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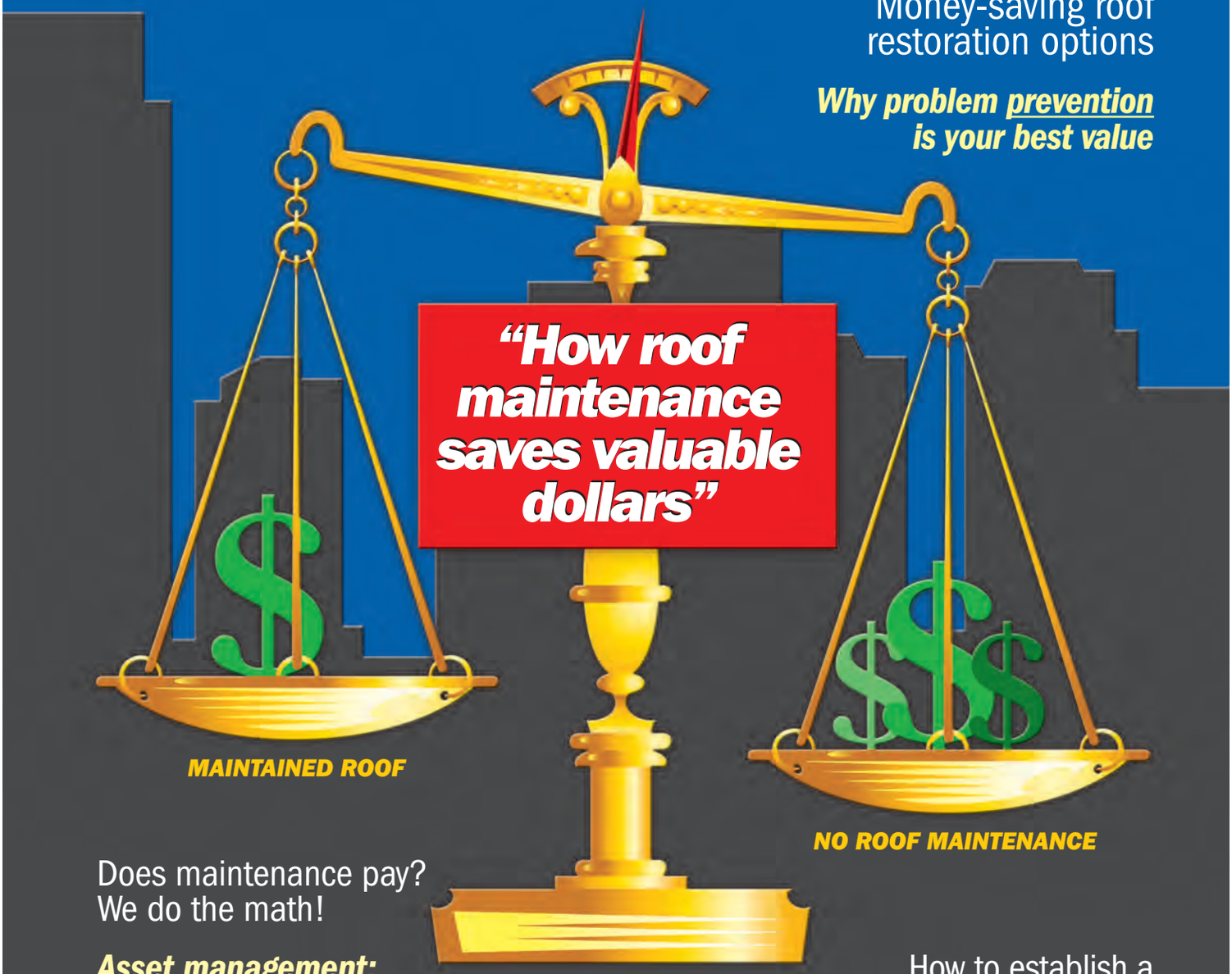

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Roofing Solutions

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GAF Materials Corporation is North America's largest roofing manufacturer, with more than $1.6 billion in sales. Founded in 1886, GAF's success is based on delivering on two simple promises: helping residential and commercial property owners get their best and safest choice in roofing; and helping distributors and contractors build their businesses while avoiding hassles. GAF's proud tradition of innovation and excellence has made it one of the most respected roofing manufacturers in the world.

Since 1945, more than 23,000 contractors have relied on RSI Magazine for timely news, technical and business management information. RSI is a winner of the Jesse H. Neal award for excellence in reporting—the business equivalent of the Pulitzer Prize. RSI's parent company, Advanstar Communications, is a worldwide business information company with 92 top business publications, 79 tradeshows and conferences, and a wide range of direct marketing, database and reference products and services.

Founded in 1886, the National Roofing Contractors Association (NRCA) has 5,000 members located throughout the United States and in more than 50 countries worldwide. NRCA provides technical, safety and health information to its members; advocates on their behalf in Washington, D.C.; publishes a variety of training and educational materials; and sponsors the largest convention and trade show in the industry. More information about the association is available at www.nrca.net.

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The Roof Consultants Institute (RCI) is an international collective of architects, engineers, and former contractors who as roof consultants specialize in the specification and design of commercial roof systems. For 20 years, RCI members have offered unbiased roofing design, repair planning, quality observance, legal testimony, and general roof management services. For more information about the Roof Consultants Institute, call 800-828-1902. You'll receive a free copy of the International Directory of Roofing Professionals—a handy reference guide that lists contact information for RCI members in your area. You can also visit RCI online at www.rci-online.org.

CARE is the Center for the Advancement of Roofing Excellence, an educational organization sponsored by GAFMC, U.S. Intec, and BMCA. CARE is dedicated to changing the roofing industry through excellence in education and sponsors a wide variety of industry seminars for contractors, distributors, architects, specifiers and building owners. CARE runs three full-time training centers in Walpole, MA, Ontario, CA, and Michigan City, IN. Part-time education centers are located in Baltimore, MD, Tampa, FL and North Branch, NJ.

Buildings magazine is the information resource for major building owners and facilities management and development professionals involved with commercial, institutional, and government facilities. It offers a unique editorial mix of company profiles and projects; how-to and solutions-oriented articles on processes and products; and monthly columns dedicated to covering issues that most directly impact commercial facilities professionals.

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Why Roof Maintenance Pays

How to Set Up a Roof Maintenance Program

How roof maintenance can work for you

Welcome to RSI Magazine's Commercial Roofing Solutions pocket guide on roof maintenance—a reference designed to help you get more life out of your current roofing system.

The goal of this guide is to prove that roof maintenance pays. An "out of sight, out of mind" attitude toward roofing systems is dangerous. It's also poor asset management. Too many owners and managers have been burned by premature roof failure. When water starts entering the building, hard assets, corporate profits—and reputations—start taking a beating.

The pain may be real, but it still isn't easy convincing yourself, or others, that budgeting for roof maintenance makes sense.

That's where our Commercial Roofing Solutions guide comes in. Through life-cycle cost analyses, case histories, testimonials, and expert opinions, we've made a case for roof maintenance. And you don't have to be a roofing expert or CPA to understand it all.

The contractor is key

If you are a building owner or facilities manager, then you've probably been given this guide as part of a bid proposal or sales package by one of RSI's 12,000 commercial roofing contractor readers.

RSI's circulation represents the elite of the commercial roof contracting market. This is important in an industry where some contractors are forced to close their doors before the roof systems they install reach the end of their service lives. RSI's readers have been in business an average of 25 years—many far longer. Most are second, third or fourth generation, family-owned and operated businesses and members of the National Roofing Contractors Association (NRCA), or a state or regional group. RSI's circulation qualifications are rigorous, so if you've been handed this guide by one of our readers, he or she is someone you can trust.

Likewise, the editorial contributors to this guide have spent nearly all of their professional lives writing, reporting and working in the commercial roofing industry. Our editorial staff has no agendas or axes to grind; we tell it like it is.

This entire project was bankrolled by GAF Materials Corporation, America's largest roofing manufacturer. GAF's corporate philosophy is unique in the roofing industry: to build trust through education. Their ultimate goal is to become a "world-class" company in what has always been a commodity industry. This guide is their brainchild, but the information contained herein is as generic as possible.

The CARE logo appears on the cover of this publication and on each editorial page. CARE is an educational organization funded by GAF. The truth is we had to twist the company's proverbial arm to give it any sort of credit for this undertaking. It's an attitude we like, and it's allowed us to keep the technical information as objective as possible.

The industry is changing

One area that has always been neglected by roofing contractors, and the industry in general, is roof maintenance. According to RSI's surveys, only 28% of installers offered owners a roof maintenance program in 1995. Today, almost 75% offer these services.

With bottom-line profitability so important, corporate executives who are looking long-term can squeeze more money out of the roofs over their heads. Facility managers can look like heroes instead of profit-spenders. Roof maintenance pays. Read on, and let us prove it to you.

—Mike Russo, Editor

"An 'out of sight, out of mind' attitude toward roofing systems is dangerous. It's also poor asset management."

Why Roof Maintenance Pays

Don't live a roofing nightmare

BY MIKE RUSSO · RSI EDITOR/ASSOC. PUBLISHER

It's hard to understand why some building owners remain in denial as the roofs over their heads deteriorate. I have a friend in the roofing industry who's living his own roofing nightmare right now.

As I sit with him in his office, we catch ourselves looking up at an exposed roof deck above a suspended fabric ceiling. After an unusually wet year in Northeast Ohio, we know the 2.5 inches of composite board insulation are saturated and the seams of this once proud PVC roof are opening. I've walked the roof with him and wondered what became of the striking, sloped single-ply membrane we all admired when this building first opened in 1982.

This roof graced the cover of our inaugural issue of Roof Design in March 1983, and now it's in tatters. It leaks—primarily over the computer room, a temperature-controlled "nursery" that houses rows of sensitive mainframes. Employees in that section of the building are moving their desktops around, dodging the drips. The scene is reminiscent of all those roofing ads we've seen with the pails and umbrellas. Except this is happening to them, and it isn't funny.

Mike Russo

Even more disturbing is the fact that the managers responsible for this property are in no rush to do anything about it.

At the risk of getting flak from these same managers, who read RSI, we'll review how they rolled over and into this wet spot in the first place.

Simply put, this Ohio company was spoiled by the superior performance of their reinforced PVC roof. If not for its strength and the roof's considerable slope, they would have been in this situation years earlier. But the roof gave its owners a false sense of security. Despite warnings from the building manager, they paid lip service to roof maintenance. The roof was cleaned—for aesthetic purposes only—regularly during its life. The only real repairs ever made were on the flashings around the skylights. Unlike most roof membranes, skylights typically leak—early and often. Needless to say, if the company spent about $0.30 per square foot five years ago for a remedial restoration—maybe seam repairs and a coating—it wouldn't be facing a complete roof tear-off today.

There's an old saw heard often in the roofing industry: A roof accounts for only 10% of the total cost of constructing a building, but 90% of its problems down the road. If this is true, then this company got away easy. It spent nothing on roof maintenance for more than 20 years. But now it is faced with disposing of 60,000 square feet of soggy, mechanically attached insulation and PVC roofing.

'Despite warnings from the building manager, this company paid lip service to roof maintenance.'

What went wrong?

Managing a commercial facility is much like running a business. The key fundamental concern is cash flow. Successful business owners ensure that their companies flourish by using strict financial controls. In other words, they work to keep expenses down while maximizing the cash-generating functions. In this regard, the managers of this particular company were experts. Unfortunately, major roof repairs were deferred for too long.

Even smart business owners and facility managers make costly mistakes when it comes to roof maintenance—or the lack of it. The goal of this special supplement is to prove to you that maintenance does pay. **RSI**

TESTIMONIAL:

A preventive maintenance "program is "very cost effective," says Jennifer Galvin of Galvin Realty, in Upstate New York. "It's cost saving, and our contractor takes very good care of us."

Why Roof Maintenance Pays

Problem prevention is your best value

BY DICK FRICKLAS · RSI CONTRIBUTING EDITOR

Business guru Peter Drucker recognized the true value of a roof system

Some 10 years ago, business guru Peter F. Drucker published an article in The Wall Street Journal entitled, "We need to Measure, not Count." The thrust of the article was that traditional cost accounting does not take into account the cost of nonproducing. He proposed activity-based accounting as a better alternative.

Dick Fricklas

To translate this into a roofing context, traditional accounting methods would consider the capital cost of a new roof system, and might even consider the Operating and Maintenance costs of keeping that roof going. This tends to seek the lowest cost roof that will do the job, or perhaps a more sophisticated owner might even compare options on a life-cycle basis.

Mr. Drucker suggests we could do more. Consider the scenario where a reasonably priced roof is installed by a reputable contractor. The life expectancy is 20 years, and a life-cycle comparison has indicated the best value. The roof budget would be prepared as part of an overall corporate plan.

But in Drucker's context, let's look at a potential case where all does not go as planned. A severe storm moves through, with wind gusts reported to 100 mph, and hailstones as large as 2" in diameter.

This severe hail causes many punctures in the roof system, and the presence of hailstones causes temporary blocking of the roof drains. Even worse, the metal edging on the corner of the building facing the wind has failed, and 40 squares of roofing along that edge have peeled back.

This results in considerable water entry, damaging critical components, including inventory, electrical systems and computers. The building is out of operation for two weeks. Orders are unfulfilled, sending customers to seek other sources.

As Mr. Drucker might ask, Where are these costs in the overall accounting program? Had some "best guess" costs been applied, things might have been different.

Mr. Drucker's article is aimed at converting those businesses that use traditional accounting methods to incorporate these new measurements. When the critical true value of the roof system is recognized, we'll build better roofs and take better care of them. **RSI**

What "wears out" roofs?

- **Exposure...**
  Either long-term exposure to the elements (sun, water, freeze-thaw) or shorter-term exposure to damaging air pollutants and chemicals
- **Structural Movement...**
  Such as building settlement or expansion/contraction not accommodated by the roofing system
- **Biological Growth...**
  Such as vegetation in areas of standing water or algae
- **Not Fixing Problems Promptly...**
  These can add up to a much shorter roof life – e.g., if a small problem is not repaired, then a large amount of insulation can be damaged
- **Forgetting About Maintenance...**
  This is perhaps the single biggest cause of premature roof failure
- **Change in the Use of the Building...**
  e.g., an increase in the interior relative humidity of a building can cause severe condensation problems within the roofing system

Why Roof Maintenance Pays

Making a case for Roof Maintenance

BY ROBERT W. LYONS, FRCI · LYONS / WALDRON CONSULTING GROUP, LLC

In this period of tough economic pressure and uncertainty, it is imperative for building owners and anyone in the facilities maintenance and management profession to spend their monies wisely and manage their facility assets properly. The ultimate goal should be to achieve maximum service life at the least possible cost. For this reason, life-cycle costing has never been more appropriate.

Frankly, we live in a world looking for short-term, quick fix solutions. We often compromise the end-goal by taking the road of least resistance. When it comes to our commercial roofing portfolios, we frequently have the misconception that if our roofs are not leaking, we don't need to bother with them. This out-of sight, out-of-mind perspective is one of the root causes for premature roofing failures. We need to adopt a proactive roof maintenance protocol to ensure the maximum service life from our roofing system, and to reduce the collateral damage caused by leaking roofs at our facilities.

Starting fresh

If a building owner starts out with a problematic roofing system, the situation typically goes downhill from there, creating a maintenance nightmare. So let's assume we are starting out with a reasonably good roofing installation as part of a new construction process or a complete tear-off and reroofing.

Our goal is to immediately—from year #1—take on a preventive maintenance program to ensure the maximum service life of this good roof.

Additionally, with the new long-term warranties that most building owners desire (10 years +), you are contractually responsible to perform annual (or semi-annual) roof inspections and the associated repairs in order to maintain the terms of your extended warranty. These reports should be filed with records of the corrective work that has been performed. There are numerous roof management database programs available to help streamline this process (see "New tools help owners track roofing assets," later in this Guide).

Progressive roofing manufacturers like GAF are also offering building owners incentives for scheduled maintenance. The company's Well Roof Advantage program will extend a Diamond Pledge guarantee at no cost for a term equal to 25% of the original guarantee length when a GAF roof is inspected and maintained by a Master Select Roofing Contractor.

As far as cost, roofing industry experts say that a building owner should budget a minimum of $0.05 per square foot per year for preventive maintenance (beginning in year #1) for their commercial roof; and that at periodic intervals during the life of the roof, they would be advised to spend as much as $0.25 per square foot for a more extensive remedial restoration.

Economic models support that the payback for these types of expenditures can be significant in helping to reduce the frequency of reroofing and the large capital expenditures they create. In the process, it is feasible to extend the life of a 10 year+ roofing system to a 20-year roofing system, or longer.

There have been many innovative roofing systems developed for the commercial roofing market in the past decade, and there have been even more new products developed for the ongoing maintenance and restoration of these systems.

GAF's TOPCOAT restoration system, for example, offers a 10-year warranty with 100% coverage against material defects. With 85%+ reflectivity, this can mean up to $70,000 in energy

Managing your company's roof

1. Use life-cycle costing to assure maximum roof service life.
2. Adapt a pro-active roof maintenance protocol.
3. Perform semi-annual roof inspections and repairs.
4. Budget a minimum of $ .05 per square foot per year for preventative maintenance (beginning in year #1).
5. Budget $0.25 per square foot for a more extensive remedial restoration.
6. Track all collateral building damage and incidental costs associated with leaking roofs.
7. Show management how past collateral damage costs exceed the cost of implementing a roof maintenance and management program.

What can cause immediate problems?

▶ **Extreme Weather...**
Lightning, high winds, hail, drenching rains that overflow the flashing heights

▶ **Equipment Additions...**
Improperly added equipment or other items improperly added on the roof (items added by tenants are a very common source of roofing problems)

▶ **Trade Damage...**
Punctures, holes, etc. caused by trades other than your roofing contractor

▶ **Unintended Abuse...**
Vandalism or accidental damage…even a small hole can let in a large amount of water into the roofing system

saving over a 15-year period on a 50,000 square foot roof. Moreover, the system is proven, with more than 15 million square feet installed since 1979.

The coatings industry has taken a leadership role in the development of many of these new restoration systems, and the prognosis looks favorable on their performance in the field. Built-up roofing systems, single-ply roofing systems, modified bitumen roofing systems, and metal roofing systems all now have coating and restoration systems that have been developed for the purpose of extending their service lives.

One of the short-sighted ruts that building owners have gotten themselves into is waiting too long to initiate any kind of a proactive roof maintenance and management program. This only cheats them out of realizing the full potential service life of any of their roofing systems within their overall portfolio.

To help get buy-in and support from your senior management team, we would recommend that you begin tracking all collateral building damage and incidental costs associated with having dysfunctional, leaky roofs. Often, the collateral damage costs greatly exceed the cost of implementing a roof maintenance and management program.

To help provide a list of costs and expenses to track, your company CFO can provide you with:

- Costs of damage to building interiors (furnishings & fixtures)
- Costs of damage to merchandise and inventory
- Costs of damage to equipment (computers, electrical, HVAC, etc.)
- Costs from lost use of space
- Costs and exposure to issues of air quality and work environment
- Costs of legal claims ("slip & fall" accidents)
- Costs of water damage clean-up
- Costs of energy loss through wet and damp roof insulation in both the heating and cooling seasons
- Costs of business interruption
- Costs associated with higher insurance premiums due to more frequent claims arising from water damage
- Costs of premature roof replacement

We are firmly convinced that if more facility managers would track and report these collateral damage expenses, they would have less resistance to getting the resources they need to establish a model roof maintenance and management program.

There is a false economic perspective that is pervasive in this area. It is not a question of will you spend the money; it is more of question of when, where and how you will spend the money on your roofs.

The good news is that it costs less to be proactive than reactive. And it does help to reduce the stress. And who among us could not benefit from a little budget savings and stress reduction? **RSI**

Bob Lyons is principal of Lyons / Waldron Consulting Group, LLC, and has served in the roofing industry for almost 30 years. He is the co-founder and 1st Two-Term President of the Roof Consultants Institute (RCI). Lyons received the distinguished first Fellow of the Institute award. He has been a faculty member of the Roofing Industry Educational Institute (RIEI) for more than 15 years. In 1997, he was elected to the board of directors of the Professional Retail Store Maintenance Association (PRSM). Contact Lyons at 800-630-9578 or email him at lyonsrobertw@aol.com.

Why Roof Maintenance Pays

Is maintenance a good investment?

Try the math

Roofing systems are assets, and have a finite life expectancy. Life spans have ranged widely from as little as five years to documented cases of 50 years or more. However, most membrane roofing systems will be replaced or can expect to receive significant renovation in less than 20 years.

Figure 1

Assumptions

Roof Size: 100,000 square feet
Study Period: 20 years
Cost of Initial Roof System: $300,000
Hurdle Rate: $10%
Roof Replacement Cost: $500,000
Leak Repairs: $750 each occurrence
Interior Damage from Leaks: $500 each occurrence
Wasted Energy: $1.08/ft./year
Inspection Program: $1,000/year
Visual Surveys: $1,000/Year
Moisture Surveys: $5,000 each

Few people would purchase a new car and not change the oil to protect their major investment. Unfortunately, once an investment is made in a roof system, the roof is out of sight and is unlikely to get much thought until there is a problem. By then, damage may be extensive.

It takes good financial controls and a corporate commitment to ensure that the roof is maintained. The good news is that the payback can be spectacular over the long-term. (Please see Figure 2).

Crunching the numbers

The goal of this study is to express, in financial terms, the value of Roof Maintenance Management. Still another goal is to enable the roof to perform its primary mission: to protect the interior of the building.

Another goal is to conserve energy by keeping the insulation dry. Since wet insulation loses effectiveness, a dollar value can be assigned to this wasted fuel cost.

The long-term presence of wet roofing materials can have other consequences. In its most dramatic manifestation of neglect, roof decks have failed, endangering roofing workers and/or occupants beneath. Disintegrated components such as rotted nailers and corroded insulation fasteners, have contributed to catastrophic wind blow-off.

Before we begin our financial analysis, let's address some of the frequently asked questions pertaining to Roof Maintenance Management.

Figure 2

Roof Maintenance Alternatives	Reactive (1)	Moderate (2)	Aggressive (3)
Capital	$800,000	$625,000	$300,000
Leak Repairs	$21,000	$9,000	$5,000
Total Consequential Costs	$4,984	$2,566	
Total Asset Management Program Costs		$41,000	$58,000
Preventative Repair Costs		$2,250	$4,500
Total Repair Consequential & Management Costs	$25,984	$54,816	$67,500
Total Investment Value (Net present value)	$503,921	$394,756	$284,928
Uniform Capitol Recovery	$40,436	$31,676	$22,863

How much should we be spending on our Roof Maintenance Program?
Before we answer this question, let's see what we'll need:

1. Visual surveys—roofs should be visually examined twice a year. Damage surveys should be conducted after periods of violent weather or after a roof has been subjected to construction traffic.

2. Moisture surveys—insulated roofs should also be surveyed by nondestructive means on a periodic basis. This might be on a 2-5 year interval, as well as just prior to making major decisions on the fate of the roof system.

Step #1
Roof maintenance program costs:
$0.10-$0.15 per square foot, per year.

Including the overhead to manage a moisture survey program, 10 to 15 cents per square foot, per year, is not unreasonable.

An owner who plans to perform sizeable repairs on older roofs might expend 45-50 cents per square foot for labor and materials.

For comparison with roof management, here are some estimates for roof replacement:

Tear off and install a new roof.....$2.50-$3.50/ft²
New construction.....$2.00-$3.00/ft²
Recover.....$2.25-$3.25/ft²
Wood deck replacement.....$1.50/ft²
Steel deck replacement.....$3.50/ft²

Start-up costs for an effective Roof Management program would include:

- Acquisition of software
- Acquisition of hardware
- Operator and inspector training
- Acquisition of the initial detailed database
- Establishment of an emergency plan

In the event of a catastrophe, an Emergency Plan would include a 24-hour directory of key personnel, establishing an initial inventory of repair materials, having a cache of tools, tarps, buckets, wet vacs and other emergency gear, and having a 24/7 contact with a local roofing contractor. Costs should include training of personnel.

Is Maintenance Management worth the cost and effort?

That is the crux of this article. We will follow a "textbook" example1 for correct protocol.

Step #2

Study Parameters:

Study Period = 20 years
Roof Area = 100,000/ft²
Cost of Initial Roofing System = $300,000
Hurdle Rate = 10%

A Life-Cycle Study

Approach #1: A Passive Program

- No formal maintenance program
- Repair roof only when it leaks
- Take no precautions to protect roof warranty
- Replace roof at end of 10 years

Assumption—Capital Costs

- Installation cost.....$3.00/ft² = $300,000
- Replace cost.....$5.00/ft² = $500,000*

*Assume total removal due to wet insulation, as well as some corroded decking and rotted nailers.

Assumption—Maintenance Costs

- Inspection program = none
- Leak repair @ $750 each by roofing contractor

We will assume no leaks or repairs for two years (contractor warranty usually lasts two years). From year 3-7, we will assume one leak/repair per year;

By year 8, the roof condition is worsening, and the roofing contractor is called back twice—three times in year 9—and four times in year 10. By now, we are sufficiently frustrated that we decide to tear the entire roof system off and start the cycle again.

Assumption—Wasted Energy

Compare the 'R' value of wet insulation material to dry and calculate the "excess" fuel used during both the heating and cooling cycle.

Assumptions—Fixing Leaks

Since we have no maintenance program, we must bring in a roofing contractor at $750.00 for each callback. Repairs begin in year 3 and accelerate in years 8-10. The cycle repeats for the second roof.

Assumptions—Interior Damage

While we allowed for some deck, insulation and nailer replacement in the reroof during year 11, there is interior damage as well. We have estimated the cost at $500.00, incurred in years 5, 8, 11 (after installing new roof), 15 and 18.

Step #3

Life Cycle Cost Analysis:

The total investment (net present value) for the Passive Maintenance Program is $503,921.

Approach #2: Active Maintenance Program

- Moderate Maintenance Program
- One visual survey per year
- Moisture survey only at year 15, prior to recovering
- Damaged areas repaired, rather than just "patched"

Assumption—Capital Costs

- Initial cost .....$3.00/ft² = $300,000 (year 0)
- Replace cost*...$3.25/ft² = $325,000 (year 16)

*Recover: Old roof left in place, wet areas removed

Assumption—Maintenance Costs

- Inspection program overhead.....$0.01/ft² = $1,000/year
- Visual survey (once/year).....$0.01/ft² = $1,000/year
- Moisture Survey (year 15 to determine extent of wet insulation).....$5,000 each
- Leak repairs by trained crew.....$250 each
- One repair each year from 3 to 15, 17 to 20
- Interior damage.....$500 each (Repairs in years 7 and 16 only)

Assumption—Wasted Energy.....$1.08/ft2/year
One new leak (about 5' x 5' in area) in years 3, 5, 7, 9, 11, 13, 15, 18 and 20

No moisture survey is conducted, except in year 15 (to prepare budget for re-cover in year 16). Even though leakage is minimized, some wet areas occur and are undiscovered.

Approach #3: Pro-Active Program (Recommended)
- Visual surveys twice per year, plus after severe storms at .01¢/ft² each
- Moisture surveys on a 3-year cycle at .05¢/ft² each
- Maintain data base, manage roofs and warranty service at .02¢/ft²/year

Assumption—Capital Costs
- Initial cost.....$3.00/ft²
- Replacement in year 21 (not part of study period). By properly repairing the roof promptly and detecting wet materials, we are able to recover in year 21 with virtually no deck, nailer or insulation replacement.

Step #4
Roof maintenance saves $218,993 in Year 21, which can be put toward the cost of a new roof.

Assumption-Maintenance Costs
- Visual surveys.....$0.02/ft² = $2,000/year
- Repairs at $250 each
  (In every year, starting in year 3 when contractor's warranty ends)
- Moisture survey.....$0.05¢/ft² = $5,000 each
  (In years 3, 6, 9, 12, 15, 18)

ANNUAL COSTS DEPRECIATION
For corporations that are not tax exempt, depreciation may be an important factor. As part of the tax reform bill of 1993, depreciation of structures completed (or roofs capitalized) after May of 1993 must use straight-line depreciation over 39 years (previously 31.5).

SUMMARY OF THIS LIFE CYCLE EXAMPLE
Assuming a new roof is installed in year 21 at a cost of $325,000, the $218,993 saved (Total Investment Value) compared to a passive maintenance program will pay 67% of the cost of the new roof.

Example #3 with a conscientious Roof Maintenance Management Program reduces the annual roofing costs of this 1,000 square

After Year 21, roof restoration is another option if the roof has been well maintained.

Step #5
An aggressive roof maintenance program reduces annual roofing costs by $17,573.

roof from $40,436 to $22,863—a savings of $17,573 (17.6¢/ft2) each and every year over the 20-year study period.

This example provides a credible method of finding the best value for a building system. We are confident that your analysis will also show that roof management is always a good investment. **RSI**

References

ASTM E917: ASTM, 100 Barr Harbor Drive, W. Conshohocken, PA 19428-2959, www.astm.org.

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Proof that roof maintenance pays big dividends

Or, how not to lose $0.15 per square foot per year on your roofs

BY CHUCK MARVIN, RRC

Case history: the Polygram Facility

In July of 1996, the Polygram facility was approaching 20 years of age. Excluding air handling equipment, there had never been more than a couple of minor roof leaks at any given time. The vast majority of time, the facility was leak free during rain storms due to an aggressive roof maintenance program.

How much benefit was realized from the aggressive maintenance program for this building?

The answer is a great deal (see charts).

Polygram Facility

Roof Size: 220,000 square feet

Cost of aggressive roof maintenance program:
$0.03 per year

Roof and related costs *without* a maintenance program:
$0.15 per year

Annual cost to owner of not having a roof maintenance program:
$54,700 per year

Why roof maintenance worked

The Polygram story begins with its original roof survey, including an infrared scan, that located and defined six wet areas of insulation. Each subsequent year, up to three new wet areas were discovered until the last year, when the number jumped to six.

Each year all wet insulation was replaced and new roofing installed. The cost of this restoration process is a valid factor in selecting a maintenance approach. Wet areas average out to be about 30 sq. ft. The largest one identified was in 1988 at only 120 sq. ft. This means they were repaired while still small.

Based on the facility being approximately 220,000 sq. ft. and the program being provided over a seven-year period, the cost is only $0.03 per sq. ft. per year. Remember also that this program was started after the roofs exceeded 10 years of age. The earlier years are typically much less costly and would pull this average lower still.

This $0.03 per sq. ft. number is exactly the estimated cost Dennis Firman suggested based on his experience with more than 600 million sq. ft. of roofing with the U.S. Air Force. A review of five other clients conducting this type of aggressive maintenance program for at least five years also proved to be around this $0.03 number. It is accurate to say the cost of an aggressive maintenance program will fall between $0.03 and $0.04 per year, per sq. ft.

The costly alternative

Firman suggests the choice not to have maintenance program can cost an owner as much as $0.15 per sq. ft., per year. Based on this estimate, the owner would be losing $33,000 per year. If only a fraction of this amount is correct, the cost savings more than offset the most aggressive maintenance programs.

Cost without a roof maintenance program*

Year 1.....**$135,000**
Tear-off of roof section #2; more than 20% of insulation wet in six locations, ranging from 30 to 120 square feet in size.

Year 2.....**$0**
Nothing is done. However, wet insulation increases in roof sections #1 and #3

Year 3.....**$135,000**
Complete tear-off required for roof section #1.

Year 4.....**$180,000**
Complete tear-off of roof section #3.

Year 5.....**$20,000**
Major replacement and repairs for misc. areas

FIVE YEAR TOTAL: $470,000

**Based on a conservative estimate of expansion of existing wet areas (30-120 square feet); assumes (unrealistic) cost advantage of no money spent prior to Year 1.*

At this point we decided to see what this facility would look like if only patching was done to stop leaks with minimum maintenance. Very conservative estimates were used to paint a best-case scenario for the owner.

Included in the study were actual infrared photos of one wet area taken eight months apart. In that time, the area of wet insulation increased 20% or more. However, to be ultra-conservative, we charted linear dimensions of the wet areas to expand at a rate of only 5% per year. Of course, this comparison is unrealistic in evaluating the true cost to the client. If the wet insulation remains, the following are sure to happen:

A. Freeze thaw cycles will cause

"The decision not to employ an aggressive roof maintenance program is costing owners between $0.10 and $0.15 per sq. ft. per year."
—Dennis Firman, P.E., U.S. Air Force

splits and accelerate the leaks and saturation of insulation. This takes place because the moisture is left in the insulation.

B. Wet insulation does not insulate and will cost substantially more through wasted energy dollars. Our client heats and cools the facility. Ask yourself: What effect would several hundred or thousand square feet of uninsulated roof area have on your monthly bill?

C. Structural concerns arise due to water weight gain and corrosion of structural components. This adds remedial cost and becomes a potential safety issue.

Cost of aggressive roof maintenance program

Year 1	$14K
Year 2	$4.5K
Year 3	$5K
Year 4	$4K
Year 5	$5K
Year 6	$6K
Year 7	$8K
Total	**$46.5K**

Owner's bottom line

Now, let's compare a best case scenario for the low maintenance approach versus a worst case for aggressive maintenance: low maintenance: $470,00 versus aggressive maintenance at $196, 500. The savings equal $273,500. There is also tens of thousands in energy savings, return on capital and more.

With a maintenance program spanning 13 years and square footage of about 220,000 square feet, the cost savings per square foot, per year is close to $0.10. This is based on making the aggressive program look as cost ineffective as possible. Firman's conclusion of $0.15 is probably more realistic.

Assumptions play a huge role in this type of costing and are always subject to challenge. To effectively manage your roofing assets, you must be proactive. To what degree and at what cost are the questions. Try your own numbers with your own assumptions. You will likely find the aggressive approach will save you substantial time and money.

It is conservatively accurate for us to tell building owners that their business decision not to employ an aggressive maintenance program is costing them between $0.10 and $0.15 per sq. ft. per year. Now, multiply this times the number of square feet you own or manage and show this bottom line as an annual loss. It's a powerful argument to start a formal roof maintenance program today.

Update: A few years ago, my North Carolina client initiated recovers for all of his roofs. They were all past 20 years of age and never experienced more than a few minor leaks in any given year thanks to an aggressive roof maintenance program. At the time of recover, no wet insulation was found and the metal deck remained structurally sound. **RSI**

Why facility manager Gerry Martin chose to maintain his roofs

If a building owner spends $500,000 on one roof replacement, while several other restorable roofs fail, he is making a grave mistake. If repairs can buy a few years (or the leaks do not present a safety hazard, structural concern, or otherwise can be controlled) then he should spend the money to prevent failures first.

The problem is that if the roof does not leak into the building and an aggressive maintenance plan is absent, the owner will not know a roof is in trouble until it is too late. Roofing contractors and consultants should be convincing their clients to make aggressive maintenance a high priority.

Dennis Firman, PE, the U.S. Air Force's maintenance chief, said way back in 1988 that an owner's choice not to have a maintenance program could cost him $0.15 per square foot, per year. Why is it, then, that so few owners have aggressive maintenance programs for their roofing assets?

More recent articles in RSI Magazine suggest that a minimum of $0.07 per square foot is lost per year based on a for-

mula included in the ASTM E-917 standard (www.astm.org).

To come up with an accurate number, I asked a few of my long established clients for help. Upon review of the written responses, one client stood out: a large manufacturer in North Carolina that produces compact discs and has critical production areas inside. Gerry Martin was in charge of correcting and maintaining the roofs that were about 12 years old back in 1988. Some leaks were occurring which needed repair; however, his focus was always on maximizing their long-term service life.

As a result, Martin set up an aggressive maintenance program. Hard choices were made in response to several recommendations from different sources. Martin's choice to employ an aggressive program has easily saved his company several hundred thousand dollars, and the savings are well documented.

Contrasting approaches

The first approach to roof maintenance is to do nothing. This entails calling for repairs only when the roof leaks. A moderate maintenance plan would require visually inspecting the roof once a year or so and perhaps scanning it near the end to determine if a recover is possible. An aggressive approach would be to have a formal inspection twice a year combined with an annual moisture survey. An in-depth, computerized management program should be included for large, more complicated facilities.

"Martin's choice to employ an aggressive maintenance program has easily saved his company several hundred thousand dollars."

Depending on the roof's construction, different equipment would be used for moisture surveys to maximize effectiveness. For this client's example, infrared was chosen.

Based upon the documented results obtained, there are few exceptions where an aggressive program with annual moisture surveys would not be my recommendation today. The following represents the original situation, reasoning for selecting the aggressive maintenance plan, and the results.

The general construction of the Polygram facility roof consisted of a metal deck, 3" perlite (two 1.5" layers mopped together) and four-ply asphalt built-up organic felts with flood coat and rock surfacing.

Status in late 1988

A few leaks existed over clean room type environments. A general survey was conducted to recommend short and long-term needs. The inspection included a moisture survey with infrared scan and membrane tensile-strength evaluations.

Approximately six wet areas were defined. The largest area was roughly 120 sq. ft. while the smallest was closer to 2' by 4'. One existing roof leak was identified as originating from a smaller wet area located with the scan. Negative air pressure in air handling units was creating leaks blamed on the roofs. Once properly identified, this was handled separately.

Problems existed, however. Walkways trapped water underneath, rotting the membrane, and drain valleys ponded water for several days after rains. The roof also had substantial traffic to service the formidable amount of equipment on the roof. These conditions, along with voids or other installation shortcomings, allowed for an occasional leak to develop. But for its size, this facility was in relatively good shape.

Rationale for program selection

Based on the above findings, replacing the wet areas of insulation and roofing was specified. Additionally, repairs to the walktreads, pitch pockets, flashing and other items were included.

To reduce the massive amounts of ponding water in the valleys, the installation of additional drains was recommended. This is where things became more complicated. The near clean room environment inside the building would mean the loss of critical production time. Also, if dust and debris reached the production equipment, a work stoppage would be required for a thorough inspection. The amount of money lost could pay for the replacement of an entire roof section.

Drains were the right choice from a roofing standpoint. Unfortunately, the clean room conditions in the plant eliminated this as an option.

Not being able to include drains to ensure a sound roofing system helped in deciding to incorporate the aggressive maintenance program as a compromise. Two visual inspections combined with an infrared moisture survey annually would identify any potentially critical problems before they fully developed.

As it turned out, this aggressive roof maintenance plan saved the building owner $470,000 over a five-year period. **RSI**

Author Charles Marvin founded Roof Solutions Inc., an independent consulting firm, in 1994. Marvin has designed roof systems for Manhattan public parks, 47 New York skyscrapers and developed plans for heavy industrial plants, hospitals, schools and shopping malls. He is the recipient of the Richard M. Horowitz Award for excellence in technical writing (1998) and assisted in two reroofing projects on the perimeter of Ground Zero after the collapse of the World Trade Center in 2001. He is a member of the Roof Consultants Institute and National Roofing Contractors Association.

How to Set Up a Roof Maintenance Program

How to establish a Roof Maintenance Program

The most important reason for establishing a roof maintenance program is to protect the capital investment of a new roof. Proper roof maintenance will not only add years to the life of a roof, it will also uncover problems before a roof leak wets insulation, creates mold and damages the interior of the building.

Fortunately, the professional roofing contractor and roofing manufacturer are ready to help, with programs specifically designed to make it easier for building owners to keep track of roof maintenance work.

The first step in creating a program is to establish roof information files. This data is essential for any roof inspection if a proper and ongoing evaluation of the roof conditions is to be made. The file should contain the following sections:

Design

- Project records, roof drawings, specifications, etc.
- Roof plans showing the location of all penetrations, rooftop equipment, drains, entry doors, etc.
- Approved submittals of roofing supplier's product data used for the new roof.

Installation

- Field reports related to the roof installation
- All correspondence between the GC, roofing sub contractor, architect, engineer, etc., involving the roof installation.
- Warranties from the roof or system manufacturer with contact names.

Inspection and Maintenance

- Periodic inspection reports filled out chronologically
- Reports and digital photos of repairs
- Record of any construction changes or modifications to the roof surface. Examples would be the installation of a new HVAC unit, exhaust vent or roof walkway system.
- Record of rooftop equipment services—who, when and where.

The next step in creating a roof maintenance program is usually implementing a periodic inspection regimen. These should be made twice a year, just before the roof passes through the most severe weather cycles—typically late Fall and early Spring. Additional roof inspections should be made after storms or rooftop service calls.

Before starting the inspection, a checklist should be developed. It is best to create a customized checklist for the generic roof type—built-up, single ply, modified bitumen, spray polyurethane foam, shingles, etc. Problem areas should be marked on the roof plan and notes made on the checklist.

GAF includes detailed roof maintenance information and guidelines, as well as checklists that are included with the company's warranty.

The first step is to identify the roof problems, then the repairs necessary, and log it in the roof record file. This makes it easier for prior repairs to be located and checked during inspections.

The third step in the program is scheduled maintenance. This typically occurs on an immediate basis, in response to storm damage; on a yearly basis, for re-caulking, etc.; and on a multi-year basis for more elaborate base flashing repairs, coatings and restorations.

Costs are typically estimated on an individual repair basis. In this

Building owner's maintenance responsibilities

- Minimize roof traffic
- Pick up and dispose of rooftop debris—nails, fasteners, bottles, etc.
- Clean or unclog roof drains and gutters
- Use de-icing salt on frozen roof drains; don't crack the ice
- Trim tree limbs that overhang the roof
- Keep rooftop equipment in good repair

TESTIMONIAL:

"It's better to spend the few bucks on maintenance than the thousands a new roof would cost," says Rick Helbig of the Veteran's Outreach Center in Rochester, NY. He estimates contractor Elmer A. Davis' maintenance program has saved the company $60,000 in roofing costs so far.

way maintenance scheduling can be budgeted accurately. This method also allows for cost comparisons of projected maintenance by roof type or age. Through maintenance scheduling, a comparison of projected maintenance costs versus roof replacement costs can also be made at any time.

Developing the program

There are many ways to develop a roof maintenance program. The first is for the owner or facilities manager to set up an in-house program. This method requires that roof information, roof inspection files and maintenance scheduling and implementation are handled by the same people. This may require a capital investment for personnel and equipment.

Another option is for the owner to contract with a roofing contractor and/or roof consultant. The filings and inspections would be performed by the roofing professional, who would also handle maintenance scheduling, which would be performed by the professional roofing contractor.

Finally, the owner can work with the consultant or contractor on the first two steps. The owner's staff would handle emergency and yearly maintenance, with a roofing contractor providing major repair and restoration services.

Today, most roof contracting firms offer some type of maintenance program for existing roofs. GAF Master and Master Elite contractors offer a roof maintenance contract when it's most important—right after the roof has been completed and the guarantee issued.

A few roofing contractors now feature computerized roof maintenance and repair services, with regularly updated photos and data on the roof's condition available to owner's through their Web sites.

Some large owners may feel they can't live without the objective, third-party advice of roof consultants. For others, roofing contractors are finally offering a turn-key approach to roof maintenance that can save considerable money down the road. **RSI**

After 6 months, inspect the following...

What To Inspect	*Maintenance/Check Required*
Exterior Walls	for leaks, staining, missing mortar
Interior Roof Deck	for signs of leaks or deterioration
Ceiling	for signs of leaks
Interior Walls	for signs of leaks
Roof Edge	for deterioration
Fascia/Coping	for deterioration
Expansion Joints	for signs of excessive movement, leaks, deterioration
HVAC	· check duct work, housings, condensate lines, pipes · inspect sheet metal cabinets and gaskets · inspect equipment base/tie-in
Penetrations	· fill all pitch pans, inspect pipe boots
Drainage System	· clear all gutters, downspouts, scuppers · clean out drains · make sure drains are working properly · check strainers and clamping rings
Field Of Roof	· redistribute any ballast across bare spots · note any deficiencies or damage and contact GAF · inspect coating if present and recoat as necessary
Base Flashings	· check attachment and repair as necessary · check counter flashings · inspect for signs of movement
Metal	· check attachment and repair as necessary · paint any rusted metal · re-caulk as necessary
Other	check for oil deposits/surface contamination, soft areas, vandalism, ponding water, etc.

GAF makes it easy for owners to keep track of roof maintenance with checklists that are included with each roofing warranty

How to Set Up a Roof Maintenance Program

Don't Blame the Roofer

Many 'roof' leaks are caused by mechanical equipment

BY STEVEN A. MANDZIK, RRC, CDT

As the in-house roof consultant in charge of more than 12 million square feet of roofing for a large property owner, I've had the advantage of managing the same roofs for many years.

My associate and I have walked each of 400 roofs yearly to review their condition, specify repairs, reroof when necessary and inspect the completed work. Naturally, I've become familiar with what works and what doesn't work, where leaks come from, and most importantly, why they are many times never fixed.

Tracking the leaks

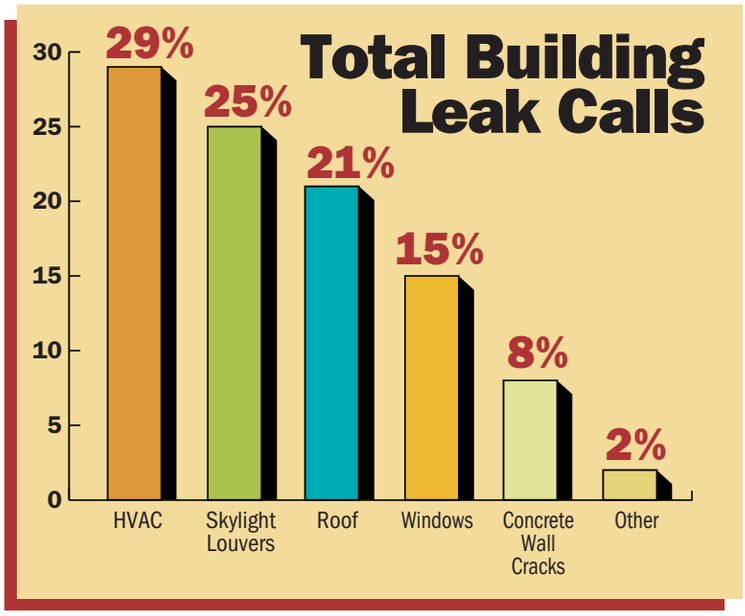
Thanks to a sophisticated property management department that tracks leak calls from more than 1,600 tenants, we have kept records on where roofers found leaks and what repairs where made. Most building owners would be surprised about what they are sending roofers out to fix (see chart below). Amazingly, only 21% of these leaks came from the roof.

Unfortunately, the roof is a working platform and drop spot for every construction trade (mechanical, electrical, plumbing, etc.), and many times the equipment itself is not waterproof. This often leads to roof leaks; maybe not immediately, but sometimes years later, when the warranty has run out.

Tenants incorrectly assume that all wet ceiling tiles mean roof leaks, but in reality it is often rooftop equipment that is no longer waterproof—not the roof membrane. So a roofer is called to look at the roof, while mechanical, electrical and plumbing contractors remain blissfully unaware of the equipment problems.

This dilemma is compounded on poorly maintained roofs where there are always roof problems to fix and nothing else is considered. Even on maintained roofs, roofers still look for roof problems and make repairs to anything in the vicinity, thinking the "roof leak" is solved. Meanwhile, air-conditioning units or skylights continue to take in water.

Roofer's have typically concentrated on roofing only, not mechanical, electrical or plumbing. Consequently they are untrained in these areas. Many times they are told directly by their management not to inspect or repair rooftop equipment for fear of liability, or simple lack of know-how. When calling in the non-roofing trades to fix the equipment problems, finger pointing is often the result. The building manager or



The huge amount of equipment placed on this EPDM roof will require careful monitoring by maintenance personnel.

Common leak spots for rooftop equipment

- Poorly designed filter access covers on HVAC ductwork.
- Improperly sealed joints, seams and holes on HVAC ducts.
- Bent, loose or missing filter access panels on HVAC units.
- Holes and loose edges on HVAC fresh air intake hoods.
- Holes and poor weather stripping in HVAC air intake panels.
- Wind-blown rain through skylight louvers.
- Concrete wall crack leaks above the ceiling line reported as roof leaks.

owner is then left in an impossible situation.

However, we are seeing a few knowledgeable, full-service roof contracting companies that are offering maintenance programs that take rooftop equipment problems into consideration. Their crews may not be able to fix all the leaks, but they are adept at discovering and then documenting them for the other trades.

Right now there's an open market for any smart roofing entrepreneur who knows what building owners really need. A few are answering this call. **RSI**

Author Steven A. Mandzik is a Registered Roof Consultant and holds a CDT certificate from the Construction Specifications Institute. He provides roof surveys, reroof specifications, management and consulting for the roof consulting department of a large property owner.

Mandzik was a senior consultant with a national roof consulting firm for more than nine years and a roofing contractor prior to consulting. He was also senior roofing manager for a nationwide property management company for more than 12 years and has 31 years of construction experience on a variety of roofing systems. Mandzik is a member of the Roof Consultants Institute (RCI) and the International Conference of Building Officials (ICBO).

Proactive vs. Deferred Roof Maintenance

Executives are looking 'up' to find savings for their bottom lines

BY ROBERT W. LYONS, FRCI

In this day of troubled economies, corporate downsizing, and drive for bottom-line profitability, corporate executives are looking anywhere they can to find synergies, efficiencies, and areas where they can reduce expenses. And that search now includes the roof, where money can be found through proactive roof maintenance programs.

An often-overlooked opportunity to significantly save money (or to contribute to corporate profits) is in the area of corporate facilities maintenance and management. Taking proper care of the company's assets is the business of skilled and savvy middle management, often known as FM's or Facility Managers. They can also be known as Facility Engineers, Corporate Maintenance Managers, Construction & Maintenance Managers, Property Managers and a number of other specialty titles. Different as their titles may be, they all share common problems.

The perception of their superiors (who may not have first-hand experience with all the specific areas of responsibility for FM) is that they are always firefighting and asking for more money, more staff, and more programs. Often, there is a division placed between these two groups of corporate managers

(Executives and FM's), and the groups are categorized as, Money-Makers (Corporate Executives), and Profit-Spenders (FM's). What these groups fail to realize is that facility management and maintenance does not have to fall into the Profit-Spender category as a necessary evil.

The fact is that buildings do not get better with age. We have all learned that in order to get the maximum service life and utilization out of our hard assets within our companies, we need to perform regular and routine maintenance on them.

We have learned these lessons well in our personal lives with our homes, cars, appliances, lawnmowers, etc. These items last longer and perform better with routine maintenance and care.

We have also learned the economic benefits of spending money to make money. Think of the comparison between the $19.95 oil changes in our cars versus the $1,995.00 upper engine block replacement because we did not do the routine oil changes. Just as the famed TQM expert Deming preached that "Quality is Free," experienced and disciplined Facility Managers have learned that it is always cheaper to repair and maintain almost anything in a building than it is to rebuild or replace it.

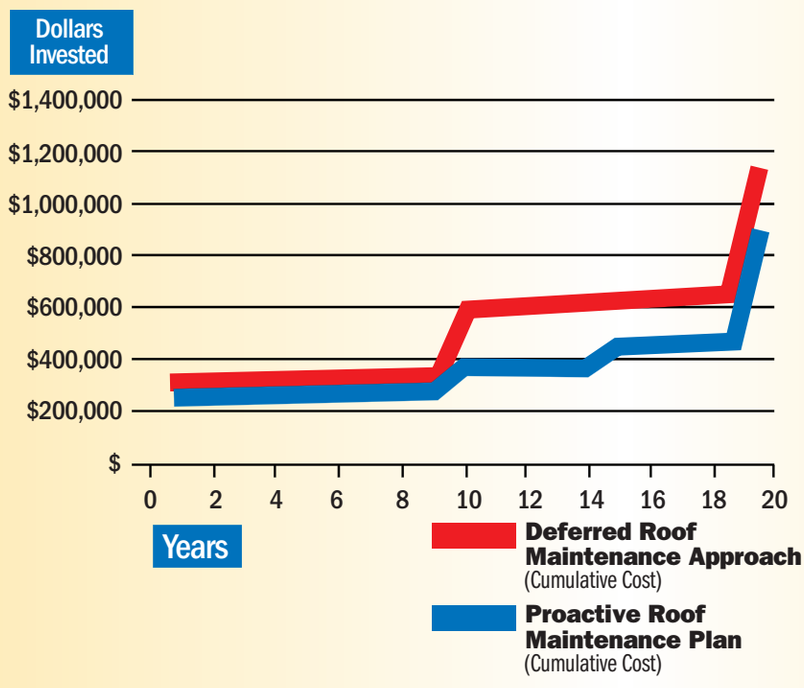
The fifth wall

On industrial, commercial, and institutional buildings the roof serves as the fifth wall of the building. These roofs on large profile buildings are typically flat (low-sloped) roofing systems that are exposed to the harshest elements. Extreme heat and cold, extreme UV, heavy rains and winds, chemical spillages, and rooftop traffic are the most common attacks that a roof must withstand on a regular basis. These roofing systems must be 100% effective in order keep water out of buildings.

On a 100,000 square foot roof, 99.999% perfection would still leave the potential for one square foot of total roof area to be defective.

Let's imagine that one square foot of defective roofing is divided up in 144 square inches, and each of these square inches was spread out over the entire roof. The result is 144 leaks, with a one-inch square hole or split at each leak location. This scenario could create a catastrophic condition in most buildings, and in a heavy rain, could result in significant damage to the building interior and contents. This damage can result in many types of consequential damages, such as:

- Roof insulation and deck damage
- Interior ceiling tile, walls and floors
- Interior furnishings and fixtures
- Interior office equipment
- Interior production equipment
- Finished goods and inventory
- Electrical systems
- Air quality



Notes:

- *Based on 100,000 square foot roof area on typical commercial building.*
- *Based on initial roof cost @ $2.50/sf.*
- *In deferred maintenance scenario, roof is replaced at 10 yr. intervals.*
- *In proactive plan, same roof is put under an Annual Maintenance Service plan for all 20 years. (Compliance then Preferred then Ultimate as roof ages)*

The Hidden Costs of a Roof Leak

Interior roof leaking can also result in other expenses and legal exposures to your company that can be at least as costly (if not more) than any of the areas previously mentioned.

- Downtime of production areas—lost revenues
- Lost use of space—lost revenues
- Tenant complaints, lost use of income, lawsuits
- Slip and fall accidents and legal claims
- Mold and mildew problems resulting in air quality issues and clean-up expenses
- Employee moral and productivity issues
- Regular and overtime labor expenses for clean-up and repair work resulting from roof leaks

The problem in most companies is that they do not track these consequential damage items as being roofing related expenses. However, close examination of the origin of these costs is likely to reveal that they were incurred as a direct result of a faulty roofing system.

In the typical roofing portfolio of most companies, the costs of these consequential damages can represent a significantly larger dollar amount than the annualized budgeted roof maintenance work that was originally needed, but not performed. To sum it up, companies are reactive, not proactive when it comes to roofing needs.

Deferred maintenance

Most American businesses have adopted a strategy of deferred building maintenance rather than a proactive maintenance approach. While this approach can definitely reduce short-term maintenance budgets, it almost always translates into increased maintenance and capital expense budgets for roofing failures due to neglect. In essence, companies can "pay now or pay later" when it comes to their roofs.

The interesting comparison is that with deferred roof maintenance, companies will always pay more than they would if they scheduled regular roof maintenance into their facility maintenance/management budgets. This represents a paradigm shift away from Band-Aid fixes toward long-term care and maintenance to maximize the sustainable life of the roof.

Consider Figure 1, which helps to demonstrate and differentiate the two optional approaches to be considered: Should we have a PROACTIVE roof maintenance and management approach? Or should we continue with our DEFERRED maintenance approach?

Clearly, without considering any of the costs associated with the consequential damages or legal liabilities issues presented earlier, adopting a proactive roof maintenance and management program will allow most companies to save significant bottom-line dollars on an annual basis. And executives used to think that roofs couldn't make their companies any money. **RSI**

Bob Lyons is principal of Lyons / Waldron Consulting Group, LLC, and has served in the roofing industry for almost 30 years. He is the co-founder and 1st Two-Term President of the Roof Consultants Institute (RCI). Bob is the recipient of the distinguished first Fellow of the Institute award. He has been a faculty member of the Roofing Industry Educational Institute (RIEI) for more than 15 years. Email him at lyonsrobertw@aol.com.

Key Terms

Life-cycle Cost Method, n— a technique of economic evaluation that sums over a given period the costs of initial investment (less resale value), replacements, operations (including energy use), and maintenance and repair of an investment decision expressed in annual or value terms.

Present Value, n— the value of a benefit or cost found by discounting future cash flows to the basic time. The Present Value Factor is used to convert future values (benefits and costs) to present values. The Future Value is the benefit or cost at some point in the future, considering the time value of money.

Annual Value, n— a uniform annual amount equivalent to the project costs or benefits, taking into account the time value of money throughout the study period.

Investment Cost, n— first cost and later expenditures, which have a substantial and enduring value (generally more than one year) for upgrading, expanding or changing the functional use of a building or sub-system like a roof.

Capital Asset, n— a piece of equipment, machinery (or roof) that must be depreciated and meets the following requirements: used in business or held to produce income; expected to last more than one year; something that wears out.

Recovery Period, n— the number of years over which the basis (cost) of an item or property is retired.

Class Life, n— the number of years that establishes that property class and recovery period.

How to Set Up a Roof Maintenance Program

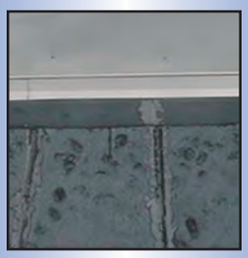
Fixing the leak

It's not as simple as it looks

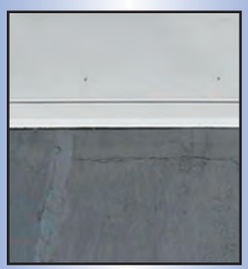
BY MICHAEL RUSSO, RSI ASSOCIATE PUBLISHER & EDITOR

Even roofs that enjoy regular maintenance may leak at some point in their service lives. One of the advantages of a formal roof maintenance program is that it makes it easier to predict, pinpoint and repair small roof problems before they become catastrophic.

While building maintenance personnel may have the skills to make temporary, emergency repairs, it is always better to rely on the roofing contractor to handle this work. Sending untrained personnel to patch a roof during a rainstorm can be dangerous, and their efforts may wind up voiding the manufacturer's warranty.



Before – Open seams and deteriorated surface on modified bitumen membrane on sloped wall



After – Reinforced open seams by using a three-course flashing repair system including a fibrated asphalt emulsion coating.

Also, keep in mind that the cause of a leak may not be roof-related (see "Don't blame the roofer," on page 18). Either way, the first step to take when a roof leak is suspected is to inspect the building's interior. Look for signs of moisture infiltration and staining on the walls, ceilings and roof deck, if visible. Keep in mind that depending on the type of roof system, it may also be difficult to determine the exact source of water entry. Leaks occasionally result in damage far from where the water first entered the building.

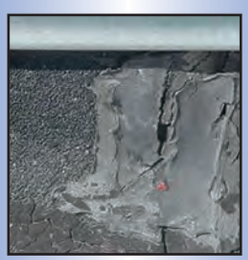
The roof system should be inspected by a qualified contractor or roof consultant before corrective work is undertaken. In the meantime, your maintenance personnel can check for clogged roof drains, scuppers, gutters or leaders. Displaced ballast or walkway pavers are another clue that something may be amiss. Also, look for uneven, settled or depressed areas that prevent proper drainage and lead to ponding water.

If the roof is under warranty, the manufacturer should be contacted. Once a general survey is completed, a more detailed inspection of roof details should be undertaken. The areas to concentrate on include copings, cap, counter and base flashings, gravel stops, roof edging and fascia. Check the condition of pitch pockets and pipe boots at roof penetrations. On single-ply membranes, inspect the seams to ensure there are no voids or open seams. On built-up and modified bitumen membranes, watch for blisters, wrinkles, worn spots, holes and deteriorated areas.

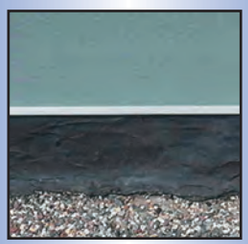
Built-up roofing membranes

Spot repairs can often address deficient or degraded conditions at isolated locations in the field of the roof or at flashings. These problem spots are often punctured, cracked, blistered or wrinkled areas that are beginning to lose—or have already lost—their waterproof integrity. Roof cements, coatings and trowel-grade products can be quick fixes in these situations. However, one must be careful not to void an existing roof warranty. For example, if an inexperienced maintenance crew uses asphalt-based patching materials on a PVC thermoplastic membrane, further roof damage is likely to occur.

It is best to leave permanent repairs to the roofing contractor. Let the professionals cut out and replace damaged sec-



Before – Open joint in modified bitumen flashing on built-up roof system



After – Repaired open joint in flashing by using the three-course flashing repair method.

Before – Tenting of EPDM membrane at perimeter wall due to loss of attachment of membrane to base tie-in.

After– Installation of new Reinforced Perimeter Flashing Strip with butyl tape attached and EPDM flashing. New EPDM flashings are seamed to the underside of the existing EPDM field membrane.

tions of the roof, replace failed flashings and reseal open field seams.

Spot repairs can be cost-effective for temporary repairs and add a few months or years to the life of a roof, depending on its condition. But if problems are widespread or a significant amount of water has already entered the roof system, it's unlikely these techniques will stem the leak.

Modified bitumen

Major modified bitumen repairs involve priming the membrane and then patching with a modified bitumen material eight inches wider in all directions, with three-inch radius corners.

Depending on the modified bitumen roof membrane type, the patch can be hot- or cold-applied or torched down. The majority of SBS modified bitumens today are still compatible with hot asphalt, while APPs can be patched with a hand torch or compatible cold adhesives.

Repair of split membrane by using a three course flashing repair method, consisting of a base layer of plastic cement, a layer of asphalt coated fabric and a top layer of plastic cement.

Single-ply membranes

Emergency repairs of thermoset (EPDM) and thermoplastic (TPO, PVC) are often made with duct tape, roofing tape, peel and stick seam tapes, polyethylene sheets, or butyl or polyurethane sealants, depending on the size and severity of the damage. As mentioned above, don't use liquid or pourable asphalt repair products on single-ply membranes.

Permanent repairs usually involve resealing or re-welding large areas of open seams and/or applying professionally-installed patches made of the same membrane type. This typically involves a thorough cleaning and priming of the surface to be patched.

The Repair Manual for Low-Slope Membrane Roof Systems is an excellent reference on single-ply repair techniques. To order, call the National Roofing Contractors Association (NRCA) at 800-323-9545 or visit them at www.nrca.net.

Another good technical resource is the "Manual for inspection and maintenance of built-up and modified bitumen roof systems: A guide for building owners," which is also available through NRCA. **RSI**

How to Set Up a Roof Maintenance Program

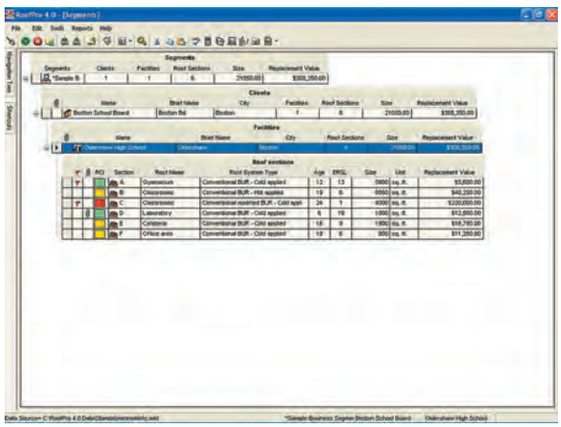
New tools help owners track roofing assets

Pop quiz: What is one of the most important tools building owners can use to protect their roofing investments?

Answer: Information. Knowing the condition of the roof, when an inspection is due, when the warranty expires or when a roof was last repaired can help building owners be proactive in maintaining a roof, and therefore avoid expensive roof repairs or replacements.

Jim Nugent is national service manager at generalRoofing, the nation's largest roof contracting company. He says that studies have shown that being reactive to roofing situations is triple the price of being proactive.

Obtaining and managing this information used to be a tedious and time-intensive task, but today there are new technologies and tools available to streamline this process. The result is more valuable, accurate information that can help building owners save time and money by extending the life of their roofs.



Roofing asset management software programs can collect information in their own electronic file on a database. This data can then be put into a consistent format, and can be easily accessed and cross-referenced. (Photos courtesy of Digital Facilities Corporation, Acton, MA.)

Collecting information

Traditionally the commissioning of a new building to its owner is accompanied by the transfer of a stack of paper documents, such as warranties, maintenance guidelines and building plans. This mountain of paper grows with the addition of items such as hand-written inspection reports, rough sketches by roofing consultants, and maintenance updates. Many of these documents are in different formats and can't easily be cross-referenced, and they are often stored in file cabinets where they are easily misplaced. As a result, this valuable information is often ignored.

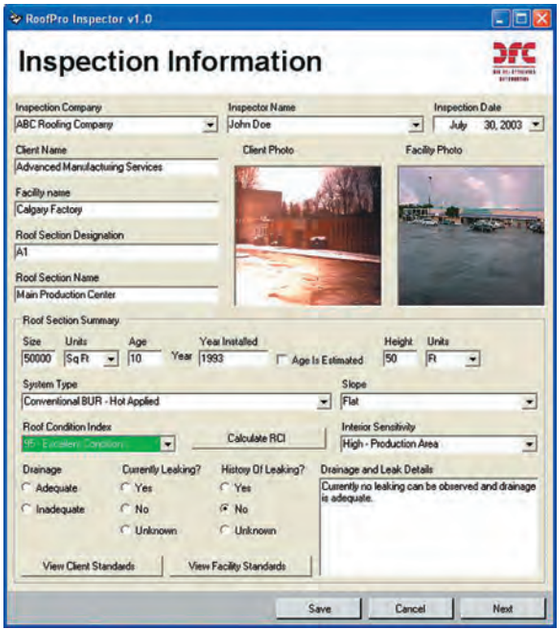
Now, however, there are roofing asset management software programs that can collect this information—whether it is an inspection report, a photograph, or warranty data—in its own electronic file on a database. This data can then be put into a consistent format, and can be easily accessed and cross-referenced.

Thanks to technological innovations, entering this information into these databases is becoming easier day-by-day. Roof inspectors can enter data while on the roof using tablet computers—wireless machines that allow them to use a touch screen or make hand-written notes with a stylus or digital pen. New battery technology now gives some tablets a run time of eight to 16 hours, so inspectors don't have to worry about the computer "dying" while they are on the roof. And some software programs for tablets offer inspection templates for the inspectors to use, which ensures that all the necessary information is collected in a uniform format.

Digital cameras also allow inspectors to easily and quickly take photographs of problems areas on the roof. These photographs, as well as information stored on the tablet PC, can then be downloaded directly into a database when the inspectors return to their offices, eliminating several steps in the collection process.

Accessing Information

With roofing asset management software, building owners no longer need to search for a paper file folder for each roof and hope it still contains important materials such as maintenance and repair reports. Not only is this information easy to find on a roofing database, but it can also be manipulated to perform functions such as generating comparison budgets on roof repair versus replacement, or identifying trends or similarities among other roofs in the sys-



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tem, giving building owners a bigger picture of all roofing assets. Some roofing asset management programs can index roofing conditions using a color-coded system, which enables users to look at 25 roofs at a time and quickly discern by their colors which buildings need immediate attention.

As Ken Fifelski, building envelope specialist at Western Michigan University (WMU), states, "We have about 500 roofing sections stored in an asset management database system, so it is very easy to do a search on something like age and use the results to quickly produce a report on aging roofs." He adds, "There is no way we could do that with paper files."

A roof's history can also be easily compiled for analysis.

"We had one situation where the single-ply roof had problems, but the client didn't know what kind of roof it was or why the problem was so chronic," Nugent says. "By accessing information we kept on our asset management database, we were able to go through past inspection and repair reports and identify that the problem was a product failure and how to best handle the situation. We were able to trouble-shoot an entire roof system by looking at the history of one particular problem."

Presenting information

In the past, if a building owner wanted to produce a report using roofing information, he or she would take the available information and produce a Power Point report. Now, however, there are special roofing proposal software programs that can create high quality reports that include marked-up CAD drawings, budget estimates, external reports, and photographs. The results are easy-to-understand documents with valuable information that can be presented through email, as hard copy, or via a Web site.

Another advantage to these systems is that they allow the user to customize reports for different audiences. For instance, a report on roofing conditions might use a pie chart to convey this information to building owners, whereas a roofing consultant or contractor might receive a much more detailed listing of roofing problem areas and recommended repairs.

Thanks to tools such as tablet PCs, digital cameras, proposal writing and asset management software programs, accessing and presenting roofing information is easier and fast than ever. According to Fifelski, having access to up-to-date, accurate data helps WMU do a better job maintaining their roofs.

"We can use this information to focus on roofs that are in poor condition, have warranty issues, or are in a crucial, sensitive area," he explains. "By making more informed decisions we are able to react faster to potential problems and extend the lives of the roofs." **RSI**

Author Steven James is president of Digital Facilities Corporation, which offers integrated software solutions, consulting, and online services to building owners and facility managers; service providers (contractors, consultants and distributors); and product manufacturers. For more information about Digital Facilities Corporation, call 905-844-3300 or www.digital-facilities.net.

How to Set Up a Roof Maintenance Program

The search for a Worry-Free Roof

BY MICHAEL RUSSO, RSI ASSOCIATE PUBLISHER & EDITOR

Looking for a maintenance-free roof for your new building? Well, good luck, because you won't find one.

Despite the greatest efforts of today's roofing technologists, there is still no such thing as a 20-year, maintenance-free roof. Sure, there are some roofing systems that come close, but there are always trade-offs, usually in the form of initial cost or installation hassles. Plus, even the toughest roof systems need to have their drains or gutters cleaned out every once in a while.

That's why conducting life-cycle cost studies—and having a general knowledge of roofing systems—is so important before making a new or reroofing decision. In general, the property use will define the type of roofing system that's best for your building, along with the roofing contractor's and/or roof consultant's recommendations.

While the choice of roofing system is important, the selection of the roofing contractor is critical to the success of any new or reroofing project. Roofing contractor skills and experience vary widely.

These days, most manufacturers certify their contractors, but some even offer different levels of certification. For example, GAF offers its Master Select roofing contractor program. These applicators can offer owners services and benefits that are only available to the top tier of GAF's contractor base. In fact, these installers represent less than 3% of all roofing contractors in the U.S. It's an exclusive group that requires high standards in workmanship and financial strength, and it offers greater security to building owners looking for quality installations.

GAF Master and Master Select contractors offer benefits that 95 out of 100 contractors can't provide. These enhancements include:

- Available guarantee extensions of up to 10 years after the original warranty has expired.
- Steep/flat warranty coverages that include both labor and materials.
- Problem prevention inspections by quality assurance representatives.
- Available 32-year labor and materials warranties.
- Incentives for scheduled maintenance that extend the warranted life of the roof.
- Exclusive coverage where leaks are most likely to occur that are custom-fit to your roof.

You can find a GAF Master Select contractor at www.gaf.com.

Top 10 Restoration problems and solutions

Problem	Solution
Improper substrate preparation	Clean thoroughly
Flashing fabric not imbedded	Cut, flatten, add fabric
Loose fasteners	Tighten; replace stripped fasteners
Leaking details	Properly re-flash all details
Improper coating application	Apply to specified thickness
Restoring roof beyond repair	Restore only "sound" roofs
Coating over wet substrates	Surface scan potentially wet areas
Applying coatings over hot substrates	Apply between 40-120 degrees F
Applying coatings to cold substrates	Do not apply below 40 degrees F
Repairing EPDM seams with fabric	Repair with EPDM overlays

(All charts are courtesy of The Center for the Advancement of Roofing Excellence (CARE))

How roofing products perform

We've all seen or read about the copper-clad steep roofs that have waterproofed historic landmarks in the U.S. and Europe for centuries. But few building owners would opt for such a material on an office, high-rise or manufacturing facility, unless used sparingly for a dome, tower or portico.

Those copper roofs of old had other intrinsic advantages, such as steep slopes and no roof traffic. Institutional building owners of the time also didn't have to worry about rooftop equipment.

On paper, contemporary standing seam and metal panel systems offer many of the same aesthetic and performance benefits as hand-formed copper. Although relatively expensive per square foot, metal roofing can fare well in life-cycle costing analyses. It can also be a great recover option that adds slope and drama to an existing flat roof. Installation tolerances are tight, however, and a quality coating is key for long-term corrosion protection.

Recently, a number of roof consultants have reported problems with inferior materials being used in place of more expensive products originally specified for metal roofing projects. This has created havoc with roof detailing and premature failures. So be sure you are working with a knowledgeable roofing contractor or roof consultant before considering metal roofing.

Timeless slate roofing has been the clear winner in any steep-slope Strong Man contest. The key to slate's long-term performance was the use of durable lead or copper flashings. Even the nails used on these roofs were brass or copper. The underlayments were at least 30# and of greater quality than those available today.

But cost, weight and difficulty in finding qualified installers are challenges for slate. Stone-coated metal shingles and superheavyweight asphalt products are also viable options for steep slope projects.

The hot stuff

Almost 20 years ago, a roofing manufacturer gave out pin-on

Top 10 Asphalt Shingle problems and solutions

Problem	Solution
Decking spaced improperly	Contractor checks deck
Installing over rotted plywood	Repair/remove rotted plywood
Installing over buckled underlayment	Repair/remove underlayment
Underlayment not installed under drip edge	Install underlayment, then drip edges
No leak barrier in valleys	Install leak barrier for all systems
Valley shingles not clipped and sealed	Seal every shingle to metal or shingle beneath
Improper step flashing	Install step flashing for every shingle
No sealant at starter strip; doesn't overhang 1/8"	Cut starters to align sealant at the edge
Improper ventilation	Install ridge and soffit vents to FHA min.
Improper nailing	Nail in location recommended by supplier

Top 10 Torch-Applied problems and solutions

Problem	Solution
Fire safety	Train installers, use extinguishers, infrared scans
Over, under torching	Perform inspections, ensure proper bleed-out
Dry laps	Roll in laps
Voids	Relax sheets, avoid phasing
Improper flashing	Prime metals, ensure proper adhesion
Backwater laps	Start at low point of roof; install shingle fashion
Poor base sheet attachment	Relax sheets, increase fasteners at corners
Improper material preparation	Store materials properly; protect roll ends
Inadequate head laps	Follow manufacturers' specs
Lack of moisture barrier (coping)	Use 2nd barrier, slope coping cap

Top 10 Hot Bituminous problems and solutions

Problem	Solution
Temperature control of asphalt	Use infrared thermometers
Mopping practices	Follow specs; ensure equipment is okay
Poor interply integrity	No foot traffic; don't install too hot
Improper flashing	Ensure proper height, length of flashing
Dry laps	Broom felts
Inaccurate head laps	Check ply lines; use chalk lines
Fire safety	Check thermometers on kettles
Poor base sheet attachment	Relax sheets; conduct pull-out tests
Gravel embedment	Don't overheat asphalt; embed gravel quickly
Lack of coping moisture barrier	Ensure blocking and cap attached properly

Top Single-Ply problems and solutions

Problem	Solution
Poor, inconsistent weld	Conduct test welds; probe all seams
Seam voids	Don't start and stop welding excessively
Fastener placement	Adjust screw gun clutch setting
Fasteners too long, short	Ensure fastener engages deck, in top flange
Unadhered membrane	Use correct adhesives at right rate and temp.
Unadhered base flashing	Use initial priming, 2nd adhesive application
Contaminated roof substrate	Use broom or blower prior to installation
Flashing displacement	Follow fastener placement guidelines
Abuse of installed roof	Protect membrane; use job sequencing

"As long as the cost of maintenance is less than 1.6% of the initial cost of the project, the cost of the maintained roof—on an annual basis—will be less than the un-maintained roof."

Peter Kalinger,
Technical Director,
Canadian Roofing Contractors Association.

buttons to the press that proclaimed: "Built-up roofing works." That statement is still true today, according to RSI's commercial roofing contractor surveys. From 1978—when RSI first began collecting data—to the present, contractors report the fewest callbacks and failures with built-up roofing.

"I have some built-up roofs that are approaching 20 years old," said Harry Bruton of Bruton-Gomez, Corpus-Christi, TX. "In my experience, I've never had a product failure, even under our severe heat and frequent high winds."

"Built-up roofing holds up much better in high traffic industrial environments than other systems," adds Malcolm Nunn, Jr. of Roof Systems of Virginia, Richmond.

Another powerful recommendation comes from Larry Scroggins of Hankins Roofing, Kansas City, MO: "Four-ply, gravel-surfaced, BUR offers our clients the best return on their investment on a cost per-year-of-service basis. BUR is repairable in later years, and it gives plenty of warning to the building owner before it goes out. Owners have time to budget repair or reroofing costs and nurse the roof through until they've got the money."

BUR continues to be one of the most repairable, maintainable roofing systems around. But it has also lost market share to single-ply roofing systems. The potential installation hazards of hot roofing, along with visions of foul-smelling asphalt and coal tar pitch, have not helped BUR's image. Compare that to installing a clean, cool single-ply membrane, and it's clear why some roofing crews prefer applying light-colored flexible membrane systems.

Ambient-applied coal tar and modified bitumen products are helping this segment survive, but these new systems don't have the long track record of traditional BUR. In general, labor and materials costs for built-up and hot-applied modified bitumen tend to be higher, and fluctuating asphalt prices don't help. But BUR costs out well over the long-term, and many large industrial owners swear by the product.

Single-ply innovations

Today, efforts by SPRI and the American Society for Testing and Materials have brought the industry numerous material and performance standards and technical documents on single-ply roofing. A visit to www.spri.org is well worth the building owner's time, as some of the most valuable documents are now downloadable in PDF format.

While not as sophisticated as today's systems, the early 45-mil, unreinforced, ballasted EPDM membrane systems offered owners tremendous value, even if they lasted only 10-15 years. Today, manufacturers are offering tougher, 80 mil-plus fleece-backed membranes and a variety of installation options designed to reduce labor costs.

Nevertheless, thermoplastic, heat-weldable membranes like PVC and TPO have eaten into EPDM's market share as of late.

Single-ply systems are arguably less maintainable than asphalt-based membranes, and the thinner sheets are more prone to damage. Multi-ply BURs and modifieds offer redundancy against leaks and puncture, while one open single-ply seam can cause havoc for the owner. Still, single-ply systems are among the most economical, energy efficient options around. And, if caught in time, they can be repaired, recoated and restored, with five or 10 (warranted) years of life added to the system.

The subject of maintaining roofs to keep them reflective is a newer issue that will need to be addressed. Will building owners actually spend the time and money to power wash their roofs every three years? From a practical perspective, we think not, lest the yearly energy savings of a white roof are eclipsed by maintenance costs. Perhaps the best solution is to design more slope into the roof system in the first place to reduce dirt accumulation.

Also, building owners today have a much greater investment in thermal insulation. Roofs that once had barely an inch of wood fiber are now sporting R-values 10 times as high. This makes the economic consequences of roof leaks that much greater. When one considers the liability issues associated with mold and mildew, the need for roof maintenance is stronger than ever before.

No, there's no such thing as a maintenance-free roof, or a roof that will work for every building. Be wary of suppliers pushing "single solutions" to all your roofing problems, but pay close attention to those offering "good-better-best" menu options for their roofing systems.

A reroof or tear-off can be a painful process, and it's tempting to forget about the new roof once it's finally installed. But if your company plans on keeping the building, keep that pain fresh in your mind, because you'll be feeling it again if you don't maintain your new roof. **RSI**

While the choice of roofing system is important, the selection of the roofing contractor is critical. GAF Master and Master Select contractors offer benefits that 95 out of 100 contractors can't provide.

How to Set Up a Roof Maintenance Program

Protecting roofs from Bigfoot

BY MICHAEL RUSSO, RSI ASSOCIATE PUBLISHER & EDITOR

Horror stories about the havoc wreaked by maintenance personnel and other trades on roofing membranes often seem a bit far-fetched. But don't you believe it. All the tales are true.

Many of you may remember the old United McGill Corp. "Bigfoot" ad. It featured a Dennis Franz (NYPD Blue) look alike—except he was a lot bigger and meaner—tromping over the company's metal walkway system. Besides his big feet, he was armed with a huge toolbox. Presumably, it was filled with lots of sharp metal instruments capable of piercing most roofing membranes when dropped from his considerable height.

The ad was aimed at the architect and building owner, and I'm sure many facility managers smiled at the photo, secure that even if someone as big, mean and ugly as Bigfoot existed in the real world, he wouldn't be walking around on *their* roof.

I would have thought the same thing—until a few years ago, when I walked the three-month-old roof of a new Kansas City, KS, casino. The tour convinced me that Bigfoot is alive and well and still living somewhere in the Midwest. It was either Bigfoot—or the HVAC contractor from Hell had his way with this poor roofing membrane.

When I walked through the penthouse door and stepped out onto the roof, I almost fell over. Someone had put a row of loose-laid, two-foot-wide, fiberboard "pavers" outside the door. They rocked back and forth as you walked on them, and someone carrying a heavy load (or less coordinated than I) would certainly have taken a tumble.

This rickety roof walkway simply ended about 100 feet into the field of the roof, as if its creator ran out of material or couldn't decide which direction to take. The unfinished walkway looked like a diving board poised over a large pool—in this case, a brand-new, fully-adhered EPDM roof.

That's when I spotted the first signs of Bigfoot. The trail—consisting of random flaps of torn roof membrane—was easy to follow. It led to a meticulously flashed HVAC unit. Unfortunately, there were puncture holes all around the equipment. The trail of devastation led up a metal access ladder onto a stone-ballasted section of roof.

I thought I'd lose the trail here for sure, but the rock was displaced and the damage to the 45 mil, unreinforced membrane was easy to follow. I hoped that it was just wind scouring that displaced the stone, and not Bigfoot, as he shuffled menacingly along on the roof's surface.

The footprints led to a couple of exhaust pipes. The smell of grease from a kitchen below was heavy in the air, but the roofing contractor was careful enough to have laid down pads to protect the surface of the EPDM membrane from the oily residue.

But that didn't stop Bigfoot from somehow shifting them

TESTIMONIAL:

"A roof maintenance program allows you to "find out about possible problems before they occur," reports Monte Shelton, Monte Shelton Motors (Jaguar) of Wilsonville, OR. "Columbia Roofing and Sheet Metal does a good job for us. Roof maintenance is obviously worthwhile or we wouldn't be doing it."

out of position and away from the offending pipes.

I walked back down to a third roof section, which featured a mechanically attached membrane. The stronger, 60 mil, reinforced sheet was dished in places and scuffed up pretty good, although it looked watertight. But oh, the size of those indentations!

I had seen enough. Besides, the wind was really picking up. It rippled the underside of the mechanically fastened membrane, making an eerie flapping noise.

Maybe Bigfoot had wings.

The maintenance man from hell

I made my way back to the penthouse, careful to avoid stumbling over the fiberboard walkway.

When I met with the building manager later on, I asked him about the roof. "We've already had a number of leaks," he said, frowning.

Yet, not a drop of water had passed through a faulty seam or flashing detail. Workmanship on the project seemed excellent. But the building owner was disappointed with his single-ply roof; he was also miffed at the contractor and the membrane supplier. It just didn't seem fair.

Suddenly, a large, dark shadow loomed in the doorway. "Here's Roy. He's our maintenance man," said the building manager.

I really didn't want to stay and meet "Roy," but I just had to get a look at the size of this guy's feet. **RSI**

Helpful Web sites for building owners

www.gaf.com
www.rsimag.com
www.nrca.net
www.fwdodge.com
www.rci-online.org
www.spri.org
www.asphaltroofing.org
www.pima.org
www.roofcoatings.org
www.coolroofs.org
www.astm.org
www.roofinfo.com
www.aecinfo.com
www.csinet.org
www.roofingcanada.com

Center for the Advancement of CARE™ Ltd. Roofing Excellence

"Improving an Industry through Excellence In Education"

Founded in 1999, CARE is an educational organization dedicated to excellence in the roofing industry. CARE is funded by GAF Materials Corporation and U.S. Intec. Beginning in 2004, the Indy Racing League has also pledged its support. CARE has successfully provided education to more than 25,000 roofing industry professionals, including contractors, distributors, specifiers, purchasing professionals, and even property owners.

Why CARE?

The need for education within the roofing industry has never been greater:

▶ More Technologies = A Why and How Crisis... the technological complexity brings with it a, "When do I use this technology versus that one"—and—if using a specific roof system, how do I estimate and apply it right, and avoid common mistakes!

Consider how many systems options there are

New and replacements roof systems, including asphaltic (modified and BUR), single ply (EPDM, TPO, PVC), metal, etc.; restoration; repair and maintenance; shingle systems (3-tab, architectural, designer), etc.—there are so many combinations—and so many things that can go wrong!

▶ Industry Growth = Talent Crisis... roofing attracts "a rare breed" that enjoys the unique stresses and challenges of this industry. Other than "on the job," where can industry professionals (including installers, foremen, supervisors, estimators, distributors, specifiers, architects and even property owners) learn how to specify and properly install the myriad of roofing systems that are now available?

CARE Principles

CARE educational events are not biased toward any roofing technology. The core principle of CARE is that all roof systems have strengths and weaknesses. Likewise, every facility has its own unique combination of characteristics, such as weather exposure, environmental factors, owner's investment criteria, current/future use, etc. CARE's professional educators help students understand how these roof system differences can influence roofing selection.

How Is CARE Available?

CARE education is available in many formats. However, the majority of CARE initiatives are "hands-on" events (both in English and Spanish), at either CARE Training Centers (located strategically around the country) or at the more than 100 "on-the-road" events that are customized regionally and locally through GAF Materials Corporation and its most supportive distributors. CARE also helps produce educational programs on DVD, CD, video, pamphlets, guides, and even on the Web.

CARE Core Education Process

Unlike most traditional educational approaches, CARE employs two advanced learning methods that have been proven to maximize student comprehension:

1. Right And Wrong Techniques... Teach not only "how to do things right" —but also how to "avoid common mistakes."

2. What And Why... Not just "what" to do—but also "why" it's important

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Please visit www.gaf.com or call 1-866-671-CARE (2273)

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