**GENERAL DESCRIPTION**

Rainwater harvesting is the interception, collection and conveyance of rainwater for future use. The rainwater is usually captured as surface water from roofs and other impervious areas, and conveyed into a storage tank. Storage tanks range in size from rain barrels for residential land uses (typically 750 to 4000 litres in size), to large cisterns for industrial, commercial and institutional land uses. A typical pre-fabricated cistern can range from 750 to 40,000 litres in size.

With minimal pretreatment (e.g., gravity filtration or first-flush diversion), the captured rainwater can be used for outdoor non-potable water uses such as irrigation and toilet flushing due to potential for contamination with toxic compounds.

**CATCHMENT AREA**

The catchment area is the total surface area from which rainfall is collected. Generally, roofs area the catchment area, although rainwater from low traffic parking lots and sidewalks can be suitable for some rainwater harvesting systems (e.g. lawn irrigation). The quality of the harvested water will vary according to the type of catchment area and material from which it is constructed. Water harvested from parking lots, walkways and certain types of roofs, such as asphalt shingles, tar and gravel, and wood shingled roofs, should only be used for irrigation or toilet flushing due to potential for contamination with toxic compounds.

**COLLECTION AND CONVEYANCE SYSTEM**

The collection and conveyance system consists of the eavestroughs, downspouts and pipe that channel rainwater into the storage tank. Eavestroughs and downspouts should be designed with screens to prevent large debris from entering the system. For dual use eavestroughs (used year-round for both outdoor and indoor uses), the conveyance pipe leading to the cistern should be buried at a depth no less than the local maximum frost penetration depth and have a minimum 1% slope. If this is not possible, conveyance pipes should either be located in a heated indoor environment (e.g., garage, basement) or be insulated or equipped with heat tracing to prevent freezing. All connections between downspouts, conveyance pipes and the storage tank must prevent entry of small animals or other debris into the storage tank.

**PRE-TREATMENT**

Pre-treatment is needed to remove debris, dust, leaves, and other debris that accumulates on the roof and in the eavestroughs. For dual use systems, a settling compartment for removal of sediments should be included in the pre-treatment system. Sediments and other debris that settle in this compartment can be removed and disposed of properly.

**STORAGE TANKS**

The storage tank is the most important and typically the most expensive component of a rainwater harvesting system. The required size of storage tank is dictated by several variables: rainfall and snowfall frequencies and totals, the intended use of the harvested water, the catchment size, aesthetics, and budget. In the Greater Toronto Area, an initial target for sizing the storage tank could be predicted rainwater usage over a 10 to 12 day period.

**DISTRIBUTION SYSTEM**

Most distribution systems are gravity fed or operated using pumps to convey harvested rainwater from the storage tank to its final destination. Typical outdoor uses of gravity systems use gravity to feed systems via a tap and spigot. For underground cisterns, a water pump is needed. Underground systems usually require a pump, pressure tank, back-up water supply line and backup preventative. The typical pump system may consist of a conventional pump from the top of the cistern to a pressure area down gradient of the storage tank, where suitable grading exists. The overflow discharge location should be designed to discharge to a pervious area, vegetated filter strip, or grass swales. The overflow conveyance system should be designed to prevent damage to environmentally sensitive areas or downstream areas.

**OVERFLOW SYSTEM**

An overflow system must be included in the design. Overflow pipes should have a capacity equal to or greater than the inlet pipe size. The overflow system may consist of a conventional pump from the top of the cistern to a pressure area down gradient of the storage tank, where suitable grading exists. The overflow discharge location should be designed to discharge to a pervious area, vegetated filter strip, or grass swales. The overflow conveyance system should be designed to prevent damage to environmentally sensitive areas or downstream areas.

**OPERATION AND MAINTENANCE**

Maintenance requirements for rainwater harvesting systems vary according to use. Systems used to provide supplemental irrigation water have relatively low maintenance requirements, while systems designed for indoor uses have much higher maintenance requirements. All rainwater harvesting system components should be regularly inspected every six months during the spring and fall seasons to keep leaf screens, eavestroughs and downspouts free of leaves and other debris; check screens and patch or replace damaged screens; check and clean first-flush diverters and filters, especially those on drip irrigation systems; inspect and clean storage tank lids, paying special attention to vents and screens on inflow and outflow spigots; and replace damaged system components as needed.

**ABILITY TO MEET SWM OBJECTIVES**

- **BMP**
  - **Rainwater Harvesting**
    - magnitude depends on the use of water
    - for outdoor non-potable water uses such as irrigation and toilet flushing due to potential for contamination with toxic compounds.

**GENERAL SPECIFICATIONS**

**Component**

- **Eavestroughs and Downspouts**
  - Length of eavestroughs and downspouts is determined by the size and layout of the catchment area.
  - Length of eavestroughs and downspouts is determined by the size and layout of the catchment area.

**Quantity**

- **Pre-treatment**
  - At least one of the following:
    - leaf and mosquito screens (1 mm mesh size);
    - first-flush diverters;
    - in-ground filter;
    - biofilter.

- **Storage Tanks**
  - Materials used to construct storage tanks should be structurally sound. Tanks should be installed in locations where native soils or building structures can support the load associated with the volume of water it will hold.
  - Storage tanks should be water tight and have an adequate minimum 1% slope. If this is not possible, storage tanks should be insulated or equipped with heat tracing to prevent freezing.
  - All connections between downspouts, conveyance pipes and the storage tank must prevent entry of small animals or other debris into the storage tank.

**SITE CONSIDERATIONS**

- **Available Space**
  - Storage tanks can be placed underground, on grade, or above ground adjacent to buildings depending on intended uses of the rainwater.

- **Siting**
  - Influences the placement of the storage tank and the type of distribution and overflow systems.

**PLANNING AND DESIGN GUIDE - FACT SHEET**

**RAINWATER HARVESTING**