Roof Top Access And Ventilation

Understanding the 2020 NYS Uniform Code as it relates to roof top access and ventilation for residential and nonresidential solar energy systems

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Overview

Through the 2020 New York State Uniform Fire Prevention and Building Code (Uniform Code), specific codes are set in place regarding rooftop access and ventilation when installing a solar photovoltaic (PV) system. This section provides information on the parts of the 2020 Residential Code of New York State (2020 RCNYS) and the 2020 Fire Code of New York State (2020 FCNYS) that are applicable to solar PV installers and Authorities Having Jurisdiction (AHJ), when installing and inspecting PV systems. Additionally, figures are shown in this chapter to visualize and explain scenarios where rooftop access and ventilation will be needed to adhere with the 2020 Uniform Code.

We encourage you to have a discussion with your local code official to determine the specific requirements for your solar installation. In New York State, it is the responsibility of the local AHJ to administer and enforce the Uniform Code as well as any applicable local zoning and land use laws.

Always consult with your local code official to determine code compliance.

2020 RCNYS Code text is black.

Additional commentary is blue.

1. Residential Roof Top Access – 2020 Residential Code of NYS

1.1 Section 324 - Solar Energy Systems

R324.1 General. Solar energy systems shall comply with the provisions of this section.

R324.2 Solar thermal systems. Solar thermal systems shall be designed and installed in accordance with Chapter 23 and Fire Code of New York State.

(This is a reference to the 2020 Fire Code of New York.)

R324.3 Photovoltaic systems. Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.1 and NFPA 70 and the manufacturer's installation instructions.

(NFPA 70 is also known as the National Electrical Code.)

R324.3.1 Equipment Listings. Photovoltaic panels and modules shall be listed and labeled in accordance with UL1703. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction.

R324.4 Rooftop-mounted photovoltaic systems. Rooftop-mounted photovoltaic systems installed on or above the roof covering shall be designed and installed in accordance with this section.

R324.4.1 Structural requirements. Rooftop-mounted photovoltaic panel systems shall be designed to structurally support the system and withstand applicable gravity loads in accordance with Chapter 3. The roof on which these systems are installed shall be designed and constructed to support the loads imposed by such systems in accordance with Chapter 8.

R324.4.1.1 Roof load. Portions of roof structures not covered with photovoltaic panel systems shall be designed for dead loads and roof loads in accordance with Sections R301.4 and R301.6. Portions of roof structures covered with photovoltaic panel systems shall be designed for the following load cases:

1. Dead load (including photovoltaic panel weight) plus snow load in accordance with Table R301.2(1).

2. Dead load (excluding photovoltaic panel weight) plus roof live load or snow load, whichever is greater, in accordance with Section R301.6

R324.4.1.2 Wind load. Rooftop-mounted photovoltaic panel or module systems and their supports shall be designed and installed to resist the component and cladding loads specified in Table R301.2(2), adjusted for height and exposure in accordance with Table R301.2(3).

R324.4.2 Fire classification. Rooftop-mounted photovoltaic panel systems shall have the same fire classification as the roof assembly required in Section R902.

R324.4.3 Roof penetrations. Roof penetrations shall be flashed and sealed in accordance with Chapter 9.

(The adequacy of the roof structure should always be determined by a New York State Licensed Professional Engineer or Registered Architect)

R324.5 Building–integrated photovoltaic systems. Building–integrated photovoltaic systems that serve as roof covering shall be designed and installed in accordance with Section R905

R324.5.1 Photovoltaic shingles. Photovoltaic shingles shall comply with Section R905.16

(R905 is the 2020 Residential Code's section for "Roof Assemblies." R905.16 specifically addresses photovoltaic shingles, which references back to R324 and NFPA 70)

R324.5.2 Fire classification. Building-integrated photovoltaic systems shall have a fire classification in accordance with Section R902.3

R324.6 Roof access and pathways. Roof access, pathways and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access in the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.

Exceptions:

1. Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises and similar structures, shall not be required to provide roof access.
2. Roof access, pathways and setbacks need not be provided where the building official has determined that rooftop operations will not be employed.
3. These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less.

[NY] R324.6.1 Pathways. Not fewer than two pathways, on separate roof planes from the lowest roof edge to ridge and not less than 36 inches (914mm) wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment. Pathways on opposing roof slopes shall not be located along the same plane as the truss, rafter, or other such framing system that supports the pathway.

Exception: Access pathways shall not be required on roof slopes containing photovoltaic modules, panels, or an array where the opposing or adjacent roof slope is an access roof.

[NY] R324.6.2 Setback at ridge. Photovoltaic arrays shall not be located less than 18 inches (457 mm) from a horizontal ridge.

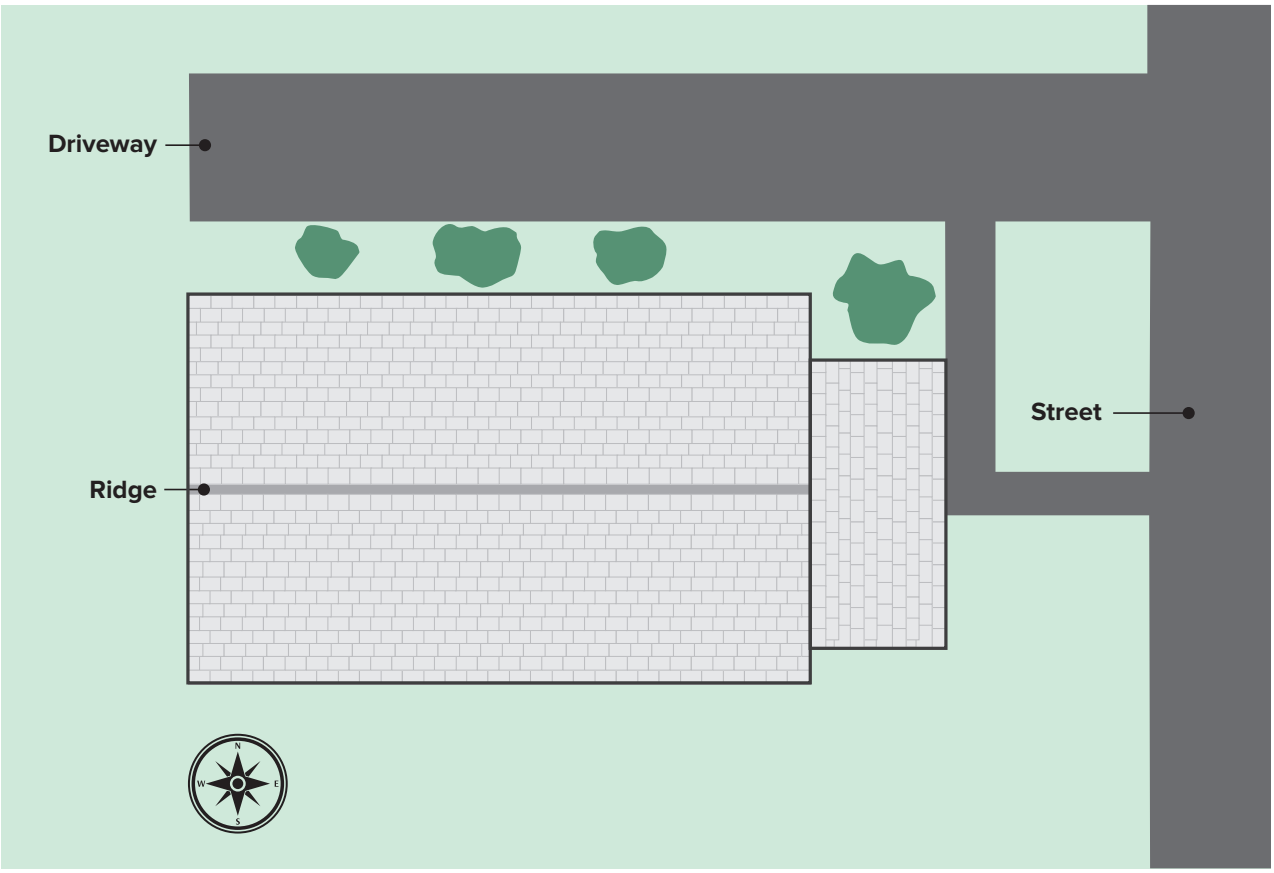
[NY] R324.6.2.1 Reserved.

R324.6.2.2 Emergency escape and rescue opening. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36 inches (914mm) wide shall be provided to the emergency escape and rescue opening.

R324.7 Ground-mounted photovoltaic systems. Ground-mounted photovoltaic systems shall be designed and installed in accordance with Section R301.

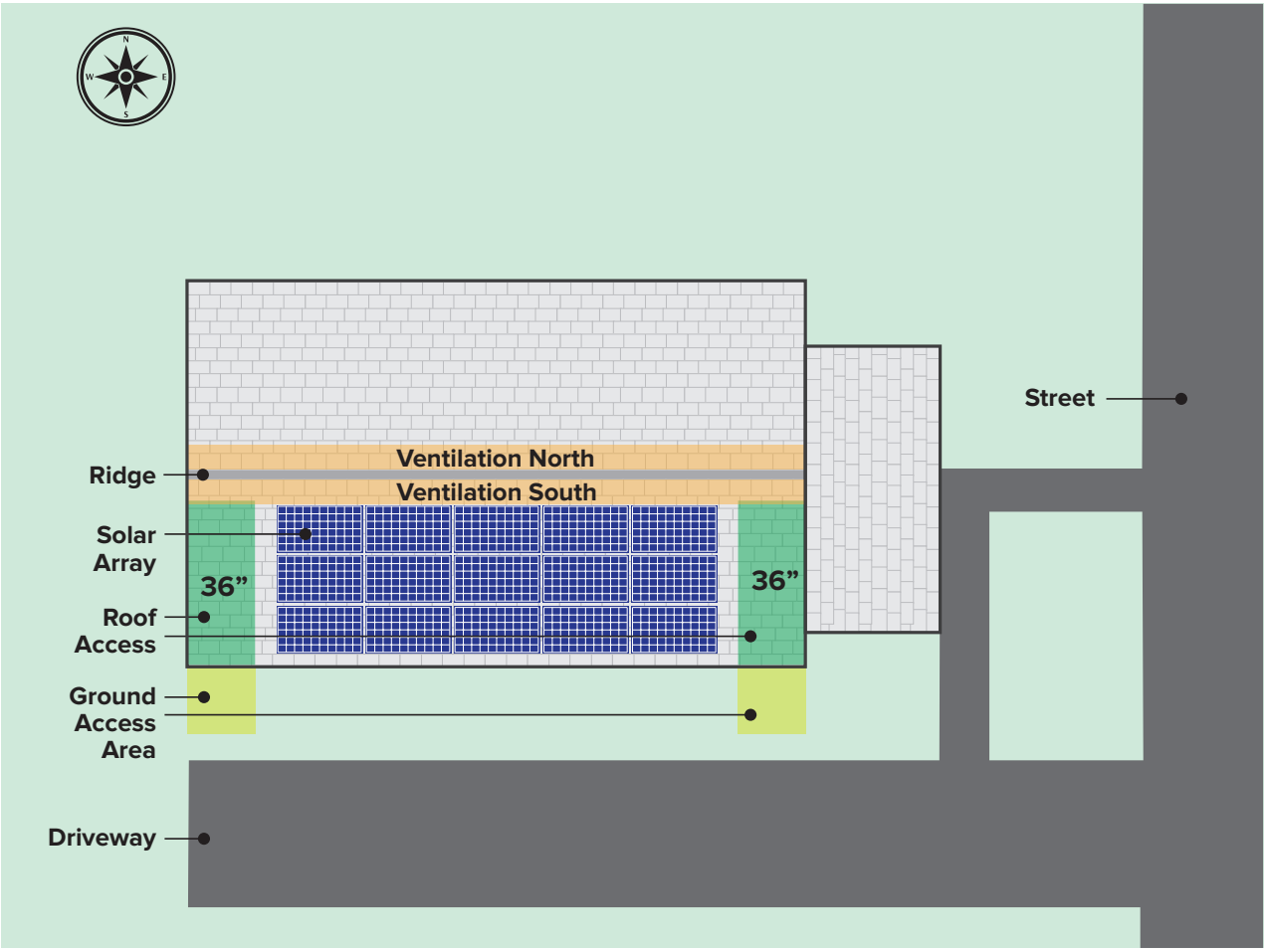
1.2. Possible Scenarios for Rooftop Access & Residential PV Installations

Typical single ridge residence (Figure 1)



This is a typical residential single ridge residential structure. We will use this as an example to further evaluate and explain the various options.

Typical single ridge residential (Figure 2)

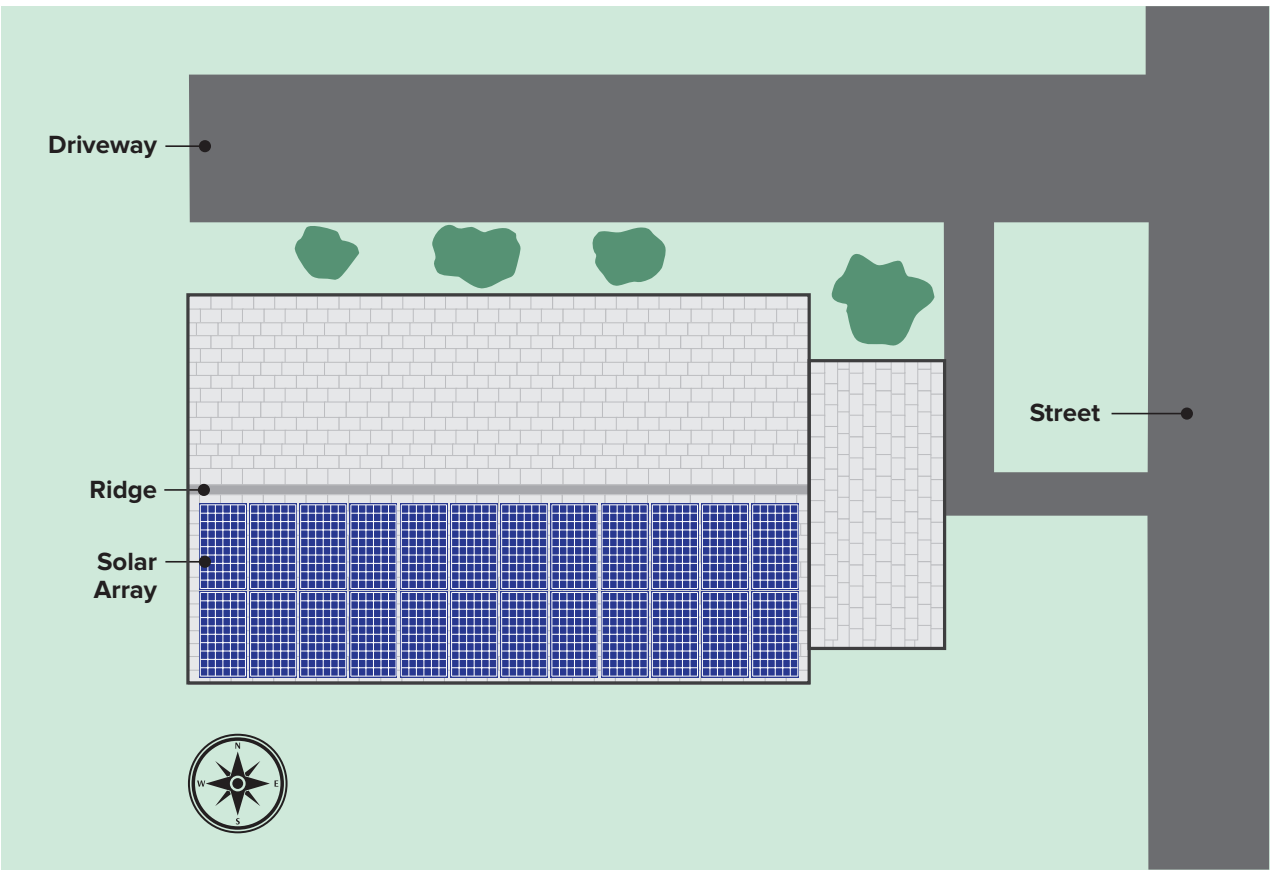


This is a typical single ridge residential structure that complies with the required setbacks, pathways and ventilation with no exceptions. The Emergency Escape and Rescue Opening (EERO) is on gable end.

Basic Requirements being met:

1. ***Not fewer than two pathways***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

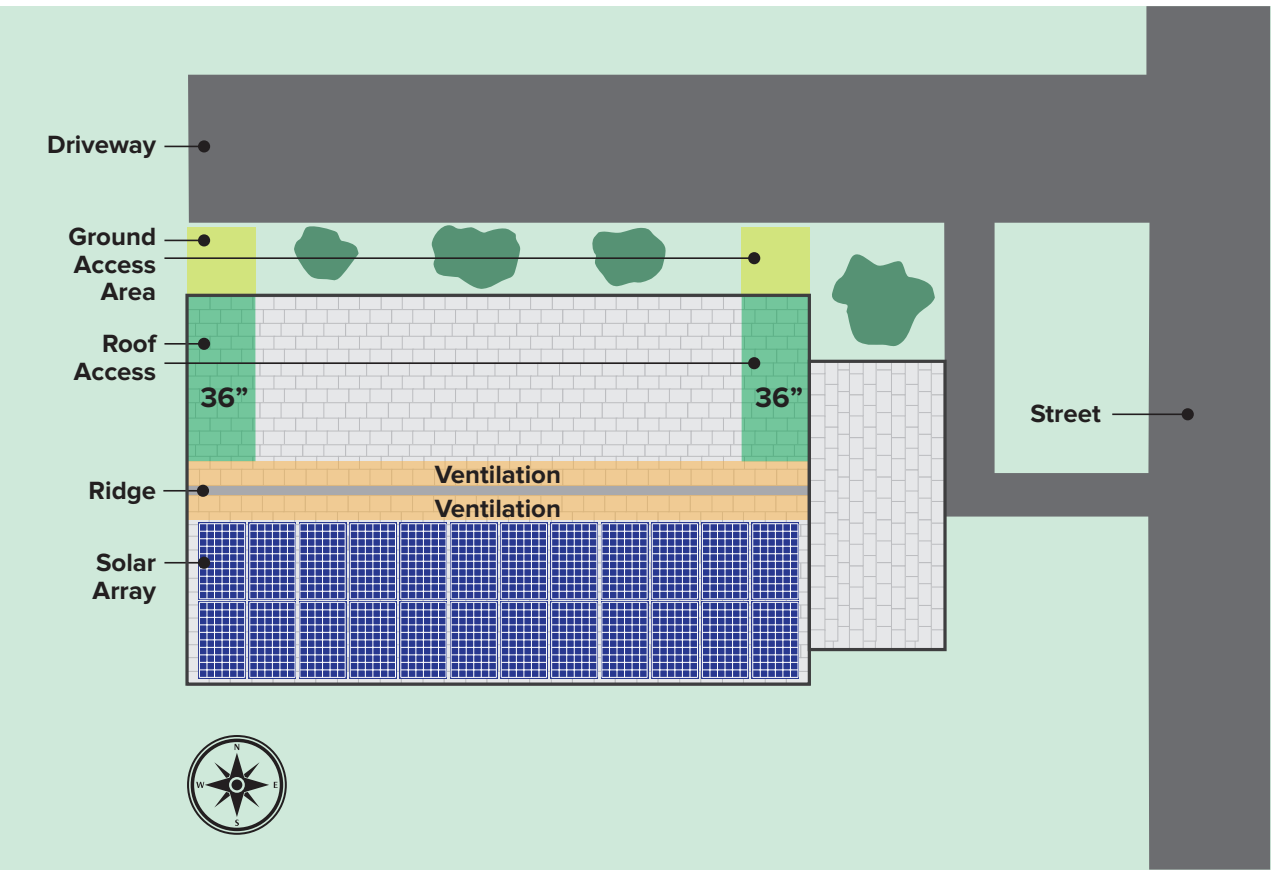
Typical single ridge structure where one or more exceptions apply (Figure 3)



The following exceptions apply to all residential structures:

1. ***Detached, nonhabitable structures, including but not limited to detached garages, parking shade structures, carports, solar trellises, and similar structures shall not be required to provide roof access***
2. ***Roof access, pathways and setbacks need not be provided where the building official has determined that rooftop operations will not be employed***
3. ***These requirements shall not apply to roofs with slopes of two units vertical in 12 units horizontal (17-percent slope) or less***

Single ridge residential access from opposing roof slopes (Figure 4)

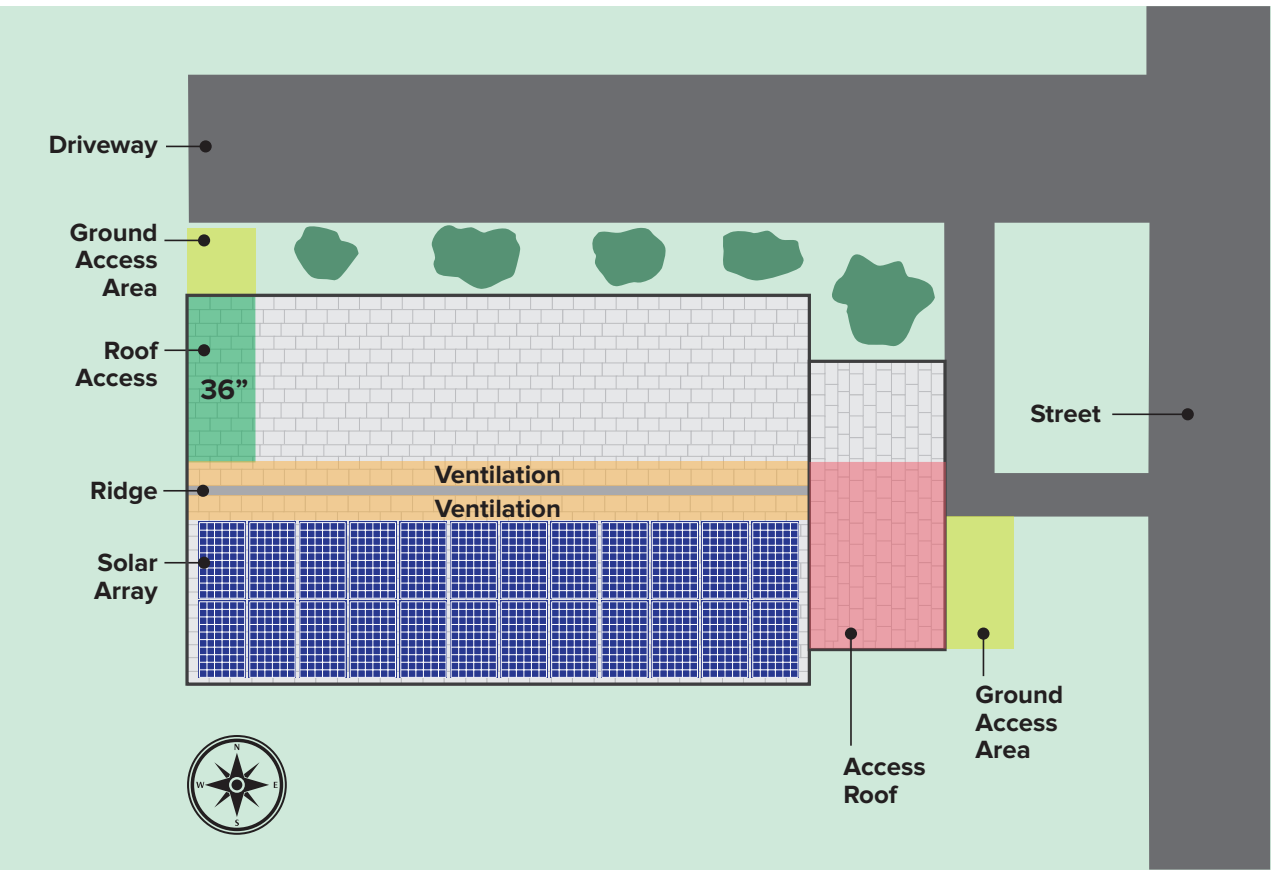


This is showing a single ridge with access from an opposing roof slope. The two access points and pathways allow two directions of access and egress which do not share a common truss or rafter.

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

Single ridge residential roof access from adjacent roof (Figure 5)

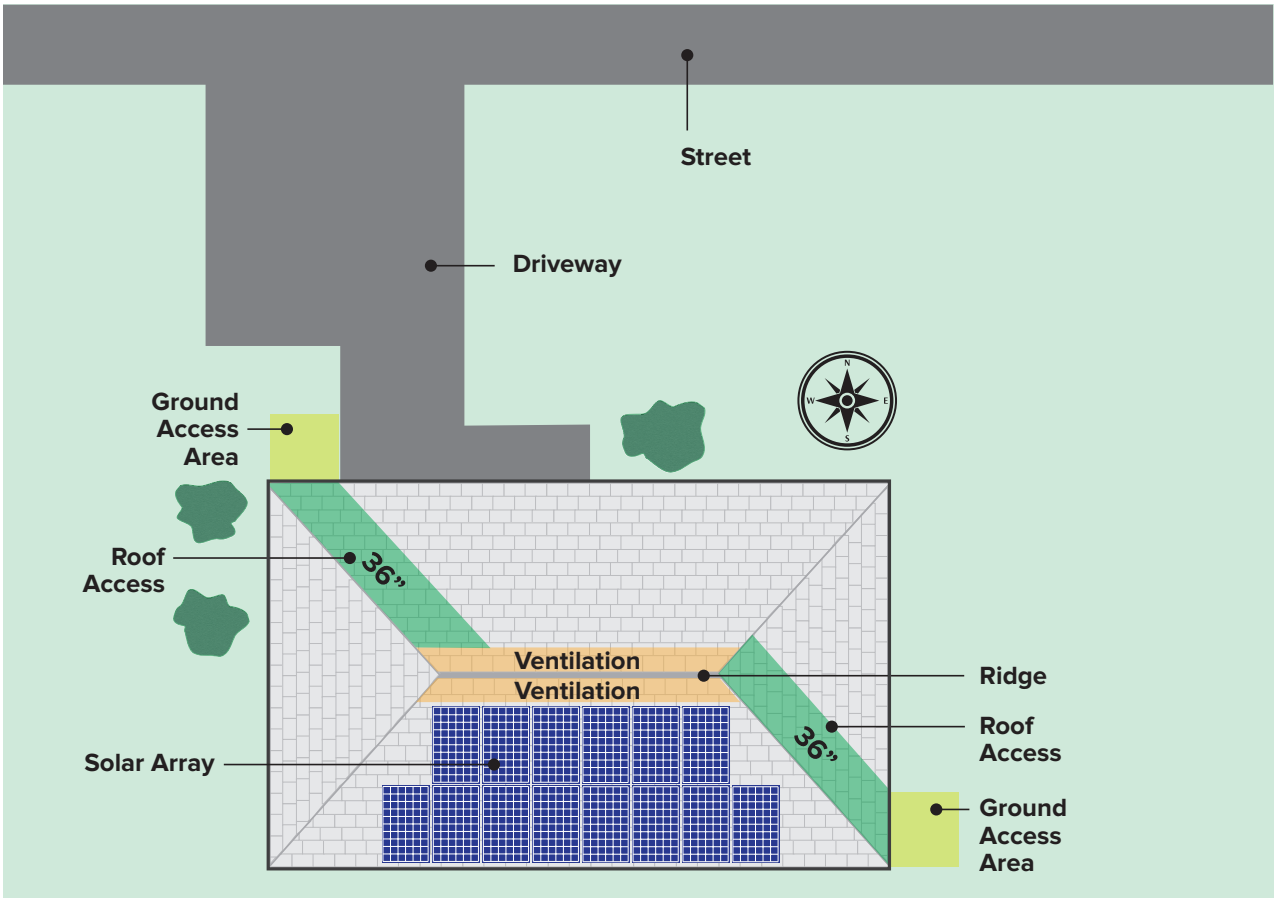


Similar to the previous figure, but with adjacent roof providing 36” wide minimum access to the ridge or peak of an adjoining roof surface containing solar panels, modules, or array. This figure shows that access is provided by the opposing and adjacent roof planes, but not the same roof plane as the array. This demonstrates how to use opposing and adjacent roofs to meet the requirements

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope, one adjacent roof***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

Hip Roof — venting with two roof pathways and ground access (Figure 6)



Typical hip roof showing venting location on both sides of the ridge and clear access pathway extending from the roof access point to the ridge or peak. Access and egress are from opposite sides and does not rely on the same roof truss or rafter and clear ground access.

Basic Requirements being met:

1. ***Not fewer than two pathways; one opposing roof slope, one adjacent roof***
2. ***Not fewer than one pathway shall be provided on the street or driveway side of the roof***
3. ***For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge***

2. Nonresidential Roof Top Access – 2020 Fire Code of New York State

The following explains the 2020 Fire Code of New York requirements for access, pathways and ventilation for other than Group R-3. Many of the requirements are similar to those for residential structures (Group R-3) yet there are some differences as explained below.

2.1 Section 1204 Solar Photovoltaic Power Systems

1204.1 General. Solar Photovoltaic systems shall be installed in accordance with Sections 1204.2 through 1204.5, and the Building Code of New York State or Residential Code of New York State. The electrical portion of solar PV shall be installed in accordance with NFPA 70.

1204.2 Access and pathways. Roof access, pathways, and spacing requirements shall be provided in accordance with Sections 1204.2.1 through 1204.3.3. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions, such as vent pipes, conduit or mechanical equipment.

Exceptions:

1. Detached, non-habitable Group U structures including, but not limited to, detached garages serving Group R-3 buildings, parking shade structures, carports, solar trellises, and similar structures.
2. Roof access, pathways and spacing requirements need not be provided where the fire code official has determined that rooftop operations will not be employed.

1204.2.1 Solar photovoltaic systems for Group R-3 buildings. Solar photovoltaic systems for Group R-3 buildings shall comply with Sections 1204.2.1.1 through 1204.2.1.3.

Exceptions:

1. These requirements shall not apply to structures designed and constructed in accordance with the Residential Code of New York State.
2. These requirements shall not apply to roof with slopes of 2 units vertical in 12 units horizontal or less.

1204.2.1.1 Pathway to Ridge. Not fewer than two 36-inch -wide (914mm) pathways on separate roof planes, from lowest roof edge to ridge, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, not fewer that 36-inch-wide (914mm) pathway from lowest roof edge to ridge shall be provided on the same roof plan as the photovoltaic array, on an adjacent roof plane or straddling the same adjacent roof planes.

1204.2.1.2 Setback at ridge. For photovoltaic arrays occupying 33 percent or less of the plan view total roof area, a setback of not less than 18 inches (457mm) wide is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total area, a setback of not less than 36 inches (457 mm) wide is required on both sides of a horizontal ridge.

1204.2.1.3 Alternate setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with Section 903.3.1.3, setbacks at the ridge shall conform to one of the following:

1. For photovoltaic arrays occupying 66 percent or less of the plan view total roof area, a setback of not less than 18 inches (457 mm) wide is required on both sides of a horizontal ridge.
2. For photovoltaics arrays occupying more than 66 percent of the plan view total roof area a setback of not less than 36 inches (914mm) wide is required on both sides of a horizontal ridge.

1204.2.2 Emergency escape and rescue openings. Panels and modules installed on Group R-3 buildings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway of not less than 36 inches (914mm) wide shall be provided to the emergency escape rescue opening.

1204.3 Other than Group R-3 Buildings. Access to systems for buildings, other than those containing Group R-3 occupancies, shall be provided in accordance with Sections 1204.3.1 through 1204.3.3

Exception: Where it is determined by the fire code official that the roof configuration is similar to that of a Group R-3 occupancy the residential access and ventilation requirements in section 1204.2.1.1 through 1204.2.1.3 are a suitable alternative.

1204.3.1 Perimeter Pathways. There shall be a minimum 6-foot-wide (1829 mm) clear perimeter around the edges of the roof.

Exception: Where either axis of the building is 250 feet (76 200 mm) or less, the clear perimeter around the edges of the roof shall be permitted to be reduced to a minimum width of 4 feet (1219 mm).

1204.3.2 Interior pathways. Interior pathways shall be provided between array sections to meet the following requirements:

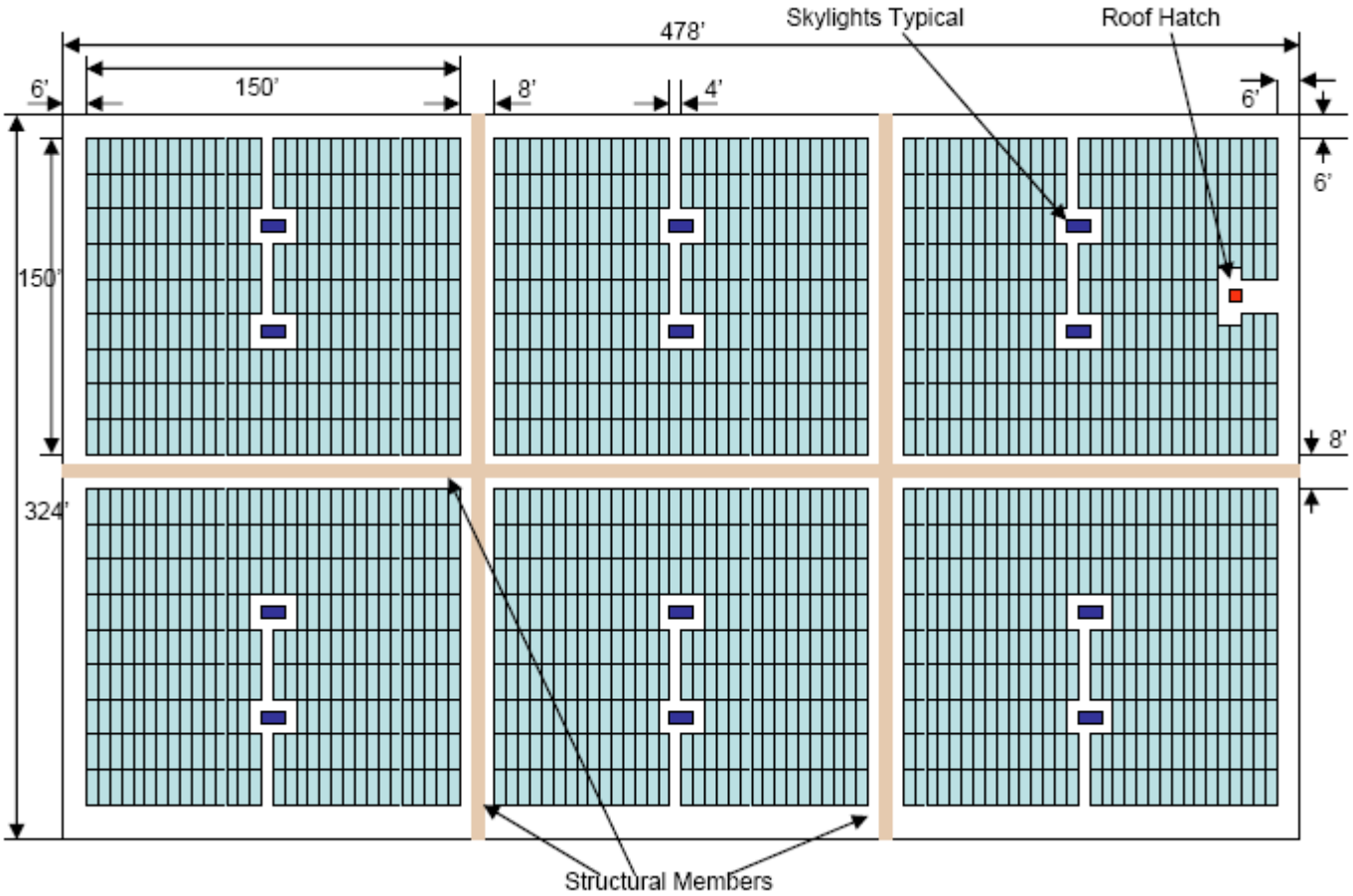
1. Pathways shall be provided at intervals not greater than 150 feet (45 720 mm) throughout the width and length of the roof.
2. A pathway not less than 4 feet (1219 mm) wide in a straight line to roof standpipes or ventilation hatches.
3. A pathway not less than 4 feet (1219 mm) wide around roof access hatches, with not fewer than one such pathway to a parapet or roof edge.

1204.3.3 Smoke ventilation. The solar installation shall be designed to meet the following requirements:

1. Where nongravity-operated smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide shall be provided bordering all sides.
2. Smoke ventilation options between array sections shall be one of the following:
   - 2.1. A pathway not less than 8 feet (2438 mm) wide.
   - 2.2. Where gravity-operated dropout smoke and heat vents occur, a pathway not less than 4 feet (1219 mm) wide on not fewer than one side.
   - 2.3. A pathway not less than 4 feet (1219 mm) wide bordering 4-foot by 8-foot (1219 mm by 2438 mm) venting cutouts every 20 feet (6096 mm) on alternating sides of the pathway.

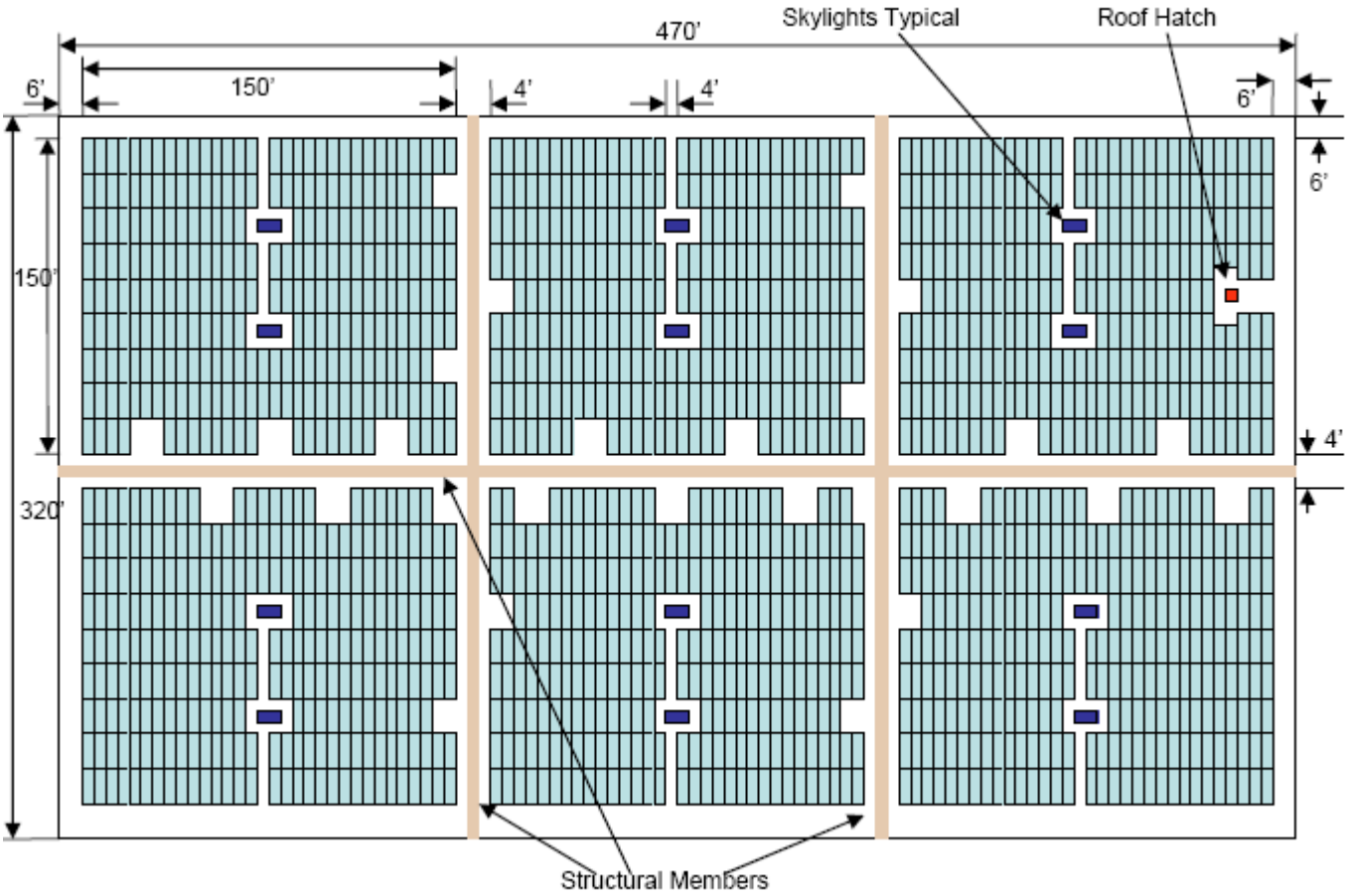
2.2 Possible Scenarios for Rooftop Access & Nonresidential PV Installations

Typical Nonresidential roof access greater than 250 feet (Figure 1)



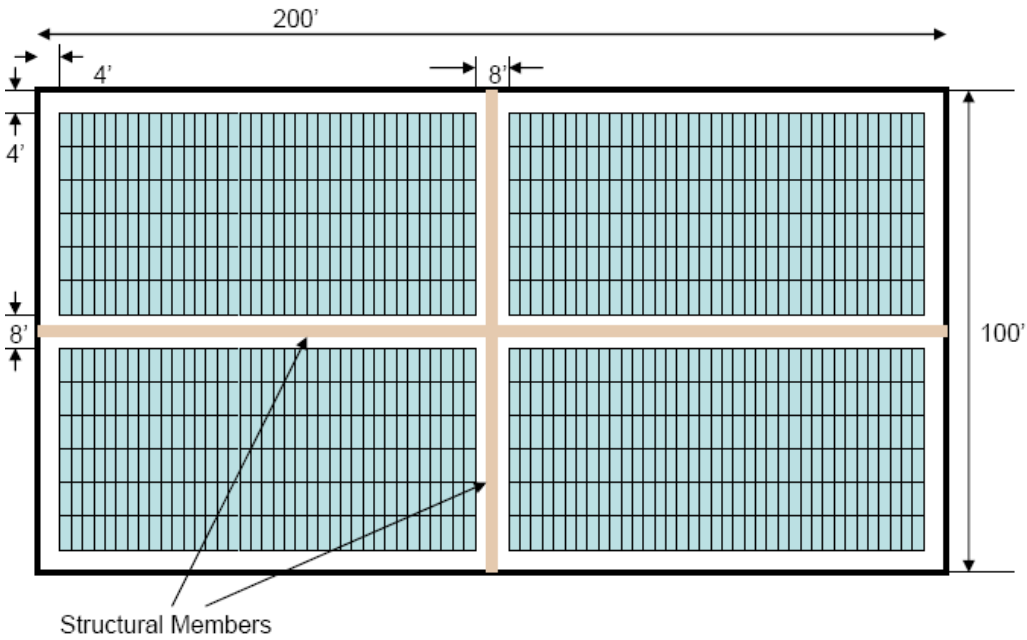
Nonresidential building with either axis greater than 250 feet, minimum perimeter pathway of 6 feet. Interior pathway not less than 8 feet, arrays of 150 feet maximum spacing with a 4-foot walkway to ventilation skylights. (not drawn to scale)

Typical Nonresidential roof access greater than 250 feet with 4 foot by 8-foot ventilation skylight space (Figure 2)



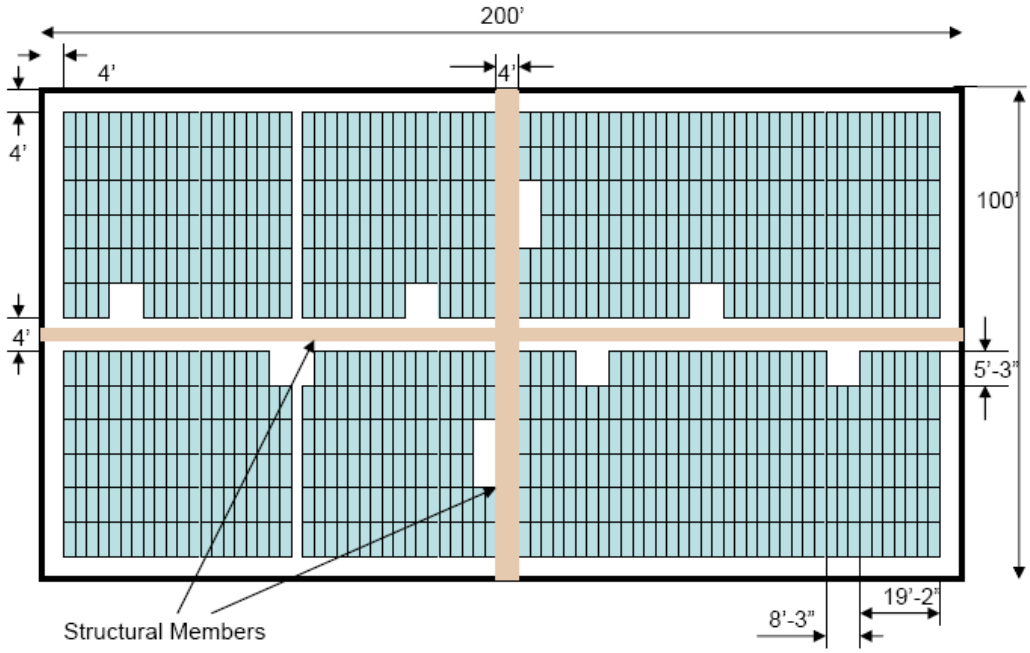
Nonresidential building with either axis greater than 250 feet, minimum perimeter pathway of 6 feet. Interior pathway not less than 8 feet, array of 150 feet maximum spacing between pathways, with a 4-foot by 8-foot walkway to ventilation space. (not drawn to scale)

Typical Nonresidential roof access less than 250 feet (Figure 3)



Nonresidential building with either axis less than 250 feet, minimum perimeter pathway of 4 feet. Interior pathway not less than 8 feet, array of 150 feet maximum spacing between pathways. (not drawn to scale)

Typical Nonresidential roof access less than 250 feet, with 4 foot by 8-foot ventilation space (Figure 4)



Nonresidential building with either axis less than 250 feet, minimum perimeter pathway of 4 feet. Interior pathway not less than 4 feet, array of 150 feet maximum spacing between walkways with 4 foot by 8-foot ventilation space. (not drawn to scale)

3. NYSERDA's Conclusion

The 2020 NYS Uniform Code allows the designers of photovoltaic systems several options and alternatives with regard to access, pathways and ventilation. These illustrations are offered as possible examples. It is not possible to show every possible scenario. It is however up to the judgment of the local code official to determine final compliance with the codes. Contractors, design professionals, and AHJ's must consider many ventilation scenarios and consider that:

1. A fire can break out **anywhere** in a building. Methods should consider fires occurring in less than ideal locations and during less than ideal conditions.
2. Emergency responders do not have x-ray vision. When approving an alternate ventilation method, AHJ's should consider the presence of attic storage atop a plywood base, finished attic space, or other such conditions that could deter ventilation operations.
3. Contractors and AHJ must remember that the direction and magnitude of a prevailing wind can affect the location of the ventilation opening.

   For example, a wind from the north places positive pressure on the northern roof slope and negative pressure on the southern slope. Under ideal conditions, a fire occurring in the northern portion of the building could necessitate a ventilation opening on the northern roof slope. A moderate wind from the north, however, could reduce the effectiveness of this opening due to positive wind pressures. In this case, it may be more effective to take advantage of the negative roof pressures and place the ventilation opening on the southern roof slope.
4. Design professionals, contractors, and AHJ must consider how the building is framed.

   For example, a building with a cathedral ceiling and a dividing wall along its peak would appear to necessitate ventilation openings on both slopes to accommodate fresh air in less than ideal locations.