

swales. The native and adaptive plant palette decreases water dependency, but the Colorado climate warrants irrigation in times of drought or extreme heat. Controllers download data from area weather stations to adjust water use. The custom pedestrian pole lighting (Beta, Edge LEDs on 20-ft. poles) has occupancy sensors to reduce energy needs and limit the impact on the neighbors.

NREL points with pride to data from the U.S. Department of Energy (DOE) that shows it leads all DOE national labs when it comes to working with businesses on research and development efforts to commercialize cutting-edge technologies.

NREL, for instance, recently spent six weeks testing a hydrogen fuel cell electric vehicle, the Kia Borrego. Hydrogen vehicles are not just a pipe dream. Kia reports scaling up facilities to support FCEV production in 2014-2015. NREL will also soon test a plug-in Prius and Mitsubishi i MiEV electric vehicle.



The smaller scale west courtyard functions as an expansion of the indoor cafeteria. Movable furniture (Catena chairs, Marneaux tabletops and Solstice umbrellas) lets people face the expansive views of Colorado's Front Range.

NREL's home is Golden, Colo., just west of Denver at the foothills of the Front Range of the Rocky Mountains. Golden lies in a sheltered valley fed by Clear Creek, between Lookout Mountain (burial site of Buffalo Bill Cody) and North Table Mountain and South Table Mountain.

Inspired by Golden's mesa geography, NREL's new zero-energy LEED Platinum building is the Research Support Facility (RSF). Its 800 occupants consume only the amount of energy generated by renewable power on and near the building, according to NREL. RSF is a new paradigm for landscape design, serving as the front door to world-class scientists who are blazing new territories in the realm of sustainable initiatives. The landscape provides an engaging laboratory to view these initiatives at work and test new technologies.



The east plaza extends across a swale of native alkali sacaton (*Sporobolus airoides*) to the vehicular drop-off area with a Euro-style bus shelter and U-

shaped Bola bike racks. A low, arcing wall extending from the east courtyard, through the building and into the west courtyard mirrors the mesa in form and material. A 100-space, photovoltaic covered parking lot is in the background.

The Project

The RSF was a design/build, firm fixed price project. There was complete transparency between designer and contractor, with a set budget in place for a set program. Materials fluctuated within this program to maintain the budget and create maximum value for the client. The landscape architects lead an interdisciplinary team of mechanical, electrical, structural and civil engineers.

Irrigation, lighting, signage and data/telecom designers were involved, as was an ecologist to assist with site remediation. NREL had an internal integrated project team responsible for reviewing and advancing the project from multiple perspectives. Architecture, engineering, fire protection, security, LEED, and environmental health and safety representatives participated in weekly design and construction meetings. Each group brought particular expertise to the table that instilled a sense of ownership in every aspect of the project.



The threshold of the east courtyard is a switchgrass (*Panicum virgatum*) planted drainage swale. Steel bollards mark the swale edge and delineate accessible parking spaces. One-watt in-grade LEDs (mini-micro Drivestar, B-K Lighting) light the pedestrian ways.

The Challenge

Set against the backdrop of Golden's South Table Mountain, the site presented two immediate issues: steep slopes and excavation material littered with rock, rendering it unusable for backfill.

A second challenge focused on the overall design. What type of design accompanies a 222,000 square foot, zero energy, LEED Platinum building?



A new 300-space surface parking lot (a seven-minute walk to the southwest corner of campus!) serves the RSF until the south portion of the site is complete. NREL mandates a .6 parking space to employee ratio. A campus shuttle loop has new shelters with a photovoltaic panel roofs, LED lighting and a campus security Talk-a-Phone call station. This parking lot is an outdoor laboratory to investigate porous paving: Filterpave (left) and porous concrete (right). The surfacing will be assessed for effectiveness, maintenance and durability. The adjacent bioswales filter stormwater and minimize irrigation dependence.

The Setting

The RSF is the latest addition to the unique family of projects at the National Renewable Energy Labs. The surrounding shortgrass prairie landscape is dotted with native rabbitbrush, wild plum, and hackberry. Jagged rock outcroppings line the steep slopes to the north, with willows and cottonwood groves populating the natural arroyos. Residential neighborhoods to the east and west, and county owned open-space to the south frame the NREL campus with the RSF functioning as the administrative core.



The native landscape, gabion walls and site-excavated boulders reflect the mesa environment of Golden, Colo.

The Analysis

The team analyzed the RSF context at the campus-wide level and at the site-specific scale. This project was the critical first phase implementation of the updated campus master plan and establishes a revived palette and design style for future development. A primary objective was drawing from the natural and historical mesa environment and reflecting these features as part of the built environment. Pedestrian scale analysis focused on the intimacy of the outdoor spaces framed by the building and how these areas could be comfortable, safe, and inviting. Benches, tables and chairs, and occupancy-sensor controlled lighting completes these spaces. Sun exposure, wind effects, snow drifting, storage, security/safety requirements, and stormwater drainage needs were all studied as part of the design. These findings provided a programmatic framework for plaza elements.

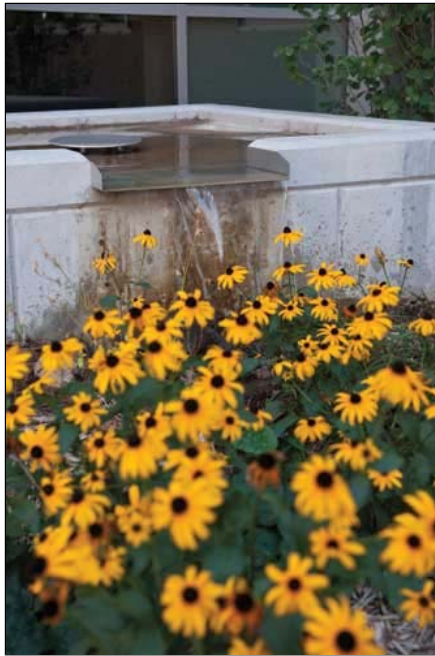


Here's a closer look at the metal deck bridges across the planted swales. Various seed mixes, blue grama prominent here, were developed and used to restore the disturbed shortgrass prairie landscape and unite the site with the area's mesa geography.

The Design

The east and west plazas blur the line between the native ground and the new office building. NREL emphasizes the importance of quality outdoor spaces and their correlation to employee health, happiness and productivity. Direct access to organized outdoor spaces and the mesa landscape is a primary goal of the campus master plan.

The east plaza is the arrival point on campus and invites employees and visitors to model sustainable site design initiatives. The plaza accommodates staff assemblies, smaller breakout meetings and individual seating areas. Socialization was the principal motive behind designing the west plaza, as it is an outdoor extension of the employee cafeteria.



Groundwater is pumped to the surface in the west courtyard (bottom photo) to irrigate a channel planted with black-eyed Susans. Interpretive signage explains benefits of the process and the design.

Stormwater: Roof drainage water for the landscape is captured and discharged into concrete catch basins filled with 100 percent post-consumer recycled glass. The glass filters the runoff, dissipates energy and allows the water to infiltrate back into the ground. During storm events, the water cascades over stainless steel weirs and moves through the site as visible, usable stormwater. Given the high water table on the site, a catch basin in the west courtyard collects water pumped to the surface and distributes it through a planted swale out into the landscape.

Walls and water shape the outdoor spaces, given the extreme topography at the foot of South Table Mountain and the two large arroyos cutting through the site. Strict Colorado water laws prohibit water retention, although stormwater can be held to achieve water quality requirements through infiltration. Overland drainage through the plazas minimizes piping and increases potential plant specimens without increasing the dependence on irrigation.

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Project Team

Client: National Renewable Energy Laboratory (NREL)

RNL

Landscape Architecture / Lead Designers / Lighting Design / Construction Administration

RNL, Landscape Architects, Lead Designer:

Marc Stutzman, RLA, LEED AP Principal-in-Charge
Steve Breitzka, RLA, LEED AP Project Manager
Brian Nicholson, LEED AP BD+C Lead Designer
Scott Anderson Landscape Designer

Civil Engineering: Martin/Martin Inc.

Structural Engineering: KL & A, Inc.

Mechanical and Electrical Engineering: Stantec

Security / Data / Telecom Design: Technology Plus Incorporated (TPI)

Restoration Ecologist: The Restoration Group, Inc.

Irrigation Consultants / Design: Hydrosystems KDI, Inc.

Signage Consultant: Arthouse Design

General Contractor: Haselden Construction, LLC

Vendors

Bus Shelters: Tolar Manufacturing Co.
Edging, Aluminum: Permaloc Corp.
Gabion Walls: Hilfiker Retaining Walls
Interpretive Signage: ADCON & Izone Imaging

Lighting

Controls: Douglas Lighting Controls
In-grade accent luminaries: B-K Lighting
In-grade solar pavers: Meteor Lighting
Linear LEDs: Winona Lighting
Occupancy sensors: WattStopper
Pedestrian, roadway, parking lot luminaries: Beta LED
Pedestrian, roadway, parking lot poles: KW Industries
Plaza poles custom: Structura, Inc.
Step lights: Lucifer Lighting
Pavers: Pavestone Co.

Plaza Planting

Porous Paving: Filterpave, Presto Geosystems
Recycled Glass: Eco-Cycle
Rock Skirt: Vision Recycled Aggregate
Security Call Stations: Talk-A-Phone Co.
Site Furniture: Landscape Forms
Tree Anchors: Duckbill Tree Support, Foresight Products, Commerce City, Colo.
Tree Grates: Ironsmith, Inc.
Wood Mulch: Oxford Recycling, Inc.

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