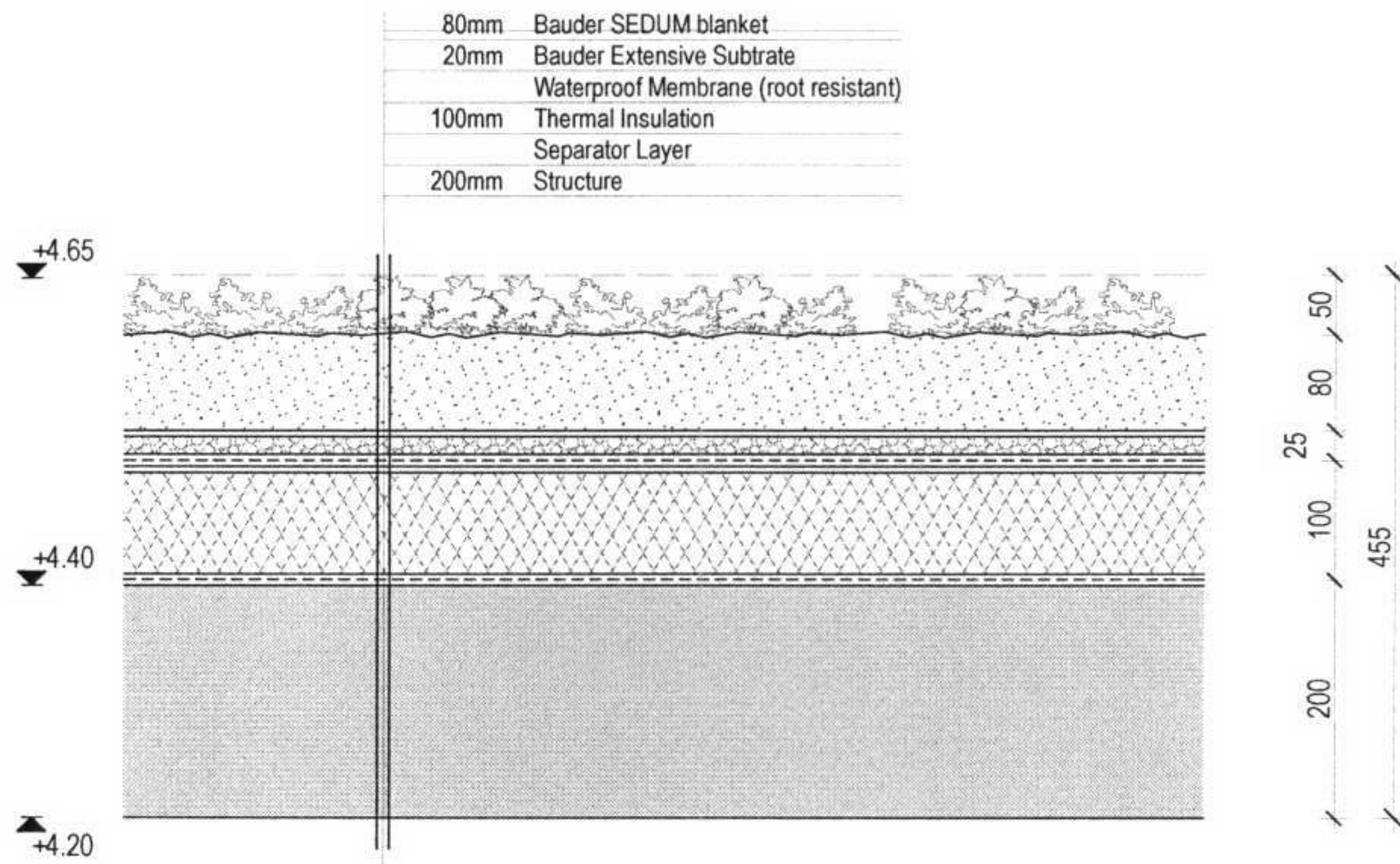


TECHNICAL DESCRIPTION OF THE GREEN ROOF

May 2007

200a Goldhurst Terrace, London
NW6 3HL

PROPOSED ROOF STRUCTURE M=1:10



ECOLOGICAL AND ENVIRONMENTAL BENEFITS

Control of rainwater and precipitation

The steady increase in urban development continues to reduce the total area of permeable ground available to absorb rainwater run off. Hard construction materials (like roof tiles, concrete paving and tarmac roadways etc.), discharge water very quickly reducing effective evaporation and loading the drainage systems which in turn can contribute to flooding.

Green roofs can play a significant role in helping to manage storm water run-off. Even the thinnest extensive green roof system will absorb 40% of the average rainfall and equally importantly, the remaining 60% will drain off at a much slower rate compared to an exposed roof. This significantly reduces the pressure on the drainage systems and allowing much faster evaporation of accumulated moisture. Intensive green roofs with their deeper soil levels can actually retain up to 90% of the average rainfall.

Many European countries have already recognised this problem and provide legislation for rainwater management, and in return offer significant tax reduction incentives to owners of commercial or industrial buildings who install green roof systems.

Energy Conservation

An unprotected or poorly insulated roof can lead to overheating of rooms directly below it as hard impervious construction materials such as concrete, stone, asphalt or tarmac, absorb solar energy raising temperatures.

Green Roofs improve the thermal performance of buildings, helping to keep them cool during warm weather by reducing heat absorption and allow air conditioning costs to be reduced.

In winter a green roof provides additional insulation so reducing heating costs for the building. Planting can also act as a wind break thereby reducing wind chill.

Air Quality Improvement

Green roofs retain and therefore reduce airborne dust helping to filter and improve air quality by attracting particles to the damp surfaces of the vegetation and soil. Plants also absorb gaseous pollutants through their leaves and metabolise them so removing them from the environment.

During the natural process of photosynthesis, plants convert carbon dioxide to oxygen which improves the immediate air quality.

Noise reduction

The plants and substrate contribute as a sound barrier providing excellent acoustic performance towards noise reduction. When the green roof is wet this enhances the reduction even further.

Sustainable habitat for plants & wildlife

With continued urban expansion, vital natural habitat is lost every day for many of our indigenous plants, insect and bird species.

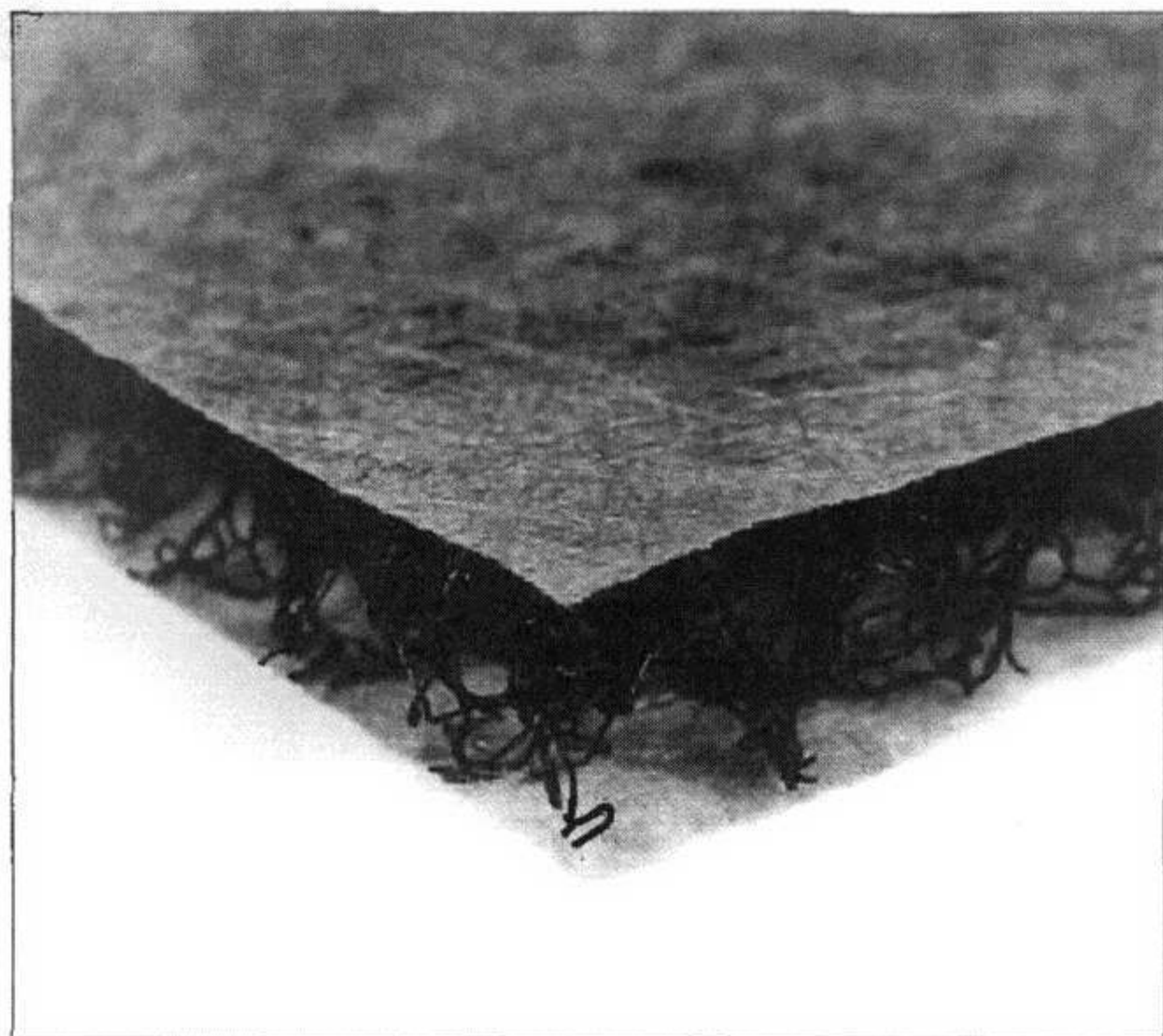
Green roofs provide a practical and effective alternative, helping to both restore and sustain a natural habitat. With Green Roofs it is possible not only to create new living areas, but also recreate the natural habitat for many of our endangered species of plants and insects and provide safe and undisturbed nesting sites for birds.

Use of recycled materials

Many of the materials used in green roof construction are manufactured from recycled building materials, plastics and rubber reducing landfill disposal.

Bauder SDF Mat

The cost effective solution for large areas



Bauder SDF Mat is manufactured from ultraviolet resistant nylon woven loops which are thermally bonded to geo-textile filter fleece facings. The nylon loops create an open mesh through which the rainwater drains, whilst the filter fleece prevents substrate fines from washing away.

Bauder SDF Mat is a multi functional single layer that provides filtration, drainage and protection of the waterproofing system. Bauder SDF Mat is the most cost effective extensive roof construction, ideally suited to lightly trafficked roof areas.

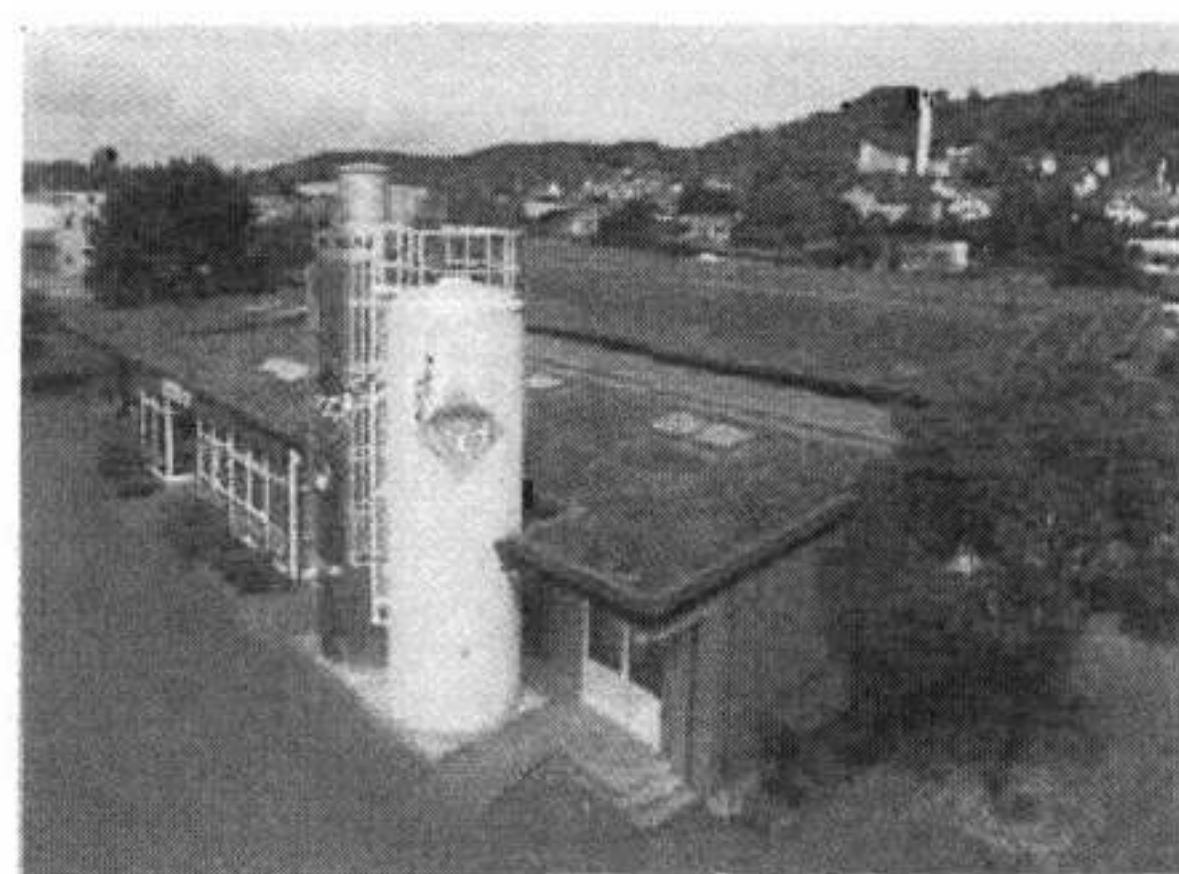
Material

Geo-textile facings with UV resistant woven nylon loops

Roll size	1 m x 20 m ²	1 m x 50 m ²
Thickness	20 mm	20 mm
Coverage	20 m ²	50 m ²
Weight	ca. 600 g/m ²	
Pressure resistance	ca. 20 kN/m ²	

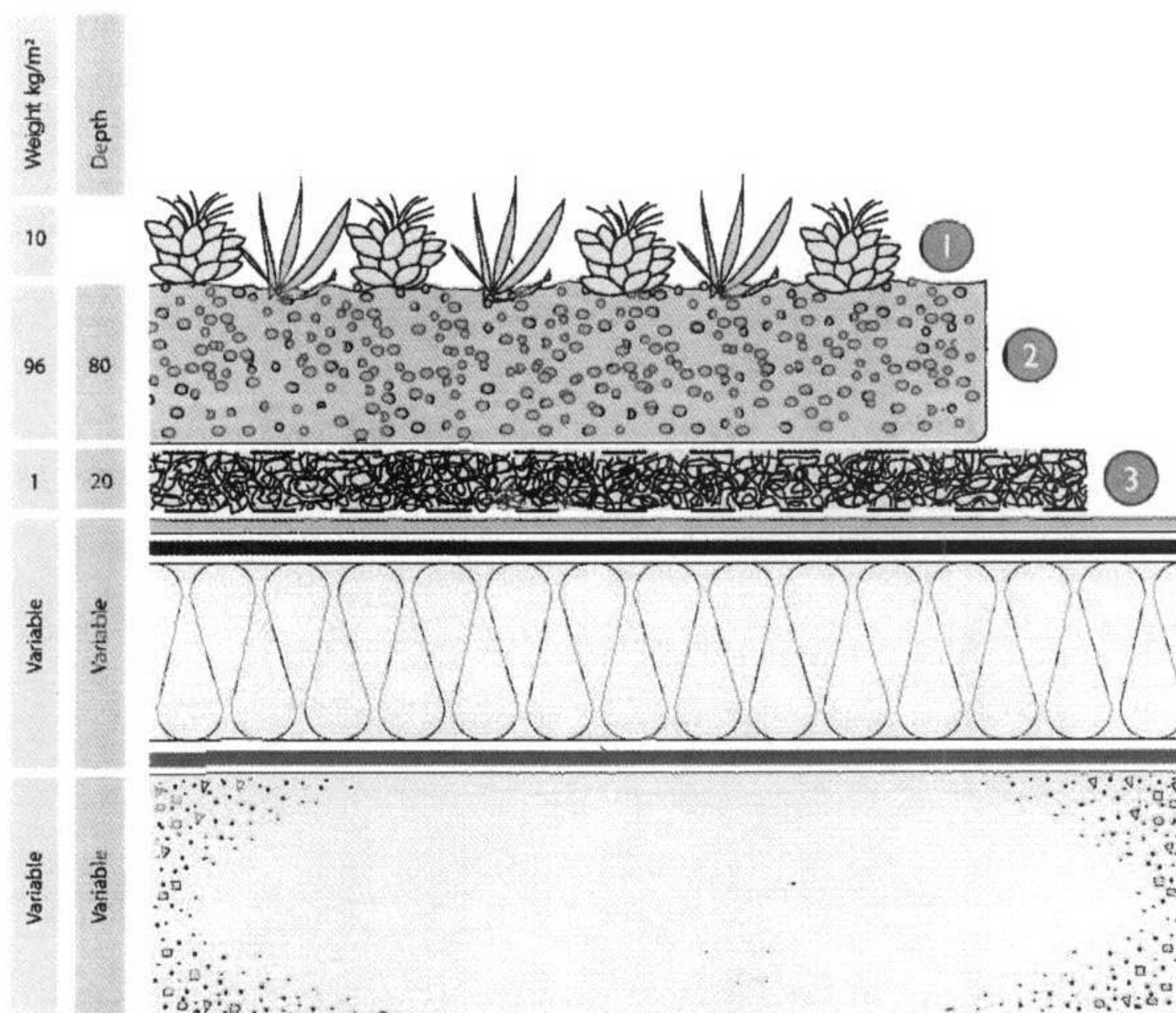
On roofs where paved walkways or platform mounted equipment are required, Bauder SDF Mat is not suitable because of its compressive nature. In this situation, Bauder PLT20 should be used either throughout or adopted in the specific areas where additional support is required; in this circumstance, a separate filter fleece layer is used to lap onto any adjoining Bauder SDF mat.

Planting options are: hydroplanting where a mixture of pre-selected plants are incorporated, or plug-planting, where specific plants may be chosen.



Roof slope > 1° and up to 10°

(0 - 1° only if less than 15 mm of standing water present)



1 Plug Planting or Hydroplanting

Selected species to suit the project and site location.

2 Bauder Extensive Substrate

Lightweight growing medium, depth 80 mm. Manufactured and used in accordance with FLL guidelines.

3 Bauder SDF Mat

Multi-functional drainage, filtration and protection layer, 20 mm thick.

4 Bauder Waterproofing System

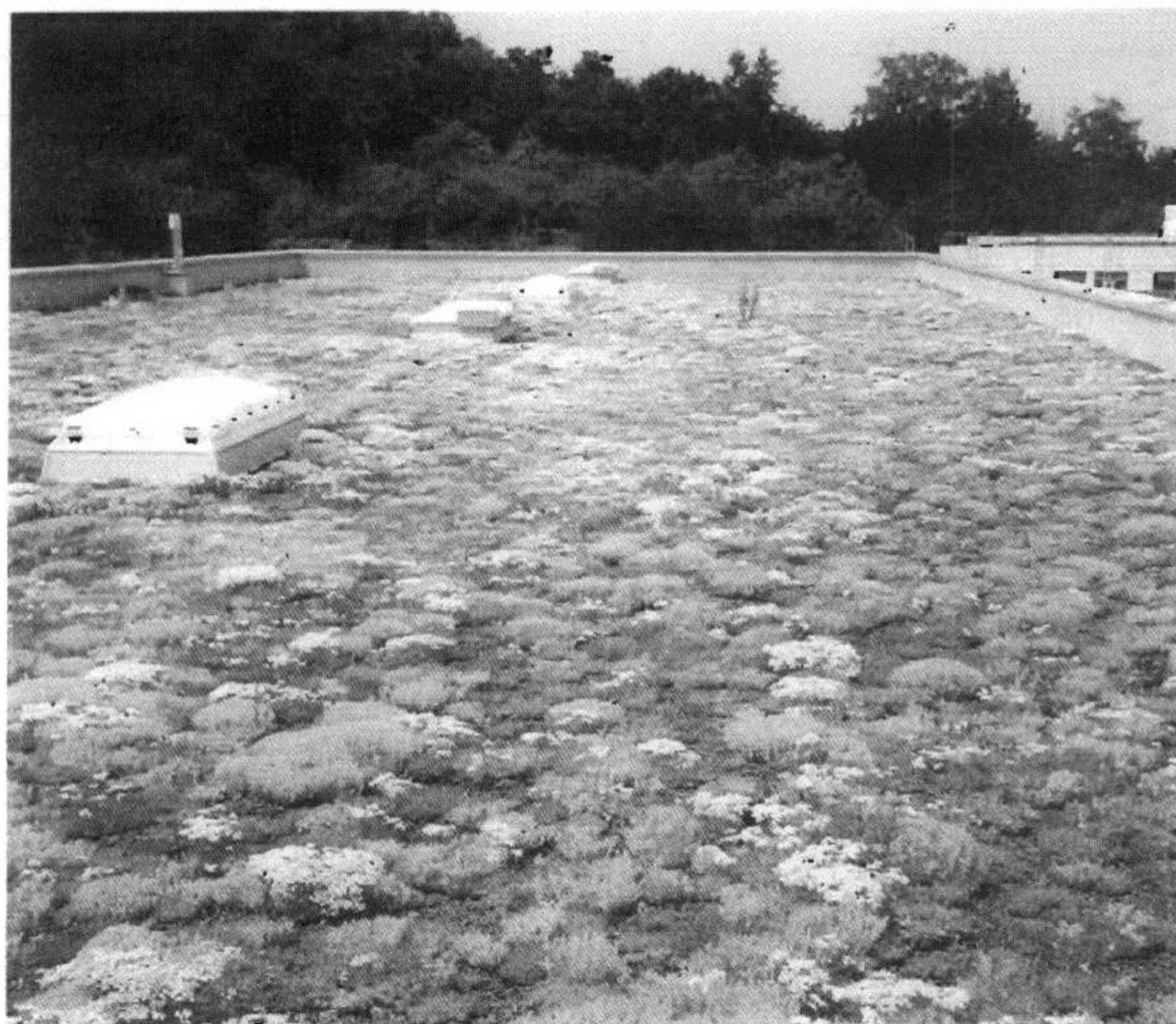
High performance waterproofing membranes suitable for green roof systems.

Technical data

Build up height	100 mm
Total water storage capacity of system	38 litres/m²
Total weight (exc. waterproofing)	107.0 kg/m²
Weight of waterproofing system (assuming 100 mm PIR insulation)	19.1 kg / m²

MAIN FEATURES:

- Utilised on roofs with 1 - 10° slope
- Suitable only for lightly trafficked areas
- Drainage, filtration and protection from a single product
- Cost effective construction
- Excellent drainage



Annual maintenance is normally carried out each spring. It is important to ensure that safe access can be gained to the roof and that relevant health and safety procedures are followed. Safety harness attachment points or man safe systems should be provided in the construction where appropriate.

Fertilising

A granular fertiliser, either organic or slow release, should be applied during spring, but no later than the beginning of May. It is an essential part of the maintenance routine, providing the plants with nutrients allowing them to become hardy enough to resist extreme cold, heat and drought. On small roof areas, fertiliser can be scattered by gloved hand from a bucket or a hand held spreader. For roofs over 100 m², we recommend using a trolley applicator for a faster distribution that provides accurate coverage.

Information regarding suitable fertilisers can be found on our web site www.bauder.co.uk or through our technical department who will be pleased to offer advice concerning maintenance issues.

Debris

All debris and leaves should be removed from the roof surface, rainwater outlets, chutes and gutters. Roofs in the vicinity of deciduous trees will require a further visit at the end of the autumn to remove any leaves that are covering underlying plants.

Plant Encroachment

Any plants that have encroached into areas surrounding rainwater outlets, walkways, pebble vegetation barriers, gutters, etc. must be removed in order to prevent blockage or impeded drainage.

Weeding

Any unwanted vegetation such as weeds, grass or saplings can be removed either by hand or by using a 'weed wipe'. Large areas of weeds most often occur after a wet and warm summer and do not cause any damage to the waterproofing or roof structure.

Repairing Bare Patches

Any bare patches that remain after the removal of large weeds or grass will eventually be covered over by sedum plants. This coverage process may be accelerated by taking cuttings or small clumps of sedum and placing them on the affected area and then covered with substrate, fine sandy soil, or compost and then watered. After 3 - 4 weeks, the cuttings will become fully rooted. Works to bare patches should be undertaken during spring or late autumn, as the cuttings will not establish in extreme climatic conditions such as frost or hot sun.

Monitoring Colour and Growth

The sedums will naturally change colour depending on the seasons and weather conditions. For example Sedum album 'coral carpet', one of the more prominent species, means that visually the plants vary in appearance from green during spring, to blushing red in the summer months.

The colour and rate of growth should be examined to determine the condition of the plants. If the plants are shrunk back and dark crimson in colour, this may indicate a lack of water or inadequate nutrition. A simple application of water and fertiliser should resolve this problem. If severe degradation has occurred, Bauder Limited should be contacted to advise on the appropriate course of action.

Vegetation Barrier

If settlement of the vegetation barrier has occurred, then additional washed pebbles, grade 20/40 mm must be added.

Promenade Tiles or Paving Slabs

Where promenade tiles or paving slabs have been incorporated it is important to ensure that they are still secure in their original position and are in good condition.

Rainwater Pipes

All rainwater pipes must be free of blockage to enable water to flow freely through them. Any protective metal flashings or termination bars should still be securely fixed into place. The mastic sealant should be examined for signs of degradation and renewed where appropriate.

For clarification on any maintenance issues please contact our Green Roof Technical Department for advice, T: +44 (0)1473 257671

Any alterations to the system without consultation with Bauder may invalidate the guarantee. Bauder should be advised of any amendments that need to be made to the roof so that we can provide the correct procedure for their installment, thus ensuring the guarantee will not be affected.