

### Section 3.7 Rainwater Harvesting (RWH)



Rainwater Harvesting systems intercept, store, and release rainfall for future use. For purposes of this specification, Rainwater Harvesting includes the collection and conveyance of roof runoff into an above- or below-ground storage tank where it can be reused or safely diverted to a receiving area for infiltration.

#### A. Purpose

- Collects and treats runoff from roofs including homes, businesses, farm buildings, and accessory structures such as garages and sheds.
- Capture runoff is primarily used for non-potable uses such as irrigation, livestock watering and exterior washing.
- Captured runoff used for potable uses such as drinking, pools and interior washing need to have approval from the local building and health authorities.

#### B. Site Criteria

- The collection and reuse of surface runoff from parking lots and other surfaces is not addressed in this specification. No surface runoff should be collected.
- Storage tanks can be placed underground, above ground, or indoors.
- Above ground tanks may be adjacent to buildings, leaving enough room for access.
- Underground tanks are appropriate where the tank can be buried above the water table.
- Underground tanks should be a minimum of 10 feet from building foundation.

#### C. Design Criteria

- Storage tanks shall be sized to capture the 1-inch volume of runoff. For tank sizing, see the Calculations in Appendix A.1.
- The minimum treatment volume to receive cost share is 250 gallons (treating at least 422 ft<sup>2</sup> of roof).

- Final storage tank size should consider dead storage and freeboard storage. Dead storage is the volume at the bottom of the tank that is never used. Freeboard storage is the volume above the overflow outlet. For gravity systems assume 10% of the tank volume will be used for dead storage and freeboard. Submersible pump systems should provide enough dead storage based on pump specifications.
- Reused storage tanks should have been previously used for potable water or food grade products.
- Above ground tanks:
  - Above ground tanks should be both UV- and impact-resistant and should be opaque to prevent algae growth. Non-opaque tanks should utilize opaque covers. Plastic tanks are preferred to regulate the temperature of stored water. Insulated covers could be used to minimize freezing if there is year-round water use.
  - Unless otherwise noted in the manufacturer's instructions, above ground tanks shall be placed on a foundation of densely compacted stone aggregate or concrete pad at least 6 inches thick. Concrete foundations may be necessary based on size and soil bearing capacity.
  - Above ground storage tanks should have a height to width ratio of less than 2:1 whenever possible. An engineered design is required for storage tanks over the 2:1 ratio. The engineered design would include anchoring and additional structural support to prevent safety hazard.
- Underground tanks:
  - Underground Storage Tank. Below ground storage tanks must have 18 to 24 inches of cover. These tanks must be designed to support the overlying sediment and other loads that may exist. Standard-sized riser for maintenance access should be provided. This access should be secure and prevent surface water intrusion. The foundation of a below ground tank should be 4 to 6 inches of masonry sand or densely compacted stone aggregate.
  - If the tank is buried partially below the water table, buoyancy should be calculated to determine if earth anchors, or ballast is needed to prevent floatation.
- If new gutters and downspouts are added, the sizing shall be in accordance with chapter 13 of the National Standard Plumbing Code (NSPC).
- Pretreatment is required to keep leaves and debris out of the tank. Gutter and downspout guards / screens may be used to filter coarse debris such as leaves. Additional pretreatment to remove fines should be used for indoor or potable uses. Secondary pretreatments include first flush diverters or vortex separators. See Appendix B for examples.
- Overflows must discharge to a stabilized location to avoid scouring or erosion. Diverters (preferred) back up the inflow pipe, sending excess water to an overflow path. Internal overflows use an elevated pipe sized to match the downspout, preventing backups. For overflow conveyance details, see Appendix A.3
- Internal pumps are used in underground tanks and external pumps are typically used in above ground tanks. Internal shallow well submersible pumps designed to push water should be placed in the lowest portion of the tank. External pumps designed to pull water can be placed above or below ground. Check valve and backwash preventers should be used to prevent pressurized water from returning to the tank. Pumps may be designed with a pressure tank. Pressure tanks, hosing, and other water delivery components are not covered by this specification.

#### **D. Design Plan Components**

- The district must be notified of any proposed changes to the approved design. Changes to the approved design may jeopardize cost share reimbursement. The Steering Committee has discretion to approve or deny cost share reimbursement in the event of design changes.
- Information required in the plan includes (see VCAP Submission Checklist for a comprehensive list):
  - The design plans should have a professional seal or be on licensed business letterhead; or Form-5 Release Agreement signed and attached to waive the requirement for the design plan to be certified by a licensed professional. Release Agreement may be accepted on a case-by-case basis.

- Photo documentation of site and resource concern, noting downspouts.
- Soil map with description of soil and depth to water table via Web Soil Survey.
- Aerial photo with an outline of practice location and roof area treated.
- Sketch of project plan including dimensions, foundation design, pretreatment and overflow. Cross section showing foundation, inlet, pretreatment, tank, outlet.
- Sizing calculations for the practice (See Calculations in Appendix A).
- Other calculations per practice standards (structural loading, pretreatment sizing, etc.)
- Installation requirements including timeline, sequence, and site stabilization.
- Material list and itemized cost estimates from contractor, vendor, and/or supplier.
- Water Use Plan describing how and when water will be dispersed.
- Winterization Plan
- Site constraints identified (utilities, right-of-way, etc.).
- A statement regarding compliance with any permitting requirements or local codes.
- Other information as requested by the local District.
- Applicants should contact their local health department or other regulatory authority for required gray water permits.
- Verification by a licensed professional may be required by the District to verify practice installation.

#### **E. Operation and Maintenance**

- Maintenance shall apply to gutters, downspouts, pretreatment, inlets, pumps and outlets.
- Routine Maintenance:
  - Check pretreatment device after every rainfall event of 1 inch or more. Clean out as needed or seasonally.
  - Clean by flushing tank if debris accumulation is visible.
  - Maintain pump per manufacturer guidelines.
  - Drain water as needed within 7 days of rainfall.
- Winterization of the tank should be performed annually. Winterization should follow manufacturer guidelines or can be achieved in one of the following ways.
  - Disconnect and drain the tank;
  - Keep tank drained and freeze proof valves, pumps and faucets; or
  - Maintain an insulated cover over tank to satisfy the year-round water demand.

#### **F. Cost-Share Rates/Incentives**

- See **District Guide to VCAP** for practice cost-share rates and caps.
- Cost-share rate is applied to the 1-inch volume of runoff collected rounded up to the nearest gallon.
- Eligible costs may include: excavation, grading of pad, installation (placement, connection and stabilization), collection system (reasonable gutters/downspouts), pretreatment devices, tank, stone/concrete for pad/bedding, overflow piping, elevated platform and pumps and valves.

#### **G. Technical References**

- [Virginia Rainwater Harvesting Manual. Cabell Brand Center. 2009.](#)
- Virginia Stormwater Management Handbook, Version 1.0. 2024. Virginia Department of Environmental Quality.
- [Virginia Department of Health. Virginia Rainwater Harvesting & Use Guidelines. 2011.](#)
- [Virginia Cooperative Extension. Summer Lawn Management: Watering the Lawn. Pub 430-010.](#)
- [Virginia Cooperative Extension. Irrigating the Home Garden. Pub 426-322.](#)
- National Standard Plumbing Code. Chapter 13 Storm Water Drainage. IAPMO. 2024.