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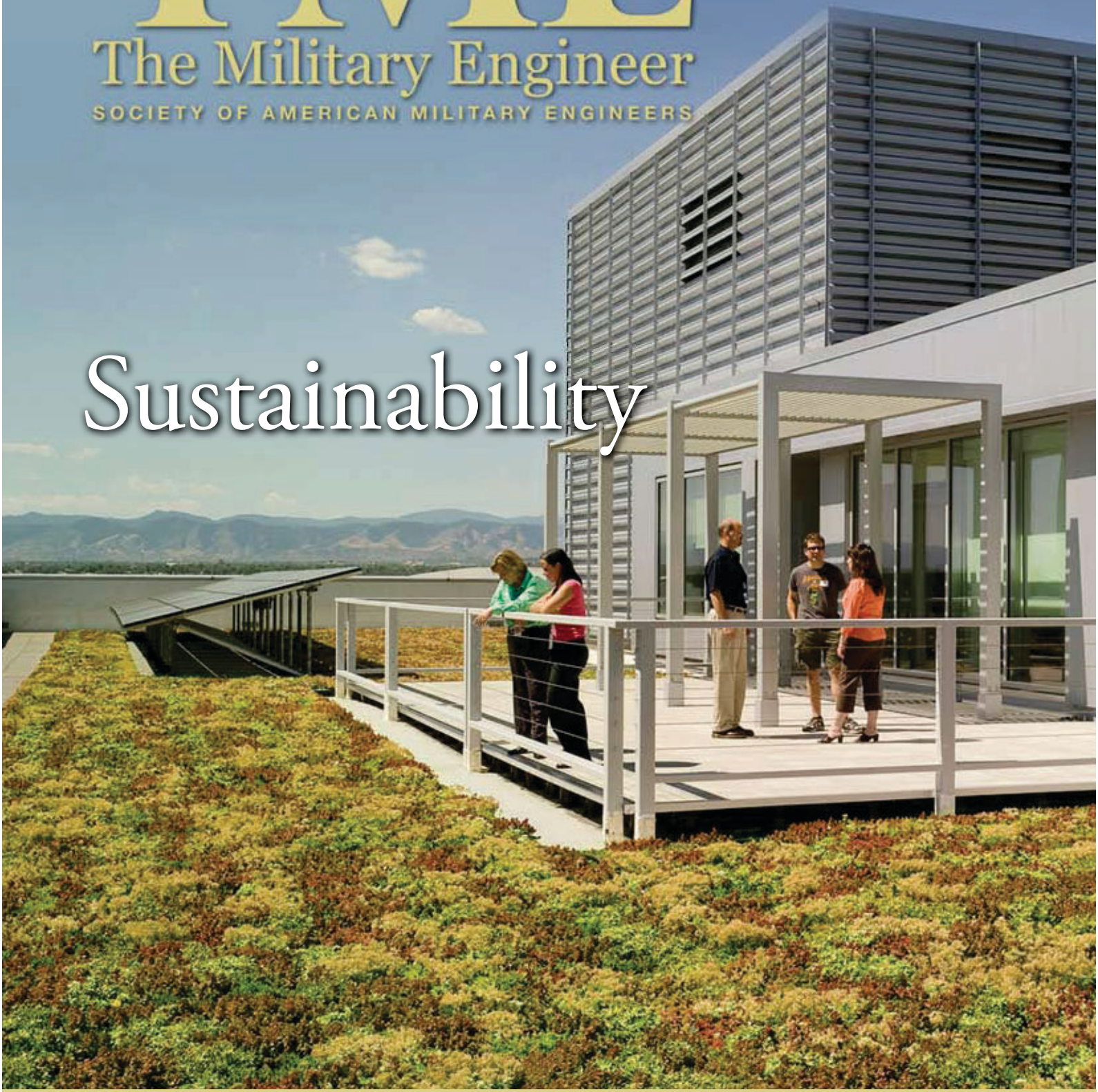
TME

The Military Engineer

SOCIETY OF AMERICAN MILITARY ENGINEERS

Sustainability



SPECIAL REPORT: ENGINEERING SERVICE FY10 PROGRAMS

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On the Cover:

The Environmental Protection Agency's Region 8 headquarters building in Denver, Colo., includes one of the first green roofs of its kind in the state. The roof provides air and water quality benefits and reduces building heating and cooling needs.

Photo courtesy EPA

Exclusively in *The Military Engineer Online*

- Read about how a design-build team at Scott Air Force Base, Ill., delivered a new high-performance logistics facility meeting Department of Defense security standards in "Expedited LEED Construction," by Craig L. Shumate, PMP, and Douglas M. Brown, P.E., PMP, LEED AP, M.SAME;
- Learn firsthand how one SAME Sustaining Member Company has adapted to the green building movement in "Incorporating Sustainability," by Thomas A. Womeldurf, AIA, LEED AP, M.SAME; and
- Examine the limitations of short-term, project-based international infrastructure programs with two former Peace Corps volunteer engineers in "Sustainable International Development," by Lt. Kevin R. Bingley, P.E., M.SAME, USPHS, and Lt. Ryan J. Gross, P.E., M.SAME, USPHS;

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Sustainable Stormwater Management

By Steven P. Roy, LEED AP, M.SAME, Ganesh Krishnan, P.E., CPESC, M.SAME, Russell R. Adams, M.SAME, and Robert Goo

In December 2007, Congress passed *The Energy Independence and Security Act of 2007* (EISA). The law includes numerous provisions related to energy efficiency, fuel economy standards and renewable energy as well as an important stormwater-related provision titled "Storm Water Runoff Requirements for Federal Development Projects." This one paragraph, Section 438, has the potential to change significantly the way stormwater is managed at federal facilities.

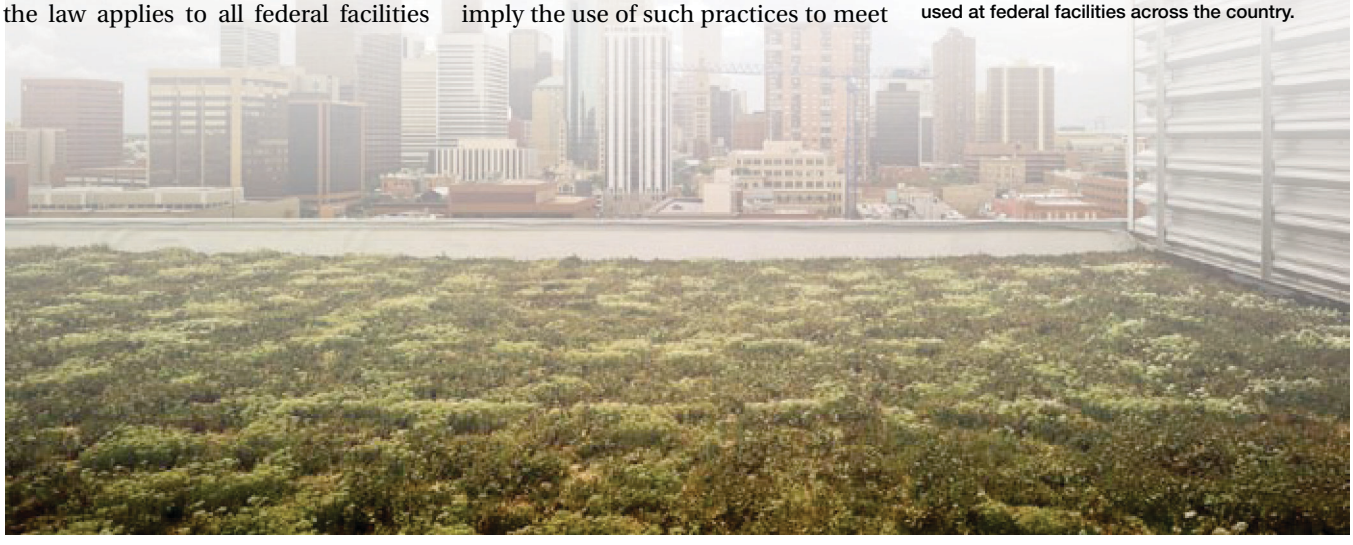
EISA Section 438 requires that "the sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow."

There are several significant aspects of this section that should be noted. First, the law applies to all federal facilities with a development or redevelopment footprint of more than 5,000-ft^2, including all Department of Defense (DOD) facilities, General Services Administration (GSA) facilities and facilities operated or owned by other federal departments or agencies. Second, it is assumed that the provision will be self-implemented by each agency, as no enforcement or compliance authority was specified. Third, the law requires facilities to implement the provision to the maximum extent technically feasible, definition guidance for which was not provided. Finally, the predevelopment hydrology of the property must be maintained as specified; again no interpretation was provided regarding how to define and implement the terms used.

Recently enacted legislation has the potential to impact greatly the management of stormwater at federal facilities across the country.

Low-Impact Development Techniques

Because predevelopment of sites cannot be maintained or restored without the use of green infrastructure or low-impact development (LID) techniques, the provisions of Section 438 seem to imply the use of such practices to meet



The green roof of EPA's Denver building, which overlooks the city's skyline, is one example of low-impact stormwater design techniques being used at federal facilities across the country.

Photo courtesy U.S. Environmental Protection Agency

the requirements of the act.

The primary goal of LID practices is to mimic the predevelopment site hydrology by using site design techniques that store, infiltrate, evaporate and detain runoff. Use of these techniques helps reduce off-site runoff and ensure adequate groundwater recharge. There are many examples around the country of federal buildings and military installations that have incorporated green stormwater design and LID stormwater features such as green roofs, permeable surfaces, bioretention, rain gardens, constructed wetlands, and rainwater capture and reuse, among others.

The general movement of progressive stormwater managers and designers is to manage stormwater on site as much as possible and move away from the conventional stormwater management approach of collecting, conveying and discharging stormwater off site. Thus, using LID approaches, stormwater engineers and designers are using site design techniques to reduce the generation of stormwater at the source, minimize impervious surfaces, disconnect flow paths and distribute stormwater across the site. These practices can be selected and designed with the intent to slow the velocity of the runoff and to infiltrate or evapotranspirate as much rainwater on the facility property as possible.

Green stormwater technology can be used almost anywhere soil and vegetation can be incorporated into the hardscape. DOD facilities tend to have a significant amount of hardscape surfaces such as buildings, parking, runways and equipment storage areas. There are many green techniques that can be used to break up large impervious surfaces and infiltrate runoff through engineered systems or other green spaces. Green infrastructure also can include rainwater harvesting and reuse techniques such as rain barrels and cisterns that can be used to capture and reuse rainfall for landscape irrigation or flushing toilets.

The New Stormwater Standard

The most important aspect of Section 438 is the new standard for stormwater management that is specified by the use of the term "to the maximum extent technically feasible" (METF). EISA has raised the bar for stormwater management at federal facilities; however, how high the bar has been raised is yet to be determined.

Meeting METF will require site engineers to approach stormwater management in a completely different fashion than in the past. In addition to existing stormwater requirements to design facilities to control flooding and peak discharges, this new law requires the facility developer and designer to consider temperature, rate, volume and duration of flow in their design. To achieve these performance measures, stormwater control practices that reduce the volume of stormwater discharge must be used to achieve the stated goals of preserving or restoring site hydrology during both the development and redevelopment processes. It can be inferred that this requirement is intended to achieve the following goals: reduce the energy and infrastructure needed to manage stormwater, combined sewer overflows and drinking water systems; protect drinking water supplies and recharge drinking water aquifers; maintain or restore stream flows (rates and volumes) to ensure channel stability; and manage water temperatures that are protective of aquatic biota.

Engineers, hydrologists, scientists, planners and architects have improved their ability to design better stormwater management facilities. New approaches to stormwater management—including LID techniques—have changed the way stormwater is treated. Stormwater is now viewed as a resource to manage and protect—not just an annoyance to move off a site and discharge into the nearest stream, lake, or wetland.

Will an LID stormwater design meet this new standard of "maximum extent technically feasible?" It depends on a number of factors, including site use and site conditions that may constrain the use of specific practices or dictate a specific use of the space on site. Even given these uncertainties, stormwater management practitioners have quite a distance to go before they can be confident stormwater has been managed to the maximum extent technically feasible. Often, limits on budgets, available space and conflicts with planned development create impediments to achieving the optimum management of stormwater. Federal facilities must now use all known, available and reasonable methods of stormwater retention and reuse to prevent the discharge of stormwater runoff in a manner consistent with METF.

Interagency Sustainability Working Group

A small subcommittee of The Interagency Sustainability Working Group (ISWG) is developing a guidance document detailing recommendations for compliance with Section 438. The ISWG was established in September 2001 in response to *Executive Order (E.O.) 13123–Greening the Government Through Efficient Energy Management*. Under *E.O. 13423–Strengthening Federal Environmental, Energy and Transportation Management*, issued January 2007, ISWG was charged with providing interagency assistance for implementing the *E.O. 13423* sustainable building design requirements. According to the draft guidance, compliance with METF can be achieved by either managing all storm events up to the 95th percentile rainfall event, or conducting a full hydrologic analysis to determine the pre-development runoff conditions and then design the stormwater controls to match this condition across all rainfall events: 1-, 2-, 10-, 25-, 50- and 100-year storms.

The final guidance document was planned for release by April 2009 and will meet its intended purpose as a framework for designers and engineers working on federal projects to use in selecting and designing effective stormwater management systems as part of overall facility designs. TME

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