ENEMIES OF THE ROOF

BY JOHN W. WELLS, RRO

The old roof adage "out of sight, out of mind" is no longer an appropriate term for today's building owner or manager. With roofing costs easily exceeding $10.00 per square foot, busy contractors, and a saturated market, roofing represents an expensive and always important part of the building asset. Maximizing roof performance and life expectancy require knowledge and experience with roofing materials, as well as building and maintenance technology.

Numerous articles on roof maintenance have been written over the last few years, including many by this author. The topic of this dissertation, however, spotlights a different area of roof maintenance than is usually explored: protection from birds, especially particular species (see *Photo 1).*

The popularity of exposed SBS modified bitumen roof membranes in commercial, industrial, and institutional buildings has, in certain locales and conditions, revealed a unique limitation with these materials. Concentrations of bird droppings can contribute to the rapid removal of the granule cover. The surface granules on the top ply or cap sheet supply the UV resistance to the membrane assembly and are a critical item in the long-term performance and life expectancy of the roof membrane assembly. Degradation caused by bird droppings can expose the asphalt beneath to localized UV deterioration (see *Photo 2*).

This phenomenon has been recognized for a number of years in the Victoria, BC, area, but changing weather patterns (longer, drier summers) and a lack of attention by building operators have brought new focus to the problem.

The case study presented here is based on a real-world investigation recently performed by Wells Klein Consulting Group (WKCG) on a building on the west coast of British Columbia. Brief portions of the report are excerpted and italicized herein.

Photo 1 – Gulls are sociable birds. They like to roost on a place higher than their nests, where they can see the nesting area. In this case, the area is below and to the right on a nearby building. Unfortunately, this "sociability" includes another function.

Photo 2 – The amount of fecal matter and damage discovered on the first site visit was quite astonishing... and the smell wasn't great either!

Photo 3 – This picture demonstrates damage to the membrane that almost reaches the reinforcing mat. Granular degradation is devastating; the asphalt blend is softened and contaminated.

The building referenced is a new addition connected to a renovated, older public building and was only six months old when WKCG was retained to investigate. The building is a concrete structure, four stories in height, and about 8,700 sf (815m^2) in roof area.

"Bird roosting and droppings problems are common everywhere in the world and particularly in seaside locations or near any sources of food. The problems are specifically caused by the acidic feces deposited by flying, roosting, and nesting seagulls (specifically herring gulls) on this building."

"This new roof exhibits one of the most severe bird dropping problems that this consultant has viewed. Significant and severe damage has occurred to the membrane and its protective granules."

In many spots, the effects of the droppings had actually not only removed granules, but softened or affected the top portion of the asphalt membrane proper, similar to hydrocarbon or oil contamination. In limited locations, membrane reinforcing had been exposed, indicating the erosion (removal) of granules and perhaps 1.5mm of asphalt sheet! (See *Photo 3*.)

"Seagull feces contain high concentrations of uric acid and the effects of the droppings on many surfaces, including steel and paint, is well known."

The other (and just as significant) side to the fecal contamination is the potential for serious health problems. Seagull droppings are a proven source of a variety of bacterial, viral, mycotic, and protozoal diseases. Bird droppings in sufficient volume may be considered hazardous waste.

Direct contact or contact through airborne sources must be considered. A direct source can be something as simple as tracking fecal matter on shoes from innocent contact on the roof. Airborne sources are through air handling and HVAC equipment (see *Photo 4*).

"Gull feces could be a major contributor of E. coli (105-109 CFU g1) and enterococci.[1] *However, another concern is the transmission of human pathogens such as salmonella, which gulls have been known to carry.*[2] *Dust and soil contaminated by bird and bat droppings may cause an infectious lung disease, according to the National Institute for Occupational Safety and Health (NIOSH). Roofing was listed as one industry that may be affected."*[3]

The specific problem appears to affect only exposed, granulated membranes. All roofing in the region and localized area is

subject to similar conditions. Traditional, built-up roofing with gravel cover seems to break up and distribute the fecal matter without a visible effect on the membrane. Inverted roofing systems offer similar break-up, but in time, the residue filters down to the membrane level and causes an odiferous and bacterial soup. Exposed, single-ply PVC and TPO membranes seem to offer a relatively impervious surface, as does EPDM, but the physical properties of these membranes bring their own unique circumstances, including many instances of birds (gulls and crows specifically) actually penetrating the membrane and removing the insulation below. These birds aren't stupid – they use the insulation for nesting material.

In this particular investigation, certain facts seemed to synergistically combine to cause the severe damage. The location of the building, the weather condi-

Photo 4 – Given the amount of fecal matter, a dry weather spell, and then a rainstorm, the air intakes can (and did!) draw some very objectionable odors into the building, to say nothing of the bacterial problems.

tions at the time, the type of membrane, and the lack of "bird control" devices or preventative action (and to a lesser extent), all appear to significantly contribute to the problems.

Weather Conditions

"The summer of 2004 has been a dry period, with no significant rainfall for a couple of months. Unlike more usual Victoria conditions, the dry period has allowed the bird droppings to build up and dry in situ *and in significant amounts. No washing or dilutive action from rain has been available, and this has contributed in a major way to the deterioration of the roof membrane surface.*

There is a significant objectionable odor on the roof, which is exacerbated after the short (to early August) periods of rain experienced. The odor is easily picked up by the building air intakes and distributed in the building. Since this report was commenced, more significant rain has been experienced, and dilution and some washing have taken place. The membrane damage has, however, been done, and major steps to repair and protect will be required in order to establish any semblance of realistic life expectancy."

"Bird droppings in sufficient volume may be considered hazardous waste."

Interestingly, when so-called "normal" rainfalls returned, much of the fecal matter did wash off, but the severe membrane damage was already done.

Roofing Membrane

"The roof membrane on the building is, generically, a 2-ply, SBS, modified bitumen membrane system, with the top ply-torch applied and the base sheet fully adhered with hot asphalt to a wood fiber insulation overlay adhered with hot asphalt to polyisocyanurate insulation. The insulation is in turn adhered to a concrete deck with hot asphalt."

The roofing assembly was installed by a professional roofing contractor, inspected by an independent roofing inspection firm, and warranted by a third-party roofing association, all to the highest industry standards.

Photo 5 – One of the attempts to " fix" the problem was an elastomeric coating. As demonstrated, the birds loved it. This particular coating proved ineffective.

Bird Deterrent or Control Devices

"At the time of our first site visits (the roof was some six months in service), no bird control plan had apparently been considered. No devices were in place, and as a result, the severe build-up of bird droppings had caused significant damage to the roof membrane.

Some roof areas, including ledges on the old building, were difficult to access. Seagulls were roosting on all parapets, ledges, roof fall arrest anchors, the roof membrane, and on top of the cooling tower."

Photo 6 – This photo was taken after the roof had been well washed by rain. The small, round marks are typical of granule loss damage to modified bitumen membrane caused by gull droppings. The larger, "splotchy" marks exhibit damage to the actual membrane, down to the reinforcing, in some locations. Some of what these birds eat and defecate dissolves or softens asphalt!

Drainage

The roof drains in all locations on the building stand slightly proud of the level of the roof and are causing some relatively minor water ponding. While minor, the ponding, when coupled with the bird problems, has created some concerns at drains on the north side of the main roof and all drains on the old police building. The drains are operating, but very slowly at this time. Algae growth is evident. With the amount of fecal matter, it is likely this water could be very contaminated, and extreme caution is advised.

THE SOLUTIONS

Successful resolution to the severe problems identified with the roof on this building will require a planned, integrated approach in several categories, including roof repairs, bird control devices, and regularly scheduled bird control inspections (for new nests, etc.) and maintenance (including washing at times) by the building operator or his subcontractor.

Membrane repairs on this building will be extensive and expensive in order to restore the roof to any semblance of its normal life expectancy. Specialized elastomeric coatings (see *Photo 5*), methacrylate coatings, an additional layer of cap sheet, or even the addition of a hot asphalt pour coat and gravel surfacing are plausible considerations.

Regular inspection and very careful surface washing (in dry times when rain is not a regular occurrence) may be required in order to keep the build-up of fecal matter to a minimum. Even if the coating protects the membrane as envisioned, the bird droppings will still have to be eliminated if further build-ups occur. Extreme care must be taken not to remove protective granules unless another protective measure is identified (see *Photo 6*).

A planned, integrated, and aggressive approach must be taken to solve the bird predicament. This may be achieved by a number of diverse bird-deterrent and bird-repellant systems and devices.

The products generally recommended for gull control include stainless steel or polypropylene plastic bird spikes, audio or visual deterrents, netting, etc. All can be effective – at least for a while. In our experience, none are an absolute panacea.

Ongoing Inspection and Maintenance

The last section of the proposed integrated solution involves ongoing inspection and maintenance of the roof and its protective systems. Keep in mind that gulls are a protected species and care must be taken to recognize that fact.

Using trained, in-house personnel or subcontracting the work, a planned program of regular scheduled inspections must be implemented. This program will be to visually monitor the condition of the protective roof coating and the effectiveness of the bird control devices.

One caution: nesting and roosting birds can be very aggressive on the roof. Personnel should go on the roof in paris and take precautions to protect themselves. Birds will usually only swoop and attack from behind. Carrying a full-sized corn or whisk broom above one's head is often effective in warding off an attacking bird. A hard hat is sometimes a good idea, as are towels and antibacterial wipes to clean up the effects of the dive-bombing attacks!

Nesting must be prevented. This is the first step in controlling and protecting the asset. If the initial control measures are not effective and gulls are attempting to build nests, then removing the nests and contacting the control specialist is required. There is no law, to our knowledge, that prevents personnel from removing the nest prior to eggs being laid. If nesting becomes apparent, then additional lawful measures to prevent and protect will be required.

A bi-weekly, walk-around inspection is all that is required. Should problems with birds, fecal build-up, or anomalies with the protective coating be observed, then a report can be generated and the appropriate steps to solve the problem can be established.

The roof is an important, expensive, and even critical component of the building. Protection and maintenance of the asset can be a challenge and only with information and planning can this process be effective.

References

1 L.R. Fogarty, S.K. Haack, M.J. Wolcott, and R.L. Whitman, "Abundance and Characteristics of the Recreational Water Quality Indicator Bacteria *Escherichia Coli* and *Enterococci* in Gull Faeces," *Journal of Applied Microbiology*, Volume 94, Issue 5, Page 865, May 2003, doi:10.1046/j.1365-2672.2003.01910.x.

2 *Manual for Gull Control at Massachusetts Landfills*, Massachusetts Department of Environmental Protection, Bureau of Waste Prevention, Massachusetts Division of Fisheries and Wildlife, May 1998.

3 "It's No Joke, NIOSH Warns Against Bird Droppings," *Professional Roofing*, February 1998.

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SPRI CELEBRATES 25 YEARS

SPRI (Single Ply Roofing Industry) celebrates its 25th anniversary in March 2007. The organization, representing sheet membrane and component suppliers to the commercial roofing industry, has released statistics showing the increased acceptance, growth, and enhanced field performance of single-ply and modified-bitumen roof systems.

In 2006, SPRI member companies shipped out more than 3 billion square feet of sheet membrane roofing, more than double SPRI member shipments in 1984.

According to independent market research from Infometrics Inc., Duluth, MN, in 1979, single-ply roofing systems accounted for only 10% of the U.S. low-slope roofing market. This percentage increased to 25% in 1983, one year after SPRI's founding. In addition, while the use of single-ply and modified-bitumen systems has increased dramatically over the years, field performance for these membranes has also significantly improved.

Data from Penn & Associates, a Cleveland, Ohio-based research firm, show that while single-ply roofing represented less than 30% of the average roofing contractor's dollar volume in 1984, roof failures and callbacks with these systems were initially higher. Today, Penn estimates that single ply and modified bitumen represent 67% of the average roofing contractor's annual volume. With more than twice the volume, total failures and callbacks with these systems have dropped nearly 20% since 1984.

EPDM roofing systems fueled single-ply growth in the 1970s and 1980s. According to Infometrics, EPDM accounted for most of single ply's volume early on, with a low-slope roofing market share of 19% in 1980. In 1985, Springborn Laboratories of Enfield, CT, put single ply's market share at 48% and modified bitumen's share at 12%, with EPDM still representing 60% of all single-ply sales.

Today, energy-efficient, white membranes, such as TPO and PVC, are becoming more popular. In particular, TPO (thermoplastic polyolefin) is the hottest product in the single-ply market, with double-digit growth rates over the last several years. In a 2006 survey conducted by a leading trade publication, almost 75% of contractors said they were pleased with the performance of TPO roofing.

The popularity of single-ply roofing systems also led to increased participation among roofing suppliers within SPRI. By 1987, 111 member companies had joined SPRI – 36 membrane suppliers and 75 associate members. Since its inception on March 3, 1982, SPRI has developed scores of technical publications and roofing manuals, as well as a number of SPRI/ANSI standards.

For more information about SPRI and its activities, visit SPRI's Web site at **www.spri.org**, or contact the association at info@spri.org.