When discussing sustainability for campus facilities, a common focus is on energy efficiency, natural lighting, indoor air quality, environmentally friendly materials, solar and wind power, and regenerative/adaptive uses. While all of these are highly valuable, they predominantly involve new construction and major renovation projects.

There are many eloquent and elaborate definitions for sustainability in construction; the simplest and best is, “the capacity to endure.” Yet proactive maintenance of the roofing system, the most important facility asset, is often overlooked (or disregarded) in contemporary evaluations of sustainability.

The National Roofing Contractors Association’s (NRCA) Project Pinpoint: Ten-Year Experience in Commercial Roofing states, “Roofing systems, unlike most building components, are directly exposed to the weather. The materials are expected to endure extensive variations in temperature, moisture (humidity, rain, snow, hail, dew), solar radiation and wind.” The roofing industry typically defines the life expectancy of a conventional low-sloped roof as 20 years, but in many cases roofs are replaced after just 13 to 17 years. This is often due to a lack of biannual inspections and a lack of routine maintenance.

Postponing maintenance by not adequately budgeting for it may necessitate an urgent reroofing well short of the maximum service life. When a roof system only meets three quarters of its value, there are a number of negative outcomes: premature disposal of existing materials, consumption of energy and natural resources, emissions into the atmosphere and failure to derive maximum benefit from the roof investment. Crisis management is reactive, with options limited by emergency funding.

Inspect, Maintain, Record and Plan

In a time of tighter budgets and increased awareness of the value of sustainability, it makes more sense than ever for board members and facility managers to take a proactive approach to maintaining
their buildings’ roofs. A three-point strategy is to hire skilled designers, contractors and consultants; use quality materials; and develop roof asset management plans and roof maintenance plans that will positively affect the bottom line and deliver value to stakeholders.

A management plan is a tool to anticipate roofing repair and replacement costs for campus facilities over time. It provides an analysis of existing building stock — types of roofing, when each was installed and general conditions. A maintenance plan is more specific for individual roofs — a schedule for twice-yearly inspections (once in autumn and again in spring); a record of what details to inspect, what repairs have been done, what areas to keep an eye on and additional inspections after any heavy storms; and instructions for regular removal of debris. Organized planning is the best protection to head things off before they become critical issues.

Take into account the roof’s age and its record on maintenance. If there were flaws during installation or maintenance has been deferred, moisture may be slowly infiltrating even though leaks may not be evident. By the time leaks are noticeable, structural decay could well be under way. Such costly damage is preventable if there is a proactive schedule to make simple repairs, like tears in the membrane.

Be aware that the most common spots for water infiltration are through a roof’s penetrations and terminations. A penetration literally means an interruption in the roofing membrane for a function such as a chimney, skylight, vent stack or pipe. Termination refers to a location where there is a change in the level, angle or edge of the roof, such as an intersection, perimeter, joint, curb or parapet wall.

Water may be forced through building members, if it is allowed to pond on a roof membrane, by hydrostatic pressure, water vapor gradient, capillary action or wind-driven rain. This is aggravated by porous concrete, cracks, structural defects or joints or drainage outlets that are improperly designed, installed or maintained.

Regular visual inspections involve making sure drains are clear; flashings and seams are tightly in place; no parts have blown or fallen off; and there are no telltale signs of aging such as spongy, soft or inconsistent spots in the membrane, or erosion, stains and warping on the flashings.

Checking the entire roof assembly — including the insulation — has become highly specialized using nondestructive testing (NDT) technology and pinpoint-accurate probes and core sampling. NDT methods employ nuclear backscatter, infrared thermography, electrical capacitance, electric field mapping, wind uplift and high-contrast digital imaging. An infrared scanner (IR) is the most frequently employed non-destructive tool to determine underperforming areas, including the insulation under the membrane.

Facilities staff can be trained to conduct frequent visual surveys and cleaning of low-slope roofs in coordination with regular professional inspections. Campuses that have historic buildings with steep slopes and roofing materials such as slate, copper or tile should limit staff maintenance to clearing the gutters. Hire a seasoned roofing contractor using proper safety and damage prevention methods to conduct inspections on historic roofs.

Facility managers have a good handle on thermal/energy use, notes Thomas M. Gernetzke secretary/treasurer at RCI, Inc., a professional association of building consultants. He suggests the following tips for detecting patterns.

- Occupant comfort. If the facilities department is getting regular climate control service calls from the same areas of a building, it could be a sign of problems in the corresponding area of the roof.
- In northern climates, note heat losses by inspecting the roof early in the morning after a heavy frost and noting where ice has melted or is dammed.
- In warmer climates, damage is more likely to occur from increased heat and UV exposure. A professional using specialized tools will be able to detect energy losses or moisture retention more readily.
- And the most obvious impending end of useful life is frequent systemic leakage.

By being proactive, facility managers can prevent water infiltration crises and ensure the full useful life and maximum value of a roof installation. Other benefits include maintaining thermal efficiencies, minimizing/eliminating potential issues such as mold and moisture damage and...
reducing operational delays/shutdowns.

In sum: Select a high quality roof, make sure it is properly installed and take steps to regularly maintain its integrity. This will maximize its life span. It’s the best thing you can do from a sustainability standpoint.

High Quality Materials and Adding Insulation

Materials selection for sustainability must include durability along with other environmentally friendly attributes. “Unfortunately, many of the roofs being installed today, whether for cost or other factors, are not lasting even 20 years regardless of warranty terms; and that can lead to disappointment and a discard of an otherwise great idea to benefit our environment,” says David R. Hawn, RCI’s immediate past president.

Heavily consider potential risks associated with the use of new materials and technology. Let the bugs get worked out first and do not rely on a warranty term that exceeds actual proven performance of the material. In some cases, trendy new materials and components are rushed to market without proper testing. Failure to conduct due diligence may result in the worst-case scenario of a roofing system that fails and needs to be replaced too soon.

A current trend in roofing is reflective materials that promise to reduce energy bills. Reflective roofs do reduce urban heat island effects when used in urban areas. They may also result in savings in southern regions, but not so much in northern climates. A properly insulated roof will save energy year round in every climate.

It is key is to pay extra attention to the roof system insulation component during design and construction when the greatest opportunity to improve the long-term energy performance exists.

There are techniques to make your roofing insulation more effective and efficient, says Hawn. For example, use two layers rather than one to limit thermal losses at joints. Also, consider ways to avoid through-fastening of the roof system (causing thermal bridging) or account for some minor loss at the time of roof planning.

If your project is a retrofit, before determining the amount of insulation to add to the roof, it is essential to ensure that the building will benefit, notes Hawn. A careful analysis by a consultant can quantify the amount of energy savings to expect by addressing such underlying questions as the following.

• The HVAC equipment may be sized for efficiency at a lower R-value. Will increasing the R-value of the roof substantially decrease equipment-operating efficiencies?
• Will the additional height of insulation require modifications of windows and doorway openings, roof perimeter conditions and penetration flashings?
• Will adding R-value affect dew point and cause water vapor to condense within the insulation and result in moisture damage?
• Will added insulation affect roof attachments or reduce the stability of the roof assembly?

To maintain the functional properties of insulation, the most important thing is to make sure it stays dry. Individual gas and air pockets provide the thermal value; when moisture fills these pockets, the insulation is as useless as a wet blanket. A roofing consultant uses specialized tools to conduct a moisture survey of the roof to identify if and where there is wet insulation. The consultant can identify where to remove the wet substrate material and roof membrane above the affected area, determine how it became wet, and provide direction for replacement with dry material and repair of the location where moisture infiltrated.

Obtaining Objective Advice

The bottom line? Work with a professional who is not selling other products or services. Watch out for free estimates and assessments: they often lead to large bills. The most objective, cost-effective approach is to hire an independent roof consultant who has no motive to find something on your roof that may not be there, and specializes in identifying issues that a contractor may miss. A roofing consultant will provide both A) a precise report that isolates causes vs. symptoms and B) detailed specifications to rectify problems or track solutions.

Governing agencies are increasingly requiring the involvement of third-party, licensed, independent building professionals to comply with local codes, ordinances
and administrative rules, notes Gernetzke.

In addition, more contractors are recognizing the value of working in tandem with roof consultants. The perspective provided by a consultant’s expertise on the roofing team helps eliminate problems, lowers overall costs and improves client satisfaction. The resulting reputational capital strengthens the contracting firm’s competitive advantage.

**WHAT SHOULD YOU LOOK FOR WHEN SELECTING A ROOFING CONSULTANT?**
- an objective, independent perspective,
- knowledge of roofing systems and the overall building envelope,
- experience with similar projects,
- a proven track record,
- an established and well-qualified staff,
- required insurances (general liability, workman’s compensation and errors and omissions) and
- any licenses or registrations required by state and local governments based on the scope of work.

**HOW SHOULD YOU USE YOUR ROOFING CONSULTANT?**

The predominant services are to
- assess the condition and needs for your facility’s roofs,
- assist in the management of and budgeting for your roofs (repairs and replacements),
- provide design services for the roof work and
- administer construction projects on behalf of the owner.

**HOW CAN YOU QUALIFY ROOFING CONSULTANTS?**

RCI, Inc., a professional association of building envelope consultants, has developed registration programs for both roof consultants and roof observers that establish standards for ethics, work experience and education. In addition, RCI-registered consultants must pass a rigorous exam and submit annual continuing education credits to maintain their certification. Many roofing consultants are also licensed architects and engineers.

Employ your institution’s procurement process with a well-defined scope of work in the Request for Proposals (RFP). Procurement codes for government agencies and many private sector companies require a selection process for design professionals. Your procurement staff may find helpful the generic guidelines that RCI has developed to enable you to compare and select a roof-consulting firm at www.rci-online.org/members-choose.html.

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