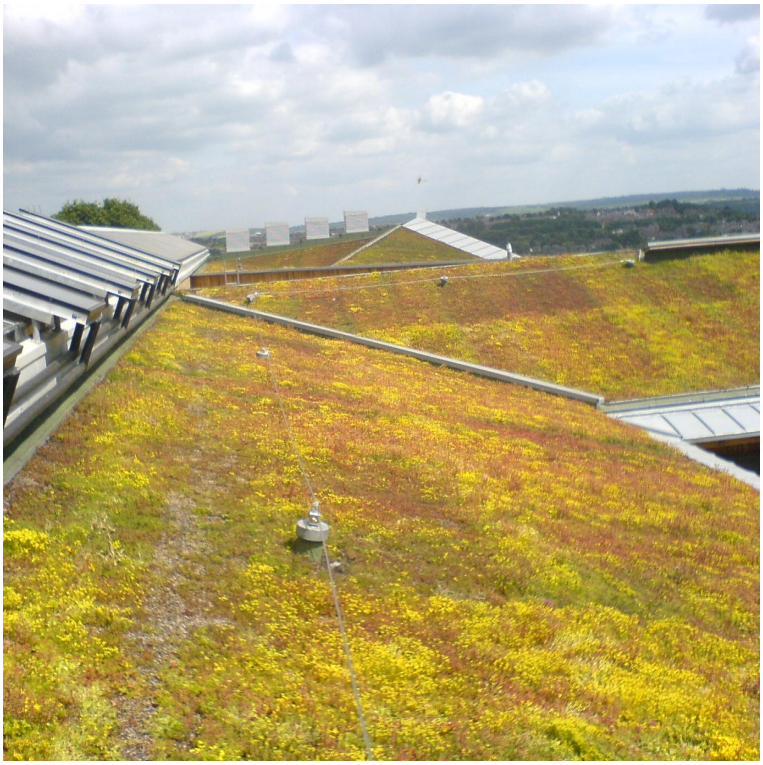
Rainwater Harvesting



Access Irrigation Guide to Rainwater Harvesting

Guide to Rainwater Harvesting

A guide for architects and landscape designers

Introduction

Access Irrigation has been involved with designing and installing irrigation systems for over 40 years. Many projects involve irrigation systems for new buildings, houses, car parks and town centres. In this time we have worked with many architects, landscape architects and landscapers.

As irrigation is a specialist field many architects do not have time to obtain a vast knowledge of the subject. With this in mind we felt that it would be helpful to produce a booklet aimed specifically at the needs of architects and landscape architects.

This booklet covers the general concepts of rainwater harvesting along with some technical information on individual components.

As a company Access Irrigation can provide specialist advice and detailed costs for each project along with full specifications for the client. For more complex projects, Access can work as consultants to the architect, producing an overall irrigation scheme, along with tender specifications.

Once a project has been approved, Access would normally work with the main contractor to install the system. On larger projects we can provide project management services to the main contractor. On completion the system would then be demonstrated and handed over to the client.

We do hope that you will find this guide helpful. We do two further guides in this series the *'Access Irrigation Guide to Landscape Irrigation'* and the *'Access Irrigation guide to Green Roof Irrigation'*. Either of these can be posted to you or downloaded as a PDF from our website.

If you have any comments on the guide or would like any advice on any proposed irrigation projects, please give me or any of our sales team a call.

Regards

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Benefits of rainwater harvesting

Changing climate conditions are making water saving a big issue. Not only do parts of the UK have relatively little water per capita, but as population pressures increase government and water companies are looking hard at existing users of water, and trying to prioritise usage.

As water has become a precious resource, gone are the days when mains water could be wasted.

Projected water price rises make the use of rainwater even more attractive, as the price of water continues to rise, payback periods will become shorter.

Even during times of water shortage, such as hosepipe bans and drought orders, there are no restrictions on the use of rainwater for irrigation. As an additional bonus, rainwater is far better than tap water for growing healthy plants - after all that is what nature intended.

Cost Savings

As well as being green, big cost savings can be made by using rainwater, but the potential benefits of effectively free water need to be weighed against the capital costs of installing capture and storage systems.

Typically the greatest savings will be made when a harvesting scheme can be built-in to a construction project from the outset. If this is the case, then even suburban homes with relatively modest water requirements can make savings.

For retro-fit schemes, those likely to see the biggest gains will be heavier users of water with relatively large available catchment and storage areas. These will include commercial buildings, garden centres, nurseries using the water for irrigation, along with farms seeking to provide winter drinking water for cattle. For these users, payback periods of 2-3 years is quite achievable. Domestic householders are unlikely to achieve short term paybacks for domestic scale irrigation schemes.

Catchment areas

Large surfaces such as roofs or driveways are ideal for rainwater harvesting and can yield hundreds of cubic meters of useable rainwater per annum.

Large pitched roof areas with relatively few down-pipes will make the most economical catchment areas. Examples include office roofs, glasshouse or tunnel roofs and metal 'shed' type buildings. If necessary other catchment areas such as hard standings can be used, although areas such as car parks will need oil interceptors fitting.

The run off from the catchment areas is simply piped to the storage tank using traditional rainwater drainage pipes and fittings.

Calculating tank sizes

Most formulas for calculating tank size are aimed at year-round use of the water storage, such as toilet flushing or vegetable washing. Sizing tanks for irrigation needs to be done slightly differently as water consumption peaks in the Summer months when rainfall itself is less plentiful - although it is surprising how much rain we get during the Summer.

Access Irrigation have developed a sophisticated computer programme to forecast tank size. The programme looks at month by month rainfall for the area, along with evapo-transpiration data. Evapo-transpiration is a calculation of the likely watering requirements of plants on a month by month basis. Data is adjusted for planting type and planting area. The larger the area the more water is required, but also the type of planting has an effect – shrubs require more water per day than grass areas.

The programme also looks at the available catchment areas and their type. A large catchment area with a small area to be watered will result in a smaller tank size. A smaller catchment area with a larger watering area will conversely need a much larger storage tank.

The type of catchment area also has an effect on how much water can be caught. A glasshouse roof will catch water more effectively than a clay tiled roof or a flat roof.

Storage Tanks

The key to the system is the rainwater storage tank. This can either be above or below ground depending upon application. Below ground tanks have the advantages of cooler holding temperatures and reduced visual impact, but are more expensive to purchase and install.

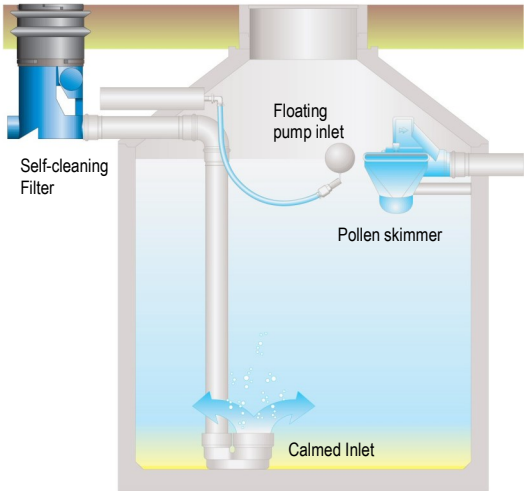
The underground tanks are purpose built and have pipe inlets, pump platforms and overflow traps pre-fitted, making installation straightforward. Most underground storage tanks are made from MDPE materials which have more flexibility that traditional GRP type tanks. Underground tanks have the advantage that they are completely lightfast and keep the water at a stable temperature, prolonging storage times. As cleaning is difficult with underground tanks, it is especially important to ensure that the water is filtered before it enters.

Above ground tanks are often used in horticulture and agriculture, where costs are being minimised and storage space is plentiful. As the tanks do not need to withstand the pressures and movements of the ground around them, they can be manufactured either from thinner MDPE mouldings or from sectional galvanised steel with an inner waterproof liner.

Although above ground tanks are cheaper to install, small storage tanks may allow the water temperature to build up to unacceptable levels, so screening may need to be considered.

Filtration

It is essential that any rainwater collected is filtered to remove leaves and debris which will inevitably be washed down from the roof before it enters the tank and potentially clogs the system.



Filtration is usually achieved in 4 stages. As the water comes off the roof it is filtered with a course filter to remove leaves and debris.

For lighter, finer material such as pollen, which will float to the surface of the tank a skimmer is fitted to the overflow, clearing the top layer

of water in overflow conditions.

When the water is drawn from the tank, the pump suction inlet will have a filter attached. In addition the inlet will normally draw from just below the surface, where the water is the cleanest.

Finally, as the water exits the pump it will pass through a fine particle filter of around a 100 microns.

All filters irrespective of there sophistication will have a detrimental effect on the amount of water collected. A filter will only allow 90% of the water to flow to the tank.

For catchment areas less than 150m^2 a simple downpipe filter should be sufficient. In this unit a fine filter is fitted in line which traps leaves and other debris. This filter is removable for cleaning.

For larger catchment areas up to 700m^2 a more advanced filter system is recommended. These usually work on a vortex principle, rainwater enters the unit in a swirling action, water passes through the filter mesh and debris is collected and diverted to the normal drains. These units are usually fitted underground.

It is inevitable on rainwater systems that sediment will collect in the tank. To ensure that this does not present a problem underground storage tanks have a smooth flow inlet fitted. This simple device ensures that any incoming rainwater does not disturb the sediment at the base of the tank causing potential clogging. Any system design should also ensure that the pump suction inlet is prevented from picking up this sediment. This can be done using floating suction filters which ensures that the inlet automatically adjusts to the water level.

To ensure that a constant supply of water is available even in periods of low or no rainfall, the storage tank can be fitted with a mains water top up system. This will fill the tank with sufficient mains water to run the system but will leave plenty of room for any rainwater when available. If the mains water is being added to an underground tank, an alarm system must also be fitted to comply with the Water Regulations.

Pumps

To take the rainwater from the storage tank a pump is required. The pump has the potential to stir up the sediment, so it is usual to fit the suction port to

the pump onto a floating inlet. The inlet floats up and down with the water level, always drawing water from the top 200mm of water (above the sediment but below pollen and floating debris).

Surface mounted pumps are used for smaller systems, connected to a floating inlet. Surface pumps make maintenance easier and can be located some way from the tank itself.

If a simple standpipe system is required, the surface mounted pump is fitted with a pressure sensing device which will automatically operate the pump when the demand for water is required.

For larger schemes a submersible pump is located inside the tank itself. This can either be connected to a floating inlet, or for tanks with the possibility of large amounts of sediment - such as a green roof catchment area, a self cleaning filter pump can be used.

Control systems

To control the irrigation system a mains powered multi-zone controller will be fitted. The controller will schedule the irrigation to ensure each zone receives the correct amount of irrigation. Zones with shrubs can be watered every few days, zones with small planters can be watered several times a day.

The controller also operates the pumping system and monitors the water levels in the tank, suspending irrigation if there is insufficient water available.

To make the most effective use of the water available, a controller with a weather station is normally used on harvesting systems. The weather station calculates the evapo-transpiration of the site on a daily basis, and then uses these figures as a basis for calculating the irrigation running times. Such systems reduce water consumption by up to 30%.

For harvesting systems where it is not possible to store enough rainwater for the entire season, or for schemes where mains water is provided as a backup for the rainwater, a separate mains fill controller will also be fitted to the system. This will add water to the tank when it becomes low. The unit is pre-set to only add the minimum water necessary to ensure the irrigation

cycle can operate, leaving the storage tank with plenty of room in case it rains.

Risk Assessments

When using recycled water, care needs to be taken to ensure any risks are minimized through comprehensive risk assessments.

Where water quality needs to be of the highest standards, UV disinfection systems can be used to kill any bacteria present.

Rainwater Harvesting

Drawing Ref:	Description:	Guide Price
3301	Typical rainwater harvesting system with underground storage tank. System includes rainwater filter, calmed rainwater inlet, siphon overflow, floating pump inlet and back-up mains water supply with level switch control, Automatic submersible pump provides pressurised water supply to the irrigation system. Guide price includes 4400 litre tank with filter for up to 200m^2 roof area and pump delivering 1.4m^3/h at 4 bar.	**£5750**

Drawing Ref:	Description:	Guide Price
3302	Typical rainwater harvesting system with above ground polythene storage tank. System includes rainwater filter, calmed rainwater inlet, siphon overflow, floating pump inlet and back-up mains water supply with level switch control. Automatic submersible pump provides pressurised water supply to the irrigation system. Guide price includes 5500 litre tank with filter for up to 200m^2 roof area and pump delivering 1.4m^3/h at 4 bar.	**£4000**

Drawing Ref:	Description:	Guide Price
4401	Typical rainwater storage from a shed or glass roof. Rainwater ducted into a galvanised storage tank from downpipe, via rainwater filter and calmed inlet. System includes back-up mains water supply to tank, with level switch control. Guide price includes filter for up to 400m² roof area and 96m³ tank with EPDM liner and steel cover.	**£10,250**

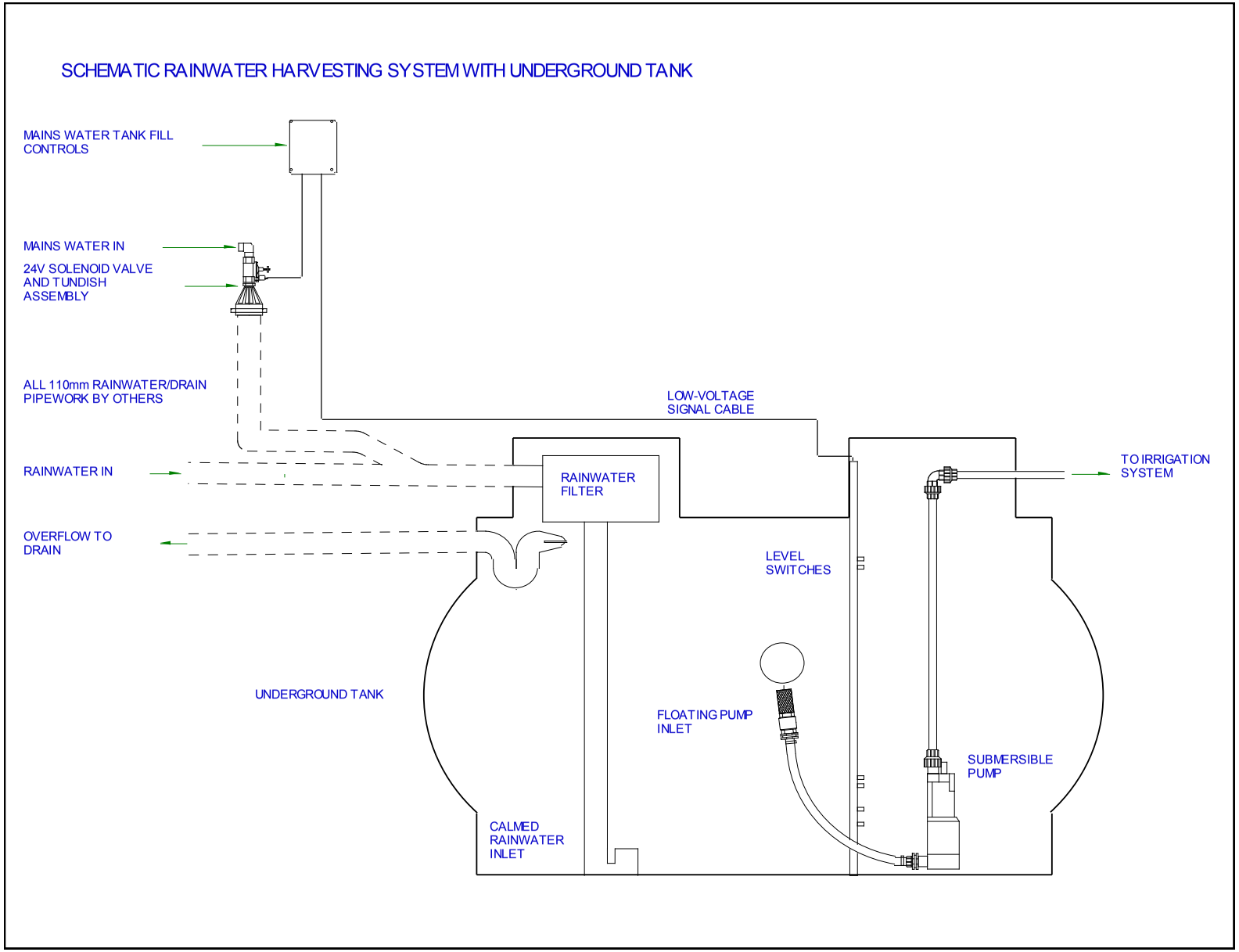
Drawing Ref:	Description:	Guide Price
		£

Rainwater Harvesting

Drawing Ref:

3301

Notes:



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Rainwater Harvesting

Drawing Ref:

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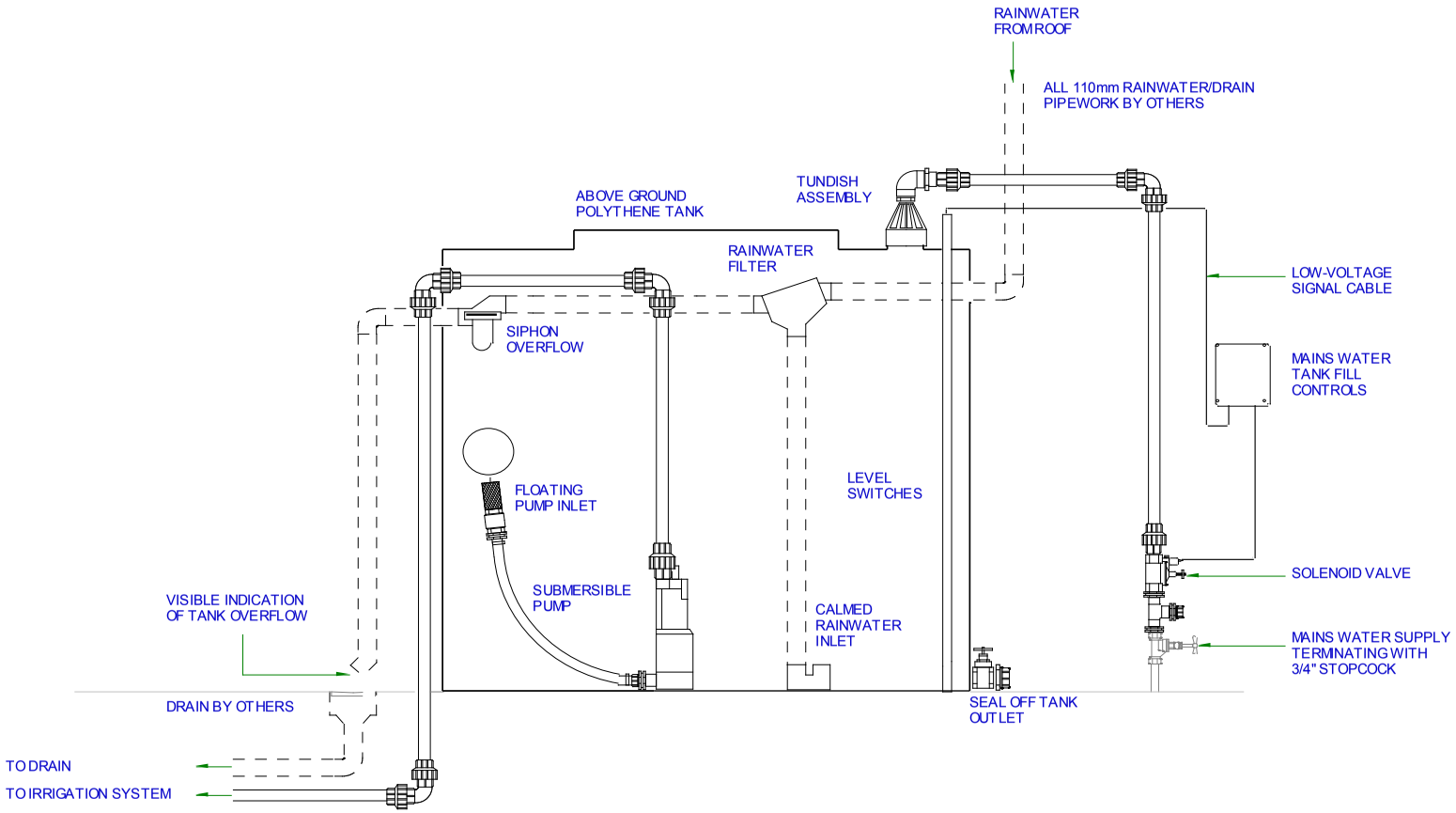
Notes:

SCHEMATIC RAINWATER HARVESTING SYSTEM WITH ABOVE GROUND TANK



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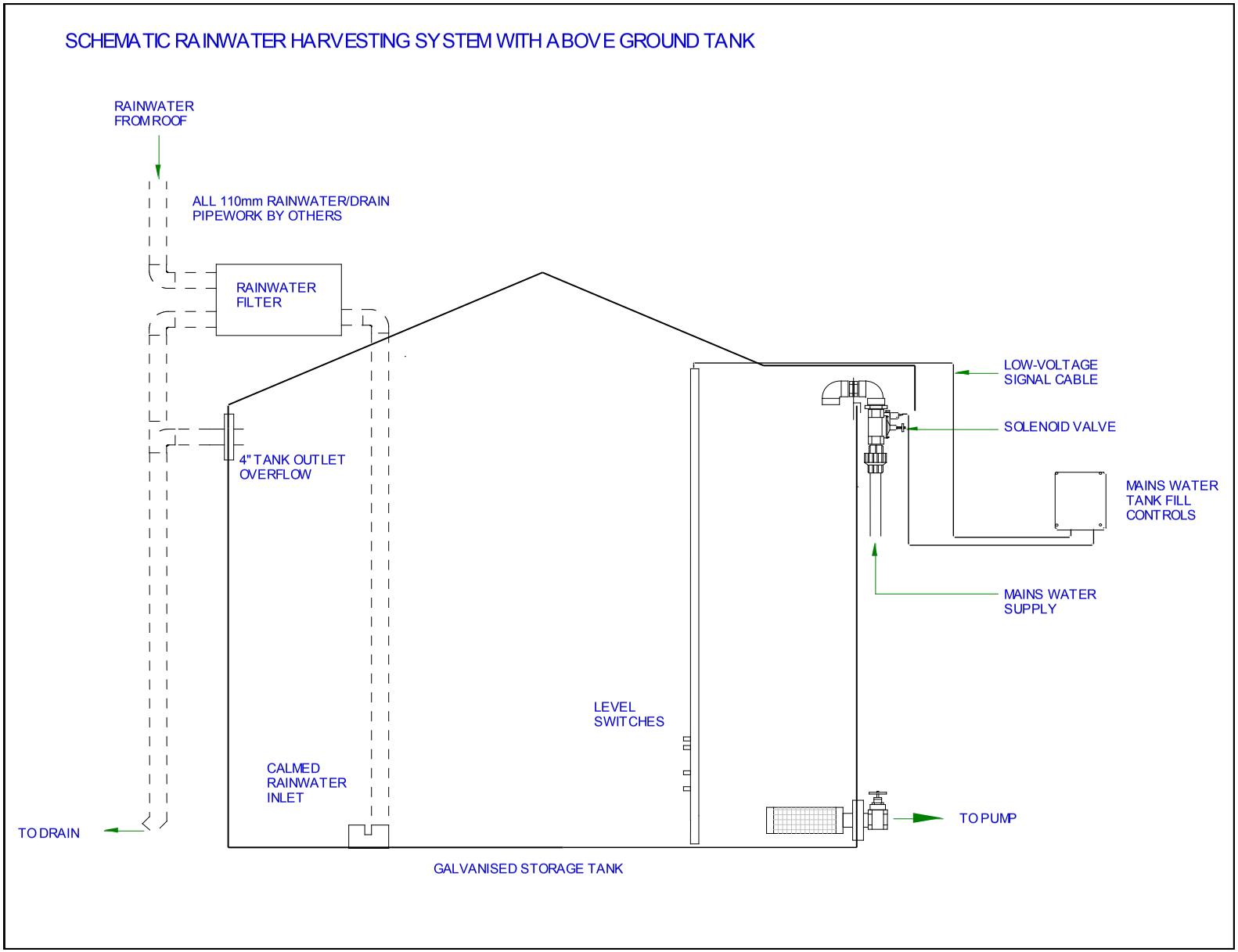
Notes:

Typical rainwater Storage systems:

- **Farms-shed roofs**
- **Nurseries-glass roofs**



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