Innovative Technologies
Rainwater Harvesting Workshop

April 25, 2012

Green Partnership for Greater Cincinnati
Greater Cincinnati Foundation
City of Cincinnati
Code Changes
Harvesting Rainwater
Cincinnati’s Approach...

Stewardship
Leadership
Collaboration
Our road to success...

- A City Ordinance
- Focus on a pilot project
- Define Agencies Having Jurisdiction
- Assess and address all concerns
- Research best practices and applicable standards
- Apply a national standard code
- Craft language for the agencies’ and community’s needs
**Cincinnati’s vision.... Build Greener Buildings**

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## INNOVATIVE WASTEWATER TECHNOLOGIES

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<th>WE Credit 2</th>
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Initial Stages...

April, 2011 Resolution

Supported by the Greater Cincinnati Foundation

Resolution 2011-01
Creation of a GPGC Rain Water Harvesting Task Force

WHEREAS, The Green Partnership for Greater Cincinnati ("GPGC") is a collaboration of six local institutions ("Partners") to promote sustainable practices for the individual institutions and to promote programs that have the support of all Partners and that benefit our community;

AND WHEREAS, Storm water issues, specifically Combined Sewer Overflow issues, are of significant concern to our community and some of the Partners;

AND WHEREAS, Utility costs, specifically water and sewer related expenses for the Partners' facilities, can affect the operational costs for each of the Partners;

AND WHEREAS, Cincinnati State has reported that environmental benefits and utility cost savings have been achieved in other United States' communities by the application of Rain Water Harvesting ("RWH") for non-potable use (toilet flushing, for instance);

AND WHEREAS, It has been reported to the Steering Committee of the GPGC that obstacles currently existing within our community preclude the Partners and other members of the community from implementing RWH techniques;

AND WHEREAS, A Partner, Cincinnati Public Schools, has requested the assistance of the GPGC to facilitate the removal of such obstacles so that the RWH system originally planned for Dater Montessori made be connected;
Initial Stages...

April, 2011 Resolution

Supported by the Greater Cincinnati Foundation

City motion to investigate codes
April, 2011 Resolution

Supported by the Greater Cincinnati Foundation

City motion to investigate codes

Formation of Task Force

• 37 Members representing 18 Departments & Agencies
• Meetings began in June 2011
• Started with a pilot project
Cincinnati’s vision for using rainwater inside a building.

Dater Montessori School

SITE
The site has been designed to include transportation via bus and bike, low-emitting and fuel efficient vehicle parking spaces, dark-sky compliant light fixtures and of course, space for the “Meadow Maze”, water efficient landscaping.

Congratulations!
Your renovated school building has been designed to meet LEED Silver Certification (pending). The renovation included adding wall and ceiling insulation, completely new mechanical, electrical, plumbing and control systems to provide state of the art energy efficiency.

Storm water detention swale for controlling storm water runoff and to reduce storm water sent to rivers and streams.

Rain barrels hold rainwater collected from the roof. Use rainwater instead of city water to water your garden!

Bikers can now use bike lanes and bike racks. More bikers means less car and bus pollution.

Constructed in 1926 your renovated school has been rebuit with sustainable, green features.
Rainwater Harvesting Task Force Subcommittee...

Specific Departments and Agencies have authority to make decisions and standards for the community…
Rainwater Harvesting Task Force Goals...

Permit Dater Montessori School

Develop standards for others to follow in Cincinnati

Amend City Plumbing Code

Coordinate the findings for others in GCWW / MSD service area
Significant Concerns...

Jurisdiction for Water Quality
Backflow Prevention Standard
Model Code
Which agency has jurisdiction in Cincinnati?

Conflicting responsibility:
OEPA and GCWW

- OAC 3745-95-02:
  Solution must be approved by GCWW and OEPA

- ORC 6109.13:
  Solution must be approved by OEPA
Jurisdiction RESOLVED

Dec. 2011

OEPA Confirmed GCWW has jurisdiction for:

- Non-potable use
- Water quality standards
- Protecting the public water supply
Backflow preventers RESOLVED

GCWW Rules details procedure and application

Planning Department, Plumbing Inspections confirms OPC Standard

- Existing standards are acceptable
- No significant modification is needed
Model Code needed...

A national standard model code is expected

- Final Draft version to be approved Nov 2011
- Standard for Dater and others
- Department of Planning can compare Dater against the standard
A national standard is now available: IgCC

- Approved March 2012
- Provides a code for our community to follow and Planning Department enforceable standards
Significant details that were addressed...

- Jurisdiction for Water Quality
- Backflow Prevention Standard
- Model Code
- Water quality requirements
- Periodic inspections
- Certified maintenance protocol
- Metering
Ordinance Passed...

Livable Communities Committee

City Council: April 10, 2013

Overview:

- Allows use of Rain Barrels
- References IgCC Code
- Defines agencies having jurisdiction
Rainwater Harvesting Task Force Goals COMPLETED

Permit Dater Montessori School

Develop standards for others to follow in Cincinnati

Amend City Plumbing Code

Coordinate the findings for others in GCWW / MSD service area
Items remaining...

- Communication to community
- Permitting fees
- Metering / Sewer fees
- Certified maintenance protocol
Department of Planning and Buildings....
Rainwater Harvesting Tanks...
Rain Barrel...
Rain Barrel to Flush Water Closet...
Rain Harvesting System...
106.5 Alternative engineered design. The design, documentation, inspection, testing and approval of an alternative engineered system shall comply with sections 106.5.1 to 106.5.3 of this rule.

106.5.1 Design criteria. An alternative engineered design shall conform to the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, fire resistance, durability and safety. Materials, equipment or components shall be designed and installed in accordance with the manufacturer's installation instructions.

106.5.2 Submittal. The registered design professional shall indicate on the application that the system is an alternative engineered design. The approval and permanent approval records shall indicate that an alternative engineered design was part of the approved installation. Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.

106.5.3 Technical data. The registered design professional shall submit sufficient technical data to substantiate the proposed alternative engineered design and to prove that the performance meets the intent of this code.
Bath Tub Faucet with Air Gap...
Manual Fill Valve with Air Gap...
608.13 Backflow Protection...

- **608.13 Backflow protection.** Means of protection against backflow shall be provided in accordance with Sections 608.13.1 through 608.13.9.

- **608.13.1 Air gap.** The minimum required air gap shall be measured vertically from the lowest end of a potable water outlet to the flood level rim of the fixture or receptacle into which such potable water outlet discharges. Air gaps shall comply with ASME A112.1.2 and air gap fittings shall comply with ASME A112.1.3.
Double Detector Check BFP...
ASSE 1013 RPZ High Hazard BFP...
608.8 Identification of nonpotable water. In buildings where nonpotable water systems are installed, the piping conveying the nonpotable water shall be identified either by color marking or metal tags in accordance with Sections 608.8.1 through 608.8.3. All nonpotable water outlets such as hose connections, open ended pipes, and faucets shall be identified at the point of use for each outlet with the words, “Nonpotable-not safe for drinking.” The words shall be indelibly printed on a tag or sign constructed of corrosion-resistant waterproof material or shall be indelibly printed on the fixture. The letters of the words shall be not less than 0.5 inches in height and color in contrast to the background on which they are applied.
Identifying Signage...
Identifying Signage...
608.1 General. *A potable water supply system shall be designed, installed and maintained* in such a manner so as to *prevent* contamination from nonpotable liquids, solids or gases being introduced into the potable water supply through cross-connections or any other piping connections to the system.

- Backflow preventer applications shall conform to Table 608.1, except as specifically stated in Sections 608.2 through 608.16.10.

- **608.2 Plumbing fixtures**. The supply lines and fittings for every plumbing fixture shall be *installed so as to prevent backflow*. Plumbing fixture fittings shall *provide backflow protection in accordance with ASME A112.18.1*
Cross Connection...
608.8.1 Information. Pipe identification shall include the contents of the piping system and an arrow indicating the direction of flow. Hazardous piping systems shall also contain information addressing the nature of the hazard. Pipe identification shall be repeated at maximum intervals of 25 feet (7620mm) and at each point where the piping passes through a wall, floor or roof. Lettering shall be readily observable within the room or space where the piping is located.

608.8.2 Color. The color of the pipe identification shall be discernable and consistent throughout the building. The color purple shall be used to identify reclaimed, rain and gray water distribution systems.
106.5 Alternative engineered design. The design, documentation, inspection, testing and approval of an alternative engineered system shall comply with sections 106.5.1 to 106.5.3 of this rule.

106.5.1 Design criteria. An alternative engineered design shall conform to the intent of the provisions of this code and shall provide an equivalent level of quality, strength, effectiveness, fire resistance, durability and safety. Materials, equipment or components shall be designed and installed in accordance with the manufacturer's installation instructions.

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106.5.3 Technical data. The registered design professional shall submit sufficient technical data to substantiate the proposed alternative engineered design and to prove that the performance meets the intent of this code.
Section 110 Appeals...

- **110.1 Hearing and right of appeal, local board of building appeals.** Adjudication hearings shall be in accordance with sections 119.09 to 119.13 of the Revised Code, as required by section 3781.031 of the Revised Code, and the following:

- **1. Requests for hearing shall be within thirty days of the mailing date of an adjudication order.** The local board shall schedule a hearing and notify the party. If the hearing concerns section 3781.111 of the Revised Code or rules adopted thereunder, reasonable notice of time, date, place, and subject of the hearing shall be given to any local organization composed of or representing persons with disabilities, as defined in section 3781.111 of the Revised Code, or if there is no local organization, then to any statewide organization composed of or representing persons with disabilities.
1.1 For purposes of conducting adjudication hearings, the local board may require attendance of witnesses, production of records and papers, and may take depositions of witnesses in accordance with section 119.09 of the Revised Code.

1.2 Testimony shall be under oath and, as outlined in section 109.1, a stenographic or mechanical record of testimony and other evidence submitted shall be taken at the expense of the local board of building appeals.

1.3 The local board may postpone or continue any adjudication hearing on its own motion or upon the application of any party.

1.4 The board shall keep a full and complete record of all proceedings which shall be open to public inspection.
2. The Board shall render its decision within thirty days after the hearing.

3. Following the hearing, an order shall be entered on its journal, and the local board shall serve by certified mail, return receipt requested, upon the party affected thereby, a certified copy of the order and a statement of the time and method by which an appeal may be perfected. A copy of the order shall be mailed to the attorney or other representatives of record representing the party.

4. Any municipal or county officer, official municipal or county board, or person who was a party to the hearing before the municipal or county board of building appeals, may apply to the state board of building appeals for a de novo hearing, or may appeal to the court of common pleas of the county in which he is a resident or in which the premises affected by such order is located.
5. In addition, when the adjudication hearing concerns section 3781.111 of the Revised Code, or any rule made thereunder, any local organization composed of or representing persons with disabilities, or if no local organization exists, then any statewide organization representing persons with disabilities may file appeals as indicated in paragraph 4. of this section.

6. Application for a de novo hearing before the state board shall be made no later than thirty days after the municipal or county board renders its decision.
Rainwater Harvesting Metering Requirements - Single Tank Systems

- MSD Billing Deduct Meter
- MSD Billing Cancellation Meter
- GCWW Domestic Water Meter
- Domestic Use Meter
- Rest of Building
- Purge/Overflow Line
- Irrigation

All Secondary Meters To Be Installed/Maintained By Property Owner
Rainwater Harvesting Billing Requirements...

- Metering/Billing not required for harvesting tanks exclusively used for irrigation

- Single tank systems used for irrigation and non-potable uses are required to install meters per the diagram (flat billing allowed for residential/no meters required)

- Commercial systems using multiple tanks are eligible for flat billing (evaluated case by case and billing adjusted annually)
Water quality requirements...

Water Quality Standards are established.

<table>
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<th>PARAMETER</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>pH</td>
<td>6.0 – 7.0</td>
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<tr>
<td>Biological oxygen demand</td>
<td>Not greater than 10 mg/L</td>
</tr>
<tr>
<td>Nephelometric turbidity unit</td>
<td>Not greater than 2</td>
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<td>Fecal coliform</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Chlorine</td>
<td>No detectable chlorine in 100 mL</td>
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<tr>
<td>Enteroviruses</td>
<td>No detectable enteroviruses in 100 mL</td>
</tr>
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Maintenance manuals...

No codes currently define the O&M Manual content

Necessary to ensure the public water supply is protected

Owner develop the O&M manual, for review and certification by the Planning Department


707.13.1 Manual. A detailed operations and maintenance manual shall be supplied in hardcopy form with all rainwater collection systems.

707.13.2 Schematics. The manual shall include a detailed system schematic, the locations of all system components, and a list of all system components including manufacturer and model number.

707.13.3 Maintenance procedures. The manual shall provide a maintenance schedule and procedures for all system components requiring periodic maintenance. Consumable parts including filters shall be noted along with part numbers.

707.13.4 Operations procedures. The manual shall include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.
To ensure the system has not been compromised.

Department of Buildings and Inspections – create:

- A defined inspection process
- Inspection fee
- Inspection schedule

707.15.1 Water quality testing. Collected rainwater shall be tested. Accumulated water to be tested shall be the result of not less than two rainfall events. Testing shall be in accordance with Sections 707.15.1.1 and 707.15.1.2.

707.15.1.1 Test methods. Water quality testing shall be performed in accordance with the latest edition of APHA–Standard Methods for the Examination of Water and Wastewater and in accordance with Sections 707.15.1.1.1 and 707.15.1.1.2.

707.15.1.1.1 Annual tests required. Accumulated rainwater shall be tested prior to initial use and annually thereafter for Escherichia coli, total coliform, heterotrophic bacteria and cryptosporidium.

707.15.1.1.2 Quarterly tests required. Accumulated rainwater shall be tested prior to initial use and quarterly thereafter for pH, filterable solids, residual chlorine if disinfection is used, and turbidity. The pH shall be tested in accordance with ASTM D 5464; filterable solids shall be tested in accordance with ASTM D 5907; residual chlorine shall be tested in accordance with ASTM D 1253 and turbidity shall be tested in accordance with ASTM D 6698.
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