

Seattle Permits

— part of a multi-departmental City of Seattle series on getting a permit

Renewable Energy and Solar-Ready Roofs for Commercial Buildings

Updated May 23, 2017

This Tip discusses the regulations for renewable energy and solar-ready roofs for commercial buildings as outlined in the 2015 Seattle Energy Code. The “Commercial Building” provisions in the Energy Code have two different rules relating to solar energy.

1. A smaller renewable (solar) energy system that you install at the time of construction. (Section C411)
2. A solar-ready roof to facilitate a larger solar energy installation in the future. (Section C412)

The first rule ensures that solar energy will become a standard part of Seattle building construction. The second rule ensures that installation of future larger-scale solar installations will be straightforward and economical when solar energy becomes competitive with grid power. (Note that these rules do not apply to residential buildings, defined in the Energy Code as single-family and two-unit dwellings and townhouses, and multifamily buildings up to three stories above grade.)

Throughout this Tip, the relevant Energy Code section numbers are shown in parentheses next to each regulation summary. It is important that you read the actual code language for important details that are not included in this brief summary.

Which Buildings Have to Comply With These Solar Rules?

These rules apply to new construction and additions, but not to alterations in existing buildings. If you are building an addition, the rules only apply to the area of the addition itself.

	5,000 Square Feet or Less Floor Area	Over 5,000 Square Feet Floor Area
Multifamily 1 – 3 stories	NR	NR
Multifamily 4+ stories	NR	Renewable energy
Non-residential 1 – 20 stories	Solar-ready roof	Solar-ready roof and renewable energy
Non-residential 21+ stories	NR	Renewable energy
NR = Not Required		
(1) A solar-ready roof is not required if the roof is heavily shaded.		
(2) The alternates described in this Tip may be used instead of providing renewable energy.		

Renewable (Solar) Energy Systems Required at the Time of Construction

System size. (C411.1) You should size your solar photovoltaic (PV) system at 70 watts for every 1,000 square feet of conditioned space (interior spaces that are heated or cooled—see definition in Chapter 2). For example: A building with 31,000 square feet of conditioned area would require a 2.17 kW PV system (31,000 / 1000 x 70 = 2,170 watts). This system would likely occupy 180 – 200 square feet of the roof.

If you elect to install a solar water heating system instead of PV, it must be large enough to produce 240 kBtu of hot water annually for every 1,000 square feet of conditioned space. For this option, a 31,000-square-foot building would require a system that produced 7,440 kBtu per year (31 x 240). This might be met with a roof panel of approximately 20 square feet, although



the systems available vary widely. Note that solar water heating systems typically require freeze protection and ongoing maintenance.

Taller buildings. (C411.1) For buildings more than 5 stories tall, you only need to include the conditioned floor area of the largest 5 above-grade stories when sizing the renewable energy system.

Three alternates. (exceptions to C411.1) Where renewable energy is not desired or is not practical for your project, you have three alternatives.

Exception 1: You may substitute HVAC equipment that is 10 percent more efficient than required by code for the required renewable energy. For purposes of calculating the 10 percent additional HVAC equipment efficiency:

- You must calculate heating and cooling separately, and each must comply separately.
- Both the “part load” and the “full load” equipment efficiencies must be 10 percent better than those listed in the Section C403.2.3 tables.

Exception 2: You may substitute a heat recovery system that will conserve at least as much annual energy as would have been produced by the required solar energy system.

Exception 3: If your building is primarily served by electric resistance heating and does not have a central HVAC system, you may construct a higher-performing building envelope instead of the renewable energy required by Section C411. To qualify for this alternative, the building envelope must have a total Design UA value that is at least 15 percent below the Target UA value, using the calculation method in Section C402.1.5.

This third exception is not available to buildings served primarily by central HVAC systems or buildings with primary heating systems that are not electric resistance.

Solar-Ready Roof to Accommodate Future Solar Energy Systems

You need to provide a solar-ready roof on each non-residential building up to 20 stories in height, unless it is excessively shaded by existing buildings, trees, or landforms (see the exception to C412.1 for a definition of excessively shaded). If your building is primarily residential (where more than half of the conditioned floor area is classified as an R-occupancy), you are not required to provide a solar-ready roof. (C412.1)

Solar zone size. (C412.2) Typically, the required solar zone (the section of the roof prepared for the installation of solar energy arrays in the future) is 40 percent of the roof area. The roof area is defined as the gross area of the roof, minus the area of skylights, roof decks, and planted areas. For buildings with extensive rooftop equipment, such as laboratory exhausts or industrial equipment, the solar zone can be reduced to the maximum practicable area. The solar zone can be made up of several smaller areas, if each area is at least 5 feet wide. (C412.3)

Alternatively, you can also calculate the solar zone size as a PV array with peak power large enough to supply 20 percent of the building’s electric service. This could result in a smaller solar zone for warehouses and other low-rise buildings with low power demand.

Obstructions and shading. (C412.4 and C412.5)

The solar zone on the roof must be free of vent pipes, exhaust fans, skylights, and the like, and must be set back a distance twice the height of any object that is south, east, or west of the solar zone. For example, the edge of the solar zone would be 4 feet away from a 2-foot-tall parapet, or 6 feet away from a 3-foot-high exhaust fan. (You do not have to consider the future height of growing trees.)

Roof structure. (C412.7) Within the solar zone, include 4 additional pounds of dead load per square foot in the structural roof design to support the future solar panels. You should also designate a smaller area for a future inverter, at 175 pounds per square foot. It may be advantageous to place the future inverter space directly above a structural column or beam.

Electrical or plumbing connections. (C412.8) For future PV systems, you should provide a capped sleeve through the roof for future conduit, near the designated inverter location. At the main electrical panel, you should either provide space for a future breaker or provide lugs to connect a future external breaker. For future solar hot water systems, you should provide two capped tees in the piping upstream of the water heating equipment for future connections, and provide two capped sleeves through the roof to accommodate future supply and return piping.

Construction documents. You need to show the boundaries of the solar zone on your roof plan, and calculate its total area in square feet. For PV systems, you need to show the locations reserved for the future inverters and metering equipment, and the pathway to the future wiring connections. You do not have to install

conduit for future wiring. For solar hot water systems, your plans should show the location of future hot water storage tanks, and the route for future piping from the solar zone to the plumbing connection point. (C412.8)

For more information about solar energy, see Tip 420, *Solar Energy Systems*.

For the complete code language in Sections C411 and C412, go to www.seattle.gov/dpd/codesrules/codes/energy/overview/

Access to Information

Links to electronic versions of SDCI **Tips**, **Director's Rules**, and the **Seattle Municipal Code** are available on the "Tools and Resources" page of our website at www.seattle.gov/sdci. Paper copies of these documents, as well as additional regulations mentioned in this Tip, are available from our Public Resource Center, located on the 20th floor of Seattle Municipal Tower at 700 Fifth Ave. in downtown Seattle, (206) 684-8467.