SUSTAINABLE TECHNOLOGIES 3

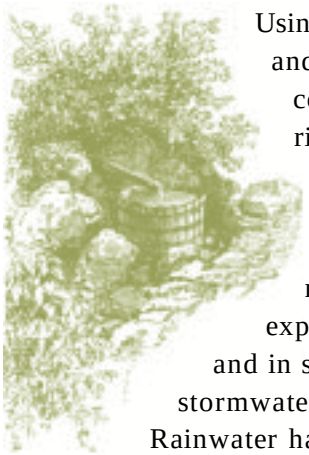
RAINWATER HARVESTING

CONSULTANTS OF CHOICE
TO THE BUILT ENVIRONMENT

INTERFACE ENGINEERING

DESIGN ASSIGNMENT: HARVEST AND USE RAINWATER

Rainwater is one of nature's most renewable resources. In fact, there are few practices more sustainable than collecting rain and putting it to work for your building and landscape needs. Across the globe, building owners increasingly are using rainwater as the sole or partial source of water for water closets and urinals, landscape irrigation, hose bibs, water features, cooling towers, secondary fire suppression and sometimes even hand washing.



Using rainwater can decrease water and wastewater treatment and conveyance costs, which are rising faster than energy costs in some areas. It can ease the burden of system development charges that are assessed on new buildings to help pay for expanding municipal infrastructure and in some cases for separate stormwater management systems. Rainwater harvesting also can turn a potential liability—runoff and resulting erosion—into an asset.

Rainwater harvesting is an excellent way to demonstrate environmental stewardship to the community and stakeholders. Depending on the design, it can help a project attain LEED® certification under the U.S. Green Building Council's Leadership in Energy and Environmental Design green building rating system.

Much of the country has sufficient rainfall for some type of harvesting system. Even areas that are perceived as dry, such as Arizona and Texas, often are candidates because they receive periodic, intense downpours that allow concentrated collection.

Similarly, the sky's the limit on the type of building that can accommodate rainwater harvesting. The most common point of rainwater collection is the roof, making low-to-mid-rise commercial and residential buildings good candidates because the ratio of roof area to water closets and urinals is greater. High-rise buildings, including dormitories, offer equal potential, with rainwater used primarily on lower floors or for other purposes such as landscape irrigation. Taller buildings have the advantage of collecting less debris, such as leaves, in the rainwater.

Rainwater harvesting integrates civil and mechanical engineering, architecture and landscape architecture toward a common design. This integration of design disciplines results in a system that is not only simple and efficient, but offers the opportunity to combine rainwater harvesting with water conservation, roof gardens and stormwater management.

Rainwater harvesting systems typically cost about $1 per gallon of storage capacity, with payback periods ranging from five to fifteen years (or more).

MEETING LOCAL CODE REQUIREMENTS
often has some amusing results

SYSTEM OVERVIEW

In a rainwater reclamation system, the roof-top collection area can be any type of design or material that allows rain to be conveyed by gutter or downspout to a storage tank. In most cases, it's possible to collect 80 to 90 percent of the rain that falls annually on the available roof area. The storage tank can be above or below ground and made of a number of materials. Tank selection varies by project, with tank size dependent on the collection area, annual rainfall, intended use of rainwater and cost. A pump and piping system distributes rainwater from the tank to designated fixtures, with filtering and ultraviolet treatment occurring prior to delivery.

Image courtesy of YGH Architecture.

BEHAVIORAL AND SOCIAL SCIENCES BUILDING

Humboldt State University; Arcata, California

ISSUE

Deliver a LEED Gold-Certified Building on a Hilltop Site in a Very Developed Area

SOLUTION

To assist with the target LEED rating, provide a rainwater reclamation system that will flush toilets in an 85,000 sq.ft. classroom and office building, contributing to reducing building water use by more than 40%.

The cistern system combines the rainwater harvesting and stormwater management systems to control excess stormwater runoff from up to a 100-year storm. A 20,000-gallon storage tank holds runoff from 20,000 sq.ft. of roof area, with chlorination of the return water for toilet flushing. Once this cistern is full, additional roof runoff overflows into a second 20,000-gallon tank that also takes site runoff, with eventual release to the local storm sewer.

Image courtesy of Robert S. Leeb Architects.

THE TOWER AT STATION PLACE

Portland, Oregon

ISSUE

Integrate Rainwater Harvesting into a Three-Tower Elderly Housing Complex

SOLUTION

Rain collects into a gravity tank on each tower, feeding into the common fire sprinkler storage tank, located under a ramp in the parking garage. Rainwater supports 75 water closets with locking tank lids.

Eckert & Eckert

EPLER HALL

Portland State University; Portland, Oregon

ISSUE

Harvest Rainwater from the Roof of a Six-Story Dormitory Located in an Urban Stormwater Management Zone

SOLUTION

Rain collects into a 5,600-gallon underground tank, located in an adjacent plaza. Rainwater is used in flushometer-type fixtures in ground-floor public restrooms, with excess used for landscape irrigation.

EVALUATING THE RAINWATER HARVESTING OPTION

OPPORTUNITIES

- Water utility cost savings
- Reduced system development charges
- Stormwater management cost savings
- Erosion and runoff control
- Reduced burden on municipal infrastructure
- Use of a free renewable resource
- Simple, proven technology
- Applicable to many building types
- Innovative approach to sustainability
- Outward sign of environmental stewardship
- Assists in getting up to eight LEED points from water conservation innovation and stormwater management

CHALLENGES

- Payback less favorable than other green building strategies
- Learning curve of regulatory environment
- Large tanks may pose location challenges
- Water treatment requirements vary with use
- Municipality may require measures to prevent use of stored rainwater for drinking water during emergencies
- Ongoing maintenance of pumps, filters, valves and controls

SYNERGIES

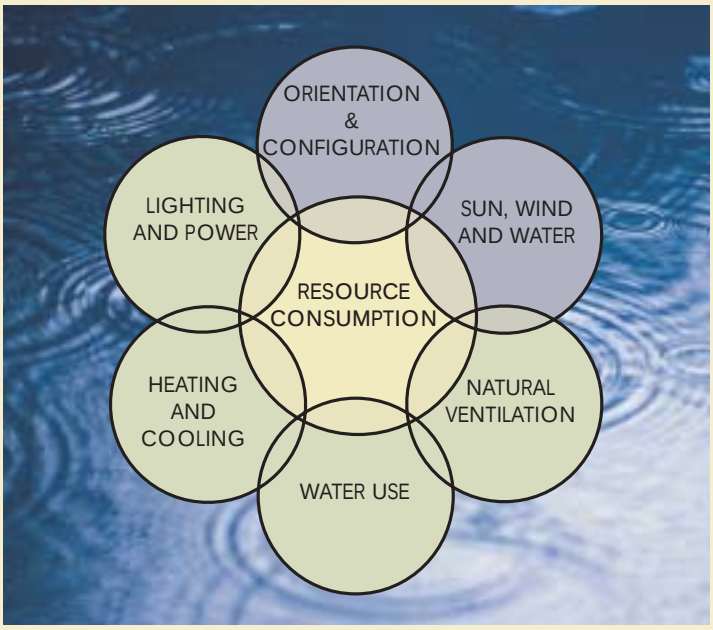
- Roof gardens, terraces, courtyards
- Water-efficient fixtures
- Harvested gray- or blackwater for non-potable use
- Native or adapted landscape plants
- Water-efficient irrigation
- Stormwater management systems

Interface Engineering has a long history of incorporating green or sustainable design factors into each building. We believe it is our mission to provide services that save our clients money while at the same time protecting the environment.

Our approach to building water systems management typically involves coordinating between civil, mechanical and plumbing engineers as well as landscape architects and other designers. Together, we craft an integrated approach to water conservation and efficient use. This integrated design process results in creative solutions and synergies that minimize first cost, while taking advantage of the latest technologies and sustainable building practices.

As a result, our rainwater harvesting systems often are integrated with roof gardens, water-efficient fixtures, landscaping that is adapted to local climate, drip irrigation and reuse of graywater and blackwater. In this way, some of our projects have been able to achieve between 28 and 45 percent water use savings. It is possible for these projects to garner up to eight LEED points for water efficiency and stormwater management, helping to attain LEED Silver or Gold ratings.

URBAN WATER MANAGEMENT
requires a systems approach involving multiple disciplines.



Adapted from Bunting Coady Architects.

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