

## trends

Installing auxiliary roofing functions, such as support for energy producing equipment, requires forethought.

By Tom Hutchinson, AIA, RRC

For decades, “keep it off the roof” has been the mantra of knowledgeable roof system designers. The first and perhaps most effective method for extending the life of a roof system has been to keep it free of mechanical equipment and superfluous items while also limiting unnecessary foot traffic. However, the growing popularity of alternative energy sources has given the roof a new role to play. Increasingly, roof systems are also being looked at as a platform for energy production through the installation of solar energy systems, wind turbines, or vegetated roof systems. The roof surface has become too valuable a space to be left underused.

As a consequence, roofs are being called upon to be the base support for other functions independent of its traditional purpose. These other functions need to be designed and integrated into the roof system. In order to meet these dueling demands in the most effective manner, it is necessary to understand how best to marry the two together to ensure a sustained level of high performance.

### Co-Existing With Solar And Wind Energy Systems

While much attention in recent years has been paid to vegetated roofs, significant growth in installation of solar energy systems and wind turbines can also be anticipated. This process requires the involvement and coordinated efforts of members of the project team. Roof consultants need to prepare the roof for its new role; architects, engineers, and registered licensed professionals need to deal with the new construction and/or installation from their perspective; and facility

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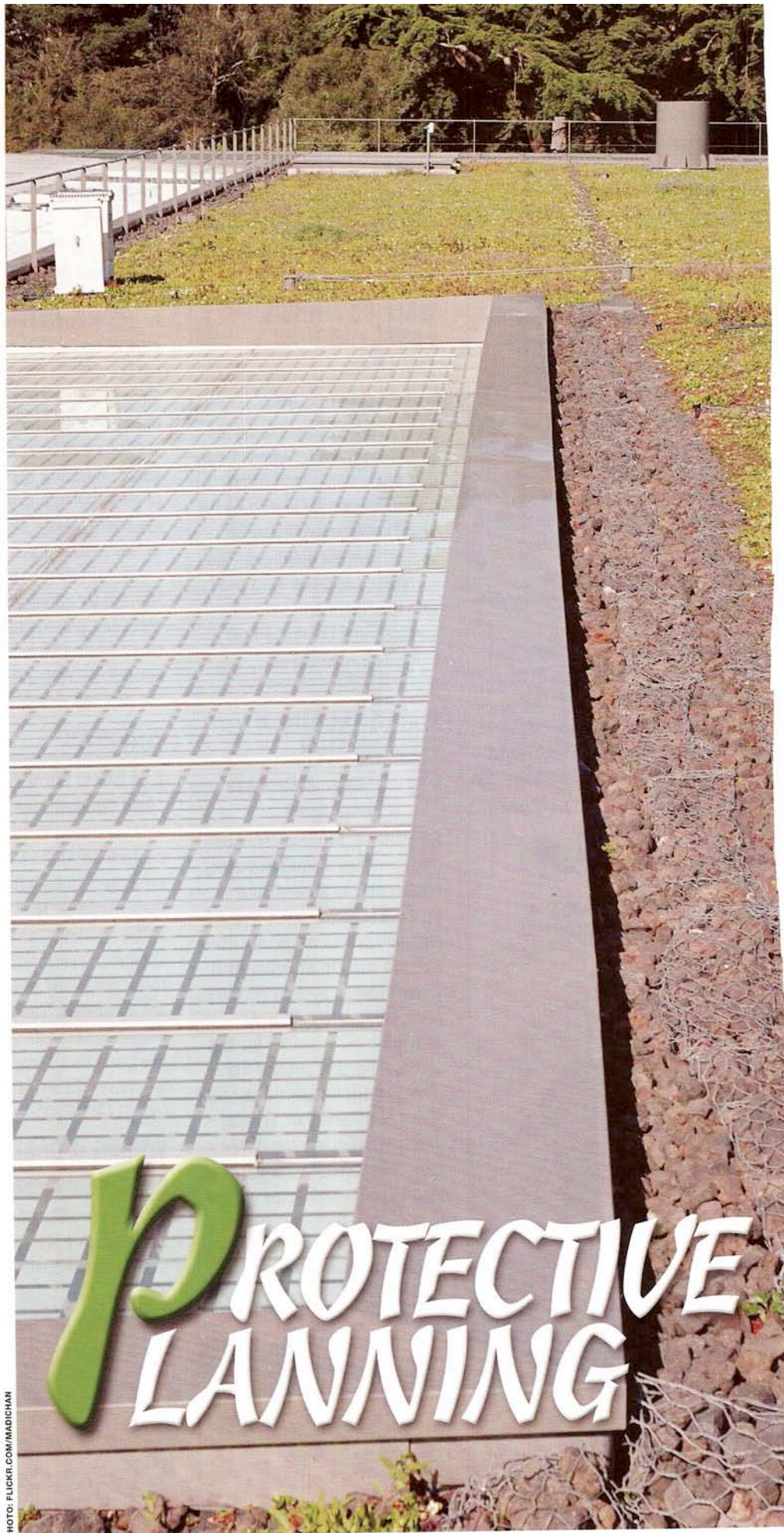


PHOTO: FLICKR.COM/IMADICHAH

*Protective Planning*

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managers (fms) need to maintain the roof in such a way to ensure its ongoing performance.

Once the roof has been chosen to support energy producing components, the designer should immediately start a matrix of those functions, their design, construction, and maintenance requirements. This will enable all concerned to understand the effect on the roof and to develop plans to deal with the design and coordination issues they will face.

For example, using the roof as a platform for other functions most likely involves the addition of equipment. The type of equipment, their need for securement, and dead load and potential live load weight need to be determined and coordinated with the structural engineer, so the roof deck and structure can accommodate the systems' weights and potential support. The weight of potential resultant snow loads also needs to be considered.

In the case of roofs hosting solar arrays and wind turbines, equipment that extends above the roof surface often results in "sail like" manifestations that need to be accommodated by the structural engineer, while the roof system designer deals with potential wind uplift on the roof's surface that is created by equipment.

These auxiliary systems also require supports, optimally elevated above the roof surface on a raised structurally sound curb rail, platform curb, and/or pipe support to isolate them from the water plane of the roof. Whatever method is selected, the support is required to be integrated into both the structure and roof system.



PHOTO: COURTESY OF TOM HUTCHINSON

Generating solar energy with a rooftop installation requires taking into account the impact of additional equipment on the facility structure.



PHOTO: COURTESY OF MEIJER

This retailer installed wind turbines on its roof. Equipment like this that rises above the roof surface significantly needs to be accommodated to ensure it stays in place.

The support should also provide proper clearance above the roof membrane to enable maintenance or repairs below, and it should be spaced to allow for access between units. It is especially important in these situations to incorporate redundancies; therefore, the base of the support should be waterproofed at the roof deck level—perhaps into a vapor retarder. Vibration and harmonic movement can work on the rooftop flashing, so a secondary barrier will provide added protection.

To ensure the inherent quality of the roof, a vapor barrier/temporary roof is highly recommended when large rooftop equipment is being installed and crews

will be working over the roof (with the finished roof installed afterward). A vapor barrier/temporary roof is also beneficial if work crews are using the roof as a staging area for other construction such as masonry, windows, metal wall cladding, and carpentry. The vapor barrier also protects the facility interior and the roof itself from the effects of construction generated moisture.

Additionally, thermal insulation is increasingly a focus, with higher thermal values and greater insulation thicknesses becoming the norm. The insulation should be protected by a cover board of substantial density and point load resistance. The thermal insulation in roofs of the future will represent a substantial initial investment, but this is also an investment in potential future savings.

Roof system assemblies are tested minus the presence of rooftop equipment. Consequently, the addition of such equipment on the roof surface may impact code compliance. The design professional must

verify and coordinate with the relevant tradesman that all elements meet the appropriate codes.

**Protecting The Roof**

A roof that will serve as a platform needs to be designed for heavy foot traffic and for access to both the roof and the equipment it supports. The key for roof system designers is to understand construction sequencing. With platform roofs, the need is to prevent damage by the tradespeople throughout the installation of equipment—solar arrays, wind turbines, hot water tanks, and the like. The roof surface is impacted not only by

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## Protective Planning

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foot traffic but also material packaging, tools, sharp materials, as well as workman setup and construction.

As previously stated, the best decision is to install a vapor retarder/temporary roof and allow the work to take place over that. If this is not possible, the use of the most robust and puncture resistance membrane is recommended: 80 and 90 mil for single plies, with a second "sacrificial" protective layer of membrane in known areas of construction and anticipated maintenance foot traffic.

To avoid physical damage not only to the roof membrane but roof insulation and flashings, the designer should specify exact protection measures for material storage, debris storage, work areas, and assembly.

It is crucial that key personnel be involved on-site to observe the construction, provide solutions to field conditions as they arrive, and look to see that other trades are informed of their impact on the roof. These key individuals must not only confirm installation is in accord with the contract documents, but they should also be able to make field decisions and provide design and details for



PHOTO: FLICKR.COM/KEVINDOOLEY

Solar panel systems are sometimes sited above open spaces. In this case, the structures that surround the parking lot play a part in supporting this installation.

alteration as they arise. Field sketches for changing conditions need to be expeditiously produced and provided to the necessary parties.

The appropriate personnel also needs to take a leadership role in pre-construction and coordination meetings. This is when sequencing, protection, and other concerns that have potential to damage

or affect the roof system can be addressed.

It is imperative to share shop drawings related to the specific rooftop equipment. For example, solar array rack support system drawings should be provided to the architect who in turn should forward them to the roofing contractor to verify the roof flashing detailing.

Daylighting systems, such as the installation shown here featuring domes with prismatic layers, decrease the need for artificial lighting in a space. When put into service, they also require consideration of the existing roof.



PHOTO: FIRESTONE BUILDING PRODUCTS

## After Installation

As the finish line nears, the formal closeout of a project and the related paperwork must be handled successfully. Warranty and closeout documents provide promises of corrective action and protection for the owner/fm, contractor, architect, and manufacturer as they define an installation and scope of warranty coverage.

Fms should recognize that a warranty inspection by roof system manufacturers needs to take place; this includes inspections prior to the materials installation to allow for viewing of the roof system itself. Inspections should look at the entire roof platform and indicate all items that affect the roofing systems' performance.

Fms should understand the need for proactive and continuous maintenance, given the fact that the roof is performing multiple functions. This maintenance, as well as the first several years of climatic cycling, can affect the roof systems. Proactive and specified roof maintenance for the first two years should be specified in the project documents. By requiring the roofing contractor to return on a scheduled basis, minor items can be attended to before they manifest into larger concerns—ones not covered under warranty.

The completed roof system will then need to be managed, with all activities recorded. As a quality assurance measure, the roof should be inspected before and after any activity or ancillary work occurs. Fms should inform work crews requiring access to the roof that the area was inspected prior to their arrival and

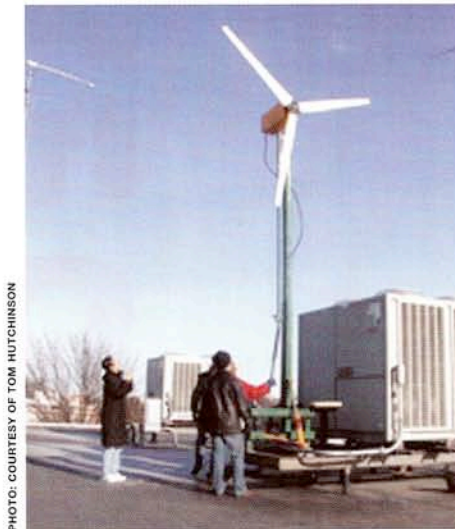


PHOTO: COURTESY OF TOM HUTCHINSON

Energy producing equipment on a roof means more foot traffic during installation and throughout its life cycle.

that it will be inspected after their departure. Locking the roof access point and monitoring access, as opposed to unrestricted access, can be a successful strategy.

Roof systems today are being asked to perform many more functions than their predecessors, and these should be designed in a way that reflects emerging needs. Taking a holistic approach to roof system design, construction, and management results in watertight performance while supporting other activities, such as solar and wind energy production. For many facilities, the roof is, or will become, a valuable contributor to its environmental, aesthetic, and energy performance. **TFM**

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Are you considering installing energy producing equipment on your roof? What issues do you face? Send your thoughts to [avazquez@groupc.com](mailto:avazquez@groupc.com).

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