



# Constructing Cistern Installations for Stormwater Management

David McDonald  
& Bob Spencer  
Seattle Public Utilities  
Installing Rain Gardens  
& Cisterns

*Trainings for contractors, 11/3/2011*

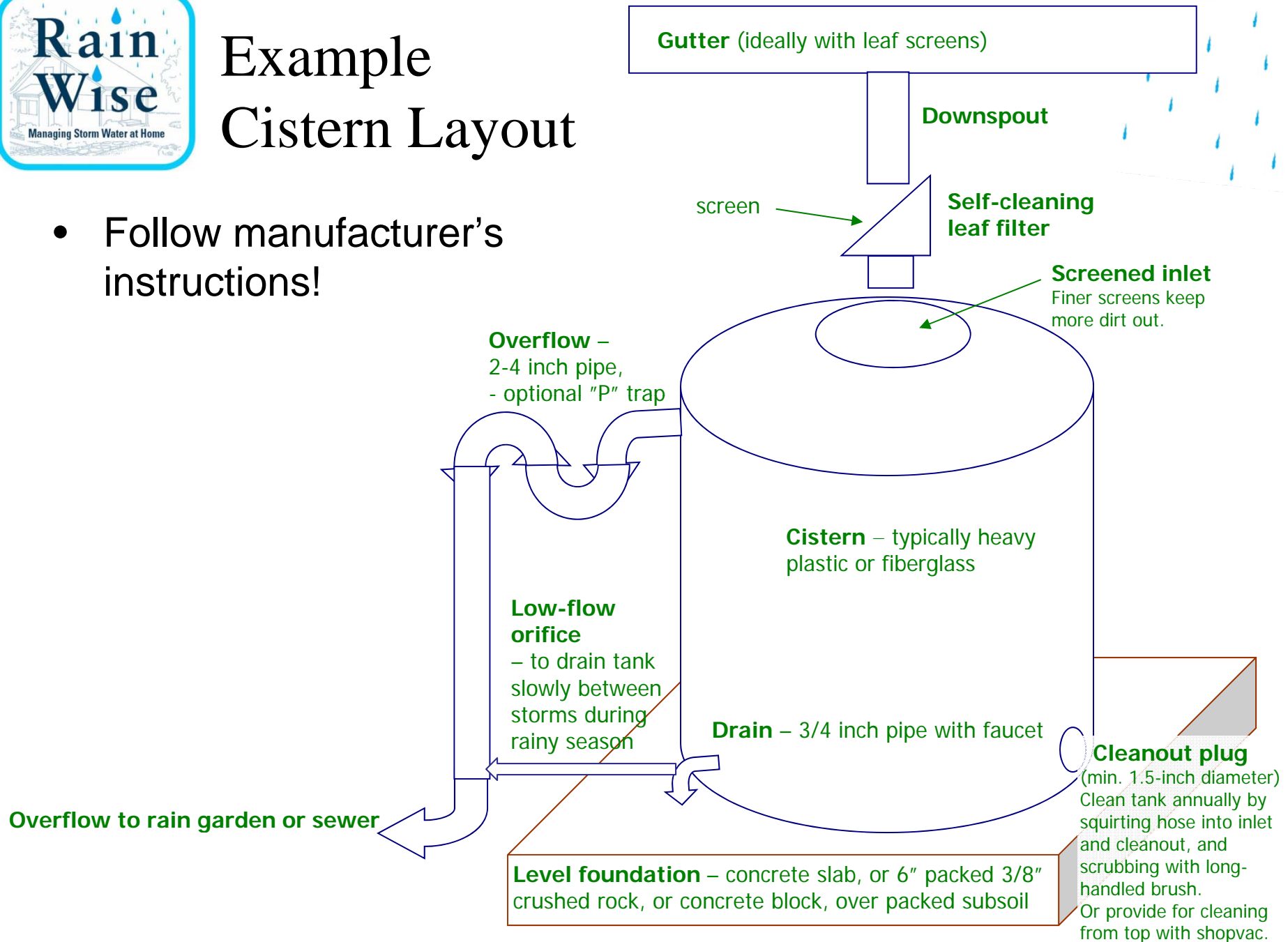
[www.seattle.gov/util/rainwise](http://www.seattle.gov/util/rainwise)





# Example Cistern Layout

- Follow manufacturer's instructions!





# What makes a cistern work for storm water detention?

- **The “low-flow orifice”**  
In this case, a  $\frac{1}{4}$  inch hole that’s left open October-May, to allow tank to drain out between storm events, so there’s space to store and slowly release the next rainfall.
- If the cistern is full when it rains hard, it provides no stormwater benefit.  
It must be able to drain between storms!





## Step 1: Build a level foundation to support a cistern full of water

- Excavate topsoil at least 3 inches: create hard a level surface – don't place on un-compacted fill
  - Pack subsoil with hand tamper or mechanical compactor
  - Place a level foundation:
    - Ground-contact-treated lumber box, filled with 6 inches of 3/8 crushed rock, well compacted. May top with 1 inch of sand or fine gravel to get smooth level surface under cistern.
    - Concrete blocks or heavy (min. 3-inch thick) pavers – perfectly level on top
    - Concrete slab
- No property setbacks or DPD permit required as long as cistern is less than 4.5 ft. tall, 4 ft. wide, or 600 gallons in size.





Example: connection to underground pipe to rain garden (schedule 40 PVC required)





# Example: cinderblock foundation (but inlet pipe is poorly supported)





## Step 2: Place cistern tank

- Don't block opening of doors & windows, emergency egress, vents, utilities access, etc.
- Plan for downspout flow to cistern, and overflow routing
- Consider appearance and consult neighbors
- Follow manufacturer's instructions
- Don't use tank that's taller than wide. (Tall narrow tanks require earthquake securement, which is usually impractical, so it's best not to use them.)





# Connect additional tanks, if used







## Step 3: Install a screened inlet, to keep debris & mosquitoes out

- At minimum, wrap and secure aluminum screen over inlet opening
- Additional protection against clogging:
  - Gutter screens and wire cages in gutter outlets to exclude leaves
  - Self-cleaning leaf excluder in downspout run to cistern – commercially available or home-assembled – Google “Downspout filters, screens”
  - Divert dirtier initial flow after dry period: Google “First flush diverters”, “Roof washers”, or “Cistern Installation” for ideas.



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This is NOT an adequate screened inlet





## Step 4: Make gutter connections

- 3-4" Aluminum, ABS, or PVC NDS pipe
- Secure all connections with stainless steel screws & silicone seal, or glue
- Strap & support as needed
- May put a self-cleaning leaf excluder in line: typically a sloped screen so leaves are pushed aside
- Arrange so water falls into screened inlet, with access to clean screen







## Step 5: Install overflow pipe that's as big as the inlet pipe

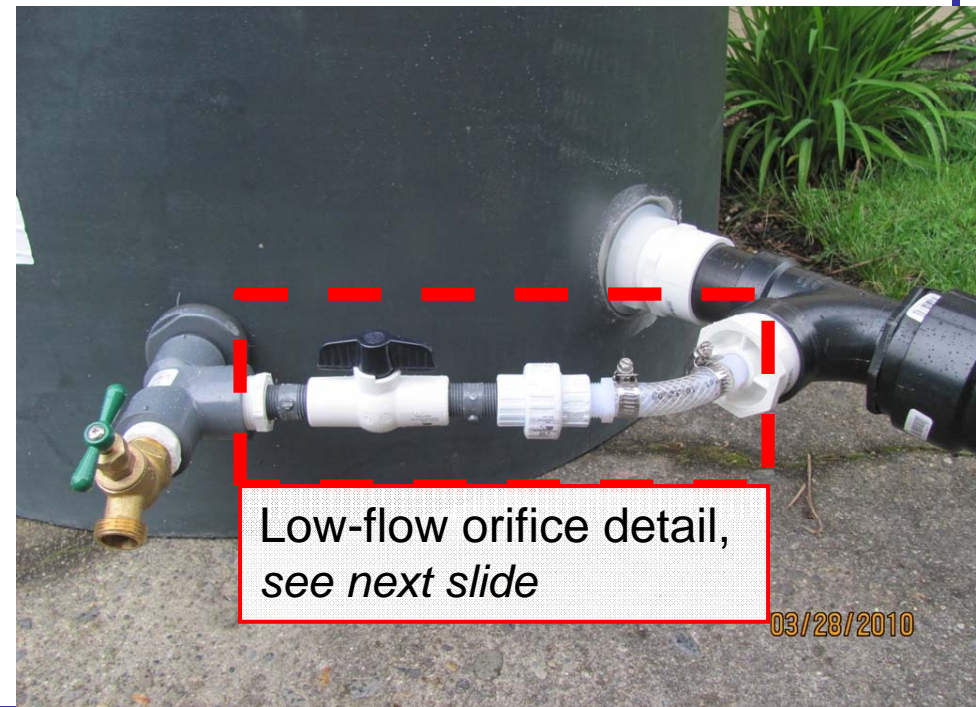
- Watertight bulkhead fitting at top, or internal overflow riser, or both (if less than 3 inch)
- Should be big enough to carry full gutter flow once cistern fills – (2" minimum, 3" is better).
- Optional: install "P" trap to prevent mosquito and rat entry.





## Step 6: Install drain valve, and “low-flow” orifice connecting to overflow

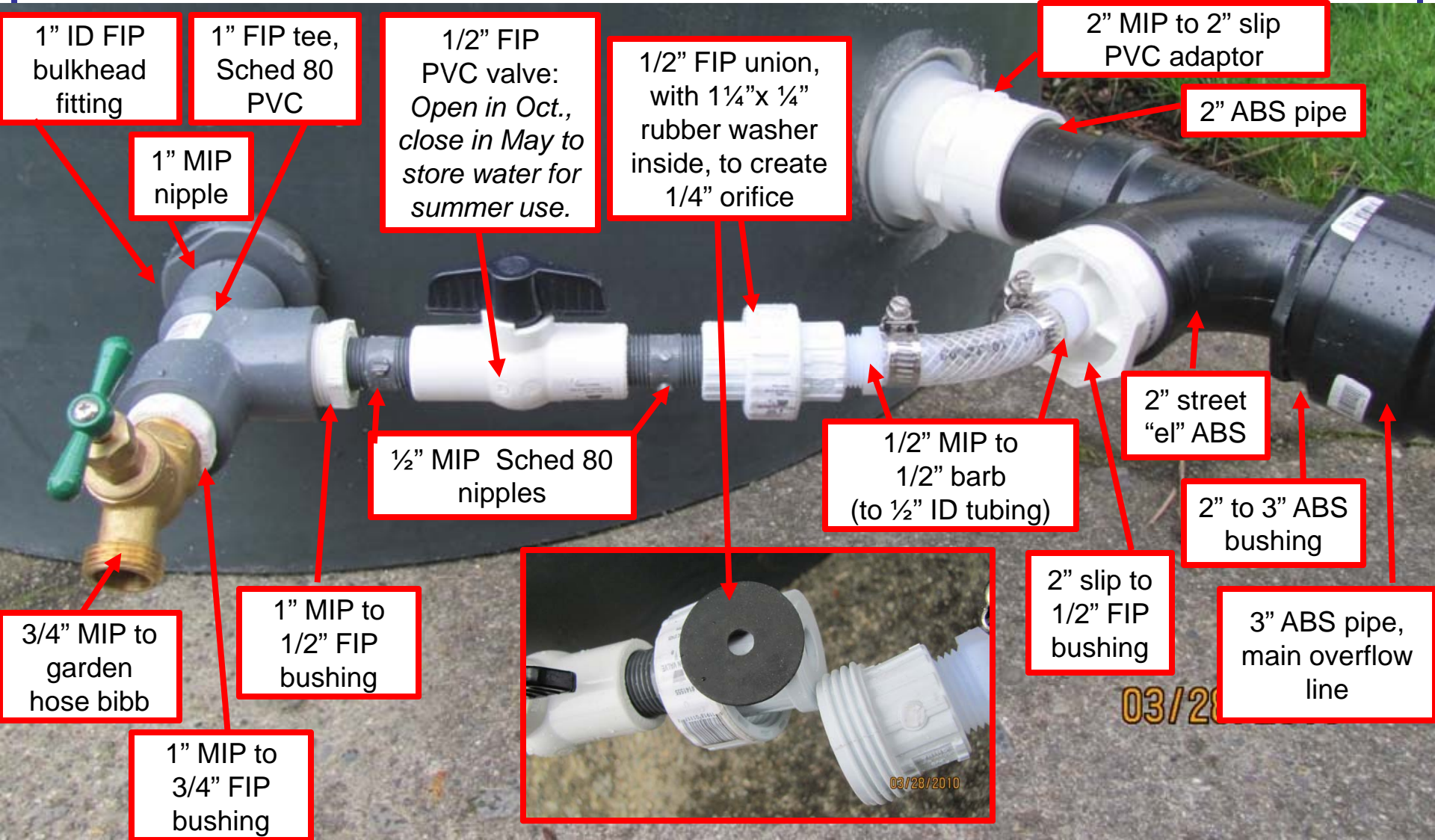
- Use oversize (1-3”) bulkhead fitting, so entire fitting can be removed for cleaning tank. Or install separate cleanout plug.
- “Hose bibb” garden hose faucet works for draining tank, and summer water use
- Tee off small line, with valve to drain “low-flow” orifice to main overflow line from October through May.





# Low-flow 1/4" orifice drain into main overflow, to drain cistern slowly in between storms

– one possible design, using easily available fittings



1" ID FIP bulkhead fitting

1" FIP tee, Sched 80 PVC

1/2" FIP PVC valve:  
*Open in Oct., close in May to store water for summer use.*

1/2" FIP union, with 1 1/4" x 1/4" rubber washer inside, to create 1/4" orifice

2" MIP to 2" slip PVC adaptor

2" ABS pipe

1" MIP nipple

1/2" MIP Sched 80 nipples

1/2" MIP to 1/2" barb (to 1/2" ID tubing)

2" street "el" ABS

2" to 3" ABS bushing

3/4" MIP to garden hose bibb

1" MIP to 1/2" FIP bushing

2" slip to 1/2" FIP bushing

3" ABS pipe, main overflow line

1" MIP to 3/4" FIP bushing



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## Step 7: Extend overflow pipe to an approved discharge point

1. **To a rain garden**
2. **Into landscape** at least 5' from buildings, or 10' from building with basement + 1 ft. for each foot the basement extends below 5'
3. **Into sewer** (make connection above ground, to avoid requirement for side sewer permit from DPD)
  - Rubber “hubless” unions protect against breakage, and allow maintenance
  - Use rocks or gravel to prevent erosion and disperse overflow into rain garden







# Consider appearance

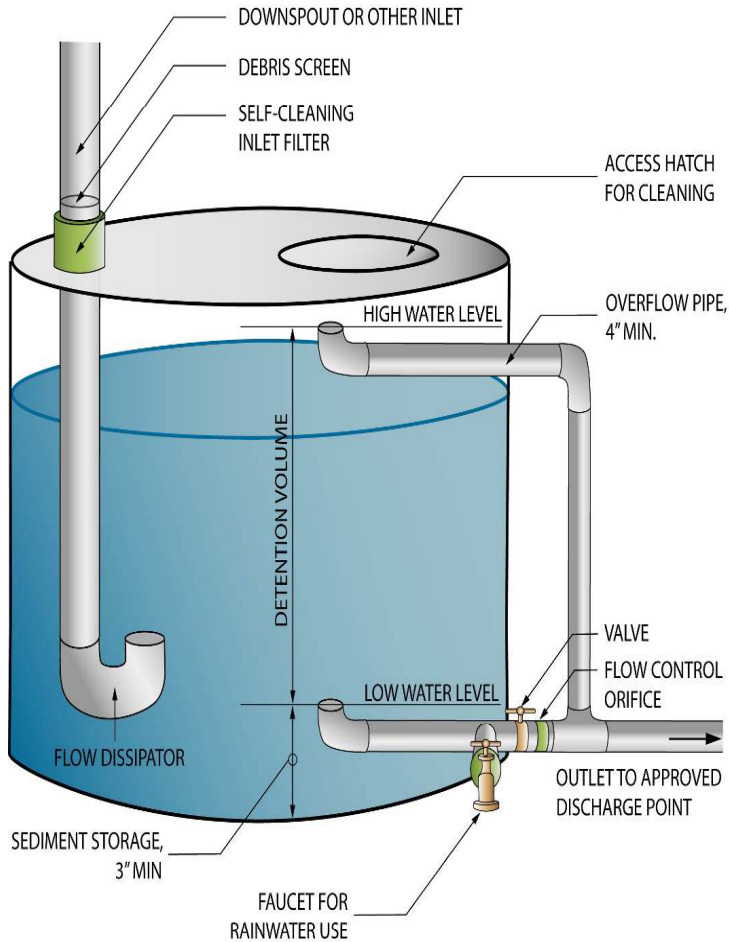
- Can screen cistern with fencing, latticework, cedar or bamboo wrap, etc.
- Plastic paint works on ABS & PVC pipe
- Blend with existing architectural finishes
- Consult with neighbors

South Seattle Community College cistern overflowing to rain garden in a downpour, Nov. 2009

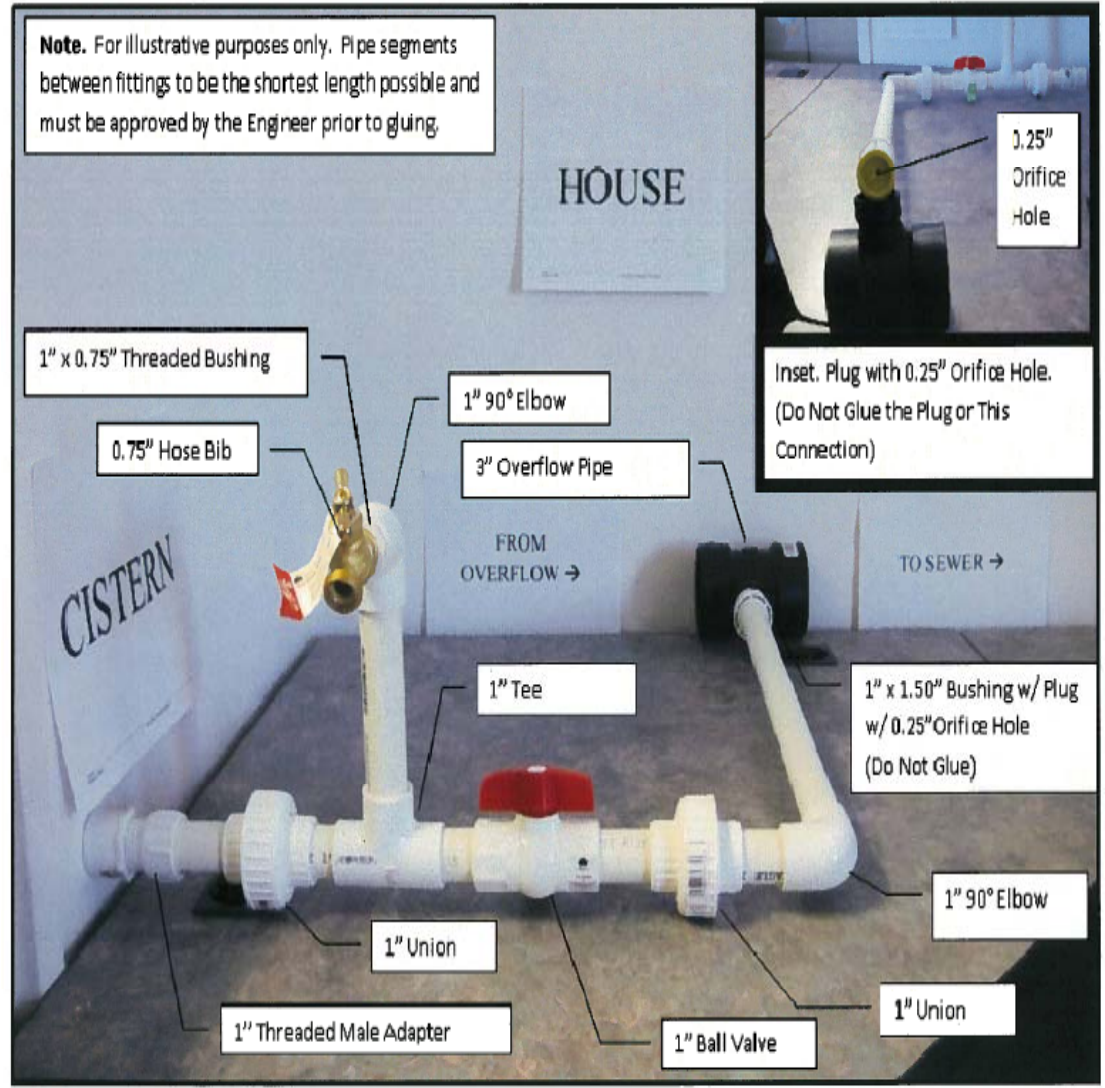




# Low-flow orifice plumbing for Code-permitted cisterns (example from Lakewood project)



DETENTION CISTERN  
(SINGLE FAMILY RESIDENTIAL ONLY)





# Example: Above ground connection to side sewer





Example: foundation of treated timbers filled with compacted gravel. Overflow goes to rain garden.

