

Interior Gardens

*Designing and
constructing
green spaces in
private and
public buildings*

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7–140

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141–176

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177-212

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213-224

+

4-6

Typologies of interior gardens

1

With reference to international projects, the following chapter presents the different types of inner gardens:

- Vertical Gardens → **p. 12**
- Small indoor plantings and gardens in private homes → **p. 26**
- Open and enclosed inner courtyards and patios → **p. 48**
- Atria and large conservatories → **p. 78**

Types of planted gardens under glass that are not primarily intended as places for people to spend time in, such as botanical gardens or zoological parks, are not included here. Greenhouses of that type are usually intended primarily for the protection and controlled cultivation of plants, or for food production; their construction is simple and the light-permeable outer shell is traditionally single-glazed, although it may also include film or sheeting. The greenhouse effect plays a decisive role in heat gain in these structures, which are generally not otherwise heated. They are also often equipped with irrigation and shading systems. And even though they are not included here, much interesting information about gardens inside buildings can be garnered from plant cultivation and agricultural designs; for instance, materials generally used in tomato production were used for the atria of the Alterra building → **p. 120**.

The boundaries between the categories are fluid: there are overlaps in terms of architectonic design, with various possible interpretations. This typology should not be viewed too dogmatically – it is only a loose grouping based on the key features of each design. If the designs were classified differently (by function, for instance), they would be grouped differently.

The exceptional diversity of the projects presented here is intended to demonstrate the full spectrum of design possibilities for plants inside buildings. To varying degrees, the descriptions of the designs here concentrate on the aspects that are relevant to the planting and its functions. Many of the design ideas, design elements, and constructions included here could be applied to other projects on a different scale or with different functions.

The exceptional design, size, layout, and functions of the Sky Gardens at the Fusionopolis building in Singapore means that the project is in a class by itself. It could be seen as a vision of a future in which architecture and planting exist as an inseparable whole, with the use concept including ecological concerns, energy conservation, and people's general well-being.

VERTICAL GARDENS

These vertical gardens demonstrate the use of wall planting in enclosed inner spaces or in an open but secluded inner courtyard in a private home. What all these designs have in common is that they have no contact with the ground. The whole installation – base structure, substrate, plants, and supply of water and nutrients – is secured to a vertical supporting wall.

Despite each installation being unique, these designs are not experimental projects – they are tried and tested systems by specialist firms, each adapted to specific localized conditions. Wall gardens can fulfil the same range of requirements in different types of buildings as other indoor garden types, and have the advantage of saving space. The aesthetics, however, are as important as the function: wall planting adds interesting possibilities to the interior architecture design range that can be integrated into many design concepts.

- Planted wall in the inner courtyard of the Morris House, Richmond, Australia → p. 12
- Planted lift shaft and canteen in the Tryg insurance company headquarters in Copenhagen, Denmark → p. 16
- Vertical garden at the headoffice of the Mannheimer Swartling law firm in Stockholm, Sweden → p. 22

SMALL INDOOR PLANTINGS AND GARDENS IN PRIVATE HOMES

The size of a planting doesn't matter – a well-placed bed or plant container can change the whole look of a space and fulfil various functions. A small leaf volume can be enough to improve the quality of a small space, dampening noise or forming part of a route system. A small planting may be enough to create a visual connection between the indoor and the outdoor space – as demonstrated by the Seattle Public Library project → p. 38.

Our examples of unusual small-scale designs provide creative suggestions for integrating plants into any building type. We have intentionally excluded

'traditional' private glazed conservatories, because these extensions of the living space, often decorated with plants in tubs, have already been well documented (see bibliography) and because their design and construction principles are not significantly different from the guidelines and sample projects presented in this book.

- Roofed pation with garden terrace in the Foothills family home, Pokeno, New Zealand → p. 26
- Loft apartment with indoor garden in Düsseldorf, Germany → p. 30
- A tree in an Athens apartment, Greece → p. 34
- Planting concept for the Seattle Public Library, USA → p. 38
- Planting concept for the office space at the Combined Traders Company, Haarlem, the Netherlands → p. 42

OPEN AND ENCLOSED INNER COURTYARDS AND PATIOS

An 'inner courtyard' is a space surrounded by building structures on all sides, generally with a rectangular floor plan and open to the sky. An 'atrium' contributes to the lighting of a building's interior, and may be roofed over. 'Patio' originally meant a Spanish inner courtyard – a feature found in noblemen's palaces, but also in small houses, where it would provide an extra living and meeting place and help to cool the building. Open patios traditionally include large or small potted plants, which may be hung from the walls. Central elements include a fountain, or other water feature, and seating.

Some of the designs presented here are for air-spaces several storeys high, which can be viewed from a variety of different heights, making the planting look different (as in the Chelsea Harbour Design Centre in London, the Can-West (Postmedia) building in Toronto, and the ESO hotel rotunda in Chile). There are two open courtyards presented here that have completely different functions: an enclosed,

secluded area in a private home (see the roof apartment project with garden courtyard in London), and a quiet place in a school building (see the Giardino delle Ninfe project).

- Tree installations in the Chelsea Harbour Design Centre, London, UK → **p. 48**
- Indoor gardens in the ESO Hotel in the Atacama desert, Chile → **p. 54**
- Tropical garden in the roofed patio of the Can-West (Postmedia) building in Toronto, Canada → **p. 60**
- Planted atrium in the St. Pölten retirement and care home, Austria → **p. 64**
- Planted patio delle Ninfe patio, Bologna, Italy → **p. 68**
- Loft apartment with garden courtyard in London, UK → **p. 74**

ATRIA AND LARGE CONSERVATORIES

An atrium was originally an inward-looking central space in a private house – a feature of Roman architecture. Over the past few decades, a new architectural model and new materials and techniques have led to the atrium being reinterpreted in a number of ways. What all these multi-storey glass-covered courtyards and halls, some of which are very large, have in common is that they are transparent and open to the sky. An atrium may be a climate-controlled space that can be used all year round (such as the Genzyme Center), or a glass structure that acts as a thermal buffer zone.

Glass structures serve to house plants and people, to protect them from the weather, and to moderate changes in external temperatures. They benefit from the greenhouse effect and are therefore not heated (or are heated only by the exhaust air from the adjacent rooms). These light-permeable constructions have to fulfil the static and construction requirements for occupied rooms (as in the Covent Garden and Alltours projects). Conservatories were originally built to house (and preserve) sensitive plants during the winter. Today, the word is usually understood to mean a trans-

parent or semi-transparent structure or part of a building where people can spend time. The walls and the roof may be wholly or partially glazed. All the usual construction and building regulations for habitable buildings must be met. The greenhouse effect is useful in keeping the inner space warm and can help to optimize the energy budget in unheated constructions that are thermally separated from the main building. Specifically, such spaces can act as an air buffer by providing prewarmed air to be channelled into the heated parts of the building. For heated conservatories, heat protection glass must be used, and the roof and ceiling must also be insulated to prevent heat loss through thermal bridges.

- Glass Bubble greenhouse in Malmö, Sweden → **p. 78**
- Planted atrium in the Covent Garden building complex in Brussels, Belgium → **p. 84**
- Devonian Gardens indoor gardens in Calgary, Canada → **p. 90**
- Themed gardens in the atria of the Lufthansa Aviation Center at Frankfurt airport, Germany → **p. 98**
- Atrium hall in the Alltours headquarters in Duisburg, Germany → **p. 114**
- Atria for the Alterra laboratory and administration building in Wageningen, the Netherlands → **p. 120**
- Indoor planting for the Genzyme Center office building, Cambridge, USA → **p. 128**
- ‘Gardens in the sky’ in the Fusionopolis building complex in Singapore → **p. 134**

A planted wall in the inner courtyard of the Morris House

VERTICAL GARDEN: Fytogreen Pty, Ltd.

ARCHITECT: Michael Morris of Morris Partnership Architecture and Planning Pty Ltd.

COMPLETION: 10/2009

LOCATION: Richmond, Melbourne, Australia

PLANNING ASSIGNMENT

Vertical planting of the freestanding boundary wall of a narrow two-storey courtyard with view protection.

CONTEXT

This little inner-city single-family home plot is hemmed in by tall buildings on two sides. Nevertheless, including a narrow courtyard in the plan and setting the two-storey house back from the street created plenty of interior space, with a range of views of the outdoors.

The central courtyard is surrounded by the building on three sides, with a free-standing metal wall on the remaining side. The courtyard can be entered and used, but its function is primarily visual. It can be seen from almost all rooms of the house through the large windows that look onto it. The courtyard expands the living space and provides the interior with daylight. At the same time, the freestanding metal wall protects the privacy of the inhabitants from the neighbouring apartment block.

CONCEPT

The narrow inner courtyard and its low surface area suggested the idea of planting the metal wall with two 8 m vertical gardens. They are a major decorative element for the house, and this garden cannot be

seen into from outside. The wall faces west and is protected from the wind and partly by the house. The Australian grasses and ferns offer an interesting contrast against the hard, shimmering metal surface. The lush greenery and the combination of different leaf structures and textures looks lively and gentle – an effect enhanced by the fluid arrangement of the plants as laid out in the planting plan [5](#) → [p. 15](#), which looks like an abstract painting.

The design, planning and construction of this wall were carried out by the architect in close collaboration with the Fytogreen planted walls company, in order to have the best possible construction. Several layers of perforated aluminium sheeting are secured on both sides to a steel substructure on three untreated steel supports. Alucobond Spectra Cupral is a material that changes colour depending on the light and on the angle it is seen from. The holes in the upper section are small so that it conceals more, while their diameter increases lower down, leaving the metal supports visible.

1 The two planted vertical garden beds are flush with the aluminium wall cladding in the narrow, two-storey inner courtyard of a private house.



The colour, transparency and texture of the wall are different at different times of the day. The spaces for the planned planting modules for the two Fytowalls were cut out of the aluminium, and containers made from plastic-coated, watertight plywood with an overall surface area of 10.5 m² were fitted into the gaps to house the wall planting systems and all installations. The outer edges of the planting modules are flush with the aluminium surface.

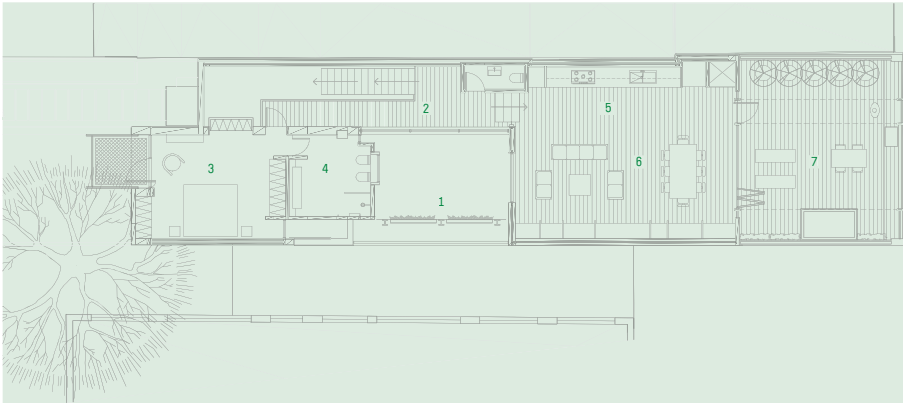
The modules have standard dimensions of 100 × 50 × 15 cm and consist of a special hydroculture substrate. This non-soil substrate can absorb large amounts of moisture and transport it upwards by a wicking effect. This means that the plants only have to be provided with water and nutrients via the driptubes laid between all rows of modules for 5 to 10 minutes every day.

The standard parameters for the Fytowall – orientation, light, direct sunlight, air movement, shade, temperature and precipitation – were checked on site. The supporting wall that anchors the hooks for the plant modules can support 88 kg/m². After the supporting wall was completed and the necessary water and electricity supply had been fitted, the concealed irrigation system was added. In the event of municipal restrictions on water use during a drought, the planted wall will be supplied from rainwater tanks integrated into a natural stone wall along the access path.

The planted walls firm had started growing the plants in the modules 12 weeks before the Fytowall was installed, so that when they were installed in the wall, leaf cover was at about 80%. Moisture sensors and a control unit were provided to regulate the amount of water and nutrients required by the plants and the duration of the supply each day.

After completion and checking of all installations, the individual plant modules were hung on the stainless steel fastenings mounted on the wall. The actual planting was completed in a few hours.

Completion services included installing and checking the control apparatus and the drip pan, which catches any excess water at the planted wall's lower edge and channels it into the house's drainage system. The drip pan is 20 cm deep – 5 cm deeper than the planting modules – so that it can catch any water dripping from the leaves.



2 Layout of house with courtyard.

3/4 The vertical gardens are framed in perforated aluminum sheeting. The fine pattern of holes in the upper half provide privacy protection from the neighbouring apartment buildings, while the large holes lower down leave the untreated steel supports visible.

5 Fytowall planting plan.

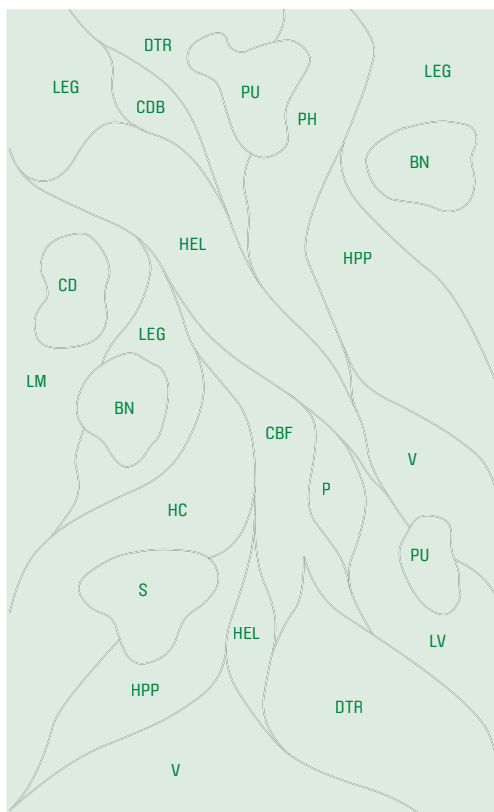
- 1 PATIO
- 2 UPPER GALLERY
- 3 MASTER BEDROOM
- 4 ENSUITE
- 5 KITCHEN
- 6 LIVING/DINING
- 7 DECK



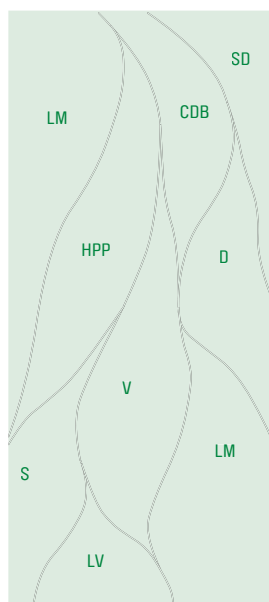
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4



5a



5b

LEG	Liriope 'Evergreen Giant'	<i>Liriope 'Evergreen Giant'</i>
HEL	hellebore	<i>Helleborus</i>
DTA	Dianella	<i>Dianella</i>
LV	Liriope variegata	<i>Liriope variegata</i>
BN	bird's-nest fern	<i>Asplenium australasicum</i>
S	elkhorn fern	<i>Platycerium bifurcatum</i>
HPP	alum root	<i>Heuchera purple plum</i>
CBF	Serbian bellflower	<i>Campanula poscharskyana</i>
PH	Pteris hendersoni	<i>Pteris hendersoni</i>
HC	mother spleenwort	<i>Asplenium bulbiferum</i>
LM	lilyturf	<i>Liriope muscari</i>
P	Pratia	<i>Pratia</i>
V	common violet	<i>Viola odorata</i>
SM	Ophiopogon japonicus 'Nana'	<i>Ophiopogon japonicus 'Nana'</i>
SD	Ophiopogon 'Snow Drops'	<i>Ophiopogon 'Snow Drops'</i>
D	hare's foot fern	<i>Davallia</i>
CDB	Dalmatian bellflower	<i>Campanula portenschlagiana</i>
CD	rainbow fern	<i>Calochlaenda dubia</i>
CDB	Campanula portenschlagiana	<i>Campanula portenschlagiana</i>
CD	Calochlaenda dubia	<i>Calochlaenda dubia</i>

5

Planted lift shaft and canteen for the headquarters of the Tryg insurance company

PLANTWALLS: Green Fortune

ARCHITECTURE, DESIGN: Built Identity, Copenhagen, Denmark

COMPLETION: 2007–2011

LOCATION: Ballerup, Copenhagen, Denmark

PLANNING ASSIGNMENT

Vertical planting in an office building: as a cladding for a lift shaft, as a sound-dampening feature, and the eye-catching ‘café tree’ meeting place.

CONTEXT

This new interior architecture and design concept visually represents and reinforces the merger of two large insurance companies – on the outside and on the inside. The Copenhagen company Built Identity created a renewal concept that went far beyond simply renovating the building.

After analysing the company’s list of values, they created a new and vital corporate identity. The values of humanity, innovation and energy were incorporated into an organic, visionary and distinctive design.

The tree as a metaphor is an important element, recurring throughout the building. This is why several vertical wall plantings were part of the plan from the beginning: they represent the tree, and their natural liveliness contrasts with the pale-coloured, unadorned Scandinavian interior.

There are also ‘tree’ elements in the entrance area (roots), on the lift shaft (trunk), in the ‘café tree’ (crown), on the floor elements in the lift shaft (branches), and in the offices (fine twigs with leaves and flowers). →

1 The café tree in the canteen is an eye-catching feature and a meeting place. At the same time, both the planting and the panels installed in its interior reduce noise.



CONCEPTS

Planting of the round lift shaft

The company's Copenhagen headquarters consists of eight buildings. In a multi-step process, these have been redesigned and partially enlarged. They are connected by an elongated, roofed access space known as 'The Street'. This 'Street' is a two-storey transit area that receives plenty of sunlight through a glass roof and glass facades on the gable sides. Apart from a strip of red floor tiles, white predominates – which makes the planting on the round lift shaft in the middle of the access space all the more striking. The varied green of the plants contrasts distinctly with the functional, clear inner space. The different shapes and volumes of the leaves and stems and the movement of the overhanging planting give the space depth, warmth and structure.

The Plantwall structure is an inorganic fabric in which plants can flourish. It is only 75 to 80 mm thick, and can bend to fit around rounded walls. The planting begins a few centimetres above the ground, and can be seen from several different heights. The selection of plants takes the conditions into account, featuring plants from warm climates that thrive at a lighting strength of 700 to 1000 lux. Spotlights mounted around the upper edge of the shaft ² optimize the light provision (the daylight falling through the glazed roof is insufficient because the isolating glass blocks much of the red end of the spectrum). The automatic watering and nutrient supply building systems are housed in a small box. Maintenance is largely confined to checking regularly on the health of the plants and making sure that the supply system is functioning properly.



2



Planting in the canteen

Before the redesign, the large canteen was an uncomfortable, cold and noisy room used for taking quick meals. Since the redesign, the visitor enters a bright café through the new entrance area. It has a new eye-catching feature and meeting space: the 'café tree'.

The sides of the square 'café tree' structure are covered with the same Plantwall system as the lift shaft. Because the plant elements are only 75 to 80 mm thick, they do not impose any additional loads. There are noise-absorbing panels inside the café tree's steel structure that significantly improve the space's acoustic qualities. All the electricity and water conduits are integrated into the cladding so that they do not affect the simple design of the visible structure. The planting, with its large leaf volumes, actively contributes to the spatial climate by absorbing sound and increasing humidity in the air. The artificial lighting had to satisfy two requirements: adequately supplying all plants with light, while keeping the canteen free of glare.

The redesign shows that well-designed shared spaces can contribute to a strong corporate identity. Workers at the Copenhagen headquarters use the canteen and café throughout the day as a new multifunctional work space: for working on laptops, for discussions with colleagues or customers, and for breaks. The combination of artificial and natural elements creates a 'living house' where employees and customers can feel welcome, meet up, and work together. The design seamlessly combines practical use and communication – indoors and outdoors.

3



- 2 In this narrow space, the additional lighting needed for the plants creates a play of light and shadow that changes throughout the day.
- 3 From a distance, the round wall planting looks like a massive trunk. Closer to, one becomes aware of the texture, scent, moisture and movement of the plants.
- 4 Floor plan of traffic areas with lift shaft.

4

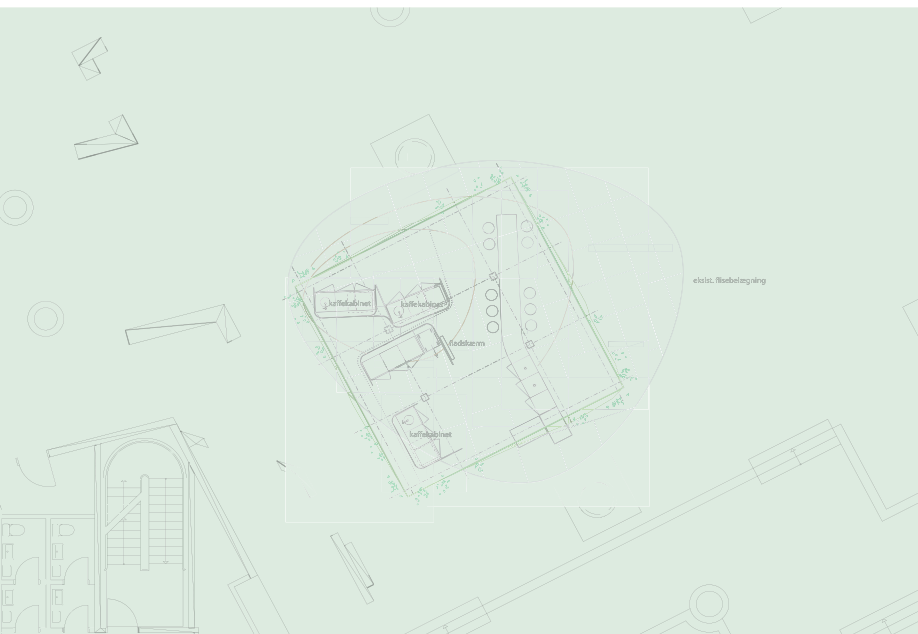


- 5 The café tree symbolizes development, harmony, balance and growth.
- 6 The compact wall planting system places no extra demands on the loadbearing structure, allowing the café tree to be a freestanding structure.
- 7 Floor plan of café tree.
- 8 Construction principles of café tree.
- 9 Cross section of café tree.
- 10 Detail of drip gutter.
- 11 Detail of corner.

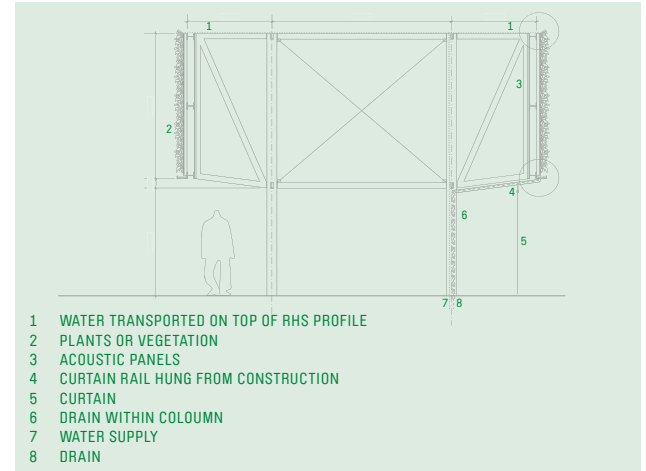




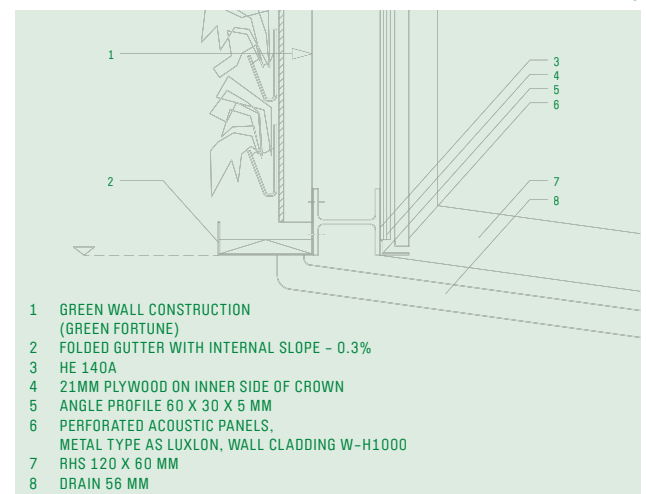
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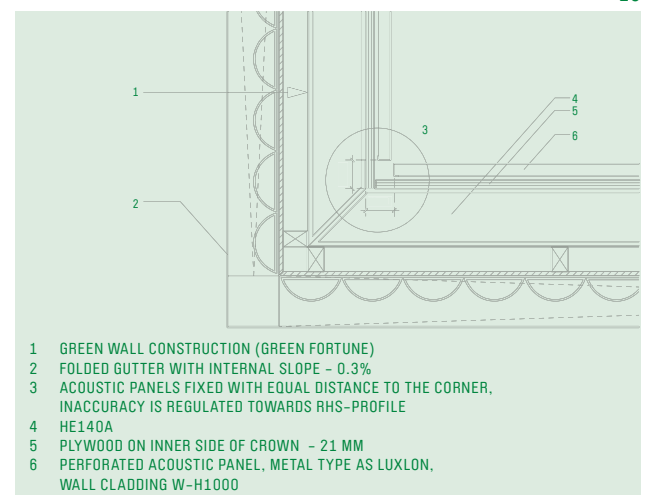
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11

Vertical garden at the head office of Mannheimer Swarthling law firm

PLANT WALL: Green Fortune

ARCHITECT: Strategisk Arkitektur

PROJECT DESIGN: Gretchen Milliken
and Jonas Ericsson

COMPLETION: 2008

LOCATION: Stockholm, Sweden

PLANNING BRIEF

A wall of greenery integrated into the marble wall cladding to enhance the company's profile and to enliven the traditionally styled interior architecture.

CONTEXT

The Mannheimer Swarthling legal practice is an international legal advice firm. The spectacular new office building, which has 14,000 m² of usable space, plays an important role in getting the firm's message across – as is expressed by the architectural language and generous volumes of this steel and glass building, in which the materials and colours of the interior – marble, wood, muted colour tones – are based on classical ideals.

CONCEPT

The client requested that a planted wall be included in the interior design. The vegetation seems to grow directly out of the marble facade cladding adjacent to the broad access steps in the atrium's foyer area. The greenery of this vertical garden does not

make it look as if nature is breaking into the building – instead, it fits into the space's design as if it was an elegant wall covering.

This kind of 'plant wall' is usually installed in a climate-controlled, heated interior space where the temperature does not significantly deviate from 200 °C. The location factors – especially temperature, humidity and light – are analysed and used to determine what plants will be used.

In this interior space, there was insufficient daylight even for shade-loving plants, because the atrium's glazing almost completely blocks the light wavelengths used by plants. A way of providing light for the whole expanse of the wall had to be found. Ten metal halogen lamps on mountings projecting high above the steps are trained on the green space in such a way that the individual species each receive the amount of light they require. This lighting scheme also makes the wall stand out more and emphasizes the aesthetics of the planting. →

- 1 The 'plant wall' complements the broad access steps of the Mannheimer Swarthling, a large law firm in Stockholm. This 70 m² plant wall is one of the largest designs by Green Fortune, which specializes in wall plantings in interiors.

