



## Energy Efficiency Solutions

### Exterior work to improve summer comfort

Well-designed landscaping can minimize summer heat gain in your hotel, reducing your cooling needs by between 20% and 100%. Planting a deciduous shade tree on the southwest or southeast side of your hotel, for instance, will help reduce your cooling needs and help maintain a comfortable indoor air temperature. Well-placed deciduous trees can help keep your hotel cool in summer by providing the building with shade from the sun. You may also consider planting indigenous shrubs, or installing open pools or fountains for evaporative cooling. Choosing the right ground cover for the surrounding area also plays an important role in summer comfort. Green walls and roofs act as an exterior thermal insulation material (for summer and for winter)

#### Ground cover

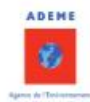
- The ground cover of the surrounding area of the hotel influences heat radiation and reflection onto windows and walls.
- It is better to choose ground cover that minimises ground reflection and keeps the ground surface cooler, thereby preventing re-radiation.
- If you are paving along the south side of the hotel, for example, it is recommended to use only permeable pavement or permeable light-coloured concrete.
- You may also use bushes and plants to shade pavements, or cover pavements with wood.

#### Open pools and fountains: evaporative cooling

- Open pools and fountains can improve summer comfort in the area surrounding the building. For cooling to occur, it is best if the fountain or pool is active, with water and air mixing to encourage evaporation.
- A fountain's potential to cool an area also depends on ambient conditions. Fountains installed on the North side of buildings and walls are sheltered from the sun and thus provide better cooling.

#### Plants and trees

- Plants and trees do not only provide shade, they also cool by evapotranspiration, which is heat removal due to the evaporation of water from the leaves.





- Green surfaces help to reduce urban “heat island” effects and improve air quality.
- Plants and trees are important carbon sinks, helping to remove carbon dioxide, a ‘greenhouse gas’, from the atmosphere.
- Planting trees and shrubs to shade the outdoor parts of your hotel’s air conditioner could increase its efficiency by as much as 10%, but be careful not to obstruct airflow around the unit.
- Planting trees improves summer comfort by helping to keep the building cool in summer and by reducing the use of active air conditioning systems (which may not provide the best comfort).
- In addition, your guests will appreciate walking under the trees in summer. They will be happy to stay outside just to sit and relax.
- Do not plant trees directly to the south of the hotel. Instead, plant trees on the southwest or southeast exposures. In the winter, even the bare branches of mature deciduous trees can reduce the amount of sun reaching your south-facing windows, limiting natural heat and light gain.
- Shading your roof, or using a green roof, will increase cooling effects even more than shading windows. Place trees that grow tall, with widespread branches, on the southwest or southeast sides of the hotel to shade the roof when they reach full height. Trees with branches that spread closer to the ground are best on western exposures to provide shade from the lower angle afternoon sun.
- It can be helpful to have a professional determine the best location for your trees to maximize energy efficiency.

### How to choose plants and trees?

- Plants vary in the care they require. Select varieties that require minimal care and water, and can withstand local weather extremes. Ask at your local garden shop or landscaping company for plants and trees that grow well in your region, but do not require great amounts of additional water and other resources.

### Where to plant trees?

- Remember that using vegetation to reduce cooling needs requires a different approach for the roof and the East and West walls!
- Plant trees far enough away from buildings so that their roots won’t affect the buildings’ foundations.

### Green walls

- A green wall is a vertical surface filled with living, growing plant matter.
- Green walls conserve energy by insulating the hotel building envelope, reducing the need for heating in the winter and cooling in the summer (a green wall can reduce the temperature of walls by as much as 10°C in summer thus lowering cooling needs inside the building).
- Green walls also filter air particulates, improving air quality.
- Interior green walls clean the air and also add humidity to the air when your hotel heating system is turned on in winter.





## Can green walls be built indoors?



Green walls can be built indoors and outdoors. Obviously, depending on where the wall will be built, different factors will affect the construction and maintenance of the wall.

## Can any plants grow on green walls?

No, not all plants can be grown successfully on green walls. Some plants are disqualified because they require a great deal of depth for their extensive root systems. Other plants have needs that are not compatible with the conditions of indoor environments. Other factors that will affect your choices are your climate zone, irrigation supply, budget, exposure, and load bearing capacity. However, this still leaves a very long list of beautiful plants of all colors, shapes and sizes that work well in green walls.

## How to choose plants for green walls?

Plants used for green walls should not act as a barrier to sun heat in winter time: that is why it is recommended to choose plants with late leafing in the spring and early fall in autumn.

As the efficiency of green walls depends on local weather and on the sun exposure of the walls, it is recommended that you ask a professional for some advice.

## How can plants grow on a green wall without any soil in it?

Plants require water and they require nutrients, but amazingly, they are able to grow very well even if they are not potted in soil, as long as they are provided with a steady stream of water and nutrients.

## Can a green wall survive through European winters?

A green wall is no different from a horizontal, or conventional, garden in this respect. Some plants will lose their bright colors and turn to dull hues. Other plants will lose leaves and only regenerate in the springtime.

- For outdoor applications only this depends on your geographical location, climate and the plants selected. Some species are evergreen and will turn a shade of maroon in the winter but will then return to their green color as soon as spring appears. In some of the warmer climates the plants survive all year round.
- For indoor use they are just beautiful all year round.

## How are green walls irrigated?

- A special mixture of natural nutrients is dissolved into the water that runs down from the top of the green wall. As long as the automatic irrigation system functions, the plants will remain healthy.

## How much water do the walls need?

- The amount of water required is plant and climate dependent.



## How much does a green wall cost to install?

- The cost of installing a green wall varies based on a number of factors. One determinant is obviously the size of the wall, another is its location, indoors or outdoors. A third factor is the varieties of plants chosen for the wall.

## Does a green wall require much maintenance?

With carefully selected plants and proper irrigation they take care of themselves.

The only thing that may need to be done is the odd trimming of dead leaves or fertilizing, or adding plants as necessary if replacements are needed. It is very similar to hotel or garden plants in that way. Once a green wall has been installed, there is next to no work that needs to be done. A green wall pretty much takes care of itself.

## Are there costs associated with the maintenance of green walls?

Just like all gardens, vertical gardens require regular irrigation and the occasional replacing of plants. In addition to these costs, the artificial lighting systems of indoor green walls can generate some electricity costs, and require the replacing of special light bulbs.

## Green roofs

- Green roofs act as an exterior thermal insulation material (for summer and for winter) and have a greater cooling power than green walls in summer.
- Their insulating efficiency increases as moisture content increases.
- Extend a roof's life and create biodiversity conservation opportunities.
- Absorb and filter rain water

- Filter air particulates, improving air quality and help to reduce the urban heat island effect (UHI).
- Protects your roof from damaging UV rays as well as the constant heating and cooling cycles which cause expansion and contraction leading to cracks in normal roofs
- Provides cushioning against hail that could otherwise damage your normal roof.



## Is my hotel roof more likely to leak with a green roof on it?

This is one of the most misunderstood issues surrounding green roofing. A green roof must be installed over a roof that has a waterproofing membrane that is in excellent condition. Green roofs are not meant to fix a leaky roof. In effect your green roof actually lives about an inch above the roof allowing water to drain off normally.

## What happens to my green roof in the winter?

This depends on your location and the plants selected. The majority of plants are evergreen and will turn a shade of maroon in the winter but will then return to their green color as soon as spring appears.





Some grasses will look brown all winter but then will regenerate from the centre of the plant, turning green again after the first few warm spring rains.

### How is a green roof affected by wind uplift?

Each roof is unique presenting different wind uplift problems in different locations. With a wind analysis of the building high wind uplift areas can be found and a fastening plan can be designed. This may be as simple as additional ballast in the form of stones around the perimeter.

### How to choose the type of green roof?

There are two basic types of green roofs: intensive and extensive. Extensive green roofs are simpler: they require less substrate and less maintenance. They are therefore more suitable for hotels. Given the complexity of this solution, it is recommended that you ask a professional for some advice.

### Link with other solutions

If summer comfort is a problem in your hotel, you should also consider installing sun shading devices (solution n°IX). You may also study the opportunity to practise over-ventilating at night when the outside temperature is lower than the inside temperature: either by opening windows, or with a mechanical ventilation system (solution n°XX). If this is not enough, you may consider installing an efficient solution for active space cooling (solution n°XiX).



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