NY-SUN

Understanding the **roof top access** and **ventilation** requirements as described in Section R324 of the 2015 International Residential Code

Introduction

This guide is meant to help you understand the *2015 International Residential Code* and Errata amendments as adopted by New York State.

We encourage you to have a discussion with your local code official to determine the specific requirements.

In New York State, it is the responsibility of the Local Authority Having Jurisdiction (AHJ) to interpret all codes and standards. ***Always consult with your local code official to determine code compliance.***

2015 IRC Code text is black.

NYS Errata changes are highlighted in yellow.

Additional commentary is blue.

call:
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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 the International Fire Code."

(This is a reference to the 2015 International Fire Code [IFC].)

"**R324.3 Photovoltaic systems.** Photovoltaic systems shall be designed and installed in accordance with Sections R324.3.1 through R324.7.7 and NFPA 70. Inverters shall be listed and labeled in accordance with UL 1741. Systems connected to the utility grid shall use inverters listed for utility interaction."

(NFPA 70 is also known as the 2014 National Electrical Code.)

"**R324.3.1 Equipment Listings.** Photovoltaic panels and modules shall be listed and labeled in accordance with UL1703.

"**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 Section R907"

(2015 IRC Code section "R907 Rooftop –Mounted Photovoltaic systems," is the section on "Roof Assemblies" and also contains references to R324, NFPA 70, wind loading R301, fire classification R902, and UL 1703, which are all related sections and standards.)

"**R324.4.1 Roof live load.** Roof structures that provide support for photovoltaic panel systems shall be designed for applicable roof live load. The design of the roof structures need not include roof live load in the areas covered by photovoltaic panel systems. Portions of the roof structures not covered by photovoltaic panels shall be designed for roof live load. Roof structures that provide support for photovoltaic panel systems shall be designed for live load, $\mathbf{L}_R$, for the load case where the photovoltaic panel system is not present."

(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 2015 IRC section for "Roof Assemblies".

R905.16 specifically addresses photovoltaic shingles, which references back to R324 and NFPA 70)

"**R324.6 Ground-mounted photovoltaic systems.** Ground-mounted photovoltaic systems shall be designed and installed in accordance with Section R301."

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"**R324.6.1 Fire separation distances.** Ground-mounted photovoltaic systems shall be subject to the fire separation distance requirements determined by the local jurisdiction."

(R301 is the "Design Criteria" section of the 2015 IRC in the front under the title "Building Planning" which contains information on items such as winds load, snow loads, and design temperatures.

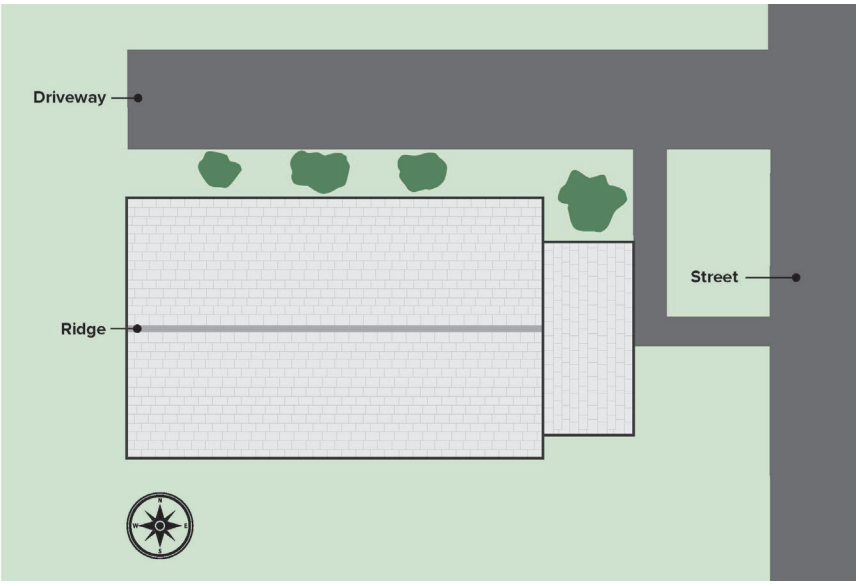
R324.6.1 reinforces the need to coordinate with the local authority having jurisdiction)

"**R324.7 Access and Pathways.** Roof access, pathways and spacing requirements for solar photovoltaic systems shall be provided in accordance with Sections R324.7.1 through R324.7.6

Exceptions:

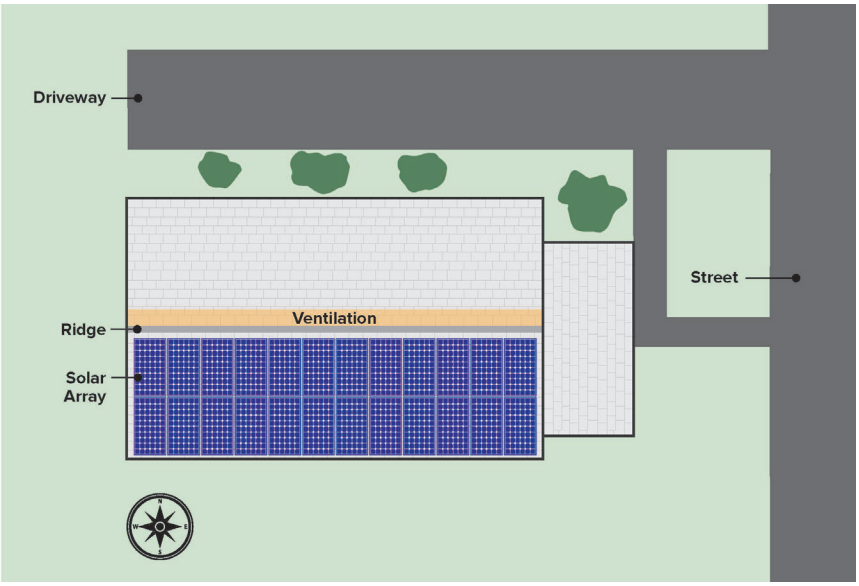
1. Roof access, pathways and spacing need not be provided where an alternate ventilation method has been provided, or where vertical ventilation techniques will not be employed.
2. Detached garages and accessory structures."

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 roof with alternative ventilation (Figure 2)



If ventilation is required it may be possible to propose an alternate ventilation location on roof slope opposite the array or the side wall of an attic space. Alternate locations should be coordinated and approved by the AHJ.

When proposing an alternate ventilation location, indicate the direction of the prevailing wind.

"**R324.7.1 Size of solar photovoltaic array.** Each array shall not exceed 150 feet (45 720mm) in any direction."

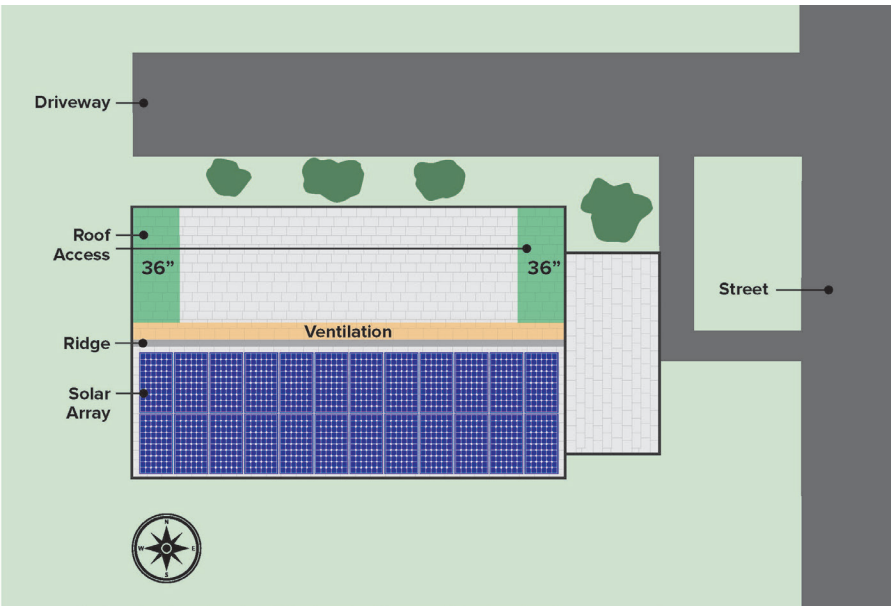
(Size 150 feet in any direction. 150' X 150' = 22,500 Square Feet. This should not be an issue for the vast majority of residences. Consult the "2015 International Building Code" for larger nonresidential structures.)

"**R324.7.2 Roof access points.** Roof access points shall be located:

1. In areas that establish access pathways which are independent of each other and as remote from each other as practicable so as to provide escape routes from all points along the roof;
2. In areas that do not require the placement of ground ladders over openings such as windows or doors or areas that may cause congestion or create other hazards;"
3. At strong points of building construction, such as corners, pilasters, hips, and valleys, and other areas capable of supporting the live load from emergency responders;
4. Where the roof access point does not conflict with overhead obstructions such as tree limbs, wires, signs;
5. Where the roof access point does not conflict with ground obstructions such as decks, fences, or landscaping; and
6. In areas that minimize roof tripping hazards such as vents, skylights, satellite dishes, antennas, or conduit runs."

(Access and egress should always be available in two locations and cannot block widow and door access or emergency egress.)

Single ridge roof with alternate ventilation shown with two access points (Figure 3)



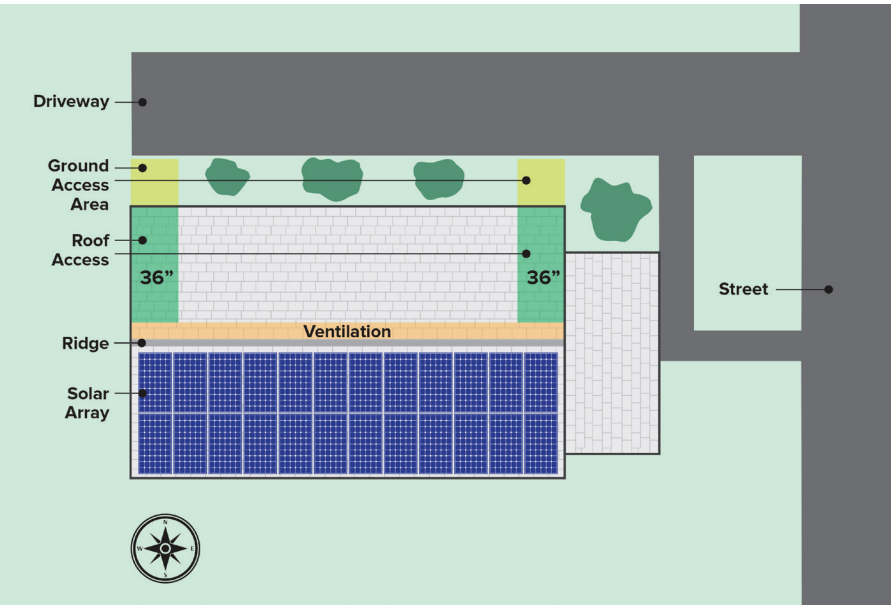
Looking back at the previous typical residential single ridge example, in order to maximize the southern facing roof it may be possible to propose an alternate ventilation on opposite roof slope and two roof access points on the opposite roof slope.

"**R342.7.3 Ground access areas.** Ground access areas shall be located directly beneath access roofs, and roof access points. The minimum width of the ground access area shall be the full width of the access roof or roof access point, measured at the eave. The minimum depth shall allow for safe placement of ground ladders for gaining entry to the access roof."

(Ground access must align with roof access.)

"**R324.7.4 Single ridge roofs.** Panels, modules, or arrays installed on roofs with a single ridge shall be located in a manner that provides two 36 inches wide (914mm) access pathway extending from the roof access point to the ridge. Access 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."

Single ridge roof indicating ground access in yellow (Figure 4)



Using the same example, you can see that the ground access aligns with roof access. Note that the two access points and 36” pathways allow two directions of access and egress and do not share a common truss of rafter. There is also adequate unobstructed ground access.

“**Exceptions:**

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less.
2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.
3. One access pathway shall be required when the roof slope containing panels, modules or arrays is located not more than 24 inches (610 mm) vertically from an adjoining roof which contains an access roof.”

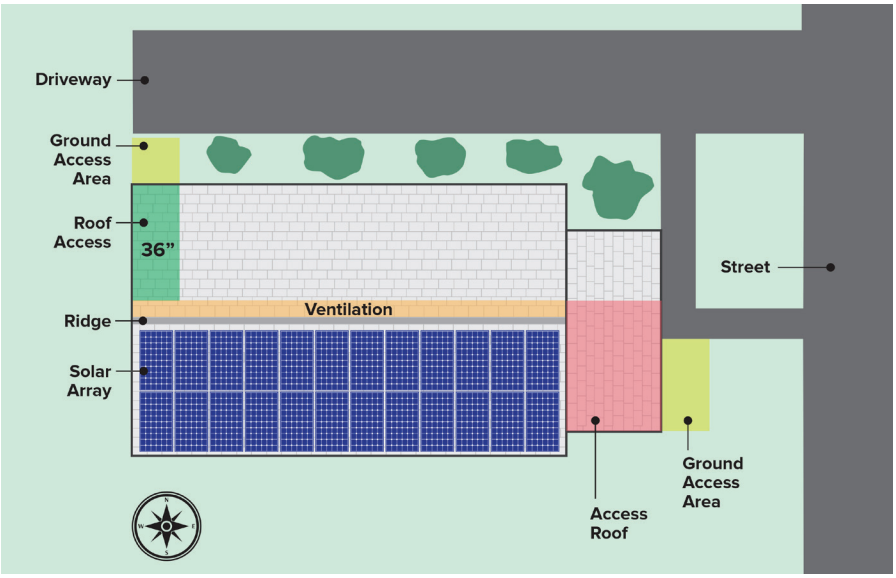
Single roof ridge exceptions:

1. Slope 2/12 or less.

2. Roof fronts a street, driveway, or readily accessible.

3. One pathway is required where roof containing modules is not more than 24” vertically from an adjoining roof that has an access roof.

Single ridge roof – single pathway with exception #3 adjoining roof within 24 Inches (Figure 5)

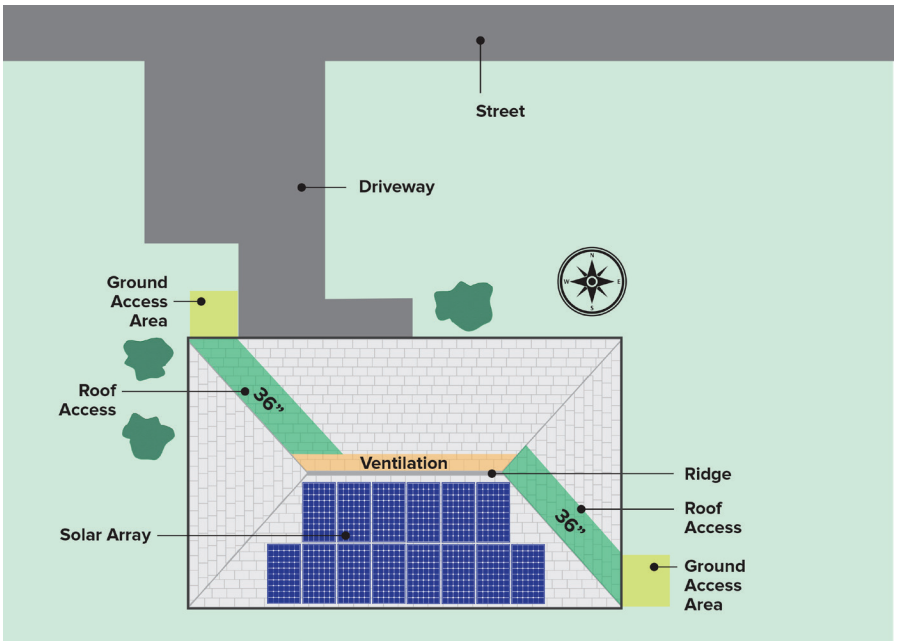


Again using the same example, with the adjoining roof within 24 inches of the array roof. Applying exception #3 you would only need a single access point and pathway on the main roof, as there is secondary access via an adjoining roof within 24 inches. This still allows two directions of egress, and does not share a common truss of rafter.

An access roof provides access to the ridge or peak of an adjoining roof surface containing solar panels, mosules, or arrays.

"**R324.7.5 Hip Roofs.** Panels, modules and arrays installed on dwellings with hip roofs shall be located in a manner that provides a clear access pathway not less than 36 inches wide (914 mm) extending from the roof access point to the ridge or peak, on each roof slope where panels, modules, or arrays are located."

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



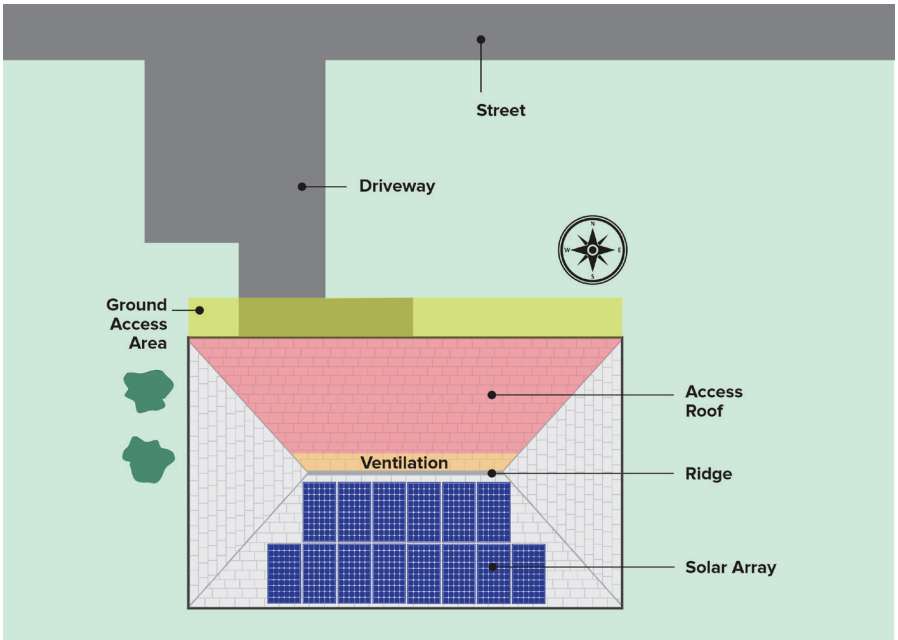
R324.7.5 Typical Hip Roof, showing alternate venting location and clear access pathway not less than 36 inches wide (914 mm) extending from the roof access point to the ridge or peak. Access and egress is from opposite sides and does not rely on the same roof truss or rafter and clear ground access.

"**Exceptions:**

1. Roofs with slopes of 2 units vertical in 12 units horizontal (16.6percent) and less.

2. Structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders."

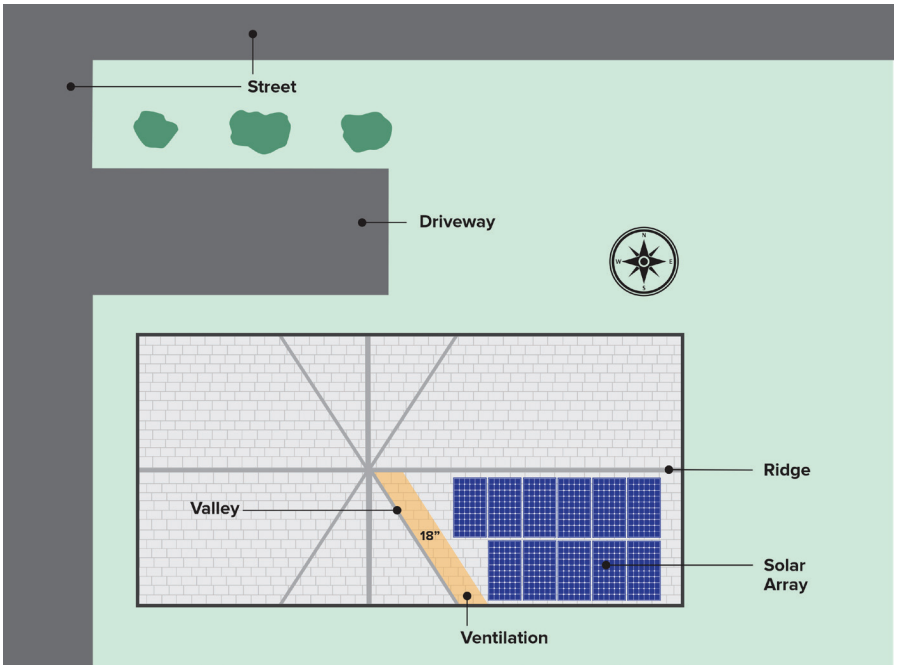
Hip Roof with exception #2 – access roof fronts a street or driveway (Figure 7)



Using the same HIP roof example, exception #2 would apply for all residential structures where an access roof fronts a street, driveway, or other area readily accessible to emergency responders.

"**R324.7.6 Roofs with valleys.** Panels and modules shall not be located less than 18 inches (457 mm) from a valley. Exception: Roofs with slopes of 2 units vertical in 12 units horizontal (16.6 percent) and less."

Valley Roof showing 18" clearance in yellow to the array (Figure 8)



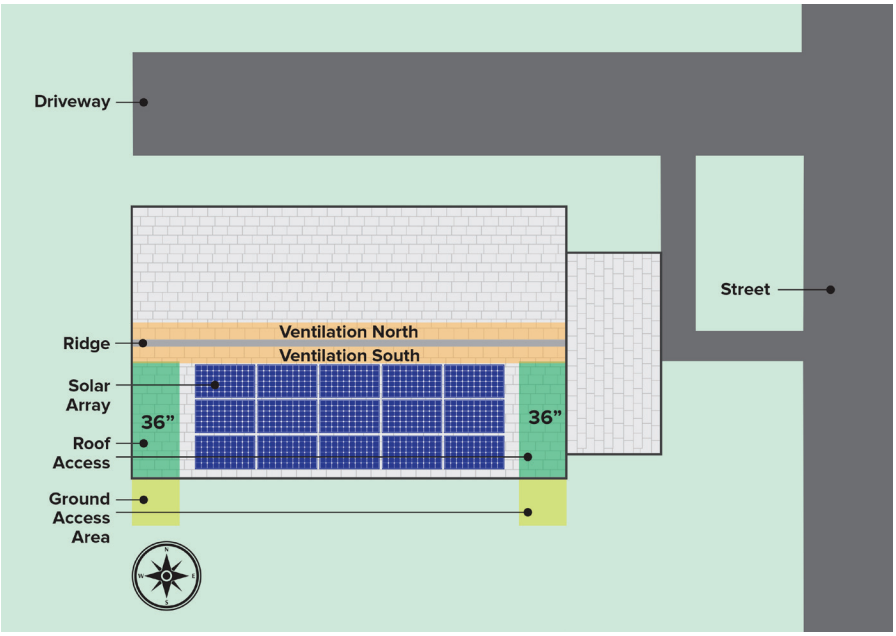
This image shows the 18 inch clear space from the valley to the array. The access and egress paths are not shown for clarity, nor is the venting location. There is street access to the front, and possible alternate venting on the opposite roof slope.

"**R324.7.7 Allowance for smoke ventilation operations**. Panels and modules shall not be less than 18 inches (457 mm) from a ridge or peak.

Exceptions:

1. Where an alternate ventilation method has been provided, or where vertical ventilation methods will not be employed between the upper most portion of the solar photovoltaic system and the ridge or peak.
2. Detached garages and accessory structures."

Single ridge roof showing a smaller array without any exceptions (Figure 9)



Using the original example, but now shown without any exceptions where vertical ventilation techniques will be employed would result in a smaller array. It's important to understand the exceptions and when they apply in order to maximize the available roof space.

NYSERDA's Conclusion

The residential building code as amended for New York State allows the designers of photovoltaic systems several options and alternatives. 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 code.

Contractors, design professionals, and AHJ's must consider many ventilation scenarios and consider that:

1. A fire can break out **anywhere** in a building. Alternate ventilation 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 fires in less than ideal locations.

For more details and definitions, view the NYS Errata.
dos.ny.gov/dcea/pdf/2016%20DOS_UniformCodeSupplement_03212016.pdf

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The following is the access, ventilation, and setback portions of R324 for your reference.

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