8.2 Rainwater Harvesting and Condensate Reuse

Applicability

This BMP is intended for use by a municipal water user group ("utility") concerned with reducing outdoor irrigation demands on the potable water system. Calculation of potential savings will depend upon regional climate patterns. Rainwater harvesting and condensate reuse are applicable to ICI buildings, while private homes can benefit from rainwater harvesting. Utilities may benefit by targeting this BMP to help shave peak demand through customer education. For maximum water-use efficiency benefit, the utility should adhere closely to the measures described below.

Description

Rainwater harvesting and condensate reuse ("RWH/CR") conservation programs are an effective method of reducing potable water usage while maintaining healthy landscapes and avoiding problems due to excessive run-off. Using this BMP, the utility provides customers with support, education, incentives, and assistance in proper installation and use of RWH/CR systems. RWH/CR systems will be most effective if implemented in conjunction with other water efficiency measures including water-saving equipment and practices. Rainwater harvesting is based on ancient practices of collecting – usually from rooftops – and storing rainwater close to its source, in cisterns or surface impoundments, and using it for nearby needs. Industrial, Commercial, and Institutional ("ICI") users have found it to be cost effective to collect the condensate from large cooling systems by returning it into their cisterns as well. Facilities with large cooling demands will be in the best position to take advantage of condensate reuse, which due to its quality can potentially be used in landscape irrigation, as cooling tower makeup water, or in some industrial processes. The variability in rate and occurrence of precipitation events requires that rainwater or condensate be used with maximum efficiency. Incentives may include rebates for purchase and installation of water-efficient equipment.

Several factors should be considered in the design of rainwater harvesting and condensate reuse systems. System components include the collection area, a first flush device, a roof washer, an opaque storage structure with the capacity to meet anticipated demand, and a distribution system. Design consideration should be given to maintaining the highest elevations feasible for collection and storage systems for the benefit of gravity flow to storage or distribution. When using drip irrigation systems, filters are necessary to prevent particulates from clogging drip nozzles. For potable water uses, a higher degree of filtration and disinfection is needed to ensure water quality adequate for human consumption. Regular maintenance of RWH/CR systems includes changing filter media on a regular basis and cleaning the first flush filter. The utility should consider providing participants with reminders of regular maintenance requirements for their RWH/CR systems. Maximum expected daily demand, and knowledge of historical precipitation patterns, including amount, frequency and longest time between rainfall events, is important in designing the system. The Texas Water Development Board's *Texas*

Manual on Rainwater Harvesting, 2004, should be used as a resource, as well as technical assistance from professional installers and manufacturers of RWH/CR equipment for proper design and implementation of RWH/CR program guidelines.

In some parts of the state of Texas, RWH/CR has been used as a private water supply for both potable as well as nonpotable uses. Using rainwater for potable supply creates a responsibility on the part of the owner/operator of the system to operate and maintain the system to a higher level than nonpotable use. For this reason most RWH/CR programs run by utilities are likely to focus on non-potable water uses. Successful implementation of this BMP is accomplished by performing one or a combination of the approaches outlined below.

While residential cooling systems are unlikely to provide significant flows of condensate, Industrial/Commercial/Institutional ("ICI") installations with large cooling demands can produce significant amounts of condensate and should be evaluated for the dual RWH/CR system. Large ICI installations can implement rainwater harvesting (from roofs) as well as capture of stormwater for irrigation or other non-potable uses. New commercial developments are often required to have either stormwater detention ponds or water quality treatment structures. In either case, permanent storage can be added beyond that required and this storage can be used to retain runoff for later irrigation use. Large buildings that have or need French drain systems for foundation drain water should evaluate the potential for recovery of this resource as well.

The utility should consider sponsoring one or more demonstration sites. Potential partners include customers with educational missions such as schools, universities, botanical gardens, and museums with large public landscapes.

Although rainwater is recommended for all irrigation uses, it is most appropriate for use with drip or micro irrigation systems. Utilities implementing this BMP should consider offering a landscape water-use survey (*See*, the related BMP) to help customers ensure that RWH/CR systems are properly designed and sized.

The water-use surveys, at a minimum, include: measurement of the total irrigated area; irrigation system checks, review of irrigation schedules or development of schedules as appropriate; provision of a customer survey report and information packet. The utility should provide information on climate-appropriate landscape design and efficient irrigation equipment and management for new customers and change-of-service customer accounts (*See*, the Water Wise Landscape Design and Conversion Programs BMP for more detail).

Implementation

Programs should consider the following elements:

1) <u>Retrofit or Rain Barrel Program</u>
   Marketing the program to the customer via bill inserts will allow the utility to target the largest summer peak users first. The utility should consider also

approaching local weather announcers, radio gardening show hosts, and newspaper columnists for assistance in notifying the public about the program. Public/private partnerships with non-profits such as gardening clubs, neighborhood associations, Cooperative Extension offices and/or with green industry businesses such as rainwater harvesting companies and local sustainable building groups are potential avenues to market the program and leverage resources.

Incentives can include rebates for RWH/CR systems, recognition for RWH/CR systems through signage, award programs, and certification of trained landscape company employees and volunteer representatives to promote the program. Utility staff can also be trained to provide irrigation audits, which can include resetting irrigation controllers with an efficient schedule.

The initial step in assisting customers with landscape irrigation systems is a thorough evaluation of the potential water capture of a RWH/CR system.

The water customers who participate in this program will need to maintain and operate their irrigation systems in a water-efficient manner. The utility should consider implementing a notification program to remind customers of the need for maintenance and adjustments in irrigation schedules and to system filters as the seasons change.

The utility needs to ensure that RWH/CR system specifications are coordinated with local building and plumbing codes.

The American Rainwater Catchment Systems Association lists evaluation training for RWH/CR programs. ICI customers may want to consider performance contracting as an option for financing retrofitted RWH/CR systems.

2) <u>New Construction</u>

a. In addition to retrofitting existing homes and buildings with RWH/CR systems a utility may also choose to support implementation focused on new construction. Under this approach, the utility could:

b. Adopt regulations requiring all new ICI properties to install a RWH/CR system that collects and stores rainwater and condensate from all eligible sources and distributes it to irrigation and/or a cooling tower make-up system or

c. Implement an incentive program to encourage builders and owners of new ICI properties to install a RWH/CR system that collects and stores rainwater and condensate from all eligible sources and distributes it to irrigation and/or a cooling tower make-up system. In large ICI buildings requiring cooling towers, design consideration should be given to returning condensate flows from air conditioning coils to cooling tower

make-up. It may be effective for this BMP to be part of a Green Builder type rating system that also includes WaterWise landscaping and adequate soil depth;

d. Implement an incentive program to encourage homebuilders and homeowners to install a RWH system for landscape use to reduce potable water consumption from the utility in the summer season or

e. Adopt regulations requiring all new homes and/or multi-unit properties to install plumbing that separately collects and stores rainwater from all eligible sources and distributes the rainwater through a subsurface irrigation system either around the foundation of the residence or building or for other landscape use.

Such programs would need to be carefully coordinated with stormwater collection programs and meet all applicable regulations for stormwater collection and reuse.

Schedule

Depending on the option(s) selected, the corresponding schedule should be followed.

1) Incentive Approach
In the first six months, plan the program including stakeholder meetings as needed. Develop a plan for educating potential homebuyers, developers, plumbers, green industry trade groups, landscape architects and realtors about this program. After six months, implement the program.

2) Ordinance Approach
In the first six months, hold stakeholder meetings to develop the ordinance. Consider offering incentives for the first year of implementation. Propose the ordinance or rules to local City Council or Board for approval. Develop a plan for educating potential homebuyers, developers, plumbers, and realtors about this program. After six months, implement the program.

Scope

To accomplish the goals of this BMP, the utility should do one or more of the following:

1) Develop and implement an incentive program to encourage RWH/CR in new multi-unit properties and certain new commercial developments such as office parks. Or,

2) Develop and implement an incentive program to encourage RWH/CR in existing multi-unit properties and certain existing commercial developments such as office parks. Or,

3) Develop and implement an incentive program to encourage residential customers to install rainwater systems and rain barrels. Or.

4) Develop and implement an ordinance requiring condensate recovery in new non-residential construction as applicable.

Documentation

To track this BMP, the utility should gather and have available the following documentation for each year of operation:

1) The number of new RWH/CR developments for which design planning started after adoption of this BMP;
2) The number and type of RWH/CR installations completed each year;
3) The estimated rainwater and condensate use in each RWH/CR installation;
4) Aggregate water capacity of RWH/CR sites;
5) Number, type, and dollar value of incentives, rebates, or loans offered to and accepted by customers; and
6) Estimated water savings achieved through customer surveys.

Determination of Water Savings

Water savings from a RWH/CR program is determined by water volume harvested and used to replace other water sources. In programs which target new construction, the water savings should be estimated based upon known water consumptions for the proposed end use. A number of sources, including other BMPs, can be helpful in estimating potential water savings. A method for estimating potential water catchment and a monthly water balance equation for estimating water storage capacity are:

1) Catchment Potential (gals) = Area x 0.62 x 0.8 x Rainfall
Where Area = total area of catchment surface in square feet
0.62 = coefficient for converting inches per ft^2 to gallons (unit conversion from 7.48 gallons per ft^3)
0.8 = collection efficiency factor
Rainfall = average rainfall in inches.
Note: median and lowest recorded rainfall can also be calculated in order to develop a range of expected values.

2) Storage Capacity
A simple assumption is that up to three months may elapse without significant rainfall. So a storage capacity to provide for a three-month period of water demand may be desired.

More precise methods of estimating needed storage capacity or additional information for estimating water balance of RWH/CR systems and of accounting

for the variability in seasonal rainfall pattern is available in the *Texas Manual on Rainwater Harvesting.*

For condensate recovery, storage should be based on the anticipated maximum holding time before the condensate is reused for irrigation or other purposes.

Cost-Effectiveness Considerations

The costs of this BMP to the utility will include both administrative program management costs and incentives to customers for implementing rainwater harvesting or condensate reuse projects. Depending on program design and whether project inspections are required, staff labor cost should range from $50 to $100 per project. Current incentives provided by the City of Austin for complete rainwater harvesting system are up to $500 per SF home and for commercial customers, the incentive for condensate reuse is up to $1 per gallon per day recovered. Marketing and outreach costs range from $20 to $50 per project. Administrative and overhead costs range from 10 to 20 percent of labor costs.

The incentive for bulk purchase rain barrels in Austin is a $20 discount from the actual costs of the rain barrel. Labor costs range from $8 to $12 per rain barrel and warehouse storage costs may be an additional consideration.

References for Additional Information

1) American Rainwater Catchment Systems Association. http://www.arsca-usa.org/
2) City of Austin Water Conservation Program. http://www.ci.austin.tx.us/watercon/rainwaterharvesting.htm
3) *First American Rainwater Harvesting Conference Proceedings*, Gerston, J. and Krishna, H., editors, ARCSA, August 2003.
4) *Rainwater Harvesting Design and Installation,* Save the Rain. saverain@gvtc.com
5) *Texas Guide to Rainwater Harvesting*, Texas Water Development Board and Center for Maximum Potential Building Systems, 2nd Edition, 1997.
6) *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* Pacific Institute, November 2003. http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf