

Rocks are the New Green

There is tremendous pressure for today's construction projects to be as "green" as possible, meaning that a facility's overall design, as well as the materials and construction practices used, should be environmentally responsible and resource-efficient throughout the building's entire life cycle. However, construction materials and practices that are widely considered "green" can be more expensive than traditional building materials, and in an era of budget cuts and con-

instead, adjacent sheets of black EPDM rubber roofing membrane are spliced together and the membrane and insulation are held down with a minimum of 10 pounds of river-washed stone ballast material per square foot.

The system quickly became very popular, due in large part to its low installed cost. Ballasted roofs require only a few components: insulation, EPDM single-ply membrane, and ballast material. There are no fasteners or bonding adhesives



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straints, economy often wins out over sustainability. Take, for example, the selection of a building's roofing system; a plethora of sustainable roofing options exist, from dark-colored roofs that reduce heating costs in cold climates, to reflective roofs that help to cool buildings in hot climates, to rooftop gardens, which help decrease stormwater runoff. Regrettably, there is not often room in tight budgets for upgraded roofing systems.

Surprisingly, however, one of the most environmentally friendly roofing options is also one of the most economical. Developed in the 1960's, ballasted EPDM roofs were the original "green" roofs, developed long before the concept of sustainability was widely applied to building design. The intention was for a ballasted system to be inexpensive, quick to install, and low-maintenance; eco-friendliness was not a consideration when this system was designed. On a ballasted roof, components are not fastened to one another or to the roof deck;

used in the field of a ballasted system, which contributes to the low cost. In addition, installing a ballasted roof takes less time than other commercial roofing systems, so labor savings are significant. Once installed, these roofs require very little maintenance, another cost-saving benefit.

Throughout the years, ballasted EPDM systems have become the go-to option for building owners who want a roof that is inexpensive, quick to install, and low-maintenance. However, the sustainable benefits of these roofs are unknown to many people. Today's rising energy prices and concerns about climate change and carbon footprint have made building owners and facility managers more conscious of environmental stewardship and resource efficiency. A ballasted system addresses a multitude of sustainability concerns.

In order for something to be sustainable, it has to be durable and long lasting—ballasted EPDM roofs are both, often

outperforming their expected length of service. A 2003 study commissioned by the EPDM Roofing Association (ERA) selected 33 EPDM membranes, aged between 16 and 26 years, from in-service roofs in nine states. The samples included ten ballasted EPDM roofs; of these, the tensile strength, tear resistance, and ultimate elongation of the membrane were relatively unchanged after 23 years of service. In the Proceedings of the RCI 19th International Conference, researcher Tim Trial, PhD, wrote, "There was no significant, observable deterioration of EPDM's physical properties."

One of the reasons the EPDM roofing membrane on ballasted roofs tends to last so long is the protection provided by the ballast material, which acts as a shield against UV rays and extreme weather, enhancing the long-term performance of the roofing system. Ballasted systems perform especially well in hail storms, as the ballast material serves to break ice balls upon impact and protects the substrate from being damaged. In addition to protecting the roof from weather, the ballast provides fortification against flying debris and falling objects. Architect Craig Tyler (AIA, CSI, LEED AP BD+C), states, "A ballasted EPDM roof is ideal for high abuse areas, such as schools or recreation centers, where vandalism is a concern. The ballast material helps shield the membrane from objects thrown onto the roof."

The non-reinforced EPDM membrane used in ballasted systems remains repairable well beyond its estimated service life. This can be a huge advantage on a job, as it can mean the difference between replacing a roof and repairing it. Mark Sobeck, RRO, owner and principal of Mark J. Sobeck Roof Consulting, states, regarding a 31-year-old ballasted roof on a hospital in Northeastern Pennsylvania, "The membrane, the ballast, and all the other components are still the same. When the owner came to us seven years ago to discuss installing a new roof, I suggested they just re-flash the old one."

If it is determined that a roofing system does require a complete replacement, disposal costs can be extraordinarily high, reaching into the hundreds of thousands of dollars. The U.S. Environmental Protection Agency (EPA) states that 40 percent of total landfill waste comes from construction and demolition debris, and one quarter of that debris is made up of roofing materials. But ballasted EPDM systems offer a unique benefit: all the main components (insulation, membrane, and river-washed stone ballast) can be recycled, reused, or repurposed once the roof reaches the end of its service life. According to the EPA, "Reducing and recycling C&D [construction and demolition] materials conserves landfill space, reduces the environmental impact of producing new materials, creates jobs, and can reduce overall building project expenses through avoided purchase/disposal costs." The most eco-friendly roofing system is one whose components will not end up in a landfill, and ballasted systems' long service life, repairability, and recyclability make them some of the most sustainable commercial roofs available.

Ballasted systems are also energy-efficient in almost any climate because the ballast provides thermal mass, which helps to minimize heat loss in the wintertime and solar heat gain in the summer. In 2008, Oak Ridge National Laboratory released a study entitled "Evaluating the Energy Performance of Ballasted Roof Systems," which determined that ballasted roofs provide cooling energy benefits comparable to those offered by traditional "cool" roofs that utilize reflective white membranes. Even though they use a black membrane, ballasted EPDM

roofs are recognized as a cool roof alternative by ASHRAE, the California Energy Commission's Title 24, and the Chicago Building Code. The cooling and heating energy savings provided by this system contribute to a smaller carbon footprint for countless buildings throughout the United States.

Despite all its benefits, a ballasted roof can have limitations and may not be ideal for every project. The ballast material is heavy, adding significant weight (10-17 pounds per square foot for stone ballast, and up to 25 pounds per square foot for architectural pavers) to a building's load, so a building owner should consult an architect before selecting this system to make sure the roof can support the additional weight. Traditional stone ballast can potentially be blown off the roof in very high winds, so very tall buildings or structures in hurricane-prone regions may require engineered locking pavers to be used as ballast. In addition, in the event of a leak on a ballasted roof, it can be challenging to pinpoint the location of the leak because the ballast covers the membrane and makes a visual inspection difficult.

In the decades since its introduction, this tried-and-true system has proven to be both economical and environmentally friendly. When you choose to install a ballasted roof, you are choosing a system that provides a host of sustainable benefits at a low cost: a long life cycle, excellent resistance against hail, extreme temperature fluctuations, UV, and vandalism, long-term repairability, energy efficiency, and the ability to reuse, repurpose, or recycle all the system's components. This system proves that, when selecting a roof, building owners do not have to choose between economy and eco-friendliness. ♦

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