**15-048 - B**

**1. State Building Code to be Amended:**

International Building Code  State Energy Code

ICC ANSI A117.1 Accessibility Code  International Mechanical Code

International Existing Building Code  International Fuel Gas Code

International Residential Code  NFPA 54 National Fuel Gas Code

International Fire Code  NFPA 58 Liquefied Petroleum Gas Code

Uniform Plumbing Code  Wildland Urban Interface Code

**Section(s):**

**(**New) Appendix N

**Title:**

Solar Readiness

**2. Proponent Name (Specific local government, organization or individual):**

**Proponent:**

Regional Code Collaboration (RCC)

Washington Association of Building Officials (WABO)

**Title:**

**Date:** 3-1-2015

**3. Designated Contact Person:**

**Name:** Kathleen Petrie

**Title:** Sustainable Codes Analyst

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**4. Proposed Code Amendment**. Reproduce the section to be amended by underlining all added language, striking through all deleted language. Insert new sections in the appropriate place in the code in order to continue the established numbering system of the code. If more than one section is proposed for amendment or more than one page is needed for reproducing the affected section of the code additional pages may be attached. (Examples on the SBCC [website](https://fortress.wa.gov/ga/apps/sbcc/Page.aspx?nid=191))

**Code(s)** International Building Code **Section(s)** (New) Appendix N

Add new language as follows:

**Appendix N**

**Solar readiness**

**N101.1 General**. A *solar zone* shall be provided on non-residential buildings of any size that are 5 stories or less in height above grade plane, and shall be located on the roof of the building or on another structure elsewhere on the site. The *solar zone* shall be in accordance with Sections N101.3 through N101.9 and the *International Fire Code*.

**EXCEPTION**. A *solar zone* is not required where the solar exposure of the building’s roof area is less than 75 percent of that of an unshaded area, as measured by one of the following:

a. Incident solar radiation expressed in kWh/ft² per year using typical meteorological year (TMY) data;

b. Annual sunlight exposure expressed in cumulative hours per year using TMY data;

c. Shadow studies indicating that the roof area is more than 25 percent in shadow, on September 21 at 10am, 11am, 12pm, 1pm, and 2pm solar time.

**N101.2 Definitions.** The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of the *International Building Code* for general definitions.

SOLAR ZONE. A clear area or areas reserved solely for current and future installation of photovoltaic or solar water heating systems.

**N101.3 Minimum Area**. The minimum area of the *solar zone* shall be determined by one of the following methods, whichever results in the smaller area:

1. 40 percent of roof area. The roof area shall be calculated as the horizontally-projected gross roof area, less the area covered by skylights, occupied roof decks and planted areas.

2. 20 percent of electrical service size. The electrical service size shall be the rated capacity of the total of all electrical services to the building. The required *solar zone* size shall be based upon 10 peak watts of PV per square foot.

**EXCEPTION**. Subject to the approval of the *building official*, buildings with extensive rooftop equipment that would make full compliance with this section impractical shall be permitted to reduce the size of the *solar zone* required by Section N101.3 to the maximum practicable area.

**N101.4 Contiguous area**. The *solar zone* is permitted to be comprised of smaller separated sub-zones. Each subzone shall be at least 5 feet wide in the narrowest dimension.

**N101.5 Obstructions.** The *solar zone* shall be free of pipes, vents, ducts, HVAC equipment, skylights and other obstructions, except those serving photovoltaics or solar water heating systems within the *solar zone*. Photovoltaics or solar water heating systems are permitted to be installed within the *solar zone*. The *solar zone* is permitted to be located above any such obstructions, provided that the racking for support of the future system is installed at the time of construction, the elevated *solar zone* does not shade other portions of the *solar zone*, and its height is permitted by the *International Building Code* and other applicable codes.

**N101.6 Shading**. The *solar zone* shall be set back from any existing or new object on the building or site that is located south, east, or west of the *solar zone* a distance at least two times the object’s height above the nearest point on the roof surface. Such objects include but are not limited to taller portions of the building itself, parapets, chimneys, antennas, signage, rooftop equipment, trees and roof plantings. No portion of the *solar zone* shall be located on a roof slope greater than 2:12 that faces within 45 degrees of true north.

**N101.7 Access**. Areas contiguous to the *solar zone* shall provide access pathways and provisions for emergency smoke ventilation as required by the *International Fire Code*.

**N101.8 Structural integrity**. The as-designed dead load and live load for the *solar zone* shall be clearly marked on the record drawings, and shall accommodate future photovoltaic or solar water heating arrays at an assumed dead load of 4 pounds per square foot in addition to other required live and dead loads. For photovoltaic systems, a location for future inverters shall be designated either within or adjacent to the *solar zone*, with a minimum area of 2 square feet for each 1000 square feet of *solar zone* area, and shall accommodate an assumed dead load of 175 pounds per square foot. Where photovoltaic or solar water heating systems are installed in the solar zone, structural analysis shall be based upon calculated loads, not upon these assumed loads.

**N101.9 Photovoltaic or solar water heating interconnection provisions**. Buildings shall provide for the future interconnection of either a photovoltaic system in accordance with Section N101.9.1 or a solar water heating system in accordance with Section N101.9.2.

**N101.9.1 Photovoltaic interconnection**. A capped roof penetration sleeve shall be provided in the vicinity of the future inverter, sized to accommodate the future photovoltaic system conduit. The capped roof penetration shall be sized to accommodate a conductor and conduit for 10 pea k watts per square foot of the required *solar zone* area. Interconnection of the future photovoltaic system shall be provided for at the main service panel, either ahead of the service disconnecting means or at the end of the bus opposite the service disconnecting means, in one of the following forms:

a. A space for the mounting of a future overcurrent device, sized to accommodate the largest standard rated overcurrent device that is less than 20 percent of the bus rating;

b. Lugs sized to accommodate conductors with an ampacity of at least 20 percent of the bus rating, to enable the mounting of an external overcurrent device for interconnection.

The electrical construction documents shall indicate the following:

a. *Solar zone* boundaries and access pathways;

b. Location for future inverters and metering equipment; and

c. Route for future wiring between the photovoltaic panels and the inverter, and between the inverter and the main service panel.

**N101.9.2 Solar water heating interconnection**. Two capped pipe tees shall be provided upstream of the domestic water heating equipment to provide plumbing interconnections between a future solar water heating system and the domestic water heating system. Two roof penetration sleeves shall be provided in the vicinity of the *solar zone*, capable of accommodating supply and return piping for a future solar water heating system.

The plumbing construction documents shall indicate the following:

a. *Solar zone* boundaries and access pathways;

b. Location for future hot water storage tanks; and

c. Route for future piping between the *solar zone* and the plumbing interconnection point, following the shortest feasible pathway.

1. **Briefly explain your proposed amendment, including the purpose, benefits and problems addressed.** Specifically note any impacts or benefits to business, and specify construction types, industries and services that would be affected. Finally, please note any potential impact on enforcement such as special reporting requirements or additional inspections required.

This proposal creates a new Appendix N in the International Building Code available for jurisdictions that would like to adopt solar-ready requirements for multifamily and nonresidential structures.

This proposal promotes non carbon emission energy generation, thereby making it easier for building owners to move away from energy producing systems toward solar photovoltaic and solar water heating. This proposal also supports the 2006 renewable portfolio law which requires large utilities in the State of Washington to obtain 15% of their electricity from new renewable resources such as solar and wind by 2020.

With the help of incentives and as the sales price for photovoltaic (PV) systems fall and as technology becomes more efficient, the use of on-site energy generation becomes increasingly appealing. The cost to retrofit an existing roof for the installation of renewables is more costly than preparing it at the time of new construction. If a building has been built to the requirements of this section, solar energy systems can be installed without upgrades to the structural or electrical systems being required.

The Regional Code Collaboration has compared the requirements of proposed Appendix N to the complete 2015 International Building Code and 2015 International Fire Code (IFC) and determined there are no conflicts.

If adopted by a local jurisdiction, this proposal will not increase enforcement efforts. Reviewers currently look for roof structural design values, and roof framing and penetration sealing are currently checked during standard building inspections.

As an appendix, each jurisdiction has the choice to determine if this requirement is appropriate for their community. Jurisdictions wanting to encourage the use of renewable energy systems, without actually mandating them, will now have a tool to do so. The advantage for the building owner is that small and inexpensive considerations during the early design and construction process will save significant costs at the time of a future installation. A pre-approved appendix proposal (Appendix U) for solar readiness is also being proposed as a 2015 IRC Washington State amendment that is similar to this appendix.

each jurisdiction has the choice to determine if this requirement is appropriate for their community and can modify it accordingly. This appendix provides a tool for jurisdictions to meet their energy and greenhouse gas reduction goals mandated by the State or local Mayor and Council.

1. **Specify what criteria this proposal meets.** You may select more than one.

The amendment is needed to address a critical life/safety need.

The amendment is needed to address a specific state policy or statute.

The amendment is needed for consistency with state or federal regulations.

The amendment is needed to address a unique character of the state.

The amendment corrects errors and omissions.

1. **Is there an economic impact:**  Yes      No

Explain:

If there is an economic impact, use the Table below to estimate the costs and savings of the proposal on construction practices, users and/or the public, the enforcement community, and operation and maintenance. If preferred, you may submit an alternate cost benefit analysis.

**Cost Impact Overview**

**Construction Document preparation:**

* No additional cost anticipated

**Material and installation costs for a capped roof penetration sleeve:**

* 100$

**Costs for additional Engineering:**

* No additional engineering assumed. Adding 4 pounds per foot to the dead load changes the dead load design value but does not change the cost of performing the calculation. The structural engineer is already providing calculations for roof loads, so this is not additional burden.

**Jurisdiction Review and Inspection:**

* No additional staff impact anticipated. Building plans examiners are already verifying design loads and building inspectors are conducting roof inspections.

**Material cost for roofing system:**

* No additional cost expected. Actual roof loads are typically only 70%-80% of the allowable roof structure capacity, so in most cases an increase of 4 pounds per foot will not require an increase in the roof system’s structural capability.

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| --- | --- | --- | --- | --- | --- | --- |
| Building Type | Construction[[1]](#footnote-1) | | Enforcement[[2]](#footnote-2) | | Operations & Maintenance[[3]](#footnote-3) | |
| Costs | Benefits[[4]](#footnote-4) | Costs | Benefits4 | Costs | Benefits4 |
| Residential |  |  |  |  |  |  |
| Single family |  |  |  |  |  |  |
| Multi-family | $100 | Less costly to address  Solar readiness at the  time of initial construction |  |  | None |  |
| Commercial/Retail | $100 | Less costly to address  Solar readiness at the  time of initial construction |  |  | None |  |
| Industrial | $100 | Less costly to address  Solar readiness at the  time of initial construction |  |  | None |  |
| Institutional | $100 | Less costly to address  Solar readiness at the  time of initial construction |  |  | None |  |

Please send your completed proposal to: [sbcc@ga.wa.gov](mailto:sbcc@ga.wa.gov)

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

1. $ / square foot of floor area or other cost. Attach data. **Construction** costs are costs prior to occupancy, and include both design and direct construction costs

   that impact the total cost of the construction to the owner/consumer. [↑](#footnote-ref-1)
2. Cost per project plan. Attach data. **Enforcement** costs include governmental review of plans, field inspection, and other action required for enforcement. [↑](#footnote-ref-2)
3. Cost to building owner/tenants over the life of the project. [↑](#footnote-ref-3)
4. Measurable benefit. [↑](#footnote-ref-4)