

Rooftop Rack-mounted PV Systems and EPDM Roof Assemblies

Roof System Choice

EPDM roof systems are a common and established roof system type and are an ideal choice for use with rack-mounted PV systems due to their durability, ease of installation, ease of flashing rack connection/bearing points, and roof system manufacturer acceptance of use with PV systems.

The Single Ply Roofing Industry (SPRI) Industry Bulletin 1-13, *A Summary of SPRI Membrane Manufacturer Photovoltaic (PV) Ready Roof Systems and Services* identifies EPDM as a rooftop-PV compatible material and indicates typical attributes that are often a part of roof system manufacturers' requirements when rack-mounted PV systems are planned including:

- An approved insulation board with a minimum thickness and compressive strength
- The addition of an approved cover board to enhance insulation protection
- An approved protection/separation sheet installed between the PV components and the roof membrane

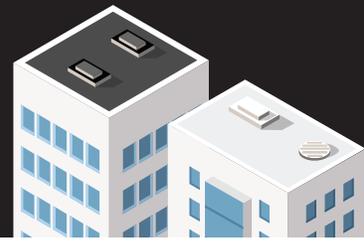
The bulleted list above is not all inclusive. EPDM system manufacturers' often work with roof system designers and contractors to identify roof system components to include based on desired performance and warranty goals.

Roof System Color/Reflectivity/Thermal Resistance

In the past it was thought a roof system should be "cool" when used in conjunction with a PV system, the thinking being a cool roof would help prevent the air conditioning system from having to overcome added heat from the roof surface in the summertime. As most jurisdictions now have adopted modern energy conservation code requirements, low-slope roof systems are generally required to have a thermal resistance (R-value) considerably more robust than in the past. A reflective surface may not be beneficial as surface heating likely will not contribute to interior heating in a significant way due to the required insulation.

Roof system designers should also consider reflective heating where energy reflected from the roof raises the surface temperature of adjacent surfaces- in some cases up to 9 °F vs. a non-reflective surface. This is significant as the efficiency of rack-mounted PV systems are reduced at higher operating temperatures; the hotter panels get, the less power they generate. EPDM membranes are available with both reflective (white) and non-reflective (black) surfaces. For buildings with proper (energy-code mandated) insulation levels, a black membrane may be a better choice. In these cases, limiting reflective heating represents a larger benefit for building owners and energy conservation codes generally allow for roof system designers to take advantage of this benefit.

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Energy Codes Generally Allow for Black EPDM in All Climate Zones with Rooftop PV

Most jurisdictions have adopted an energy conservation code based on the International Energy Conservation Code (IECC). While model energy codes require reflective roofing in climate zones 0-3, the current version of IECC, the 2021 Edition, contains provisions where reflective roof surfaces are not required when any of the following is installed on roofs:

- Photovoltaic systems or components are installed
- Solar air or water-heating systems or components
- Roof where not less than 75% of roof areas contain elements exempted from roof reflectivity requirements including: PV-related equipment; vegetative roofs; above-deck walkways; skylights; HVAC systems and components and other opaque objects mounted above the roof; rooftop ballast and pavers; and areas of roof meeting certain shading requirements.

The above provisions are found in IECC 2021, Section C402.3. Similar provisions are also found in earlier editions of IECC as well as ASHRAE 90.1, *Energy Standard for Buildings except Low-rise Residential Buildings*. Flexibility built into commonly adopted energy code allows for roof system designers to pick the right EPDM membrane for a particular project to provide the largest benefit to building owners.

EPDM — An Environmentally Responsive Choice for Rooftop PV

EPDM is a mainstream established product with a long track record of success, is easily recyclable when fastened or ballasted, and performs better than many other single-ply and bitumen-based membrane materials in key categories such as global warming, acidification and smog generation according to a peer reviewed Life Cycle Inventory and Assessment study (LCA). EPDM pairs favorably with rooftop PV for those looking for a strong sustainable option.

Selected References

Hart, Louisa *Developing Roof Systems That Prevent Energy Loss* Roofing Magazine. March 2019.

ERA Technical Committee *Cool Roofs in Northern Climates* January 2017.

Oak Ridge National Laboratory *SPRI-ORNL Study Shows Ballast and Paver Systems Save as Much as a Cool Roof* Interface. August 2008.

Case Study: Carlisle EPDM and PVC Unite Atop Colorado Hospital Carlisle-Syntec. June 2017.

SPRI Reinforced EPDM Environment Product Declaration Johns Manville. September 2016.

How Everyone Benefits From Resilient Roofing, Including Building Owners and Their Communities Firestone/Elevate. 2022.

Additional references are available on the ERA website at www.epdmroofs.org.