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# PROFESSIONAL

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# Roofing

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[Table of Contents](#) ◀[To Subscribe](#) ◀[Advertisers' Index](#) ◀[Past Issues](#) ◀[Professional Roofing](#) ◀[NRCA Home](#) ◀[Search This Site](#) ◀

## Observations from the field during 1998

***A roofing professional provides his candid thoughts about various technical issues***

by **Dick Baxter**

**Editor's note:** *Following are the author's opinions about technical roofing industry issues. Views expressed are not necessarily those of NRCA.*

During the past few years, most technical roofing problems involving litigation have been related to low-slope membrane roof systems. However, in the steep-slope arena, there have been problems associated with wrinkling of organic felt underlay sheets (mostly caused by using organic felts as temporary roof systems); glass-fiber-reinforced asphalt composition shingles; and nonasbestos fiber-cement shingles.

About the time coated roofing felts gave hot-applied built-up roof (BUR) membranes an almost uneraseable black eye because of poor performance, nonreinforced PVC, CPE, CSPE and EPDM roof membrane systems were introduced. Although many of these sheet membrane roof systems have provided satisfactory and, in some cases, exemplary service, their average service lives have been relatively short. Problems arose with some of these membrane systems because of misuse and misapplication. Now, metal has become the "hot" system.

### **Metal roof systems**

Many problems associated with metal roof assemblies have occurred primarily because of poor design. For example, some designers are content to specify only that contractors follow manufacturers' installation recommendations, rather than provide specifications and details tailored to jobs. Submittal drawings often do not match shop drawings for specific projects, and manufacturer-recommended details often come with caveats, such as, "XYZ Manufacturing Co. shall be held harmless from any and all claims arising from a lack of watertightness as a result of following these recommended details."

Another problem is that some roof systems are installed by unknowledgeable, unapproved applicators (if, in fact, approved applicators are recognized by metal roof system component suppliers). In addition, most metal roof system warranties do not include watertightness of finished roof assemblies—only the panels' finish is included in many warranties, and this could be voided if metal roof systems are installed in coastal areas or exposed to animal feces or acid environments.

Additionally, architectural metal roof system specifications often are contradictory. For example, many specifications stipulate Factory Mutual (FM) and Underwriters Laboratories Inc. (UL) classifications. These classifications may be similar but contain irreconcilable differences for roof system construction. In addition, some specifications reference Sheet Metal and Air Conditioning Contractors' National Association and manufacturers' recommendations, which, in most cases, are not similar. Many specifications include designs that do not match roof assemblies' configurations that were tested for wind-uplift and fire

properties. Following the roof assemblies' designs may violate model or local building codes.

It is up to roofing contractors to determine specification discrepancies and resolve them or take exception to the conditions before starting roof system installations.

Contractors should consider the following example:

Suppose design specifications stipulate that a completed roof assembly have a UL wind classification that meets UL 90 (90 pounds-per-square-foot [44-kg/m<sup>2</sup>] uplift). The roof assembly to be installed must be constructed exactly as the one tested by UL when the wind-uplift classification was determined.

A contractor should pay attention to the minimum type and density requirements for foam insulation over which the metal roof system is to be installed and understand that commercially available polyisocyanurate foam insulation rarely will approach 2-pounds-per-cubic-foot (32-kg/m<sup>3</sup>) density—not the 2.5-pounds-per-cubic-foot (40-kg/m<sup>3</sup>) density of tested insulation. The contractor also should note special requirements for attachment devices.

In addition, the contractor should cross-reference UL construction numbers listed in the *UL Roofing Materials and Systems Directory* to the specifier's roof section to determine whether the test and specified construction essentially are the same. If they aren't the same, the finished product will not have the wind-uplift classification prescribed in the specifications' performance criteria. The contractor then may be in breach of contract for not providing a roof system that meets the design specifications' performance criteria (i.e., UL 90).

Such small discrepancies, as described in this example, can lead to a building owner holding retainage, filing a claim against the contractor's performance bond or, worse, initiating a lawsuit for noncompliance with specifications. In addition, the problem can be expensive to correct because, in most cases, removal and replacement of a metal roof system is the only way the system can be brought into compliance with the specifications' design criteria.

If specifications call for UL and FM classifications, the contractor should be aware that the testing methods used by these organizations are different, and UL-tested constructions may not be similar to Factory Mutual Research Corp.-tested constructions. In this instance, the designer or owner must choose one testing agency's requirements, preferably before commencement of roof system construction.

It also is important that the roof system be tested, listed and approved by the specified testing agency. Some metal roof system suppliers have their systems tested at independent testing laboratories or perform the tests themselves. However, just because a supplier says a metal roof system has passed the UL 90 test does not mean the system was tested and listed by UL.

### **Metal warranties**

Roofing professionals should understand that when they purchase metal coil stock to roll metal roof panels at job sites, they become, in essence, manufacturers. This means they may be liable for the terms of the specified manufacturer's warranty. The supplier of the metal materials from which roof system components are field-fabricated will not issue a warranty for the roof system other than, perhaps, for the coil stock or panel material's paint or finish.

Roofing professionals and building owners also should understand the implications of warranty requirements included in bid documents. A roofing professional either should select a warrantable manufacturer's metal roof system to comply with the contract documents or be willing to assume responsibility for any long-term warranties required by designers. Designers must understand that conventional manufacturers' warranties may not be available for field-fabricated metal roof systems.

### **Polyiso insulation**

Problems associated with dimensional instability (i.e., shrinkage) of polyisocyanurate foam

roof insulation remain and don't appear to be going away. And the problems have not been made better with the revision of ASTM C 1289, which allows manufactured insulation boards to shrink or grow up to 4 percent of their manufactured dimensions.

Although it appears most manufacturers have been able to deal with new blowing agents, the manufacturing results remain fairly unpredictable; some batches appear to be better—some worse—than others.

To help combat dimensional instability problems, contractors should compensate for them. Installing two roof insulation layers remains the best method for addressing shrinkage and resultant open joints between polyisocyanurate foam roof insulation boards. The shrinkage still occurs, but the effects are mitigated by offset or staggered insulation board joints. When polyisocyanurate foam insulation is covered with an adhered layer of perlite or wood fiber roof insulation, the shrinkage effects appear to be minimized by the stabilizing effect of the cover boards.

### **TPO roof systems**

Thermoplastic polyolefin (TPO) roof systems are a hot topic of conversation in the industry. Those who understand TPOs best believe the chemistry for this roof system type is not yet completely acceptable. Unlike PVC roof membranes, TPOs are not inherently fire-resistant. Chemical formulations for nonfire-resistant TPO membranes generally provide suitable weathering and handling properties for roof system applications. The problems with the long-term weathering properties of TPO membranes are associated with the introduction of chemicals that provide fire-resistant qualities.

Although TPOs offer more promise to the sheet membrane roofing segment than any previous sheet membrane roofing material, there will be some tough lessons learned by those spearheading the movement. Prudence dictates a conservative approach to TPOs. Contractors should make sure all current application recommendations are followed carefully. Then, if problems arise with a completed membrane before expected, the responsibility for the problem cannot be blamed on application techniques or practices.

### **Coal-tar pitch membranes**

A polymer-modified coal-tar pitch membrane roof system was reintroduced during 1998. The latest modified coal-tar membrane is flexible enough to be installed with hot coal-tar pitch, a torch or special coal-tar-pitch-based modified adhesive. Although the waterproofing bitumen is coal-tar-pitch-based, contractors should not expect that a mineral-granule-surfaced, coal-tar-based modified bitumen membrane will possess the same cold-flow properties as thermoplastic coal-tar or same resistance to ponded water as an aggregate-surfaced, coal-tar pitch membrane.

A mineral-granule-surfaced, modified, coal-tar pitch roof membrane requires positive drainage to minimize breakdown of the fire-resistant top surface. Even though the material is represented as being suitable for use wherever coal-tar pitch BUR membranes are used, it will not perform as expected under even moderate ponding water conditions. With top surface degradation (degranulation, crazing, etc.), roof membrane deterioration—similar to that of an SBS-modified asphalt roof membrane—can be expected.

### **Summing it up**

Overall, it has been an interesting year. It is important for the industry to continue development efforts for cost-effective roof systems; it's just as important not to get caught in the mire between new products and time-tested, proven ones.

No roofing industry segment is much different from any other. There are those who try to provide tested, proven roof systems and materials and those who don't care if a system or material works as long as they collect their money.

It is, indeed, caveat emptor.

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