls with metal studs spaced on 16- or 24-inch centers with insulation installed to fill wall cavities in lieu of using the zone method provided in Chapter 25 of Standard RS-1 listed in Chapter 7.

Metal Building Wall, Table 10-5A(3): A wall whose structure consists of metal spanning panels supported by steel structural members (does not include spandrel glass or metal panels in curtain wall systems). These values may be used for assemblies where the average girt spacing is at least 52 in. The first nominal R-value is for insulation compressed between metal wall panels and the steel structure. ((~~For double-layer installations, the second rated R-value of insulation is for insulation installed from the inside, covering the girts. For continuous insulation (e.g., insulation boards) it is assumed that the insulation boards are~~)) For assemblies with continuous insulation, the continuous insulation is installed on the outside or inside of the girts, uncompressed and uninterrupted by the framing members. Insulation exposed to the conditioned space, ((or))including a semi-heated space, shall have a facing, and all insulation seams shall be continuously sealed ((~~to provide a continuous air barrier~~)). U-factors for metal building wall assemblies with average girt spacing less than 52 in. shall be determined in accordance with Section A9.2 of RS-9.

Concrete and Masonry Walls, Table 10-5B(1) Single-Family and Multifamily Residential.

Peripheral Edges of Intermediate Concrete Floors, Table 10-5B(2) Single-Family and Multifamily Residential, and Nonresidential.

Concrete and Masonry Walls, Table 10-5B(3) Nonresidential.

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Metal Stud Walls: The nominal R-values in Table 10-5A may be used for purposes of calculating metal stud wall section U-factors in lieu of the ASHRAE zone calculation method as provided in Chapter 27 of Standard RS-1.

TABLE 10-5A

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

TABLE 10-5A(1)

Overall Assembly U-Factors for Metal Stud Walls

Metal Framing	R-Value of Continuous Foam Board Insulation	R-Value of Foam Board Insulation with ≤ 0.04% Metal Penetrations	R-Value of Foam Board Insulation with > 0.04% and ≤ 0.08% Metal Penetrations	Cavity Insulation						
				R-0	R-11 (4" nom)	R-13 (4" nom)	R-15 (4" nom)	R-19 (6" nom)	R-21 (6" nom)	R-25 (8" nom)
16" o.c.	R-0 (none)	R-0 (none)	R-0 (none)	U-0.352	U-0.132	U-0.124	U-0.118	U-0.109	U-0.106	U-0.102
	R-1	R-1.3	R-1.5	U-	U-	U-	U-	U-	U-	U-

			0.260	0.117	0.111	0.106	0.099	0.096	0.092
R-2	R-2.5	R-3.0	U-0.207	U-0.105	U-0.100	U-0.096	U-0.090	U-0.087	U-0.084
R-3	R-3.8	R-4.5	U-0.171	U-0.095	U-0.091	U-0.087	U-0.082	U-0.080	U-0.078
R-4	R-5.0	R-6.0	U-0.146	U-0.087	U-0.083	U-0.080	U-0.076	U-0.074	U-0.072
R-5	R-6.3	R-7.5	U-0.128	U-0.080	U-0.077	U-0.074	U-0.071	U-0.069	U-0.067
R-6	R-7.5	R-9.0	U-0.113	U-0.074	U-0.071	U-0.069	U-0.066	U-0.065	U-0.063
R-7	R-8.8	R-10.5	U-0.102	U-0.069	U-0.066	U-0.065	U-0.062	U-0.061	U-0.059
R-8	R-10.0	R-12.0	U-0.092	U-0.064	U-0.062	U-0.061	U-0.058	U-0.057	U-0.056
R-9	R-11.3	R-13.5	U-0.084	U-0.060	U-0.059	U-0.057	U-0.055	U-0.054	U-0.053
R-10	R-12.5	R-15.0	U-0.078	U-0.057	U-0.055	U-0.054	U-0.052	U-0.051	U-0.050
R-11	R-13.8	R-16.5	U-0.072	U-0.054	U-0.052	U-0.051	U-0.050	U-0.049	U-0.048
R-12	R-15.0	R-18.0	U-0.067	U-0.051	U-0.050	U-0.049	U-0.047	U-0.047	U-0.046
R-13	R-16.3	R-19.5	U-0.063	U-0.049	U-0.048	U-0.047	U-0.045	U-0.045	U-0.044

	R-14	R-17.5	R-21.0	U-0.059	U-0.046	U-0.045	U-0.045	U-0.043	U-0.043	U-0.042
	R-15	R-18.8	R-22.5	U-0.056	U-0.044	U-0.043	U-0.043	U-0.041	U-0.041	U-0.040
	R-20	R-25.0	R-30.0	U-0.044	U-0.036	U-0.036	U-0.035	U-0.034	U-0.034	U-0.034
24" o.c.	R-0 (none)	R-0 (none)	R-0 (none)	U-0.338	U-0.116	U-0.108	U-0.102	U-0.094	U-0.090	U-0.086
	R-1	R-1.3	R-1.5	U-0.253	U-0.104	U-0.098	U-0.092	U-0.086	U-0.083	U-0.079
	R-2	R-2.5	R-3.0	U-0.202	U-0.094	U-0.089	U-0.084	U-0.079	U-0.077	U-0.073
	R-3	R-3.8	R-4.5	U-0.168	U-0.086	U-0.082	U-0.078	U-0.073	U-0.071	U-0.068
	R-4	R-5.0	R-6.0	U-0.144	U-0.079	U-0.075	U-0.072	U-0.068	U-0.066	U-0.064
	R-5	R-6.3	R-7.5	U-0.126	U-0.073	U-0.070	U-0.067	U-0.064	U-0.062	U-0.060
	R-6	R-7.5	R-9.0	U-0.112	U-0.068	U-0.066	U-0.063	U-0.060	U-0.059	U-0.057
	R-7	R-8.8	R-10.5	U-0.100	U-0.064	U-0.062	U-0.059	U-0.057	U-0.055	U-0.054
	R-8	R-10.0	R-12.0	U-0.091	U-0.060	U-0.058	U-0.056	U-0.054	U-0.052	U-0.051
	R-9	R-11.3	R-13.5	U-	U-	U-	U-	U-	U-	U-

			0.084	0.057	0.055	0.053	0.051	0.050	0.048
R-10	R-12.5	R-15.0	U-0.077	U-0.054	U-0.052	U-0.050	U-0.048	U-0.048	U-0.046
R-11	R-13.8	R-16.5	U-0.072	U-0.051	U-0.049	U-0.048	U-0.046	U-0.045	U-0.044
R-12	R-15.0	R-18.0	U-0.067	U-0.048	U-0.047	U-0.046	U-0.044	U-0.043	U-0.042
R-13	R-16.3	R-19.5	U-0.063	U-0.046	U-0.045	U-0.044	U-0.042	U-0.042	U-0.041
R-14	R-17.5	R-21.0	U-0.059	U-0.044	U-0.043	U-0.042	U-0.041	U-0.040	U-0.039
R-15	R-18.8	R-22.5	U-0.056	U-0.042	U-0.041	U-0.040	U-0.039	U-0.038	U-0.038
R-20	R-25.0	R-30.0	U-0.044	U-0.035	U-0.034	U-0.034	U-0.033	U-0.032	U-0.032

TABLE 10-5A(2)

Effective R-Values for Metal Framing and Cavity Only

	Cavity		Insulation		
	Nominal Depth, Inches	Actual Depth, Inches	Nominal R-Value	Effective R-Value 16" O.C.	Effective R-Value 24" O.C.
Air Cavity	Any	Any	R-0.91 (air)	0.79	0.91
	4	3-1/2	R-11	5.5	6.6

Wall	4	3-1/2	R-13	6.0	7.2
	4	3-1/2	R-15	6.4	7.8
	6	5-1/2	R-19	7.1	8.6
	6	5-1/2	R-21	7.4	9.0
	8	7-1/4	R-25	7.8	9.6
Roof		Insulation is uncompressed	R-11	5.5	6.1
			R-19	7.0	9.1
			R-30	9.3	11.4

TABLE 10-5A(3)

Default Metal Building Wall U-Factors

Insulation System	Rated R-Value of Insulation	Overall U-Factor for Entire Base Wall Assembly	Overall U-Factor for Assembly of Base Wall Plus Continuous Insulation (Uninterrupted by Framing)								
			Rated R-Value of Continuous Insulation								
			R-6.5	R-9.8	R-13	R-15.8	R-19 ((~~R-19.5~~))	R-22.1	R-25 ((~~R-26~~))	R-32 ((~~R-32.5~~))	R-38 ((~~R-39~~))
Single Layer of Mineral Fiber	None	1.180	0.136	0.094	0.072	0.060	0.050 ((~~0.049~~))	0.044	0.039 ((~~0.037~~))	0.030	0.026 ((~~0.025~~))
	R-10	0.186	0.084	0.066	0.054	0.047	0.041 ((~~0.040~~))	0.036	0.033 ((~~0.032~~))	0.027 ((~~0.026~~))	0.023
	R-11	0.185	0.084	0.066	0.054	0.047	0.041 ((~~0.040~~))	0.036	0.033 ((~~0.032~~))	0.027 ((~~0.026~~))	0.023
	R-13	0.162	0.079	0.063	0.052	0.046	0.040 ((~~0.039~~))	0.035	0.032 ((~~0.031~~))	0.026	0.023 ((~~0.022~~))
	R-16	0.155	0.077	0.062	0.051	0.045	0.039	0.035	0.032 ((~~0.031~~))	0.026	0.022

	R-19	0.147	0.075	0.060	0.050	0.044	0.039 ((~~0.038~~))	0.035	0.031 ((~~0.030~~))	0.026 ((~~0.025~~))	0.022

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Concrete Masonry Walls: The nominal R-values in Table 10-5B may be used for purposes of calculating concrete masonry wall section U-factors in lieu of the ASHRAE isothermal planes calculation method as provided in Chapter 27 of Standard RS-1.

TABLE 10-5B(1)

SINGLE-FAMILY AND MULTIFAMILY RESIDENTIAL:

DEFAULT U-FACTORS FOR CONCRETE AND MASONRY WALLS

TABLE 10-5B(1a) Single-Family and Multifamily Residential:

8" Concrete Masonry

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Block, Both Sides	0.40	0.23	0.24	0.43
R-5 Interior Insulation, Wood Furring	0.14	0.11	0.12	0.15
R-6 Interior Insulation, Wood Furring	0.14	0.11	0.11	0.14
R-10.5 Interior Insulation, Wood Furring	0.11	0.09	0.09	0.11
R-8 Interior Insulation, Metal Clips	0.11	0.09	0.09	0.11

R-6 Exterior Insulation	0.12	0.10	0.10	0.12
R-10 Exterior Insulation	0.08	0.07	0.07	0.08
R-9.5 Rigid Polystyrene Integral Insulation, Two Webbed Block	0.11	0.09	0.09	0.12

TABLE 10-5B(1b) Single-Family and Multifamily Residential:

12" Concrete Masonry

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

TABLE 10-5B(1c) Single-Family and Multifamily Residential:

8" Clay Brick

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

TABLE 10-5B(1d) Single-Family and Multifamily Residential:

6" Concrete Poured or Precast

WALL DESCRIPTION	CORE TREATMENT			
	Partial Grout with Ungrouted Cores			Solid Grout
	Empty	Loose-fill insulated		
		Perlite	Vermiculite	
Exposed Concrete, Both Sides	NA	NA	NA	0.61
R-5 Interior Insulation, Wood Furring	NA	NA	NA	0.16
R-6 Interior Insulation, Wood Furring	NA	NA	NA	0.15

R-10.5 Interior Insulation, Wood Furring	NA	NA	NA	0.12
R-8 Interior Insulation, Metal Clips	NA	NA	NA	0.12
R-6 Exterior Insulation	NA	NA	NA	0.13
R-10 Exterior Insulation	NA	NA	NA	0.09

Notes for Default Table 10-5B(1)

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

TABLE 10-5B(2) Single-Family and Multifamily Residential, and Nonresidential:

Default U-Factors for Peripheral Edges of Intermediate Concrete Floors

SLAB EDGE TREATMENT	AVERAGE THICKNESS OF WALL ABOVE AND BELOW			
	6 inches	8 inches	10 inches	12 inches
Exposed Concrete	0.816	0.741	0.678	0.625
R-5 Exterior Insulation	0.161	0.157	0.154	0.152
R-6 Exterior Insulation	0.138	0.136	0.134	0.132
R-7 Exterior Insulation	0.122	0.120	0.118	0.116
R-8 Exterior Insulation	0.108	0.107	0.106	0.104
R-9 Exterior Insulation	0.098	0.097	0.095	0.094

R-10 Exterior Insulation	0.089	0.088	0.087	0.086
R-11 Exterior Insulation	0.082	0.081	0.080	0.079
R-12 Exterior Insulation	0.076	0.075	0.074	0.074
R-13 Exterior Insulation	0.070	0.070	0.069	0.068
R-14 Exterior Insulation	0.066	0.065	0.065	0.064
R-15 Exterior Insulation	0.062	0.061	0.061	0.060
R-16 Exterior Insulation	0.058	0.058	0.057	0.057
R-17 Exterior Insulation	0.055	0.054	0.054	0.054
R-18 Exterior Insulation	0.052	0.052	0.051	0.051
R-19 Exterior Insulation	0.049	0.049	0.049	0.049
R-20 Exterior Insulation	0.047	0.047	0.047	0.046
R-21 Exterior Insulation	0.045	0.045	0.044	0.044
R-22 Exterior Insulation	0.043	0.043	0.043	0.042
R-23 Exterior Insulation	0.041	0.041	0.041	0.041
R-24 Exterior Insulation	0.040	0.039	0.039	0.039
R-25 Exterior Insulation	0.038	0.038	0.038	0.038

TABLE 10-5B(3) Nonresidential:

Default U-Factors for Concrete and Masonry Walls

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
Base Wall only				
No Framing	R- 0	U- 0.740	U- 0.580	U- 0.480
	Ungrouted Cores Filled with Loose-Fill Insulation	N.A.	N.A.	U- 0.350
Continuous Wood Framing				
0.75 in.	R- 3.0	U- 0.247	U- 0.226	U- 0.210
1.5 in.	R- 6.0	U- 0.160	U- 0.151	U- 0.143
2.0 in.	R- 10.0	U- 0.116	U- 0.111	U- 0.107
3.5 in.	R- 11.0	U- 0.094	U- 0.091	U- 0.088
3.5 in.	R- 13.0	U- 0.085	U- 0.083	U- 0.080
3.5 in.	R- 15.0	U- 0.079	U- 0.077	U- 0.075
5.5 in.	R- 19.0	U- 0.060	U- 0.059	U- 0.058
5.5 in.	R- 21.0	U- 0.057	U- 0.055	U- 0.054
Continuous Metal Framing at 24 in. on center horizontally				
1.0 in.	R- 0.0	U- 0.414	U- 0.359	U- 0.318
1.0 in.	R- 3.8	U- 0.325	U- 0.290	U- 0.263

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
1.0 in.	R- 5.0	U- 0.314	U- 0.281	U- 0.255
1.0 in.	R- 6.5	U- 0.305	U- 0.274	U- 0.249
1.5 in.	R- 11.0	U- 0.267	U- 0.243	U- 0.223
2.0 in.	R- 7.6	U- 0.230	U- 0.212	U- 0.197
2.0 in.	R- 10.0	U- 0.219	U- 0.202	U- 0.188
2.0 in.	R- 13.0	U- 0.210	U- 0.195	U- 0.182
3.0 in.	R- 11.4	U- 0.178	U- 0.167	U- 0.157
3.0 in.	R- 15.0	U- 0.168	U- 0.158	U- 0.149
3.0 in.	R- 19.0	U- 0.161	U- 0.152	U- 0.144
3.5 in.	R- 11.0	U- 0.168	U- 0.158	U- 0.149
3.5 in.	R- 13.0	U- 0.161	U- 0.152	U- 0.144
3.5 in.	R- 15.0	U- 0.155	U- 0.147	U- 0.140
4.5 in.	R- 17.1	U- 0.133	U- 0.126	U- 0.121
4.5 in.	R- 22.5	U- 0.124	U- 0.119	U- 0.114
4.5 in.	R- 25.2	U- 0.122	U- 0.116	U- 0.112
5.0 in.	R- 19.0	U- 0.122	U- 0.117	U- 0.112
5.0 in.	R- 25.0	U- 0.115	U- 0.110	U- 0.106
5.0 in.	R- 28.0	U- 0.112	U- 0.107	U- 0.103

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
5.0 in.	R- 32.0	U- 0.109	U- 0.105	U- 0.101
5.5 in.	R- 19.0	U- 0.118	U- 0.113	U- 0.109
5.5 in.	R- 20.9	U- 0.114	U- 0.109	U- 0.105
5.5 in.	R- 21.0	U- 0.113	U- 0.109	U- 0.105
5.5 in.	R- 27.5	U- 0.106	U- 0.102	U- 0.099
5.5 in.	R- 30.8	U- 0.104	U- 0.100	U- 0.096
6.0 in.	R- 22.8	U- 0.106	U- 0.102	U- 0.098
6.0 in.	R- 30.0	U- 0.099	U- 0.095	U- 0.092
6.0 in.	R- 33.6	U- 0.096	U- 0.093	U- 0.090
6.5 in.	R- 24.7	U- 0.099	U- 0.096	U- 0.092
7.0 in.	R- 26.6	U- 0.093	U- 0.090	U- 0.087
7.5 in.	R- 28.5	U- 0.088	U- 0.085	U- 0.083
8.0 in.	R- 30.4	U- 0.083	U- 0.081	U- 0.079
1 in Metal Clips at 24 in. on center horizontally and 16 in. vertically (also, where allowed by Section 1332, for assemblies with a ratio of metal penetration area/ mass wall area of <0.0004 (<0.04% of the mass wall area)[5]				
1.0 in.	R- 3.8	U- 0.210	U- 0.195	U- 0.182
1.0 in.	R- 5.0	U- 0.184	U- 0.172	U- 0.162

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
1.0 in.	R- 5.6	U- 0.174	U- 0.163	U- 0.154
1.5 in.	R- 5.7	U- 0.160	U- 0.151	U- 0.143
1.5 in.	R- 7.5	U- 0.138	U- 0.131	U- 0.125
1.5 in.	R- 8.4	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 7.6	U- 0.129	U- 0.123	U- 0.118
2.0 in.	R- 10.0	U- 0.110	U- 0.106	U- 0.102
2.0 in.	R- 11.2	U- 0.103	U- 0.099	U- 0.096
2.5 in.	R- 9.5	U- 0.109	U- 0.104	U- 0.101
2.5 in.	R- 12.5	U- 0.092	U- 0.089	U- 0.086
2.5 in.	R- 14.0	U- 0.086	U- 0.083	U- 0.080
3.0 in.	R- 11.4	U- 0.094	U- 0.090	U- 0.088
3.0 in.	R- 15.0	U- 0.078	U- 0.076	U- 0.074
3.0 in.	R- 16.8	U- 0.073	U- 0.071	U- 0.069
3.5 in.	R- 13.3	U- 0.082	U- 0.080	U- 0.077
3.5 in.	R- 17.5	U- 0.069	U- 0.067	U- 0.065
3.5 in.	R- 19.6	U- 0.064	U- 0.062	U- 0.061
4.0 in.	R- 15.2	U- 0.073	U- 0.071	U- 0.070
4.0 in.	R- 20.0	U- 0.061	U- 0.060	U- 0.058

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
4.0 in.	R- 22.4	U- 0.057	U- 0.056	U- 0.054
5.0 in.	R- 28.0	U- 0.046	U- 0.046	U- 0.045
6.0 in.	R- 33.6	U- 0.039	U- 0.039	U- 0.038
7.0 in.	R- 39.2	U- 0.034	U- 0.034	U- 0.033
8.0 in.	R- 44.8	U- 0.030	U- 0.030	U- 0.029
9.0 in.	R- 50.4	U- 0.027	U- 0.027	U- 0.026
10.0 in.	R- 56.0	U- 0.024	U- 0.024	U- 0.024
11.0 in.	R- 61.6	U- 0.022	U- 0.022	U- 0.022
Continuous Insulation Uninterrupted by Framing				
No Framing	R- 1.0	U- 0.425	U- 0.367	U- 0.324
	R- 2.0	U- 0.298	U- 0.269	U- 0.245
	R- 3.0	U- 0.230	U- 0.212	U- 0.197
	R- 4.0	U- 0.187	U- 0.175	U- 0.164
	R- 5.0	U- 0.157	U- 0.149	U- 0.141
No Framing	R- 6.0	U- 0.136	U- 0.129	U- 0.124
	R- 7.0	U- 0.120	U- 0.115	U- 0.110
	R- 8.0	U- 0.107	U- 0.103	U- 0.099
	R- 9.0	U- 0.097	U- 0.093	U- 0.090

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
	R- 10.0	U- 0.088	U- 0.085	U- 0.083
No Framing	R- 11.0	U- 0.081	U- 0.079	U- 0.076
	R- 12.0	U- 0.075	U- 0.073	U- 0.071
	R- 13.0	U- 0.070	U- 0.068	U- 0.066
	R- 14.0	U- 0.065	U- 0.064	U- 0.062
	R- 15.0	U- 0.061	U- 0.060	U- 0.059
No Framing	R- 16.0	U- 0.058	U- 0.056	U- 0.055
	R- 17.0	U- 0.054	U- 0.053	U- 0.052
	R- 18.0	U- 0.052	U- 0.051	U- 0.050
	R- 19.0	U- 0.049	U- 0.048	U- 0.047
	R- 20.0	U- 0.047	U- 0.046	U- 0.045
No Framing	R- 21.0	U- 0.045	U- 0.044	U- 0.043
	R- 22.0	U- 0.043	U- 0.042	U- 0.042
	R- 23.0	U- 0.041	U- 0.040	U- 0.040
	R- 24.0	U- 0.039	U- 0.039	U- 0.038
	R- 25.0	U- 0.038	U- 0.037	U- 0.037
No Framing	R- 30.0	U- 0.032	U- 0.032	U- 0.031
	R- 35.0	U- 0.028	U- 0.027	U- 0.027

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
	R- 40.0	U- 0.024	U- 0.024	U- 0.024
	R- 45.0	U- 0.022	U- 0.021	U- 0.021
	R- 50.0	U- 0.019	U- 0.019	U- 0.019
	R- 55.0	U- 0.018	U- 0.018	U- 0.018
	R- 60.0	U- 0.016	U- 0.016	U- 0.016
Brick cavity wall with continuous insulation				
No Framing	R- 0.0	U- 0.337	U- 0.299	U- 0.270
No Framing	R- 3.8	U- 0.148	U- 0.140	U- 0.133
No Framing	R- 5.0	U- 0.125	U- 0.120	U- 0.115
No Framing	R- 6.5	U- 0.106	U- 0.102	U- 0.098
No Framing	R- 7.6	U- 0.095	U- 0.091	U- 0.088
No Framing	R- 10.0	U- 0.077	U- 0.075	U- 0.073
No Framing	R- 10.5	U- 0.079	U- 0.077	U- 0.075
No Framing	R- 11.4	U- 0.070	U- 0.068	U- 0.066
No Framing	R- 15.0	U- 0.056	U- 0.055	U- 0.053
No Framing	R- 16.5	U- 0.054	U- 0.053	U- 0.052
No Framing	R- 19.0	U- 0.046	U- 0.045	U- 0.044
No Framing	R- 22.5	U- 0.041	U- 0.040	U- 0.039

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
No Framing	R- 28.5	U- 0.033	U- 0.032	U- 0.032
Continuous Insulation Uninterrupted by Framing with Stucco and Continuous Metal Framing at 24 in. on center horizontally				
1.0 in.	R- 0.0 + R-19 c.i.	U- 0.047	U- 0.046	U- 0.045
1.0 in.	R- 3.8 + R-19 c.i.	U- 0.045	U- 0.044	U- 0.044
1.0 in.	R- 5.0 + R-19 c.i.	U- 0.045	U- 0.044	U- 0.043
1.0 in.	R- 6.5 + R-19 c.i.	U- 0.045	U- 0.044	U- 0.043
1.5 in.	R- 11.0 + R-19 c.i.	U- 0.044	U- 0.043	U- 0.043
2.0 in.	R- 7.6 + R-19 c.i.	U- 0.043	U- 0.042	U- 0.041
2.0 in.	R- 10.0 + R-19 c.i.	U- 0.042	U- 0.041	U- 0.041
2.0 in.	R- 13.0 + R-19 c.i.	U- 0.042	U- 0.041	U- 0.041
3.0 in.	R- 11.4 + R-19 c.i.	U- 0.041	U- 0.040	U- 0.039
3.0 in.	R- 15.0 + R-19 c.i.	U- 0.040	U- 0.039	U- 0.039
3.0 in.	R- 19.0 + R-19 c.i.	U- 0.040	U- 0.039	U- 0.038
3.5 in.	R- 11.0 + R-19 c.i.	U- 0.040	U- 0.039	U- 0.039
3.5 in.	R- 13.0 + R-19 c.i.	U- 0.040	U- 0.039	U- 0.038
5.0 in.	R- 19.0 + R-19 c.i.	U- 0.037	U- 0.036	U- 0.036
5.0 in.	R- 25.0 + R-19 c.i.	U- 0.036	U- 0.035	U- 0.035

Framing Type and Depth	Rated R-Value of Insulation Alone	Assembly U-Factors for Solid Concrete Walls	Assembly U-Factors for Concrete Block Walls: Solid Grouted	Assembly U-Factors for Concrete Block Walls: Partially Grouted (cores uninsulated except where specified)
5.0 in.	R- 32.5 + R-19 c.i.	U- 0.035	U- 0.035	U- 0.034
5.5 in.	R- 19.0 + R-19 c.i.	U- 0.036	U- 0.036	U- 0.035
5.5 in.	R- 21.0 + R-19 c.i.	U- 0.035	U- 0.035	U- 0.035

Notes for Default Table 10-5B(3)

1. It is acceptable to use the U-factors in Table 10-5B(3) for all concrete and masonry walls, provided that the grouting is equal to or less than that specified.
   – For ungrouted walls, use the partially-grouted column.
   – For metal studs and z-furring, use the continuous-metal-framing category.
   – For discontinuous metal clips 1 inch square or smaller, use the metal-clip category.
   – For insulation that is attached without any framing members (e.g. glued), use the continuous-insulation-uninterrupted-by-framing category. Continuous insulation may be installed on the interior or exterior of masonry walls, or between stand-alone walls in multi-layer masonry walls, or on the interior or exterior of the concrete.
2. For Table 10-5B(3), the U-factor includes R-0.17 for exterior air film and R-0.68 for interior air film - vertical surfaces. For insulated walls, the U-factor also includes R-0.45 for 0.5 in. gypsum board. U-factors are provided for the following configurations:
   (a) Concrete wall: 8-in. normal weight concrete wall with a density of 145 lb/ft^3.
   (b) Solid grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 and solid grouted cores.
   (c) Partially grouted concrete block wall: 8-in. medium weight ASTM C90 concrete block with a density of 115 lb/ft^3 having reinforcing steel every 32 in. vertically and every 48 in. horizontally, with cores grouted in those areas only. Other cores are filled with insulating material only if there is no other insulation.
3. For walls with insulation contained in a framing layer, the U-factors in Table 10-5B(3) assume contact (and thermal bridging) between the mass wall and other framing. For wall assemblies with multiple layers where the wood or metal framing layer does not contact the concrete or

masonry layer (i.e. walls with an airspace between the stud wall layer and the mass wall layer), it is acceptable to use the appropriate wood or metal frame wall default U-factors in Tables 10-5 or 10-5A. Note, it is acceptable to use this approach where the insulation extends beyond the framing and is in contact with the mass wall layer (e.g. a nominal four-inch metal stud containing insulation that is nominally six inches thick and therefore extends two inches beyond the back of the metal stud).

4. Except for wall assemblies qualifying for note 3, if not taken from Table 10-5B(3), mass wall U-factors shall be determined in accordance with RS-9, Appendix A, Section A3.1 and Tables A3.1A to A3.1D, or Section A9.4. If not taken from Table 10-9, heat capacity for mass walls shall be taken from RS-9, Appendix A, Table A3.1B or A3.1C.

5. See Section 1332 for determination of U-factors for assemblies that include metal other than screws and nails.

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SECTION 1006 — DEFAULT U-FACTORS FOR FENESTRATION, GLAZING, AND DOORS

1006.1 Fenestration, Glazing and Doors Without NFRC Certification: Fenestration, glazing, ((~~Glazing~~)) and doors that do not have NFRC Certification shall be assigned the following U-factors.

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TABLE 10-6

OTHER THAN SINGLE-FAMILY RESIDENTIAL:

DEFAULT U-FACTORS FOR VERTICAL FENESTRATION((~~GLAZING~~)),

SKYLIGHTS((~~OVERHEAD GLAZING~~)) AND OPAQUE DOORS

Vertical Fenestration((~~Glazing~~))	
	U-Factor

	Any Frame	Aluminum W/Thermal Break[a]	Vinyl/Wood/ Fiberglass Frame
Single (see below for revolving doors & vestibules)[b]	1.45	1.45	1.45
Double	0.90	0.85	0.75
1/2 Inch Air, Fixed/Operable	0.75/0.90	0.70/0.84	0.60/0.72
1/2 Inch Air, Low-e$^{(0.40)}$, Fixed/Operable	0.70/0.84	0.60/0.72	0.50/0.60
1/2 Inch Air, Low-e$^{(0.10)}$, Fixed/Operable	0.65/0.78	0.55/0.66	0.45/0.54
1/2 Inch Argon, Low-e$^{(0.10)}$, Fixed/Operable	0.60/0.72	0.50/0.60	0.40/0.48
Triple	0.75	0.55	0.50
1/2 Inch Air, Fixed/Operable	0.55/0.66	0.50/0.60	0.45/0.54
1/2 Inch Air, Low-e$^{(0.20)}$, Fixed/Operable	0.50/0.60	0.45/0.54	0.40/0.48
1/2 Inch Air, 2 Low-e$^{(0.10)}$, Fixed/Operable	0.45/0.54	0.35/0.42	0.30/0.36
1/2 Inch Argon, Low-e$^{(0.10)}$, Fixed/Operable	0.40/0.48	0.30/0.36	0.25/0.30

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

b. For revolving doors and vestibules that are fenestration:

i. Revolving doors shall use the default U-factors in Table 10-6C that corresponds most closely to the configuration (3-wing or 4-wing) and size of the rough opening for the revolving door.

ii. Vestibules shall use the default U-factor for 4-wing revolving doors in Table 10-6C that corresponds most closely to the size of the rough opening for the vestibule.

((~~Overhead Glazing~~))Skylights: Sloped Glazing (Including Frame)			
	U-Factor		
	Any Frame	Aluminum W/Thermal Break	Vinyl/Wood/ Fiberglass Frame
Single	1.74	1.74	1.74
Double	1.08	1.02	0.90
1/2 Inch Air, Fixed	0.90	0.84	0.72
1/2 Inch Air, Low-e$^{(0.40)}$, Fixed	0.84	0.72	0.60
1/2 Inch Air, Low-e$^{(0.10)}$, Fixed	0.78	0.66	0.54
1/2 Inch Argon, Low-e$^{(0.10)}$, Fixed	0.72	0.60	0.48
Triple	0.90	0.66	0.60
1/2 Inch Air, Fixed	0.66	0.60	0.54
1/2 Inch Air, Low-e $^{(0.20)}$, Fixed	0.60	0.54	0.48
1/2 Inch Air, 2 Low-e$^{(0.10)}$, Fixed	0.54	0.42	0.36
1/2 Inch Argon, 2 Low-e$^{(0.10)}$, Fixed	0.48	0.36	0.30

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

Opaque Doors	
	U-Factor
Uninsulated Metal	1.20
Insulated Metal (Including Fire Door and Smoke Vent)	0.60
Wood	0.50
Other Doors	See Table 10-6C

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1007.2 Component Description: The ((~~four~~)) types of ceilings are characterized as follows:

Ceilings Below a Vented Attic: Attic insulation is assumed to be blown-in, loose-fill fiberglass with a K-value of 2.6 $h \cdot ft^2 \cdot °F/Btu$ per inch. Full bag count for specified R-value is assumed in all cases. Ceiling dimensions for flat ceiling calculations are forty-five by thirty feet, with a gabled roof having a 4/12 pitch. The attic is assumed to vent naturally at the rate of three air changes per hour through soffit and ridge vents. A void fraction of 0.002 is assumed for all attics with insulation baffles. Standard-framed, unbaffled attics assume a void fraction of 0.008.

Attic framing is either standard or advanced. Standard framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation. Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. Advanced framing does not change from the default value.

U-factors for flat ceilings below vented attics with standard framing may be modified with the following table:

	U-Factor for Standard Framing	
Roof Pitch	R-30	R-38
4/12	.036	.031
5/12	.035	.030
6/12	.034	.029
7/12	.034	.029
8/12	.034	.028
9/12	.034	.028
10/12	.033	.028
11/12	.033	.027
12/12	.033	.027

Vented scissors truss attics assume a ceiling pitch of 2/12 with a roof pitch of either 4/12 or 5/12. Unbaffled standard framed scissors truss attics are assumed to have a void fraction of 0.016.

Vaulted Ceilings: Insulation is assumed to be fiberglass batts installed in roof joist cavities. In the vented case, at least 1.5-inches between the top of the batts and the underside of the roof sheathing is left open for ventilation in each cavity. A ventilation rate of 3.0 air changes per hour is assumed. In the unvented or dense pack case, the ceiling cavity is assumed to be fully packed with insulation, leaving no space for ventilation.

EXCEPTION: Where spray polyurethane foam meets the requirements of Section 502.1.6.3 or 1313.2, the cavity shall be filled to the depth to achieve R-value requirements.

Roof Decks: Rigid insulation is applied to the top of roof decking with no space left for ventilation. Roofing materials are attached directly on top of the insulation. Framing members are often left exposed on the interior side.

Metal Truss Framing: Overall system tested values for the roof/ceiling U_o for metal framed truss assemblies from approved laboratories shall be used, when such data is acceptable to the building official.

Alternatively, the U_o for roof/ceiling assemblies using metal truss framing may be obtained from Tables 10-7A, 10-7B, 10-7C, 10-7D and 10-7E.

Steel Truss Framed Ceiling, Table 10-7A.

Steel Truss Framed Ceiling with R-3 Sheathing, Table 10-7B.

Steel Truss Framed Ceiling with R-5 Sheathing, Table 10-7C.

Steel Truss Framed Ceiling with R-10 Sheathing, Table 10-7D.

Steel Truss Framed Ceiling with R-15 Sheathing, Table 10-7E.

Metal Building Roof, Table 10-7F: The base assembly is a roof where the insulation is compressed when installed beneath metal roof panels attached to the steel structure (purlins). Additional assemblies include continuous insulation, uncompressed and uninterrupted by framing. Insulation exposed to a conditioned space shall have a facing, and all insulation seams shall be continuously sealed.

Single Layer. The rated R-value of insulation is for insulation installed perpendicular to and draped over purlins and then compressed when the metal roof panels are attached. A

minimum R-3 (R-0.5) thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor.

Double Layer. The first rated R-value of insulation is for insulation installed perpendicular to and draped over purlins. The second rated R-value of insulation is for unfaced insulation installed above the first layer and parallel to the purlins and then compressed when the metal roof panels are attached. A minimum R-3 (R-0.5) thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor.

Continuous Insulation. For assemblies with continuous insulation, the continuous insulation is installed above or below the purlins, uncompressed and uninterrupted by framing members. ((~~For continuous insulation (e.g., insulation boards or blankets), it is assumed that the insulation is installed below the purlins and is uninterrupted by framing members. Insulation exposed to the conditioned space or semiheated space shall have a facing, and all insulation seams shall be continuously sealed to provide a continuous air barrier.~~))

Liner System (Ls). A continuous membrane is installed below the purlins and uninterrupted by framing members. Uncompressed, unfaced insulation rests on top of the membrane between the purlins. For multilayer installations, the last rated R-value of insulation is for unfaced insulation draped over purlins and then compressed when the metal roof panels are attached. A minimum R-3 (R-0.5) thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor.

Filled Cavity. ((~~The first rated R-value of insulation is for faced insulation installed parallel to the purlins. The second rated R-value of insulation is for unfaced insulation installed above the first layer, parallel to and between the purlins and compressed when the metal roof panels are attached. The facer of the first layer of insulation is of sufficient width to be~~

~~continuously sealed to the top flange of the purlins and to accommodate the full thickness of the second layer of insulation. A supporting structure retains the bottom of the first layer at the prescribed depth required for the full thickness of the second layer of insulation being installed above it.~~)) The first rated R-value of insulation represents faced or unfaced insulation installed between the purlins. The second rated R-value of insulation represents unfaced insulation installed above the first layer, perpendicular to the purlins and compressed where the metal roof panels are attached. A supporting structure retains the bottom of the first layer at the prescribed depth required for the full thickness of insulation. A minimum R-5 (R-0.9) thermal spacer block between the purlins and the metal roof panels is required, unless compliance is shown by the overall assembly U-factor.

U-factors for Metal Building Roofs. U-factors for metal building roofs shall be taken from Table 10-7F, provided the average purlin spacing is at least 52 in. and the R-value of the thermal spacer block is greater than or equal to the thermal spacer block R-value indicated in Table 10-7F for the assembly. It is not acceptable to use the U-factors in Table 10-7F if additional insulated sheathing is not continuous. U-factors for metal building roof assemblies with average purlin spacing less than 52 in. shall be determined in accordance with Section A9.2 of RS-9.

Roofs with Insulation Entirely Above Deck (uninterrupted by framing), Table 10-7G: The base assembly is continuous insulation over a structural deck. Added insulation is continuous and uninterrupted by framing. For the insulation, the first column lists the R-value for continuous insulation with a uniform thickness; the second column lists the comparable area-weighted average R-value for continuous insulation provided that the insulation thickness is never less than R-5 (except at roof drains) and that the slope is no greater than 1/4 inch per foot.

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TABLE 10-7F

Default U-Factors for Metal Building Roofs

Insulation System	Rated R-Value of Insulation	Overall U-Factor for Entire Base Roof Assembly	Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (Uninterrupted by Framing)								
			Rated R-Value of Continuous Insulation								
			R-6.5	R-9.8	R-13	R-15.8	R-19 ((~~R-19.5~~))	R-22.1	R-25 ((~~R-26~~))	R-32 ((~~R-32.5~~))	R-38 ((~~R-39~~))
Standing Seam Roofs with Thermal Spacer Blocks [a,b]											
Single Layer	None	1.280	0.137	0.095	0.073	0.060	0.051 ((~~0.049~~))	0.044	0.039 ((~~0.037~~))	0.031 ((~~0.030~~))	0.026 ((~~0.025~~))
	R-10	0.115	0.066	0.054	0.046	0.041	0.036 ((~~0.035~~))	0.032	0.030 ((~~0.029~~))	0.025 ((~~0.024~~))	0.021
	R-11	0.107	0.063	0.052	0.045	0.040	0.035	0.032	0.029 ((~~0.028~~))	0.024	0.021
	R-13	0.101	0.061	0.051	0.044	0.039	0.035 ((~~0.034~~))	0.031	0.029 ((~~0.028~~))	0.024	0.021 ((~~0.020~~))
	R-16	0.096	0.059	0.049	0.043	0.038	0.034 ((~~0.033~~))	0.031	0.028 ((~~0.027~~))	0.024 ((~~0.023~~))	0.021 ((~~0.020~~))
	R-19	0.082	0.053	0.045	0.040	0.036	0.032 ((~~0.038~~))	0.029	0.027 ((~~0.026~~))	0.023 ((~~0.022~~))	0.020
Double Layer	R-10 + R-10	0.088	0.056	0.047	0.041	0.037	0.033 ((~~0.032~~))	0.030	0.028 ((~~0.027~~))	0.023	0.020
	R-10 + R-11	0.086	0.055	0.047	0.041	0.036	0.033 ((~~0.032~~))	0.030	0.027	0.023	0.020
	R-11 + R-11	0.085	0.055	0.046	0.040	0.036	0.033 ((~~0.032~~))	0.030	0.027 ((~~0.026~~))	0.023	0.020
	R-10 + R-13	0.084	0.054	0.046	0.040	0.036	0.032	0.029	0.027 ((~~0.026~~))	0.023	0.020
	R-11 + R-13	0.082	0.053	0.045	0.040	0.036	0.032	0.029	0.027 ((~~0.026~~))	0.023 ((~~0.022~~))	0.020
	R-13 + R-13	0.075	0.050	0.043	0.038	0.034	0.031 ((~~0.030~~))	0.028	0.026 ((~~0.025~~))	0.022	0.019
	R-10 + R-19	0.074	0.050	0.043	0.038	0.034	0.031 ((~~0.030~~))	0.028	0.026 ((~~0.025~~))	0.022	0.019

	R-11 + R-19	0.072	0.049	0.042	0.037	0.034	0.030	0.028	0.026 ((0.025))	0.022	0.019
	R-13 + R-19	0.068	0.047	0.041	0.036	0.033	0.030 ((0.029))	0.027	0.025	0.021	0.019
	R-16 + R-19	0.065	0.046	0.040	0.035	0.032	0.029	0.027	0.025 ((0.024))	0.021	0.019 ((0.018))
	R-19 + R-19	0.060	0.043	0.038	0.034	0.031	0.028	0.026	0.024 ((0.023))	0.021 ((0.020))	0.018
Liner System	R-19 + R-11	0.035									
	R-25 + R-11	0.031									
	R-30 + R-11	0.029									
	R-25 + R-11 + R-11	0.026									
	R-30 + R-11 + R-11	0.024									
Filled Cavity with Thermal Spacer Blocks [c]											
	R-10 + R-19	0.041 ((0.057))	0.032 ((0.042))	0.029	0.027 ((0.033))	0.025	0.023 ((0.027))	0.022	0.020 ((0.023))	0.018 ((0.020))	0.016 ((0.018))
Standing Seam Roofs without Thermal Spacer Blocks											
Liner System	R-19 + R-11	0.040									
Thru-Fastened Roofs without Thermal Spacer Blocks											
	R-10	0.184	0.084	0.066	0.054	0.047	0.041	0.036	0.033	0.027	0.023
	R-11	0.182	0.083	0.065	0.054	0.047	0.041	0.036	0.033	0.027	0.023
	R-13	0.174	0.082	0.064	0.053	0.046	0.040	0.036	0.033	0.026	0.023
	R-16	0.157	0.078	0.062	0.052	0.045	0.039	0.035	0.032	0.026	0.023
	R-19	0.151	0.076	0.061	0.051	0.045	0.039	0.035	0.032	0.026	0.022
Liner System	R-19 + R-11	0.044									

(Multiple R-values are listed in order from inside)

a. A standing seam roof clip that provides a minimum 1.5 in. distance between the top of the purlins and the underside of the metal roof panels is required.

b. A minimum R-3 thermal spacer block is required.

c. A minimum R-5 thermal spacer block is required.

***

TABLE 10-7G

ASSEMBLY U-FACTORS FOR ROOFS WITH INSULATION ENTIRELY ABOVE DECK

(UNINTERRUPTED BY FRAMING)

Rated R-Value of Insulation Alone: Minimum Throughout, Unsloped	Rated R-Value of Insulation Alone: Average (R-5 minimum), Sloped (1/4 inch per foot maximum)	Overall U-Factor for Entire Assembly
R-0	Not allowed	U-1.282
R-1	Not allowed	U-0.562
R-2	Not allowed	U-0.360
R-3	Not allowed	U-0.265
R-4	Not allowed	U-0.209
R-5	Not allowed	U-0.173
R-6	R-7	U-0.147
R-7	R-8	U-0.129
R-8	R-9	U-0.114
R-9	R-10	U-0.102
R-10	R-12	U-0.093
R-11	R-13	U-0.085

Rated R-Value of Insulation Alone: Minimum Throughout, Unsloped	Rated R-Value of Insulation Alone: Average (R-5 minimum), Sloped (1/4 inch per foot maximum)	Overall U-Factor for Entire Assembly
R-12	R-15	U-0.078
R-13	R-16	U-0.073
R-14	R-18	U-0.068
R-15	R-20	U-0.063
R-16	R-22	U-0.060
R-17	R-23	U-0.056
R-18	R-25	U-0.053
R-19	R-27	U-0.051
R-20	R-29	U-0.048
R-21	R-31	U-0.046
R-22	R-33	U-0.044
R-23	R-35	U-0.042
R-24	R-37	U-0.040
R-25	R-39	U-0.039
R-26	R-41	U-0.037
R-27	R-43	U-0.036
R-28	R-46	U-0.035
R-29	R-48	U-0.034
R-30	R-50	U-0.032
R-31	R-52	U-0.031
R-32	R-54	U-0.031

Rated R-Value of Insulation Alone: Minimum Throughout, Unsloped	Rated R-Value of Insulation Alone: Average (R-5 minimum), Sloped (1/4 inch per foot maximum)	Overall U-Factor for Entire Assembly
R-33	R-56	U-0.030
R-34	R-59	U-0.029
R-35	R-61	U-0.028
R-36	R-63	U-0.027
R-37	R-66	U-0.026
R-38	R-68	U-0.026
R-39	R-71	U-0.025
R-40	R-73	U-0.025
R-41	R-75	U-0.024
R-42	R-78	U-0.023
R-43	R-80	U-0.023
R-44	R-83	U-0.022
R-45	R-86	U-0.022
R-46	R-88	U-0.021
R-47	R-90	U-0.021
R-48	R-93	U-0.021
R-49	R-96	U-0.020
R-50	R-99	U-0.020
R-55	R-112	U-0.018
R-60	R-126	U-0.016

***

1009.1 General: Tables 10-9 and 10-10 list default mass values for concrete masonry construction for residential. Calculations are based on standard ASHRAE values for heat-storage capacity as listed in Standard RS-1, Chapter 26. For heat capacity values for brick, concrete, and concrete masonry materials used in other projects, see Table 10-B.

Thermal capacity of furniture is ignored, as is heat storage beyond the first four inches of mass thickness. All mass is assumed to be in direct contact with the conditioned space. Concrete separated from the heated volume by other materials must multiply the listed concrete mass value by the result of the following formula:

Ln(R-value) x (-.221) .+ 0.5

Where:

Ln = Natural log

R-value = R-value of material covering concrete

Note: All default values for covered concrete slabs have been adjusted according to this procedure.

Section 10. The following sections or subsections of Chapter 11 of the 2009 Washington State Energy Code are amended, and new sections are added to that Chapter, as follows:

SECTION 1100 — TITLE

Chapters 11 through 16((~~20~~)) of this Code shall be known as the "((~~Washington State~~)) Seattle Nonresidential and Multifamily Residential Energy Code" and may be cited as such. Any

reference to the "Seattle Energy Code" in the Seattle Municipal Code or any Seattle ordinance, to the extent applicable to those spaces, shall include the Seattle Nonresidential and Multifamily Residential Energy Code. ((~~; and will be referred to herein as "this Code."~~))

SECTION 1105 — APPLICABILITY TO MULTIFAMILY RESIDENTIAL SPACES

Until the effective date of the 2009 Washington State Energy Code, the 2006 Washington State Energy Code, as filed in Seattle City Clerk's File 308938, and the amendments thereto adopted by Ordinance 122530, constitute the Seattle Energy Code for multifamily residential spaces. Effective upon the date when the 2009 Washington State Energy Code takes effect, the 2009 Washington State Energy Code, with the Seattle Amendments only to Chapter 1, constitutes the Seattle Energy Code for multifamily residential spaces.

EXCEPTION: Sections 1133, 1140, 1141.1, 1141.2, 1144, and 1162 of Chapter 11 of this Code, which relate to procedure, administration and enforcement, including Seattle Amendments to those sections, and the procedural requirements in all chapters, apply to all spaces and occupancies both before and after effectiveness of the 2009 Washington State Energy Code.

For purposes of this Section: (1) Prior to the effective date of the 2009 Washington State Energy Code, "multifamily residential spaces" are defined as spaces within the definition of "Group R" occupancy in Chapter 3 of the 2006 Seattle Building Code and not falling within the scope of Section 101.2 of the 2006 Seattle Residential Code, and (2) effective upon the date when the 2009 Washington State Energy Code takes effect, "multifamily residential spaces" are defined as set forth in Chapter 2 of this Code under "RESIDENTIAL".

Informative Note: Prior to the effective date of the 2009 Washington State Energy Code no spaces in Group I occupancy are classified as "residential," therefore all Seattle Amendments to sections relevant to those spaces apply to all such spaces.

SECTION 1110 — PURPOSE AND INTENT

The purpose of this Code is to provide minimum standards for new or altered buildings and structures or portions thereof, including systems and equipment used for commercial and industrial processes contained therein, to achieve efficient use and conservation of energy. It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve efficient use and conservation of energy.

The purpose of this Code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by the terms of this Code. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

The provisions of this Code do not consider the efficiency of various energy forms as they are delivered to the building envelope.

Informative Note: As indicated in Section 1120, the Energy Code applies to industrial facilities, as well as commercial and industrial processes. Thus, the purpose and the intent is that requirements apply to industrial facilities, as well as systems and equipment used in commercial and industrial processes.

SECTION 1120 — SCOPE

This Code sets forth minimum requirements for the design and commissioning of new or altered buildings and structures or portions thereof that provide facilities or shelter for public assembly, educational, business, mercantile, institutional, storage, factory, industrial, and multifamily residential occupancies by regulating their exterior envelopes and the selection of their mechanical systems, domestic water systems, electrical distribution and illuminating systems, and equipment for efficient use and conservation of energy, including systems and equipment used for commercial and industrial processes contained therein.

EXCEPTION: The provisions of this code do not apply to temporary growing structures used solely for the commercial production of horticultural plants including ornamental plants, flowers, vegetables, and fruits.

—Temporary growing structure means a structure that has the sides and roof covered with polyethylene, polyvinyl, or similar flexible synthetic material and is used to provide plants with either frost protection or increased heat retention. A temporary growing structure is not considered a building for purposes of this Code.

***

1132.1 Building Envelope: Alterations or repairs shall comply with Chapter 13, including the nominal R-values and ((~~glazing~~))fenestration requirements in Table 13-1 or 13-2.

EXCEPTIONS:

1. Storm windows installed over existing glazing.
2. Glass replaced in existing sash and frame provided that glazing is of equal or lower U-factor.
3. For solar heat gain coefficient compliance, glazing with a solar heat gain coefficient equal to or lower than that of the other existing glazing.

4. Existing roof/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 Sections 1311 and 1313.

5. Existing walls and floors without framing cavities, provided that any new cavities added to existing walls and floors comply with Exception 4.

6. Existing roofs where the roof membrane is being replaced and

   a. The roof sheathing or roof insulation is not exposed; or

   b. If there is existing roof insulation below the deck.

7. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided that the rough opening and the door size does not change, and provided that any existing vestibule or revolving door that separates a conditioned space from the exterior shall not be removed.

In no case shall the energy efficiency of the building be decreased.

1132.2 Mechanical Systems: Those parts of systems which are altered or replaced shall comply with Chapter 14 of this Code. Additions or alterations shall not be made to an existing mechanical system that will cause the existing mechanical system to become out of compliance.

All new systems in existing buildings, including packaged unitary equipment and packaged split systems, shall comply with Chapter 14.

Where mechanical cooling is added to a space that was not previously cooled, the mechanical cooling system shall comply with Sections 1413 and either 1423 or 1433.

EXCEPTIONS: These exceptions only apply to situations where mechanical cooling is added to a space that was not previously cooled.

1. Water-cooled refrigeration equipment provided with a water economizer meeting the requirements of Section 1413 need not comply with 1423 or 1433. This exception shall not be used for RS-29 analysis.

2. Alternate designs that are not in full compliance with this Code may be approved when the building official determines that existing building or occupancy constraints make full compliance impractical or where full compliance would be economically impractical.

Alterations to existing mechanical cooling systems shall not decrease economizer capacity unless the system complies with Sections 1413 and either 1423 or 1433. In addition, for existing mechanical cooling systems that do not comply with Sections 1413 and either 1423 or 1433, including both the individual unit size limits and the total building capacity limits on units without economizer, other alterations shall comply with Table 11-1.

When space cooling equipment is replaced, controls shall be installed to provide for integrated operation with economizer in accordance with Section 1413.3.

Existing equipment currently in use may be relocated within the same floor or same tenant space if removed and reinstalled within the same permit.

In no case shall the energy efficiency of the building be decreased.

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

Other tenant improvements, alterations or repairs where ((~~60~~)) 20 percent or more of the fixtures, or of the lamps plus ballasts alone, in a space enclosed by walls or ceiling-height partitions are ((~~new~~)) altered, added, or replaced shall comply with Sections 1531 and 1532. (Where this threshold is triggered, the areas of the affected spaces may be combined for lighting code compliance calculations.) Where less than ((~~60~~)) 20 percent of the fixtures in a space enclosed by walls or ceiling-height partitions are new, the installed lighting wattage shall be maintained or reduced. Where ((~~60~~)) 20 percent or more of the lighting fixtures in a suspended

ceiling are new, and the existing insulation is on the suspended ceiling, the roof/ceiling assembly shall be insulated according to the provisions of Chapter 13, Section 1311.2.

Any new lighting control devices shall comply with the requirements of Section 1513. Where new wiring is being installed to serve added fixtures and/or fixtures are being relocated to a new circuit, controls shall comply with Sections 1513.1 through 1513.5 and, as applicable, 1513.8. In addition, office areas less than 300 ft^2 enclosed by walls or ceiling-height partitions, and all meeting and conference rooms, and all school classrooms, shall be equipped with occupancy sensors that comply with Section 1513.6 and 1513.8. Where a new lighting panel (or a moved lighting panel) with all new raceway and conductor wiring from the panel to the fixtures is being installed, controls shall also comply with the other requirements in Sections 1513.6 through 1513.8.

Where new walls or ceiling-height partitions are added to an existing space and create a new enclosed space, but the lighting fixtures are not being changed, other than being relocated, the new enclosed space shall have controls that comply with Sections 1513.1 through 1513.2, 1513.4, and 1513.6 through 1513.8.

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

In no case shall the energy efficiency of the building be decreased.

1133 Change of occupancy or use or space conditioning. Changes of occupancy or use or space conditioning shall comply with the following requirements:

a. Any unconditioned space that is altered to become semi-heated, cooled, or fully heated, or any semi-heated space that is altered to become cooled or fully heated space shall be required to be brought into full compliance with this Code. Existing warehouses and repair shops are considered unconditioned space unless they are indicated as conditioned space in DPD records or they were built after 1980 and they comply with the building

envelope requirements for conditioned space in effect at the time of construction. (See the Seattle Mechanical Code for requirements for combustion appliances.)

b. Any nonresidential space which is converted to multifamily residential space shall be brought into full compliance with this Code.

c. Any multifamily residential space which is converted to nonresidential space shall be required to comply with all of the provisions of Sections 1130 through 1132 of this Code.

***

1135 Commissioning. Commissioning in compliance with Sections 1416 and 1513.8 shall be required for new systems or modified portions of systems((~~, with a heating capacity of 600,000 Btu/h or a cooling capacity of 40 tons or more~~)).

***

1141.2 Details: The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed including, but not limited to: design criteria; exterior envelope component materials, U-factors of the envelope systems, R-values of insulating materials; U-factors and solar heat gain coefficients and visible transmittance of fenestration or shading coefficients of glazing; area weighted U-factor calculations; efficiency, economizer, size and type of apparatus and equipment; fan system horsepower; equipment and systems controls; lighting fixture schedule with wattages and controls narrative; commissioning requirements for HVAC equipment, HVAC controls, and lighting controls, and other pertinent data to indicate compliance with the requirements of this Code.

***

1141.4 Systems Analysis Approach for the Entire Building: In lieu of using Chapters 12 through 16((~~20~~)), compliance may be demonstrated using the systems analysis option in Standard RS-29. When using systems analysis, the proposed ((~~building~~))design, as defined in Standard RS-29, shall provide ((~~equal or~~)) better conservation of energy((~~than~~)), to the extent required by Section 1.2 of Standard RS-29 than the ((~~standard design~~))baseline building design, as defined in Standard RS-29, that would comply with this Code without reference to this Section 1141.4. If required by the building official, all energy comparison calculations submitted under the provisions of Standard RS-29 shall be stamped and authenticated by an engineer or architect licensed to practice by the state of Washington.

***

1143.2 Required Inspections: The building official, upon notification, shall make the inspection required in this section, in addition to or as part of those inspections required in Section 109.3 of the ((~~International~~))Seattle Building Code. Inspections may be conducted by special inspection pursuant to Section 1704 of the ((~~International~~))Seattle Building Code. Where applicable, inspections shall include at least:

1143.2.1 Envelope

a. Wall Insulation Inspection: To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

b. ((~~Glazing~~))Fenestration Inspection: To be made after ((~~glazing~~))fenestration materials are installed in the building.

c. Exterior Roofing Insulation: To be made after the installation of the roof insulation, but before concealment.

d. Slab/Floor Insulation: To be made after the installation of the slab/floor insulation, but before concealment.

1143.2.2 Mechanical

a. Mechanical Equipment Efficiency and Economizer: To be made after all equipment and controls required by this Code are installed and prior to the concealment of such equipment or controls.

b. Mechanical Pipe and Duct Insulation: To be made after all pipe and duct insulation is in place, but before concealment.

1143.2.3 Lighting and Motors

a. Lighting Equipment and Controls: To be made after the installation of all lighting equipment and controls required by this Code, but before concealment of the lighting equipment.

b. Motor Inspections: To be made after installation of all equipment covered by this Code, but before concealment.

***

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

1144.1 Violations: It is a violation of this Code for anyone to:

1. erect, construct, enlarge, repair, move, improve, remove, convert, demolish, equip, occupy, operate, inspect or maintain any building or structure in the City, contrary to or in violation of any of the provisions of this Code;

2. knowingly aid, abet, counsel, encourage, hire, commend, induce or otherwise procure another to violate or fail to comply with this Code;

3. use any material or to install any device, appliance or equipment that does not comply with the applicable standards of this Code, or that has not been approved by the building official if that approval is required;

4. violate or fail to comply with any final order issued by the building official pursuant to the provisions of this Code or with any requirements of this Code;

5. remove, mutilate, destroy or conceal any notice or order issued or posted by the building official pursuant to the provisions of this Code, or any notice or order issued or posted by the building official in response to a natural disaster or other emergency; or

6. make or submit any false or misleading statement or information as part of or in connection with any application for any permit or approval under this Code.

1144.2 Notices, Review and Enforcement: The provisions of Section 103 of the Seattle Building Code regarding notices of violation, orders, recording, review, and legal proceedings apply under this Code. Section 103 of the Seattle Building Code, as adopted by SMC Section 22.100.010, is incorporated in this Section by this reference. Nothing in this Section 1144 shall be deemed to limit or preclude any action or proceeding pursuant to the Seattle Building Code or any other ordinance, and nothing in this section shall be deemed to obligate or require the building official to issue a notice of violation prior to the imposition of civil or criminal penalties.

1144.3 Penalties and Remedies: Any person violating or failing to comply with the provisions of this Code or an order of the building official under this Code shall be subject to the same civil and criminal penalties as provided for a violation of the Seattle Building Code under Section 103

of that code. The provisions for additional remedies in Section 103 of the Seattle Building Code apply under this Code.

***

1150 Conflicts with Other Codes. In case of conflicts among Codes enumerated in RCW 19.27.031 subsections (1), (2), (3) and (4) and this Code, the first named Code shall govern. The duct insulation requirements in this Code ((~~or a local jurisdiction's energy code, whichever is more stringent,~~)) supersede the requirements in the Mechanical Code.

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

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

***

1162 Liability: Nothing contained in this Code is intended to be nor shall be construed to create or form the basis for any liability on the part of ((~~any city or county~~)) the City or its officers, employees or agents for any injury or damage resulting from the failure of a building or any fixture or equipment to conform to the provisions of this Code, or by reason of or in consequence of any inspection, notice, order, certificate, permission of approval authorized or issued or done in connection with the implementation or enforcement of this Code, or by reason of any action or inaction on the part of the City or by its officers or agents related in any manner to the

enforcement of this Code. This Code shall not be construed to lessen or relieve the responsibility of any person owning, operating or controlling any building or structure for any damages to persons or property caused by defects, nor shall DPD or the City of Seattle be held to have assumed any such liability by reason of the inspections authorized by this Code or any permits or certificates issued under this Code.

***

TABLE 11-1:

ECONOMIZER COMPLIANCE OPTIONS FOR MECHANICAL ALTERATIONS

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	**Any alteration with new or replacement equipment**	**Replacement unit of the same type with the same or smaller output capacity**	**Replacement unit of the same type with a larger output capacity**	**New equipment added to existing system or replacement unit of a different type**
1. Packaged Units	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2,3]	Efficiency: min.[1] Economizer: 1433[2,3]	Efficiency: min.[1] Economizer: 1433[2,4]
2. Split Systems	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: + 10/5%[5] Economizer: shall not decrease existing economizer capability	Only for new units < 54,000 Btuh replacing unit installed prior to 1991 (one of two): Efficiency: + 10/5%[5] Economizer: 50%[6]	Efficiency: min.[1] Economizer: 1433[2,4]

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	**Any alteration with new or replacement equipment**	**Replacement unit of the same type with the same or smaller output capacity**	**Replacement unit of the same type with a larger output capacity**	**New equipment added to existing system or replacement unit of a different type**
			For units > 54,000 Btuh or any units installed after 1991: Option A	
2a. Equipment within the scope of ASHRAE Std 127	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]
3. Water Source Heat Pump	Efficiency: min.[1] Economizer: 1433[2]	(two of three): Efficiency: + 10/5%[5] Flow control valve[7] Economizer: 50%[6]	(three of three): Efficiency: + 10/5%[5] Flow control valve[7] Economizer: 50%[6] (except for certain pre-1991 systems[8])	Efficiency: min.[1] Economizer: 1433[2,4] (except for certain pre-1991 systems[8])
4. Hydronic Economizer using Air-Cooled Heat Rejection Equipment (Dry	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: + 10/5%[5] Economizer: shall not decrease existing economizer capacity	Option A	Efficiency: min.[1] Economizer: 1433[2,4]

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	**Any alteration with new or replacement equipment**	**Replacement unit of the same type with the same or smaller output capacity**	**Replacement unit of the same type with a larger output capacity**	**New equipment added to existing system or replacement unit of a different type**
Cooler)				
4a. Hydronic Economizer using equipment within the scope of ASHRAE Std 127	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: min.[1] Economizer: 1433[2]
5. Air-Handling Unit (including fan coil units) where the system has an air-cooled chiller	Efficiency: min.[1] Economizer: 1433[2]	Economizer: 1433[2] for equipment installed outdoors or in a mechanical room adjacent to the outdoors, otherwise shall not decrease existing economizer capacity	Option A (except for certain pre-1991 systems[8])	Option A (except for certain pre-1991 systems[8])
6. Air- Handling Unit (including fan	Efficiency: min.[1] Economizer: 1433[2]	Economizer: 1433[2] for equipment installed	Option A (except for certain pre-	Efficiency: min.[1] Economizer: 1433[2,4]

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	**Any alteration with new or replacement equipment**	**Replacement unit of the same type with the same or smaller output capacity**	**Replacement unit of the same type with a larger output capacity**	**New equipment added to existing system or replacement unit of a different type**
coil units) and Water-cooled Process Equipment, where the system has a water-cooled chiller[10]		outdoors or in a mechanical room adjacent to the outdoors, otherwise shall not decrease existing economizer capacity	1991 systems[8] and certain 1991-2009 ((2004)) systems[9].)	(except for certain pre-1991 systems[8] and certain 1991-2009 ((2004)) systems[9])
7. Cooling Tower	Efficiency: min.[1] Economizer: 1433[2]	No requirements	Option A	Option A
8. Air-Cooled Chiller	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: + 5%[11] Economizer: shall not decrease existing economizer capacity	Efficiency (two of two): (1) + 10%[12] and (2) multistage Economizer: shall not decrease existing economizer capacity	Efficiency: min.1 Economizer: 1433[2,4]
9. Water-Cooled Chiller	Efficiency: min.[1] Economizer: 1433[2]	Efficiency (one of two):	Efficiency (two of two):	Efficiency: min.[1] Economizer: 1433[2,4]

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	**Any alteration with new or replacement equipment**	**Replacement unit of the same type with the same or smaller output capacity**	**Replacement unit of the same type with a larger output capacity**	**New equipment added to existing system or replacement unit of a different type**
		(1) + 10%[13] or (2) plate frame heat exchanger[15] Economizer: shall not decrease existing economizer capacity	(1) + 15%[14] and (2) plate-frame heat exchanger[15] Economizer: shall not decrease existing economizer capacity	
10. Boiler	Efficiency: min.[1] Economizer: 1433[2]	Efficiency: + 8%[16] Economizer: shall not decrease existing economizer capacity	Efficiency: + 8%[16] Economizer: shall not decrease existing economizer capacity	Efficiency: min.[1] Economizer: 1433[2,4]

1. Minimum equipment efficiency shall comply with Section 1411.1 and Tables 14-1A through G((~~M~~)).
2. System and building shall comply with Section 1433 (including both the individual unit size limits and the total building capacity limits on units without economizer). It is acceptable to comply using one of the exceptions to Section 1433.
3. All equipment replaced in an existing building shall have air economizer complying with Sections 1413 and 1433 unless both the individual unit size and the total capacity of units without air economizer in the building is less than that allowed in Exception 1 to Section 1433.

4. All separate new equipment added to an existing building shall have air economizer complying with Sections 1413 and 1433 unless both the individual unit size and the total capacity of units without air economizer in the building is less than that allowed in Exception 1 to Section 1433.

5. Equipment shall have a capacity-weighted average cooling system efficiency:

a. for units with a cooling capacity below 54,000 Btuh, a minimum of 10% greater than the requirements in Tables 14-1A and 14-1B (1.10 x values in Tables 14-1A and 14-1B).

b. for units with a cooling capacity of 54,000 Btuh and greater, a minimum of 5% greater than the requirements in Tables 14-1A and 14-1B (1.05 x values in Tables 14-1A and 14-1B).

6. Minimum of 50% air economizer that is ducted in a fully enclosed path directly to every heat pump unit in each zone, except that ducts may terminate within 12 inches of the intake to an HVAC unit provided that they are physically fastened so that the outside air duct is directed into the unit intake. If this is an increase in the amount of outside air supplied to this unit, the outside air supply system shall be capable of providing this additional outside air and equipped with economizer control.

7. Have flow control valve to eliminate flow through the heat pumps that are not in operation with variable speed pumping control complying with Section 1432.2.2 for that heat pump.

– When the total capacity of all units with flow control valves exceeds 15% of the total system capacity, a variable frequency drive shall be installed on the main loop pump.

– As an alternate to this requirement, have a capacity-weighted average cooling system efficiency that is 5% greater than the requirements in note 5 (i.e. a minimum of 15%/10% greater than the requirements in Tables 14-1A and 14-1B (1.15/1.10 x values in Tables 14-1A and 14-1B)).

8. Systems installed prior to 1991 without fully utilized capacity are allowed to comply with Option B, provided that the individual unit cooling capacity does not exceed 90,000 Btuh.

9. Economizer not required for systems installed with water economizer plate and frame heat exchanger complying with previous codes between 1991 and ((~~June 2004~~)) the effective date of the 2009 Seattle Energy Code, provided that the total fan coil load does not exceed the existing or added capacity of the heat exchangers.

10. For water-cooled process equipment where the manufacturers specifications require colder temperatures than available with waterside economizer, that portion of the load is exempt from the economizer requirements.

11. The air-cooled chiller shall have an IPLV efficiency that is a minimum of 5% greater than the IPLV requirements in EER in Table 14-1C (1.05 x IPLV values in EER in Table 14-1C).

12. The air-cooled chiller shall:

    a. have an IPLV efficiency that is a minimum of 10% greater than the IPLV requirements in EER in Table 14-1C (1.10 x IPLV values in EER in Table 14-1C), and

    b. be multistage with a minimum of two compressors.

13. The water-cooled chiller shall have an ((~~NPLV~~)) IPLV efficiency that is at least 10% lower((~~a minimum of 10% greater~~)) than the ((~~NPLV~~)) IPLV requirements in kW/ton in ((~~Table 14-1K, Table 14-1L, or Table 14-1M~~)) Table 14-1C (1.10 x ((~~NPLV~~)) IPLV values in kW/ton in ((~~Table 14-1K, Table 14-1L, or Table 14-1M~~)) Table 14-1C). Water cooled centrifugal chillers designed for non-standard conditions shall have an NPLV efficiency that is at least 10% lower than the adjusted maximum NPLV rating in kW/ton defined in paragraph 1411.2.1 (1.10 x NPLV).

14. The water-cooled chiller shall have an ((~~NPLV~~)) IPLV efficiency that is at least 15% lower ((~~a minimum of 15% greater~~)) than the ((~~NPLV~~)) IPLV requirements in kW/ton in ((~~Table 14-1K, Table 14-1L, or Table 14-1M~~)) Table 14-1C (1.15 x ((~~NPLV~~)) IPLV values in kW/ton in ((~~Table 14-1K, Table 14-1L, or Table 14-1M~~)) Table 14-1C). Water cooled centrifugal chillers designed for non-standard conditions shall have an NPLV efficiency that is at least 15% lower than the adjusted maximum NPLV rating in kW/ton defined in paragraph 1411.2.1 (1.15 x NPLV).

15. Economizer cooling shall be provided by adding a plate-frame heat exchanger on the waterside with a capacity that is a minimum of 20% of the chiller capacity at standard AHRI rating conditions.

16. The replacement boiler shall have an efficiency that is a minimum of 8% higher than the value in Table 14-1F (1.08 x value in Table 14-1F), except for electric boilers.

Section 11. The following sections of Chapter 12 of the 2009 Washington State Energy Code are amended, and new sections are added to that Chapter, as follows:

Chapter 12 Energy Metering and Energy Consumption Management

1201 General. All buildings shall comply with Chapter 12. Whole building energy supply sources shall be metered to supply energy consumption data to the building owner to effectively manage energy. The building shall have a totalizing meter for each energy source.

1202 Whole Building Energy Supply Metering. For buildings with a gross conditioned floor area of 20,000 ft^2 and larger, measurement devices with remote communication capability shall be provided to collect energy use data for each energy supply source to the building including gas, electricity and district steam. The system shall collect energy use data for the total building and separately for each of the end-use categories listed in Sections 1202.1 through 1202.5 and Figure 12A.

Exceptions:

1. Buildings where the total usage of each of the load types described in Sections 1202.1through 1202.5 is measured through the use of installed submeters or other methods approved as equivalent by the building official.
2. Up to 5% of the total calculated load of each end-use category, as defined in Sections 1202.1 through 1202.5, may be excluded from the energy submetering requirements of this chapter.
3. Separate metering is not required for fire pumps, stairwell pressurization fans and associated life-safety systems that operate only during testing or emergency.
4. Health care facilities with loads in excess of 150kVA may 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.

All measurement devices shall be configured to automatically communicate the energy data to a data acquisition system. At a minimum, measurement devices shall provide daily data. The data acquisition system shall be capable of electronically storing the data, for a minimum of 36

months, from the measurement devices and other sensing devices and creating user reports showing daily, monthly and annual energy consumption. The system shall be commissioned in accordance with Section 1416.

((~~Meters with remote metering capability or automatic meter reading (AMR) capability shall be provided to collect energy use data for each energy supply source to the building including gas, electricity and district stream, that exceeds the thresholds listed in Table 12-1. Utility company service entrance/interval meters are allowed to be used provided that they are configured for automatic meter reading (AMR) capability.~~

~~Master submetering with remote metering capability (including current sensors or flow meters) shall be provided for the systems that exceed the thresholds in Table 12-1 to collect overall totalized energy use data for each subsystem in accordance with Table 12-2.~~))

Metering shall be digital-type meters for the main meter. Current sensors or flow meters are allowed for submetering. ((~~For subsystems with multiple similar units, such as multicell cooling towers, only one meter is required for the subsystem.~~)) Existing buildings are allowed to reuse installed existing analog-type utility company service/interval meters.

1202.1 HVAC System Total Energy Use. This category shall include all energy used to provide space heating, space cooling, and ventilation to the building including boilers, chillers, pumps, fans for supply, return, relief, exhaust, and parking garages, etc.

1202.2 Lighting System Total Energy Use. This category shall include all energy used by interior and exterior lighting, but not including plug-in task lighting.

1202.3 Plug Load System Total Energy Use. This category shall include all energy used by plugged-in task lighting, appliances, and other equipment and devices.

1202.4 Process Load System Total Energy Use. This category shall include all energy used by any non-building operation load (e.g. nonresidential refrigeration and cooking) that accounts for

over 2% of the total building connected load. If the total process energy use is less than 2% of the total building connected load, the process energy use is allowed to be included in miscellaneous process energy use.

1202.5 Miscellaneous Total Energy Use. This category shall include energy use other than those specified in Sections 1202.1 through 1202.4 including domestic hot water, elevators and escalators, and swimming pools.

1203 Metering for New or Replacement Systems and Equipment: Where new or replacement systems or equipment is installed in an existing building, metering shall be installed so that that system or equipment is included in the total for the corresponding end-use category in accordance with Section 1202.

Exceptions:

1. Where new or replacement systems or equipment that falls below the threshold in Table 12-2 is installed in an existing building that was not subject to the requirements of this chapter, no additional metering shall be required.

2. Where new or replacement systems or equipment ((~~is installed~~)) that exceeds the threshold in ((~~Table 12-1 or~~)) Table 12-2 is installed in an existing building that was not subject to the requirements of this chapter, metering shall be installed for that system or equipment in accordance with Section 1202((~~1201~~)) except that a data acquisition system shall not be required for buildings less than 50,000 ft^2.

1204 Energy Display. For each building subject to Section 1202, a permanent, readily accessible and visible display shall be provided in the building accessible by building operation and management. At a minimum the display shall be capable of providing the current energy demand for the whole building, updated for each energy source, as well as the average and peak demands for the previous day and the same day the previous year, and the total energy usage for the previous 12 months.

Exception: For existing buildings where a data acquisition system is not required, compliance with Section 1204 shall not be required.

FIGURE 12A

ENERGY SOURCE AND SEPARATE END-USE SUBMETERING

Energy Source	Separate End-use Submetering
Electrical service	HVAC, Lighting, Plugs, Process, Miscellaneous Energy used in the project
Gas and steam service	HVAC, Process, Miscellaneous Energy used in the project
On-site renewable electric power	Electrical energy supplied to the project
Geothermal	Heat content supplied to the project
On-site renewable thermal energy	Heat content supplied to the project

Informative Note: Metering of on-site renewable thermal energy, such as for solar water heating systems, will typically require measurement of input and output temperature and flow to determine the thermal energy.

((~~TABLE 12-1~~

~~ENERGY SOURCE METER THRESHOLDS~~

~~Energy Source~~	~~Main Metering Threshold~~
~~Electrical service~~	~~> 500 kVA~~
~~On-site renewable electric power~~	~~> 10 kVA (peak)~~
~~Gas and steam service~~	~~> 300 kW (1,000,000 Btu/h)~~
~~Geothermal~~	~~> 300 kW (1,000,000 Btu/h) heating~~
~~On-site renewable thermal energy~~	~~> 10 kW (30,000 Btu/h)~~

))

TABLE 12-2

COMPONENT ENERGY MASTER SUBMETERING THRESHOLDS

Component	Submetering Threshold
Chillers/heat pump systems	> 70 kW (240,000 Btu/h) cooling capacity
Packaged AC unit systems	> 70 kW (240,000 Btu/h) cooling capacity
HVAC fan systems	> 15 kW (20 hp)
Exhaust fan systems	> 15 kW (20 hp)
Make-up air fan systems	> 15 kW (20 hp)
Pump systems	> 15 kW (20 hp)
Cooling tower systems	> 15 kW (20 hp)
Boilers, furnaces and other heating equipment systems	> 300 kW (1,000,000 Btu/h) heating capacity

Component	Submetering Threshold
General lighting circuits	> 15 kVA
Miscellaneous electric loads	> 15 kVA

Section 12. The following sections or subsections of Chapter 13 of the 2009 Washington State Energy Code are amended, and new subsections are added, as follows:

***

FIGURE 13A

BUILDING ENVELOPE COMPLIANCE OPTIONS

Section Number	Subject	Prescriptive Option	Component Performance Option	Systems Analysis Option
1310	General Requirements	X	X	X
1311	Insulation	X	X	X
1312	((~~Glazing~~))Fenestration and Doors	X	X	X
1313	Moisture Control	X	X	X
1314	Air Leakage	X	X	X
1320	Prescriptive Building Envelope Option	X		
1321	General	X		
1322	Opaque Envelope	X		
1323	((~~Glazing~~))Fenestration	X		

1330	Component Performance Building Envelope Option		X	
1331	General		X	
1332	Component U-Factors		X	
1333	UA Calculations		X	
1334	Solar Heat Gain Coefficient		X	
1335	Visible Transmittance		X	
RS-29	Systems Analysis			X

***

1310.1 Conditioned Spaces: The building envelope for conditioned spaces shall also comply with one of the following paths:

a. Prescriptive Building Envelope Option Sections 1320 through 1323.

b. Component Performance Building Envelope Option Sections 1330 through ((~~1334~~)) 1335.

c. Systems Analysis. See Section 1141.4.

1310.3 Cold Storage and Refrigerated Spaces: Exterior and interior surfaces of frozen storage spaces or cold storage spaces in refrigerated warehouses may comply with either the prescriptive or component performance approach using insulation values in Table 13-3. The remainder of refrigerated warehouse area containing conditioned or semi-conditioned spaces shall comply by using either the prescriptive or component performance approach using Tables 13-1 and 13-2.

EXCEPTIONS:

1. Areas within refrigerated warehouses that are designed solely for the purpose of quick chilling or freezing of products with design cooling capacities of greater than 240 Btu/hr-ft^2 (2 tons per 100 ft^2).

2. Controlled atmosphere storage exterior floor and partition wall insulation.

TABLE 13-3

REFRIGERATED WAREHOUSE INSULATION

SPACE	SURFACE	ASSEMBLY MAXIMUM U-FACTOR (Btu/h·ft^2·°F)	INSULATION MINIMUM R-VALUE (h·ft^2·°F/Btu)
Frozen Storage Spaces (28°F or below) and Cold Storage Spaces (28-45°F)	((~~Exterior~~)) Roof/Ceiling	U-0.027	R-38 ((~~R-36~~))
	((~~Exterior~~)) Wall	U-0.027	R-38 ((~~R-36~~))
	((~~Exterior~~)) Floor	U-0.027	R-38 ((~~R-36~~))
	((~~Interior Partition~~[1]))		((~~R-28~~))
((~~Cold Storage Spaces (28-45°F)~~))	((~~Exterior Roof/Ceiling~~))		((~~R-28~~))
	((~~Exterior Wall~~))		((~~R-28~~))
	((~~Interior Partition~~[1]))		((~~R-19~~))