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The site design at the Ray and Maria Stata Center at Massachusetts Institute of Technology, Cambridge, is a good example of sustainable site systems design.

Setting Your Sites

Planning for sustainable elements in site design can help turn a project's interference into enhancements.

By Stephen Benz

Schools and universities recognize that many of the people and neighborhoods they serve expect education institutions to embrace environmental stewardship and sustainable design. Standards such as the LEED-registered facility program, managed by the U.S. Green Building Council, are receiving more attention. Schools can demonstrate their commitment to the environment by meeting the criteria for LEED registration.

Attention to sustainable design often focuses on buildings; incorporating sustainable elements in a building's site design can yield additional benefits. LEED-accredited professionals can help a school or university plan and incorporate sustainable-design elements into new or replacement facilities.

A traditional engineering approach often views disruption of the natural environment as a necessary part of construction. But sustainable site elements can become an integral part of the overall campus development. These elements can enhance designs and provide lasting benefits to the institution and the community it serves. One such element is the management of stormwater runoff from a site; a sustainable site design can maximize retention and reuse of this resource.

Managing stormwater

Stormwater happens. But simply disposing of it—treating it as a disposable nuisance and not as the valuable resource it is—is short-sighted. Stormwater runoff reuse conserves this resource.

In some geographic areas, managing this resource effectively is a regulatory compliance issue. For example, in Cambridge, Mass., the home of Harvard University and the Massachusetts In-

stitute of Technology, regulations state that a new facility must release a volume of stormwater significantly smaller than what the site generated before development and release it at or below the predevelopment rate. To meet these stringent requirements, colleges and universities must commit to sustainable site design, which can strengthen relations with the communities they serve.

Simply adding a retention pond onsite to satisfy stormwater regulations overlooks significant considerations. By employing newer techniques such as greening, infiltration, biofiltration, created wetlands and daylighting of streams to enhance a site, stormwater management can be done in harmony with the site.

More traditional engineering solutions handle stormwater through underground piping and a system of drainage collection systems. This hides the solution underground, and ignores possible drainage and flooding concerns at the site or adjacent areas. Yet landscape retention or detention can use excess stormwater for the creative enhancement of a site … and combining or "clustering" of mitigation techniques often results in a better solution.

For example, if a civil engineer creates an outwash basin as a natural feature for a site, but it cannot handle the total volume of stormwater, the basin can be combined with other technologies. Excess flow can be routed to an underground storage reservoir and slowly bled back into the basin. A structural reservoir can support the adjacent surfaces under an outwash basin. And, solar-powered pumps can be designed to pump stormwater gradually from the reservoir to irrigate the vegetation in the outwash basin above, and simultaneously provide water quality "polishing."

If the site is steep, "trickle swales" can be integrated into this system. These consist of a grass channel with a perforated underdrain constructed on a series of cascading vegetated terraces. Collected stormwater is directed to underground storage facilities. This creates a terraced knoll that can add visual interest to a site, as well as serve as a functioning landform as part of a stormwater-management system.

Environmental responsibility in practice

Sustainable site design added "function" to the landscape "forms" at the site of the Ray and Maria Stata Center at Massachusetts Institute of Technology in Cambridge. The design exemplifies sustainable concepts that can be applied at other campuses.

Key features of the project:

•An outwash basin that treats stormwater and provides a beautiful natural system that enhances public use.

•A stormwater-management system that captures and reuses 90 percent of site stormwater.

•Stormwater harvesting for irrigation and toilet flushing, saving more than $20,000 annually in water and sewer bills.

•Solar-powered pumping for stormwater quality "polishing" and outwash basin irrigation.

The site design addresses flooding issues in the adjacent neighborhood. It also serves as an outdoor education facility focusing on technology applications and sustainable design.

Rainwater harvesting for site or building use is a concept that is gaining attention. This process saves resources and often results in significant cost savings. For instance, site irrigation and sanitary facilities inside new or renovated buildings can reuse stormwater and eliminate the need for facility managers to purchase water for irrigation, toilet flushing and other similar uses.

Creating natural systems

Many techniques exist to use or create natural systems for site development. Processes that enhance a site and provide systems to manage stormwater offer sustainable design opportunities. One such technique is biomimicry.

Defined as the reintroduction of natural systems into the built environment, biomimicry is an effective development concept to enhance the beauty and utility of a site. Particularly relevant at dense, urban sites, the creative design of natural systems can add warmth and natural beauty to an otherwise sterile setting. And because nature is so resilient, newly created natural areas flourish quickly with plants and wildlife, demonstrating that "if you build it, they will come."

Creating natural environments adds value to a facility's site development by conserving resources and by developing site facilities that invite public use. These areas also can serve as outdoor education facilities.

Another technique, biofiltration, provides a natural process that improves the quality of stormwater runoff as it percolates (or passes down through) a layer of plants and soil. Hydrophilic, water-loving plants are used along with soil layers to filter the water on its journey through the created wetlands.

"Green roofs" provide still another opportunity for schools and universities to create attractive public spaces, and to conserve and reuse rainwater. Employing this technique enables soil and natural plantings to replace traditional roofing materials, reduces the effect of heat islands and helps insulate the top floor of the building.

As environmental regulatory compliance standards become more complex, designs should maximize the use of technologies that incorporate sustainable elements. Collaborative teams, including the institution, architect, landscape architect, civil engineer, and contractor, benefit from the "collision of ideas" that results when a creative team focuses on optimizing the design. The results can be sustainable site systems that benefit the whole community, and provide lasting value to protect and preserve the environment. ■

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