

Choosing A Durable Roofing System

By Wayne Tobiasson

Indoor and outdoor climates influence durability, as do conditions during construction. Cost is almost always a very important aspect of choosing a durable roofing system, and life-cycle costs are the most important costs to consider. The word “sustainable” connotes preservation of the environment. A host of other issues must be considered when the aspect of sustainability is included in the decision-making process. Governments have enacted environmental laws that limit choices, but governments have also contributed research and development funds that have helped advance the roofing industry. A vast array of information is available to assist in choosing durable roofing systems, some of it contradictory. Less risk is involved when proven roofing systems are chosen. Careful consideration of details also can significantly reduce risks. For most situations, a few systems are available that will provide excellent durability. The trick is to avoid the materials and systems that are unsuitable for each situation. Choosing a durable roofing system is a challenge.

Introduction

In choosing a durable roofing system, it is important to know the climate of the place, since the system must endure the climatic stresses imposed upon it (e.g., by wind, snow, solar radiation, and temperature extremes) or fail (Figure 1). The conditions to be expected during construction are also important (Figure 2). It is not easy to build a good roof when it is wet, windy or cold. Some roofs are much more sensitive to application conditions than others. The conditions inside the building are also a factor, the key issues being pressure, temperature, and relative humidity (Figure 3). Deterioration from indoor moisture is much more likely for a wet occupancy, such as a bakery, than for a dry occupancy, such as a hardware store.

Cost is almost always an important issue. It is wrong to think only in terms of first cost, since the real cost of any system is the total cost over its useful life (i.e., its life cycle cost). Thus, costs to maintain, repair, and replace a system should be considered. All roofing systems need a certain amount of preventive maintenance, some more than others (Figure 4). If the owner is insensitive to the need for maintenance, some types of roofing systems should not be considered.

Durable vs. Sustainable

My dictionary defines “durable” as “having the quality of lasting or enduring; not easily worn out or decayed.” “Sustainable” is defined as “enduring without giving way or



Photo 1: Wind damage to a fully-adhered single-ply membrane.



Photo 2: Snow removal from a deck in preparation for roofing.



Photo 3: Condensation on the underside of standing seam metal roofing.

yielding; to keep going.” Both words mean about the same thing, and that meaning is strongly tied to time. Thus, in choosing a durable (sustainable) roofing system, issues like service life, life-cycle assessment, and cradle-to-grave thinking should be considered.

In today’s environmental lexicon, “sustainable” also means to use natural resources wisely; to preserve the environment. Nowadays, to build an environmentally sustainable roof, we are tasked to protect Mother Nature as well as defend against her. The extent to which each of us will adjust our choices to accommodate environmental sustainability varies considerably (i.e., we have different sensitivities to environmental issues). When the sustainability issue is added, a broader range of choices is to be expected when we are free to make our own decision. Government regulations relative to the environment, however, (e.g., the Montreal Protocol) now create many restrictions on what we can choose.

The government is involved in directing our choices—not only by forcing compliance, but also by collecting and disseminating information of benefit to the industry. The National Bureau of Standards (now the National Institute for Standards and Technology) and other governmental agencies, including the one I recently retired from, have made important contributions to the roofing industry. Increasing use is being made of cooperative research and development agreements between government and industry. Such ventures are addressing important issues of interest to us all. Many of these ventures are being conducted at Oak Ridge National Laboratory.

Sources of Information

A mountain of information is available to help in choosing a durable roofing system. Some of it is in the form of regulatory documents such as national standards, building codes, and government regulations. Other information is in the form of studies, reports, manuals, books, and other compilations by experts in the field. Many important documents

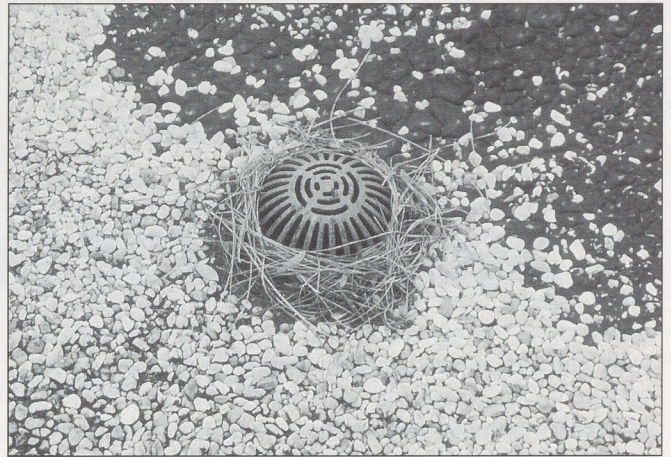


Photo 4: Periodic preventive maintenance is needed to clear drains and such.

are available from trade associations, such as the NRCA and RCI (Figure 5). Excellent short courses on many aspects of roofing technology are available from educational institutions, such as the Roofing Industry Educational Institute (RIEI).

Manufacturers’ literature is another essential source of information. However, like my own resume, it tells of great things accomplished without saying much about limitations and weaknesses.

As information on roofing is accumulated, a number of contradictions stand out. Are vapor retarders needed? Can breather vents dry out wet insulation? Where should expansion joints be placed? Such issues often can be resolved when measurements in the database are separated from opinions with no supporting data. On the other hand, it is unwise to dismiss the points of view of people who work on roofs every day without conducting controlled tests. The written database is vital, but it also can be overwhelming at times. In this rapidly changing industry, it takes considerable time and effort just to keep abreast of current events. Attending conferences, seminars, and workshops such as RCI’s is another way to keep up and avoid the numerous

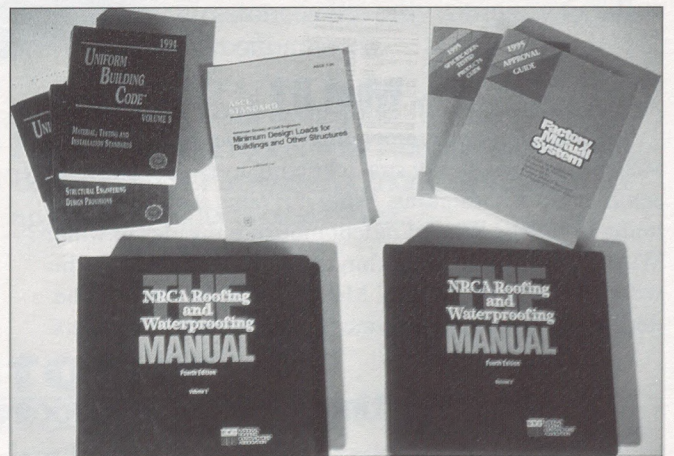


Photo 5: Code and standards manuals and FMRC approval guide.

pitfalls present on the path to choosing a durable roofing system.

Materials and Systems

Things do not get any simpler when the papers are set aside and the products themselves are examined. A vast array of roofing materials and systems is available. Since many incompatibilities exist, it is usually best to use systems that have been used before, rather than invent new systems from the myriad of materials available. However, every industry needs pioneers who will take risks to break new ground. It is fine to be a pioneer as long as you understand that additional risks are being taken and as long as you do your pioneering at the right place and time. As the three little pigs found out, some ways of building are more durable than others.

When materials or systems do not perform as expected or mistakes are made, high prices often must be paid. We live in a litigious society. We engineers get blamed for creating

this mess of fallible technology, and the attorneys get blamed for the way people beat up on each other when things go wrong.

Among the salmon laying eggs in Alaska's streams are trophy rainbow trout coveted by fishermen. The "bows" are after

salmon eggs. An egg with a leach attached is supper and dessert to a rainbow, and the egg-sucking leach fly (Figure 6) is deadly. Alaskans have nicknamed it "The Attorney."

In fact, we are all collectively to blame for the difficulties we sometimes get into. All of us also deserve credit for keeping things going as well as they do in this changing world.

What if?

In choosing or recommending a roofing system, I find it valuable to periodically stop, close my eyes, and engage in some "what if?" thinking. What if it rains as the system is being installed? What if indoor moisture invades in winter? What if seams leak? This thinking helps me focus on the weak links and the details. Most of us agree that it is the details that usually determine the winners and the losers.

Starting Fresh

It is a difficult, complicated job to choose a new roofing system, but it is a much more difficult and complicated matter to choose a system that will work over an old system

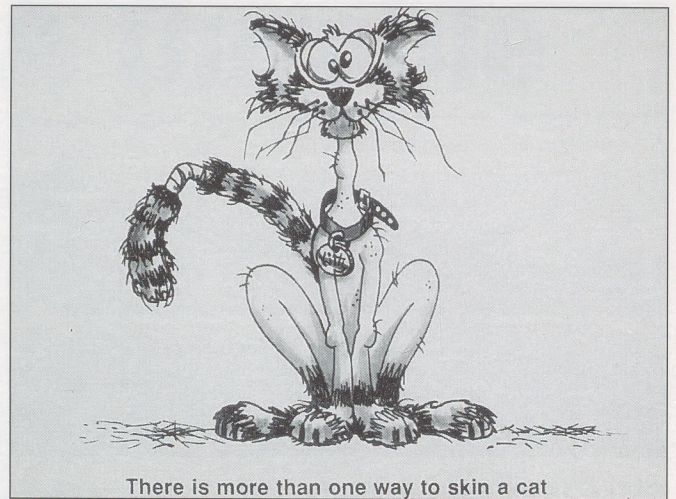


Photo 7: Usually, there is more than one way to skin a cat.

with problems of its own. There are many incentives, several of them environmental (e.g., less landfilling), for keeping existing systems in place and reroofing over them rather than carting them away. But there are also serious durability issues to consider when wet insulation, corroded fasteners, split membranes, and such are left in place.

Summary

The good news is that in most situations, there are several alternatives that offer excellent durability (i.e., there is usually "more than one way to skin a cat" (Figure 7). The bad news—or the challenge—is that for most situations there are countless unsuitable materials and systems. That is what makes the job of choosing a durable roofing system so interesting. The papers that follow have many very interesting aspects of this challenge to share with you. I am sure they will "sustain" your attention.



Photo 6: The "deadly" egg-sucking leach fly.



About The Author

Wayne Tobiasson was the keynote speaker introducing the subject of Sustainable Roofing at RCI's 12th Annual Convention and Trade Show. His speech was previously presented and published as a part of the Proceedings of Sustainable Low-Slope Roofing Workshop at the Oak Ridge National Laboratory and is republished here with ORNL's permission.

Wayne is a civil engineer, having recently retired from the U.S. Army Corps of Engineer's Cold Regions Research and Engineering Laboratory (CRREL) in Hanover, NH. He is a member of the American Society of Civil Engineers, has been a member of the faculty of RIEI, and is an honorary member of RCI.