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from the ground up

Benchmark PERSPECTIVES

roof and pavement consultants

newsletter

Thermoplastic Polyolefin Membranes (TPOs)

– What we think

by Jeff Evans, RRC

Benchmark has been sitting on the fence with respect to TPO membranes for at least the past 10 years. We have been advising clients of our concerns about TPOs for longer than we ever expected to, and that in itself, says something about TPOs.

In our view, thermoplastic polyolefin (TPO) membranes have an uneven performance history. We have first hand experience with some mid-1990 TPO membranes that had problems with welding, even when new. We have seen many TPO roofs less than 10 years old with serious levels of membrane deterioration.

Our investigations of our clients' roofs continue to identify issues with some TPO membranes: splitting and crazing along rows of fasteners, accelerated aging along walkpads, polymer erosion to the point of exposing scrim reinforcement; enough issues for us to have concern.

The news in the industry supports our position of caution. The MRCA T&R committee recently released an "Advisory on TPO" (see page 4), noting TPO's potential susceptibility to deterioration from exposure to high heat and/or UV

(solar) loads. Heat and reflected/focused sunlight are the primary concerns in this advisory.



Crazing of TPO membrane

SPRI (Single-Ply Roofing Industry), of which Benchmark is a member, responded that the MRCA advisory addressed concerns regarding heat and solar loading - which apply to all roof membranes - and felt TPOs were being unreasonably singled out.

In an excerpt from Firestone's response, they said: "Not all TPO products are the same. Other TPO roofing manufacturers

continued on page 5

inside:

TPO Membranes.....	1
Solar Homework.....	2
2010 Seminar.....	back page

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TPOs – What we think (continued)

may alter their formulations and experience issues with high solar and temperature exposure. This is not the case with Firestone.”

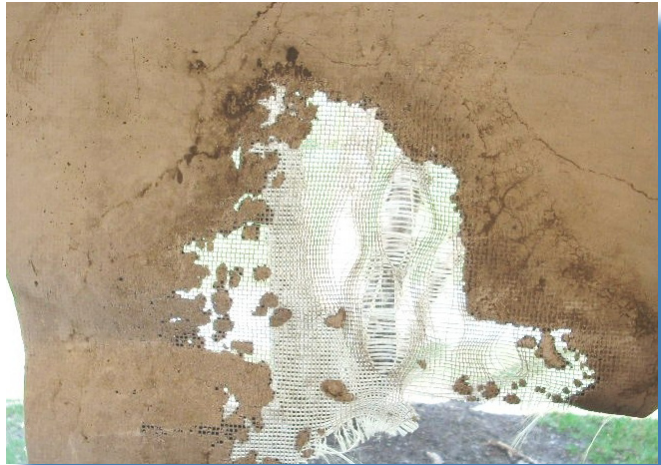
Firestone’s comment that “not all TPO products are the same,” and their statement that other TPO manufacturers might have “issues with high solar and temperature exposure” are at the heart of the issue for Benchmark. Clearly, there have been issues with TPO formulations. Who has it right? Does anyone?

We have seen many TPO roofs less than 10 years old with serious levels of membrane deterioration.

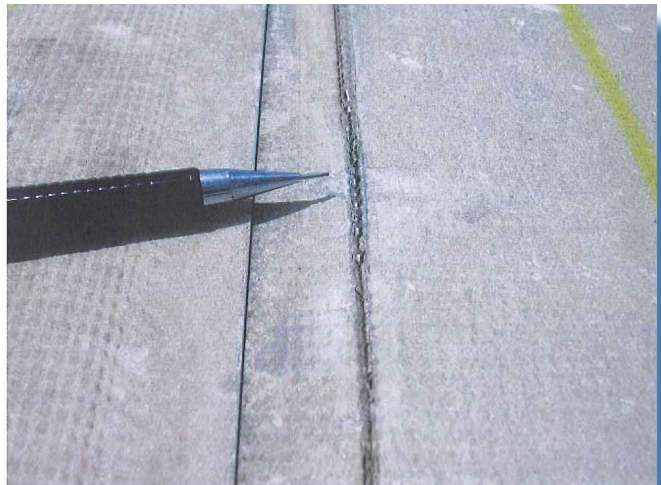
Our firm has had the opportunity to view thousands of squares of new TPO membrane being installed, and it does appear that manufacturers have resolved the weld-ability issues. From our field observations, TPO membranes can perform - at least in the short term.

We still have serious questions about the TPO products. Which manufacturers’ formulations will survive, how long will they perform, and what will eventual

failure look like? Until we know the answers to these questions, we will be taking a conservative approach to thermoplastic polyolefins.



Dramatic loss of TPO polymer, exposing reinforcing scrim.



Split of TPO membrane at field seam.

continued on page 4

TPOs – What we think (continued)

MRCA T&R Committee Advisory on TPO

Information is being circulated in the industry indicating that high solar loading and elevated temperature lead to the premature exhaustion of anti aging components such as anti oxidants, UV absorbers and heat and light stabilizing compounds within TPO. This could lead to the breakdown of the sheet in affected areas.

This also might explain some reported problem applications with localized deterioration of membranes. One manufacturer has recently changed formulation to account for this problem; another advises their product not be "subjected" to high thermal or solar loading; while others remain silent. Southern states appear to have this problematic local condition due to the heat load these roofs experience.

The committee believes that enough information has surfaced concerning TPO accelerated weathering due to solar or

thermal loading to advise members to:

Review roof plans for situations where sunlight is reflected back on membrane; such as areas below metal and glass or highly reflective curtain walls, or high profile reflective wall flashings.

Look for heat emitting equipment or heat exhausting vents or dark emissive materials laid on the roof that can elevate the temperature of the covered sheet; as well as areas under or over elevated temperature operations.

If situations exist that may commonly elevate temperatures over 160 degrees or increase solar loads beyond "normal" incoming solar load, question the manufacturer as to the suitability of their product for the situation; consider changing the product to a material that will clearly withstand the loading; consider changes in design to forestall the loading.

If you have existing TPO roofing subjected to these situations you may well want to inspect the applications for incipient, developing or obvious local problems. The manufacturer can then be approached for direction in addressing or rectifying any deficiency.

Please inform the committee of any problem found as well as any reaction from the manufacturer involved.

T&R Committee

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Going Solar . . . First do your homework! *by Kent Mattison, P.E.*

Our nation's movement towards being more environmentally responsible cannot be ignored. The use of alternative, renewable energy sources will continue to grow at an increasingly quick pace. Solar energy is at the forefront of this movement.

Many of us, whether potential providers of services related to solar energy or potential users of solar energy, don't want to miss out on the following benefits:

Financial Savings

The initial cost of purchasing and installing a photovoltaic (PV) solar system to offset the cost savings of reduced electrical use is usually not considered a cost-effective payback, unless some financial incentives are available. The federal and some state governments and utilities can offer incentives in the way of tax credits and subsidy programs. Even as the costs of the solar cells themselves continue to drop, the initial up-front cost of purchasing and installing a PV system is still considered prohibitive for many building owners.

That has led to the development of Solar Power Purchase Agreements (SPPA). A SPPA is a financial arrangement between a third party developer who installs, owns, operates, and maintains the PV system for a customer (building owner). The building owner agrees to host the PV system on their roof or property and purchase the electricity from the

provider for a predetermined period of time. This will allow the host customer to receive electricity at a predictable cost with the potential to have a positive cash flow from the day the system is put into service. The solar provider receives the tax credits and the income generated from the sale of the electricity.

Environmental Advantages

Obtaining electricity from a renewable source will help preserve the earth's finite resources. Photovoltaics are a renewable, clean, and universal power source. Solar energy will help clean up the environment by producing no pollution. It is estimated that a 2 kilowatt system will reduce CO₂ emissions by 85,576 pounds over its lifetime.

Reliability

A solar PV system can provide power during an electrical outage with a battery powered storage system.

Avoid Future Electrical Rate Increases:

PV is less vulnerable to electrical rate hikes, which have averaged about 6 percent in recent years. The electricity produced by PV panels is a fixed rate over the life of the system. The cost of the PV solar cells, primarily its main component silicon, has also been dropping quite dramatically recently.

National Security

Renewable energy sources lessen our

dependence on foreign oil.

Peak Energy Savings

The cost of peak power can be reduced. A PV system produces the most power in the summer at midday when the sun is the highest. Therefore, it supplements the need for expensive power at peak generator operating times.

Public Relations

PV has a legitimate positive influence with people. The user company is viewed as taking action for the betterment of our environment which provides a tangible public image.

However, before a PV solar system is designed and installed there are numerous considerations to be taken into account. Two important questions must first be answered:

1. Is it even practical to consider the installation of a PV system based on the existing physical characteristics of the project site?
2. What is the financial model of the PV system installation and is the financial model acceptable to you?

Following is a brief outline of questions regarding the physical feasibility and economics of installing a PV system on your roof that must be answered before one goes forward with the

continued on page 3

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design and installation of the system.

Feasibility Study

Job Site Assessment:

- Is the building and roof orientation capable of taking full advantage of the sunlight?
- Is the roof area clear of shading from nearby trees or other buildings that would reduce the amount of sunlight that reaches the solar panels?
- Is there enough area on the roof to install the system without restricting access to rooftop equipment?
- Can the system be installed without restricting rooftop drainage?
- Can the PV system meet all fire, wind, snow, and seismic load requirements of the local building codes?
- Is the roof structure capable of supporting the weight of the PV system?
- Will the roof system itself last as long as the PV system? If not, the cost of removing the PV System to replace the roof and reinstall the PV system could be enormous. The condition of an existing roof or the performance of a new roof must first be evaluated.
- Is a roof system warranty in affect? If so, will the installation of a PV system affect the warranty?
- Can the PV system be properly attached to the roof system without causing damage to the roof system? The potential detrimental affects of flashing or adhering PV systems on a roof system must be evaluated. Certain types of PV systems (specifically the building integrated thin cell PV panels adhered to the membrane) have been known to cause accelerated heat aging to some of the roof membranes that they are adhered to.
- What type of photovoltaic system will best meet your needs - thin-film or chrystalline? Each has different benefits so the choice will depend on many factors, such as available area for panel installation, structural weight restrictions, cost comparison of panels, projected panel performance in the specific environment, support structure, roof type, drainage, roof age, installing contractor base, etc.
- How difficult is it going to be to connect the PV system to the building's electrical system?
- Are there local code or utility interface restrictions that may affect your system?

Economic Profile:

- What are the available federal, state, and local government and utility incentives, rebates, and credits in your area?
- What is the potential for a Solar Purchase Power Agreement or other financing options?
- What are the projected installation costs for the chosen system?
- What are the projected energy cost savings?
- What is the projected payback time-frame, return on investment, and cash flow?

Having this type of analysis performed is critical for determining the potential success of a PV solar system.

The next step is to have a professional design the PV solar and electrical systems and a qualified contractor perform the installation.



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