

PROCEEDINGS



ROOF WARRANTIES – DURATION VS. COVERAGE: SUSTAINABLE?

BRIAN P. CHAMBERLAIN

CARLISLE CONSTRUCTION MATERIALS

1284 Ritner Hwy., Carlisle, PA 17013

Phone: 717-245-7072 • Fax: 717-960-44852 • E-mail: chamber@syntec.carlisle.com



ADDRESSING THE BUILDING ENVELOPE

ABSTRACT

Customers view warranties as indicators of the relative life expectancy of the roof system based on duration. Most often, the warranty language defines the coverage, which has limitations, so the roof warranty may have little relationship to the duration or sustainability of the assembly. What language should be looked for to confirm or verify guarantee performance? How can a warranty back up sustainability? Should warranties be used as design criteria? This presentation will assist specifiers in determining the value of using warranties compared to focusing on materials, performance assemblies, and workmanship.

SPEAKER

BRIAN P. CHAMBERLAIN — CARLISLE CONSTRUCTION MATERIALS - CARLISLE, PA

BRIAN CHAMBERLAIN has been with Carlisle Construction Materials since 1987. He graduated from the University of Wisconsin at Milwaukee, where he earned a bachelor's degree in architectural design. Brian has been assisting architects, consultants, and specifiers on developing special-engineered roofing, focused on performance and sustainability assemblies. He is part of a team that is responsible for all system configurations and detail development, including all code-testing operations for those assemblies. He has been involved in numerous technological presentations within the U.S., Canada, South Korea, and China. His presentations include unique design issues such as energy efficiency, geographic influence, and uplift performance. He is a member of RCI and has 25 years of experience in the roofing industry.

ROOF WARRANTIES – DURATION VS. COVERAGE: SUSTAINABLE?

INTRODUCTION

In today's market, we find significant focus from building owners on sustainable and durable roof installation. To accomplish this goal, building owners look to designers to specify durable products, supply qualified installers, and have material manufacturers offer long-term warranties. The first two conditions can be controlled and monitored to make sure that the installation is verified to have the proposed quality. The roofing warranty is looked upon by building owners and specifiers as a way to get a guarantee that these first two conditions are met. It's very similar to an architect's specifying a white membrane roof with the expectation, without any true consideration, that white membrane will help save energy associated with the operation of the building and, in turn, reduce the carbon footprint of the building. Unfortunately, without fully understanding how geography plays a major role in energy performance, the specifier may not design the roofing system to offer true energy performance and inadvertently raise other concerns. Studies have shown white membrane roofs need to be designed according to the building's geographic location.¹

With the same consideration, it should be understood that warranties are tools to assist in the selling of roofing manufactur-

ers' products and may not be an indicator of durability.

To understand this fully, we need to review how roofing material manufacturers promote warranties and then review the fine print of what they are covering within the language of the warranty.

DURABLE ROOFING ASSEMBLIES

The basic premise of a long-term warranty can be seen from the way a manufacturer's specification promotes sustainable assemblies. One of the first products we find typically required for longer-term warranties is thicker membrane. Where shorter-term warranties allow the use of thinner membrane, such as 45-mil, longer-term warranties are published with thicker membranes, such as 90-mil. There are significant data to show that thicker membranes are superior to thinner membranes. For comparison, *Figure 1* shows the results of a Federal Puncture Test with nonreinforced EPDM. The EPDM membrane with a 90-mil thickness has a 60% increase in puncture resistance over a 45-mil membrane.

Another indication of durability can be found by testing roofing materials within the Xenon Arc Weathering Test (ASTM G 155). In *Figure 2*, the results for a reinforced TPO membrane can be seen based on kJ/m². The 80-mil-thick reinforced TPO has

42% greater weatherability than a 45-mil reinforced TPO.

These results can then be analyzed relative to the proposed building location, based on expected radiant exposure, to determine the minimum design consideration. The designer should, however, plan to exceed the minimum specified in building codes, thereby offering a durable, long-lasting assembly. In most cases, the designer will find this parameter already required by the roofing materials manufacturer. See *Figure 3*.

As membrane thickness is promoted by manufacturers through longer-term warranties, other components of the roof assembly are promoted above the typical shorter-term warranties. The splicing of EPDM membranes is specified to be either wider seams with tapes or factory-applied tapes, while thermoplastic membrane assemblies promote overlayment of the seams with additional welded products. Longer-term warranties promote factory-manufactured flashings such as pipe seals and premade curb flashings. Multiple layers and the thickness of insulation are important to reduce energy costs in the long term and in performance of the building. A single layer of insulation may assist in the initial sale of the assembly, but the typical gap left behind with energy loss could be significant

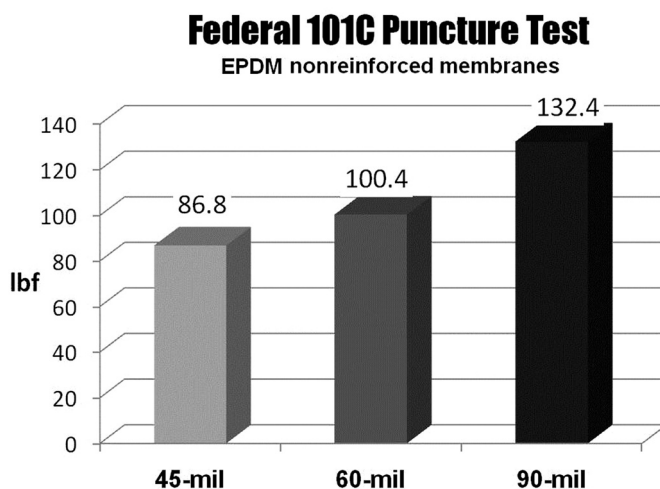


Figure 1

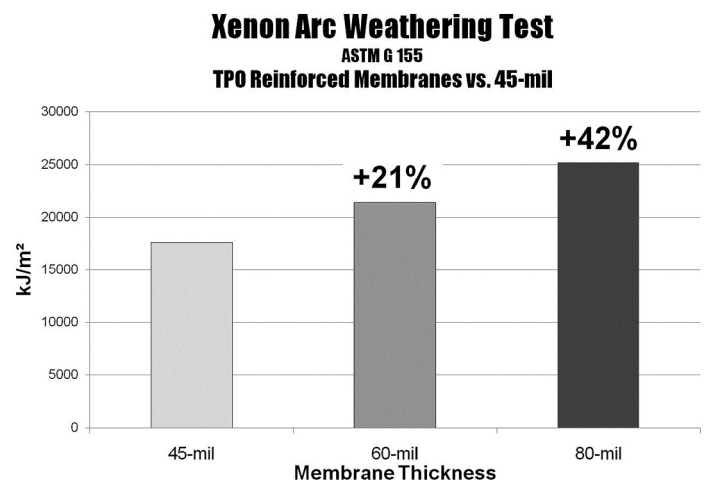
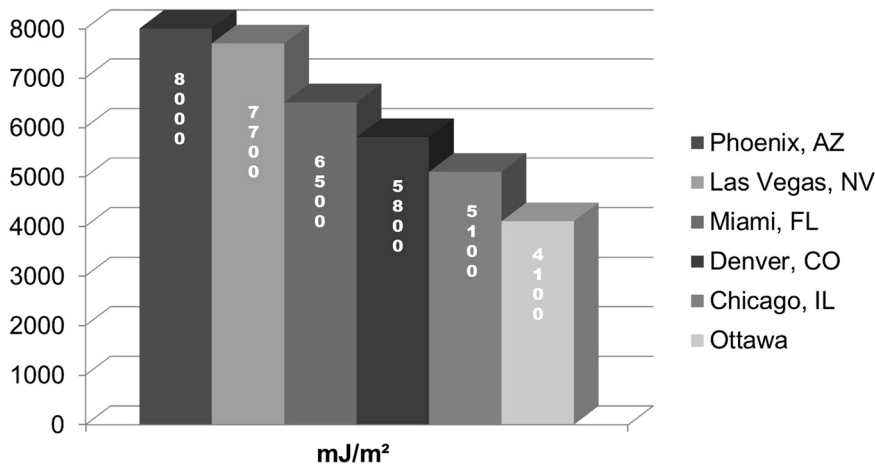


Figure 2

Radiant Exposure



http://www.atlas-mts.com/en/services/natural_weathering_testing/natural_weathering_testing_sites/north_america/index.shtml

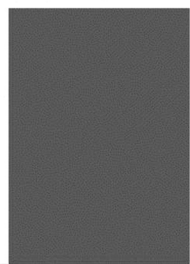
Figure 3

Operating Cost Comparison*

Pennsylvania 75,000 SF roof – 20 year cycle

Operating Expense (\$ 000's)

\$672



Black Membrane
One layer of 2-in. iso

\$348



Black Membrane
Two layers of 2-in. iso

* Calculated using Roof Sense

Figure 4

Wind Uplift Performance

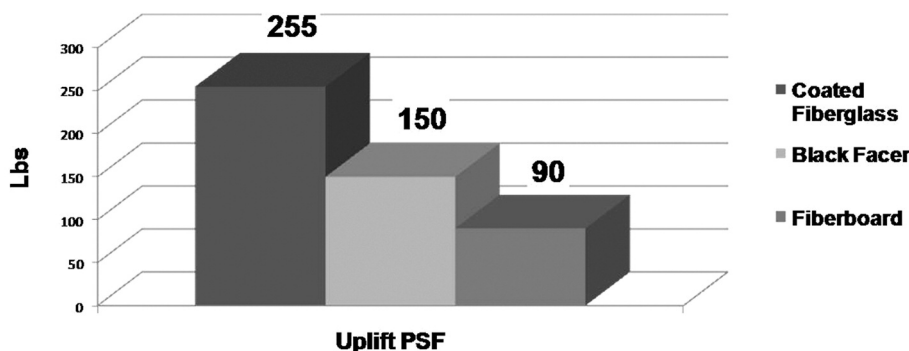


Figure 5

over the long term, as shown in *Figure 4*.

As technology improves products, they are promoted for longer-term warranties. New insulation facers have been developed that offer moisture, mold, and wind uplift resistance. *Figure 5* shows the typical uplift results among a fiberboard, a standard black paper facer on polyisocyanurate, and a fiberglass-coated facer on polyisocyanurate.

Manufacturers try to take into account foot traffic and unusual weather conditions that a roof assembly may experience over a long-term warranty, so their roofing specifications include cover boards or higher compressive-strength insulation to offer additional durability.

Besides warranties promoting thicker membranes, superior cover boards/insulations, and prefabricated accessories, there are incentives that can be included

within the warranty such as accidental puncture coverage, hail coverage, and reflective stability, if promoted enhancements by the manufacturer are specified. Some warranties will include other components, such as skylights, photovoltaic arrays, walking decks, and garden roof materials. In the case of the photovoltaic arrays, walking decks, and garden roofs, a membrane roof assembly's components are specified to handle these additional uses of a roof area. If specified properly, the manufacturer can include overburden removal and replacement within the warranty coverage, giving the owner the peace of mind that if a leak should occur, the investigation will not cost him anything additional.

WIND SPEED WARRANTY COVERAGE

Warranties also promote higher wind-speed coverage and, to deal with long-term performance, often incorporate cover boards, higher compressive-strength insulation, and higher fastening density of the insulation. At times, the specifier will find that the metal edging, which is the first line of defense against any wind storm, must be premanufactured and has been tested following the criteria in ANSI/SPRI ES-1 and exceeds International Building Code (IBC) standards. In higher-wind locations, "storm strips" (a row of securement around the perimeter) might be suggested, with the consideration to minimize storm damage.

For mechanically fastened assemblies, longer-term warranties are available by specifying reduced spacing between rows of securement to increase uplift performance and reduce fatigue on the roofing membrane. When a warranty must cover special wind conditions, an air barrier may be installed below the insulation on a steel deck to assist in mitigating the interior pressure from the uplift, adding to the overall performance during wind.

WARRANTY LANGUAGE

This effort by a manufacturer to specify thicker membrane, better insulation, durable accessories, and incentives for additional coverage with a longer-term warranty increases the manufacturer's reputation with the building owner in a positive

manner. The building owner, in turn, assumes that the manufacturer's warranty is an indicator of responsibility by the manufacturer and the relative life expectancy of the roof system. Unfortunately, warranties are used more often as marketing tool to assist in selling of roofing materials, so even though a long-term warranty is preferable, the owner needs to review and understand what the warranty is actually offering as coverage.

Research of numerous published warranties and the phrases within them shows that some warranties with equal duration do not match up with coverage. How many times have we heard, "Your 20-year warranty requires additional components, unlike your competitor's? Aren't all 20-year warranties the same?" Though the length of the warranty could be important, how each warranty is worded for coverage could be different, allowing one roofing manufacturer more flexibility to deviate from the published specification by substituting lower-performing products to have a more competitive advantage. To make sure the roofing installation has the same-quality installation from either manufacturer, it becomes necessary for a building owner to understand what a warranty covers beyond its duration.

Once a building owner is convinced to read what is within a warranty, it can be difficult for the building owner to interpret the language. One of the reasons this is a problem is because warranties are written by the membrane manufacturer's lawyer. The lawyer's goal is to limit the liability of the membrane manufacturer. To make sense of what the building owner is actually receiving as coverage with a warranty, we need to focus on specific parts within a typical warranty.

Warranties are most often broken down into two parts. The first part is what the warranty covers, which is typically referenced as the "roofing system," defined as membrane, insulation, fasteners, flashing, and whatever additional components the manufacturer sells associated with the project. In my research, I have found that the definition of "roofing system" can be altered. In one warranty, the definition of the "roof system" was limited to just the roofing membrane without referring to any other associated purchased materials. Even though the warranty was titled "Roof System Warranty," the coverage only included the membrane, which is very sim-

Warranty Coverage Comparisons

Example – Original Cost of Roof: \$100,000

| | 20-Year No Dollar Limit | 25-Year Prorated |
|----------------------|----------------------------|---------------------|
| Warranty Costs | \$0.10 / sq. ft. | \$0.10 / sq. ft. |
| 30,000 sq. ft. | \$3,000.- | \$3,000.- |
| Value After 14 Years | Full Value (+) Inflation | \$44,000.- |
| Replacement Cost | \$158,000.- | \$158,000.- |
| Owner Out-of Pocket | \$0.- | \$114,000.- |

Figure 6.

ilar to a material warranty. Though there is nothing wrong with a manufacturer's defining a roofing system this way, it can be misleading.

As mentioned, the first part also lists what else may be included under the coverage of the warranty. Sometimes a manufacturer does not sell a specific product required for the assembly, but is unwilling to lose the sale of its assembly, so it lists these products on the warranty so as not to be excluded from the sale. This offers the flexibility necessary to keep the manufacturer in the running for winning the project. At the same time, the manufacturer may list products that it does not cover; or it may simply not list such products at all, leaving the building owner with a potential hole in his or her expected coverage. An example would be a membrane manufacturer's having the ability to sell all of the components of an architecturally specified installation except for the asphalt required for insulation attachment. In this case, the manufacturer may be willing to take responsibility for the asphalt by listing this component on the warranty. If the manufacturer does not want to cover the performance of the asphalt, he may still offer the warranty but list the asphalt as excluded from the coverage. Or the manufacturer will offer his warranty but simply not mention the asphalt at all within the warrantable components. Again, none of the above is wrong, but it does reinforce the need for a building owner to read and understand the warranty coverage.

The second part is

most often called "Terms, Conditions, and Limitations" of the warranty. This section of the warranty can include numerous phrases that should be looked at closely to understand what is being offered. In this section, the membrane manufacturer offers details on how he will assist in paying for repairs. Some of the most common phrases have been "prorated," "limited to original cost," and "no-dollar-limit" financial coverage. "Prorated" starts off with the original cost of the installation, and then that amount is reduced a percentage each year, based on the duration of the warranty. "Limited to original cost" limits the manufacturer's financial responsibility to the initial cost excluding any inflation that could happen over the long term. "No dollar limit" is the original cost with the inclusion of inflation. To see the difference between the two, Figure 6 shows an example of a 25-year prorated warranty versus a 20-year no-dollar-limit warranty. Even though the duration of the longer warranty is five years, upon a catastrophic failure's occurring at the 14th year, the replacement cost to the building owner is more than the original cost of the roof system. In this case, duration did not equal coverage.

Beaufort Wind Speed Scale

| No. | Category | MPH |
|-----|---------------------------|----------|
| 7 | Moderate Gale (near gale) | 32 - 38 |
| 8 | Fresh Gale (gale) | 39 - 46 |
| 9 | Strong Gale | 47 - 54 |
| 10 | Whole Gale (storm) | 55 - 63 |
| 11 | Storm (violent storm) | 64 - 72 |
| 12 | Hurricane | 73 - 136 |

Figure 7.

In addition to the method of handling a warranty payment, the second section of the warranty includes wind coverage. Wind speed coverage is a moving target. Historically, roofing system warranties did not offer this type of coverage. When it was thought to assist in the sales of the roofing system, warranties began to use words such as “gale-force winds.” The definition of this term can be found on *Figure 7*, a portion of the Beaufort Wind Scale.

Referring to *Figure 7*, one might be surprised to see that there are four different “gale-force winds.” The term, referenced in some warranties, is considered to be defined by the manufacturer as “fresh gale,” offering coverage up to 39-46 mph wind. Though the industry accepted this concept, owners demanded to know what the exact wind speed number might be, so some warranties started to actually list the wind speed as “not to exceed 55 mph,” which we can see on *Figure 7* is “strong gale” wind coverage. When longer-term warranties were introduced, they included an option of possible higher-wind coverage, so 72 mph was offered, which is one mile per hour short of a hurricane.

With the introduction of wind coverage, building owners and specifiers have become confused about how this might relate to building codes.²

The bottom line is that they have no relationship to each other. The IBC does not require a wind warranty on roofs—only that they meet the allowable uplift pressures determined and calculated by using ASCE 7. In this same respect, other components such as structural walls, decking, etc. must also meet this calculated pressure, but none offers wind-speed warranty coverage. Since this is the case, a warranty wind speed is not based on ASCE 7 or the ANSI/FM 4474 uplift rating test. Warranty wind speeds are typically based upon the manufacturer’s installation experience and the demands of the market.

In an attempt to reduce misunderstanding, roofing manufacturers can offer warranty wind speed coverage in miles per hour that equal the local wind speeds as published by ASCE 7. It is important to remember that ASCE 7 is referenced under the performance or quality assurance section of a bidding specification, while the warranty wind speed needs to be listed in miles per hour in the warranty section. If the requested wind speed coverage is not in the warranty section, the contractor will bid the

project at the minimum wind-speed warrant coverage offered by the manufacturer. Typically, when this is discovered, the roofing system has been installed and may no longer qualify for the higher wind speed warranty. See *Figure 8*.

Though manufacturers include higher wind speed coverage if requested, their standard coverage can be worded to limit their liability, while at the same time offering the illusion that they are covering more. An example of this would be not listing the miles per hour in the warranty but using words like “gale-force winds” (39-46 mph). Another example would be calling out wind coverage up to “Beaufort Scale #8” (39-46 mph). In both cases, the miles-per-hour coverage is hidden by words and must be clarified.

Wording, as to the location of wind speed measurement can also be creative. Most warranties are measured at “ground wind speed,” which is 33 ft. or 10 meters from the ground surface, the same height at

which airports measure wind speed. Some warranties have the phrase “rooftop wind speed.” The higher the roof area, the greater the wind speed, so if you are considering wind speed coverage, ground wind speed offers better coverage on a higher building. As an example, if the building is 30 to 40 ft. high, there is practically no difference in the coverage, but it can make a huge difference on high-rise roof areas. In *Figure 9*—on a 300-ft.-high roof area with a rooftop wind speed of 80 mph—the ground wind speed

ASCE 7 Basic Wind Speed Map – East USA

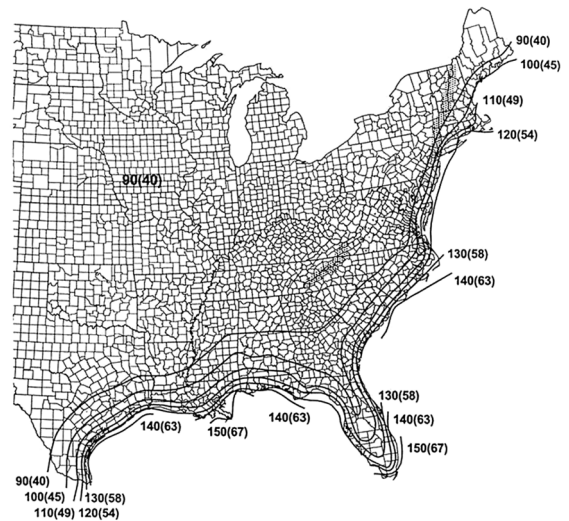


Figure 8 – Values are nominal-design three-second gust wind speeds in miles per hour (m/s) at 33 ft. (10 m) above ground for Exposure “C” category.

Rooftop Wind Speed Calculations

Exposure “C”
Ground Wind Speed (10 m or 33 ft.)

| | 55 | 72 | 80 | 90 | 100 |
|-----|----|-----|-----|-----|-----|
| 75 | 71 | 92 | 102 | 115 | 127 |
| 120 | 74 | 97 | 107 | 120 | 134 |
| 200 | 78 | 102 | 113 | 127 | 141 |
| 300 | 82 | 107 | 118 | 133 | 148 |
| 400 | 84 | 110 | 122 | 137 | 152 |

$$V_r = 0.854 \times W^{0.985} \times H^{0.108}$$

(Calculation developed by UBC)

Figure 9

would be 55 mph, while a ground wind speed of 80 mph would actually cover winds up to 118 mph for the same building.

EXAMPLES OF WARRANTY LANGUAGE

The examples that follow provide sample warranty wording that was discovered on different membrane manufacturers' Web site samples.

In one manufacturer's 30-year system warranty, the financial liability of the manufacturer was "limited to the original cost," so if the roof system cost \$100,000, that would be the maximum the manufacturer would pay. In addition, it was listed in the warranty that the owner pays for two inspections every five years in addition to any cost for repairs required by the manufacturer. This warranty did not list any wind speed coverage, so we can assume that if the roof system is damaged by any wind greater than zero, it is not covered under the warranty. And finally, this warranty was "nontransferable." Though most schools and government buildings typically will never transfer ownership, a warehouse or office building could change hands within the 30-year duration of the warranty, leaving the new building owner with no coverage at all.

A 25-year warranty sample found on the Web began by stating that this warranty only covered the membrane. If deterioration of the membrane were discovered, the manufacturer's responsibility is to ship and replace "defective" membrane. The cost to the manufacturer was limited not to exceed the original cost of the membrane and shipping to the building site. Though it did offer wind coverage up to full gale-force winds (46 mph), it was clear that it did not include any failure of the substrate under the membrane or failure of any other roofing components. How would wind cause the deterioration of the membrane? As a final note, the membrane manufacturer stated it would not cover the workmanship by the installer.

Another long-term warranty (20-year) requires the building owner to schedule inspections with the manufacturer after two, five, ten, and 15 years at the owner's expense. It did publish wind speed coverage less than 73 mph, which the Beaufort Wind Scale defines as being the lowest miles per hour for a hurricane. This warranty again was "nontransferable," and the coverage was "prorated," so a \$100,000 roof installation would lose coverage year after year.

| 20 Year Warranty | % Coverage | Cost of Installation \$100,000.- |
|--|-------------------|----------------------------------|
| 1 st – 10 th Year | 100% Total System | \$100,000.- |
| Estimate Material Cost at Installation | | \$15,000.- |
| 11 th Year | 80% of Material | \$12,000.- |
| 12 th Year | 60% of Material | \$9,000.- |
| 13 th Year | 40% of Material | \$6,000.- |
| 14 th – 20 th Year | 30% of Material | \$4,500.- |

Figure 10

One manufacturer published its warranty including similar language ("non-transferable" and "limited to the original cost"), but this 20-year warranty offered wind coverage with "gales excluded." Returning back to the Beaufort Wind Scale, we see that gale-force winds begin at 32 mph, so in reality, this warranty only offered coverage up to 31 mph.

Though there are many more warranty versions, the last one I offer is called a 20-year system warranty and for the first ten years has coverage very similar to a "no-dollar-limit" system warranty. But in the body of the warranty it states that after ten years, the warranty becomes a "prorated" material warranty (labor not included) and lists the actual percentage of coverage. Figure 10 gives an idea of financial assistance offered by the manufacturer, assuming the original installation cost \$100,000.

PHRASES TO LOOK FOR

When assisting a building owner in the design of the roofing system, to achieve the goal of durability, knowing the type of wording to look for in the warranty can be invaluable. Here are a few phrases that may be encountered:

- Whereas a material warranty will only cover the sheet goods of the roofing system, a system warranty typically is defined as covering all products offered by the manufacturer and includes the labor to install the referenced materials.
- Is the warranty to a new owner upon the sale of the building, or is there a limitation and stipulation that should be reviewed based on the owner's plans for the future?

- Wording within the warranty may require the building owner to pay for by the roofing material manufacturer, including any costs associated with repairs found necessary during those inspections.
- A notation of by the building owner, if not performed by the building owner, could void the warranty.

Though the above are some of the terms that should be reviewed closely, some of the more favorable language that should be included is listed below.


- The warranty offers " " that includes labor to install and repair, if necessary, and material costs.
- " " so that if a catastrophic problem occurs and it is at the fault of the roof system, replacement of the roof system will cost the building owner nothing.
- The warranty should be " " and there should be clarification of the cost and inspection requirements.
- Look for " " which should be listed in , and where the wind speed is measured should be specified.
- Depending on the building owner's needs, possible additional coverage, such as

should be included. This type of coverage is available but is not typically included in standard warranties. The building owner must have these needs referenced in the warranty section of the building specification.

In conclusion, the assemblies specified in association with a long-term warranty do offer durable options for the building owner. They promote thicker membranes, stronger substrates, and better-combined assemblies to match the length of the warranty and expectations of the building owner. Unfortunately, published warranties need to be reviewed closely to make sure they match what is being offered.

One way a specifier could assist the building owner would be to review the warranty section of the proposed architectural specification to make sure some of the favorable phrases listed earlier are incorporated in this section. Another would be to require a sample copy of the proposed warranty to be included with all bidding documents so that coverage can be reviewed along with cost. If anything within warranty wording seems amiss, based on the building owner's needs, clarification can be request-

ed in writing from the manufacturer to clear up any confusion.

Keep in mind, if one manufacturer's coverage is different from a competitor's, it can offer an assembly based on its warranty liability. The result could be a more cost-competitive system, with the building owner unaware of the potential loss of warranty coverage. With this information, the specifier can guide the building owner away from using warranties as design criteria and focus on quality materials, proper assemblies, and verifiable workmanship. 

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FOOTNOTES

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2. Marty Gilson and Brian Chamberlain, "Roofing Warranty Wind Speed Coverage Versus Local Building Codes, Local Wind Speeds, and FM Global: Solving the Mystery," Northern Illinois CSI link, May 2007.