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ASU's Pervious Concrete Parking Lot is Water Smart

A new celebrated installation at the Arizona State University Art Museum is not in a gallery but is its parking lot which has recently been redesigned to showcase a state-of-the-art environmental-friendly alternative to conventional pavements. The featured attraction is pervious concrete.

Pervious pavement has various environmental advantages over the conventional asphalt parking lot. A mixture of Portland cement, coarse aggregate (stone), water and admixtures, pervious concrete is highly porous, containing 15 - 25 percent void space that interconnect within the pavement to form channels. These enable water and air to pass through the paved area.

This high porosity accounts for its environmental advantages over conventional lots. One advantage is that pervious concrete naturally filters storm water, reducing or eliminating pollution through natural biological processes. Larger pollutants in water infiltrating the soil beneath the pavement are filtered out. Microorganisms further control pollution by breaking down pollutants until they are inert. The result is a reduced pollutant load entering streams, ponds and rivers.

Groundwater recharge also benefits; instead of flowing off a surface to a storm water drainage system, water infiltrates the pervious concrete, eventually reaching the aquifer. Trees and other plant life surrounding a pervious concrete parking look better and live longer, their root systems benefitting from the improved access of air and water. This is an natural amenity achievable even in densely developed urban areas.

The storm water management applications of pervious concrete are especially useful. Faced with stricter storm water runoff regulations, property owners will likely be burdened with increased cost for installing an adequate drainage system when developing real estate. By reducing runoff from paved areas, pervious concrete lessens the need for separate storm water retention ponds and enable the use of smaller capacity storm sewers. Property owners are thus able to develop a larger area of their property at less cost.

The U.S. Environmental Protection Agency recognizes the proper utilization of pervious concrete as a Best Management Practice for first-flush pollution control and storm water management. Pervious concrete also earned kudos from the U.S. Green Building Council's Leadership in Energy and Environmental Design program for integrating paving and drainage. This reduces the amount of land needed to manage storm water.

Another bonus of using pervious pavement is reduced maintenance. It is expected to last about six times longer than conventional pavement.

The ASU project includes alternative water and landscaping design to mitigate the effects of the Urban Heat Island. By absorbing and storing less heat, pervious surfaces reduce urban heat buildup and heat radiation caused by conventional asphalt and concrete pavements. Urban heat buildup has been shown to indirectly affect water use. Planners also considered aesthetics to ensure an enhanced visual appeal.

The parking lot also serves as a demonstration project enabling researches to study its performance. Kamil E. Kaloush, co-director of EPA-designated National Center of Excellence on SMART Innovations for Urban Climate and Energy at ASU says "We wanted to sample the material, know more about its strength characteristics and durability."

Research will be ongoing at the ASU lot, with temperature and moisture sensors measuring its environmental performance for comparison with other non-pervious ASU parking lots. ASU researchers will use the data to develop technical guidelines for installing pervious parking lots.

One result is already obvious. Kaloush says that the parking lot area had problems with drainage. "When it rained it quickly flooded, and parking services would pump the water. It is quite an improvement this year because a lot of that water can go through the pavement."

The cost of pervious surfaces, which is about twice as much as traditional forms of pavements, will likely discourage its widespread use. ASU researchers expect, however, that its cost will lessen as developers and communities take an interest in the product.

Although available for 20 or 25 years, pervious concrete has not been extensively used in Arizona. Kaloush says research results will be shared with local communities since many cities have expressed an interest in the surface.

He says one project getting serious consideration is surfacing a lot outside the Tucson zoo; he invites researchers in the Tucson area who might want to participate in the project to contact him. (Kamil.Kaloush@asu.edu)

The project is a cooperative effort involving ASU's National Center for Excellence. The center is an extension of the university's Global Institute of Sustainability and the Department of Civil and Environmental Engineering in the Ira A. Fulton School of Engineering. Other program partners include ASU Parking and Transit Services, the Arizona Cement Association, the CEMEX USA company, Progressive Concrete Works Inc, and Border Products.