

2020

VERSION 17/1

# Technical Handbook

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# Welcome

Over the past twelve years we've designed, installed and maintained more square metres of living wall than any other company in the world.

A heritage in horticulture and innovative designs with global reach, we're on a mission to educate the world on how we can bring our urban landscapes to life, improve the air quality and create healthier spaces for people now and the future generations.

Our living wall system uses natural soil for optimum natural plant health. Our bespoke module is cradle-to-cradle meaning it is made from recycled material and is recyclable too.

We hope we inspire you to enhance structures naturally.



**Scott Anderson**  
Director



## What is a living wall anyway? Who's idea were they and how long have they existed?

Simply put, living walls (also known as vertical gardens and green walls) are vertical surfaces (inside or outside) covered with plants. Almost since the concept of cities was created, human civilisations have sought to integrate nature with their living style. Notably the Hanging Gardens of Babylon included vertical planting and hanging plants which are thought to be the first incarnation of the living wall.

The use of living walls has increased in modern times and a range of living wall systems have emerged with various intended applications and varying degrees of success.



The Hanging Gardens of Babylon

# Benefits



## Aesthetics

Planting patterns with varied species provide a stunning alternative to common building products.



## Improved Air Quality

Plant leaves filter out pollutants from the air and absorb dust particles.



## Increased Biodiversity

Living walls provide an alternative ecological habitats for insects, bats and birds.



## Temperature Regulation

Reduces the effects of 'urban heat island' in cities. Also acts as insulation to regulate a building's temperature which can even allow for the reduction in air conditioning requirements.



## Sound Insulation

Whether indoors or outside, plants absorb and deflect noise.



## Staff Morale

Many studies have shown the positive effect that plants can have on staff morale in the workplace.



## Property Value

Living walls have the potential to increase residential and commercial property value and can also help secure planning permission.



## Structure Protection

Outdoor structural protection from both ultraviolet rays and acid rain is increasingly important. Plants provide a natural answer to both of these considerations.



## Social Impact

Enhancing public areas can reduce vandalism including graffiti. Can have a further positive impact on both physical health and mental wellbeing.



## Branding Opportunity

Presenting your brand logo with foliage is a unique environmental statement.

Planting patterns with varied species provide a stunning alternative to common building products.

Aesthetics are always a matter of opinion, but most people will agree that a well maintained living wall makes a stunning feature. Shown below are a few ANS Living Walls to demonstrate the visual impact they can make.



## Plant leaves filter out pollutants from the air and absorb fine dust particles.

Leaves of plants provide a large surface area which is capable of filtering out particulate matter (PM<sub>x</sub>), other pollutants such as NO<sub>x</sub> (conversion to NO<sub>3</sub> and NO<sub>2</sub>) and CO<sub>2</sub> in daytime. A green façade will block the movement of particulate matter particles along the side of a building and filter them. Vegetation has a large surface area and also promotes vertical transport by enhancing turbulence. When concrete, brick, stone, glass and asphalt surfaces are heated during the summer period, vertical thermal air movements (upwards) are created and dust particles found on the ground are carried and spread in the air. Particulate matter is adsorbed by the leaves, twigs and stems and is an efficient sink for particulate matter. According to Hosker and Lindberg (1982) fine dust concentrations are reduced when particles are adhered to the leaves and stems of plants. Literature claims that by rainfall the adsorbed particulate matter is washed off into the soil or substrate below.

Heavy metal concentrations and fine particles were found on leaves of a green façade in the inner city of Dusseldorf (daily traffic level 12,500 vehicles). The same results were found by comparing ivy leaves from different sites (by counting particles on ivy leaves), the leaves from the sites exposed to a high daily traffic level, had collected a significant number of particles compared to the sites that are less exposed. Besides particle binding plants are also known to absorb gaseous pollutants through the stomata (CO<sub>2</sub> and NO<sub>x</sub>). Via photosynthesis CO<sub>2</sub> is sequestered in the leaves. Negative health effects of particulate matter pollution for humans stand for decreasing lung functions, increased respiratory problems, and other health care

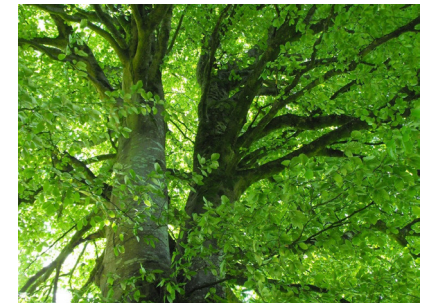
visits for respiratory and cardiovascular diseases. Besides these effects also durability problems are involved and include accelerated corrosion of metals, as well as damage to paints, sculptures and soil-exposed surfaces on man-made structures. The improved air quality by green façades has direct benefits for people who suffer a long disease. A decrease of smog formation will occur, and also durability or corrosion problems are reduced of urban infrastructure that is susceptible to damage from air pollution. Tree with a combined leaf surface area of 1600m<sup>2</sup> creates 1.71kg of O<sub>2</sub> and 1.6kg of glucose every hour (using 2.4kg of CO<sub>2</sub>, 96kg of H<sub>2</sub>O, and 25.5KJ heat energy). This level of production is equal to the oxygen intake of 10 humans every hour. Another study carried out by the University of Dresden (2009) with regard to the organic balance of a greened façade with 1000m<sup>2</sup> Hedera helix pointed out that in one year: 1019kg of water and 2351kg of CO<sub>2</sub> is consumed and bound respectively. In this reaction 5854 of organic mass (water content 4409kg and dry mass 1415kg) and 1712kg of O<sub>2</sub> is produced.

With the assumption of an leaf area index (ratio between leaf surface in m<sup>2</sup> and covered wall surface in m<sup>2</sup>) for Hedera helix of 2.6 up to 7.7m<sup>2</sup> leaf/m<sup>2</sup> wall (Bartfelder and Kohler, 1987). The following leaf surface area can be calculated for the façade. Average value of the leaf area index of Hedera Helix = 5.2m<sup>2</sup> leaf/m<sup>2</sup> wall taking a greened wall surface of 1000m<sup>2</sup> this results to: 5.2 x 1000 = 5200m<sup>2</sup> of leaf surface.

Comparing this with the investigated mature beech tree of Minke (1982) with a leaf surface of 1600m<sup>2</sup>, a greened façade with Hedera Helix is more efficient to adsorb CO<sub>2</sub> and to produce O<sub>2</sub>.



Hedera Helix



Mature Beech Tree

## Living walls provide an alternative ecological habitats for insects, bats and birds.

Vertical gardens can be designed as acceptable alternative ecological habitats. Particular species such as *Hedera helix* and climbing roses (*Rosa*) produce colourful berries enjoyed by birds in winter time. When we look at the façades or outside walls of buildings, green systems will show ecosystem characteristics, and they will function as a habitat, show structure, material and energy flows. It will also provide ecological services like breeding and resting habitat for birds which may be enjoyed by humans. Not only for micro-organisms an undisturbed habitat is created but also for smaller animals (bees, bats, birds etc) it is suitable.

Climbing plants are particularly favoured by birds and bats. Façades studied in Berlin show that mainly house sparrows, blackbirds and greenfinches are found between the climbers. Green façades functions hereby as a food source (insects) and as a nesting or breeding opportunity.

The current form of urbanisation is negative for house sparrows; since the current building design leads to a lack of nesting occasions in buildings (Vogelbescherming Nederland, 2010). A wide

range of artificial structures have been used throughout the world to provide nest sites for a great range of birds and bats.

Many types of these artificial nest boxes can be attached or incorporated to the outside of new or existing (green) buildings. Integrating nature on new buildings allows for the possibility to choose for built-in nest boxes which can be incorporated into the ecological design. Last but not least watching these animals can be a source of considerable pleasure to city dwellers as well. Incorporating nest boxes into green façade concepts (linking of functions) will increase the impact of these measures relatively to when applied separately.

Not only birds are attracted by green façades and roofs. A biodiversity study of 17 green roofs in Basel identified 245 beetle and 78 spider species in the first three years after installation of the roof. Eleven percent of beetles and 18% of the spiders were listed as rare or endangered. Also Kohler (1988) concluded from his research that climbing plants (for example *Hedera Helix* and *Parthenocissus*) form an important habitat for insects. Mainly beetles, flies and spiders are found inside a green façade.



Bird nesting in a living wall



Bees pollinating a living wall

Living walls reduce the effects of 'urban heat island' in cities. They also act as insulation to regulate a building's temperature which can allow for the reduction in air conditioning requirements.

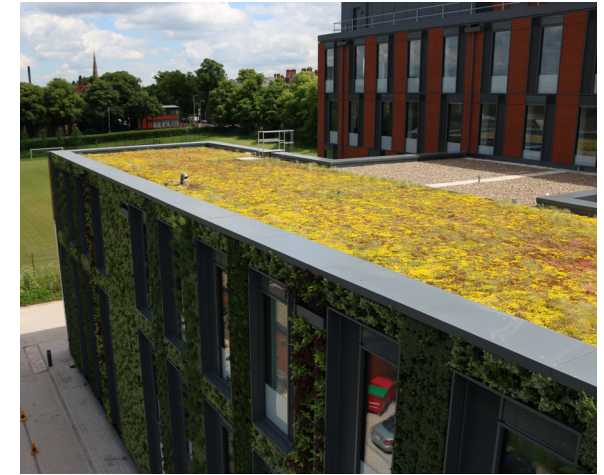
Living walls and green façades create their own specific micro-climate, quite different from surrounding conditions. Due to this specific micro climate both around the building and at grade are affected. Hard surfaces of concrete and glass encourage runoff of rainwater into the sewage system. Plants buffer water on their leaf surfaces longer than building materials, and the processes of transpiration and evaporation can add more water into the air. The result of this is a more pleasant climate in the urban area. Between façade and the dense vertical green layer (for both rooted in the subsoil as rooted in artificial soil based systems) a stagnant air layer exist. Stagnant air has an insulating effect; green façades can therefore serve as an "extra insulation" of the building façade.

Also direct sunlight on the façade is blocked by the vegetation. This ensures that the temperature will be less high inside a house. In winter, the system works the other way round and heat radiation of the exterior walls is isolated by evergreen vegetation. In addition it is claimed in literature that dense foliage will reduce the wind speed along the façade and thus also helps to prevent that the walls will cool. As a consequence every decrease in the internal air temperature of 0.5°C

will reduce the electricity use for air conditioning up to 8%. Green façades and roofs will cool local air temperatures in two different ways. First of all, walls behind greened surfaces absorb less heat energy from the sun (traditional façade and roof surfaces will heat up the air around them). This effect is clearly visible where uncovered parts of the façade are heated up and the parts covered with leaves considerable lower. Secondly, green façades and roofs will cool the heated air through evaporation of water (for evaporation of 1kg water, 2.5 MJ of energy is necessary); this process is also known as evapo-transpiration.

Most of the sun's radiation that is adsorbed by concrete, bituminous materials or masonry is re-radiated as sensible heat. Asphalt, concrete and masonry will reflect 15 to 50% of the received radiation they receive, greening paved surfaces with vegetation to intercept the radiation before it can it hard surfaces can reduce the warming up of hard surfaces, especially in dense urban areas. In an urban heat island effect situation, even night air temperatures are warmer because of built surfaces adsorb heat and radiate it back during the evening hours.

From 100% of sunlight energy that falls on a leaf, 5-30% is reflected, 5-20% is used for photosynthesis, 10-50% is transformed into heat, 20-40% is used for evapo-transpiration and 5-30% is passed through the leaf. In the urban area, the impact of evapo-transpiration and shading of plants can significantly reduce the amount of heat that would re-radiated by facades and other hard surfaces.





## Whether indoors or outside, plants absorb and deflect noise.

Living walls that are of a modular design are proven to absorb sound better. Sound levels can be reduced by around 10dB.



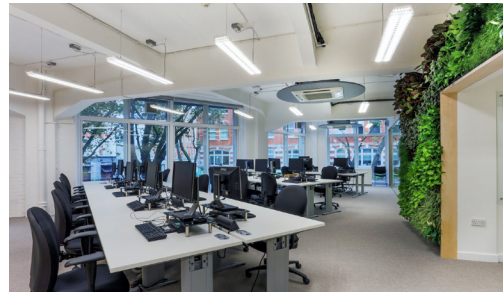
This ANS Living Wall was installed in the noisy baggage reclaim area at Christchurch Airport to reduce noise levels.



Likewise, this ANS Living Wall was installed at the NEC exhibition centre as a sound barrier to deaden noise from the arena.

## Many studies have shown the positive effect that plants can have on staff morale in the workplace.

New University of Technology Sydney (UTS) research made possible by nursery levy voluntary contribution funding has found strong evidence supporting the benefits of office plants for reducing stress and negative mood states in office workers. Plants were found to promote wellbeing, and therefore, potentially performance. Staff who had plants placed in their offices showed reductions in stress levels and negative feelings of a magnitude of 30 to 60%, while those with no plants recorded increases in stress and negativity of 20 to 40%, over the 3-month test period. Importantly, just one office plant was enough to make all the difference. In this Nursery Paper, the researchers involved outline their findings.



## Living walls have the potential to increase residential and commercial property value and can also help secure planning permission.

Living walls are often used to enhance the prospects of securing planning permission. Many councils require a certain amount of green space to be allocated in a scheme, this can take up valuable development space. With a living wall on the building facade, the green space can be achieved while maximising the development.



This ANS Living Wall was installed at the Aveda - Moyo hair salon in Dublin and the owner enjoyed a 30% increase in sales the following year

Improve environmental performance of buildings helping it reach accreditation like BREEAM. This can make a building more desirable. Living walls also have the potential to increase residential and commercial property value or soften newly built properties.

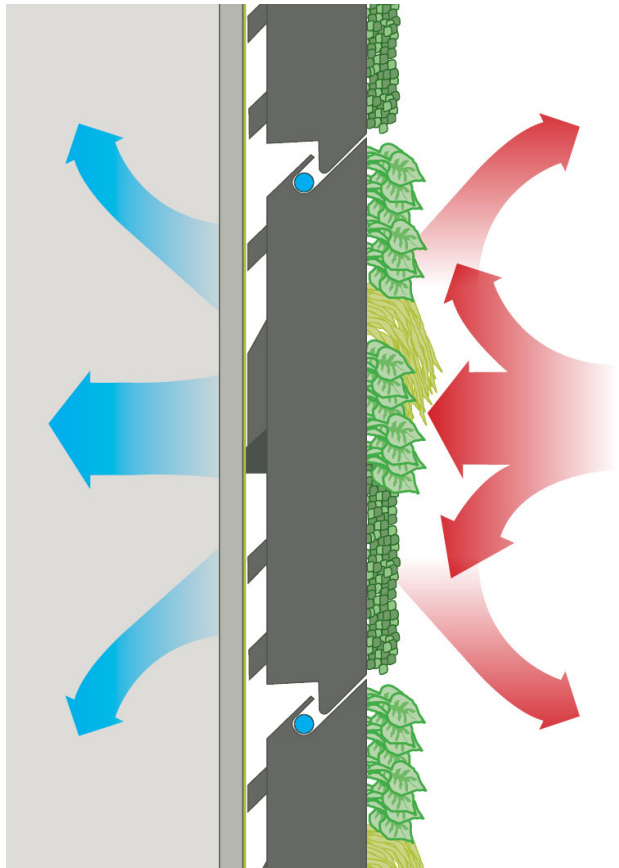
Another economic contribution is for shops which are struggling to stand out and get noticed in a retail environment. The visual impact of the living wall will draw shoppers attention and provide the ability to make shopping a memorable experience.



Likewise, this wall was installed for The Body Shop in London, the wall contained a map with global herbs matching the soaps in store.



**Outdoor structural protection from both ultraviolet rays and acid rain is increasingly important. Plants provide a natural answer to both of these considerations.**



Besides that, the green plant layer will also reduce the amount of UV light that will fall on building materials. Since UV light deteriorates material and mechanical properties of coatings, paints, plastics etc. Plants will also have an effect on durability aspects. This is a beneficial side effect which will have a cost effective effect on maintenance costs of buildings. The denser and thicker the plant layer on the green façade, the more beneficial these effects are.

**30% of heat reflected by the plants leaves**

**50% of heat absorbed by the living wall**



## Enhancing public areas can reduce vandalism including graffiti. Can have a further positive impact on both physical health and mental well-being.

People seem to feel better in a green environment which is mainly related to psychological influence. This phenomenon is called biophilia and suggests that people feel better next to all that is alive and vital. It is a feeling of a bond between humans and other live forms that comes from "the connections that human beings subconsciously seek with the rest of life" (Wilson, 1984).



Studies conducted in the past show clearly the effects that plants have on human health. For instance, it is found that visiting a botanical garden lowers blood pressure and reduces heart rate. Ulrich (1991) show that the presence of vegetation will speed up recovery from stress and in earlier research Ulrich (1984) pointed out that patients with windows looking on a natural scene had shorter postoperative hospital stays. Fjeld (1998) show that in an office space the score sum of symptoms of discomfort was 23% lower during the period when subjects had plants in their offices compared to the control period.



## Presenting your brand logo with foliage is a unique environmental statement.

Grow your brand (literally)! From covering your entire building with plants to a small entrance

feature with big impact. Using a living wall with your brand is a great way to demonstrate sustainability. Not only can it reflect a brands sustainability policy, but it can also help justify the expense of a living wall.



As in this example of Marks & Spencer, using a sign in front of the living wall allows for accurate branding.



Using illuminated signs can draw more attention to both the living wall and the brand message.



As in this example from a residential situation, wording can be achieved in the planting.



### Hydroponic

This living wall system uses a man-made substrate (such as rock-wool or insulation) for the plants to take root in. The wall requires an almost constant irrigation supply containing chemical based nutrients needed to feed the plants. The plants are kept alive in an artificial and unnatural way which limits the choice of plants.

The plants root hairs are offered insufficient protection and should the irrigation fail even for just two days, the entire wall is susceptible to drying out with devastating effect (pictured above).

ANS Global do not install hydroponic systems. While they can work in some applications the risk of failure is too great.



### Wire mesh

This living wall system comprises of stainless steel wires which trailing plants grow up. This method provides a cost effective solution for large areas with the added benefit of low annual maintenance.

The plants will however take a number of years to establish and are never likely to achieve full coverage. The planting is restricted to trailing plants only and it is impossible to create shapes, patterns or wording in the wall.

ANS Global can install wire systems where required, however it is not a true comparison to the ANS LivingWall system



### Pocket planters

Either made from woven fabric with pockets for each plant or with plastic pots with one or more plant per pot. These systems can look impressive with a full coverage when initially planted. In the long term however the constrained rooting space causes plants to fail frequently. This leads to higher maintenance costs with plant replacements or an unsightly failing wall.

Some pocket systems are very basic and lack automatic irrigation systems, while others do include irrigation.

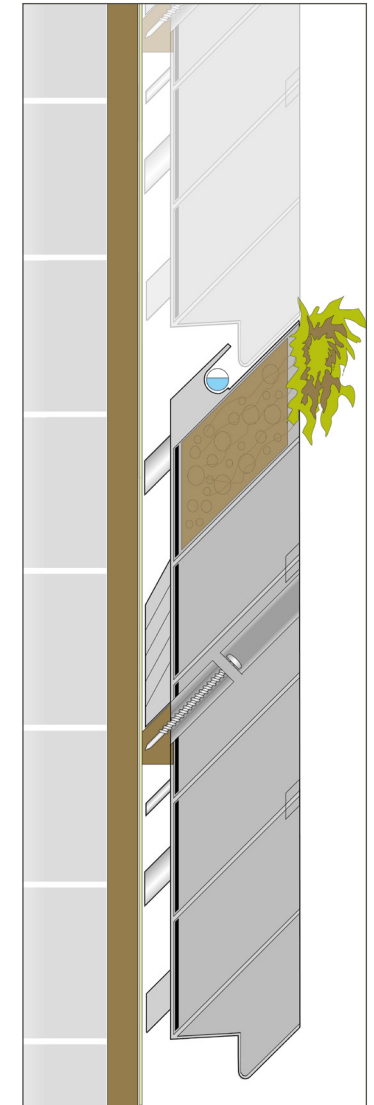
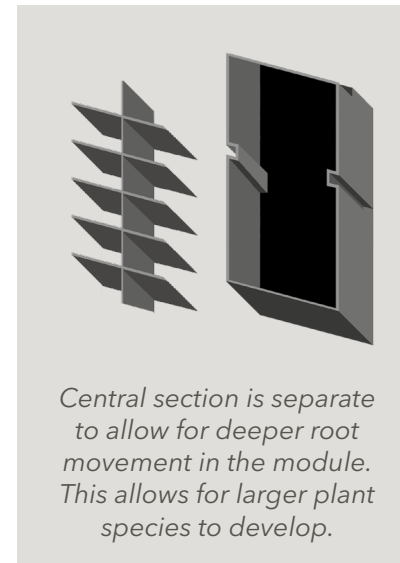
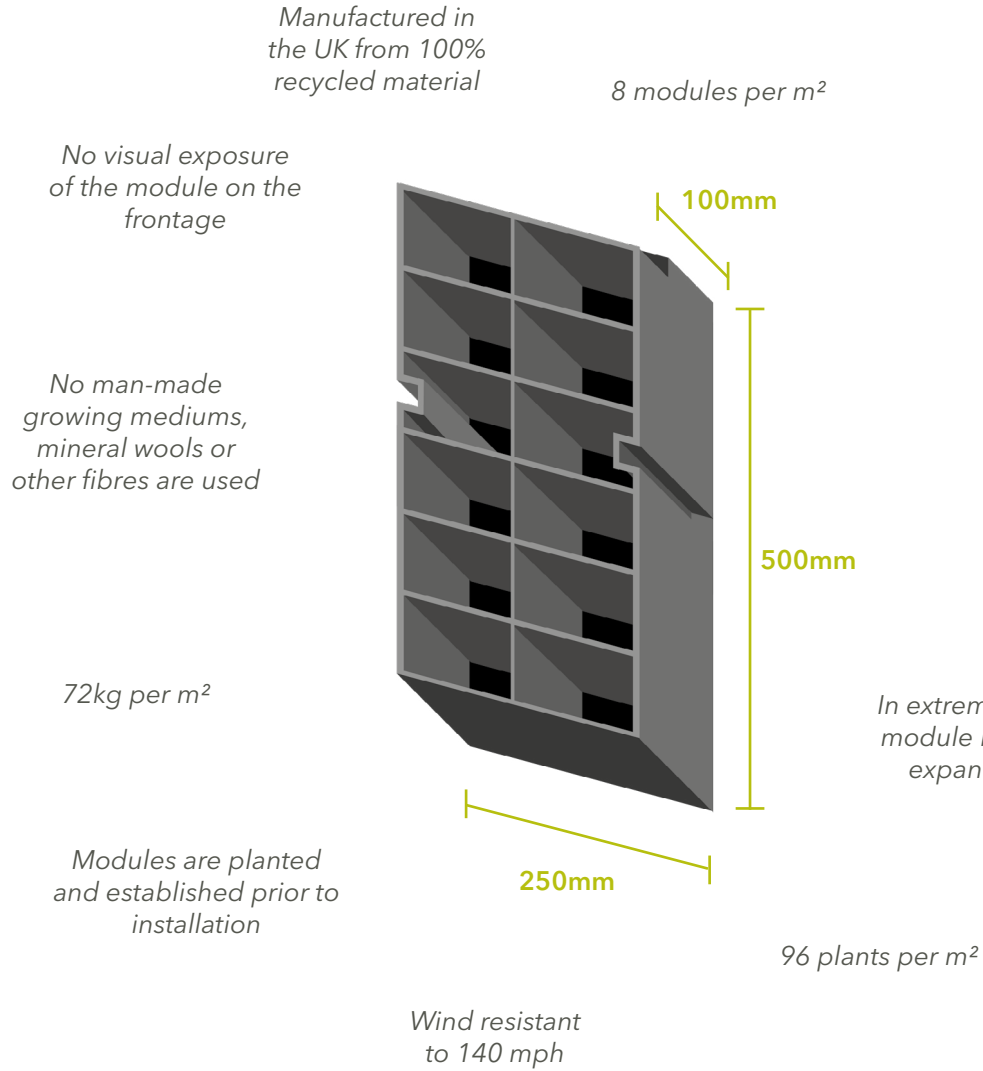
Overall these systems offer a false economy with low initial costs but a long term struggle to keep the plants alive.

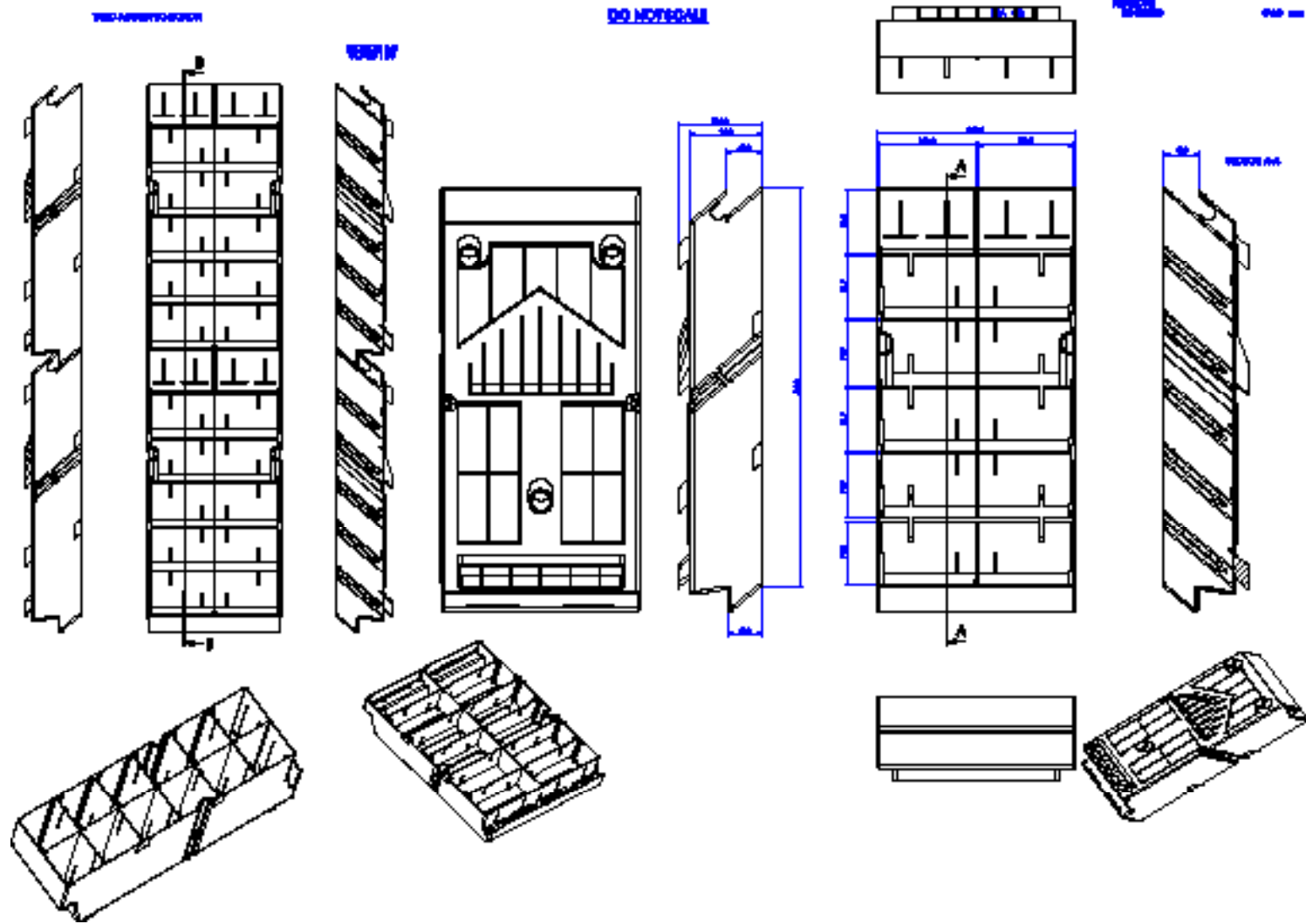


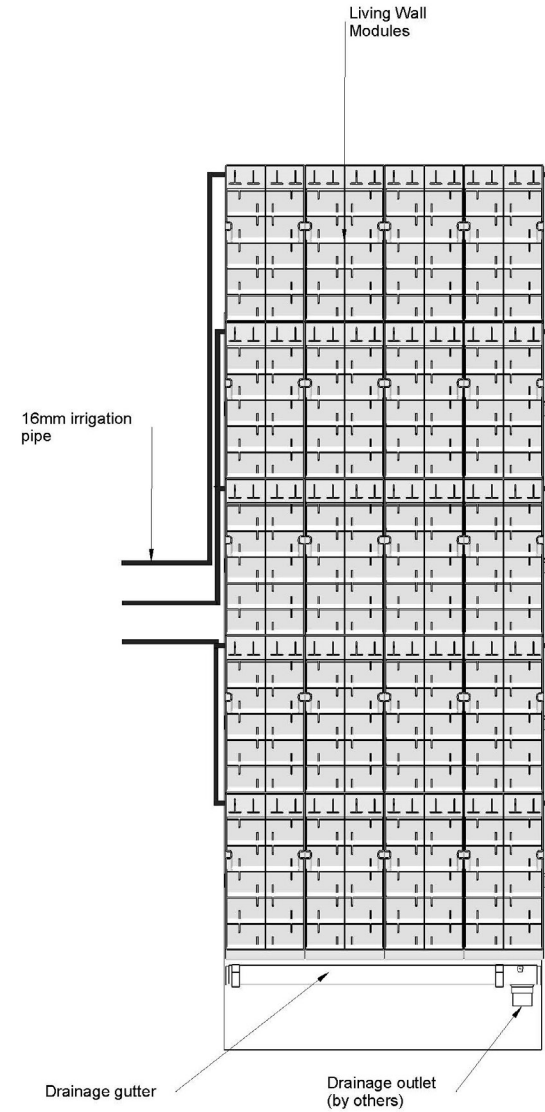
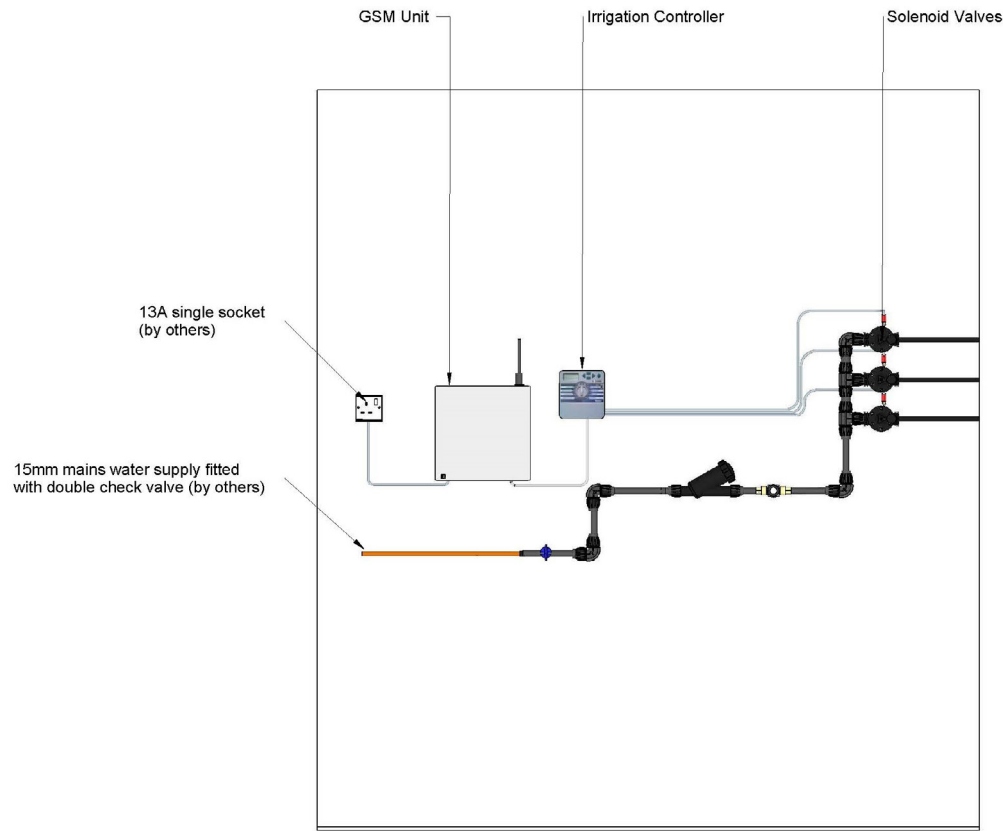
### Modular natural soil

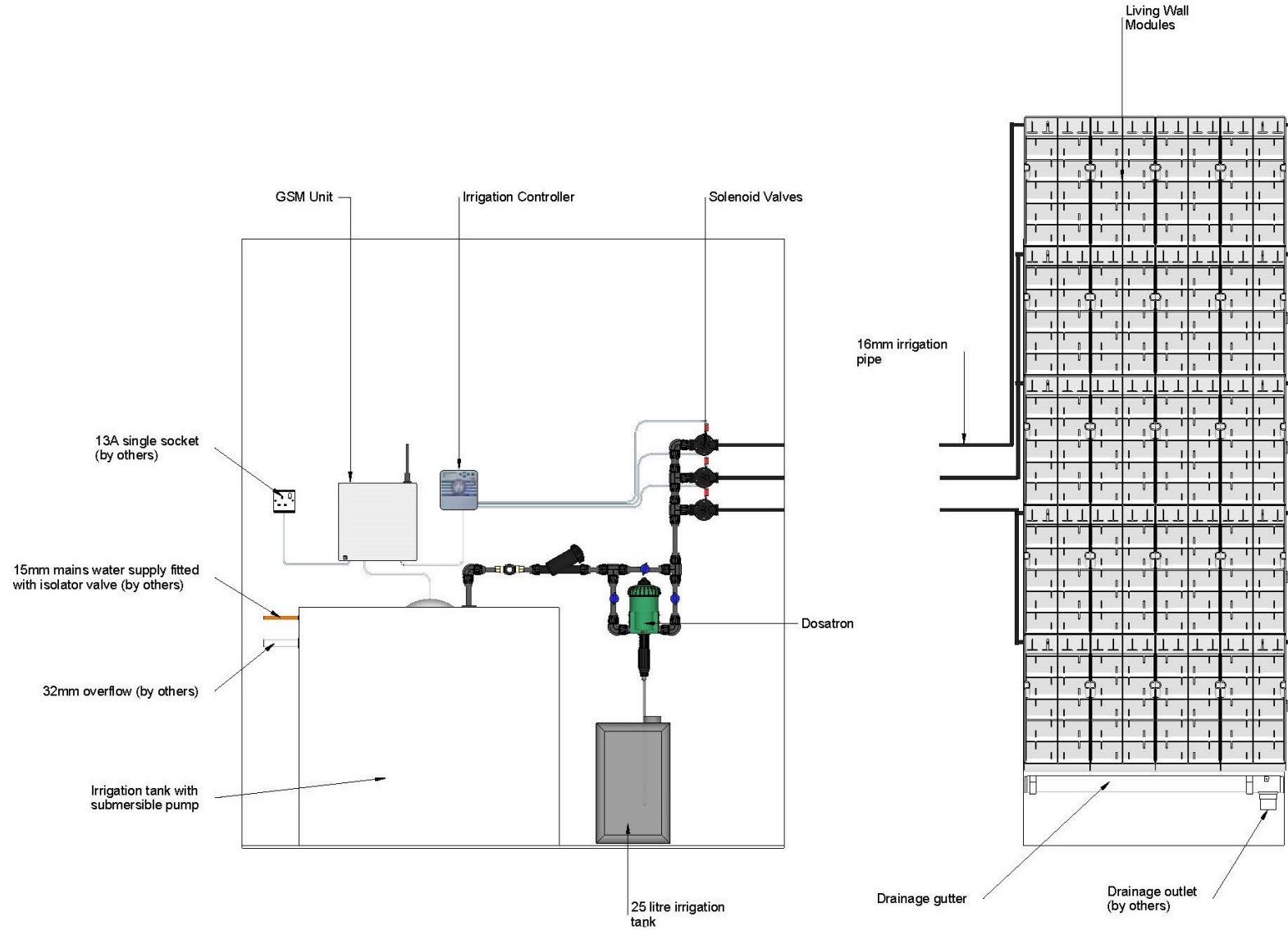
This living wall system uses a natural soil based media as the plant substrate. The plants are therefore growing in their natural environment which allows for healthy natural growth. The system allows for a huge range of plant species and the planting facilitates creativity with shapes, patterns and words. The living wall can be installed fully established giving instant impact. Natural soil is a long term stable environment for the plants, even if the irrigation should fail, the plants root hairs are protected by the contracting soil guaranteeing longevity of the wall.

The ANS LivingWall system is a patented, modular and proven natural soil system.









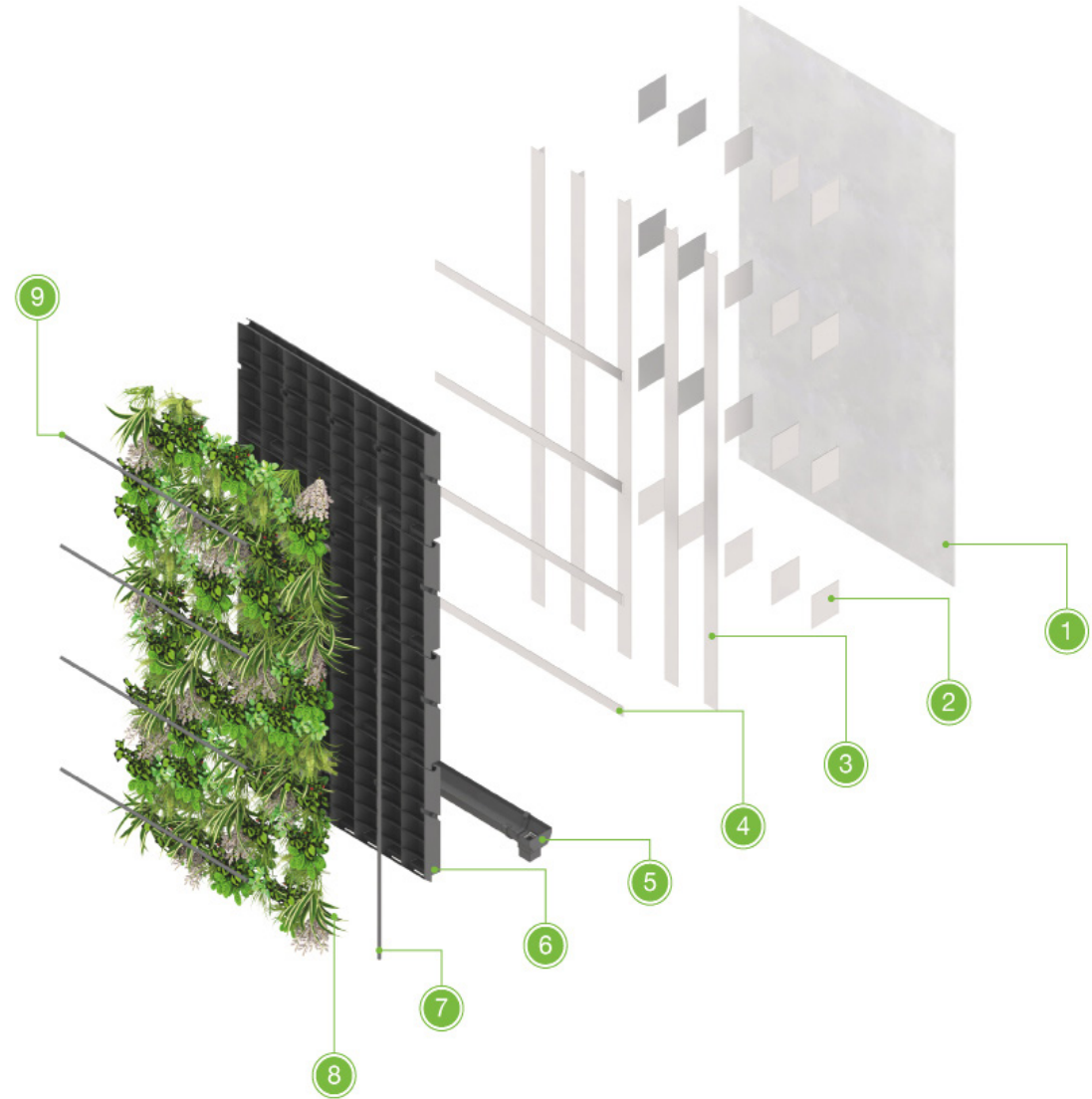
Drainage is needed to cater for the minimal run-off at the bottom of the living wall.

As standard practise we will install a 107mm x 51mm black plastic gutter. However there is no limit to your creativity in specifying different drainage channels, as per the following examples:



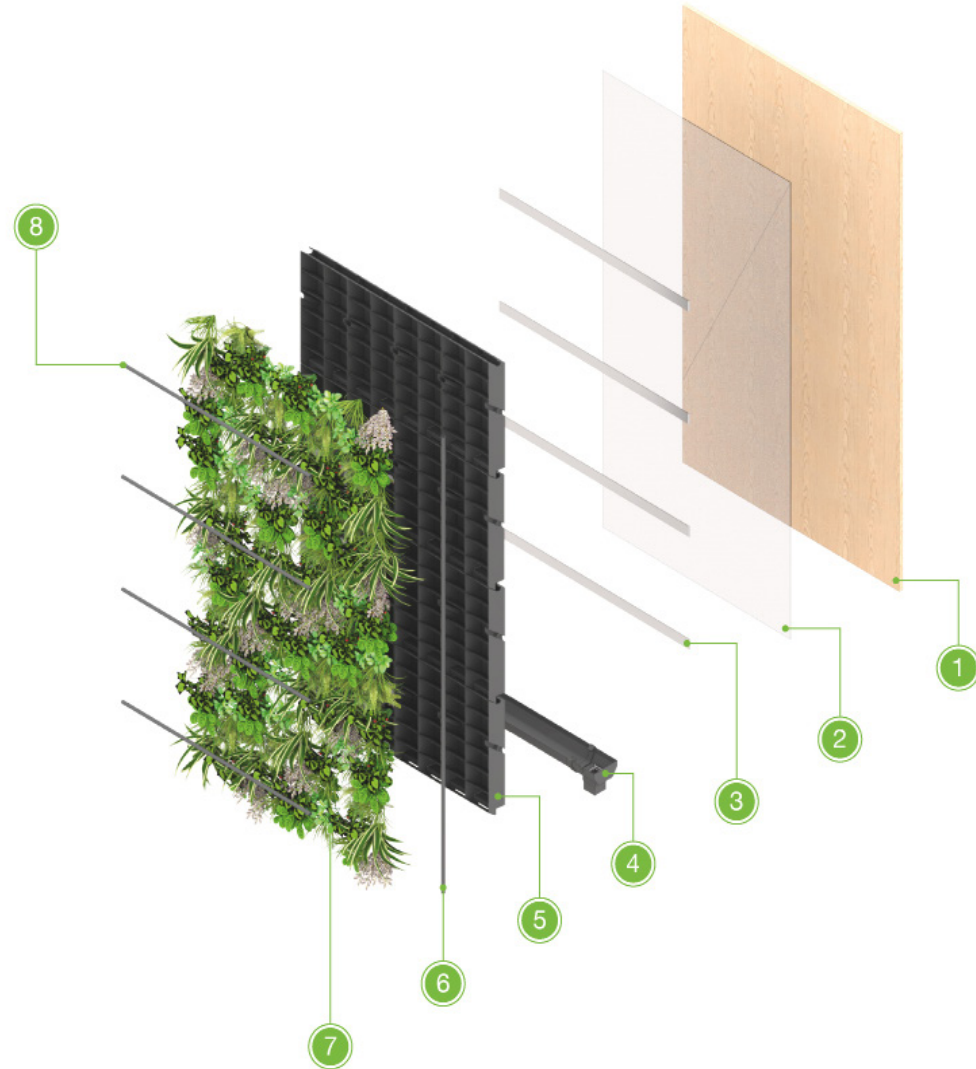
## Helping Hand System

1. Indicative brick or concrete surface
2. Helping hand 'L' bracket
3. Vertical 'T' rail
4. 48x12mm ANS Fixing Rail
5. Osma Squareline Gutter or client specified
6. ANS Living Wall Module 500x250x100mm
7. 16mm vertical irrigation pipe
8. Planting
9. 16mm inline emitter pressure regulated irrigation pipe



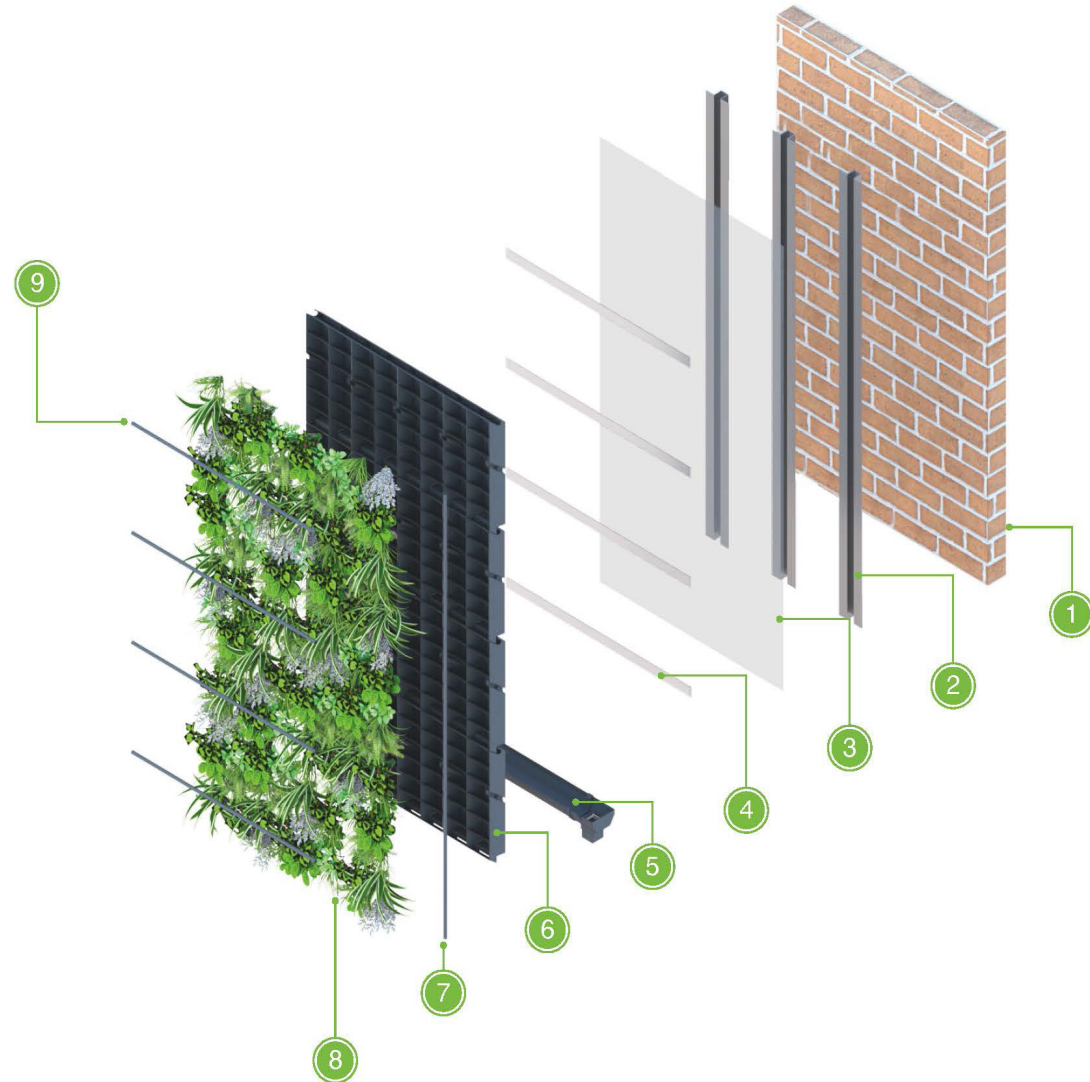
## Backing Board

1. Backing board
2. Waterproof membrane
3. 48x12mm ANS Fixing Rail
4. Osma Squareline Gutter or client specified
5. ANS Living Wall Module 500x250x100mm
6. 16mm vertical irrigation pipe
7. Planting
8. 16mm inline emitter pressure regulated irrigation pipe



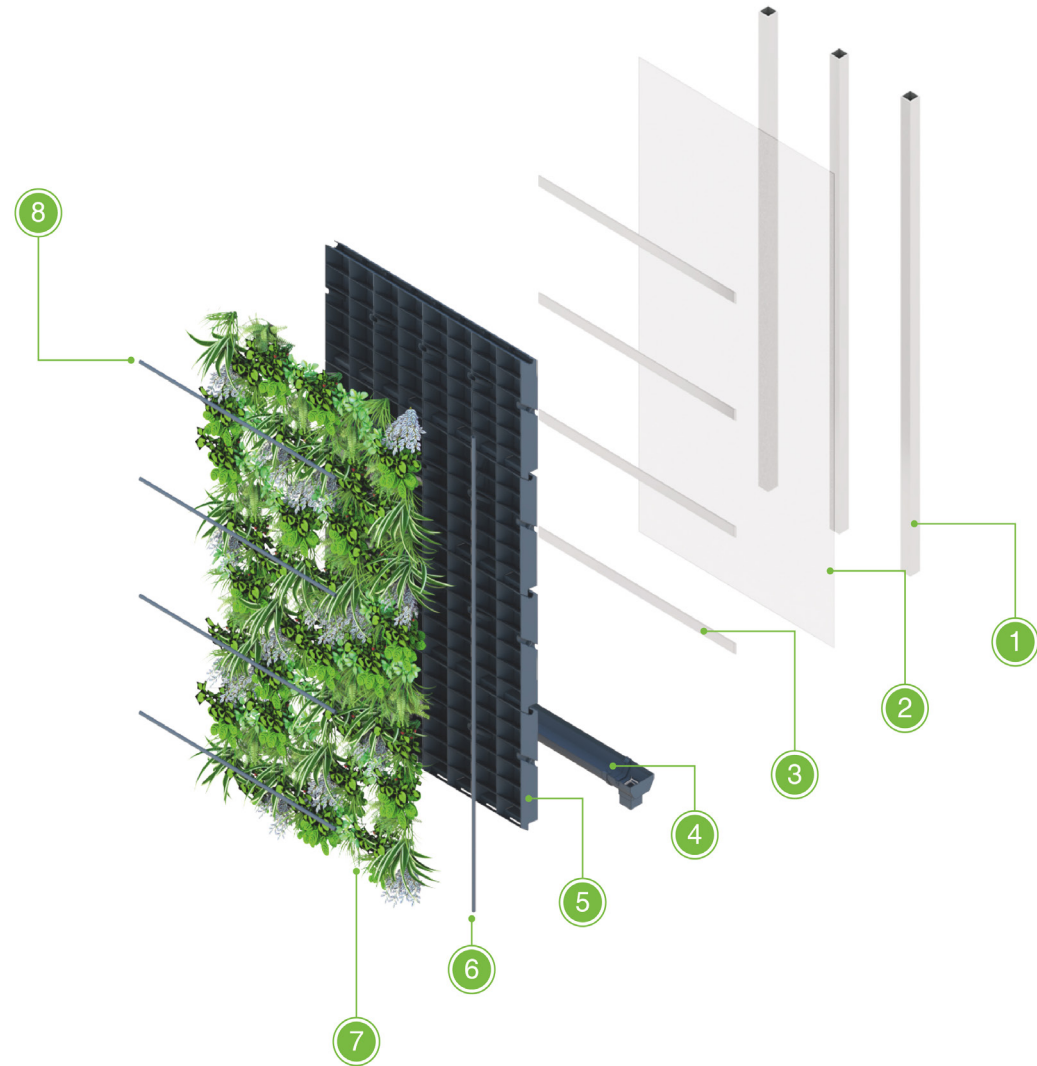
## Aluminium Batons

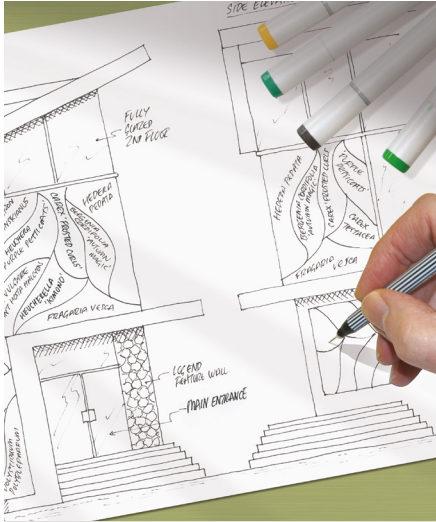
1. Indicative brick or concrete surface
2. Vertical Omega carrier rail
3. Waterproof membrane
4. 48x12mm ANS Fixing Rail
5. Osma Squareline Gutter or client specified
6. ANS Living Wall Module 500x250x100mm
7. 16mm vertical irrigation pipe
8. Planting
9. 16mm inline emitter pressure regulated irrigation pipe



## Steel Frame

1. Existing steel frame - maximum 600mm horizontal centres
2. Waterproof membrane
3. 48x12mm ANS Fixing Rail
4. Osma Squareline Gutter or client specified
5. ANS Living Wall Module 500x250x100mm
6. 16mm vertical irrigation pipe
7. Planting
8. 16mm inline emitter pressure regulated irrigation pipe





## Design

A successful living wall project starts with a thorough planning and design stage. Living walls are such a visual feature so our design team will prepare a range of visualisations to help you decide on exactly what plant mix and features you want to include. Our full proposal includes project costs, visualisations and time-scales. This puts you in control of the process and gives you the confidence to sign off the proposal.



## Planting

Once our proposal has been signed off we produce a full planting plan in our bespoke software. Our team will select the plants needed for the living wall and plant them into the ANS LivingWall modules. As the modules are planted, they are placed vertically (pictured) to fill out and grow prior to delivery to site. We normally allow for a minimum establishment time of 3-4 weeks for internal living walls and 6-8 weeks for external.



## Installation

Our standard method is to fix back to an existing structure, such as concrete or brickwork. We can also add a steel or timber frame if required. The living wall modules are pre-grown providing instant impact from the day of installation. We have improved our method over the years and can always find a way to bring your dream to reality. Our friendly team is renowned for their fast work and maintaining a neat and tidy site.



## Maintenance

All living walls require a maintenance schedule, which will be tailored to each project based on the location, aspect, plant mix, light levels and seasonal changes. Our teams will remove any airborne weeds, dead leaves and check for pests or diseases. The irrigation is recalibrated for each season. We will always maintain a tidy workspace and our friendly team will do their best to answer any questions while on site.

Not every living wall system can work in every climate. Getting plants to grow and thrive vertically can be challenging in any climate, so when you consider the variation from the freezing cold of

Sweden to the scorching heat of Dubai it is no wonder that many systems do not work globally. The ANS System has been proven to work in any climate, and here's why.

**ORGANIC SUBSTRATE MIX**

The organic substrate mix in the ANS Living Wall system can be optimised to the local environmental conditions. Also the use of natural soil protects the plants roots in high temperatures as it contracts and swells with the roots. The module also allows them to migrate around the module preventing them becoming pot-bound.

**CONTROLLED IRRIGATION**

The irrigation in the ANS Living Wall system can be carefully zoned to cater for the needs of each plant and the climate. Remote monitoring allows the irrigation to be adjusted from anywhere in the world. The system has proved successful on cruise ships which travel through a wide range of climates.

**TEMPERATURE RANGE**

The ANS Living Wall module has been designed and manufactured to remain perfectly in-tact within its temperature range of -40 degrees (centigrade) to +80 degrees. In extreme weather the module is designed to expand externally.

**BESPOKE EMITTER PIPE**

Likewise, the irrigation pipe is manufactured exclusively for the ANS Living Wall system and is designed to be very lasting in a range of temperatures. The irrigation can be turned off in freezing temperatures to prevent pipes bursting.

**LOCAL PLANTS CAN BE USED**

Plant choice is one of the most crucial factors in a successful living wall, particularly in extreme climates. The ANS system allows for an extremely wide range of plant types. When working in new regions we will carry out a full plant survey to find suitable local species.

**PRE-PLANTING AND ESTABLISHMENT**

The ANS Living Wall system is modular which allows it to be pre-planted, acclimatised and established at a nursery before delivery to site. This not only makes the living wall look excellent as soon as it is installed but also prepares the plants in a controlled environment.



Crystal Cruises uses the ANS Living Wall system to work with the ever changing climate on board.



Ursvik Recycling centre in Sweden has been successfully installed for years and proves that the ANS system can cope with the cold.



The Ritz Carlton in Bahrain has thrived over the years and is a great example of the ANS Living Wall system working in extreme heat.

## ANS Living Wall System

### Manufacturer / Supplier:

ANS Global  
Aldingbourne Nurseries  
Church Road  
Aldingbourne  
Chichester  
PO20 3TU  
Tel: 0845 505 5555  
Web: [www.ansgroupglobal.com](http://www.ansgroupglobal.com)

### Product Reference: ANS Living Wall Module™

Living Wall integral components supplies by ANS:

### ANS Living Wall Module™

500mm x 250mm x 100mm;  
Made of PP BS 476 Part 7 1997, Class 1  
80% post industrial recycled material;  
UV resistant;  
Temperature range -40°C to 80°C.

### ANS Fixing Rails

48mm x 12mm fixed to surfaces at 500mm centres;  
To be fixed to surfaces with countersunk screws, (size of which is site specific);  
Made to LDPE BS 476 Part 7 1997, Class 100% post-industrial recycled material;  
UV resistant;  
Temperature range -40°C to 80°C.

**Drainage Channel:** 107mm x 51mm gutter. (see

manufacturer's specifications)  
Product Reference: Osma Squareline (or equal and equivalent).  
Made of PVC-U, UV resistant.  
Manufacturer: <http://osma.wavin.com>  
Note: Alternatives subject to Specifier's choice and recommendations.

### Waterproof breathable membrane (see manufacturer's specifications):

Product Reference: Tyvek® HomeWrap® (or equal and equivalent).  
Manufacturer: DuPont™ Tyvek® HomeWrap®  
Web: [http://construction.tyvek.co.uk/Tyvek\\_Construction/en\\_GB/products/wall/housewrap.html](http://construction.tyvek.co.uk/Tyvek_Construction/en_GB/products/wall/housewrap.html)

### Downer DCSO31 Helping Hand Bracket aluminium subframe system

To be fixed to surfaces at 600mm centres;  
To be fixed to surfaces with site specific fixings;  
Vertical Tee carrier rail screwed to helping hand brackets.

### ANS Irrigation Unit:

Break Tank (size of which is site specific);  
Dosatron® liquid feed dispenser to ensure correct feeding of wall to ensure healthy growth of plants;  
Electronic programmer with various stations linked via solenoid valves to ensure an equal distribution of water through the wall;  
The solenoid valves automatically water each station through the emitter pipes installed on each row of modules;

The water pressure is calibrated and adjusted to ensure the water run-off is minimal;  
The small amount of run-off is directed to a box section gutter which drains into a local drain point.

### ANS Living Wall Planting Media

Plant choice as selected by ANS Global to suit location and requirements.

### Installation

Installation by ANS Global approved installation specialists. Details provided on request.

**When planning a living wall, careful plant selection is crucial. Choosing the wrong type of plants can untimely lead to the plants dying resulting in dead patches in the wall or higher maintenance costs to replace the plants and keep the wall alive.**

According to a report from Kew, there are 390,900 plants known to science, with over 2000 new plant species being discovered in 2015 alone. With this abundance of plant life choosing a few types for your living wall might seem daunting. It needn't be.

Since we produced our first living walls ten years ago we have experimented with thousands of plant types. We have discovered which plants fail in the environment of a living wall and which types thrive. The living wall is an interesting habitat, in contrast to ground level landscaping the planting is very dense and for good reason. Living walls are a very visual feature and command a lot of attention, this means it is important that they look stunning with full plant

coverage, and in the ANS Living Wall system this means 96 plants per square meter.

In some living wall systems plants have another constraint, limited space for their roots to develop and perform their normal cycle. These 'pocket systems' normally require higher plant replacements as the plants die off. Our modular natural soil system solves this issue rather neatly. The central section of each 500 mm x 250 mm x 100 mm module which splits it into 12 cells is a separate part to the frame of the module. This central section can move allowing the plants roots to migrate throughout the entire module and the normal cycle of plant life to occur. This involves the natural composting of old roots as new roots grow.

We can provide a comprehensive plant list for your project based on the location, aspect and design considerations of the wall.

## Interior



## Exterior (East facing)



## Exterior (West facing)



## Exterior (North facing)



## Exterior (South facing)



## How to choose plants for a living wall.



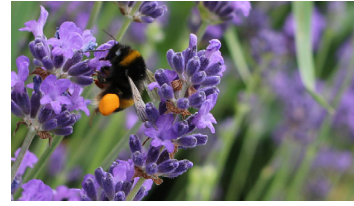
### External influences

For outdoor living walls it is important to consider the aspect and physical influences on the environment. For example a north-facing wall in a shady area with high winds will need a different set of plants to a south facing wall in direct sunlight on the sea front. We can work with you to select plants that thrive naturally in either situation. Different plants can be used for indoor living wall projects too.



### Stunning aesthetics

Plants are often chosen to make the living wall look stunning. Certain colours and shades of plants can be chosen and planted in patterns to form natural swathes and shapes or to form letters (consider recreating your logo or brand icon in plants). Even if a simple green wall is preferable, leaf size and shape can alter the overall visual effect of the wall and is worth considering. Another idea is to add flowering bulbs as well as evergreen planting. This adds seasonal interest as the flowers burst into life in spring and summer adding a splash of colour while the wall remains green at all times of the year.



### Promoting Biodiversity

Here at ANS Global we believe in giving back what was once removed. A living wall is a great way to add local plant species back to urban areas and thereby support the local ecosystem. We can carry out a survey of a local area to select plants such as wildflowers that will encourage local insects, bees, invertebrates, butterfly's, birds and other wildlife. Furthermore to compliment the natural habitat provided by the plants we can add bat or bird boxes and insect hotels to give back a home for local wildlife.



### Edible walls and biophilia

We're not suggesting you alter your diet to include bricks and mortar! Instead planting herbs and soft fruit in a living wall can encourage human and wildlife interaction with the living wall. This interaction with the living wall can help promote biophilia - the relationship between humans and nature. Many herbs can thrive in a living wall including mint, thyme or sage and add a distinctive scent. Consider adding a living wall behind a cocktail bar with fresh herbs growing which the bartenders can use as ingredients in their drinks. Soft fruits such as wild strawberries can grow too adding a tasty treat for birds and humans alike.



### Work with a theme

Plants could be selected from a certain country to express a nationality or a global theme. We have carried this out on two notable projects: The David Attenborough Building and The Body Shop. The first contained plants from almost every continent that Attenborough had travelled to and the second included a range of herbs used in the shops soap products. This included an interactive shopping experience for customers. It is also important to think about maintenance, chose from our most hardy and successful plants to make ongoing maintenance. We always encourage our clients to be creative when planning a living wall and we can help them make their concept a reality.



Insect hotel



Bird box



Bat box

Having invested in a living wall, you now have a vertical garden which will require regular maintenance to keep it in its healthy growing condition.

This will require regular visits to ensure the computer controlled irrigation system is distributing the correct amount of water throughout the wall. We recommend that this visit is monthly. At the same time visual inspection to the plants checking for any early signs of pest and disease. Should there be any concerns then our technicians will apply a bio- logical treatment which is safe for the environment through the irrigation system. Plant growth will be monitored and any localised trimming / pruning will be carried out. This visit ensures on a monthly basis the walls are kept well.

Then twice a year a full plant husbandry visit will be arranged. This will require full access to whole of the wall. The plants will be pruned back in accordance with standard horticultural practice and any aged plants or failed plants can simply be replaced in their module. Once the wall has had its overall prune, we then apply an organic phosphate / potassium feed through the dosatron to encourage root development over the coming year.



Shown below is a sample of a maintenance schedule for the United Kingdom. There must be a degree of flexibility allowed for

in each maintenance package as some seasons require more labour than others.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Visually inspect the living wall	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Check the moisture levels			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Recalibrate irrigation zones		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Check the health of plants		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Carry out remedial work if necessary		✓		✓		✓		✓		✓		✓
Remove weeds		✓		✓		✓		✓		✓		
Prune in accordance with season			✓							✓		
Dead head seasonal plants			✓	✓	✓							
Treat for pest and disease						✓	✓		✓			
Apply feed and nutrient as necessary			✓				✓					
Service irrigation system	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Check run off outlets for blockage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Replace any plants that have failed		✓	✓							✓		
Sweep and tidy below wall	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

## Building information modelling (BIM) is affecting change across the construction industry.

While living walls can be retrofitted, it is best to make consideration from the early stages of design. The ANS Living Wall system will be the first system to embrace BIM and provide models to enable specification and inclusion in the building design.

Other 3D models such as DWG format are also available. We believe that it should be easy to specify living walls.



## Lighting is an important consideration when designing a living wall.

As in natural environments, different plant species thrive in various light levels. We can select plants to accommodate the aspect and natural light intensity of each project. In areas where no natural light is present (particularly indoors) it is essential to artificially create the right light intensity and colour temperature to support healthy plant growth.

Light intensity is measured in foot candles (FC) or lumen's. For reference a clear summer day is around 15000 FC. We require a minimum of 250 FC for a long lasting living wall.

Light colour temperature is measured in Kelvin (K). Natural sunlight provides a full spectrum of colour and indoor living walls will thrive with a similar light balance (4500 K to 6000 K). For a healthy living wall we require a minimum of 3000 K.



**Not only do plants require light and nutrient-rich soil to survive. It is also important to manage the ambient temperature of indoor living walls.**

For example adding living walls to air conditioned offices is totally possible, it is just important to ensure that there is not an extreme temperature rise and fall. This might mean planning for weekends when the office is not use and temperatures drop during winter months. Positioning the living wall carefully can help - for example making sure that air-conditioning units are not overly close to the plants.

Furthermore with the increasing use of glass in building design, making sure the building does not heat up like a green house killing the plants.

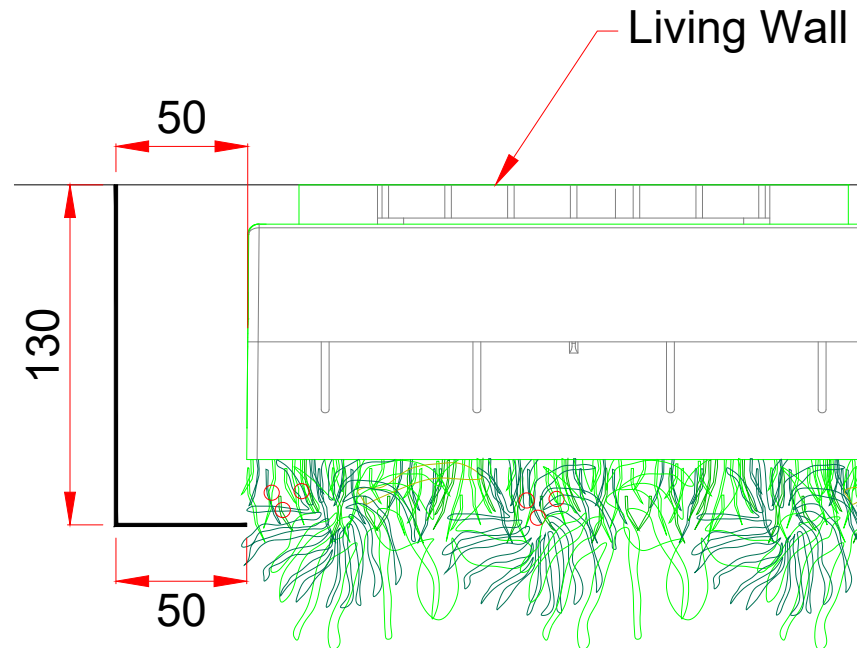
For external living walls plant choice is crucial for the local climate.



### Properly integrating a living wall with the rest of the building design can greatly improve the visual effect.

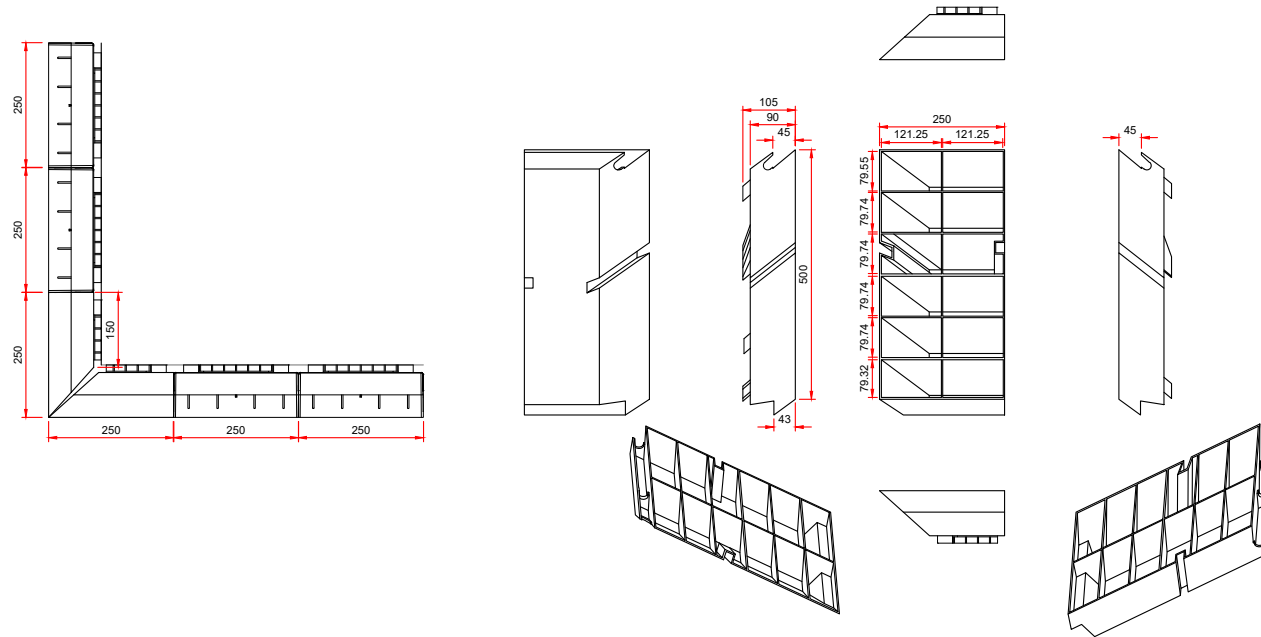
The ANS Living Wall is 100mm deep, the batons used behind it increase that by 10mm and the foliage protrudes a further 100 - 500 mm.

The side of the ANS Living Wall modules is not particularly attractive. We can add plants to the side of the module or include a corner module. Alternatively we recommend adding a trim of at least 110mm depth to enclose the system. Better still design an alcove to house the living wall.



Living walls allow the designer a great degree of flexibility and the options are endless.

The ANS Living Wall system can work on corners of any angle as per the detail shown here. The modules can also be placed around a curved shape to create a more interesting shape.



## Global Knowledge, Local Expertise.

Working with our network of certified partners and with flexible installation teams that can travel the globe, we can serve any location.

We work globally, so if you don't see your location it's because we haven't done any work in your area yet but that doesn't mean that we can't. Get in touch with our head office to discuss your requirements.

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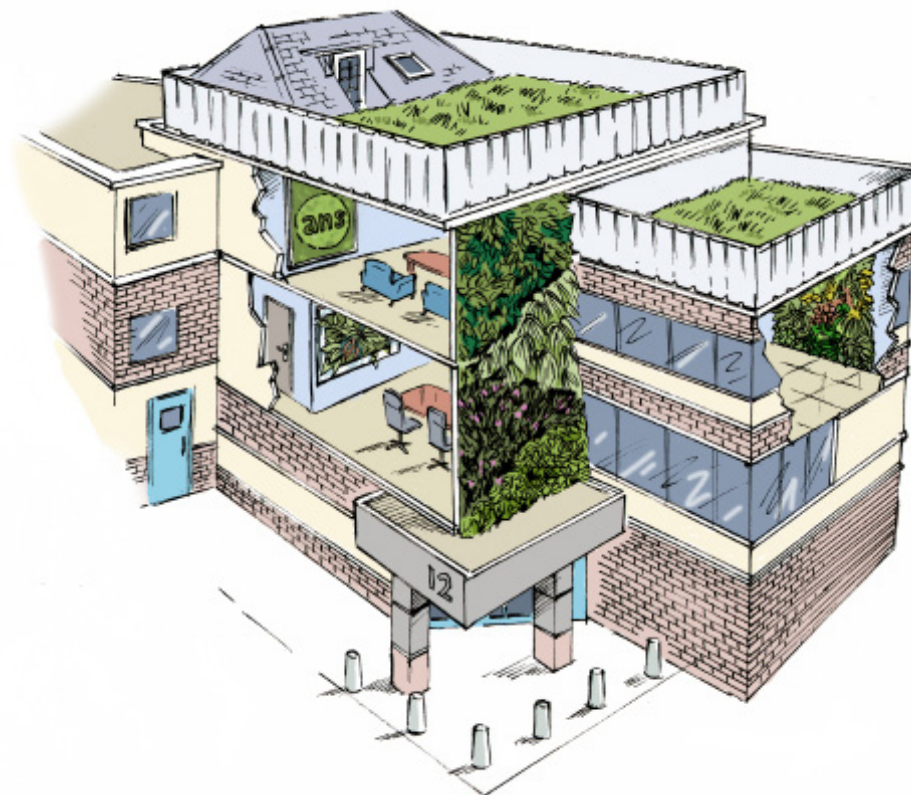
# Our Story

## Eco-architectural solutions.

More than half of the worlds population lives in cities and the number keeps increasing. As cities become more crowded, every inch of space is precious. So we've found ways to make the best use of wasted spaces.

ANS LivingWalls can clad walls both inside and out, while ANS GrufeKit turns wasted flat roofs into an ecosystem. Inside buildings we can also use ANS LivingCanvas and ANS MossArt to bring humans closer to nature.

We hope you are inspired to enhance structures naturally.



## Some clients that we have worked with:



## Disclaimers

All information contained in this technical handbook is included in good faith and deemed correct at time of publishing.

ANS Group Global Limited takes no liability for the course of action taken by any reader.

We reserve the right to change and amend this document at any time.

To seek clarification about any of the details in this guide please contact our head office.

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ans LivingWall

