



WATERTIGER™

Rainwater Harvesting

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Your own sustainable water supply

Overview



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- 1) Typical Rainwater uses
- 2) Catchment Area (roof, outbuilding, etc.)
- 3) Debris removal - screening/straining
- 4) Roof washing or first-flushes devices
- 5) Storage
- 6) Treatment (filtration/disinfection)
- 7) Maintenance
- 8) Q & A

Why Use Rainwater?



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Advantages of Using Rainwater:

- Conserves “traditional” water sources – well, surface, municipal
- Conserves energy – treatment and distribution from municipal plant or deep well requires considerable energy expenditures
- Prevents flooding and erosion by reducing runoff, and reduces contamination caused by runoff
- Reduce or eliminates water bills
- Stormwater management

Typical Rainwater Uses



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Rainwater can be used in place of “traditional” water sources for almost any purpose, including:

- Irrigation/Landscape
- Toilet/urinal flushing
- Wash/rinse/process water
- Potable water
- Livestock and pets, wildlife

How much water can I collect?



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- 1" (25mm) of rain collected over 1000 sqft is 620 gallons (0.62 gals per sq ft)
- Nanaimo receives 1150mm per year = 28,000 gallons per year per 1000 sq ft
- Tofino receives 3250mm per year = 80,000 gallons per year per 1000 sq ft
- Collection efficiency will determine how much is stored (typically 70-90%).

500 sq ft	1000 sq ft	1500 sq ft	2000 sq ft	10,000 sq ft
14,000 gal	28,000 gal	44,000 gal	56,000 gal	280,000 gal
40,000 gal	80,000 gal	120,000 gal	160,000 gal	800,000 gal

Roof Considerations



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Items to consider:

- Almost any hard or impervious surface can be used for collecting rainwater for non-potable applications
- Non-toxic materials must be used for potable applications – NSF Protocol P151 lists NSF validated coatings (Health Effects from Rainwater Catchment System Components)
- Smooth surfaces (i.e. metal) are best – they are easily cleaned with the first rain, they resist dirt, dust, etc. that will trap debris and promote bacteria growth, and will dry completely after the rainfall
- Roof design should prevent water pooling for prolonged periods – standing water will allow biological growth
- Solar panels make great catchment surfaces



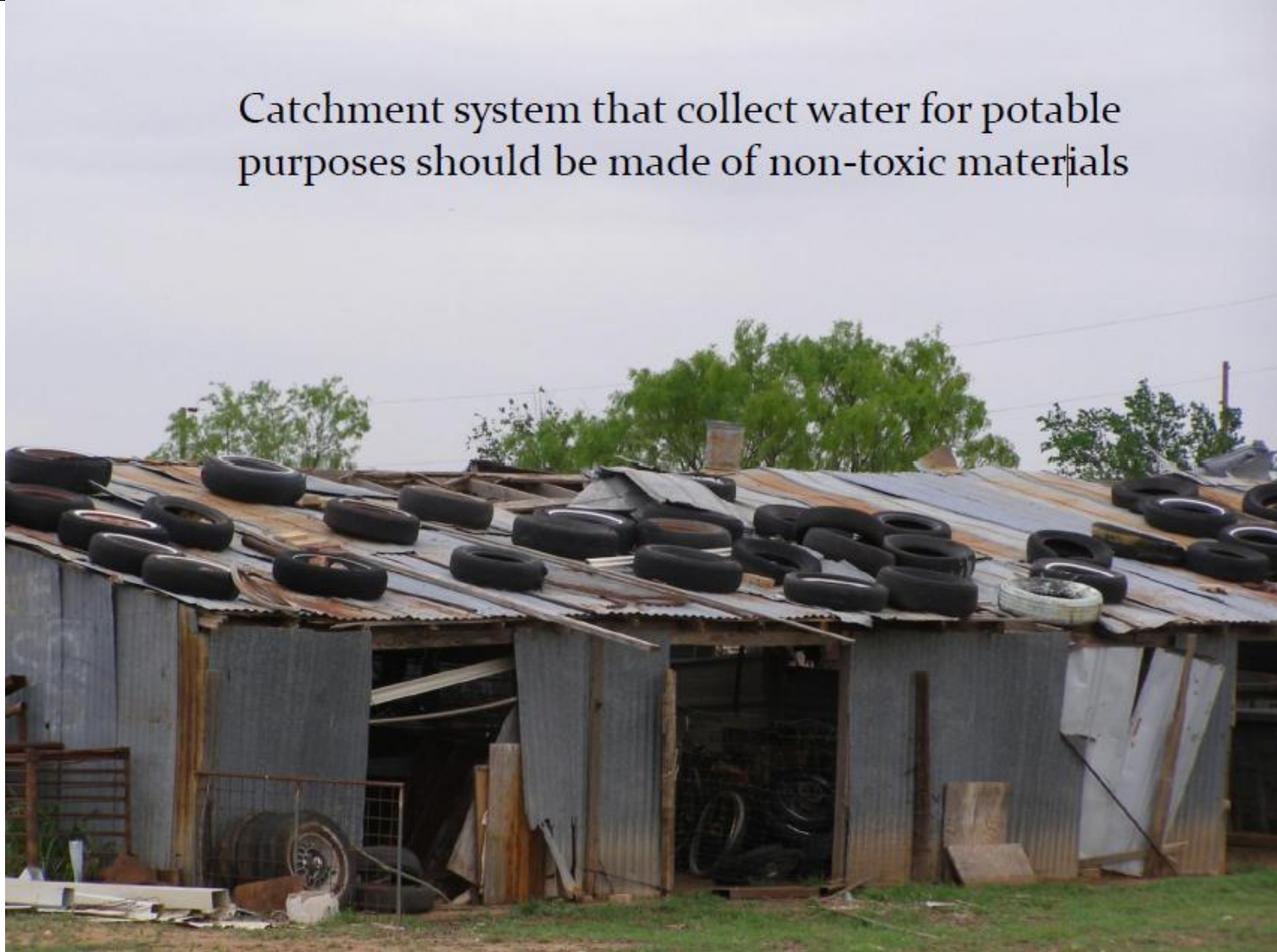
Roof considerations



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Catchment system that collect water for potable purposes should be made of non-toxic materials



Roof/conveyance Considerations



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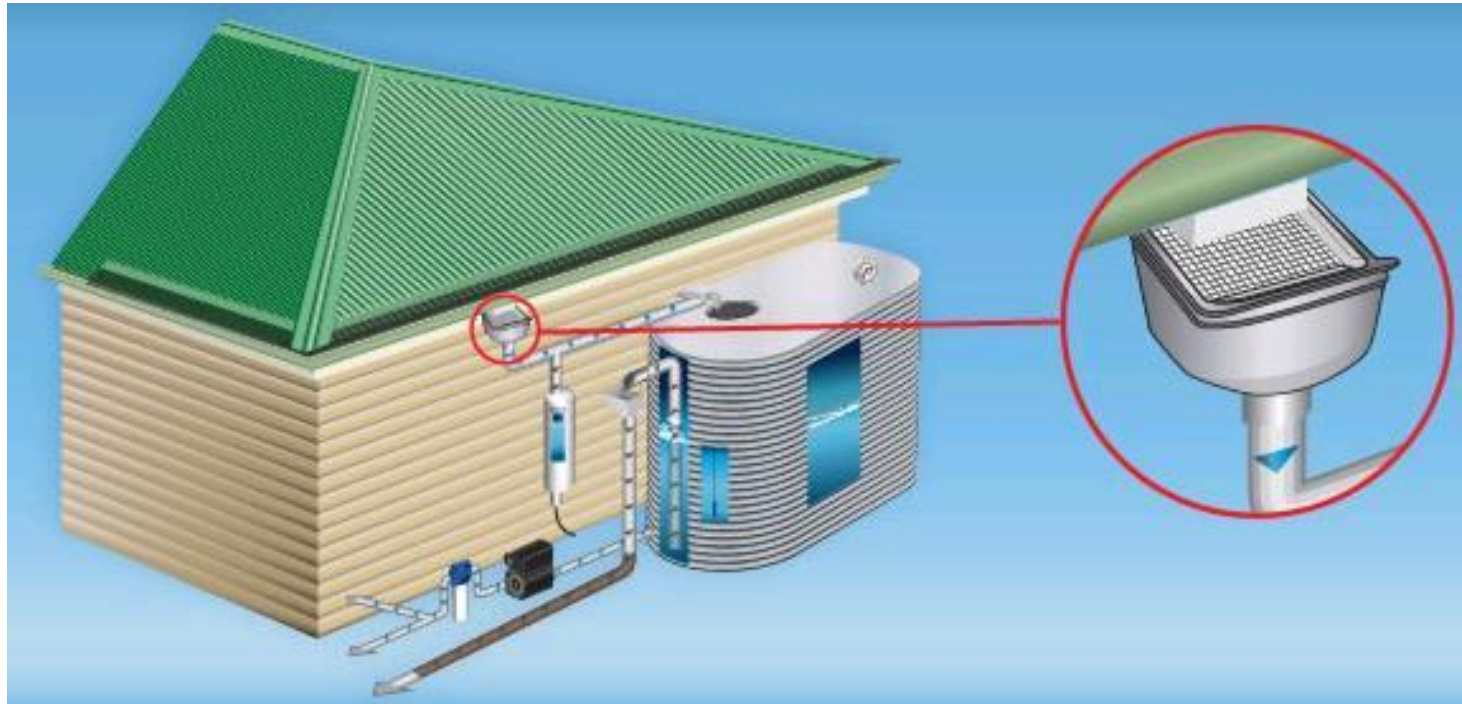


Debris Filtering



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Initial screening/straining used for the following:

- Remove large debris (leaves, needles, etc.)
- Reduce tank and system maintenance
- Easily cleanable screens – mosquito proof
- Will keep bugs and vermin out of your system
- Other options for commercial and larger applications

Debris Removal

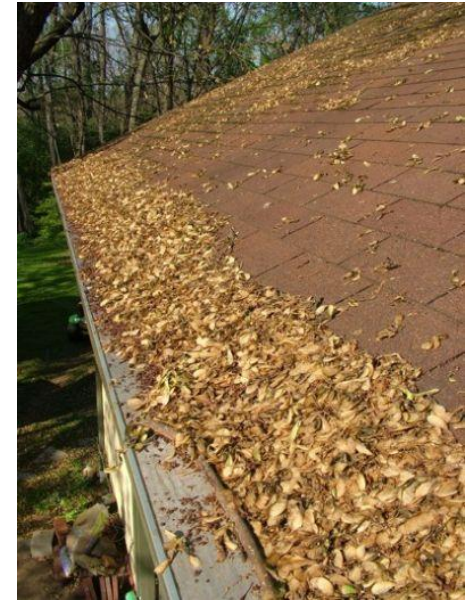


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Gutter Debris Screens

- Will keep debris out of gutters, but will reduce collection efficiency as more water runs off
- If not maintained, can provide growth/decay medium for organic and microbiological contaminants



Downspout Debris Screens

- Generally self-cleaning (but still require periodic attention)
- Require little maintenance
- Will allow debris to enter gutter and downspout, but not storage tank



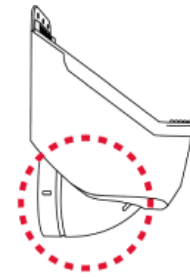
Screening / Straining



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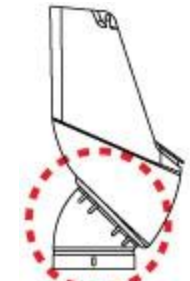
Strainer Examples



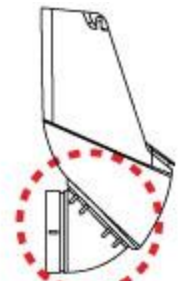
Horizontal Position



Vertical Position



Vertical position



Horizontal position

First Flush Diverters

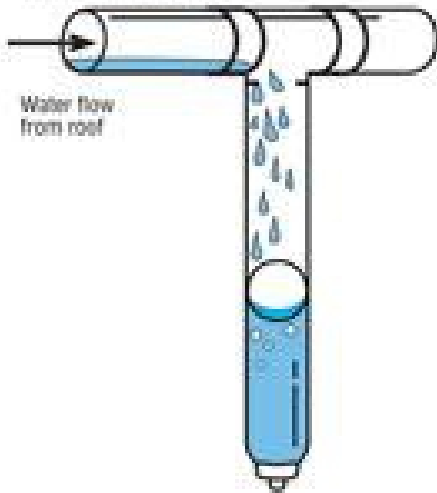
Discard first batch of rain



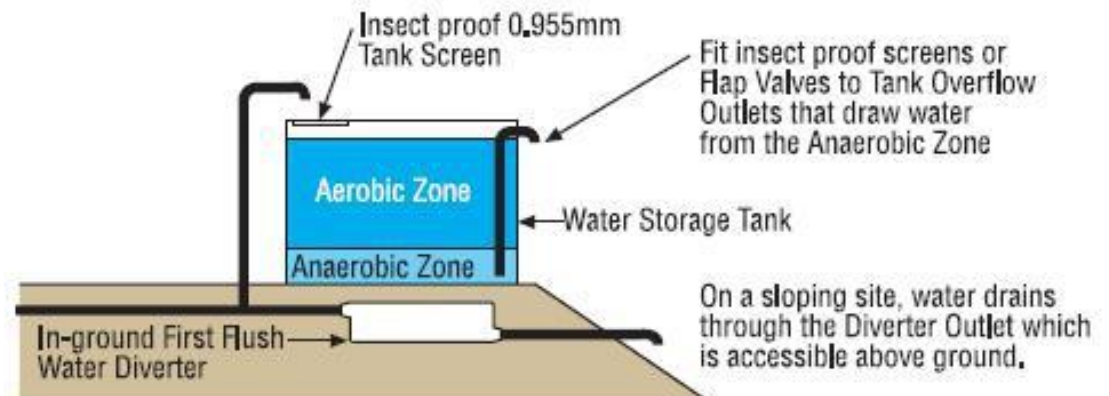
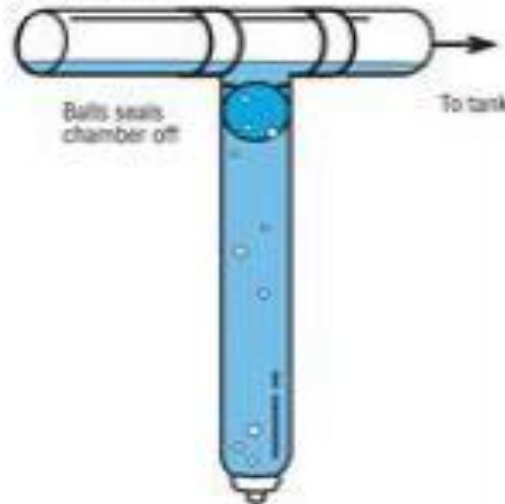
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First flush of contaminated water is diverted into chamber



Once chamber is full, fresh water flows to tank



Tank Comparisons



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Above ground polyethylene

- Common, easy to source
- Can be nested together easily
- Simple installation - lightweight
- Occupies valuable space
- Visual impact
- Easiest for access/cleaning
- Large tanks = high shipping \$

Buried poly

- Save space/reduce visual impact
- Can be shipped in sections to save on shipping costs
- Must be backfilled/anchored properly
- Ensure access port above grade

Corrugated Steel with liner

- Assembled on site – easy transport for large volumes
- Lowest \$\$ for large volumes

Buried fiberglass

- Can come in single or double wall
- Must be anchored

Precast concrete

- Low \$\$ for buried option
- Can be integrated into foundation of building
- Can have negative impact on water quality
- Heavy!

Tank Options



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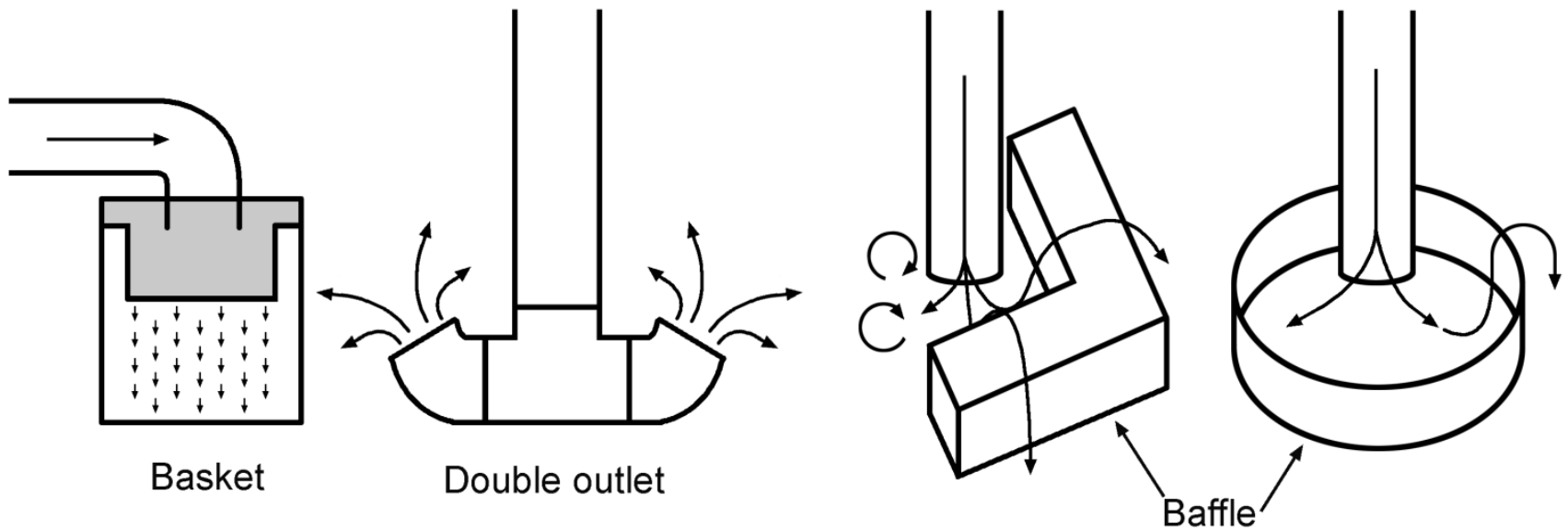


Calming Inlet



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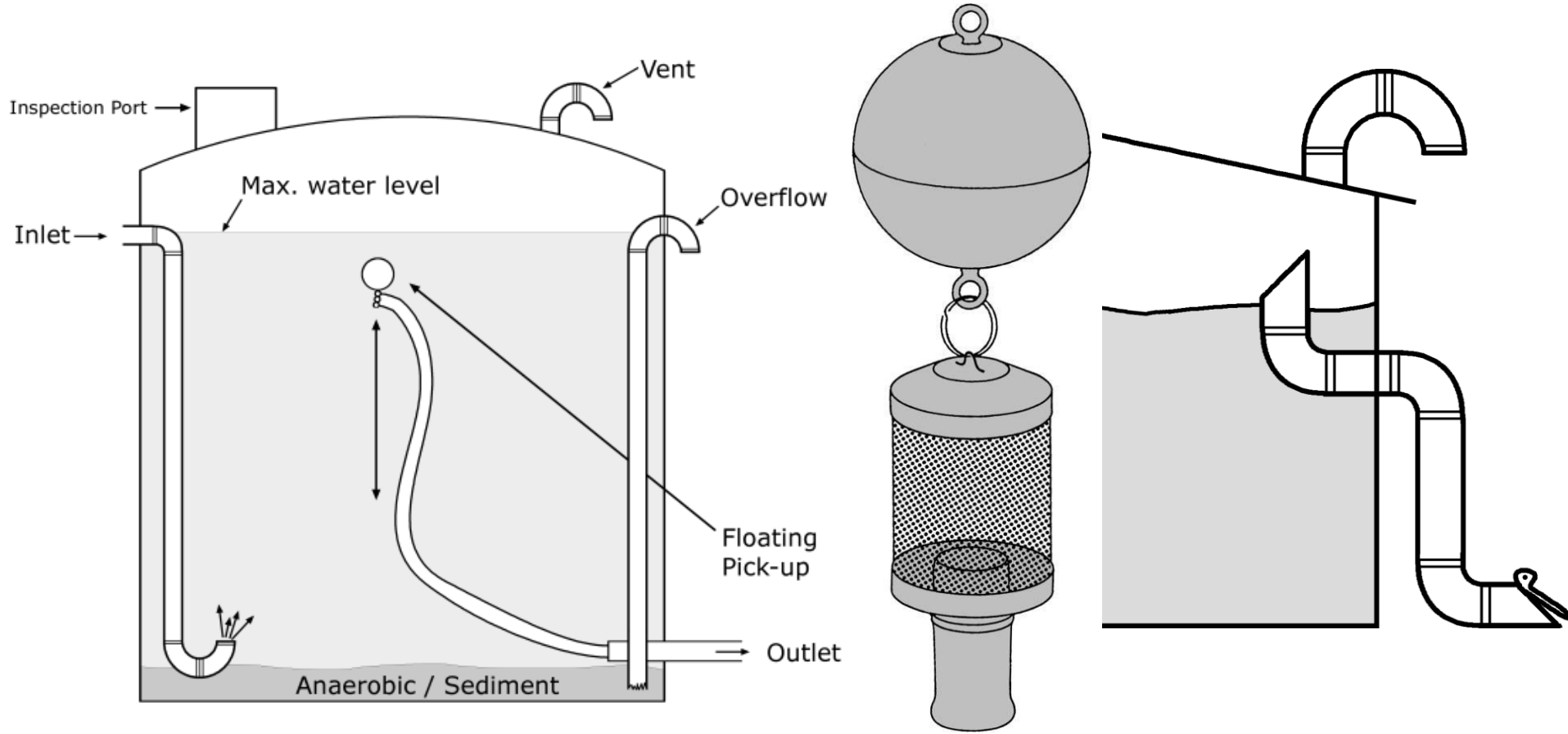




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Piping arrangement



Calculating Storage

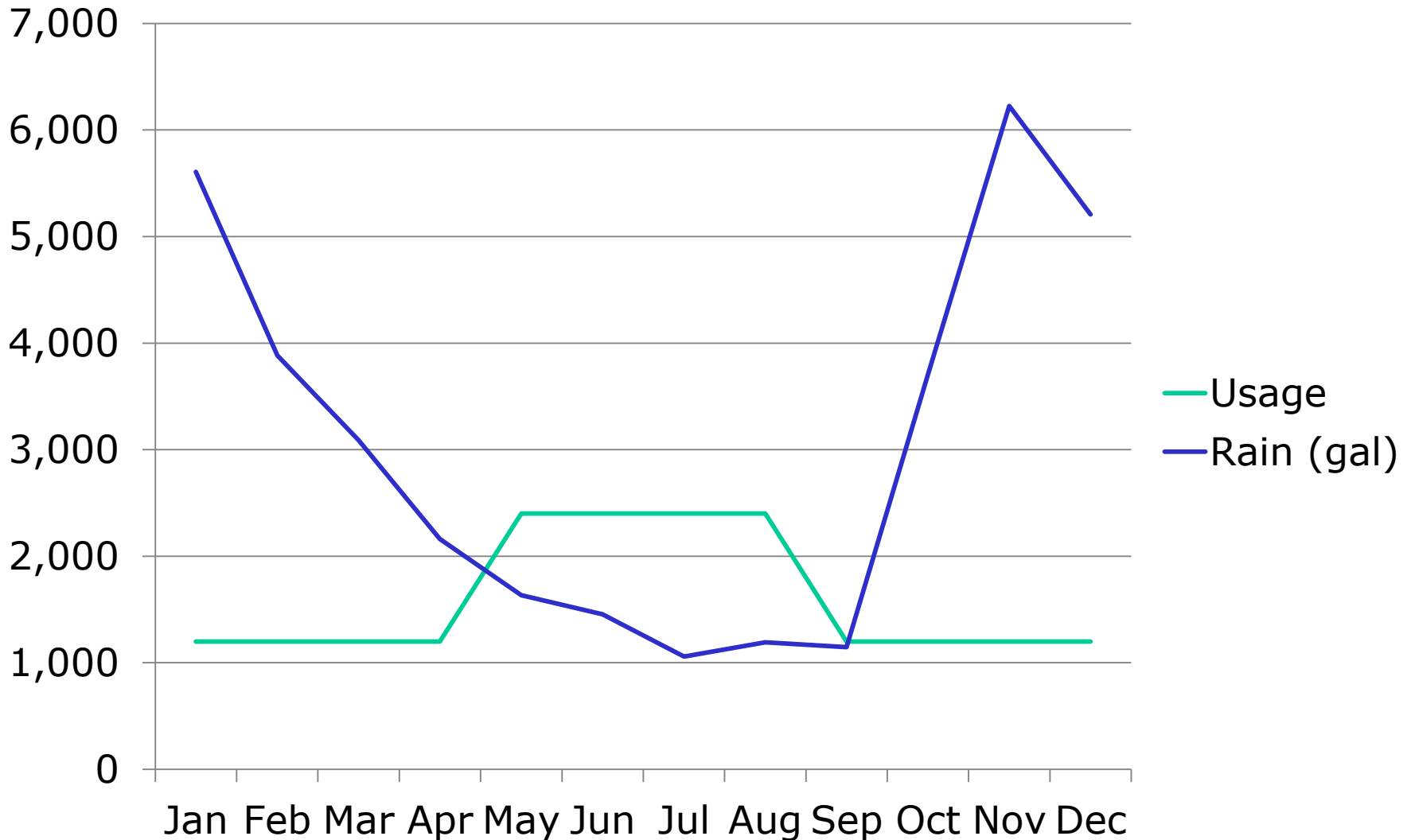
4 people x 50 GPD –part time

12 days/mnth summer, 6 days/mnth winter



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Calculating Storage

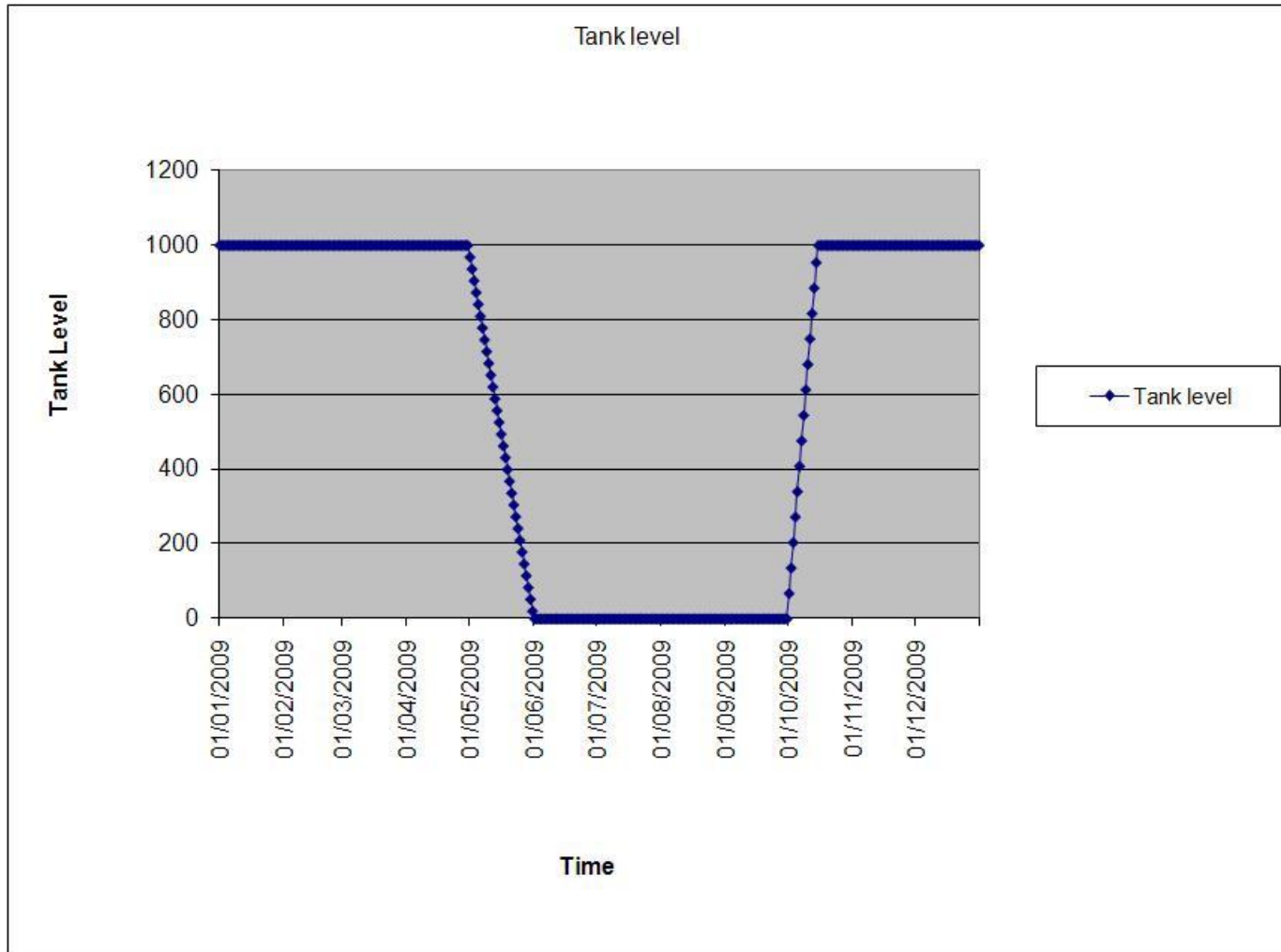
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12 days/mnth summer, 6 days/mnth winter



1000 gallon tank: will need another water source for June-Sept

Calculating Storage

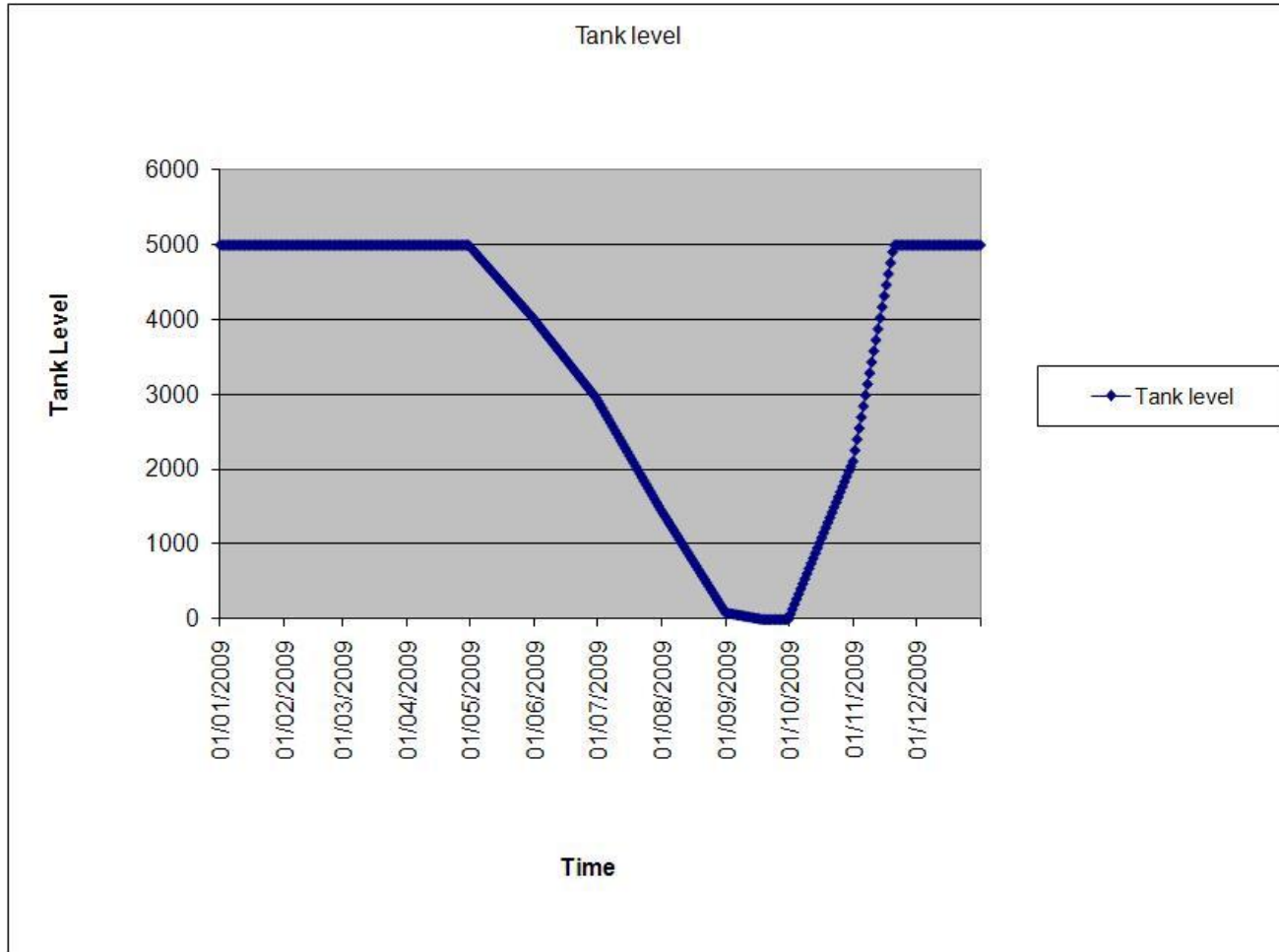
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12 days/mnth summer, 6 days/mnth winter



5000 gal tank: may just squeak by without another water source
(not considered adequate for self-reliance – no reserve/safety factor)

Calculating Storage

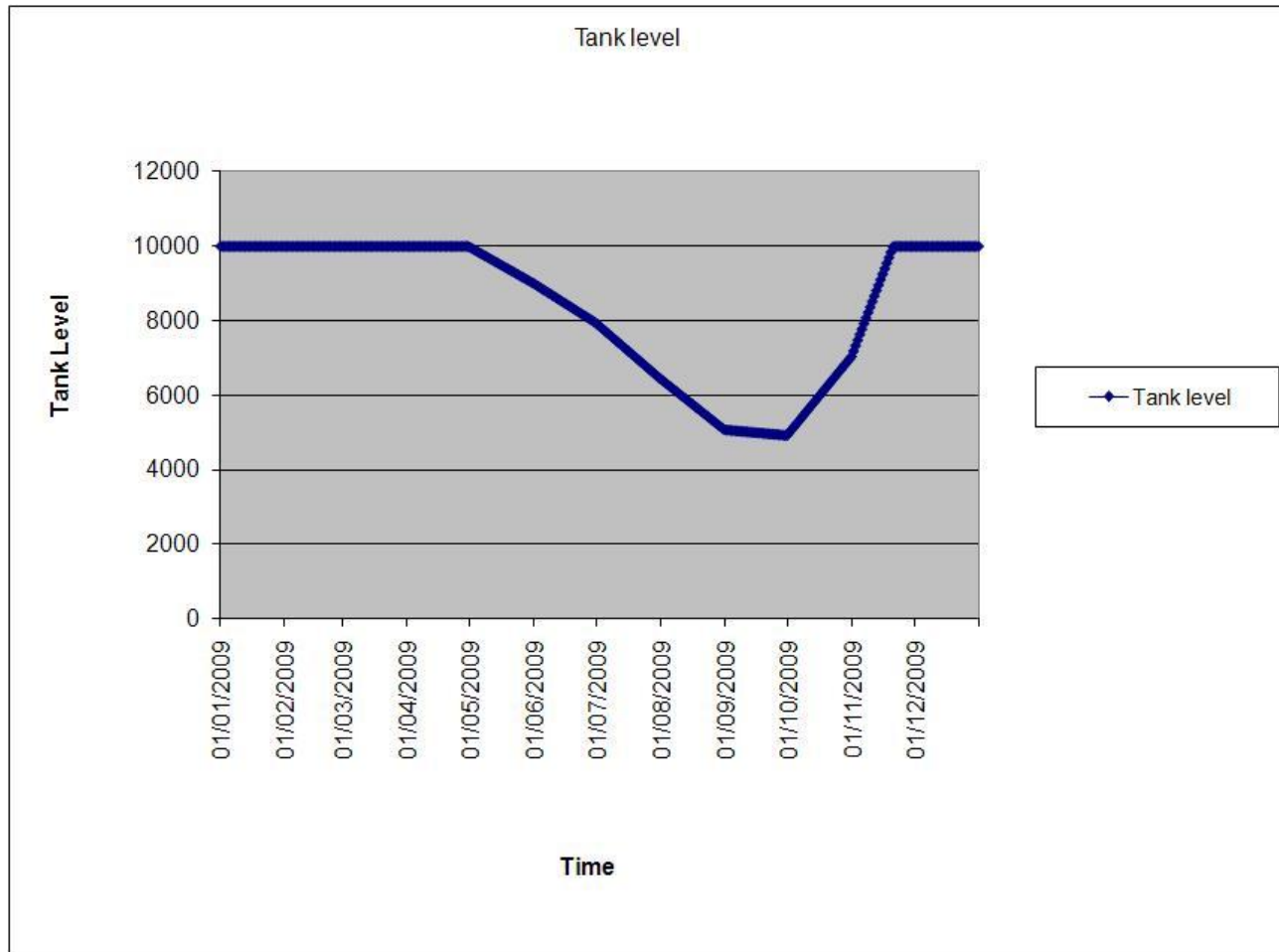
4 people x 50 GPD –part time



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12 days/mnth summer, 6 days/mnth winter



10000 gal tank: ample storage, and allows for 5000 gallons for fire protection

Storage



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Filtration



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Filtration installed after storage

- Sediment filters for basic turbidity and sediment removal (e.g. 5 micron)
- Carbon filters for taste/odour and VOC removal
- 1 micron absolute removal (NSF Standard 53) for cyst removal (e.g. Giardia and Crypto)
- 5 micron sediment required before UV treatment
- Spun polypropylene vs. pleated



Ultraviolet Disinfection

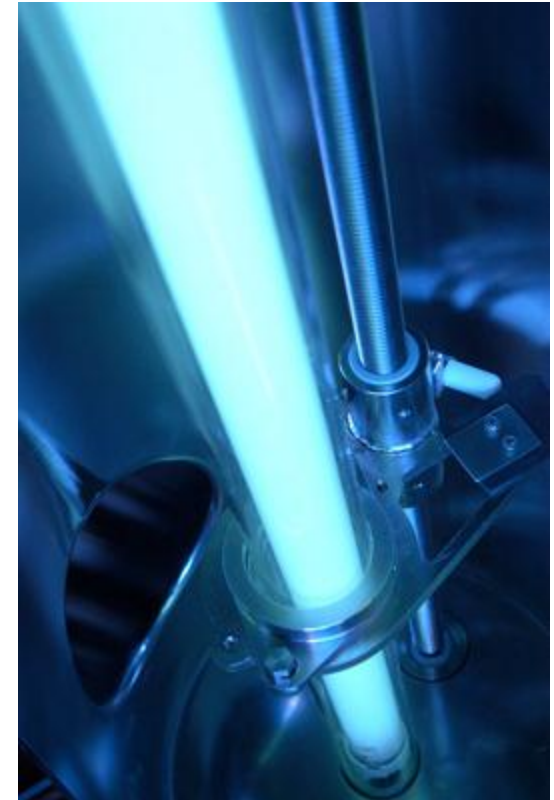


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UV Disinfection...

- Is effective against bacteria, viruses, parasites, cysts
- Requires no chemicals, does not change palatability of drinking water
- Lowest \$\$ disinfection technology
- Immediate action – no additional contact time needed
- Compatible with all other forms of water treatment



Slow Sand Filters



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Biosand

- Gravity fed system
- Ideal fit for rainwater catchment
- Manual cleaning process takes minutes
- No maintenance costs (consumables)
- Will provide pretreated water for storage
- Will remove cysts, virus, bacteria, turbidity, etc. (not 100% removal for all)



Biofiltration: Uganda



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Water source

Biofiltration: Uganda



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Gravity flow



Biofiltration: Uganda



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Before and
after

Chlorination



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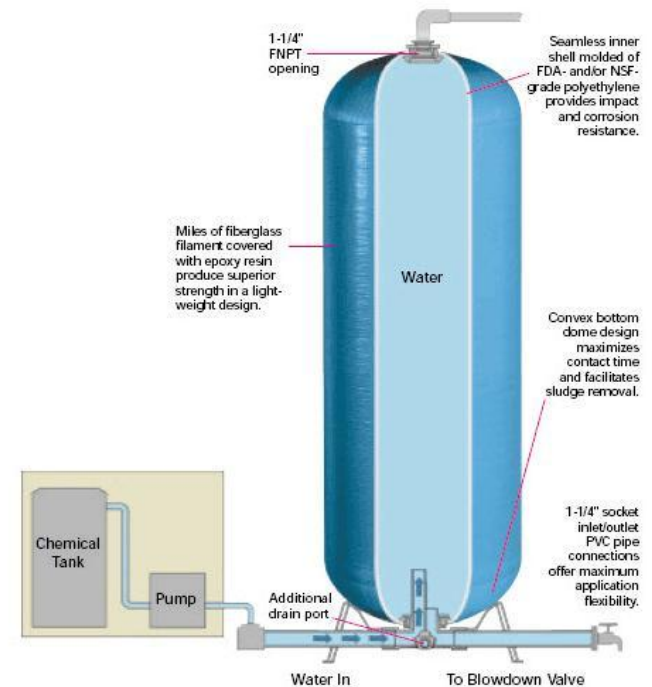
- Will provide disinfection
- Requires 20 minutes contact time (minimum)
- Will not inactivate cysts such as Giardia/Crypto



Contacting Flow Meter



Metering/Dosing Pump



Contact tanks

Corrosion Control



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Rainwater characteristics:

- Acidic (pH < 7.0)
- Low dissolved metals/minerals (TDS)
- Can be corrosive

Plastic pipe not an issue

Metal fixtures/fittings at risk – especially copper

To prevent pin-hole leaks:

- Soda Ash injection
- Calcite filter (Calcium Carbonate)



Maintenance



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Develop a maintenance checklist, include such things as:

- Clean and maintain roof and gutters
- Trim overhanging limbs and bushes
- Clean and maintain debris filters
- Check first-flush
- Monitor water levels/usage
- Change cartridge filters/UV bulbs according to manufacturer's instructions
- Check for leaks/erosion around tanks
- Test water periodically
- Check freeze protection

Keep a maintenance log

Common Regulatory Requirements



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Common regulatory requirements/best practice:

- System designed by certified professionals
- Municipal connection must be protected by a backflow preventer and air gap (if applicable)
- All components that come in contact with potable water must be potable-rated/3rd party or NSF certified
- All non-potable piping must be labeled as “non-potable” at regular intervals
- An appropriate treatment device must be installed to inactivate pathogens (disinfection)
- A maintenance program is followed and logged to ensure proper working order of all equipment
- Operating manuals and Emergency Response Plan
- Permanent sign on municipal shutoff (all shutoffs) explaining what fixtures are not connected to shutoff

Regulatory Requirements (cont'd)



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Common regulatory requirements:

- Proper and adequate signage must be attached to equipment and fixtures

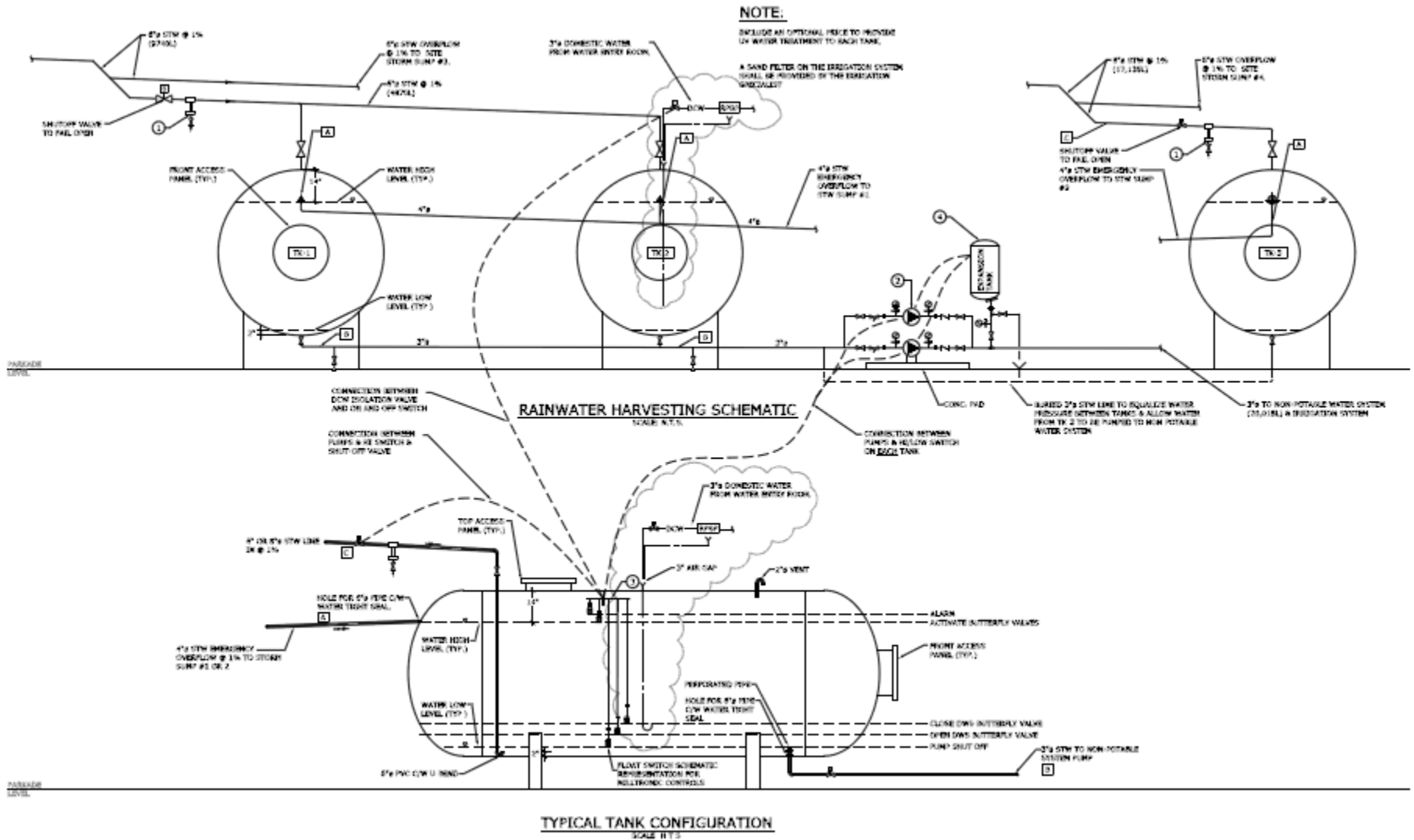


Commercial Example: Olympic Village



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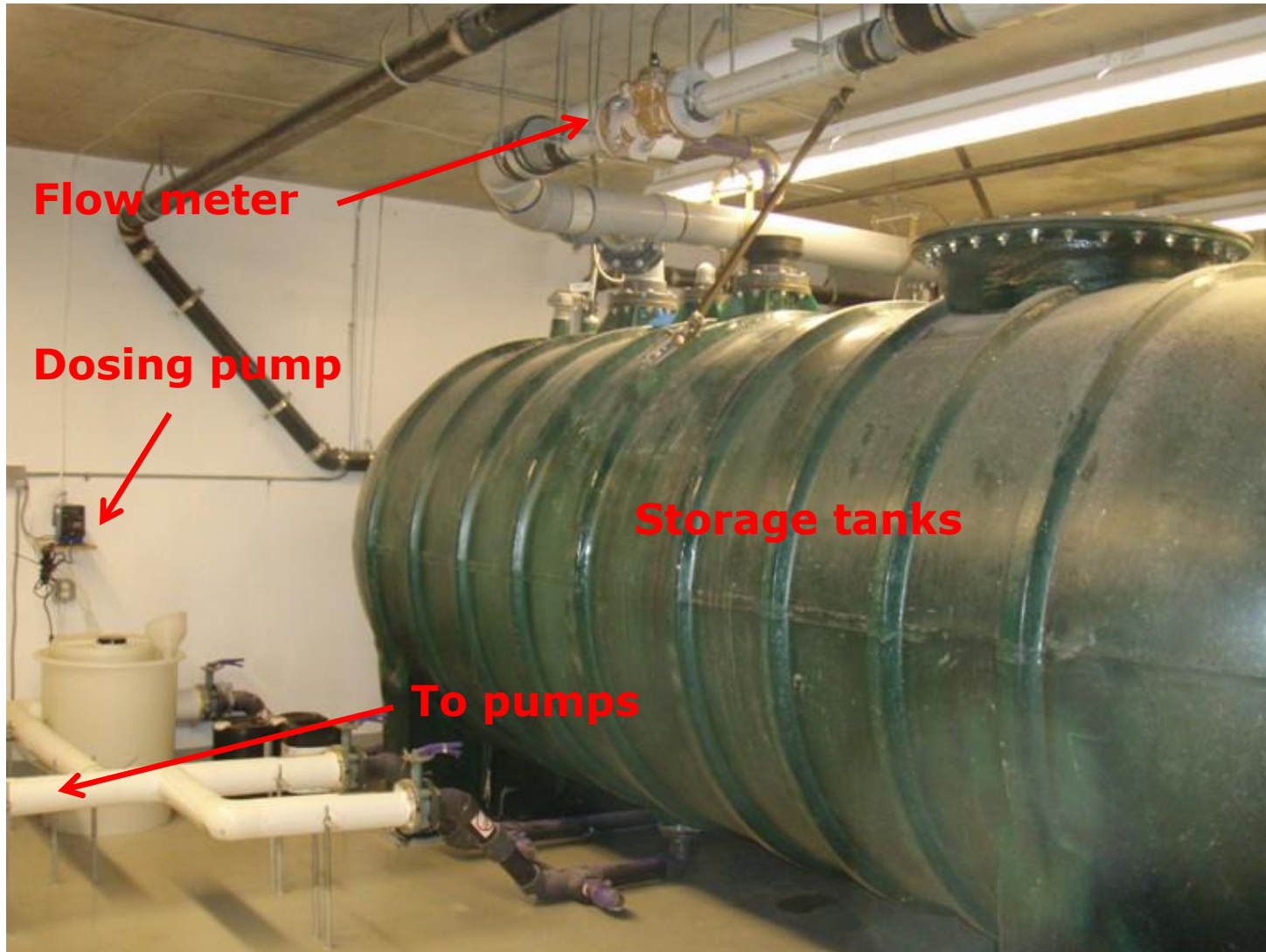


Commercial Example: Olympic Village



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Flow meter

Dosing pump

Storage tanks

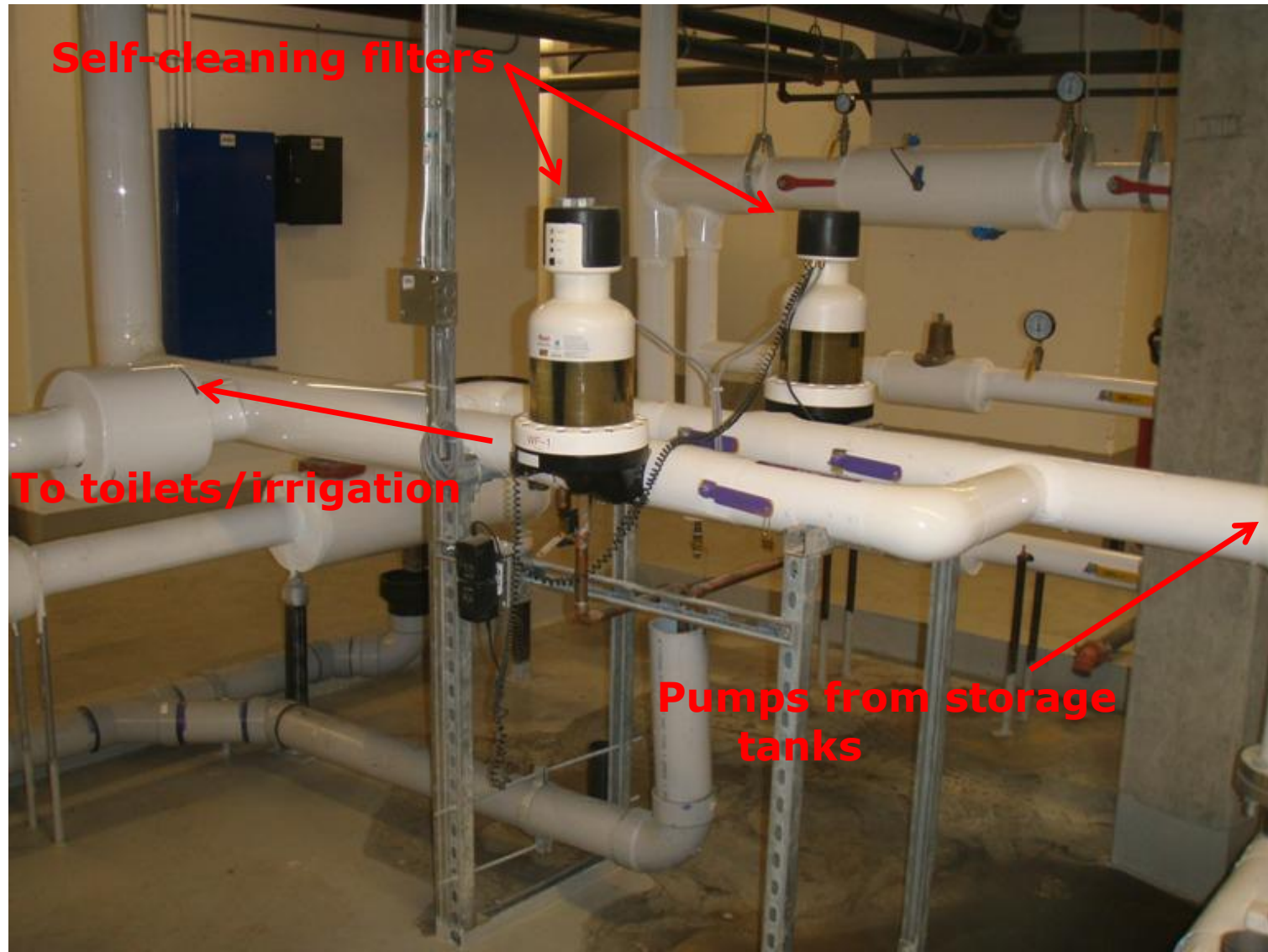
To pumps

Commercial Example: Olympic Village



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Self-cleaning filters

To toilets/irrigation

Pumps from storage tanks

Commercial Example: AESC



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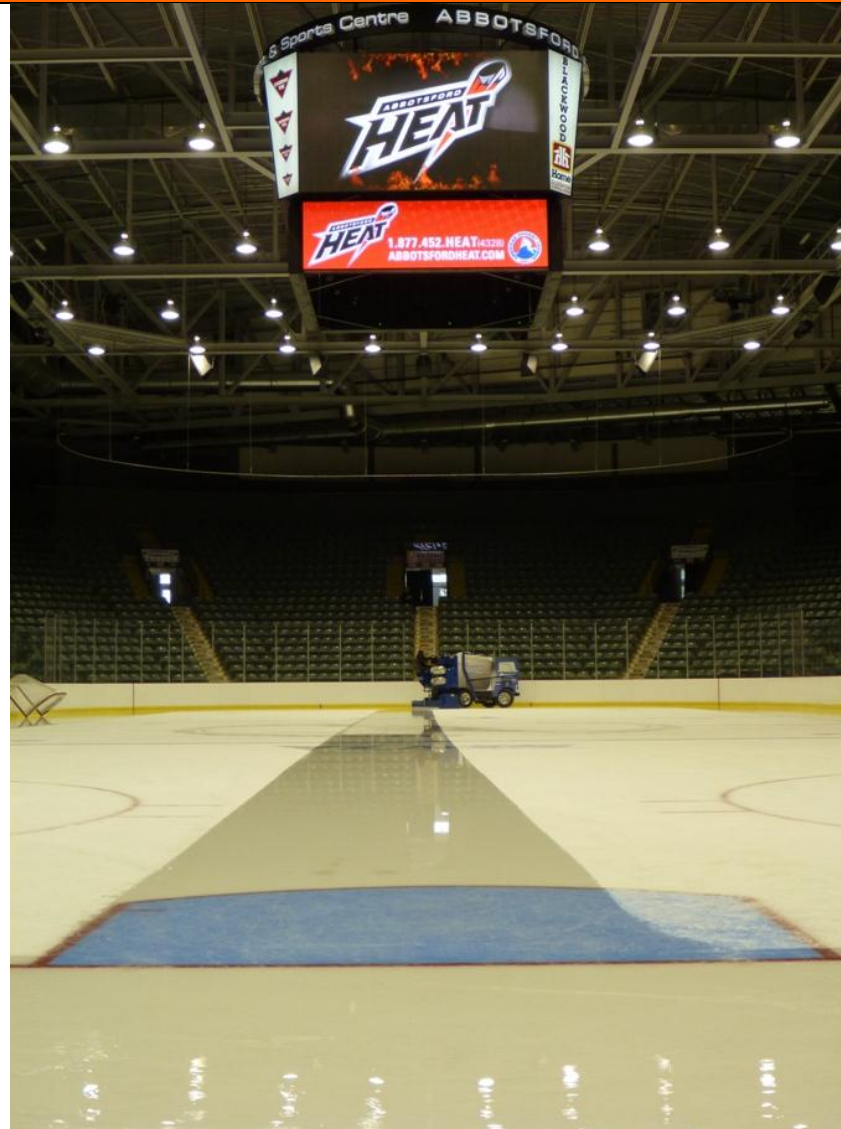


Commercial Example: AESC



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Q & A



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