A how-to-guide for Rainwater Planters

Design and build your very own rainwater planter

Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council

Foreword

We are engineers and scientists who are very passionate about green infrastructure and nature-based solutions. Through our public engagement work, we have been promoting these methods in the community. We learned that there is a need for guidance and information on smaller, localised nature-based solutions for homeowners, schools and community groups.

Rainwater planters are low-cost, versatile, easy to make and come with lots of benefits for your local environment. These include adding vegetation and colour to yards and gardens, using rainwater effectively, providing space for pollinators and contributing to the greater climate adaptation strategy. That's why we produced this booklet for you. This guidance is based on personal experience, years of research and trial and error, that allowed us to perfect our design.

We really hope you enjoy your rainwater planter as much as we do ours.

John, Averil and Sinéad

John Stack

Averil Gannon

Sinéad Hurson

Help Your Local Environment

We produced this publication to help you to get involved in improving the environment particularly on:

Water **Biodiversity** **Climate**

The project we chose was rainwater planters. We are encouraging people to put planter boxes, like the one on the cover of this publication, in their gardens or their local areas.

They will look attractive beside your:

Home | School | Place of Work | Community Space

These planters divert rain from the roof that would normally flow into your drains, and instead it flows into the ‘rainwater planter’. This helps your environment.

A rainwater planter can:

- help reuse water
- add an attractive colourful feature to your garden or space
- help keep your local river clean
- improve local biodiversity
- help pollination of plants
- help local wildlife flourish
- be part of the climate change solution.

Clean rainwater can be wasted in the sewer system

Normally, when it rains, clean rainwater flows directly into the sewer network to get treated at the nearest waste water treatment plant. However, if the pipe is full of waste and rain, the sewer network is designed to overflow into the local river. This means that clean rainwater and dirty foul material can end up untreated in your local river. This pollutes your local river.

Planter will make good use of clean rainwater

If you build a rainwater planter, you are making sure that your rainwater is not going directly into the sewer network. Instead, your clean rainwater is being used by plants in a new planter in your garden or space. This increases the biodiversity (vegetation) and amenity value in your space.

There is no need to empty your planter, like a conventional water butt (container). A planter will always accept rain, unlike a full water butt. In addition to helping to manage rainwater, a rainwater planter:

- looks attractive
- can help with pollinators such as bees
- increases vegetation in your garden or space.

This idea has been developed through our Water Framework Directive Schools Programme which has helped a number of schools to install rainwater planters on their grounds. So far, we have helped schools in Sandymount, Coolock, Ranelagh, and Ringsend.

We have also helped private householders to build their own rainwater planters or rain gardens.

Local Men's Sheds groups have helped communities, residents' associations, householders and schools in the building of these simple structures.

You can use this guide to create your own rainwater planter or rain garden at home, work or school! It provides a step-by-step approach to designing and building your very own rainwater planter. The more planters there are, the greater the benefits to the environment will be.

Why get involved?

Ireland faces many environmental challenges, including:

- poor water quality in our rivers, streams, lakes and beaches
- loss of biodiversity, habitat and ecology as a result of urban development
- climate change.

We all need to take steps to help improve our environment so that we and our children can support and enhance nature and live healthier lives.

We need good water quality for diverse and rich water habitats. Good water quality is also essential for:

- enriched biodiversity
- increased climate and flood resilience
- improved public amenity features such as park lakes.

We in Dublin City Council's WFD Office are involved in numerous projects to achieve our aims and the objectives of the Water Framework Directive. We are here to collaborate with and help you get involved. There are funding streams for groups or individuals who want to get involved and we can provide assistance with this.

Have your say and contact the DCC WFD Office at wfd@dublincity.ie

We can only achieve this by working together.

1 Rainwater Planters

What are they?

They are boxes with plants that use rainwater from your roof. They come in all shapes and sizes and can be located in both small and large spaces. This guide will show you how to design and size a rainwater planter especially for your area.

Planters are connected to a rainwater downpipe and are usually sited directly beside the building. They can:

- add colourful vegetation
- increase biodiversity
- allow you to use rainwater on your property

Depending on their size, rainwater planters can accommodate:

- small trees
- shrubs
- herbs
- flowering plants
- flowers

Rainwater planters can be made from a range of materials, including:

- concrete
- stone
- brick
- timber

What do they do?

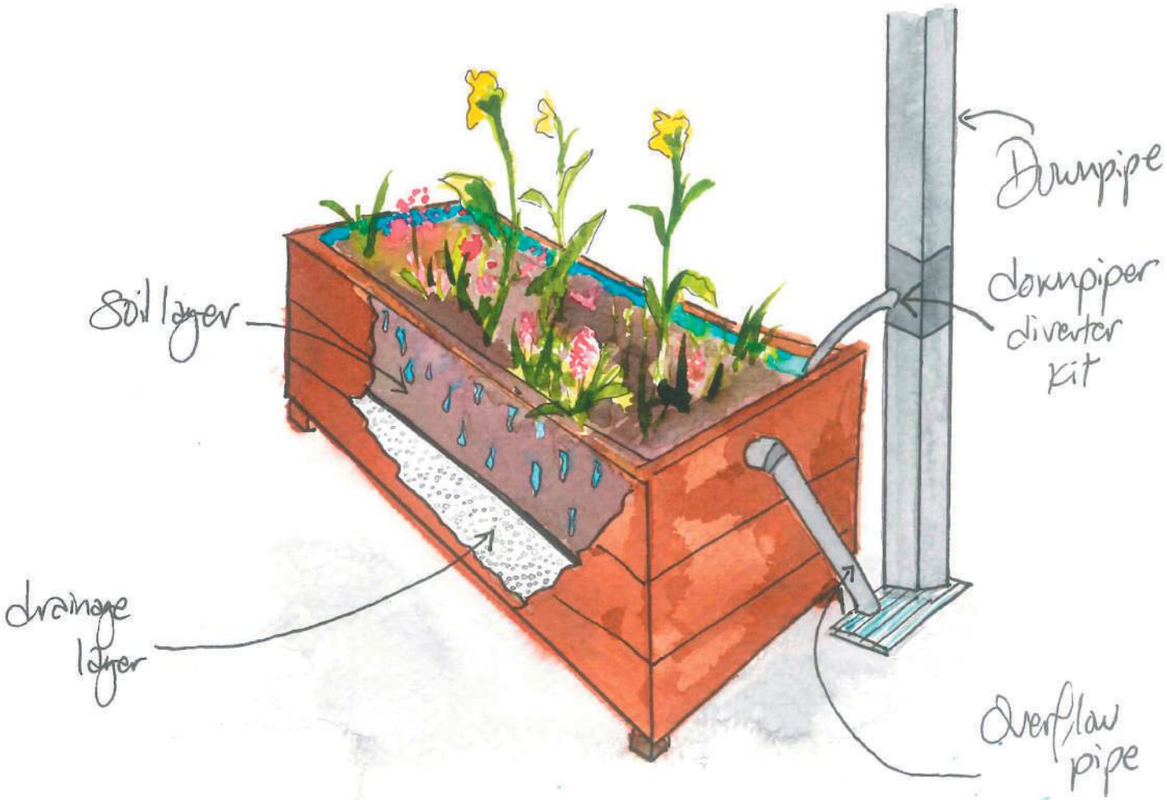
Rainwater planters slow the flow of rainfall from the roof to the drainage system. The soils and vegetation in the planter can remove pollutants by filtering the water. Otherwise, these pollutants might end up in your local river, stream, lake or beach.

Rainwater planters take rainwater from the roof because the downpipe discharges directly into the planter. Typically, water soaks into the soil in the planter. During heavy rainfall, excess water will pond in the planter, which can overflow to one of three locations:

- an existing gully
- onwards to another rainwater structure, like a garden pond.

Flow through Planters

This booklet shows you how to design a flow-through rainwater planter. Flow-through planters have sealed bases and do **not** allow water to infiltrate into the ground underneath. They are suitable for use in poorly drained soils or areas with steep slopes. This picture below shows a typical flow-through planter.



You can put flow-through planters on the ground and fill them with:

- gravel
- a soil and sand mix
- vegetation

Flow-through planters temporarily store rainwater on top of the soil. Excess water overflows from the planter to either a gulley or onwards to another rainwater structure, like a rain garden. They are typically waterproofed. This means you can put them next to buildings and boundary walls. They can also be free-standing structures.

2 Design a flow-through planter

This section discusses the design of a simple flow-through planter made from wood. The rainwater planter is designed to drain excess water within 12 hours. During this time, the water will soak through the soil and drainage layer.

- Smaller planters should be at least 30 cm (1 foot) deep to make sure they are stable on the ground. They may be up to 45 cm (1 foot 6 inches deep).
- Larger planters should be at least 45 cm (1 foot 6 inches) deep.

The following table is a summary of how to design and assemble the materials for your flow-through planter. We go into more detail about each step after the table.

Table 1: Summary of design and supplies for your flow-through planter

Step 1:	**Where is your downpipe?**
	Identify the location of your downpipe and possible planter locations (flow-through planters must be located close to the downpipe). If your roof is a standard pitched roof, you will have two downpipes at least. Identify the section of roof that drains to the downpipe which is being diverted to the rainwater planter.
Step 2:	**How much of the roof gutter will drain into your planter?**
	Find out the size of the roof area that will drain into the planter. The illustration following this table shows how to do this.
Step 3:	**How much rain will you expect?**
	What intensity rainfall event are you designing for? In Dublin, a heavy rainfall event would produce up to 25.4 mm (1 inch) of rainfall.
Step 4:	**How much space do you have for a planter?**
	Check available space beside your downpipe for the rainwater planter.

Step 5: What shape will the planter be?

Square and rectangular shaped planters are the simplest, but it depends on the size of space available. Looking at your space, decide on a possible length and width for your planter.

Step 6: What size will your planter be?

Based on the size of the roof and the rainfall, you will need to decide what size to make the planter. See example after this table.

Step 7: What materials will you use?

If made from wood, you will need:

- Planks of treated timber
- Timber battens
- Stainless steel wood screws
- Weatherproof stain
- Waterproof liner
- Gravel, topsoil and sand
- Downpipe rainwater diverter kit
- Garden hose
- Hose-to-hose connector
- 50 mm diameter Wavin pipe
- 90-degree bend compatible with Wavin pipe
- Suitable plants (see Table 2)

Step 8: What tools will you need?

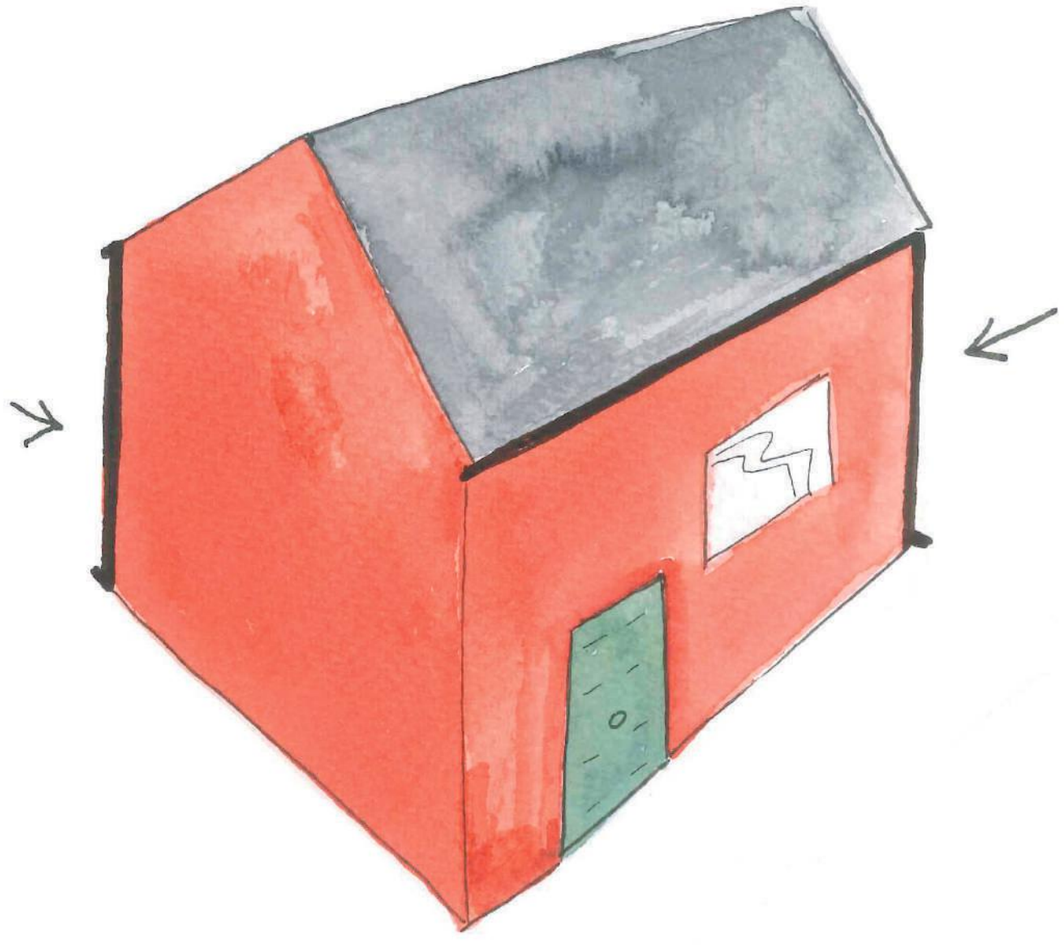
- Drill and drill bits
- Coring bit
- Circular saw or hand saw
- Staple gun
- Pencil
- Measuring tape
- Safety glasses
- Small calculator

Step 9: Build your planter

See example after this table.

Step 1: Find your downpipe

Walk around your property and locate the downpipes and the gully they drain into. You may have downpipes at the front and rear of your property. The planter must be placed on the ground, beside a gully and the downpipe draining into it. If your roof is a standard pitched (sloping) roof, you will have two downpipes at least. For a flat roof, you may have one or more downpipes.



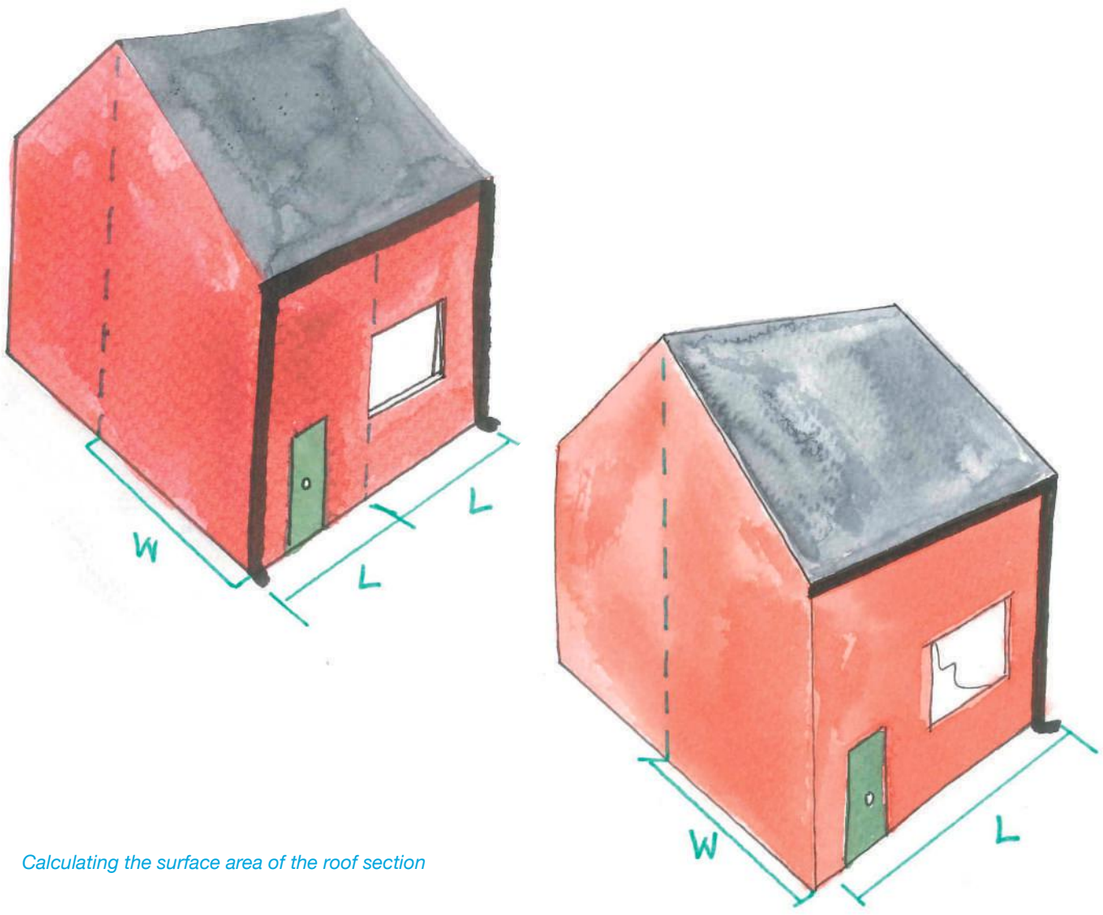
Finding the location of the downpipe

Step 2: How much of the roof will drain into your planter?

With a pitched roof, usually only one section of the roof will drain to a downpipe. Measure, at ground level, the length and width of the section of roof that will drain to the downpipe that will connect to the planter. If you have more than one downpipe draining to gullies, then you will have to allocate some of the roof to each gulley.

Important note: If you live in a terraced, apartment block or semi-detached house, check that your neighbours have their own downpipes. If they do not, then the roof area draining to your downpipe may be significantly bigger than you think, and your planter project may not be feasible.

The following illustrations show how to measure your roof section if you have 1 or 2 downpipes at the same side of your house. The downpipes considered here are those that drain into the gulley or gullies.



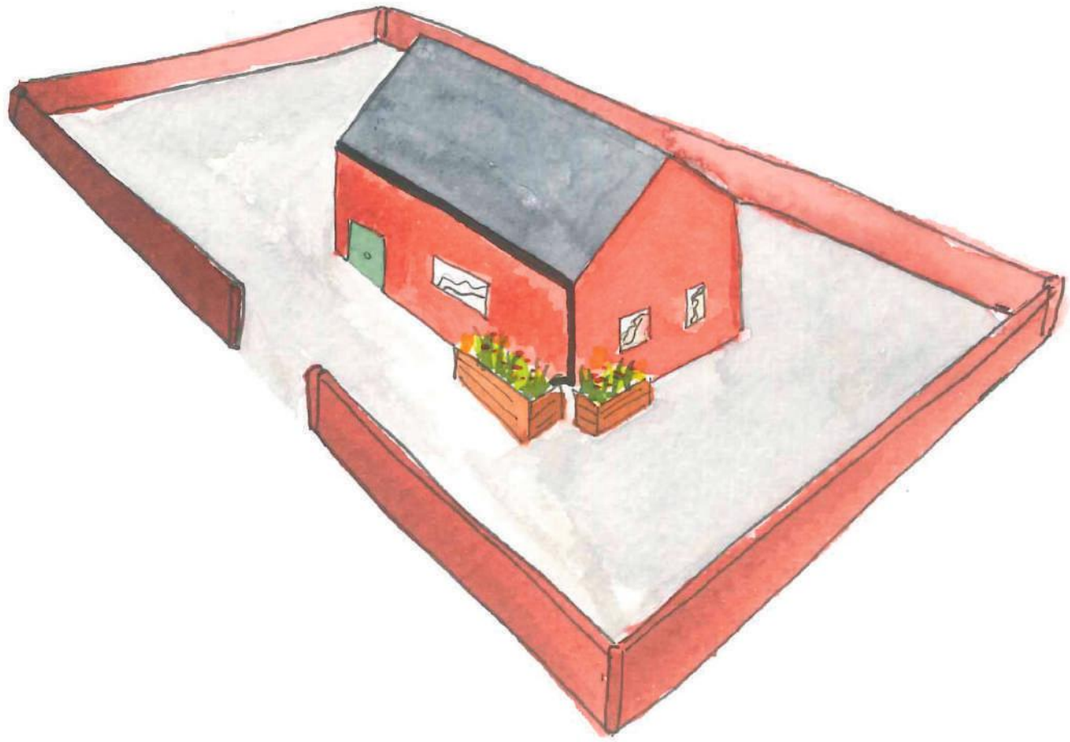
Calculating the surface area of the roof section

Step 3: What rainfall event are you designing for?

In Dublin, a heavy rainfall event would produce up to 25.4 mm (1 inch) of rainfall. This is what we will use in this example.

Step 4: How much space do you have for your planter?

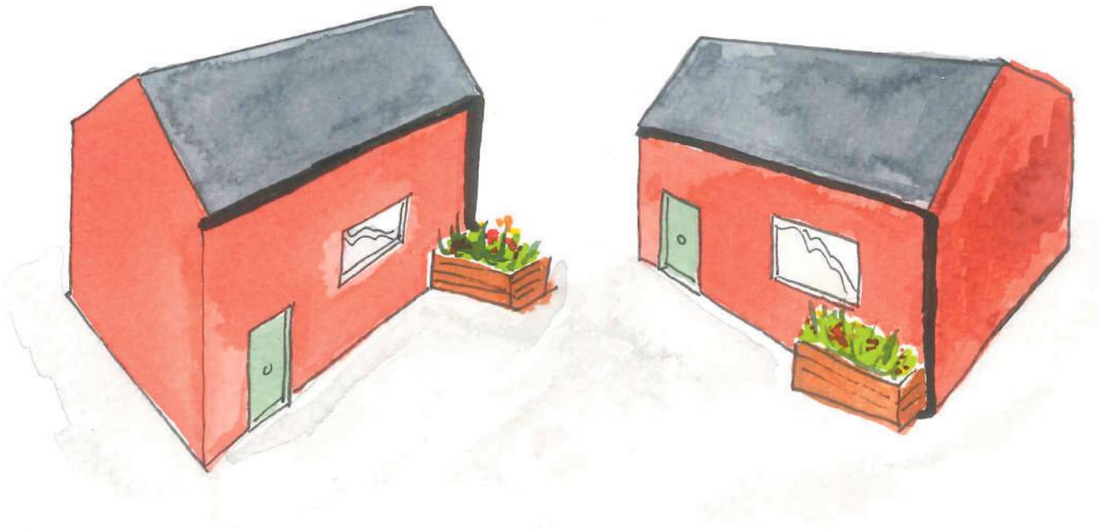
Take a look at your property. Look at the area around the downpipe to which the planter will be connected. See image below for possible locations for the planter.



Picking the right location for your planter

Step 5: What shape will the planter have?

Simple shapes, like a rectangle or square, are easiest to build. Decide which shape will best suit your space. The image below shows two possible ways to place your planter.



Choosing the right way to place your planter

Step 6: How do I calculate the size of the planter?

(a) Multiply the length (L) and width (W) of the roof area to find the surface area.

For this example:

- the length is 6 metres, and the width is 3 metres.
- The surface area is 6m x 3m = 18m^2.

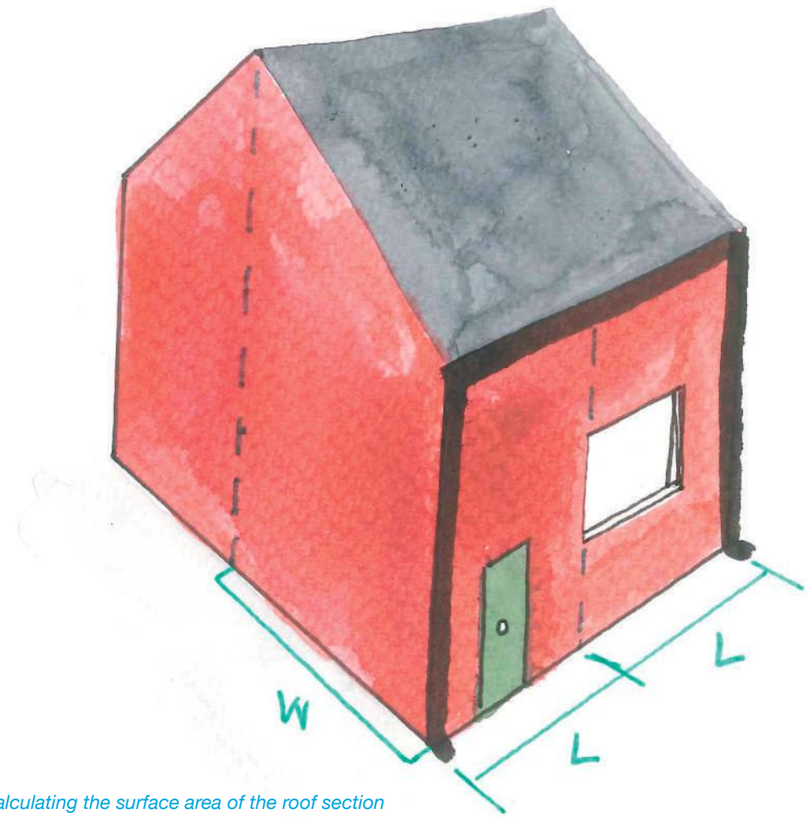
(b) Decide on the rainfall intensity level (25.4mm for this example).

- Convert 25.4 mm to metres 25.4mm ÷ 1000 = 0.0254m

(c) To find the maximum amount of water your planter will hold, multiply:

- the surface area (from step a)
- by the rainfall intensity (step b)

Maximum amount of water to be held = 18m^2 x 0.0254m = 0.4572m^3 (about 450 litres)



Calculating the surface area of the roof section

How does the planter hold 450 litres of water?

The rainwater planter will be filled with soil, sand and stone and these materials will take up some of the space in the planter. You might be wondering how the rainwater planter can 'hold' 450 litres. Please note the following.

Rain fills planter gradually

The rainwater will arrive in the planter over an extended period of time, usually over a period of hours. Therefore, the planter doesn't need to store all the 450 litres of water at once.

Rainwater planter is a living structure

The rainwater planter is an active, living structure where semi-aquatic plants consume some of the water. It is not a static, hard engineered structure. It drains water in two ways:

- it slows down the movement of water from your roof to the drainage network
- it reduces or eliminates, through use by plants, the volume of water discharging from your roof to the drainage network.

Worst-case scenario

A 25.4 mm/1 inch rainfall event over a very short duration is extremely rare in Ireland. Therefore, the planter is being designed for a worst-case scenario. If this rainfall event does occur, the overflow will allow excess rainfall to safely flow out of your planter.

Correct size is important

If the rainwater planter is too big, the plants may suffer from water shortage. A rainwater planter in Ireland can be subject to extended dry conditions and allowance must be made for this.

(d) Decide on the depth of your planter.

For this example:

- In this example, we are using 45cm (or 0.45m)

(e) To find the surface area of the planter:

- divide the volume of water to be kept (step c)
- by the depth of the planter (step d)

Surface area of the planter is $0.4572m^3 \div 0.45m = 1.016m^2$ or about $1m^2$.

(f) Find the length and width of the planter (step 5).

If you have already decided the length of the planter in step 5, then:

- divide the surface area by that length to determine the width.

In this example, the predetermined length is 1.8 metres (because this is a standard length available in hardware stores).

- Width = 1/1.8 = 0.6 metres, or 60cm.

(g) You have now designed your planter and it has dimensions:

- 180cm long
- 60cm wide
- 45cm deep

Step 7: What materials will you need to build your planter?

Table 2 shows a list of all the equipment you will need to build a planter 180cm long x 60cm wide x 45cm deep. Images are for illustration only.

Table 2: Materials you will need

Timber

Pre-treated timber boards x 13

- Length: 1800mm
- Depth: 150mm
- Thickness: 22mm

Timber Battens

Pre-treated timber battens x 6:

- Length: 1500mm
- Depth: 50mm
- Thickness: 47mm

Or as close as possible to these dimensions.

Stainless Steel Wood Screws

About 80 screws:

- 6mm x 60mm screws

Liner

Green and blue tarpaulin (see how it looks left):

- 3.5m² required.

Gravel

- 2 x 25 kg bags.

This will give about a 10cm drainage layer.

Topsoil

- About 320 litres.

This will give about a 30cm soil layer in a planter with length of 1800mm and width of 60cm.

Sand

- 1-2 bags of sand (depending on planter size)

You mix this into the soil layer to improve drainage.

Downpipe Rainwater Diverter Kit

Hose Pipe

50mm (2 inch) diameter plastic pipe.

- 1 standard length of pipe.

You will cut the length needed from this.

Hose to Hose Connector

Plastic Pipe

50mm (2 inch) diameter plastic pipe.

- 1 standard length of pipe.

You will cut the length needed from this.

90-Degree Pipe

90-degree bend for 50mm diameter plastic pipe.

Coring Drill Bit

For drilling a hole in one of the pieces of timber.

Staining

- 1 tin (0.75 litres) of weatherproof wood stain

Plants

About 6 plants. Examples of suitable plants include:

- Lobelia Fulgens ‘Queen Victoria’
- Houttuynia Cordala ‘Chameleon’
- Iris Pseudacorus ‘Yellow Iris’
- Iris Kaempferi ‘Purple Iris’
- Zantedeschia Aethiopica ‘Calla Lily’
- Primula Vialii ‘Orchid Primula’
- Acorus Gramineus Ogon ‘Japanese Rush’
- ‘Astible Fanal’

3 Constructing your planter

Scan here to watch a video on how to build your planter

Preparation

(1) Assemble all the tools, equipment and materials that you will need.

(2) Use a space that is:
- clutter free
- accessible
- large enough for you to safely and comfortably construct the planter.

(3) Make sure you have access to electricity for your power tools.

(4) Lay out all the tools, equipment and materials so that you can find them easily during the job.

(5) Allow yourself enough time to complete the job.

(6) It is easier for two people to build larger planters.

Steps to building your planter

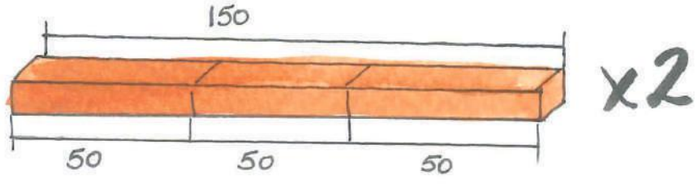
Step 1: Treat the wood

The day before you construct the planter, treat all wood with weatherproof stain.

Step 2: Cut the battens of wood

Cut the battens to size:
- 6 x 50cm lengths.

The battens are 150cm long, so you’ll get three battens here. 50cm lengths will be long enough to allow for short legs at the bottom of the planter.

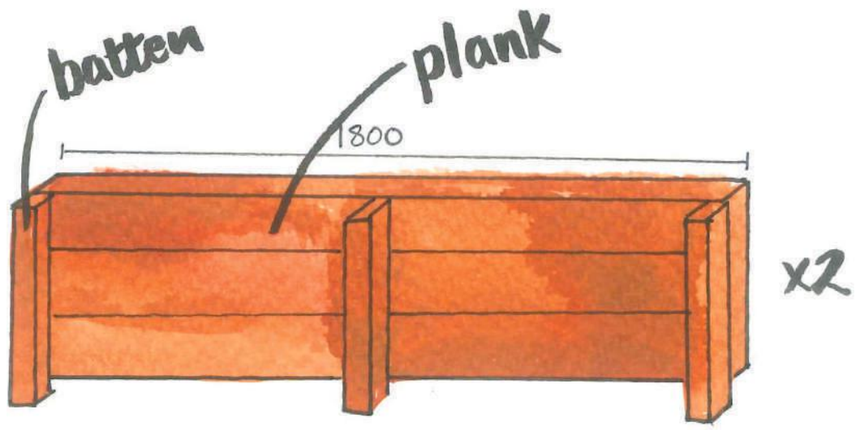


Cutting the battens

Step 3: Construct the long side

- Lay three planks side to side.
- Screw a batten at each end and in the middle.
- 2 screws per plank per batten = 18 screws.

Do this twice – one for each side.



Constructing the long sides of the planter

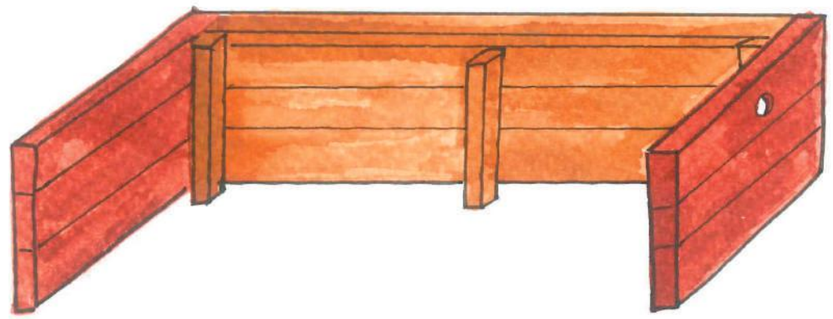
Step 4: Drill a hole for the pipe

In one of the planks, core a hole to take the 50mm diameter pipe.
This is for the overflow.

Coring a hole using a drill bit.

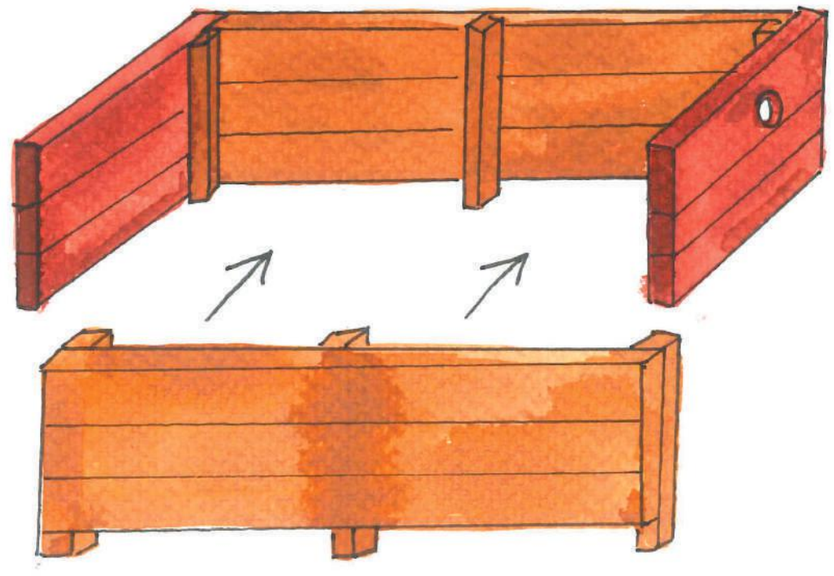
Step 5: Attach the short sides to one of the long sides

You will need to cut six lengths of wood each measuring 60cm.
Three of these are screwed onto the battens at each end of one side of the planter.
Make sure that the plank with the hole in it is at the top.



Attaching the short sides to the planter

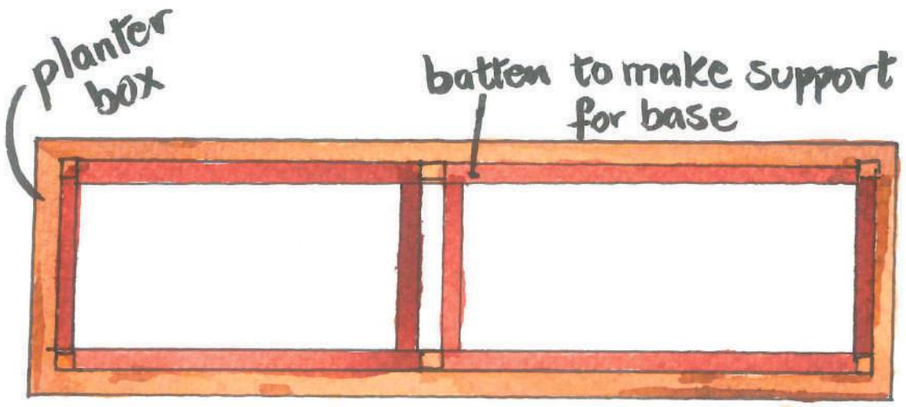
Step 6: Attach the other long side



Attaching the other long side

Step 7: Create a support for the base

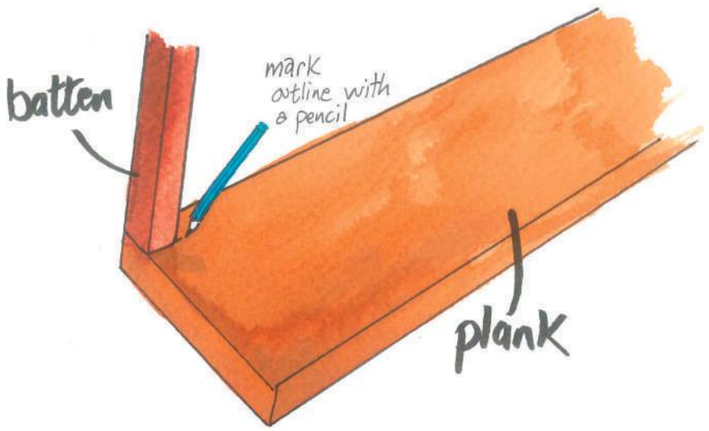
You need more battens here to be attached along the bottom edge of the planter.
Two across the middle and also along the sides. You will have to cut the battens to fit.
In the following image, you are looking down on the planter before the base has been added.

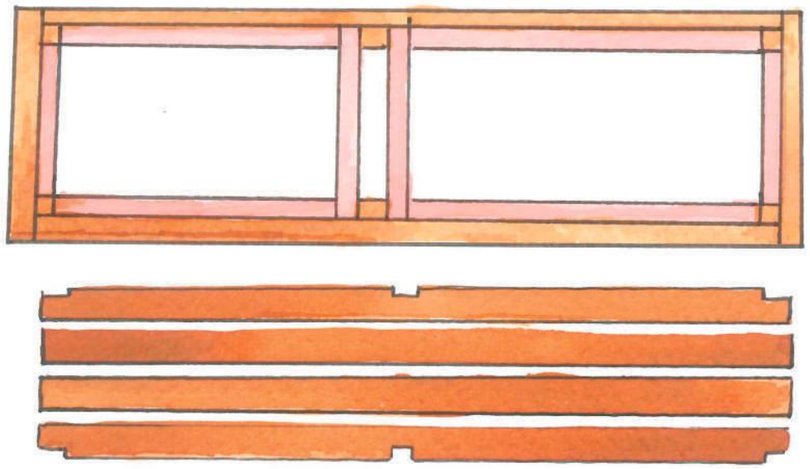


Creating a support for the base

Step 8: Lay the base

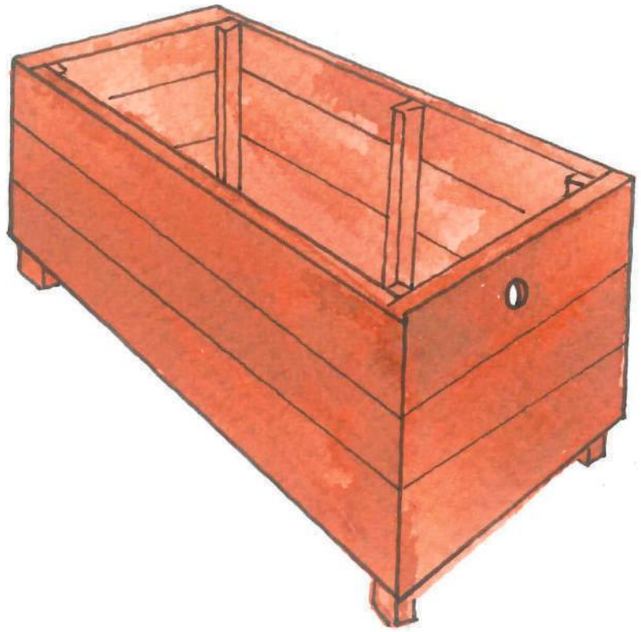
You will need 4 planks of timber for the base (from the 12 you originally bought).
You will have to cut notches in two planks to allow for the battens at each corner and halfway along the planter. You can use a batten to outline the sizes of the notches to be cut.
Once the notches have been cut into the planks, place the planks into the box to construct the base.





Laying the base for the planter

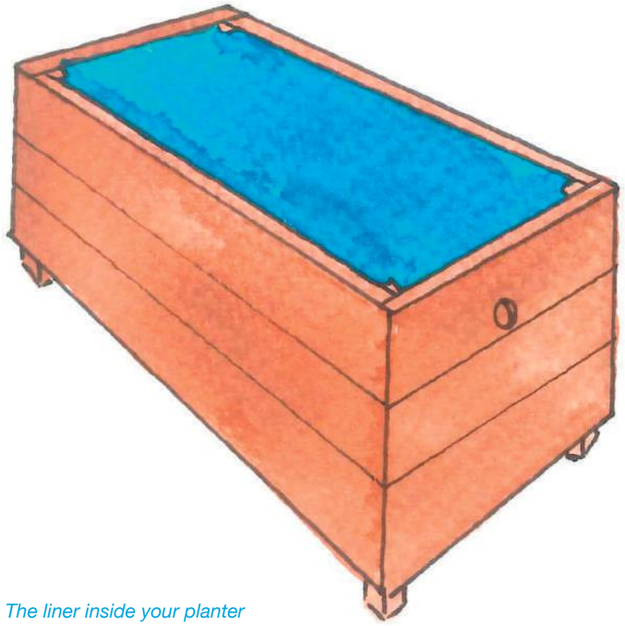
Step 9: Your planter should now look like this.



The completed planter box

Step 10: Add Liner

The entire inside of the planter needs to be lined with the green and blue tarpaulin. Use the staple gun to secure the liner to the inside of the planter. You will need to create a hole in the liner to match up with the hole in the wood.



The liner inside your planter

Step 11: Place the planter next to the downpipe

It will be too heavy to move after you have filled it. You could consider putting paving stones under the planter for extra support. Make sure that the planter is not:

- blocking any vents, windows or doorways, or
- on top of access covers.

Step 12: Add the drainage layer

Spread the gravel on the bottom of the planter. A depth of 10cm is enough.

Step 13: Lay another layer of tarpaulin on top of the drainage layer

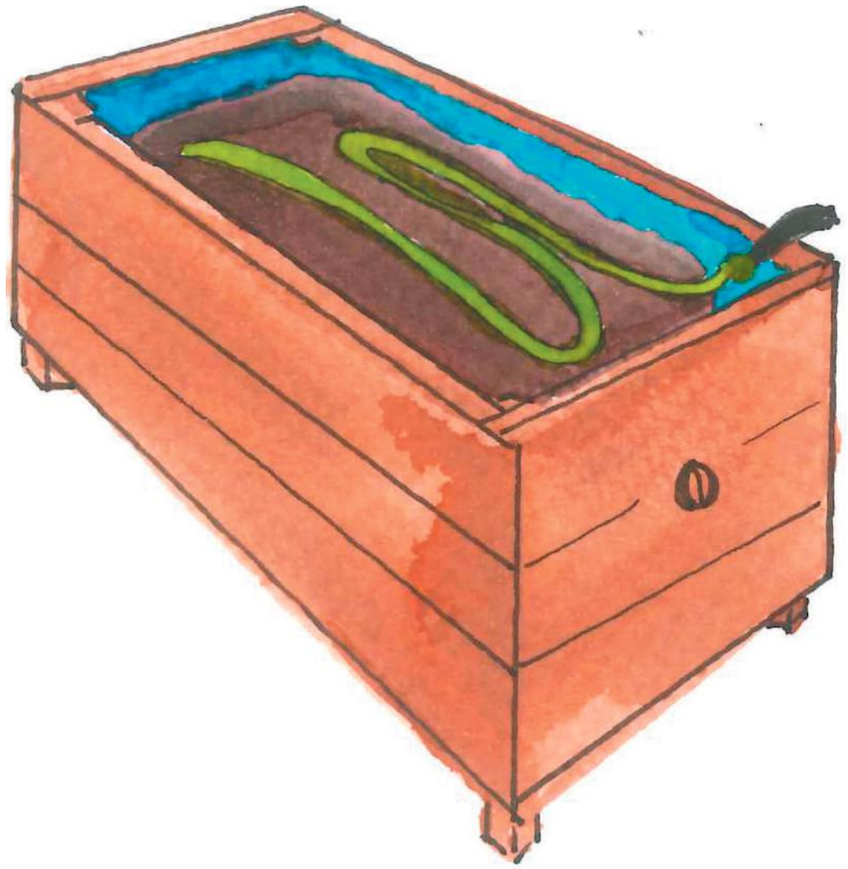
You need this to stop the soil from filling the void spaces in the drainage layer. Use a screwdriver to poke lots of holes in this layer or tarpaulin. This will allow water into the drainage layer, but not soil.

Step 14: Add the topsoil to a depth about 25-30cm

Thoroughly mix the sand into the topsoil.

Step 15: Carefully put holes in the hose pipe

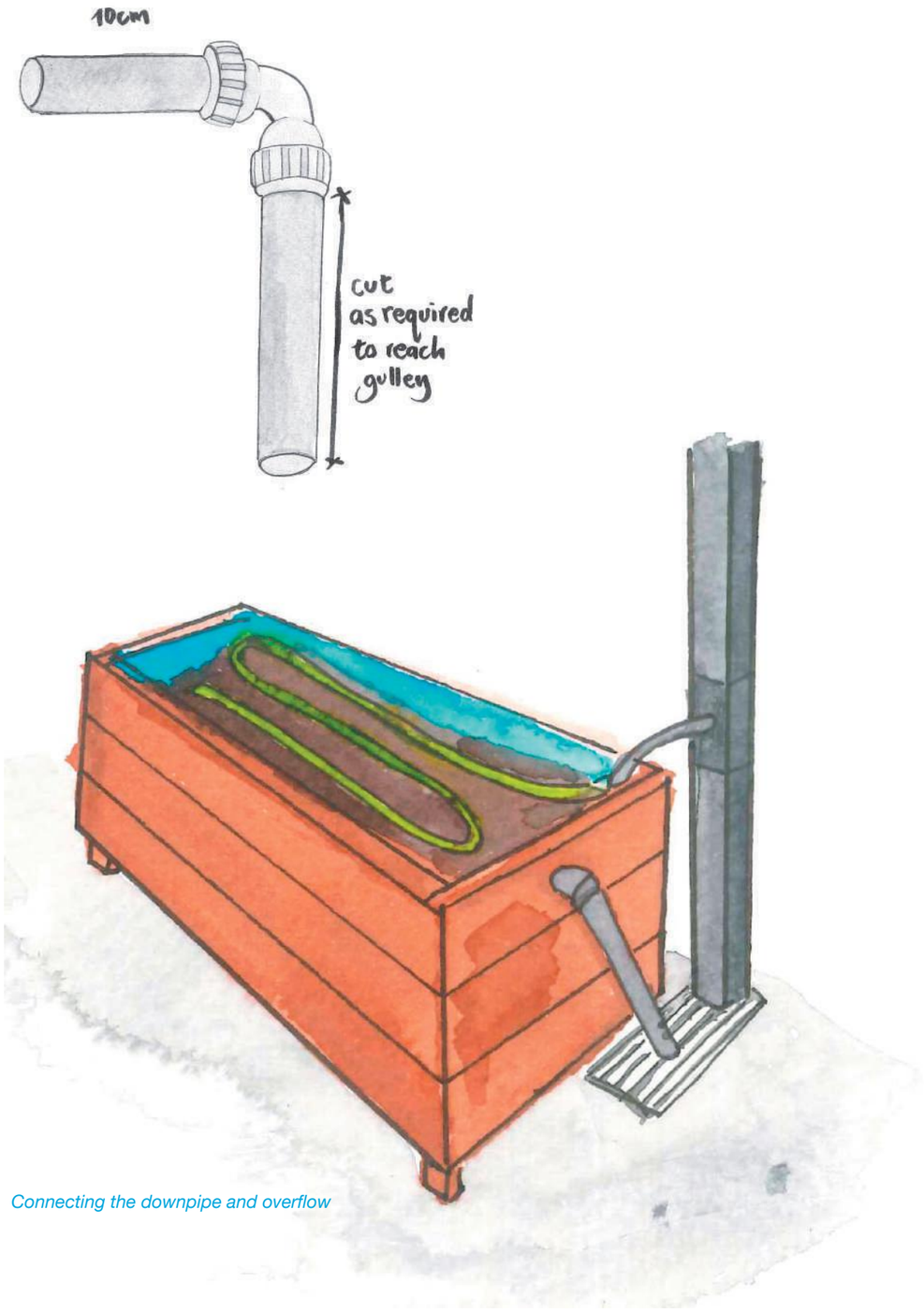
- Use your drill to make the holes.
- You need lots of holes about 5cm apart and they should be made the whole way around the hose pipe
- Bury the hose pipe in the soil layer to a depth of about 5cm.



Adding the hose – drill holes before you place the hose pipe

Step 16: Connect the downpipe to the hose pipe

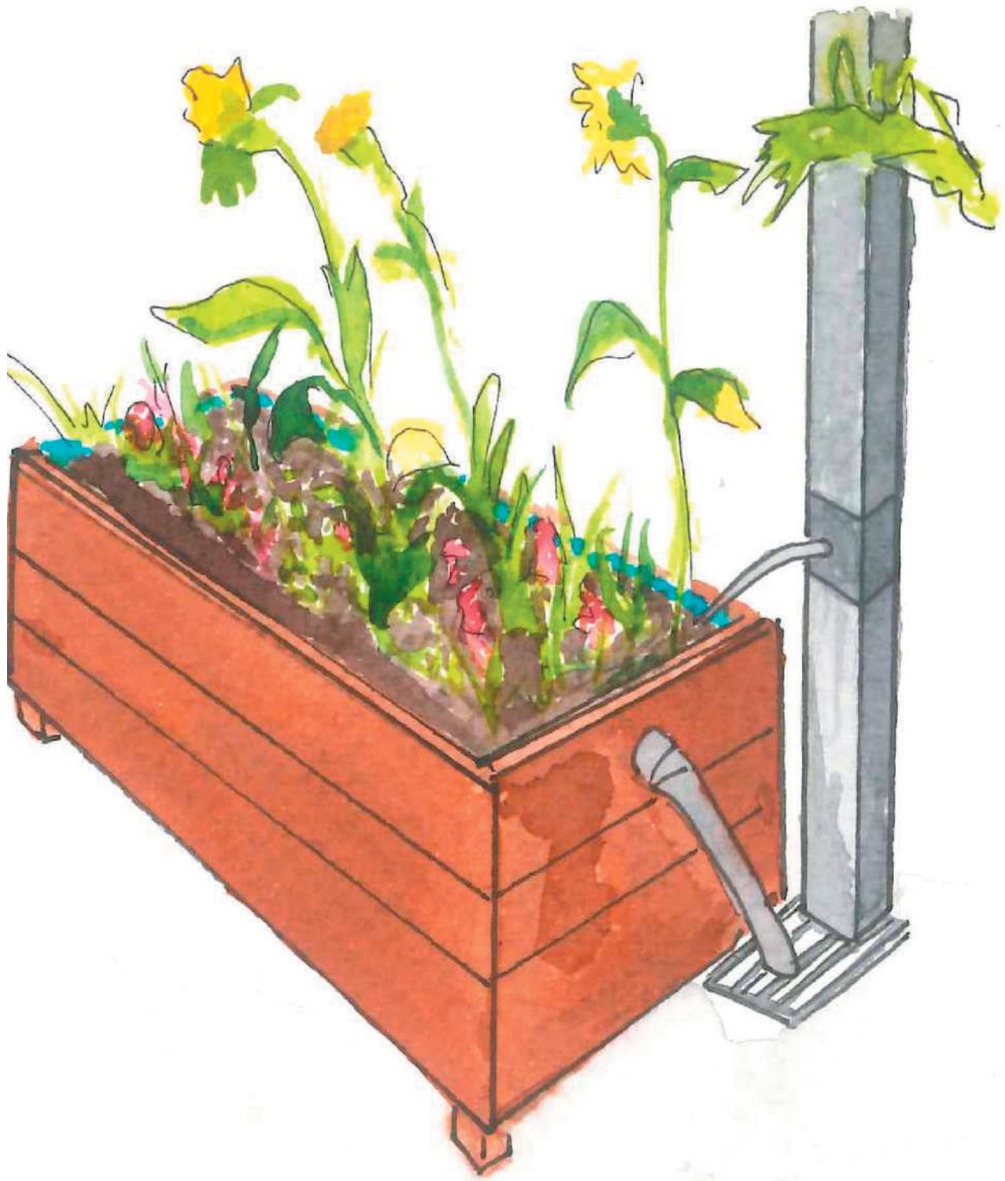
Use the hose-to-hose adaptor and connect the overflow pipe to the hole using the 90 degree bend (see below).



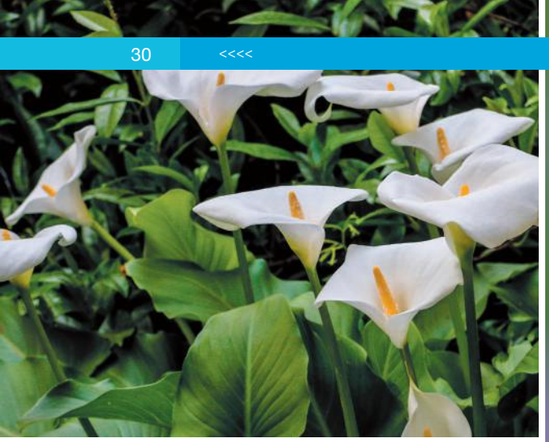
Connecting the downpipe and overflow

Step 17: Now you are ready to plant.

Note that. Depending on the time of year, your plants may not be in flower.



Adding vegetation to the planter



4 What practicalities I need to know

Permission to locate a planter

If you are not the owner of you property, you may need the permission of the homeowner to install a rainwater planter. Rainwater planters should be located within the boundary of your property and not, for example, located on a public footpath.

Not all properties are suitable

When designing a planter, you should take a realistic and practical approach. Not every property will have the space available for the size of planter you would need to intercept substantial volumes of rainfall.

You must be able to access some rainfall

The most important thing is that some amount of rainfall will go into the planter, even if it is not the 25mm (1 inch) of rainfall we mentioned earlier.

Unsuitable locations

A rainwater planter is not suitable for construction on a balcony or indoors.

Avoid wasting timber

If you are constructing a planter from timber, avoid wastage by working with standard lengths on either the length or the depth. – In most hardware stores or garden centres, timber is often ether 1800mm or 2,400mm in length.. Therefore, the most practical planter might be rectangular with a length of 1,800mm or 2,400mm and the width in proportion.

Peat moss is unsuitable

Do not substitute peat moss for top soil. It is not a suitable material for rainwater planters.

You must use suitable plants

Plants chosen for a planter must be tolerant of periodic or intermittent wet and dry conditions. Garden centres classify aquatic plants in 4 zones, with zone 1 being the driest and zone 4 being the wettest. Choose plants in zones 1 and 2 for the rainwater planter. Plants from zones 1 and 2 can tolerate both dry and wet periods.

When choosing your plants, be aware of how much sunlight your planter will receive. Select plants that can tolerate the amount of sunlight they will be exposed to. Any good garden centre should be able to provide advice on other suitable plants for the planter environment.

5 How much will my planter cost?

To build a planter the size shown in this booklet, we estimate that it will cost between €250 and €300. This excludes labour and tools. The cost of materials like timber, top soil and plants may vary from region to region. These costs can be reduced by buying materials in bulk as part of a community rainwater planter project where you are building more than one planter.

6 Maintenance

Every so often, you will need to inspect the plants in the planter boxes and the structural parts of the planter. The planter boxes will need the same type of maintenance as a regular flower box.

You may also need to do things like:

- removing debris
- cleaning and repairing pipes
- maintaining proper drainage.

Every now and then, you will also need to inspect downpipes and other things where debris may obstruct the flow.

7 Safety and siting requirements

Level ground

All planters need to be constructed on level, solid ground. They need to be constructed in a safe way so they:

- are not a trip hazard
- do not obstruct a way of escape from the building.

Consider the weight

When deciding where to put the planter, you need to consider its weight. The planter box will be heavy, as it is holding large quantities of soil and water.

Flow-through planters are versatile

Flow through planters can be used on both small and large sites. A larger roof will require a larger planter. A flow through planter has an overflow that allows excess rainwater to drain from it either to a gully or another feature such as a rain garden. You can put flow-through planters close to buildings but do leave a slight gap to allow for airflow between the timber of the planter and the wall of the building.

Enjoy your planter!

We hope you enjoy your planter for many years and in time encourage others to build one or help to improve our environment in other ways. Water Framework Directive Office Dublin City Council.

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The Water Framework Directive Office in Dublin City Council was set up in 2016. We are a team of engineers, scientists, technicians and administrative support. We have a broad knowledge base and come from varied backgrounds including engineering, environmental science, community, surveying, and planning. We try to improve water quality and enhance our aquatic environment in partnership with all stakeholders, including Dublin City Council departments, other agencies and local communities.

Disclaimer

We have tried to make this guide publication as simple and safe as possible. However, this publication should be construed as theoretical advice only. As with any DIY project, there is always some risk.

Unfamiliarity with tools and processes can be dangerous. If you are uncomfortable or inexperienced working on such projects, please reconsider doing the job yourself. Dublin City Council cannot take any responsibility for:

- any injury or damage resulting from the use of the information in this document, or
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