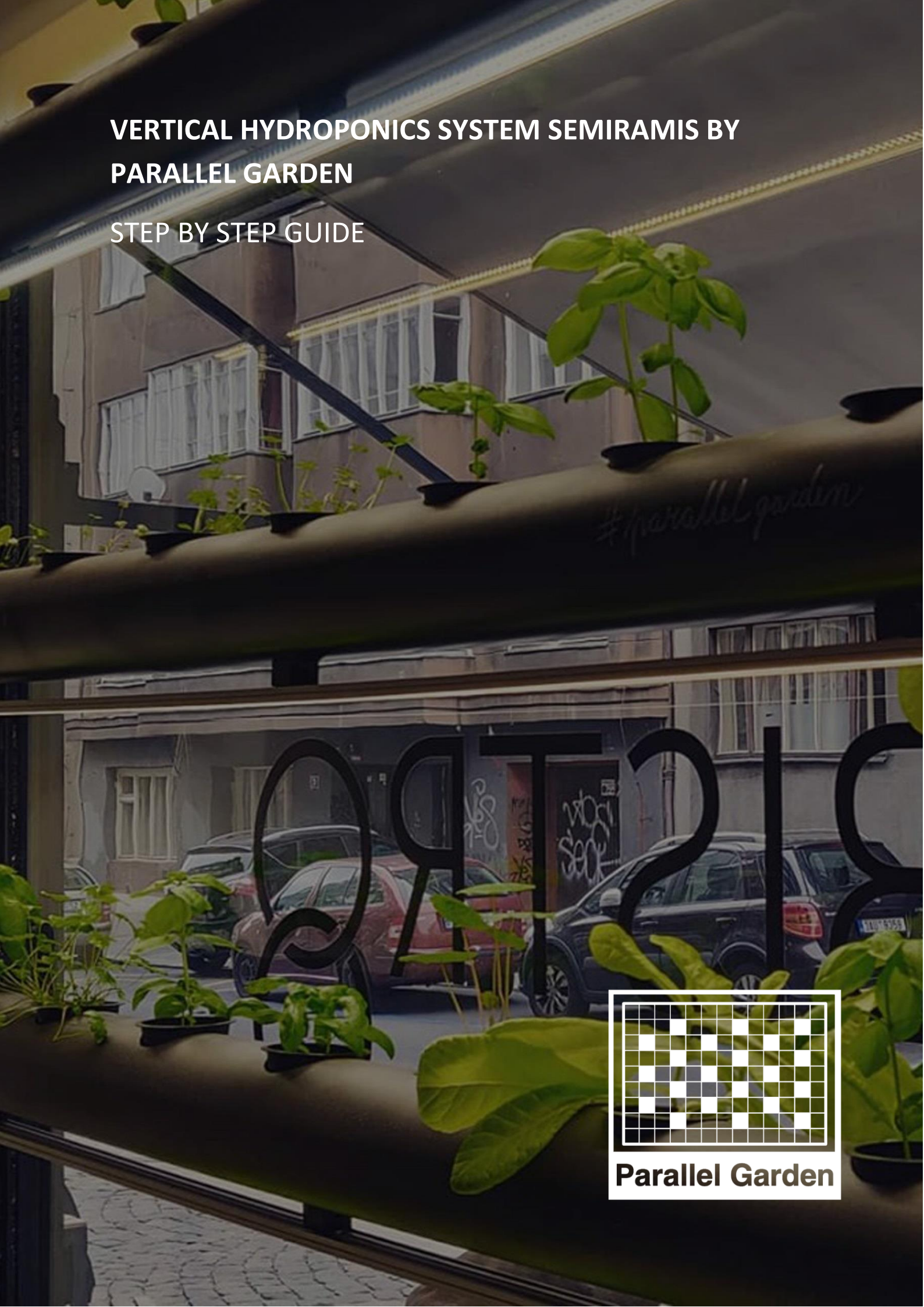


VERTICAL HYDROPONICS SYSTEM SEMIRAMIS BY PARALLEL GARDEN

STEP BY STEP GUIDE

Parallel Garden

INTRODUCTION

This documentation serves as a guide how to construct vertical hydroponics system „Semiramis“ in accordance to the design of Parallel Garden research. You are invited to build up your own hydroponics system using our current knowledge, and encouraged to share your experiences, improvements, etc.

This technology works on the principle that water with nutrients circulates in growing channels while there is a stable water level inside them. Growing medium is slightly in touch with water and takes the water up to the plant at the beginning. Later roots are growing straight to the water.

This guide shows how to build 5 stories system with capacity of 25 plants. Approximate dimensions are 220x90x30cm.

IMPORTANT!!!

While building, assembling, and adjusting your own system, please respect basic risks in order to avoid injury or damage. Keep the electric source even if it's waterproof away from possible water leakage routes. The design works with 12V regime which is considered to be harmless, but be careful anyway. Always make sure to unlpug the system from the electric socket while manipulating with the system in any way! Also make sure to use personal protective gear while building your system. You maly likely get cut or burned if not paying enough attention or not using personal protective gear.

IMPORTANT!!!

Construction of the system requires multidisciplinary experience – you are about to build everything from scratch at your own risk – it's not an installation guide of any specific product. If you lack experience with crafting, painting, soldering, hydraulics, electronics it is your responsibility to ask for professional help. Also feel free to contact us in case of any questions.

Please use our facebook page to do so: https://www.facebook.com/parallelgarden

IMPORTANT!!!

It's a good idea to read the whole document before you start shopping and building.

TOOLS

Holder

Measuring tape

Pencil

Pliers

Miter saw

Drilling machine with heads for drilling holes of larger diameters

Solder, soldering iron

Scissors

Sand paper and rasper

Iron saw

MATERIALS – GROWING CHANNELS 5pcs

5x Polypropylene HT pipes 1000 x 110mm

10x Reduction HT 110 – 50mm

10x Lid HT 50mm

25x Hydroponics growing basket 8cm in diameter and 6cm deep with notable edge

6x 1“ bulk head fittings

15x Flat rubber sealing ring compatible with 1“ bulk head fittings

1x 1“ hose connector

1x ½ inch hose connector

5x ½ inch bulk head fitting with flat top

5x ½ inch valve

5x ½“ fitting to connect the valve and hose fitting

5x ½“ hose fitting

5x 1“ pipe connector

5x 1“ hose fitting

5x 1“ plastic hose of 30cm lenght

5x 1“ Wave seal ring

1x Teflon tape

STEP BY STEP GUIDE – GROWING CHANNELS

Preparation of the top growing channel

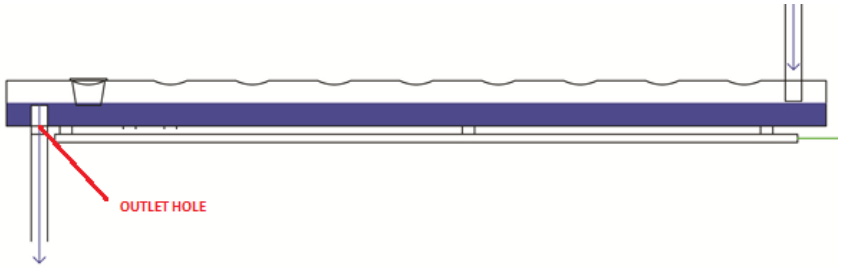
1) Cut away the neck of the pipe so the pipe has total length 90cm.
2) Measure positions of plant holes:
   a. Draw a straight line on the top of the pipe


   b. Measure centers of holes – start with the first one at 16cm distance from the edge, second one at 30cm, third at 45cm, fourth at 60cm, and fifth at 74cm.

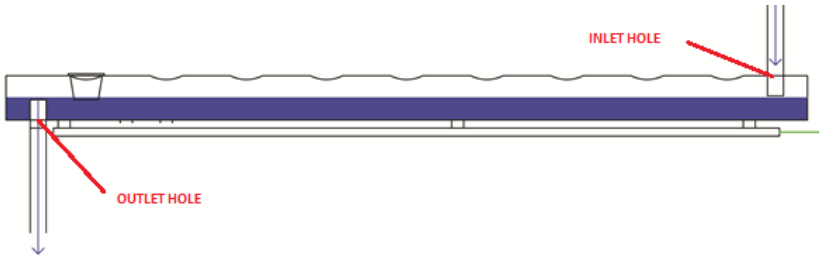
3) Drill holes of necessary diameter (8cm) as per your outline.


4) Smo ar .

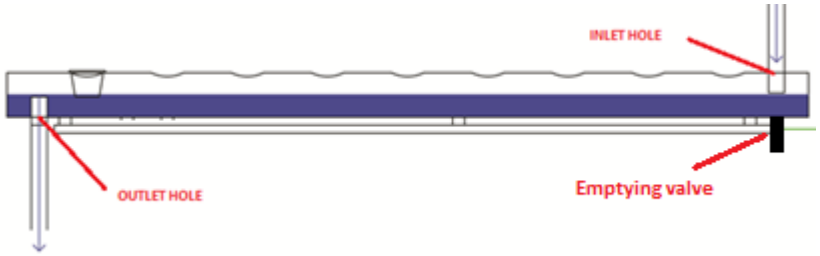
5) Measure the center position of the outlet hole – it will be pplaced on the bottom of the pipe (opposito to your plant holes). It will be placed 10cm from the end of the pipe.



6) Drill the outlet hole – the diameter should correspond with the size of 1“ bulk head fitting.
7) Measure the center position of the inlet hole – it will be placed on the same line as your plant holes (opposite to outlet hole). It will be placed 10cm from the other edge of the line than the outlet hole.



8) Drill the outlet hole – the diameter should correspond with the size of 1“ bulk head fitting
9) Measure the center position of the emptying valve hole – it will be placed on the bottom of the growing channel opposite to the outlet hole. It will be placed 10cm from the end of the pipe as well.



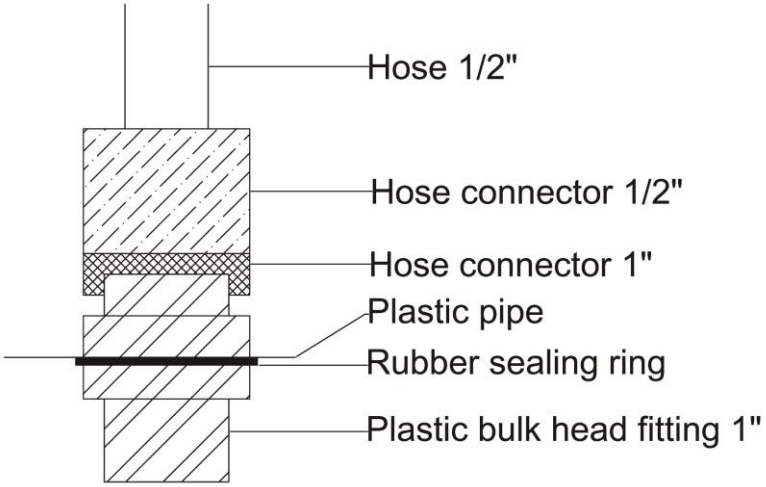
10) Drill the emptying valve hole - the diameter should correspond with the size of 1/2“ bulk head fitting.

NOTE: Now it’s good time to paint the pipe if desired.

11) Assemble the inlet structure:
    a. Install 1“ bulk head fitting into the inlet hole and tighten it slightly. Rubber sealing ring shall be placed inside the pipe.

    b. Install 1“ hose connector on the top of the bulk head fitting.

c. This is how the setup of the main inlet should look like:

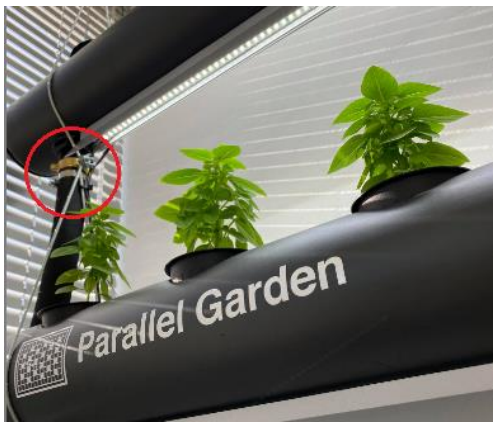


12) Assemble the outet structure:

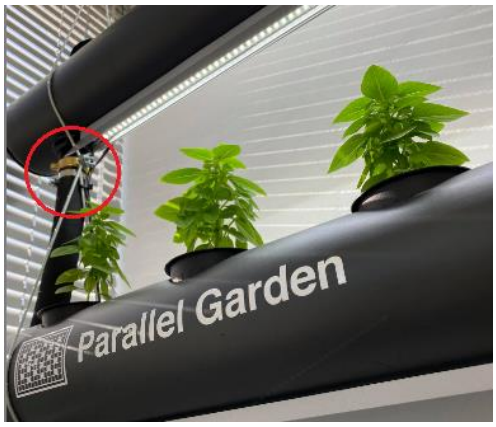
a. Install 1“ bulk head fitting into the outlet hole, but place **total 3pcs of rubber sealing rings** on the bulk head fitting. These 3 pieces should be placed inside the pipe – they will ensure waterproof contact! Tighten the bulk head fitting well!

b. Install 1“ pipe connector on the bulk head fitting inside the pipe. It will serve for regulation of the water level in the pipe – maybe this pipe connetor will need to be cut – you nee the water level high enough so the groing baskest are slightly submerged (0,5cm).

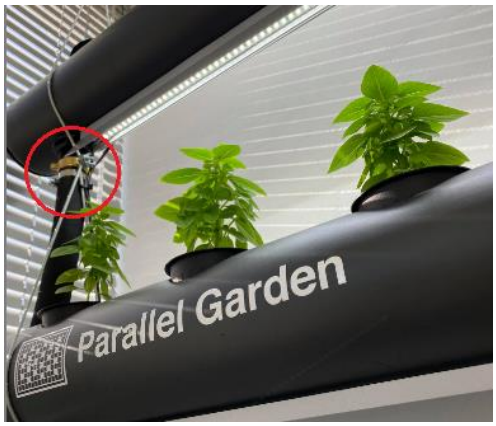
c. Install 1“ hose fitting on the bottom of the 1“ bulk head fitting.



d. Put 1“ black hose on the fitting and fix it with the wave seal ring.



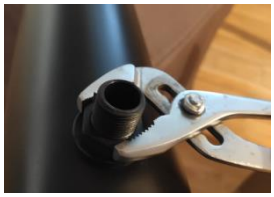

e. Setup of the outlet structure should look like this:



13) Assemble the emptying valve structure:

a. Install ½“ bulk head fitting with flat top into the hole and tighten well. Rubber sealing ring should be placed inside the pipe.





b. Install ½“ valve on the ½“ bulk head fitting. Use teflon tape to ensure the connection is waterproof.




c. Install ½“ fitting into the valve. Use teflon tape again!


d. Install ½“ hose fitting onto the fitting in the valve. You may need to use teflon tape again.


e. Setup of the emptying valve structure should look approximately like this:

Preparation of remaining growing channels

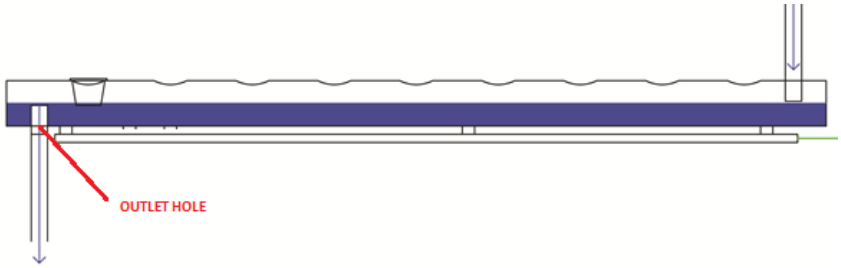
1) Cut away the neck of the pipe so the pipe has total length 90cm.
2) Measure positions of plant holes:
   a. Draw a straight line on the top of the pipe


   b. Measure centers of holes – start with the first one at 16cm distance from the edge, second one at 30cm, third at 45cm, fourth at 60cm, and fifth at 74cm.

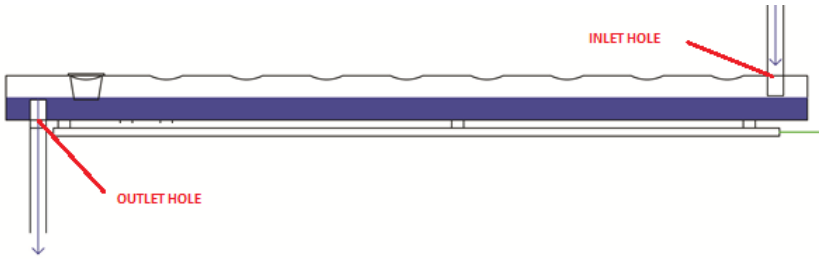
3) Drill holes of necessary diameter (8cm) as per your outline.


4) Smoothen all edges with sandpaper or with rasper.

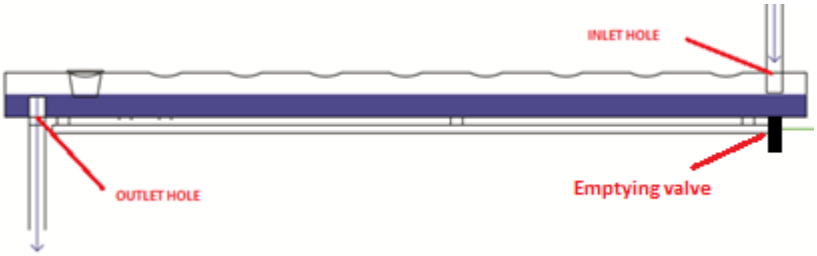
5) Measure the center position of the outlet hole – it will be pplaced on the bottom of the pipe (opposito to your plant holes). It will be placed 10cm from the end of the pipe.



6) Drill the outlet hole – the diameter should correspond with the size of 1“ bulk head fitting.
7) Measure the center position of the inlet hole – it will be placed on the same line as your plant holes (opposite to outlet hole). It will be placed 10cm from the other edge of the line than the outlet hole.



8) Drill the outlet hole – the diameter should correspond with the size of 1“ hose.
9) Measure the center position of the emptying valve hole – it will be placed on the bottom of the growing channel opposite to the outlet hole. It will be placed 10cm from the end of the pipe as well.



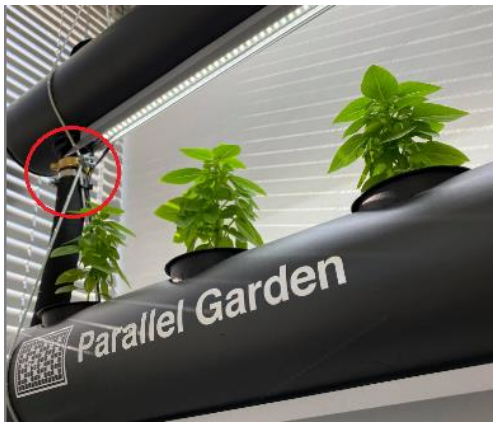
10) Drill the emptying valve hole - the diameter should correspond with the size of 1/2“ bulk head fitting.

NOTE: Now it’s good time to paint the pipe if desired.

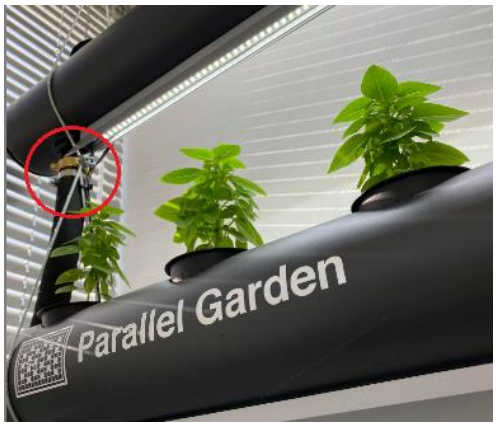
11) Assemble the outet structure:
    a. Install 1“ bulk head fitting into the outlet hole, but place **total 3pcs of rubber sealing rings** on the bulk head fitting. These 3 pieces should be placed inside the pipe – they will ensure waterproof contact! Tighten the bulk head fitting well!

b. Install 1“ pipe connector on the bulk head fitting inside the pipe. It will serve for regulation of the water level in the pipe – maybe this pipe connetor will need to be cut – you nee the water level high enough so the groing baskest are slightly submerged (0,5cm).

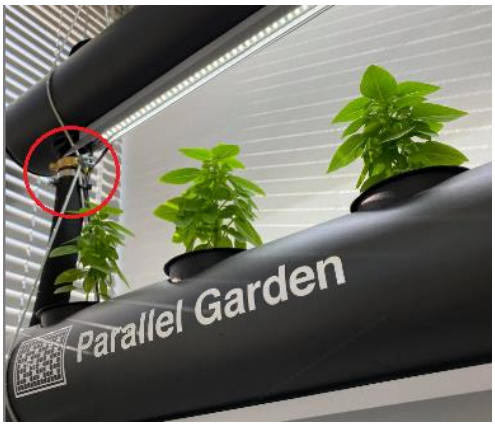
c. Install 1“ hose fitting on the bottom of the 1“ bulk head fitting.



d. Put 1“ black hose on the fitting and fix it with the wave seal ring.



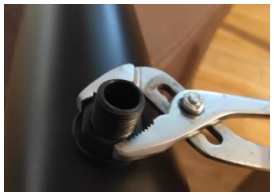
e. Setup of the outlet structure should look like this:



12) Assemble the emptying valve structure:

a. Install ½“ bulk head fitting with flat top into the hole and tighten well. Rubber sealing ring should be placed inside the pipe.





b. Install ½“ valve on the ½“ bulk head fitting. Use teflon tape to ensure the connection is waterproof.




c. Install ½“ fitting into the valve. Use teflon tape again!


d. Install ½“ hose fitting onto the fitting in the valve. You may need to use teflon tape again.


e. Setup of the emptying valve structure should look approximately like this:

MATERIALS LIGHTS

1x Super glue

5m Double side glue tape – get a good one

5x 1000mm aluminium twin bar for LED strips

7m of LED strip (12V 20W/m 6500K 2000lm/m)

10m Cable with two cores diameter 0,75mm^2

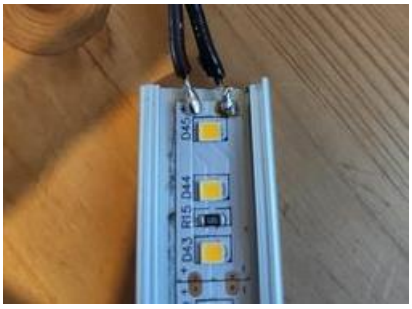
2x Cable ties

1x Aluminium stick 1m long, 0,5cm diameter

PREPARATION OF GROW LIGHTS

1) Measure 65cm on aluminium bars and cut them there.
2) Measure 10pcs of the LED strip of the same length as aluminium bars (65cm).
3) Glue LED strips on bars always in pairs (2 LED strips per bar). You may use few drops of super glue to make sure LED strips will hold well.
4) Cut 5 pcs of cables of following lengths: 2,5m, 2,2m, 1,9m, 1,6m, and 1,6m.
5) Split end of those cables and remove the insulation on all ends.

6) Solder those cables to the LED lights – cable need to be soldered always to one of the two LED strips inside the bar. Solder red core to the + contact and the black core to the – contact. Now one LED strip in your grow lights is working if connected to the source. (refer to illistrative picture below)



7) Cut 5 short pieces of the cable. Their length should be about 2cm.
8) Split them all apart so you will have 10 short single cables (5 black and 5 red).
9) Remove the insulation on their ends.

10) Now you will use these small cables to connect 2 LED strips within one bar. You will connect LED strips on the other side than the cable is attached. You need to connect + contacts of both LED strips and – contacts of both LED strips.

11) Your grow lights are ready to be installed now!

GROW LIGHTS INSTALLATION

!!! You will attach **4PCS** of your grow lights to the top 4 growing channels. Don't attach any grow light onto the bottom of the lowest growing channel as there is NO NEED for that !!!

!!! Light with the longest cable will go to the top – don't attach it to any growing channel. Light with the second longest cable will be attached to the top growing channel and so on !!!

1) Use double side glue tape and glue it to the tops of your grow lights – place it alla long, not in points but in the whole length.
2) Remove the top cover of the double side glue tape and add few drops of the super glue.
3) Glue the grow light to the growing channel. **IMPORTANT: Make sure to attach your grow lights in a way that cables will be on the same side of the system. It could make your life a bit difficult later on.**

TOP LIGHT PREPARATION

1) Top light is a bit different as it cannot be atached to any growing channel.
2) Cut the aluminium stick to the length of 90cm.
3) Use 2 cable ties and attach the grow light onto the stick approximetly in the middle.

MATERIALS – INSTALLATOIN OF THE SYSTEM

2x 6m of the steel rope, diameter 3mm. Ideally find a rope that is coated in rubber – plain steel rope will scratch the paint of your growing channels.

12x steel rope lock

INSTALLATION OF THE SYSTEM

1) You will need two anchoring points on your wall or on your ceiling. Together they should be able to carry at least 75kg of weight. These point shall be at least 2,3m high or higher. They should be placed about 65cm apart each other. Specific solution depends on the space properties, wall type, etc – we cannot provide detailed guide how to prepare anchoring points. It could look similar to this:

2) Once your anchoring points are ready take the steel ropes and put one of them through each anchoring points. Make sure both ends of each steel rope are of the same length.
3) Put the first lock on each steel rope and fix them right under the anchoring point.
4) Put second lock on each steel rope and fix them at the height of the top light (as high as possible or 2,3m high from the ground).
5) Put third lock on each steel rope and fix them approximately 40cm below the top light (1,9m).
6) Place the top growing channel into the rope. Distance of the top of the growing channel from the top light should be 20cm – adjust the positions of both locks as necessary. Make sure the growing channel is placed horizontaly.
7) Continue with installation of remaining growing channels – top of eych growing channel should be always 20cm below the grow light of the growing channel above.

WATERING SYSTEM MATERIALS

1x Plastic box 50L with lid.

1x Submersible water pump strong enough to bring water up to 2m high.

½ inch hose 2,5m black

INSTALLATION OF THE WATERING SYSTEM

1) Attach the hose to the water pump – you may need various materials to attach it depending on the pump outlet size.
2) Take one plastic box and drill a hole into the lid on the left side approximately in the middle. Size of the hole should be greater than 1“ hose so it can get through.

3) Drill another hole of the same size into the lid on the opposite side.

4) Place the pump inside the box, put the ½“ hose and the water pump cable through the hole on the right.

5) Close the box with the lid, place it under the system, and put the outlet hose of your system through the left hole of the box. Excess water will be then collected inside the box.

6) Now connect the ½“ hose to the main inlet of the system.

MATERIALS – POWERING AND CONTROLLING SYSTEM

!!! MATERIALS YOU WILL BE ABLE TO FIND MAY BE DIFFERENT. IN CASE OF ANY DOUBTS OR IF YOU HAVE NO EXPERIENCE WITH ELECTRIC INSTALLATIONS ASK A PROFFESIONAL TO HELP YOU. NEVER TOUCH ANY CABLES AND CONNECTIONS WHILE THE SYSTEM IS PLUGGED TO THE SOCKET OR OTHER ELECTRICITY SOURCE. DAMAGES OR SERIOUS INJURIES MAY OCCUR IF THE LACK OF YOUR EXPERIENCE WILL BE IGNORED !!!

1x Plastic box 50L with lid.

1x 12V 240W IP67 electric adaptor

2x Analog timer

1x Electric socket connector male (220V 16A)

3x Wago cable connector (2 locks, 300V, 20A)

2x Wago cable connector (5 locks, 300V, 20A)

2x Wago cable connector (3 locks, 300V, 20A)

1x Small waterproof electric box

2x Cable ties

1x Extension cord with 4 sockets at least

POWERING AND CONTROLLING SYSTEM INSTALLATION

!!! MATERIALS OR STANDARDS IN VARIOUS COUNTRIES MAY BE DIFFERENT. IN CASE OF ANY DOUBTS OR IF YOU HAVE NO EXPERIENCE WITH ELECTRIC INSTALLATIONS ASK A PROFFESIONAL TO HELP YOU. NEVER TOUCH ANY CABLES AND CONNECTIONS WHILE THE SYSTEM IS PLUGGED TO THE SOCKET OR OTHER ELECTRICITY SOURCE. DAMAGES OR SERIOUS INJURIES MAY OCCUR IF THE LACK OF YOUR EXPERIENCE WILL BE IGNORED !!!

1) Take the plastic box 50L and drill a hole in the back side. Place this hole at least 20cm above the bottom, diameter should be about 8cm.
2) Take small electric box, and connect electric socket connector with the electric adaptor inside – use wago connectors. Then close the box completely and lock it if possible. (illustrative picture below)






3) Put cables leading from your lights into the large box through the hole you have drilled. Put your power adaptor inside as well.

4) Connect cables from your lights to the cables that go from the power adaptor – use cascade of wago connections to connect all lights – red cables from your lights will go to „+“ power source cable, and the other ones to the „-“ power source cable. Refer to the illustrative picture below. It is also a good idea to connect these cables inside waterproof electric box as well. It is a bit tricky as you have 6 cables, but only 5 slots in one wago connection. Use another 3 slot wago connection in the cascade to get it solved.

5) Now your lighting system is ready.
6) Bring the water pump power cord into the box through the hole in the back.
7) Bring the extension cord with 4 sockets into the box through the hole in the back as well.

8) Plug two timers into sockets of the extension chord. Set one timer for lights – it should be on 14 hours every day (we usualy start at 7:00 and stop at 21:00). Set the second timer for the pump – it should be switched on idealy every hour for 10min – depending on possibilities of the timer. If you need the pump to be off during night it should be ok. If you cannot switch the pump on often enough it helps to put bubbler into the water tank to keep the water fit.
9) Plug light source to the Light timer, and the water pump power cord to the Pump timer.
10) !!! AT THIS POINT YOUR SYSTEM IS POWERED AND YOU CANNOT MANIPULATE WITH IT, NOR TOUCH CABLES, ETC !!! THIS APPLIES AS LONG AS THE SYSTEM IS POWERED !!! Plug the extension cord with 4 sockets into the power.
11) Now your system is ready for operation.

Refer to following drawing while installing the system: