



Introductory Guide to Rainwater Harvesting Systems & Their Installation

Commercial, Domestic & Garden Rainwater Harvesting Systems

Established 1999 – UK Rainwater Harvesting Association Accredited



Basic Principles

Water is an increasingly scarce resource which although falling in abundance in the UK, but is then largely lost to atmosphere and through natural water-courses into the sea.



Water extracted and processed by the utility companies is supplied through the mains at some cost and complexity, and to “potable” (ie drinking water) standard; around 50% of this water in households – rising to around 80% in non-domestic premises – is then used for “non-potable” purposes such as toilet-flushing, clothes-washing, car/fleet washing, garden/grounds irrigation and garden ponds etc.



The basic principle of rainwater harvesting is simply to capture non-potable water at the point it falls, then substitute it for mains water in non-potable applications; in the process, the effect of heavy rainfall on flood-risks can be alleviated and energy is saved by not using highly processed tap-water to flush toilets.



The Harvesting Process

The harvesting process is very straightforward, involving no more than channelling the water from the drain-pipes to a storage tank, filtering it en-route.



The storage tanks can be above ground, but for best water-quality under-ground storage is recommended. Once stored, a suitable control system is then used supply the water to the desired service using a durable electric pump.



Rainwater Calculations

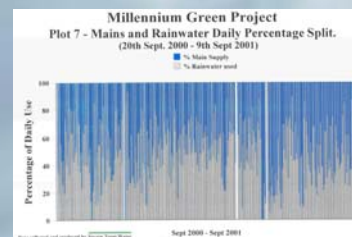
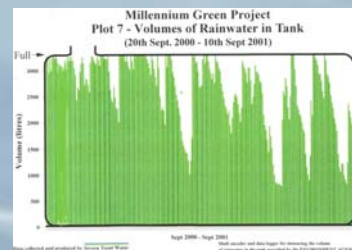
The amount of water available for collection depends upon local average rainfall, roof size and drainage efficiency, and the efficiency of the filter being used. Multiplying the roof area in metres², by the average rainfall in millimetres, and by the drainage factor and filter efficiency gives the total annual rainwater yield in litres.

The potential usage of this water depends upon factors such as the number of days per year the building is occupied, the purposes for which the water will be used, and the water efficiency of the appliances (ie toilet cisterns and clothes washing machines) being used.

Because rainfall does not fall every day, the storage tank must be correctly sized to reflect two competing factors – namely the quality of the water and continuity of supply. The tank also needs to be sized to ensure that it does overflow occasionally to skim-off any floating matter that may have penetrated the filter.

Sparkling clear water is achieved by a compromise between these various competing factors which results in a tank that provides around 18 to 21 days of supply which meets the demand rate without any rain.

The operational performance of such a tank is such that it provide nearly all of a households non-potable water requirements, reduce mains-water consumption by about 50%, on average be around half-full, overflow on a limited number of occasions through the year, and need occasional automatic mains-water back-up.



Water Quality

The quality of harvested rainwater depends on good design, high-quality components and good installation. If any one of these is absent, the quality of the water collected may be compromised.

Water falling from the sky is usually clean; only when it hits a surface does its microbiological, chemical and aesthetic qualities become compromised.

Even so, recent studies have shown that properly installed and used rainwater harvesting systems pose no significant health risk. These studies assumed that the harvested rainwater is used in accordance with the industry recommendation that it be used only for non-potable and non-bathing purposes.

The recommended usage of harvested rainwater in the UK is therefore restricted to toilet-flushing, clothes-washing machines, garden-irrigation, car and fleet washing, and industrial processes. On this basis, typical domestic installations will reduce mains-water consumption by around 50%, rising to 80% or so in some commercial/industrial installations.

Where a specific requirement exists, for example where a structure is being built that cannot access the national water grid, harvested rainwater can be brought up to potable (drinking) water standard by inclusion in the system of additional purification devices. Generally, however, this is neither a necessary nor recommended practice due to the added costs incurred.



Choice of System

Rainwater harvesting systems come in many guises, the most basic being a simple water butt which offers a limited supply of water of, potentially, indifferent quality.

A significant improvement in water supply and quality can be achieved by using one or more above-ground sealed tanks (*pictured opposite*) which are very simple to install.



For serious gardeners, underground systems offer the twin advantages of providing a water supply capable of lasting through a long summer, whilst minimising aesthetic impact of the tank. They are still relatively easy to retrofit to existing buildings and, if not topped-up with mains-water, are not subject to hosepipe bans or water restrictions.



Full domestic systems are best installed whilst a property is being built or refurbished as separate pipework is required to feed the non-potable services to be supplied. They need a mains-water top-up facility to ensure continuity of supply during dry weather and the tank size – which takes into account roof area, likely usage and water-quality – may make a garden-irrigation only system preferable for keen gardeners in potential hose-pipe ban areas.



Finally, commercial systems can usually be installed in either new-build or existing structures, with a wide range of tank sizes available to match the high harvesting potential of many commercial roofs, and associated high-demand for non-potable water.



Technical Introduction

Always read the manufacturers instructions completely before commencing installation of a rainwater harvesting system

Preliminaries

Installing a rainwater harvesting system is straightforward when undertaken by professional site workers. The main trades involved in an installation are ground-workers and plumbers.

It is the installers' responsibility to ensure good quality work and to comply with all relevant legislation.

A most important consideration is to keep the tank and all pipework clear of debris/stones throughout the installation process.

Design Considerations

Full domestic installations are best undertaken at the new-build stage, allowing separate potable and non-potable pipework to be installed easily. It is also easiest at the new-build stage to design the underground works to bring together all the roof water into the single entry-point of the storage-tank.

Arrangements also need to be made for the storage tank to be able to overflow to a soak-away or storm-drain when necessary, maintaining Building Regulation invert levels throughout. Similar falls are required on the service duct between the tank and controls.



System Characteristics

Best practice is to collect rainwater from hard roof areas only, and filter before storing underground. As the water enters the tank it needs to be calmed so not to disturb sediment.

The rainwater is then pumped direct to the point of use with continuity of supply ensured by automatic mains-water backup to the storage tank when needed.

At extra cost, a header-tank can be used, rather than direct supply, when desired and space permits inclusion of the tank. Under these arrangements, the mains-water backup is direct to the header-tank.

An advantage of this approach is that water-supply is not dependent on the electrical supply to the pump.

Statutory Requirements

In addition to meeting national Building and Water Regulations, there are four main statutory requirements that an installation must meet:

- The mains supply must be protected from possible back-siphoning from the rainwater by a type-AA or type-AB air gap
- All non-potable pipework must be clearly marked
- All tap outlets must be marked clearly as "Not Drinking Water"
- Underground tanks must have a lockable lid





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Intelligent rainwater harvesting systems

Helping to meet the Code for Sustainable Homes, BREEAM Assessments and site water-supply and storm-water management issues by providing up to 50% of household water requirements, increasing to around 80% in commercial/industrial/office premises which combine a large roof area with high non-potable water usage

We are a UK Rainwater Harvesting Association Accredited company that has been designing and supplying commercial and domestic rainwater harvesting systems since 1999. Our systems are easy to install, reliable in service and require minimum maintenance. All system components are covered by a 2-year warranty.

Contact us today for a free appraisal of your project

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