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TECHTALK
Technical Insight from the Roof Board Experts

Adding Strength and Durability to Solar Roofing Systems*

Solar-powered roofs demand the extra durability a proper cover board can provide.

In early October of 2008, Congress approved and President Bush signed the Energy Improvement and Extension Act of 2008, virtually assuring the health of the solar roofing industry through 2016. Solar-powered roofs qualify for a 30% federal tax credit (directly reducing the property owner's federal tax bill), as well as a five-year accelerated depreciation.

"Solar has become mainstream," says Michael Gumm, application technologist and business development manager for MiaSolé®, and principal of Corporate Roof Consultants.

"The roofing industry is embracing solar, and for roofing contractors solar is a great value-added product to improve their bottom line. In the future, I see solar becoming a standard component on all roofs."

Gumm has been a roofing contractor too, so he knows first-hand the extra burden that solar systems place on the roofing system. The primary force that will affect the longevity of a solar roof system is additional foot traffic experienced during installation and maintenance of raised panel or bonded photovoltaic (PV) solar systems.

Gumm says that he always recommends a gypsum board in a solar roof project to achieve a fire-rating and to create a hard, flat roof surface. More major roofing manufacturers are selling solar systems, so it makes sense that many of them would recommend or even require use of a rigid cover board to protect the roof membrane and insulation underneath. Most often, the cover board specified is a ¼" (6.4 mm) or ½" (12.7 mm) DensDeck® Prime Roof Board for maximum impact resistance.

With most PV manufacturers producing products with a service life of 25-30 years, one must design a roof system to last as long as the solar array.

"Solar roofs cost more than traditional single-ply roofs," says Gumm, "so the additional cost of including a cover board in the project becomes almost inconsequential when designers figure in the life-cycle cost benefits of extending the life of the solar roof system."

Roof-mounted solar systems

For years, building designers have found it convenient to locate HVAC systems, pipes, antennas and other equipment on the rooftop. Because the roof is open to the sky and difficult to vandalize, it has also become the most logical support for most solar systems.

With property owners looking to minimize their building "footprint" and save on soaring land costs, rooftop solar systems don't require a nearby field and a fence surrounding the site to protect the sensitive solar equipment from damage.

However, the frequent need for solar roof inspections and maintenance means that the amount of foot traffic on these systems may be far greater than the traffic generated by an occasional piece of HVAC equipment on the roof.

Hewlett-Packard Global Operations Headquarters–Sika Sarnafil® EnergySmart Roof® membrane over DensDeck® Prime roof boards, among other components, in 300,000 square foot re-roof project. Solar panels cover 85% of the roof surface.

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* Information presented in this article concerning roofing systems and assemblies is presented as a general guide for illustration purposes only. Please consult the appropriate system manufacturer or design authority for system specifications and instructions for any specific system or assembly. Georgia-Pacific Gypsum does not provide roofing design services.

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What's more, both raised panel and bonded PV systems often cover the majority of the roof surface, and both systems require regular inspections and maintenance.

While glass and flexible polymer PV modules may last 25-30 years before replacement is required, system components also include wiring, switches, combiner boxes and a DC to AC inverter.

The inverter is probably the weakest link in the system. Inverter technology has improved, Gumm says, and they can last 15-20 years before needing replacement. This additional step pretty much guarantees that these solar-powered roofs will receive more visits from non-roofing maintenance crews than traditional systems, he added.

Most raised panel solar systems consist of rack support made of aluminum trusses to secure conventional 38" x 58" (965 mm x 1,473 mm) solar panels to the roof. The racking system is attached to the roof with mounting brackets screwed into the support beams of the roof structure. Conventional racks require one or two support brackets per solar module.

Because all of this equipment needs to be maintained, the chance of sharp tools dropping onto the roof surface or impact damage from heavy traffic or equipment installation is greatly increased.

Better protection for single-ply roofs

Modern single-ply roofs typically consist of a flexible membrane over a layer of polyisocyanurate (ISO) insulation. After years of weathering and UV exposure, single-ply membranes can become more vulnerable to impact damage and punctures. Exposure is worse if the insulation below has been crushed by previous impact or foot traffic.

Adding a cover board as a protective layer between the insulation and roofing membrane can moderate the effects of both increased foot traffic and the potential for punctures to the membrane on a solar roof installation. With compressive strength of 900 psi, DensDeck® Prime Roof Board provides the dimensional stability and strength to support these double-duty roofs.

A Clear Choice

At the end of the day, using a fiberglass mat gypsum cover board within a solar roofing system provides:

- Fire-resistance
- Acts as a firm substrate for the roof membrane
- Protects insulation below from foot traffic, dropped tools or wind-blown debris
- Helps extend the life of the roof to match the service life of the solar array.

In 2014, FM Global published the **FM 1-15 Standard for Solar Roof Systems**, which includes a fire section, recommending, among others, a gypsum-based board in the assembly.

2.1.2. Fire Exposure and Classification

2.1.2.1 Provide noncombustible, compressible insulation (such as mineral wool) within roof expansion joints when new PV installations are to be installed on new or existing roof covers.

2.1.2.2 Install roof assemblies that are FM Approved per Approval Standard 4478 with the specific roof mounted

PV panel used when new roofs are to be installed before the installation of new roof-mounted solar panels. Use insulation or cover boards directly below the roof cover that are noncombustible. This includes gypsum cover boards and mineral wool or expanded glass insulation.

2.1.2.3 Do not use PV panel systems that contain foam plastic, such as extruded foam polystyrene, unless specifically FM Approved as part of the assembly (consider both interior or Class 1 rating and exterior fire exposure). The assembly should maintain a Class 1 or noncombustible fire rating for underside fire exposure. Do not install PV arrays within 50 ft (15 m) of maximum foreseeable loss (MFL) subdivisions (see DS 1-22, Maximum Foreseeable Loss).

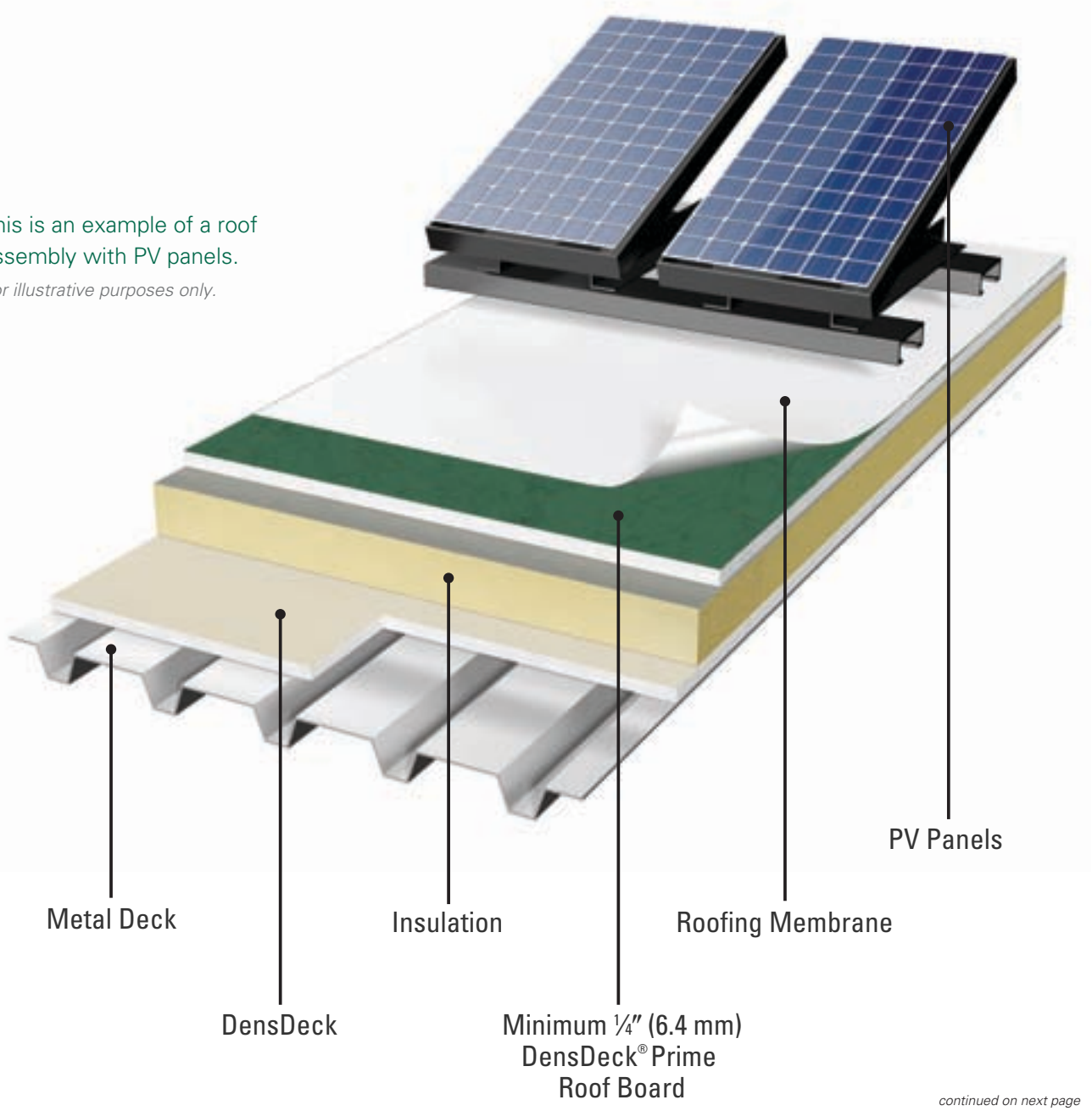
2.1.2.4 Provide sufficient aisle spaces (4 ft, 1.2 m) between other adjacent PV arrays, other adjacent rooftop equipment or penetrations, and between PV panels and expansion or control joints on each side. Submit the proposed layout to the public fire service for review and acceptance. Minimum 4 ft (1.2 m) wide aisles at a maximum of 150 ft (46 m) in each direction is recommended and may be required by some local public

For more information visit www.fmglobal.com.

Solar power produced in the United States has risen 139,000% in the past 10 years, according to an energy analyst at Deutsche Bank (Metal Construction News, January 2015). The analyst predicts that by 2016, solar power will be as cheap or cheaper than electricity from the conventional grid in every state except three.

This is an example of a roof assembly with PV panels.

For illustrative purposes only.



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Large solar array on the Music City Center, Nashville, TN.

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CAUTION For product fire, safety and use information, go to www.gp.com/safetyinfo or call 1-800-225-6119.

HANDLING AND USE–CAUTION This product contains fiberglass facings which may cause skin irritation. Dust and fibers produced during the handling and installation of the product may cause skin, eye and respiratory tract irritation. Avoid breathing dust and minimize contact with skin and eyes. Wear long sleeve shirts, long pants and eye protection. Always maintain adequate ventilation. Use a dust mask or NIOSH/MSHA approved respirator as appropriate in dusty or poorly ventilated areas.

FIRE SAFETY CAUTION Passing a fire test in a controlled laboratory setting and/or certifying or labeling a product as having a one-hour, two-hour, or any other fire resistance or protection rating and, therefore, as acceptable for use in certain fire rated assemblies/systems, does not mean that either a particular assembly/system incorporating the product, or any given piece of the product itself, will necessarily provide one-hour fire resistance, two-hour fire resistance, or any other specified fire resistance or protection in an actual fire. In the event of an actual fire, you should immediately take any and all actions necessary for your safety and the safety of others without regard for any fire rating of any product or assembly/system.

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