



DENVER AMENDMENT PROPOSAL FORM FOR PROPOSALS TO THE 2019 DENVER BUILDING CODE AMENDMENTS AND THE 2021 INTERNATIONAL CODES

DENVER
THE MILE HIGH CITY

2021 CODE DEVELOPMENT CYCLE

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2) One proposal per this document is to be provided with clear and concise information.

Is a separate graphic file provided ("X" to answer): ___ Yes or ___ No

3) Highlight the code and acronym that applies to the proposal

<u>Acronym</u>	<u>Code Name</u>	<u>Acronym</u>	<u>Code Name</u>
DBC-AP	Denver Building Code–Administrative Provisions	IPC	International Plumbing Code
IBC	International Building Code	IRC	International Residential Code
IECC	International Energy Conservation Code	IFGC	International Fuel Gas Code
IEBC	International Existing Building Code	IMC	International Mechanical Code
IFC	International Fire Code	DGC	Denver Green Code

Please provide all the following items in your amendment proposal.

Code Sections/Tables/Figures Proposed for Revision:

Instructions: If the proposal is for a new section, indicate (new), otherwise enter applicable code section.

(align solar-ready zone with definition from Residential proposal)

SOLAR-READY ZONE. A section or sections of the roof or building designated and reserved for the future installation of a solar photovoltaic and/or solar thermal system.

STEEP-SLOPED ROOF. A roof or roof section with a rise over run of at least 2 in 12 (2:12).

C405.13 Solar Access Requirement. All newly constructed buildings of International Building Code (IBC) Occupancy Group A, B, E, M, R1 and R2 shall designate a dedicated solar-ready zone on the building plans that meets the specifications of Appendix CB. This zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building on the building premise or on covered parking installed with the building project.

Exception 1: Nonresidential and high-rise residential buildings with six or more stories above grade.

C450.13.2 Shading.

C405.13.2.1 No obstructions, including but not limited to, vents, chimneys, architectural features, and roof mounted equipment, shall be located in or impacting the solar zone.

C405.13.2.2 Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located two times the height of the obstruction from the closest edge of the solar zone.

EXCEPTION: Any roof obstruction, located on the roof or any other part of the building, that is oriented north of all points on the solar zone.

Exception 2. Equipment designated for solar water heating systems, if present, are permitted to be installed in the solar zone.

C405.13.3 Structural Design Loads on Construction Documents. For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

C405.13.4 Interconnection Pathways.

C405.13.4.1. The construction documents shall indicate a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service.

C405.13.4.2. For single-family residences and central water-heating systems, the construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water-heating system.

C405.13.4.3 Documentation. A copy of the construction documents or a comparable document indicating the solar-ready zone information shall be provided to the occupant.

C405.13.4.4 Main Electrical Service Panel.

1. The main electrical service panel shall have a minimum busbar rating of 200 amps.

2. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be permanently marked as "For Future Solar Electric".

SECTION CB103 SOLAR-READY ZONE

CB103.1 General. A solar-ready zone shall be located on the roof of buildings that are five stories or less in height above grade plane, and are oriented between 110 degrees and 270 degrees of true north or have low-slope roofs. Solar-ready zones shall comply with Sections CB103.2 through CB103.9.

Exceptions:

1. A building with a permanently installed, on-site renewable energy system with existing capacity that is at a minimum the greater of 1 W/sf of roof area and 5 kW DC.
2. A building with a solar-ready zone that is shaded for more than 70 percent of daylight hours annually.
3. A building where the licensed design professional certifies that the incident solar radiation available to the building is not suitable for a solar-ready zone.
4. A building where the licensed design professional certifies that the solar zone area required by Section CB103.3 cannot be met because of extensive rooftop equipment, skylights, vegetative roof areas or other obstructions.

CB103.2 Construction document requirements for a solar-ready zone.
Construction documents shall indicate the solar-ready zone.

CB103.3 Solar-ready zone area. The total solar-ready zone area shall be not less than ~~40 percent~~ 60 percent of the roof area calculated as the horizontally projected gross roof area less the area covered by skylights, occupied roof decks, vegetative roof areas and mandatory access or set back areas as required by the International Fire Code. The solar-ready zone shall be a single area or smaller, separated sub-zone areas. Each sub-zone shall be not less than 5 feet (1524 mm) in width in the narrowest dimension.

CB103.4 Obstructions. Solar ready zones shall be free from obstructions, including pipes, vents, ducts, HVAC equipment, skylights and roof-mounted equipment.

CB103.5 Roof loads and documentation. A collateral dead load of not less than 5 pounds per square foot (5 psf) (24.41 kg/m²) shall be included in the gravity and lateral design calculations for the solar-ready zone. The structural design loads for roof dead load and roof live load shall be indicated on the construction documents.

CB103.6 Interconnection pathway. Construction documents shall indicate pathways for routing of conduit or piping from the solar-ready zone to the electrical service panel and electrical energy storage system area or service hot water system.

CB103.7 Electrical energy storage system-ready area. The floor area of the electrical energy storage system-ready area shall be not less than 2 feet (610 mm) in one dimension and 4 feet (1219 mm) in another dimension, and located in accordance with

Section 1207 of the International Fire Code. The location and layout diagram of the electrical energy storage system-ready area shall be indicated on the construction documents.

CB103.8 Electrical service reserved space. The main electrical service panel shall have a reserved space to allow installation of a dual-pole circuit breaker for future solar electric installation and a dual-pole circuit breaker for future electrical energy storage system installation. These spaces shall be labeled "For Future Solar Electric and Storage." The reserved space spaces shall be positioned at the end of the panel that is opposite from the panel supply conductor connection.

CB103.9 Construction documentation certificate. A permanent certificate, indicating the solar-ready zone and other requirements of this section, shall be posted near the electrical distribution panel, water heater or other conspicuous location by the builder or registered design professional.

Supporting Information:

All proposals must include a written explanation and justification as to how they address physical, environmental, and/or customary characteristics that are specific to the City and County of Denver. The following questions must be answered for a proposal to be considered.

- Purpose: What does your proposal achieve?
- Reason: Why is your proposal necessary?
- Substantiation: Why is your proposal valid? (i.e. technical justification)

Purpose: this proposal adds requirements for "Solar Ready" buildings to ensure that there is adequate roof area and solar access for future rooftop solar photovoltaic (PV) systems, free from obstructions and sufficient distance from any commercial rooftop equipment. The proposal also requires that designers specify allowable loads on commercial roofs. PV panels, racks, and mounting hardware typically weigh less than 4 pounds per square foot, which can be accommodated by most standard commercial roofs.

Reason: This proposal is needed because newly constructed commercial buildings do not normally allocate roof space for future solar photovoltaic systems. Large commercial roofs can contain large numbers of rooftop packaged equipment, exhaust fans, refrigeration condensing units, and other equipment. To allow for future PV installation, a solar-ready area should be identified on the building plans. This "Solar Ready" requirement does not require solar PV, but it provides capability for future renewables.

Substantiation:

Commercial roof space for nearly all buildings four stories and fewer can allocate sufficient space for photovoltaic systems. California has incorporated requirements for solar access areas for newly constructed buildings. The most recent update to the California Building Energy Efficiency Standards found that solar photovoltaic systems are cost-effective without incentives. The system size to meet a substantial portion of building loads while minimizing exports varied between 1 and 4 W/ft² of conditioned floor area, for the building types under this proposal. The recommendation for Denver is to establish a solar zone that would provide space for a system of 1 W rated output per ft² of conditioned floor area, given an estimated footprint of 100 ft² per kW of rated panel output. A larger allowance was set for single-story buildings, as they have a much greater gross roof area relative to the conditioned floor area.

This requirement can be readily met by low-rise buildings. The required area considers required allowances for fire code and standard rooftop equipment. A possible additional requirement would be to specify that any non-contiguous areas must be kept above a minimum threshold (such as 300 ft² roof area). However, given the installation techniques available for attachment and ballast, this requirement was not included in the proposal.

Bibliography and Access to Materials (as needed when substantiating material is associated with the amendment proposal):

2022 California Energy Commission. Title 24 Building Energy Efficiency Standards, August 2022.

<https://www.pointloadpower.com/articles/rooftop-integrity-the-ballasts-vs-mechanical-attachment-debate>

<https://www.solarpowerworldonline.com/2019/06/trending-in-mounting-reducing-penetrations-to-preserve-roof-integrity/>
Solar Power World 2019. Reducing penetrations to preserve roof integrity, Jun 7, 2019.

Residential:
<https://la-solargroup.com/2018/08/16/understanding-solar-roof-penetrations/>

Other Regulations Proposed to be Affected

***For proposals to delete content from the 2019 Denver Green Code in conjunction with adding it to other mandatory Denver codes and/or regulations, only.**

Please identify which other mandatory codes or regulations are suggested to be updated (if any) to accept relocated content.

Other codes (IMC) may specify attachment requirements, use of ballast as a method of securing panels, and structural requirements. There are pros and cons to using ballast instead of mechanical fasteners to secure PV racks to the roof. Other codes may specify, or need to specify, requirements for placement of panels on pitched roofs to allow for fire department access.

Referenced Standards:

List any new referenced standards that are proposed to be referenced in the code.

None.

Impact:

How will this proposal impact cost and restrictiveness of code? ("X" answer for each item below)

Cost of construction: Increase Decrease No Impact

Cost of design: Increase Decrease No Impact

Restrictiveness: Increase Decrease No Impact