Department of the Environment, Sustainability, Climate Change and Heritage

HM Government of Gibraltar

Green Roof Information Guide

General information on Green Roofs

Department of the Environment and Climate Change

Introduction

The Department of the Environment has produced this brief overview on Green Roofs to aid the decision-making process concerning green roofs in any planning application.

Please note that this is by no means a definitive or “how to” guide on the installation and/or maintenance of any type of green roof in Gibraltar.

For relevant and specific information on the installation and/or maintenance of any type of green roof, please contact any of the local horticultural companies who are experts on the local flora and best methods locally to introduce a green roof system.

Roof Types and Benefits

Green Roofs

A green roof is created when a planting scheme is established on a roof structure. The roof can be at ground level, often with an underground car park beneath, or many levels higher. Green roofs can also be designed as recreational spaces to be enjoyed by people, as visual, sustainable or ecological features to support wildlife or a combination of both.

Blue Roofs

Blue roofs are a way of controlling and reducing the speed of site rainwater runoff through roof level detention. Becoming a more common requirement to meet a specified SuDS flow rates, often required to meet planning policy requirements in areas of known flood risk.

Green roofs perform many of the functions of a blue roof. The various layers of a green roof detain and slow down the speed of run-off, considerably reducing the total volume per annum. Vegetation is often used as the upper most layer of a blue roof however, they may also be paving and/or gravel ballast.

Green roofs have risen in popularity due mainly to the positive impacts they have on the environment. Although there seem to be numerous categories of green roofs talked about in the market, they can be broadly broken down into intensive or extensive systems. Intensive systems are generally those types which are used as recreational spaces and often include similar features to traditional parks and gardens such as shrubs, trees, paving, lawns and even water features. These roofs require intensive care and maintenance.

Extensive green roofs are normally intended to be viewed from another location as visual or ecological features and are usually not trafficked. The more prevalent types of green roof which have hardier, more drought tolerant species of plants such as sedums, mosses and wildflowers fall within the extensive category.

Extensive green roofs designed specifically to create habitats for plants and animals can be termed biodiverse (or brown) roofs. These types of roofs are encouraged in urban areas in order to recreate habitat lost by the development.

Countering Climate Change and the Urban Heat Island Effect

During the day, heat from the sun is absorbed by the hard surfaces within a city, which is then radiated back during the night, creating a hotter city microclimate. Therefore, urban temperatures are often many degrees warmer than the surrounding countryside, which can lead to a higher energy demand to cool city buildings through the night. This difference in temperature is called the urban heat island effect.

Rises in temperature can lead to increased levels of air pollution which may exacerbate health problems especially in the old, young and susceptible. However, evaporation of water from soil surfaces and the leaves of plants on a green roof create a cooling effect of the surrounding air leading to a reduction in the urban heat island effect. The many layers within a green roof system also prevent solar radiation increasing roof surface temperatures and therefore subsequently radiating any heat back at night.

Energy Performance of Buildings Benefits

The evaporative cooling effect of green roofs, combined with the increased thermal mass of the build-up, can reduce the need for summer cooling with air conditioning, with a resultant reduction in carbon emissions. This additional roof mass also serves acoustic purposes, providing additional sound attenuation benefits.

Green roofs can also benefit building occupants, by providing valuable additional outdoor recreational areas for a variety of possible uses, including meeting places, amenity and relaxation.

Green Roofs and Solar Power

The demand for space on flat roofs is increasing. Often there is a requirement to have both Photovoltaic (PV) panels and green roofs on the new developments. It is not a case of an either-or situation, as PV panels can be combined with green roofs and both systems will function as they should if designed correctly.

PV panels are most efficient within an operating temperature envelope. Once there is a deviation either above or below these levels, the electricity generation becomes less efficient. A green roof maintains a more constant temperature with less daily fluctuations, resulting in PV panels working more efficiently throughout the day.

PV panels create wind and sun shade at their rear if orientated to the south, thus improving vegetation diversity in the shade, which in turn, increases the potential for increased biodiversity.

Designing Green Roofs with PV Panels

Sometimes called ‘Solar’ green roofs, the PV panels are mounted on, not integrated into the green roof system. In most cases, this means that the PV array is either mounted to a metal frame on top of the green roof system and ballasted with non-green roof materials, or it is fixed to the roof deck through the waterproofing layer.

The key issue when designing green roofs with PV panels is the distance between each array. Maximizing the roof space to pack as many solar panels onto the roof can have a detrimental effect on both the green roof and the energy production of the PV panels. Spacing needs to be considered as well as the timing of the installation to ensure that the plants and green roof build-up are not damaged by the installation of the solar panels and related hardware. Coordination between the horticultural and solar contractors needs to be ensured.

Regarding the plants selected for the green roof, remember that the solar panels will cast shadows across some of the growing area, therefore shade tolerant plants should be selected for these areas.

Information Required for a Successful Submission

In order to ensure that all the information required to carry out a proper assessment is available, please note the following checklist:

- Type of Green Roof
- Structural loading and engineering checks
- Waterproofing and root protection
- Drainage and water retention
- Substrate depth and composition
- Planting and vegetation selection
- Installation method and contractor competence
- Wind uplift and edge detailing
- Access and Safety
- Irrigation and establishment period
- Maintenance Planning

Gibraltar specific information to consider:

- High summer heat and long dry spells would require deeper substrate to prevent plant die-off (80-120mm).
- Intense sun exposure would require the installation of drought-tolerant species such as a sedum mix and Mediterranean vegetation.
- Drainage layers would need to be able to handle sudden high flows as happens during the occasional torrential rains.
- Avoid vegetation sensitive to salinity especially in areas with sea spray.
- Taller buildings need engineered wind-uplift calculations.
- Avoid lightweight loose-laid systems unless mechanically secured.
- Netting might be required during the establishment period due to possible high winds and birds.
- The time of year during which installation is planned will require mitigation measures to prevent possible complications due to torrential rains / high winds / birds nesting, etc.
- Waterproofing needs to be suitable for local conditions including high heat and UV levels.
- Ensure the green roof layers are compatible with solar panel infrastructure when both are being installed on the same roof.
- The use of water retention mats to reduce irrigation needs (outlets need accessible inspection chambers).
- All green roofs need irrigation during the establishment period. Depending on the green roof type, temporary irrigation, drip irrigation or rainwater harvesting will require consideration.