Seattle Department of Construction and Inspections
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Tip 422
Seattle Permits
— part of a multi-departmental City of Seattle series on getting a permit

Renewable Energy and Solar-Ready Roofs for Commercial Buildings

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This Tip discusses the regulations for renewable energy and solar-ready roofs for commercial buildings as outlined in the 2018 Seattle Energy Code. The "Commercial Building" provisions in the Energy Code have two primary requirements relating to solar energy.

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

The first rule ensures that installation of future larger-scale solar installations will be straightforward and economical as solar energy becomes more competitive with grid power. The second rule ensures that solar energy will become a standard part of Seattle building construction. (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.)

In addition to Sections C411 and C412, one of the "efficiency packages" available in Section C406 is Section C406.5, on-site renewable energy. The Seattle code handles this differently from the Washington state code.

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 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.

All buildings up to 20 stories must meet solar readiness requirements, with an exception for heavily shaded roofs.

All buildings, except affordable housing, with over 5000 square feet of conditioned floor area must meet renewable energy requirements. The required renewable energy can be located on site, or the project can meet one of the alternative compliance paths.

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

System size. (C412.1) Size your solar photovoltaic (PV) system at 0.25 watts per square foot of conditioned space. For example: A building with 31,000 square feet of conditioned area would require a 7.75 kW PV system (31,000 x 0.25 = 7,750 watts). This system would likely occupy 375 - 400 square feet of the roof.

You could install a solar water heating system or some other type of on-site renewable energy instead of solar photovoltaic panels, if you provide approved calculations showing that the proposed system will produce as much energy annually as the required PV. Note that solar water heating systems typically require freeze protection and ongoing maintenance.

Five alternates. (Exceptions to C412.1) Where on-site renewable energy is not desired or is not practical for your project, you have five alternatives.

Exception 1: You may provide 3 "additional energy efficiency credits" from Table C406, in addition to those already required. You may also provide 1 additional credit, and reduce you required solar array size by 1/3, or provide 2 additional credits and reduce the required array size by 2/3.

Seattle Department of Construction & Inspections
700 5th Avenue, Suite 2000
P.O. Box 34019
Seattle, WA 98124-4019
(206) 684-8600

- 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: If you are using the Total Building Performance (energy modeling) compliance path in Section C407, you may reduce the "building performance factor" (BPF) shown in Table C407.3(2) by 3 percent. You may also reduce the BPF by 1 percent and reduce your required solar array size by 1/3, or reduce the BPF by 2 percent and reduce the required array size by 2/3.

Exception 3: You may gift all or part of your required solar array to a qualified affordable housing project. If installed on an existing affordable housing facility, the array would only need to be 50 percent of the required size, and if installed on a new affordably housing project, the array would need to be 75 percent of the required size.

Exception 4: You may pay $2.50 per watt of the required solar array to a Washington state agency for solar array installation on affordable housing projects in the state. The agency could be the Housing Trust Fund or the state Housing Finance Commission.

Exception 5: If your project is an "affordable housing" project that meets the definition in Chapter 2 of the code, you are not required to install a renewable energy system.

Section C406 Credits for Renewable Energy (C406.5)

To qualify for three credits, you must provide 0.25 watts of PV generating capacity per square foot of conditioned floor space in the building. This is in addition to the renewable energy required in Section C412. (Note that this is different from the Washington state energy code version, which is based on annual energy production rather than nameplate generating capacity and has a different requirement for each occupancy type.) You can also get one credit for providing 1/3 as much solar, or two credits for providing 2/3 as much solar, as the full 0.25 watts.

C407.2 Mandatory Requirements (for energy modeling)

When using the Total Building Performance (energy modeling) compliance path, you must comply with Sections C411 and C412. However, you can include any on-site renewable energy production in the proposed building performance, but not in the baseline building performance. (See comment in Table C407.2.) This means that you can take modeling credit for your solar energy production.

Limits on renewable energy in the energy model. (C407.3) You can take full credit for renewable energy required by Section C412. In addition, you can take credit for any additional renewable energy provided, including that installed for credits under Section C406, up to a limit of 3 percent of the total carbon emissions of the baseline building.

Solar-Ready Roof to Accommodate Future Solar Energy Systems

You need to provide a solar-ready roof on each building up to 20 stories in height, unless it is excessively shaded by existing buildings, trees, or landforms (see the exception to C411.)

Solar zone size. (C411.2) 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, mechanical equipment, 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. (C411.3)

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. (C411.4 and C411.5) 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.)

Access pathways. (C411.5) You must provide a clear perimeter path and other access pathways as required by Section 605.11.1.3 of the Seattle Fire Code.

Roof structure. (C411.7) 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 connections. (C411.8) For future PV systems, you must provide a 2-inch capped sleeve through the roof for future conduit, within every 2,500 square feet of solar zone and, 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.

Construction documents. You need to show the boundaries of the solar zone on your roof plan, and calculate its total area in square feet. Also show required access pathways. 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. (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 **http://www.seattle.gov/dpd/codesrules/codes/energy/overview/**

For detailed Seattle Fire Department requirements, see Client Assistance Memo #5124, Solar Photovoltaic Power systems at: **5124CAM_PhotovoltaicPowerSystems.pdf**.

Resources for City Light Customers

The **City Light website** includes several resources for customers who are considering a rooftop solar array. It describes the steps that customers will take to apply for a renewable energy production credit for residential solar PV systems, including interconnection and net metering, production metering, and Washington State Department of Revenue system certification.

For information and assistance on City Light renewable energy and energy efficiency programs for home or business, contact a City Light **Energy Advisor** at (206) 684-3800

For assistance with energy strategy development, daylighting design guidance/simulation, and whole building energy modeling for commercial, education, and healthcare facilities contact the City Light design partners at the **UW Center for Integrated Design** at (206) 616-6566.

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.