Green Infrastructure & Stormwater Management
CASE STUDY

Target Center Arena Vegetated Roof

Location: Minneapolis, MN
Client: Minneapolis Community Planning & Economic Development
Design Firm(s): The Kestrel Design Group, Inc.: Green Roof Consultant, Leo Daly: Architect of Record, Inspec: Roofing Consultant
Landscape architect/Project contact: Peter MacDonagh
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ASLA Chapter: Minnesota

Project Specifications

Project Description: The 20,500-seat Target Center Arena is home of the NBA's Timberwolves, concerts and other events. When the Target Center Arena needed a new roof, the City of Minneapolis chose to model a sustainable building and stormwater management approach by re-roofing with a green roof. At 113,000 sq/ft, the Target Center Arena green roof, the fifth largest extensive green roof and the first green roof installed on an arena in North America (as of August, 2009), mitigates the urban heat island effect, greens views from above, provides wildlife habitat and improves urban air quality on a scale that is not feasible at grade in an urban area like downtown Minneapolis. It also mitigates stormwater runoff from a significant amount of impervious surface in a downtown location where space does not permit use of other low impact development techniques for stormwater management at grade. The green roof provides a 2.75" deep growing zone in the center of the main arena roof structure and a deeper 3.5" deep growing zone around the perimeter, where the structural capacity is greater, to maximize storm water

retention and plant vigor. A pre-grown mat of sedum plants was installed to allow plants to gain strength before facing the harsh conditions on the 150' high roof as well as to maximize plant cover and wind resistance from day one of installation. Twenty six additional species of plants native to Minnesota were planted and seeded into the mat to enhance plant diversity and maximize ecological benefits and resilience. To facilitate long term success, the project includes a 20-year warranty and maintenance contract for all the project components.

Project Type:
Commercial

Design features: Green roof

This project was designed to meet the following specific requirements or mandates: Local building codes

Impervious area managed: 1 acre to 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: 1 acre to 5 acres. The existing EPDM roof was retrofitted to a green roof.

The regulatory environment and regulator was supportive of this project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements? When Minneapolis' Target Center Arena needed a new roof, the design team began the planning process by performing a quantitative and qualitative lifecycle cost benefit analysis that enabled the City of Minneapolis to decide with confidence that replacing the conventional roof on the Target Center with a green roof was the most cost effective and ecologically sound decision over the lifespan of the proposed roof. The analysis included estimated installation and maintenance costs, as well as energy stormwater utility savings. Quantitative financial lifecycle cost benefit analysis showed that over a 20-year study period, a green roof is more cost effective than a white reflective roof. Based on 2008 Minneapolis Stormwater Utility Fee rates, it was estimated that the Target Center could receive a $9,254.12 per year stormwater utility fee credit for an 115,000 sq/ft green roof. A green roof thermal performance model developed for use with ESP-r was used to model reduction in energy costs with a green roof versus a white reflective roof and the existing roofing membrane as accurately as possible. The model estimated annual savings of $3,996 per year for both a white roof and an extensive green roof compared to a new conventional roof.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: $1,000,000-$5,000,000 (Public funding: Local)

Related Information:

- Green roof: $12.00 per sq/ft
- Irrigation $2.00 per sq/ft
- Electronic leak detection: $1.50 per sq/ft
- Waterproofing membrane: $10.50 per sq/ft

Was a green vs. grey cost analysis performed? No

Cost impact of conserving green/open space to the overall costs of the site design/development project: Not applicable

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? Not applicable

Number of jobs created: 48 (includes Target green roof and 29 conventional roofs)

Job hours devoted to project:

Planning and Design: 1,200 (green roof only)
Construction: 13,800 (includes Target green roof and 29 conventional roofs)
Annual Maintenance: 400 (green roof only)

Performance Measures

Stormwater reduction performance analysis:

Green roofs are estimated to retain 50-100% of annual rainfall. A study in Olympia, Washington found that a 2.5” deep green roof retained 67% of annual rainfall. The Target Center green roof would retain and evapo-transpire 1,156,000 GAL rain per year if it retained 67% of annual rainfall that falls on it. Rainfall retained and evapo-transpired on this green roof is not only prevented from flowing into the storm sewer system and then into Mississippi River, it also helps cool the building below and reduce the urban heat island effect.

Community & economic benefits that have resulted from the project: Replacing the traditional roof at the Target Center with a green roof greatly improved views from the adjacent Graves hotel. Rooms that overlook the Target Center roof now view an expanse of vegetation instead of an expanse of black EPDM roofing membrane.

Project Recognition

Second Place, Sika Sarnafil 2009 Project of the Year Event

Additional Information

Links to images: http://www.greenroofs.com/projects/pview.php?id=1000