

Renewable Energy and Solar-Ready Roofs for Commercial Buildings

Updated April 24, 2025

This Tip discusses the regulations for renewable energy and solar-ready roofs for commercial buildings as outlined in the <u>2021 Seattle Energy Code</u>. The "Commercial Building" provisions in the Energy Code have two different rules relating to solar energy.

- 1. A renewable (usually solar) energy system that you install at the time of construction. (Section C411.1)
- 2. A solar-ready roof to facilitate a larger solar energy installation in the future. (Section C411.3)

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 as solar energy becomes increasingly 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.

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 typical alterations in existing buildings. However, there are three categories of major alterations that require full compliance with the code, including renewable energy. Those categories are:

- Substantial alterations: Section C503.9
- Change of occupancy: Section C505.3
- Change of space conditioning: Section C505.2

If you are building an addition, the rules only apply to the area of the addition itself.

Buildings and additions with more than 5,000 ft² of conditioned floor area must meet the renewable energy requirements, and buildings up to 20 stories in height must meet the solar readiness requirements.

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

System size. (C411.1) You should size your solar photovoltaic (PV) system at 0.50 watts per square foot 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 23.25 kW PV system (31,000 x 0.50 = 15,500 watts). This system would likely occupy 1,300 – 1,500 square feet of the roof.

Note that solar water heating systems typically require freeze protection and ongoing maintenance.

Exceptions to C411.1. Where there is not enough net roof area for all or part of the required renewable energy system you have two alternatives. "Net roof area" excludes shaded areas, access pathways, mechanical equipment, sloping roofs, planted areas, skylights, or occupied roof decks.

- You can provide 27 more "additional efficiency credits" according to Section C411.1.1 instead of providing the entire renewable system, or fewer credits on a prorated basis to replace a portion of the renewables.
- You can contract for off-site renewable energy in accordance with Section C411.2. Note that compliant off-site systems are not readily available in Washington state.

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- Buildings and additions with less than 5000 square feet of conditioned floor area are not required to provide renewable energy.
- You can transfer all or part of your required renewable energy system to a qualified affordable housing project in Seattle. This system must be installed and fully operational before your project's Certificate of Occupancy will be issued.
- Alternatively, you can pay \$2.50 per watt to the solar energy fund of the Washington State Housing Finance Commission, which will use that money to install solar energy on Seattle affordable housing projects.
- Qualified affordable housing projects are not required to provide renewable energy.

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 Exception 1 to C411.3 for a definition of excessively shaded). Buildings and additions smaller than 500 square feet are also exempt from this requirement.

Solar zone size. (C411.3.1) Typically, the required solar zone (the area of the roof prepared for future installation of solar energy arrays) is 40 percent of the net roof area. The net roof area is defined as the gross area of the roof, minus the area of skylights, roof decks, planted areas, mechanical equipment, and required access paths. The solar zone can be made up of several smaller areas, if each area is at least 5 feet wide. (C411.3.2).

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. (C411.3.3 and C411.3.4) 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. (C411.3.6) 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 locate the future inverter space directly above a structural column or beam.

Electrical connections. (C412.8) (C411.3.7) 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.

Construction documents. You need to show the boundaries of the solar zone on your roof plan and calculate its total area in square feet. You also need to show the locations near the main panel reserved for the future inverters and metering equipment, and the pathway from the electrical room to the future wiring connections. You do not have to install conduit for future wiring.

For more information about solar energy, see Tip 420, Solar Energy Systems and Solar-Ready Roofs for Residential Buildings.

Visit **SDCI's webpage** for the complete code language in Sections C411 and C412.

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 <u>Energy Advisor</u> 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 <u>UW Center for Integrated Design</u> 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 <u>website</u>.