

Design feature	Things to consider
Plant species	Select plants that are appropriate and can thrive in the local conditions. Consider sun access and the potentially higher wind impact on plants on roofs or busy road corridors. Plant diversity is important for a healthy roof or wall garden. Use locally native plants in a variety of plant sizes and layer the plantings. Plants that flower at different times add aesthetic value and support biodiversity.
Water / irrigation	You will need to install irrigation to maintain healthy plants. This will not be needed consistently once the plants are established, but it is important for extremely hot days. Keeping moisture to the plants also provides extra cooling for the building through evapotranspiration. Sub-surface drip irrigators work best as they direct moisture to the plant roots without wastage. Irrigation from rainwater harvesting, or from treated grey or black water is preferred.
Waterproofing	Green roofs can extend the life of your building's waterproofing membrane. The soil and plants limit direct sun and wind exposure to the membrane. The waterproofing should be tested for leaks before the green roof is installed. For added security, you can also install a leak detection system with the green roof to help locate tiny penetrations in the waterproofing.
Weight	All green roofs and walls need to be assessed by a structural engineer to ensure the weight of the structure is suitable for your building. The saturated weight of a green roof can vary from 90kg per square metre for a shallow system, to up to 200 – 500kg per square metre for deeper or more intensive planting.
Wind	Plants, furniture and other objects installed on a roof space can be subjected to windier conditions than at ground level. Design your green roof to minimise wind uplift. Furniture, shade structures and planters need to be designed to withstand windy conditions.

Applying for a green roof or wall

A development application (DA) is needed for all green roofs and many green walls. While not all of the information below may be relevant to your particular project, these are standard conditions that apply to many developments. With your DA, think about submitting:

- Evidence the green roof or wall has been assessed as part of the structural certification for the building.
- Evidence the green roof or green wall has been assessed as part of the waterproofing certification for the building.
- A cross-sectional diagram that details all the components of the green roof or green wall:
 - The location of existing and proposed structures;
 - Drainage, irrigation and waterproofing, and overflow provisions;
 - Earthworks and mounding and retaining walls and planter boxes (if applicable);
 - The proposed growing medium, with soil types and depth;
 - The location, species and numbers of plants likely to be used;
 - Safety features such as balustrades and maintenance hooks (if applicable);
 - The parts of the green roof that are accessible and inaccessible;
 - How the green wall is attached or fastened to the wall.

You will also need to submit a maintenance plan to the City. This will help ensure the green roof or wall is properly maintained.

For more information see the City of Sydney's website for:

Green roofs and walls

cityofsydney.nsw.gov.au/vision/sustainable-sydney-2030/strategic-directions/a-leading-environmental-performer/greening-the-city/green-roofs-and-walls

Urban ecology

cityofsydney.nsw.gov.au/vision/towards-2030/sustainability/urban-ecology/urban-ecology-action-plan

Urban forest

cityofsydney.nsw.gov.au/live/trees/urban-forest



Green roofs and walls in the city

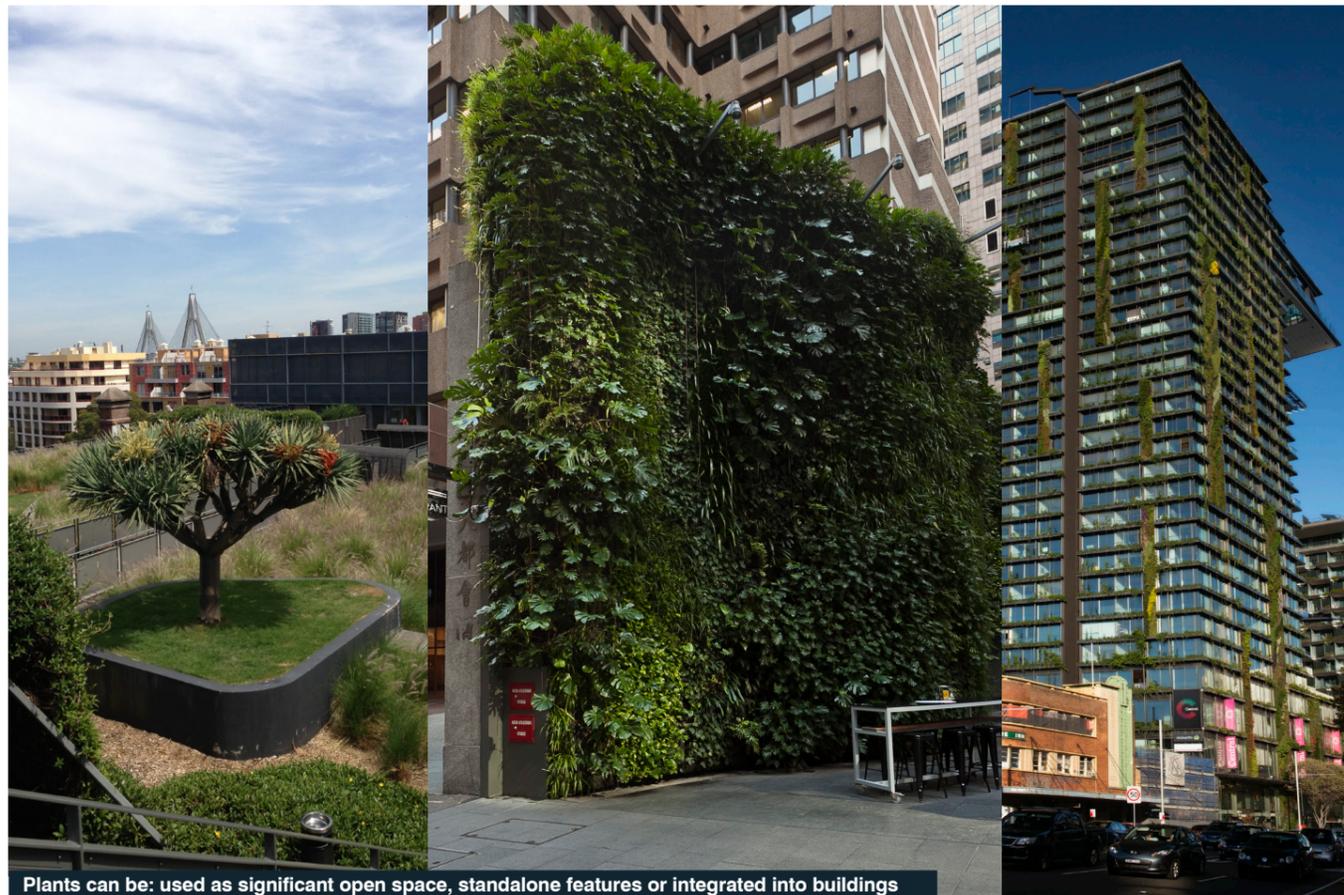
The City of Sydney encourages the use of green roofs, green walls and facades. Integrating plants into building design is essential to improve our resilience to increasing population pressures and a changing climate.

Green roofs and walls:

- create extra space for urban greening, food production and private open space;
- slow and cleaning stormwater;
- reduce the impacts of the urban heat island effect;
- improve air quality;
- provide amenity and livability;
- increase the absorption of carbon dioxide;
- create more habitat to support biodiversity;
- improve building efficiency through heating, cooling and sound insulation;
- boost the efficiency of solar panels; and
- extend roof life.

Green roofs and walls have been a feature of this city since the 1930s. The city now boasts more than 100,000 square metres of green roofs and green walls.

New technology and designs can create a beautiful addition to your building.



Plants can be: used as significant open space, standalone features or integrated into buildings

Design considerations

With good design you can make the most of underused roof and wall spaces. The ideas below may not all apply to every building, but they will help you to think about different aspects of your green roof or wall design.

Design feature	Things to consider
Access	Think about access to the roof or wall for installation and maintenance purposes. Soil can be pumped from ground level up to a roof, via crane, scissor lift or through an internal stairwell or lift. The easier the access, the cheaper to install and maintain.
Accessibility	If a green roof or wall is to be accessible, consider pathway widths and planter box depths. This will ensure the design is free of trip hazards and can be readily accessible to people in wheelchairs or with mobility or visual problems.
Biodiversity	Biodiversity is essential to human and environmental health. Any green roof or green wall can be designed to support biodiversity. Incorporate native plants from the Sydney region. Include ponds or water features to encourage bird and invertebrates to use the space. Insect hotels, rockeries and designs that provide hiding spaces for invertebrates will also support local biodiversity.
Food	Growing your own food not only cuts out significant food miles, it also provides a source of fresh food and a deep level of personal satisfaction for the grower. The minimum soil depth should be 300-400mm to ensure good growth, and an integrated irrigation system is important. Native food plants and plants with shallow rooting systems can do well on green roofs and walls.
Noise	Green roofs and walls reduce noise impacts on a building. However, you need to consider whether your green roofs will be used regularly as outdoor space. The space should be designed to minimise potential noise impact on neighbours.
Privacy	While supporting green roofs, be mindful not to impinge on others' privacy. Roof tops that overlook other private spaces may require privacy screens or setbacks.
Safety	If your green roof is to be used as open space, you will need adequate safety measures in place. The Building Code of Australia (Part 3.9.2.2) states: "A continuous balustrade or other barrier must be provided along the side of any roof to which public access is provided". If the green roof is not trafficable, you may still require a safety harness system to allow for the safe maintenance of your green roof.
Slope	A green roof requires a slope of at least 2° for proper drainage. If the roof is completely flat, layers can be added to improve drainage on the roof. Green roofs can be installed on roofs of pitches up to 45°, however green roofs over 10-15° may require added support to keep soil and plants evenly distributed on the roof.
Soil	Soil for green roofs and walls is specially engineered to be lightweight and provide sufficient support for plants to grow and drain water effectively. Once planted, a thick layer of mulch (75mm) should be added to prevent soil blowing away and to reduce irrigation requirements. Over time, soil and fertilisers will need to be added to keep your garden healthy.
Sun and wind access	For your green roof or wall to flourish, you will also need to consider the site aspect. Select plants that thrive in the particular sun and wind conditions of your site. The higher the roof or wall, the greater the potential wind and sun impact. If you are intending to grow food on your green roof or wall, maximising daily sun exposure is important.
Sound insulation	Soil in green roofs dampens low frequency noise, and plants dampen high frequency noise. For best effects the soil media depth needs to be a minimum of 300mm and plants densely planted to insulate your building from outside noise.
Solar panels	Solar panels can be integrated with green roofs. Green roofs keep ambient temperatures at an optimal level for maximum solar panel efficiency. Select low growing plants that won't over-shadow the panels.