Codes Harvest Rainwater

Story by Dave Viola

The topic of water shortages is nothing new, as cities around the globe struggle with drought, water quality, supply constraints, and failing infrastructures. However, the idea of new plumbing codes and design standards working together to assist plumbing engineers in adding harvested rainwater systems to their design arsenal has been uncharted territory — until now.

With the publication of the 2010 *IAPMO Green Plumbing and Mechanical Code Supplement (GPMCS)*, 2012 *IAPMO Uniform Plumbing Code (UPC)*, and the Rainwater Catchment Plumbing Engineering Design Standard by the American Rainwater Catchment Systems Association (ARCSA) and American Society of Plumbing Engineers (ASPE), the plumbing industry now has authoritative tools at its disposal to standardize the safe and reliable use of rainwater for potable and nonpotable applications.

Rainwater harvesting provisions were introduced in the *GPMCS* and the *UPC* by the IAPMO Green Technical Committee (GTC) as part of a broader effort to reduce the energy and water consumption of plumbing and mechanical systems while ensuring that these systems are safe and reliable. The GTC is comprised of the broadest group of expert stakeholders ever assembled to develop sustainable plumbing and mechanical requirements. ASPE and ARCSA are well represented on the GTC and played a critical role in the development of the first model code provisions for rainwater harvesting. Jeffrey L. Ingertson, CPD, FASPE, ASPE's vice president of membership, serves as ASPE's official representative, while Bob Boulware, immediate past president of ARCSA (and an ASPE member), represents ARCSA. Larry N. Oliver, CPD, FASPE, former ASPE president, and April K. Trafton, president of Donald Dickerson and Associates, round out the slate of plumbing engineering members of the GTC. Additionally, more

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than 20 sustainable plumbing engineering experts serve among the more than 125 members of the 12 task groups that operate under the GTC.

Code History

Although rainwater harvesting is an ancient practice, it has never been directly addressed by national plumbing codes. It appears that rainwater usage began to disappear in many parts of the world with the rise of urbanization, centralized supply systems, and the need to meet the escalating demand for a safe and reliable potable water supply. When national codes began to emerge in the 1900s, rainwater harvesting was not a common practice in metropolitan areas, and as a result, rainwater harvesting was never specifically addressed. The lack of direct coverage in the codes has been one of the primary hindrances to the use of harvested rainwater.

The timing of the completion of the 2010 *GPMCS*, 2012 *UPC*, and the ARCSA/ASPE design standard couldn't have been better, as the escalating stress on our available water supplies has spurred a flurry of legislative and regulatory efforts across the United States aimed at permitting the use of rainwater as a means of offsetting some of the pressures on more conventional potable water sources.

One of the more notable and high-profile examples of these activities is California Assembly Bill 275: The Rainwater Catchment Act of 2011, which seeks to permit the capture and use of rainwater for non-drinking purposes in California. (At the time of the writing of this article, the California Legislature has passed AB 275, and the bill is awaiting the governor's signature.) AB 275 requires that the installation of systems for the indoor nonpotable use of rainwater must comply with the requirements set forth in the IAPMO Green Supplement. Additionally, definitions and other bill requirements came directly from the ARCSA/ASPE Rainwater Catchment Plumbing Engineering Design Standard. The availability of these documents ensures that strong and consistent codes and design practices are in place and gives legislators the confidence they need to pass bills like AB 275.

What Do the Codes and Standard Cover?

APPLICATION

To start, the *GPMCS* and *UPC* contain identical provisions establishing that rainwater collected from roofs or other aboveground manmade surfaces is permitted to be used for nonpotable applications that include toilet and urinal flushing, trap priming, irrigation, industrial processes, water features, cooling towers, and other applications approved by the authority having jurisdiction. The section addressing rainwater applications is intentionally broad to also permit its use in car washes and automatic fire sprinkler systems.

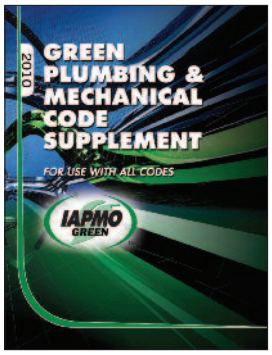
In a separate appendix, the *GPMCS* and *UPC* provide comprehensive requirements for the use of rainwater for potable water applications in homes and businesses. In instances where rainwater contacts parking lots, driveways, pedestrian surfaces, and other ground surfaces, the *GPMCS* and *UPC* require more rigorous filtration and treatment methods before it can be used for plumbing and irrigation applications. Rainwater contacting these surfaces is handled differently because the runoff may contain additional contaminants and health risks (e.g., oils, road salts, debris, hydrocarbons, and pathogens) that require unique or enhanced treatment strategies. This approach was taken to mirror the scope and intent of the ARCSA/ASPE design standard, which does not apply to the collection of rainwater from vehicular and other similar surfaces.

MAINTENANCE, TESTING, AND INSPECTION

The *GPMCS* and *UPC* require rainwater harvesting systems to be inspected, tested, and maintained regularly and establish a minimum frequency for these activities to occur. These documents assign the responsibility of compliance to the property owner or a designated appointee. Finally, a maintenance log that includes a record of the inspections, testing, and maintenance is required to be kept up-to-date and on-site at all times for inspection.

BACKFLOW PREVENTION AND CROSS-CONNECTION CONTROL

Because of the heightened cross-connection and public health and safety concerns associated with the indoor use of rainwater,



The *GPMCS* is the first and only publication that spells out the best sustainable plumbing and mechanical building practices in simple, straightforward code language. The *Green Supplement* is not a "greener" version of the *Uniform Codes*, but rather a separate document establishing requirements for green building and water efficiency applicable to plumbing and mechanical systems.

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the *GPMCS* and *UPC* specify very detailed requirements addressing the protection of the potable water supply against cross-connection. Rainwater systems are not permitted to have a direct connection to any potable water supply or alternate water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a rainwater catchment system, provided the potable or reclaimed (recycled) water supply connection is protected by an air gap or a reduced-pressure principle backflow preventer. Where any portion of a rainwater system is installed within a building, a cross-connection test is required to ensure that an inadvertent connection between the potable and nonpotable rainwater systems has not occurred.

As a final level of protection, rainwater piping systems are required to be identified with the wording "Caution: Nonpotable Rainwater, Do Not Drink" and have a purple-colored background.

SYSTEM DESIGN

The *GPMCS* and *UPC* require the pressurized portion of the rainwater system delivering water to the plumbing distribution system to be installed in accordance with the water pipe sizing provisions of the plumbing code. They also require gutters, roof drains, and rainwater conveyance pipe to be sized as storm drains in accordance with the plumbing code.

The *GPMCS* and *UPC* reference the ARCSA/ASPE design standard for guidance on estimating the potential for harvesting rainwater at a particular site (determining the maximum amount of rain that can be collected), estimating demand, and properly sizing storage tanks.

Comprehensive and harmonized provisions addressing above- and below-grade storage tank locations, supports, materials, construction, drainage and overflow, access openings, and markings are provided in the *GPMCS, UPC*, and ARCSA/ASPE design standard.

The *GPMCS* and *UPC* also contain provisions addressing algae control, vermin protection, rainwater discharge into sewer systems, debris filtering and removal, firstflush devices, and roof washers.

WATER QUALITY

The most important goal of the *GPMCS, UPC*, and ARCSA/ASPE design standard is to ensure that the output water meets a safe level of quality for the intended application. Numerous treatment devices and strategies are available to system designers that can be used to accomplish this. Although the *GPMCS* and *UPC* require adherence to minimum water quality standards for nonpotable application, they provide flexibility in the use of treatment technologies such as flocculation/sedimentation, filtration, chlorination, ozonation, ion exchange, and UV disinfection methods. Again, the *GPMCS* and *UPC* reference the ARCSA/ASPE design standard for additional guidance on the various treatment technologies and associated design strategies.

For potable applications, the *GPMCS, UPC*, and ARCSA/ASPE design standard have very specific requirements and installation details for filtration and system disinfection.

In closing, with code obstacles eliminated, it appears that rainwater collection and use are poised to become mainstream as jurisdictions around the world turn to rainwater reuse to address intensifying water crises. The IAPMO *Green Plumbing and Mechanical Code Supplement, Uniform Plumbing Code*, and ARCSA/ASPE Rainwater Catchment Plumbing Engineering Design Standard combine to provide the necessary tools for inspectors, installers, and system designers to safely and confidently embrace and utilize rainwater.