



Green Infrastructure & Stormwater Management CASE STUDY

Applebee's Support Center - Courtyard Rain Gardens

Location: Lenexa, KS

Client: Applebee's

Design Firm(s): BNIM

Landscape architect/Project contact:

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ASLA Chapter: Prairie Gateway



Project Specifications

Project Description: The Applebee's Restaurant Support Center was designed to house more than 500

associates that provide assistance to approximately 2,000 Applebee's Restaurants worldwide. The Center's design responds directly to the needs of Applebee's Services, Inc. with a focus on associate satisfaction, productivity, food innovation, and development of the land and facility in ways that minimize negative environmental impact. The project received a LEED Silver Certification by the USGBC in 2008.

The two-story building is nestled into the sloped terrain and organized along a curved circulation system – with public entries above on a prairie level and private access below at lake level. Four open-office wings extend out from the circulation spine like “fingers,” and are separated by three atria and exterior landscaped courtyards that connect down to the lake and trail system. The courtyards each have a unique design and extend the uses in each atrium. To showcase the company's focus, the Culinary Center is located on center stage directly off of the main entry in the first grand atrium. The building enclosure is energy efficient with increased thermal insulation and reflective roofing materials.

The restorative site design incorporates native landscape with water-efficient and low-maintenance prairie grasses, wildflowers, and stormwater BMPs. Stormwater management is an integral part of the site design. All on-site stormwater, as well as a percentage of off-site water, is either absorbed or routed and cleaned within a treatment train of BMPs that include native vegetated swales, rain gardens, rock sediment forebay, a sand filter, and a wetland prior



to reaching the existing neighboring lakes. Each of the courtyards includes a series of rain gardens that treat roof runoff.

Project Type:

Other (please specify)

Part of a new development

Design features: Rain garden.

Applebee's Courtyard rain gardens were integrated into the entire courtyard

design. The rain gardens are oriented as long narrow swales, filtering water as it runs down the planted swales towards the outlet structure. The rain gardens have a large pervious zone and are heavily planted with wet-mesic plants to maximize infiltration and transpiration. The rain garden functions not only to clean runoff from each rain event, but also as a public amenity. The Applebee's courtyard rain garden is designed to create beautiful public space for people to enjoy and engage in informal business meetings. The rain garden manages stormwater well and helps create an outdoor environment for people to enjoy.

Monitoring Goals

- Define the appropriate ratio of rain garden area compared to the size of watershed (The drainage area of the roof).
- Determine the size of rainfall event when runoff will occur.

This project was designed to meet the following specific requirements or mandates:
County ordinance, local ordinance

Impervious area managed: less than 5,000 sq/ft

Amount of existing green space/open space conserved or preserved for managing stormwater on site: less than 5,000 sq/ft. This is only considering the courtyard within the project. This courtyard was monitored during 2009 and 2010. The project has many BMPs and restored areas throughout the 31 acre site.

The regulatory environment and regulator was supportive of the project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements?

SUSTAINABLE FEATURES

- Restored native site that provides a rich and bio-diverse landscape, including water efficient, low maintenance prairie grasses, wild flowers, and vegetated swales and wetlands.
- A natural storm water management approach with rain gardens and filtering basins that naturally clean and manage surface water; not only from the parking areas and remaining site but also capturing and cleansing the first flush flows from Renner Boulevard.
- The building's exterior wall enclosure is of long life materials including wood plank cladding that is harvested from certified managed forests and recyclable, low maintenance zinc metal.
- Energy use reduction to achieve a score of 68% better than the average energy consumption for similar buildings in the same region. This is also a 19.3% reduction from the increased ASHRAE 90.1 2004 standards which are 30% more stringent than the previous 1999 standards.
- Highly energy efficient building enclosure with external sun shading, advanced thermal resistance and Energy Star, reflective roofing
- A low configuration of the workplace area increasing the ability for groups to work together, interact, and be more flexible for change.
- Over 50% total water use reduction attributed to low flow fixtures, waterless urinals, kitchens, sinks and showers.
- Maximizing material resources by using materials with high recycled content from local and regional resources, and by diverting over 50% of construction waste from the landfill.
- Increased thermal comfort by using an under floor displacement air supply system with individual controls and enhanced commissioning of building systems to optimize performance.
- Increased outdoor air ventilation rates to provide fresh, filtered air for improved indoor air quality.
- Selection of building materials, finishes, paints, coatings, sealants, adhesives, furniture and fabrics with zero or low levels of off-gassing volatile organic compounds (VOC's) to minimize undesirable pollutants for a healthy indoor environment.
- Designed to provide increased daylight and views that enliven internal spaces, while increasing user satisfaction and improving performance.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: \$10,000-\$50,000 (Public funding: None)

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: There was no additional costs for stormwater management. The courtyard was landscaped to provide outdoor rooms for small private meetings and would have required storm drainage improvements.

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? Did not influence costs.

Number of jobs created: 500

Job hours devoted to project:

Planning and Design: 33,100

Construction: Not available

Annual Maintenance: Not available

Performance Measures

Stormwater reduction performance analysis:

Water Quantity - This courtyard has minimal storage capacity; however it was observed that rain events of 1/3 inch or less do not reach the outlet structure.

Water Quality - The rain garden did not show significant pollutant removal rates, and in some cases exported some constituents, although at fairly low levels. This is likely due to being undersized. The contaminant loading off the roof was low:

- Total Nitrogen (TN): 2.5 ppm
- Total Phosphorus (TP): 0.2 ppm
- Total Suspended Solids (TSS): 40.3 mg/l

The rain garden was successful in extracting soil nutrients from runoff: 56% Reduction of TN and 50% Reduction of TP. The rain garden exported Chloride (Cl), Sulfur (S) and Total Suspended Solids (TSS).

Soil/Infiltration - The design with long, nearly flat rain gardens provides good infiltration rates, but does not provide much storage capacity. The rain garden does not have enough holding capacity to capture a 1.37" storm event. Although undersized for storage capacity, the garden is not washing out due to the distribution of water, swale size, use of rock, and native vegetation. If the BMP was dry then there was about thirty-eight minutes before runoff occurred from courtyard. The rain gardens can infiltrate about 1/3 inch rain event.

Vegetation - Except for the *Equisetum hyemale* (horsetail) which was planted in a shady corner, all of the plants within the rain gardens established well including Tussock sedge, Blue lobelia,

Cardinal flower, Karl Foerster feather reed grass, Brown-eyed Susan, Two row Stonecrop sedum, and bamboo. The bamboo is spreading as expected within the east/west rain garden. Protected with a sidewalk on one side and concrete curb on the other, this plant species is establishing well. As expected, bamboo planted within Plant Hardiness Zones 5a/5b, have issues with winter tip freeze.

Community & economic benefits that have resulted from the project: The property was responsible for cleaning a majority of it's runoff with a series of BMP that provides clean runoff into the adjacent development lake and downstream neighbors.

Project Recognition

2008 AIA Kansas - Merit Award | Excellence in Architecture, 2008 Kansas City Business Journal - Capstone Award | Green Design Category, 2008 Kansas City Business Journal - Capstone Award | Office Category, 2008 America's SmartCorridor - The Kansas K-10 Cities, Development Award | 2008 Kansas City Construction Specification Institute, Excellence in Construction Award

Additional Information

Links to images: <http://www.bnim.com/work/applebees-restaurant-support-center>

Lessons Learned -

- The design does not have to be complicated to be attractive.
- BMPs can provide benefit even if their size is not ideal. However, undersizing BMPs makes them susceptible to erosion, so designs need to consider how larger storm events will pass through them without damage.
- Distributing water from the roof throughout the rain garden (four entry points) likely helped limit erosion and plant disturbance. The layout of the rain garden also mimics tributary streams leading to a larger stream, providing a replication of stream forms found in nature.
- Undersized BMPs will likely have limited pollutant removal performance.
- We might be able to improve the performance of the rain garden/bioswale somewhat by the addition of mulch and periodic rock checkdams to help hold sediment and mulch in place.
- Native plants are often recommended for use in BMPs due to their adaptation to local conditions and habitat enhancement value. However, some horticultural favorites also perform well if personal tastes lean towards cultivars. Plant selections do not need to be rigid, however, potentially invasive species should not be considered.