



JAMES WRIGHT 2018

vertigrow 

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**Smart Modular  
Produce Grower**

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# Project Overview



Living in London for a year on placement, it quickly became clear that the density of people in the city and the proportion of residents living in flats and space constrained building meant for many, growing healthy fruit and veg was only possible indoors – an alien environment to these types of plants.

The desire for UK residents and city dwellers to grow their own fruit and veg is evident. **“There are over 90,000 people on the waiting list for allotments”** (National Allotment Association 2017). Some major UK cities address this with shared allotments and community gardens, of which there are 63 in London, however with major constituencies such as Westminster and Ealing still lacking these facilities, the president was set for the design of a home growing product for fruit and veg.

Not only does this proposal aim to counter the disparity we see from the sourcing of the food we eat to how it reaches our plate, it likewise aims to educate the user on food miles and the decisions made when purchasing highly convenient, often oversaturated food.





# Introducing Vertigrow

Vertigrow is a Smart Indoor Produce Grower designed to allow consumers to grow fruit and veg indoors whilst respecting the space constraints of small flats and city residencies.

Utilising a hydroponics system for reduced mess and ease of set-up and use in high-rise buildings, Vertigrow's smart water management is designed to acquaint users

Grow lighting with red and blue wavelength LEDs creates ideal growing environment. Cyclic lighting reminds user to top up water. Day/night cycle creates ideal growing conditions.

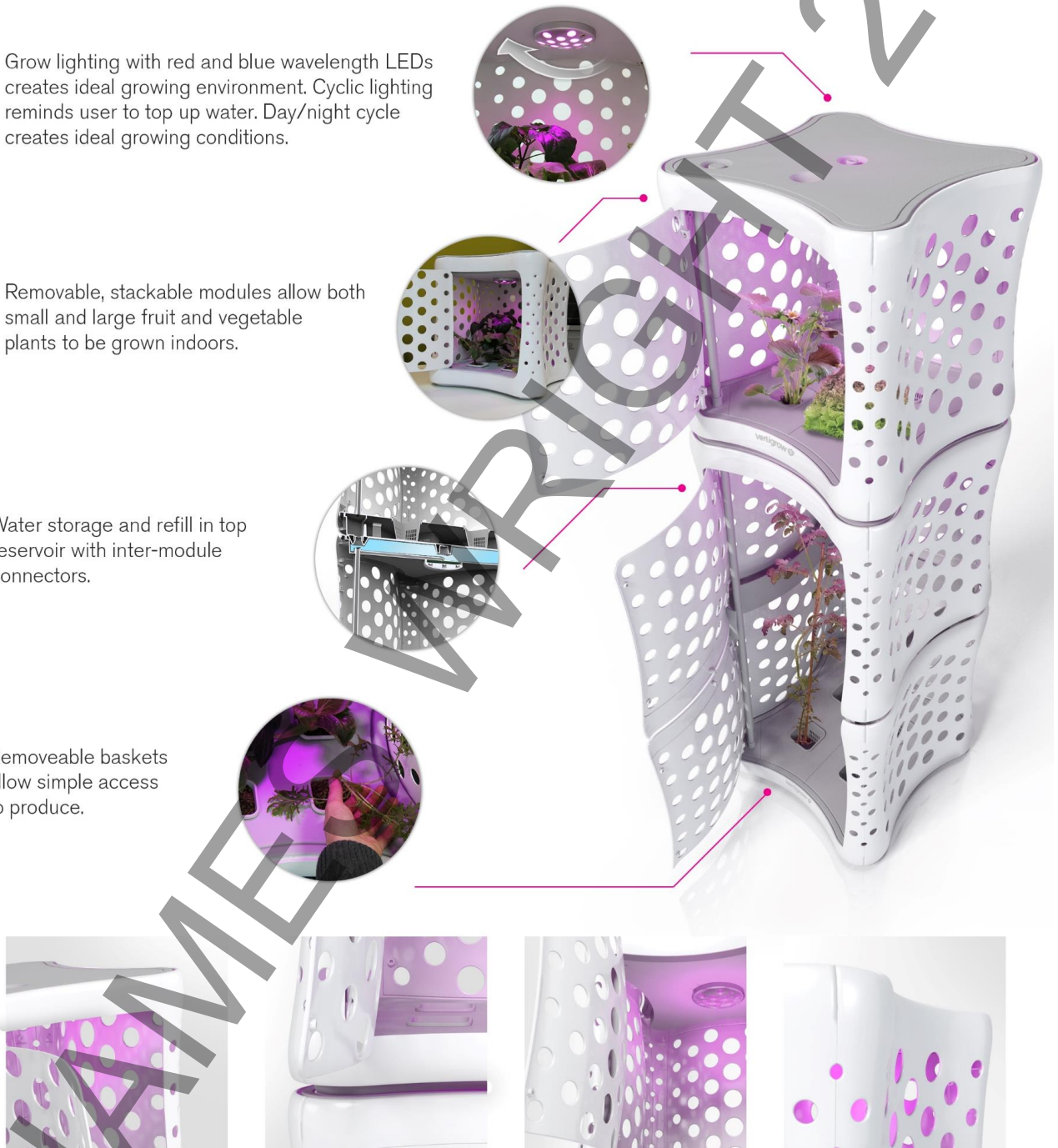
Removable, stackable modules allow both small and large fruit and vegetable plants to be grown indoors.

Water storage and refill in top reservoir with inter-module connectors.

Removeable baskets allow simple access to produce.

unfamiliar with the growing process how to effectively take care of their produce.

The removeable modules allow smaller, fast growing crops such as Pak Choi and Lettuce to be taken with the product to the dinner table, creating a focus for the dining experience. In this regard, Vertigrow can be regarded as the first product to bring the plant to the plate.



# Research



## Design Workshop

To gain an understanding of the type of product desired by a consumer in a flat or small residency, a host of potential user's were invited along to a design workshop.

A range of concepts were developed around the idea of indoor growing and evaluated by individuals including vegetarians/vegans, city dwellers, designers and allotment occupiers.

## Indoor Growing

Furthermore, initial primary research via indoor growing proved the concept of being able to produce veg crops with reliability, and hence paved the way for the product concept to be developed further.





# Testing



To understand the importance of a care system for the product, a collection of test rigs were developed as a joint testing project with course mate Daniel Mason.

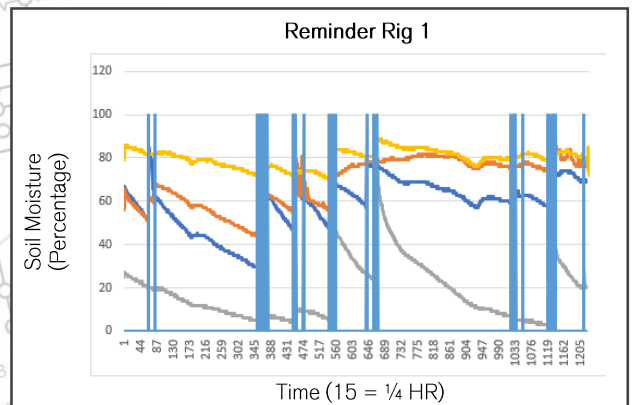
## Functionality

The rigs were developed to measure how well test subjects would remember water plants. Soil moisture sensors with Arduino Nano control and SD datalogging allowed highly valuable information to be recorded for analysis.

CAD design by Daniel and electronics and coding by James, the rigs included a slotted laser cut design and fully established prototype circuit.

Six test rigs were constructed, three with LED visual reminders and audible buzzers and three with none as a control.

After a three week test period, the results showed a reminder system for the product would be highly beneficial to its functionality and user experience.

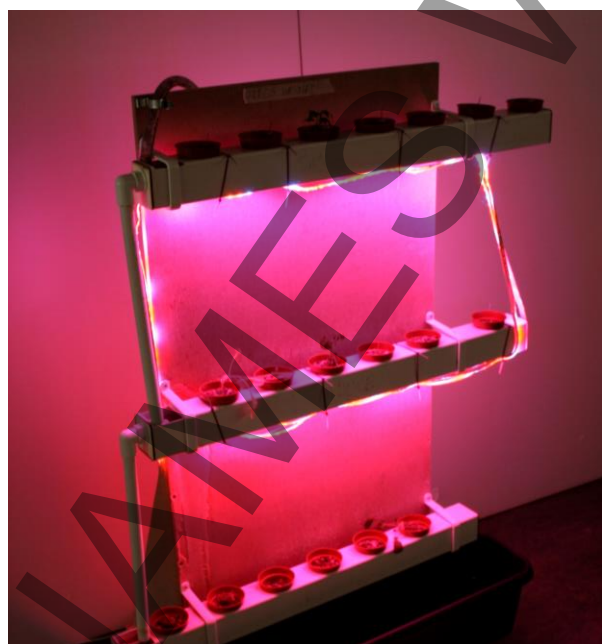


# Testing



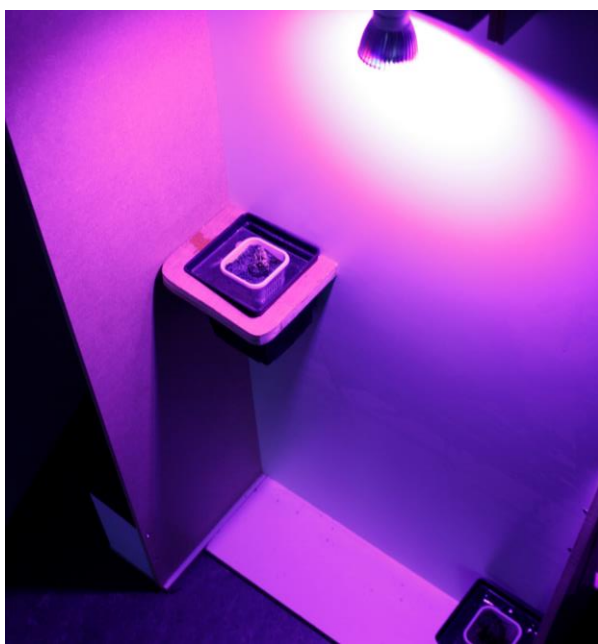
## Hydroponics Test Rig

A pumped N.F.T. hydroponics rig was developed to understand this method of growing. Hydroponics was explored with respect to its cleanliness and suitability to the city environment.



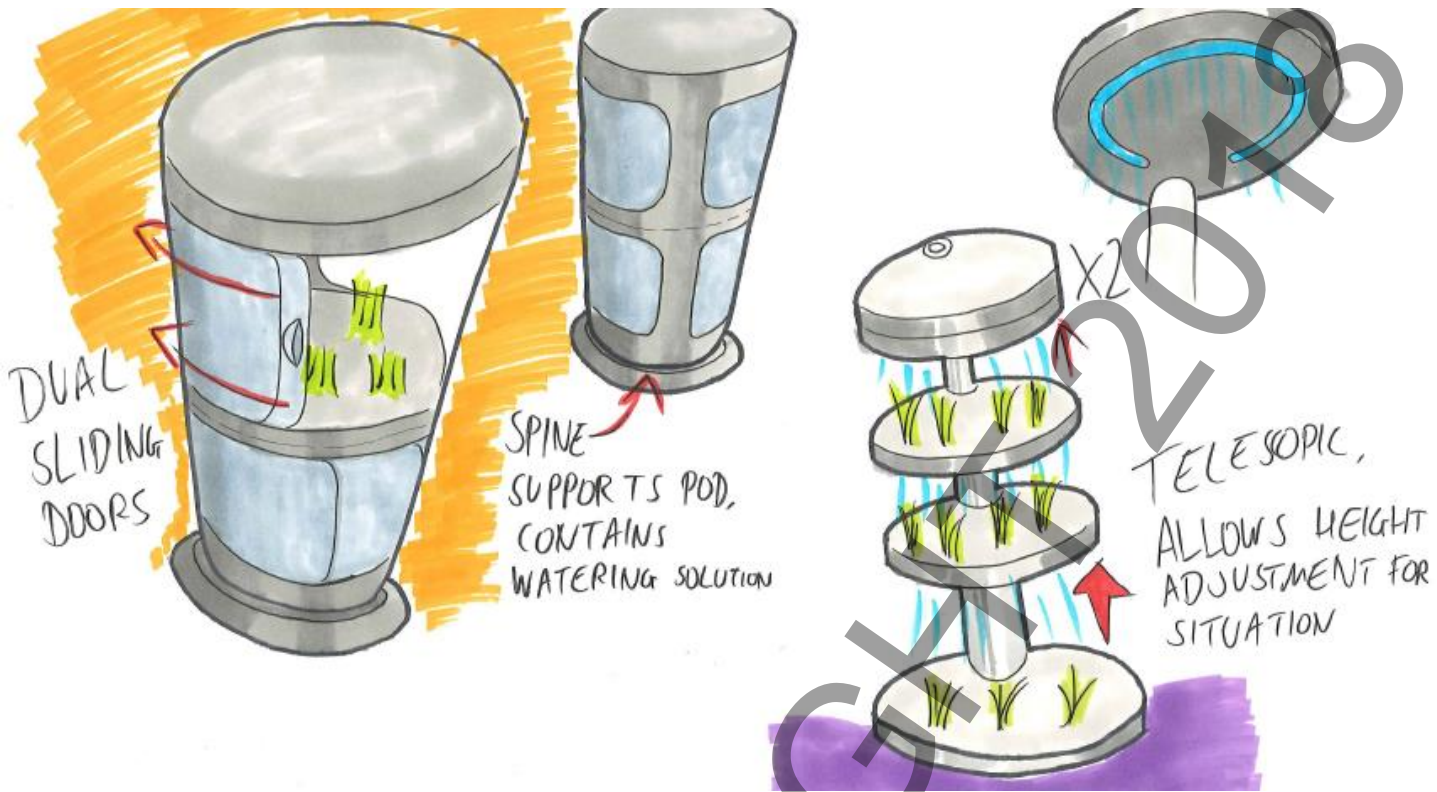
## Lighting Test Rig

A lighting test rig was designed as a method of understanding the differences between grow light power ratings and the importance of a day night cycle. Findings from this supported photoperiodism research earlier in the project.





# Concept Development



Starting from a modular totem with a removable tray system to transport plants, Vertigrow developed from a host of concepts to inspiration taken from architectural examples alongside concept model making to the form presented for the final product prototype solution. Vertigrow has been styled to be a centre piece for bringing the plant to the plate and allowing the user to show off their desire to grow their own their own healthy fruit and veg in a remarkable and novel manner.





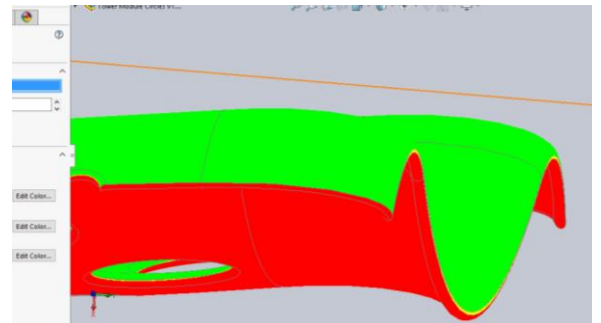
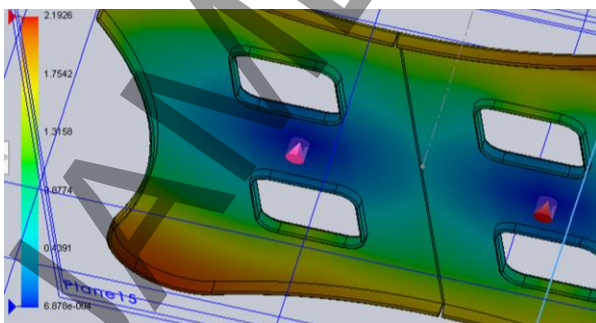
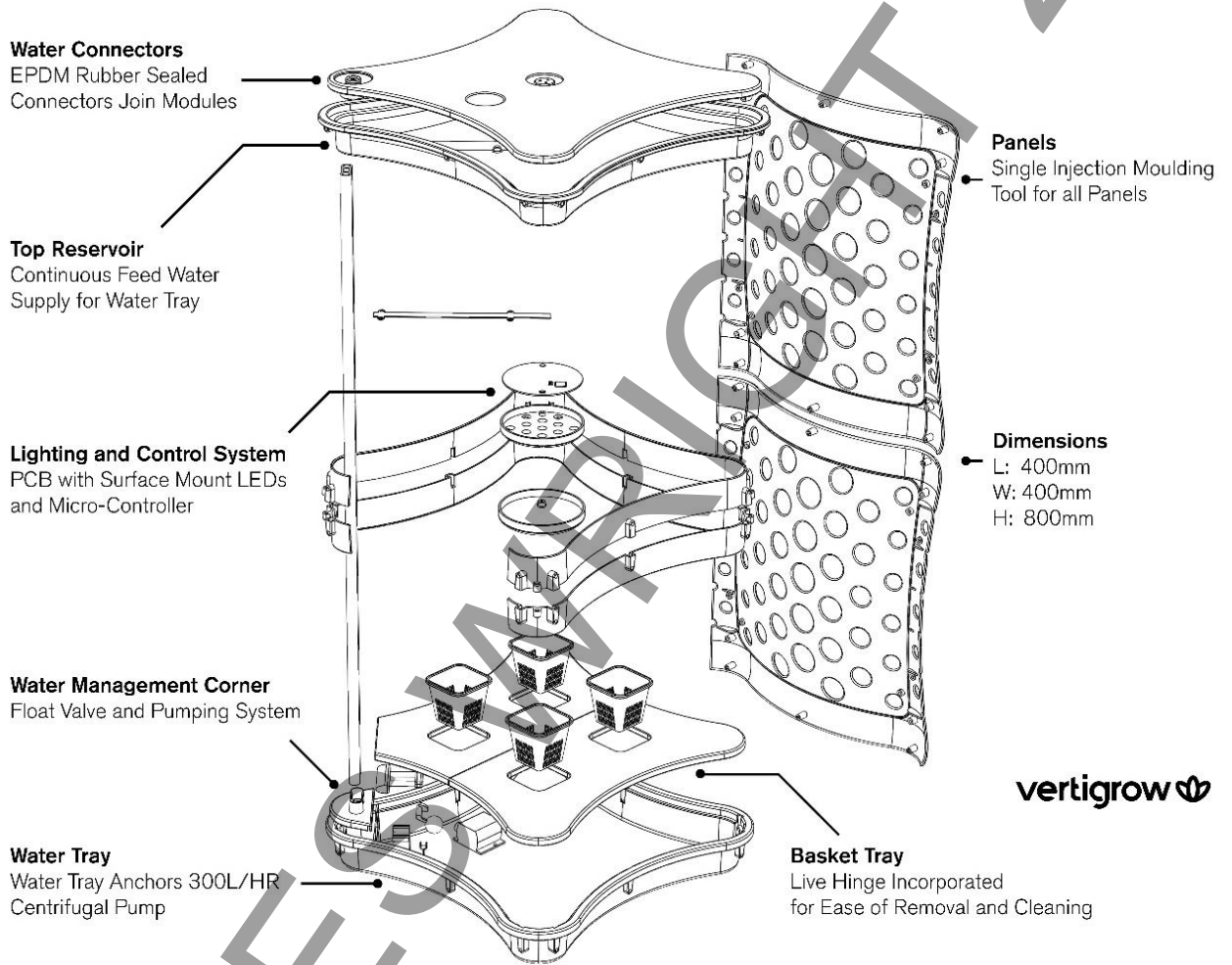
# Product Manufacture & Technical Overview

Vertigrow features a centrifugal pump to channel water from the base module to modules above. With a cyclic pattern LED smart reminder system, Vertigrow is able to react to low water levels and alert the user to care for the plants.

A top reservoir and float valve system allow the product to mechanically manage water flow to prevent overflow and damage to user's home.

Designed almost in its entirety for injection moulded manufacture, Vertigrow has undergone extensive draft analysis to ensure effective separation from injection mould tools, along with mould flow analysis to reduce sink marks and undesirable manufacture defects.

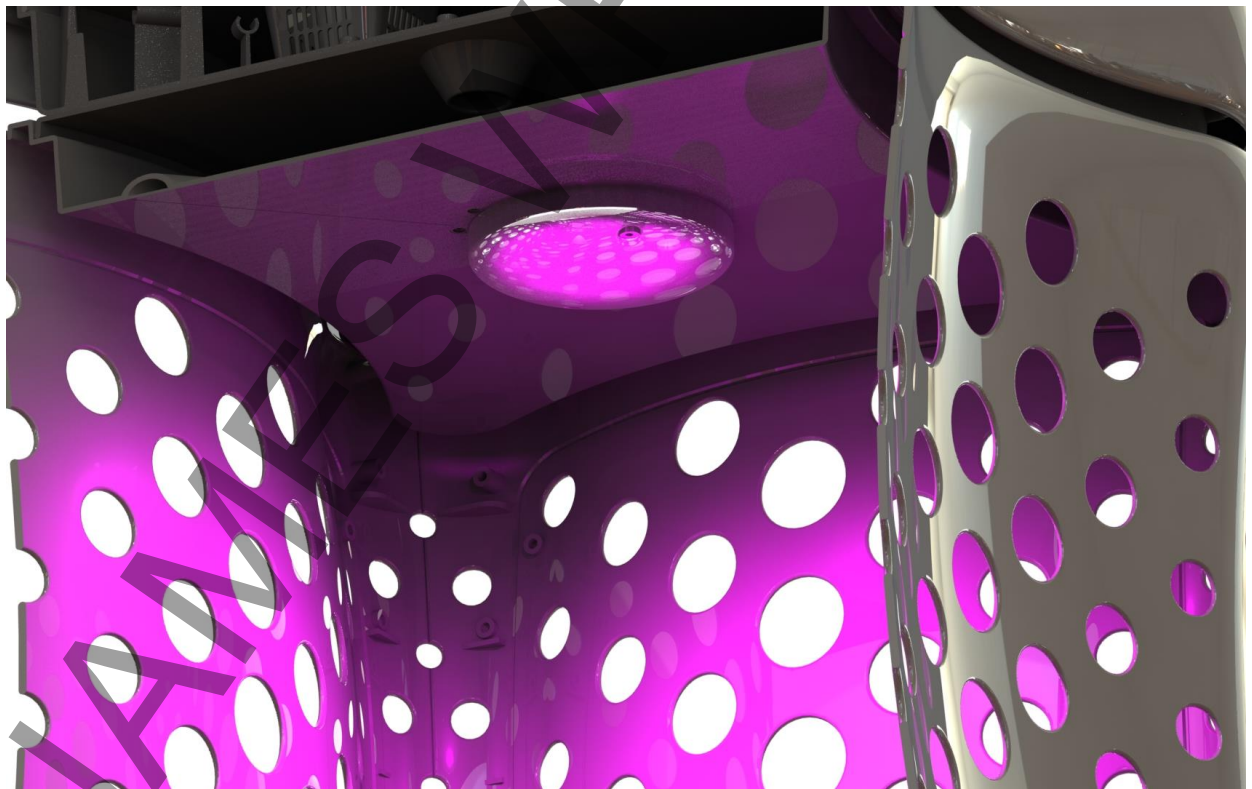
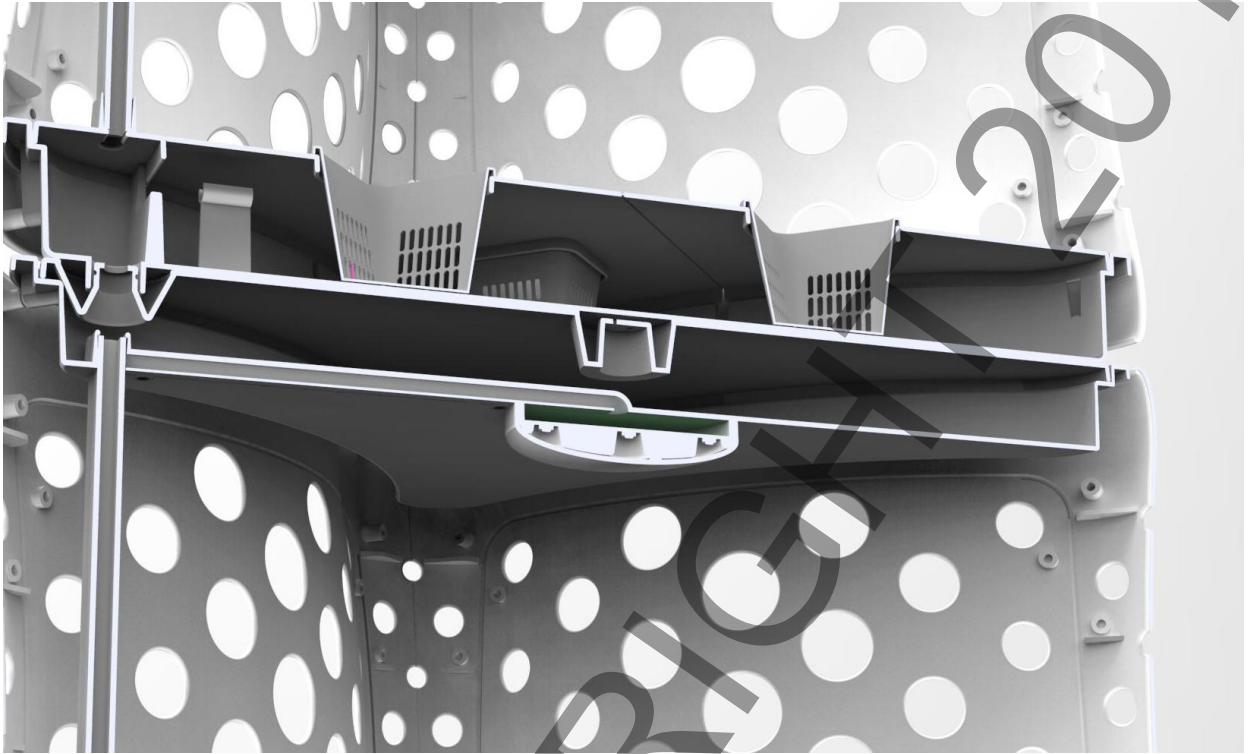
The panels are designed in such a way that all configurations of the door and frame can be produced from a single injection moulding tool.



# Technical Definition

The top mounted reservoir allows water to continuously fill the water tray, whilst connectors between modules allow water and power to be distributed throughout the

modules in use in the product. Water and power travel through a corner mounted plastic extrusion concealed at the hinge area for the product's door.

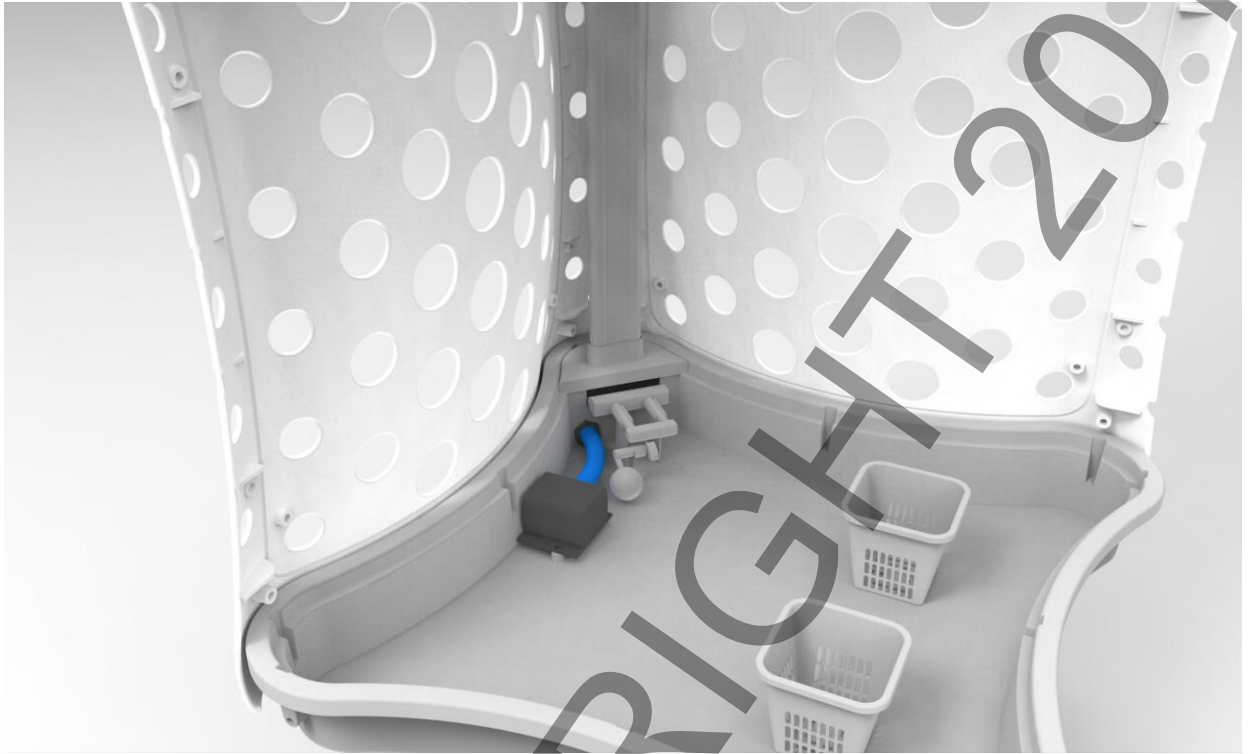




# Technical Definition

Pumping and water management is carried out in the hinged corner of the product, where a float valve mechanically manages the water level within the water tray.

Water connectors feature an interference fit EPDM rubber O-ring sealed design, which also acts to locate modules effectively when replacing them to the base module.



# Final Prototype





# Final Prototype



# Final Prototype





# Final Prototype



# Final Prototype





# Final Prototype



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