Green Matters
Concept – Design - Realisation

REMEDIAL MAINTENANCE GUIDELINES

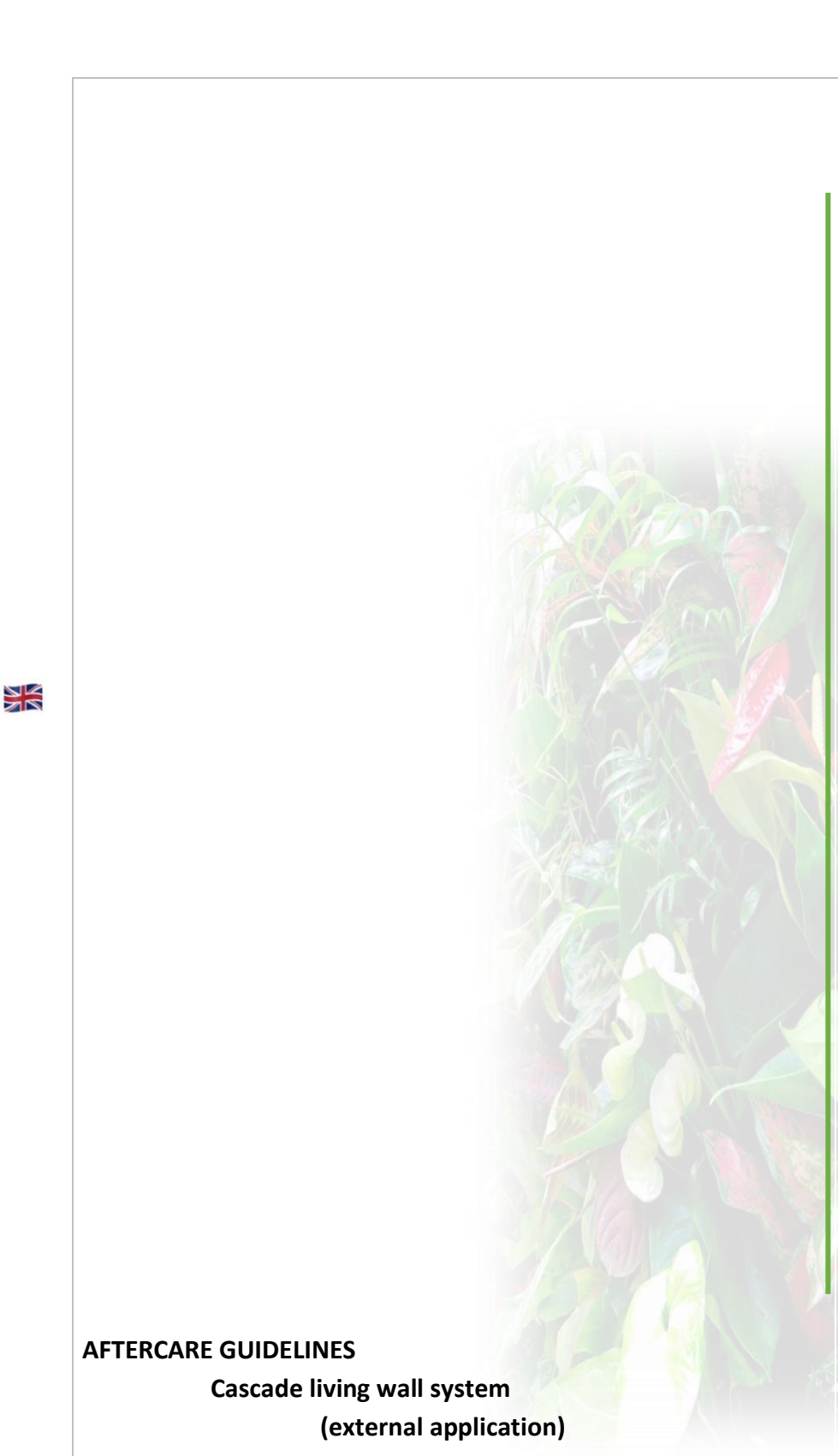


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CASCADE SYSTEM (external)

Like all living material, the plants within the living wall system require some management. Maintenance regularity depends on the species, flowering type, range of annual and perennial blends, the number of species and the maintenance requirements

Standard remedial packages contain the following elements:

1. Seasonal pruning, trimming and flower removal.
2. Weeding
3. Feeding, 1-2 times a year
4. Water management and irrigation calibration
5. Winter drain down and spring re-commissioning service
6. Drain clearance and maintenance
7. Pest and disease control

In addition, the system provides the following optional elements:

1. Plant rotation service
2. Seasonal interest package
3. Edible and harvestable package
4. Colour injection package.

Mission Statement:

Our ambition is to improve health and wellbeing for our customers by developing the symbiotic and biophilic relationship between people and plants.

Our aim is to help people to be more productive and to embrace the environment they live and work in by integrating plant material into everyday life and working practice.

We embrace small changes and strive to discover more sustainable ways of placing plants in home and work environments.

By incorporating plant material we look to remove and reduce damaging toxins from the local atmosphere, improve air quality and help to reduce pollutants than can be very damaging to health.

AFTERCARE GUIDELINES

Cascade living wall system (external application)

Contract and project particulars

sqm	41.70
Wall 1	Main building
Wall 2	Fence Line
Site	Deane Valley
Plants	1280
Density	32 per sqm

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Replacement Allowance	128
Visits	4-6 weekly
Duration	5 years
Remedial	Yes
Rotation package	Not included
Seasonal package	Not included
watering	In combination with site
Anticipated 1st visit	November
Winter prep visit	November
Spring re-commission	March 22
Plant management	Included
Pruning and weeding	Included
Feeding	Included
Plant replacement	Included 10%

Guidelines:
We have pleasure in providing full maintenance guidelines for your living wall system, the following guidelines should be followed and can be supported by either a quarterly or annual remedial, rotation and replacement program of service and support.

There are two major elements that dictate the success and sustainability of the system, the first is watering at an agreed and consistent level and the second is aspect, light and exposure
The Cascade system will need watering every 3-4 weeks depending on the heat and humidity of the wall location. Plants are selected for the aspect, the location, exposure and proximity to salt air, plants not suited to the aspect will fail and within the wall, plants located low not suitable for lower light levels and higher levels of moisture will fail.

What we Provide: (the process)
- our technician will assess the health of the living wall and carry out a plant by plant assessment removing dead or poor material and rotating the plant stock to fill any holes or to relocate plant material that is not thriving in its present location.
- Plant pruning will be done using hand secateurs, mechanical trimming is strongly prohibited as material will tear and damage.
- We will then carry out the remedial inspection adding seasonal plant material and fully rotating the design of the wall if they are part of the package program.
- We will inspect the drainage system and calibrate the irrigation system (if using automated technology)
- We will replace plant material up to the agreed amount of 8% of the system per annum where plants are struggling. **(Plant material loss due to damage by others, insufficient or excess water damage, theft or insufficient or excess lighting will be charged but will not be calculated within the 8% allowance.)**
- We will use our own equipment for walls up to 2.5m in height, over that, we will require access equipment to be provided.
- We will assess lighting levels and wall coverage of lux levels splitting the wall into top middle and bottom, we will provide a list of plants that should thrive in the different levels for site management to be done between remedial inspections.

Maintaining your system
Suggestions & Considerations
1. If planting in the Autumn / Winter the system should only be planted to 85% pot thickness to allow air to flow around newly installed plants which will be slowing growth, this allows for deciduous leaf to drop away and not rot within a tight system.
2. The system will be filled with water on completion, during march-October the controller will be required to fill the system every 4 weeks, this allows for some fill from rainfall. (if the top trough remains open)
3. The system requires an edge detail to ensure integrity. if we do not install one as part of our package, a 220mm deep detail is required to the sides to hold the plants in place to deflect potential wind and environmental damage.
4. From November to December the system should be filled and the controller set for 2 mins every 15 days and then turned off in January and the system drained.
5. Draining the system before cold weather is crucial to prevent plants rotting during non-growing periods. This is done by loosening the vertical drains from layer to layer until water drains to the base diverting water from the base trough.
6. The system is returned to pot thickness in March with the introduction of seasonal plant material for the spring (if part of the ongoing support contract) and the controller re-set to 5-7 mins / 15 days for systems up to and including 15 sqm.
7. The summer seasonal plant change will replace 40% of the plant stock with colour and flower and the Autumn change will return to the evergreen palette and reduces the system to 85% pot thickness again.
8. The system and plants within the design should be rotated at least three times a year to freshen the design and to allow plants to establish with differing elements of moisture and light.
9. The system should be fed once a year in August during the main growing season.

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10. Feature plants if included in the design need to be changed annually when the summer seasonal plant change is done.
11. Once a year the system should be flushed with de-ionized water to clear salts and residues from the drainage elements, this process has no effect on the plants.
12. Batteries in the controller should be changed in March when the system is re-commissioned and the drains reinstated.
13. During the spring and summer the watering system should contain nematode solutions to help combat soil borne pests, this is a precaution to stop unwanted plant death and establishment of pest levels in the wall.
14. If there is no direct maintenance contract in place, the company cannot take any responsibility for incorrect maintenance practice by others that may cause the plants to struggle.

System Description

The Cascade system is the only fully closed, water management system available.
The system manages water within a sealed trough unit that if correctly monitored requires no catchment or run off allowance.

The system is designed to be low maintenance and does not require the complex irrigation and feed equipment required by hydroponic systems.

All fixings are pressure moulded and connected to prevent water leakage from any trough area, all connecting elements are clipped, glued and sealed off site to make the installation process as seamless as possible.

The Cascade system is a managed delivery system that can be filled by hand or automated process.

The system holds water behind the pre-planted units which irrigate and feed through capillary draw technique using all water over a period of 3-5 weeks.

This period is dictated by the temperature and relative humidity around the plants and the amount of water they draw from the troughs.

Plants are established in a low organic hydroponic substrate containing compacted clay and volcanic pummice, coir and green waste and mycorrhizal compounds and endoparasitic nematodes to combat soil borne pest and disease.

Plant Rotation

If a plant rotation package is in place, plants within the system should be moved every 4-6 weeks. By rotating plants the loss of incorrectly located material is reduced and the design is freshened up regularly to maintain performance, function and vibrancy.

Seasonal change program

If a seasonal change program is in place, plants within the system will be changed 3 times a year to reflect seasonal interest, flowering or colour palettes. The change package represents 8-10 % of the plant material in the wall adding interest and function to both internal and external systems.

1.2 TROUBLE SHOOTING GUIDE

Symptom	reason	Solution
Plants are wilting	The system has dried out and requires filling	Fill the system
Plants are wilting with water in the system	The plants have dried out and there is a crack in the capillary substrate	Replant the plant
Plants with dead leaf tips	Too much water insufficient light	Move or replace
Plants are yellow and unhealthy	Insufficient light or water	Water and move within system
Water dripping from trough	Water fill is too fast, reduce the pressure	Fill more slowly with water
Water is dripping from the front of the troughs	Water fill is too fast, reduce the pressure	Fill the system more slowly
Water is dripping from the side of the troughs	The system has been over filled	Fill the system more slowly
Water is dripping from the bottom trough	System has been overfilled	Catch water exiting the system, until the flow stops

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Plants have mottled spotted leaf	Possible pest problem	Replace plant and dispose
Plants have yellow/white dust marks on the leaf	Possible disease problem, likely Mildew	Increase humidity by misting and remove leaves
Plants have dark spore / hairy areas on leaf	Possible disease problem, likely Botrytis	Reduce water and dry back, remove leaves
Plants are generally not developing	Plants are not suited to location	Move plant within system or change

General Recommendations

Inclusions:

To provide annual support maintenance on a single visit or agreed visit structure per annum.

- Assessment of system, plant health, pest and disease
- Application of pest and disease measures (if required)
- Removal of damaged material and dead flower heads
- Assessment of irrigation and feed regimes
- Rotation of seasonal designs or feature plants.
- Plant replacement up to 8% per annum
- Feed and irrigation calibration and servicing.
- localised pruning and foliage management
- Recording of plant loss or poor establishment and replacement of individual plant failure during the first two months. (in accordance with guidelines)
- Removal of unwanted plant material and weeds.
- Assessment and maintenance of irrigation, delivery, feed and monitoring equipment.
- Assessment and clearance of drainage gulley's, cascade troughs and catchment tanks.
- Winter drain down and spring re-commissioning service.
- Full health and maintenance report with photographs recommendations (leading to system failure, plant loss or damage)
- Damage caused by irrigation system being turned off, disabled or removed.
- Damage by other services (including maintenance procedures to surrounding areas)
- Plant loss due to insufficient or non-availability of supplementary lighting regimes or management of light requirement timings or duration.
- Equipment and method for accessing and managing the wall for maintenance, area or pavement closure, scaffold towers, cherry pickers and other forms of mechanization.
- Access to the wall outside working hours (unless agreed)

All inspections are carried out by company certified, trained qualified personnel.

The company does not advocate the use of herbicides / insecticides on the wall systems but on the rare occasion a problem appears, organic and biological control products are considered.

These are applied by certified operators adhering to all health and safety, public notices and water management policies.

Temperature

The plants selected have tolerance of low and seasonal temperature variations.

Pest & Disease

The company has a non-chemical policy.

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Exclusions:

- Irrigation system (unless stated)
- Vandalism or theft
- Noncompliance to irrigation Plants infected with diseases such as mildew and botrytis will be removed. Plant replacement is more complex and immature plants will replace established plants removed.

The system does lend itself to quick plant removal and disposal, plant change will be done during maintenance visits.

Where plants cannot be removed, biological control programs are used to ensure infestations cannot spread and remain isolated until controlled.

Allergy Management

Although used for biophilic improvement of a home or work area, flowering plants are minimized with aesthetic performance maintained through use of foliage colour and non-pollen bearing bracts.

Flowering plants can be introduced but the inclusion of flowers, pollen and nectar sources will increase insect activity on the wall.

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The company also prohibits the use of plant material that produces aerial spores that may cause problems with person or persons who have sensitive or breathing disorders.

Environmental
All our biophilic systems are designed to remove, process and absorb PMs (dust and small particles) and VOCs from the atmosphere. Our primary aim is to improve health and wellbeing by blending day/night oxygenators and removing harmful elements from the local internal atmosphere.

Irrigation
The closed substrate system works by filling the system to the agreed level every 3-4 weeks and then allowing the plants to use all the water within the closed trough system. A mains feed should be located near the top of the wall to allow the second trough to be filled. The fill process should then stop when water reaches the third trough from the bottom and is completed by hand once the system has stopped running.

Watering by Hand
Only applicable on systems in residential situations up to 5sqm in area.
Adhere to all irrigation information provided for the installation, site or specification.

Automated systems
If a computer system is being used either from a mains or pump or catchment tank system,
Controller, connections and fixings provided.
if the mains is not disconnected, the system will fill and maintain irrigation integrity automatically.

Full Irrigation systems
A series of water sensors are positioned across the wall to monitor water levels in the trough system.
The system will consist of a pump and break tank system with allowance for feed introduction.
The computer controller needs to be calibrated every year to ensure the software is updated. (this is not a part of the standard package. full irrigation systems require a plant room and can cost an additional £5,000.00 depending on the size or type of wall)

Dry System Alarm
The system can be fitted with an audible and visual alarm that monitors wall moisture levels. (this is an additional service and not included in the standard pricing template.)

Remote Monitoring
The computer system can communicate fill cycles and water usage, ambient temperature and humidity through smart technology back to our technician. (this is an additional service and not included in the standard pricing template.)

Pump System
If the system cannot be fed from above, a pump system may be considered. If a pump system is in use and the pump is not covered with sufficient water, an alarm system will switch the system off and alert the designated person responsible.
If an automatic computer and moisture sensor system is in use and the mains fail, the system will switch off and inform the designated person responsible.
Automatic systems will record data daily and send the information to the manufacturer for reference and to make change suggestions

Recirculation
The substrate system is not applicable for recirculation.

Catchment Tanks
A catchment tank is not mandatory with this system but a solution below the bottom trough to catch water if the system is over filled is recommended.

Establishment Package
A technician will attend site on a designated day under the terms of the maintenance agreement.

Weed Control
In the unlikely event that localized weed establishes, remove by hand taking care not to affect the plant. If the weed becomes so established removal is difficult, replace the pot and dispose of plant material.

Plant Removal
Remove dead, diseased or dying foliage, flower heads or stems as they appear carefully
Remove using secateurs and place into a bag and remove from site to prevent any possibility of spreading disease
In the event of widespread disease incidence or the presence of pest, inform the manufacturer immediately
Heavily infested plants should be removed and destroyed
Monitoring techniques can be provided for key pests and the manufacturer can recommend or introduce a biological control program to combat most pest infestations likely
Pest and disease control must be caught early so it is recommended to check the foliage on the surface and underside very regularly for any signs
The company does not advocate the use of herbicides / insecticides on the wall systems but on the rare occasion a problem appears, organic and biological control products only are considered

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Nutrition
The system is fed using soluble tabs every 12 months. Plants are kept hungry to maintain control over foliar elongation and to manage the plant root development.

Re-Planting Process
Plants can only be replaced within the maintenance remedial inspection visits. Plants will need removing, planters cleaned and immature plant material replaced. This process can only be carried out by a technician.

Ongoing advice and support
Maintenance and technical officer
Dave Austen (07525 862587)

Remedial Package (notice)
A technician will provide a minimum of 36-hours' notice before attending site to carry out remedial maintenance.

Plant Rotation / Feature Plant Package
Plant rotation and seasonal introduction packages are available on request.

Terms & Conditions

Wall Access:
We must have access to the wall system and a solution for reaching the wall if other than by ladder must be provided or agreed before each maintenance visit.
Do not include VAT
The price does not include for 0% VAT construction projects
Unless stated there is no allowance for ground, vertical and horizontal distribution for maintenance works
The price does not include management for waterproofing, insulation or any components unless stated
The maintenance contract does not include lighting surveys but does allow for regular light coverage assessments.
The price does not allow for main contractor's discount
12- month remedial package, 3-4 week intervals
The package is for the Cascade vertical system only
Additional vegetation management will require an additional agreement

Allowances
Free and unfettered access to the wall area should be provided for the maintenance process.
The price allows for a single visit / mobilization once a month for the term of the agreement.
The package allows for plant rotation and replacement if deemed necessary by the company. (within agreed aftercare plan)
The package includes the use of seasonal flowering plants during the maintenance and management period. (within agreed aftercare plan)
Payment Schedule
Maintenance agreements must be paid in advance for a 12-month contract period or on a single visit basis.
(Visits even included within package cannot commence until long term maintenance is agreed)

Guarantee and Warranty
The company offer a system guarantee following the completion of any establishment packages for the length of the maintenance agreement.
The warranty renews every 12 months once a maintenance agreement is agreed.
A system with no maintenance agreement carries no guarantee, warranty or plant management cover.
The company take no responsibility for plant death, water management, system and interface damage or product issues if a maintenance and guarantee package is not in place.

The company will not install any system until a suitable maintenance package has been agreed. If self-maintenance is the preferred option, the company will offer full training and maintenance guidelines.

The company will offer no maintenance or guarantee on any or part of alternative systems or where plant material has been supplied or self-planted by others.

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