CONSIDER **RAINWATER HARVESTING** AND REUSE

GLUMAC DESIGN STRATEGIES

RAINWATER
AS A SUSTAINABLE RESOURCE

RAINWATER HARVESTING
The on-site collection, treatment and storage of rainwater – typically using rooftop catchment systems – for reuse to meet a building's non-potable water needs, including plumbing, process water, and landscape irrigation,

Drop by drop, water is steadily becoming North America's most precious resource. Rainwater's nearly neutral pH helps prevent scale on piping and appliances while plants thrive on it. "Rainwater harvesting" in the built environment is the collection, conveyance, and storage of rain for re-use – particularly in non-potable applications such as toilets, urinals, irrigation, fire protection, and cooling tower makeup. For Glumac, rainwater recovery plays an increasingly important role in its plumbing designs. At Oregon State University's Kelley Engineering Center, efficiency measures combined with rainwater reclamation cut the building's base potable water usage by 65 percent. More recently, rainwater systems plus lower-flow lavatories and showers at Indigo @ Twelve|West have reduced potable water use by nearly 44 percent compared with a conventional office building; and the Vestas North American headquarters in downtown Portland, OR, expects rainwater to supply up to 100 percent of its non-potable water needs.

The price of water remains artificially low across the

Hassalo on Eighth in Portland, Oregon, capitalizes on the region's notably wet climate with a **rainwater harvesting system** helps lower the district's demand on the city's water system.

continent, averaging between $1.50 and $2.00 for 1,000 gallons (3,785 liters) thanks to decades-long subsidies and postponed municipal infrastructure upgrades. Yet, rates are rising. In recent years, the price of water in thirty U.S. metropolitan areas increased an average of 9.4 percent, while new water quality regulations and improvements to aging wastewater treatment plants will mean continually higher sewer bills for all customers. Although water and sewer prices vary widely by region, the installed cost of rainwater recovery systems presents, at best, a long-term payback scenario.

So why consider rainwater harvesting and reuse? Glumac points to rainwater use as good stewardship and a compelling part of the green building story. Among its immediate environmental and societal benefits: extending the supply of drinking water, helping utilities reduce summer peak demand, minimizing the energy and chemicals needed to treat storm water, and reducing flow to storm water drains along with non-point source pollution. Cities with a combined sewer and water system strengthen that case further, by demonstrating how rainwater harvesting lowers demand over the life of a building. Further, payback improves dramatically when utilities provide a break in system development charges.

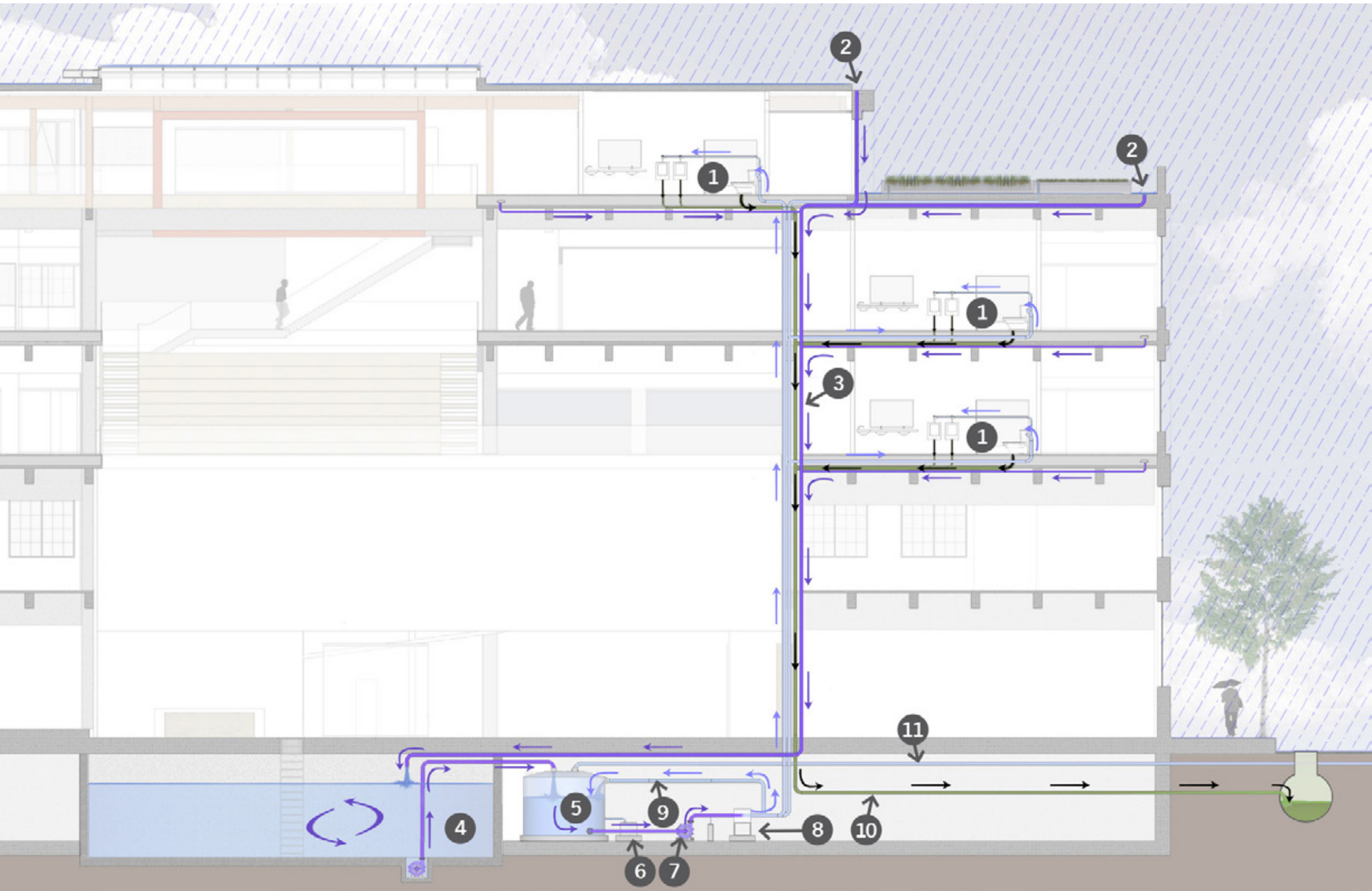
UPSTREAM: ELEMENTS OF THE SYSTEM

From rooftop to basement, a typical rainwater

VESTAS **RAINWATER RECLAMATION** SYSTEM

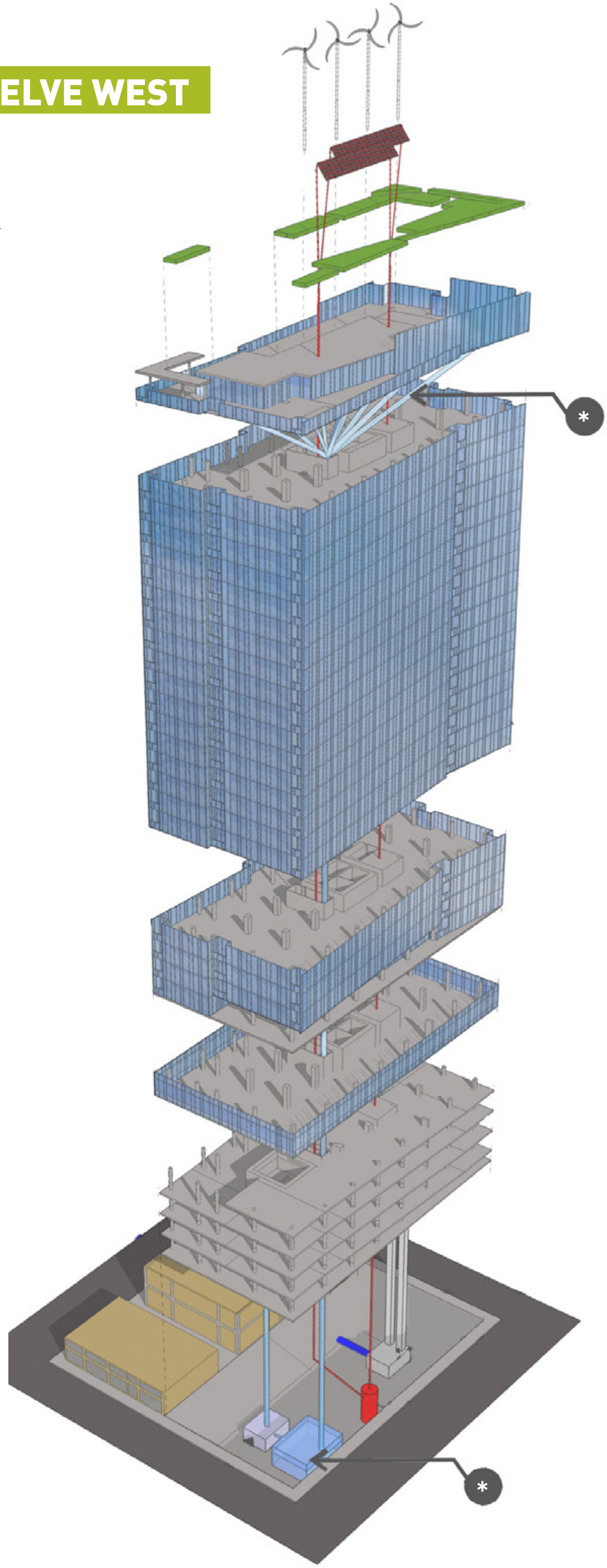
1. toilets & urinals
2. rooftop water collection w/roof drains
3. rainwater leader
4. 212,000 gallon cistern
5. 1,700 gallon (6,435 liter) filtration tank
6. treatment skid
7. pumps supplying harvest water to toilets
8. bag filter (150 gallon) [568 liter] per minute
9. filtration system loop
10. black water discharge to sewer
11. make-up water supply from city

Portland, Oregon, receives 208 days of rainfall annually – a resource the Vestas Headquarters taps through an extensive collection, diversion, treatment, and storage process for reuse. **100 percent of its annual irrigation** requirements (64,000 gallons [242,266 liters]) is supplied by this system, and **100 percent of its annual toilet** and urinal requirements (539,266 gallons [2,041,344 liters]) – effectively using 81 percent of the collected water.



RAINWATER COLLECTION AT **TWELVE WEST**

The **Indigo @ Twelve West** high-rise in downtown Portland, Oregon, has sustainable systems featured throughout, including a **roof top rainwater collection system*.** Roof drains with natural filters that use compressed leaf material clean the water as it enters the building's reclamation system and in to its 23,000-gallon storage tank.



harvesting system includes seven main components. The roof serves as the primary catchment surface to collect rainfall. Glumac designers prefer clean roofing materials such as ethylene propylene diene Monomer (EPDM); however, an eco-roof functions well once the dirt leaches out after the first few months, improving the volume of rainwater recovered. Gutter and downspouts channel the rainwater to pre-filters and then the storage tank(s).

LEED and many codes require the use of pre-filters, also known as "roof washers" to remove leaves, dust and other debris from captured rainwater before diverting it to tanks. According to system demands, Glumac recommends one of several pre-filter types: a vortex fine-mesh, self-cleaning strainer; downspout pretreatment; or below-ground pretreatment options such as hydrodynamic separators. Next, rainwater moves into one or more storage tanks, sometimes constructed as a concrete cistern. Designers calculate the optimal tank size according to location, roof area, rainfall rate, and usage (irrigation, number of fixtures, population).

DOWNSTREAM: ELEMENTS OF THE SYSTEM

Key to the delivery system, rainwater is then gravity-fed or pumped overnight to a day tank to store 24-hours worth of water – again, sized according to population, end usage and so on. A pump override keeps the tank from running completely dry. Many municipal codes also require treatment and filtration of harvested rainwater, even for non-potable uses, through a combination of ultraviolet (UV) filters, chlorinators and/or other chemicals. The UV process, for example, removes organics from water moving continuously through a closed loop system connected to the day tank. A second method integrates a chemical skid within the system, utilizing a small tank and small metering pumps that continuously treat and test water.

Other considerations in rainwater system design critically low levels. Codes also require dual piping include make-up water controls to supply the day tank with municipal water in the event rainwater supplies fall to to critically low levels. Codes also require dual piping, i.e. to separate flush water from domestic potable water serving lavatories, showers, drinking fountains and sinks. A municipal connection with an appropriate backflow device is located downstream of the pump to provide water for flushing in the event of a power outage or pump failure.

EXPERIENCE MUSIC PROJECT LAUNCH PAD, SEATTLE, WASHINGTON

> OPTIMIZING RAINWATER RECOVERY DEPENDS UPON TWO PRIMARY FACTORS: COLLECTION POTENTIAL AND PLANNED USAGE. **IDEAL CONDITIONS** FOR RAINWATER CATCHMENT WOULD BE A **SHORT, WIDE BUILDING** WITH A **LARGE ROOF AREA** AND SMALL POPULATION

PROCESS/TOOLS

Optimizing rainwater recovery depends on two factors: collection potential and planned usage. Ideal conditions for rainwater catchment would be a short, wide building with a large roof area and small population (occupancy). As an example, a building with a 10,000 square foot (929 square meters) roof area in Portland, Oregon, a city that averages 36 inches (91.44 cm) of annual precipitation, produces nearly 225,000 gallons (851,718 liters) of harvested rainwater.

Glumac engineers also consider the following rules:

- Collection rate: 80 percent of rainfall on a conventional roof; 50 to 60 percent on an eco-roof
- Overall system capacity: Use of rainwater for irrigation requires a large tank for storage over long periods (i.e. collecting and storing during rainy seasons), as well as spikes in usage thereafter. However, holding rainwater for toilets and urinals allows for a much smaller storage tank for constant use year-round
- Bypass mode: If installing an eco-roof for rainwater recovery, run the system in bypass for the first few months until the storm water flows free of solids and other debris

FURTHER DESIGN FACTORS

Plumbing codes that address rainwater harvesting vary by city, county and state. Even the Uniform Plumbing Code® (UPC), recently updated with green elements, refers only to "reclaimed water" (tertiary treatment) rather than rainwater. However, major urban utilities – Austin, San Antonio, and Tucson for example – encourage rainwater harvesting as a means of conserving water, increasingly offering tax incentives and reduced storm water fees when building owners put systems in place. Some cities, like Portland, Oregon, even provide an Ecoroof Grant and downspout disconnect Program. Development of the new Rainwater Catchment Design and Installation Standard, a joint effort of the American Rainwater Catchment Systems Association (ARCSA) and the American Society of Plumbing Engineers (ASPE), also promises to advance best practices in this still-emerging field. G