

APPLICATOR

SEALANT WATERPROOFING & RESTORATION INSTITUTE • SUMMER 2008 • 30.2



Unique Waterproof Roofing Challenges

Postnet Standard
US Postage Paid
Shawnee Mission KS
Permit #178

New Headquarters Has “America’s Fact Finders” Seeing Green

By Matt Carr

Green roofs atop the new U.S. Census Bureau Headquarters Building provide natural insulation, minimize rainwater runoff and improve outside air quality. They also offer a sensational view for upper floor occupants and provide for a pleasant walk between the two wings of this sprawling complex.

The new U.S. Census Bureau Headquarters at Suitland Federal Center, Suitland, Md., is a state-of-the-art facility, designed and built to provide a world-class workplace for 6,000 of “America’s Fact Finders.” The complex is one of the most impressive buildings in the General Services Administration’s (GSA’s) portfolio, with sweeping curves and glass cladding with vertical wooden louvers. And it is not short on green space, either.

The Census Bureau Headquarters is designed as two curved wings (the North and South “buildings”) rising from a one-story monolithic base and connected above by a walkway. The two interconnected wings curve over and around a stunning garden courtyard. Higher up – above the lobby and also above the fourth and fifth stories sit green roofs that together encompass more than 70,000 square feet of green space.

Green roofs, an integral part of the “green building” philosophy, are sprouting up across the area. Suitland, located about six miles from Washington, DC, incorporated the third largest area of green roofs in 2005, just behind Chicago and DC, according to a survey released in 2006 by the non-profit trade association, Green Roofs for Healthy Cities (GRHC). One reason for the abundance of green roof projects in Suitland and DC has been GSA’s commitment to sustainable building practices and the certification of its facilities through the Leadership in Energy and Environmental Design (LEED®) Green Building Rating System of the U.S. Green Building Council. The Census Bureau Headquarters has received a LEED Silver rating from the U.S. Green Building Council for its sustainable design and construction.

Design-Build With Bridging

Formal groundbreaking for the Census Bureau Headquarters Building took place in September 2003. The complex was constructed in two phases, with the first phase completed in

May 2006 and the second in December 2006. To ensure completion before the Bureau goes into peak mode to conduct the 2010 decennial census, GSA used “design-build with bridging” as the method of delivery. GSA contracted with one architect to develop the concept design and serve as the owner’s bridge architect, which was then followed by a separate solicitation to select an architect/contractor team to prepare the final design and build the project.

A primary motivation for the architect to add the green roofs was to obtaining LEED credit, according to Jag Bhargava, project executive with the GSA. As a means of evaluating and measuring its green building achievements, all GSA new construction projects and substantial renovations must be LEED certified, and projects are encouraged to exceed basic LEED green building certification and achieve the LEED Silver level.

“We brought in SOM to do the concept drawings and to complete 25 percent concept design,” Bhargava said. “The firm was also to indicate in the concept design its plan to ensure at least a Silver LEED rated building.” Green roofs have the potential to contribute toward several LEED points for a project – among them, the Sustainable Sites Credit 6.1 for Storm Water Management (1 point), the Sustainable Sites Credit 7.1-2 for Urban Heat Islands (1-2 points), and the Materials and Resources Credit 4.1-2 for Recycled Content (1-2 points). “In their plan there were several innovation points for LEED Silver, several energy points, and several environmental points” Bhargava said. “One of the environmental points was for the green roofs because they provide natural building insulation, minimize rainwater runoff and improve outside air quality. SOM developed the concept of putting in the green roofs and a paved pathway through these green areas and between the North and South buildings.”

Highly Visible Lower Roofs

After the concept design was completed, and following GSA’s review of proposals, the contract for the design/build work was awarded.

“SOM came up with the initial concept and schematic design for the green roofs and it was our task to take the design development drawings and finish design development, prepare the construction documents, and then take the project all the way through construction,” said Jeff Vandersall, AIA, a principal with the contracting team. The headquarters is an eight-story building with two components that have lower roofs at the fourth and fifth levels. Vandersall explained that these lower roofs are highly visible from the upper levels inside the two wings. “We implemented the original design concepts in creating the lower green roofs, which now provide a beautiful, natural environment

for those inside the buildings to enjoy. We also connected several entry points into the buildings up at the roof level with hardscape – a meandering walkway through the green roof, providing passage for people to walk from one building, or wing, to the other.”

Both Intensive And Extensive Systems

The team used both extensive and intensive green roof systems on the project, with a planting media ranging in depth from 3 1/2 inches to 3 feet. Low-growing hardy plants were chosen to create high-profile settings that would hold up to the harsh rooftop environment without the use of permanent irrigation.

“There are several different types of green roofs within this project,” said Brian Shandrick with the landscape architects. “There’s an extensive type with a very thin soil profile of 3 1/2 to 4 inches. And then there’s an 8 to 12 inch soil profile, which would be considered intensive. Finally, there’s a full-depth type profile, also considered intensive, with about 3 feet of soil. Soil depths were essentially dictated to us based on the various drawings we received, and then we developed the details for how those were to be constructed. The different soil depths basically dictated what soil materials to use as well as planting materials.”

The extensive green roofs are located over the lobby (an approximate 10,000 square foot, triangular shaped area), atop the fourth floor roof of the North building (about 35,000 square feet), and atop the fifth floor roof of the South building (about 30,000 square feet). The deeper soil profiles (8-12 inches), the intensive systems, are located on portions of the land bridge extending through the building where the division occurs between the two wings. The base shared by the two wings is underground, and the land bridge spans this lower level.

“This bridge ramps up, levels off and then ramps back down on the other side,” Shandrick explained. “At the peak, the green roof system is designed for an 8-12 inch soil depth. And then where the bridge extends beyond the building base, and over the parking garage at grade, the green roof system is designed for as much as a 3-foot soil depth.” Besides the three areas on the building itself, the 127,000 square foot roof over the parking garage is also technically considered a green roof even though it is at grade.

Complete Assemblies

The Census Bureau Headquarters green roofs combine high-performance waterproof membranes with lightweight garden planting roof technology. Components included a waterproofing membrane, insulation, drainage/moisture retention elements, and lightweight engineered soil. The Garden Roof Assembly consists of up to eight components starting with the roofing membrane



Vegetation chosen for the green roof included sedums with various shades of red and subtle greens to emphasize the different kinds of vegetation moving through the site.

(applied directly to the roof deck), a protection course/root barrier, insulation, water retention/drainage elements, filter fabric, growing media, and vegetation.

The roof membrane is a hot, fluid applied, rubberized asphalt produced with a minimum of 25 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. For the Census Bureau Headquarters project, a high density polyethylene sheet was then rolled out over the membrane as a root barrier, and a heavier sheet was applied to protect those areas that would be subjected to high amounts of construction traffic, or where plants with deeper and more aggressive root structures would be planted, such as over certain areas of the land bridge and over the parking garage.

Over the root barrier, an insulation layer was installed using a CFC-free, closed cell polystyrene that is strong, moisture resistant, and maintains long-term insulation value.

In the extensive system areas, a moisture retention mat was rolled over the insulation. Composed of recycled, non-rotting polypropylene fibers stitched through a polyethylene sheet, the mat retains moisture and nutrients as well as provides physical protection to the root barrier and waterproofing membrane.

Atop the moisture retention mat, a drainage/water storage/aeration layer was installed. This layer was installed in two distinct profiles for use in the Census Bureau green roofs extensive and intensive assemblies. The layers consist of lightweight panels made of 100 percent recycled polyethylene, molded into retention areas and drainage channels. 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 is

designed to prevent the loss of soil, mulch and plant debris while allowing for the flow of moisture.

Planting Media and Planting Selections

The planting media was put down following the installation of all components of the soil support assemblies. Proper planting medium selection is critical to the long-term success of a garden roof. A precise blend of organic and inorganic materials tailored to the specific application, the green roof planting medium is not only lightweight, but also possesses the seemingly contradictory abilities to retain water and drain well.

For the Census Bureau Headquarters project, the planting media was tailored to the specific application to provide for optimum infiltration, moisture retention, temperature and insulation and chemistry. Once the planting media was put down, it was time to plant.

“On the three upper levels there is no irrigation system so we specified typical arid climate sedum materials that are often used on the green roofs,” Shandrick said. “Many of the plants are native to the



area, and most were selected because of their drought tolerance, their acceptance of shallow soil depths and overall form and texture.” With the emphasis on the visibility of this green roof, and the way it was designed, the team chose sedums with various shades of reds and subtle greens to emphasize the different kinds of vegetation moving through the site.

“People can walk on the walkway through these indigenous plants, which will be about 12 to 18 inches tall when fully grown, said GSA’s Bhargava. “The area provides a pleasant transition between the two buildings.”

Shandrick said the plantings selection at grade, coming off the land bridge and over the parking garage area, was somewhat restricted due to the original design of the project. “The idea for the at-grade design is of an open meadow with tree plantings to reinforce the pathways. We incorporated a meadow selection of plants for both sun and shade areas, depending on their proximity to the building. The planting intent at ground level was to create a naturalized site of mostly reforestation-type native plantings with meadow areas

over the parking garage area. There are also some ornamental plants to reinforce specific areas, and then more structured planting in certain areas to play up different aspects of the building.”

Sustainability + Aesthetic Quality = Successful Green Roof

For years, the Census Bureau headquarters staff had been dispersed throughout the area in a mix of government and leased buildings, most of which were built as far back as 1942. The completion of the new Census Bureau headquarters complex now provides 1.5 million square feet of new working space – large enough to consolidate and house the entire staff of 6,000. It’s been quite a positive change, which the green roofs enhance both aesthetically and environmentally.

“Having the green roof outside of a predominantly glass building makes all the difference in the world, compared to if a reflective surface had been put down instead,” said Vandersall. “One reason this project is successful, aesthetically, is because the lower roofs are exposed to the upper floors of the building and the green landscaped surface provides a pleasing

view from the upper floors. In addition, the green roof serves as a nice accessed space for one to kind of get away from it all.”

Bhargava said the project has also been a success for all the obvious reasons, not merely providing a beautiful, natural environment for employees, but also representing important major environmental and sustainability components in GSA’s Sustainable Building Policy. “The green roofs provide insulation that lowers cooling/heating costs for the building and reduce the “heat island effect” while greatly extending the life of the roofs’ waterproofing membrane. They also require minimal maintenance and reduce annual stormwater runoff significantly, as well as provide a local wildlife habitat. Already there are birds and butterflies in abundance.”

About the Author

Matt Carr is eastern regional manager, American Hydrotech, Inc., Chicago, Ill.