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New Animal Nutrition Center Promotes Conservation, Sustainable Design

by Bill Schaefer

With its high profile green roof and other sustainable design features, St. Louis Zoo's new Orthwein Animal Nutrition Center serves as one of the first non-animal exhibits in the zoo's history.

The St. Louis Zoo has made its new animal nutrition center, typically a back-of-house facility at most zoos, a major component of its public exhibit. In addition, the zoo's new Orthwein Animal Nutrition Center (OANC) educates and informs visitors not only of the importance of plant material and nutrition for animals and animal conservation, but also serves as a high profile showcase for sustainable design.

The OANC, which opened in June 2007, prepares and distributes diverse foodstuffs to the zoo's entire animal collection, including 800 species with 22,805 individual specimens. The Animal Nutrition Center also has a dedicated research laboratory to perform the challenging work of replicating diets of animals in the wild. In addition, the center is the zoo's first building designed and built to the standard of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED®) silver certification.

"A zoo's nutritional facility is generally something that's hidden behind the scenes. So, it's a real coup to be able to put our facility front and center," says St. Louis Zoo's Staff Nutritionist, Dr. Ellen S. Dierenfeld. Dierenfeld was a big proponent of building not only a state-of-the-art nutrition center and research lab, but also a LEED certified facility.

"I see a lot of zoos globally, and think that many other countries, in general, do a better job of including sustainable features in overall design than many American zoos. Plus, we, as zoos and conservation organizations, need to emphasize the multiple aspects of conservation to the general public. This is one way to do it – to have sustainability features included very obviously in the design. The Saint Louis Zoo has included sustainable design features in its construction for decades, although often the messages have been perhaps more subtle." Dierenfeld has served for many years on the Annual Conference Program Committee for the Association of Zoos and Aquariums (AZA), assisting in setting up a number of workshops and sessions on green design and LEED certification for the zoo community, hence was familiar with some of the options available.

The new 10,000-square-foot center's sleek, modern design incorporates many green design features, including an extensive green roof, optimized heating and cooling systems, motion-sensored lighting, plus widespread use of natural light and recycled materials. Materials used in the construction have high recycled content and are locally sourced.



Photos courtesy of SWT Design

The new Orthwein Animal Nutrition Center at the St. Louis Zoo incorporates many green design features, including the Garden Roof® Assembly from American Hydrotech, Inc. The Garden Roof® was specified to provide a multilayered waterproofing membrane integrated with a soil support system for supporting plant life as well as to protect the roof membrane.

The Green Roof Decision

The OANC, with its distinctive 4,470 square-foot green roof planted with a variety of sedums and grasses, serves as one of the first non-animal exhibits in the zoo's history.

"The green roof was a shared decision among the zoo, the architect and the landscape architect," Dierenfeld says. "We felt from the beginning that we wanted to consider a LEED certified building, so if the green roof was something that could add to that, then absolutely that was something to consider. Many buildings in European zoos, for example, include green roofs and they typically look much more naturalistic, so that was a visual plus."

Fox Architects served as architect for the project and SWT Design served as landscape architect. The general contractor was Hankins Construction Company.

"Zoos, in general, tend to be extremely densely built places, and land at a zoo is always at a premium, especially for a non-animal exhibit building like this one," says John Berendzen, a principal with Fox Architects. St. Louis. "We looked at multiple sites for this building and were finally asked by the zoo to look at this particular site, which was one of the last untouched areas left in the zoo – about two acres. We knew that if we were going to cover up this area with 10,000 sq. ft. of building, plus associated vehicle access, the last thing we wanted to do was to take that green space, that habitat, out of service for the zoo. We looked at a couple of options but the one that really interested Fox was basically putting the green space back – kind of like making a slice in the ground and then sort of pulling that bit of green space up over the building."

The building was positioned to take advantage of the northeastern sun for the facility's expansive viewing windows and the southwestern sun for the extensive green roof. The building is also sited parallel to the zoo-line railroad, allowing the building to appear to expand up and out of the visitor's viewpoint as the zoo-line railroad moves along. The green roof is partially composed of grasses to insulate the building, minimize rain runoff, and reduce reflection of heat. Plantings include a mixture of colorful and very low maintenance sedum species, grasses and other native plantings.

"One of the unique attributes of this green roof is that there's a visual continuation of the slope of the roof that literally comes down to the ground level," says Ted Spaid, a principal with SWT Design, St. Louis. The building's sloping roof provides visitors with optimal viewing of the nearby alpine habitat's variety of sedums, grasses, and perennials. "The illusion to the person looking at the green roof is that there is a continuation of the land form that goes right up the green roof. It's kind of exciting because it really creates this incredible integration between the landscape and the building itself. There's an almost seamless transition between the land form and the building."

In order to ensure visitors don't walk up onto the roof, a rock wall was put in, says Berendzen. "We worked this out with the landscape architects so that the vegetation rolls up the building, but it transitions to a boulder wall, which becomes an interpretive point where the green roof can best be viewed." Here, a display discusses all of the benefits of the roof and the building and how it relates back to the zoo's mission statement for animal conservation and the need for improved sustainability in communities.

Single-Source System

By replicating natural conditions, the green roof becomes a highly self-sustaining ecosystem. A single source system, the Garden Roof® Assembly from American Hydrotech, Inc., was specified for the OANC



The planting medium, specifically engineered American Hydrotech LiteTop® soil was custom-tailored to provide for optimum infiltration, moisture retention, temperature and insulation, and chemistry for this application of traditional sedums, sedges and Indian grass.

project to provide a multilayered waterproofing membrane integrated with a soil support system for supporting plant life as well as to protect the roof membrane from physical damage and attack from plant roots.

The Orthwein Animal Nutrition Center's metal deck was covered with ½-inch Dens-Deck®, a non-structural, fiberglass-embedded treated core board. Installing the Garden Roof Assembly started with Hydrotech Monolithic Membrane 6125® EV applied directly to the substrate. The roof membrane is a hot, fluid-applied, rubberized asphalt produced with a minimum of 20 percent recycled content. This layer is applied in two coats, with a sheet of fabric between each coat for a final thickness of 215 mils to form a long-lasting, tenacious bond to the substrate that can withstand and perform in submersed water conditions.

"Having a good waterproofing membrane was very important for the owner," Spaid says. "This is a building with a tremendous amount of assets under the roof. Green roofs are very counter-intuitive because roof systems are typically designed to shed water immediately and be waterproof. Obviously with a green roof we need to have the waterproof ability, but we also need to capture and hold a certain amount of water, which brings about more potential risk."

Another aspect of the waterproofing concerned the roof's horizontal and vertical design elements. "The roof itself pitches but at a certain point the building ends, and then the roof becomes a retaining wall," Berendzen says. "We wanted to meld those two spaces, but we also had to have a waterproofing membrane system that could be used both on the roof portion and the vertical portion of the retaining wall, to maintain a consistent membrane between the two. That's a big reason why we went with the Hydrotech membrane system."

Following the installation of the roof membrane, a drainage/water storage/aeration layer called Gardendrain was installed. "Gardendrain consists of lightweight panels made of 100 percent recycled polyethylene, molded into retention areas and drainage channels," explains Steve Skinner, Garden Roof Product Manager for American Hydrotech, Inc. "The layer is designed to allow for the free drainage of excess water, while at the same time promoting irrigation through capillary action and evaporation into the soil/vegetation level."

Next, a filter fabric was installed over the drainage/water storage/aeration layer. The filter fabric, made of non-rotting, nonwoven polypropylene fibers, is resistant to natural acids and alkalis, and is chemical neutral. The filter sheet helps prevent the loss of soil, mulch and plant debris while allowing for the flow of moisture.

Planting Media & Plants

Following installation of the green roof's soil support assembly components, the planting media was put down, which was specifically engineered American Hydrotech LiteTop® soil. "The planting media is a critical

component," Skinner says, "because it must provide a stable structure for the anchorage of the plants' root system, while remaining as lightweight as possible to prevent excess loading of the roof structures." The planting media for the OANC was custom-tailored to provide for optimum infiltration, moisture retention, temperature and insulation, and chemistry for this specific application.

"The majority of the rooftop plantings are native," Jim Wolterman, a principal with SWT design, explains. "We certainly had to use a lot of traditional sedums in order to get that blend of plant material that's common and necessary to extensive green roofs, but we did venture out and used other sedges and Indian grass to help augment the traditional sedums."

Another interesting component, says Wolterman, was the addition of native Missouri rock in order to achieve a grassy savannah-like glade that reflects much of Missouri's ecosystem. "The Missouri rocky glades are areas where there are a lot of surface rock. These are actually almost desert-like climates where you have prickly pear cactus native to Missouri. This type of ecosystem really translates well into the extensive green roof landscape," Wolterman says. "A decided advantage of the green roof system selected is the ability to combine hardscape and softscape while maintaining proper drainage at the deck level and moisture retention just below the soil."

Once the slope of the roof reaches terra firma, cedars and other native trees were introduced, as well as certain grasses that require deeper soils, such as little blue stem, black-eyed Susan and switch grass. A native, ledge-rock wall along the roof garden viewing area serves as an aesthetic barrier and adds additional alpine elements with drought-resistant native plants. "Those plantings really help blur the line between what's traditional extensive roofscape and what is natural and native to the Missouri environment," Spaid says.

Planting was a very collaborative effort, according to Ellen Dierenfeld. The zoo's horticultural staff participated in much of the installation of the plantings, and this has enabled them to really understand and embrace the long-term aesthetic and functional goals of the landscape.

Public Demonstration

Medicinal plant gardens have been located in front of the building as part of the landscape to prompt the public into thinking more broadly about how nutrition impacts health and all aspects of life. "And towards the back, where you look onto the roof, there are research gardens where different aspects are built right into the landscaping," Dierenfeld says. "The other aspect, obviously, is that by using natural plants or zeroscape plants that can survive this climate without irrigation, it demonstrates to the public that beautiful landscaping is possible without having to go against water conservation principles."

"The industry has done a good job of recognizing and promoting the functional and environmental benefits of extensive green roofs," Ted Spaid of SWT Design says. "I think, moving forward, what's going to set one green roof apart from another will be how they begin to educate our future generations and how they aesthetically blend into our environment."

Each day, under the Orthwein Animal Nutrition Center's green roof, Dierenfeld and her staff prepare meals, snacks, and essential vitamin supplements for more than 22,000 residents of the renowned St. Louis Zoo. Through a large expanse of viewing windows, visitors walking a wide paved pathway next to the center can stop and watch the culinary art and science of zoo nutrition in action. Though the center's doors are not open to the public, Dierenfeld affirms that many visitors take advantage of the view each day. "There are often a lot of nose prints on the glass, absolutely."

About the Author: *Bill Schaefer joined American Hydrotech in December 1992 and in 2005 he was promoted to District Sales Manager for the North Central region of the US. Bill recently obtained his CDT certification from CSI.*