Aging Buildings: Roofing Systems

Roofing systems are more complex than meets the eye, and they can develop structural issues if they are not properly updated and maintained as they age. When assessing the structural integrity of a building's roofing, the main concern is the age of the roof itself, not the building's age. In fact, old buildings with new roofs have over three times lower loss ratios and loss frequency than older buildings with aged roofs.

However, weather exposure can wreak havoc on roofs of any age. Despite the various materials used to construct them, roofs are constantly eroded by the elements. Thus, their longevity depends upon diligent upkeep. To prevent roof failures, facilities managers should monitor all roofing for common issues.

This article highlights the causes of roof failures, the property issues following a failure and ways property owners can identify roofing system concerns.

Why Failures Happen

There are a variety of factors that impact the lifespan of a roofing system. The following can influence a roofing system's longevity:

- **Exposure**—Roofs are constantly exposed to the elements, which can weaken structural components and accelerate aging. They can be subjected to:
  - **Heat and cold**—Thermal cycling occurs when materials expand in the heat and contract in the cold. The stress caused by the sudden temperature changes can lead to blistering, tenting, cracking, splitting, and membrane, adhesive and seam failures.
  - **Snow**—Snow and ice can stress roofing systems due to the weight of the accumulation, causing cracks to form. If water gets into those cracks, it may cause water damage to the internal structure of the building. Ice dams can cause significant gutter damage as well.
  - **Hail**—Damage from hail includes weakened structural members and accelerated aging.
  - **Sunlight**—Sunlight can contribute to the of membranes, shingles, sealants and other materials.
  - **Moisture**—Moist and damp conditions from rain, snow, hail and fog can cause material degradation. When water collects on low areas of the roof's surface, the ponded water can increase the chances of roof leakage and vegetation growth.
    - Wooden shakes—Shakes and shingles made from wood can curl, thin or split as they wear out. Even laminated and reinforced wood is susceptible to rotting, cracking, mold, mildew and animal and insect infestation.
  - **Vegetation**—Uncontrolled vegetation growth can pose severe problems for a roof, including robust root systems damaging the membrane.

  - **Moss, fungus and algae growth**—Moss, fungus and algae can cause direct damage to membranes and hold moisture against the roof. The resulting slippery conditions can cause a safety hazard for those walking on the roof.

- **Weight**—Excessive weight on a roof can cause it to collapse.
- **Poor design**—Design-related problems can be expensive to correct. They include:
  - Weak structure
  - Improper roof slope, sagging roof and inadequate drainage systems
  - An incorrect system that doesn't allow expansion and contraction of changes in deck material or changes in direction
  - Incompatible roof materials
- **Clogged drainage and gutters**—Inadequate drainage can cause water to enter the building structure, resulting in wall and ceiling damage. A minimum slope of ¼ inch per foot is necessary for proper drainage.
- **Poor installation**—Poor installation of roofing material can not only be aesthetically unpleasing, but it can also allow water to seep in between cracks and ruin the sheathing underneath.

Risks

The risks of roofing failures range from minimal to catastrophic and include:

- **Water intrusion**—If a roof fails to protect the building structure from water, it can lead to a myriad of issues, such as:
  - **Mold**—Mold can lead to eye, nose, throat and lung irritation for building occupants. It can also degrade building materials and cause structural damage.
  - **Rotting wood**—Soft, weak wood can struggle to remain stable under weight and pressure, and it may eventually break down completely, leading to collapse.
  - **Damage to the electrical system**—If water from a failed roof comes into contact with electrical systems, it can become a fire hazard and create an open circuit if the insulation is worn. There is also the risk of electrocution if someone touches an electrically charged wet fuse.
  - **Foundation problems**—Water intrusion from a failed roof can result in significant foundation and structural damage.
- **Roof collapse**—Roofing systems that are not maintained and updated may succumb to stress and pressure, leading to collapse. They can collapse due to:
  - Increased weight on the roof from heavy rain or snow
  - An aging roof that has not been adequately repaired or maintained
  - Structural damage from dry rot
  - Inadequate drainage

Recognizing Issues

Facilities managers should look for the following signs when assessing roofing system failure:

- **Visible damage from the outside**—Visible deterioration, missing shingles and growths are all indicators that maintenance or updates are due.
- **Water spots on the ceiling**—A leaking roof can cause discolored, bubbling water spots to form on the ceiling.
- **Blistering**—Roof blisters are raised areas where there is a loss of adhesion. They occur in all types of roofing systems. If left unmonitored, blistering can

lead to saturated insulation and a damaged membrane.

- **Displaced gravel**—Wind forces can create stress across a roof, causing gravel and ballasted roofs to become displaced. Facilities managers should look for signs of this in the roof's corners.
- **Ponding water**—Pooled or ponding water can indicate that the structure of the roof is not adequate.

Risk Management Actions

Roof maintenance and updates can help ensure that buildings remain operational and safe. Facilities managers can mitigate risk by:

- **Budgeting for the lifespan of the roof**—Roofs can be costly and different roof types can have vastly different lifespans. Therefore, it's important to plan for maintenance, repairs and replacement.
- **Ensuring snow is removed**—Snow removal can prevent water damage to the roof and the drainage and gutter system.
- **Conducting regular roof inspections**—Commercial-grade roofing should be inspected twice a year, once in the spring and fall. Drones can be utilized to see parts of the roof that may have been difficult to access in the past, making it safer for employees. Infrared scans also make it possible to see issues not visible to the eye.
- **Performing regular maintenance**—Facilities managers should stay on top of routine maintenance, such as cleaning clogged drains, so that minor problems don't balloon into more significant issues.

Performing proactive, preventive roofing system maintenance can save time and money while keeping the building and its inhabitants safe.

For more risk management guidance, contact us today.