PROTAN

Protecting values

Protan Protected Membrane Roof

System Specification

Protan Protected Membrane Roof

Roof waterproofing membranes covered with ballast designed to withstand wind loads, are in general referred to as protected roofs. The ballast material can be paving, gravel and also soil as substrate for cultivating plants on the rooftops. Aesthetic effects, as well as utilization of the roof for other purposes of use, may be additional benefits for these types of roof construction. The weight of the ballast requires structural strength in the load bearing construction, and may cause a disadvantage if additional capacity is required. Due to this, the method is most common on roof decks of concrete.

The main object of the ballast is to prevent wind uplift of the membrane. The critical factors in this relation are not only the total weight of the ballast, but also the type of ballast material. For example would fine grained gravel be sucked off the roof at lower wind speeds compared to concrete paving. As a general thumb rule, a layer of thickness not less than 50mm with coarse gravel (graded 16-32mm) is a minimum requirement. On particular wind exposed roofs, the gravel has to be replaced with concrete paving or slab in the corner and edge zones of the roof area. «Green roofs», i.e. roofs covered with soil as growing substrate for plants, are normally resistant to strong winds.

Protected roof water proofing membranes have to fulfil tough requirements concerning dimension stability, ageing properties and resistance to pressure from water and roots. Normally the Protan G-series is recommended, but also Protan SE can be used in certain circumstances. Protection against UV and external spread of fire is only recommended where the membrane is partially or totally exposed.

In this type of flat or low pitch compact roof construction, depending on the type of thermal insulation, the insulation boards can be positioned under, over or on both sides of the roof waterproofing membrane.
So called duo-roofs and inverted roofs give both extraordinary good protection of the membrane, but require thermal insulation designed for wet conditions. However, the most common situation is placing membrane on top over the insulation boards.
Thermal insulation boards have to withstand pressure from ballast material and activities on the rooftop. The compressive strength and resistance to dynamic loads have to be in accordance to foreseen loads. Due to the effective protection against external fire spread by the covering, use of EPS- and XPS-insulation panels can be a good solution for this type of construction.

The comprehensive structural design of protected roofs and the difficult scanning for leaks if such problems should occur, require a high level of quality assurance during both planning and installation.

Gravel Ballasted Roof

Coarse gravel gives the roofs an aesthetically appealing surface and provides resistance to flame spread. The gravel layer reduces rainwater run-off, and leaves and litter are caught by the gravel surface so the risk of clogged roof drains is reduced.
The gravel's heat capacity, it's ability to light reflection and the humidity stored beneath, all contributes to cooler interior climate during hot periods summer time.

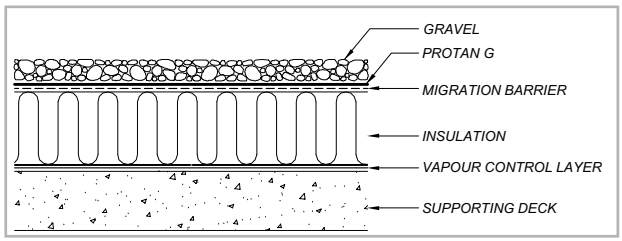
Gravel ballasted roofs are a well-proven construction, which allows use of membrane in larger sheets without any mechanical fasteners in the field. It provides easy and efficient installing, but requires mechanical anchoring of the membrane with a linear system along all upstands and terminations. The reason is to prevent movement of the membrane caused by thermal contraction or wind up lift flutter.

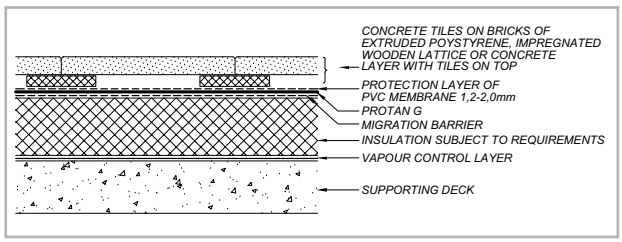
Recommended aggregate is washed fluvial gravel cleaned of fine particles, and applied to a minimum 50mm depth. When crushed gravel is used, a protection layer between the gravel and the membrane is required, i.e. 300g/m^2 polyester felt or Protan PVC-P protection sheet. Whenever non washed aggregate is to be used over a singleply polymeric membrane, a separation layer is recommended to prevent wash-down of any fines and sharps, which might reduce the life expectancy of the membrane.

Additional ballast may be needed at those areas subject to greater wind uplift, such as corners and perimeters. Aggregate should then be replaced with paving of concrete tiles or slabs. This also applies where the kerb at the roof edge is too shallow to retain the aggregate.

When maintenance traffic or other foot traffic on the roof is expected, aggregate is to be replaced by paving slabs. Where paving slabs are laid tightly butted, allowance should be made for thermal expansion by providing a border of gravel or compressible material at the perimeter of paving.

Recommended membrane for gravel ballasted roof is Protan G 1,5mm, see product specifications in Protan Specification Manual chapter 14. Protan G is stabilized to withstand UV-radiation, heat and microbes. Protan G must be separated from EPS- and XPS-panels by a migration barrier.





Green Roof

Green roofs, elevated roof surfaces covered entirely by a thin soil and vegetation layer, provide aesthetic, environmental and economical benefits, and which are especially useful in urban areas.
The vegetation comprises hardy, short growing, self-renewing species of grass, sedum, heather, bushes and herbaceous plants that can withstand soak and drought during long periods. Care and maintenance is minimal, irrigation is not required.

If green roofs, with their positive environmental impact, are incorporated into urban buildings with flat roofs, they can result in great savings. For example:

Water management
Larger buildings or mass of buildings are taking up a lot of land. The sealed off areas generate runoff because water is no longer able to infiltrate the ground, necessitating the construction of storm sewers. Green roofs help by retaining 75 percent of the water – on average – which is stored in plants and in the soil layer. The roofs also trap sediments and other particles and actually treat excess runoff in event of heavy rain.

Energy efficiency
It is difficult to estimate the savings a green roof provides through energy efficiency because much depends on the design of the building. One or two-storey buildings enjoy far greater energy savings than multi-storey structures. Nevertheless, the vegetation contributes to energy conservation because of its thermal properties.

Urban Ecology
Cities often exclude greenery and nature in exchange for progress. While green roofs are no substitute for open land space and simply cannot replace the significant function of forests and open parkland, they do provide green space and wildlife habitats from which both urban and suburban areas can benefit.
Air quality in urban centres often is hot and dry due to lack of trees and green space. For example, on hot summer days surface temperatures on rooftops can get far higher than the air temperature. The results include the urban heat island effect and a higher rate of energy consumption. A green roof's plant foliage transforms heat (energy from the sun) and soil moisture into humidity through photosynthesis and reduces roof surface heat gain. The vegetation layer traps air and prevents rapid air exchange, thereby improving a building's energy performance.

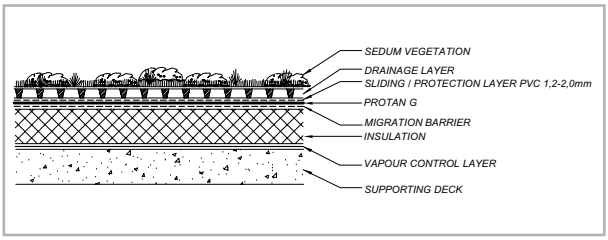
There are two different types of green roofs: extensive and intensive.

Extensive green roofs range from as little as 40mm soil depth and weigh no more than conventional gravel ballasted roofs. They are primarily built for their environmental benefits, not for access. Installing an extensive green roof is a creative alternative to the required and often costly conventional storm water management controls. Green roofs absorb rainwater, reduce peak flows and runoff, and allow excess water to slowly percolate through the soil so it is treated by the time it reaches the drainage outlet. Waste is further reduced when plants absorb nitrogen and phosphorus as nutrients, eliminating what otherwise would become non-point source pollution.

Nevertheless, a drainage layer (Nophadrain) is normally recommended between the sedum and the membrane. The weight of the cultivation substrate must be in accordance to the design wind load and implies a supporting deck that can accommodate the extra weight.

Extensive green roof is a well-proven construction that allows applying the membrane in larger sheets without any mechanical fasteners in the field. It provides then easy and efficient installation, but requires mechanical anchoring of the membrane with linear system along all upstands and terminations. The reason is to prevent movement of the membrane caused by thermal contraction or wind uplift flutter.

Recommended membrane for extensive green roof is Protan G 1,5mm, see product specifications in Protan Specification Manual chapter 14. Protan G is stabilized to withstand UV-radiation, heat and microbes. Protan G must be separated from EPS- and XPS- panels by a migration barrier.



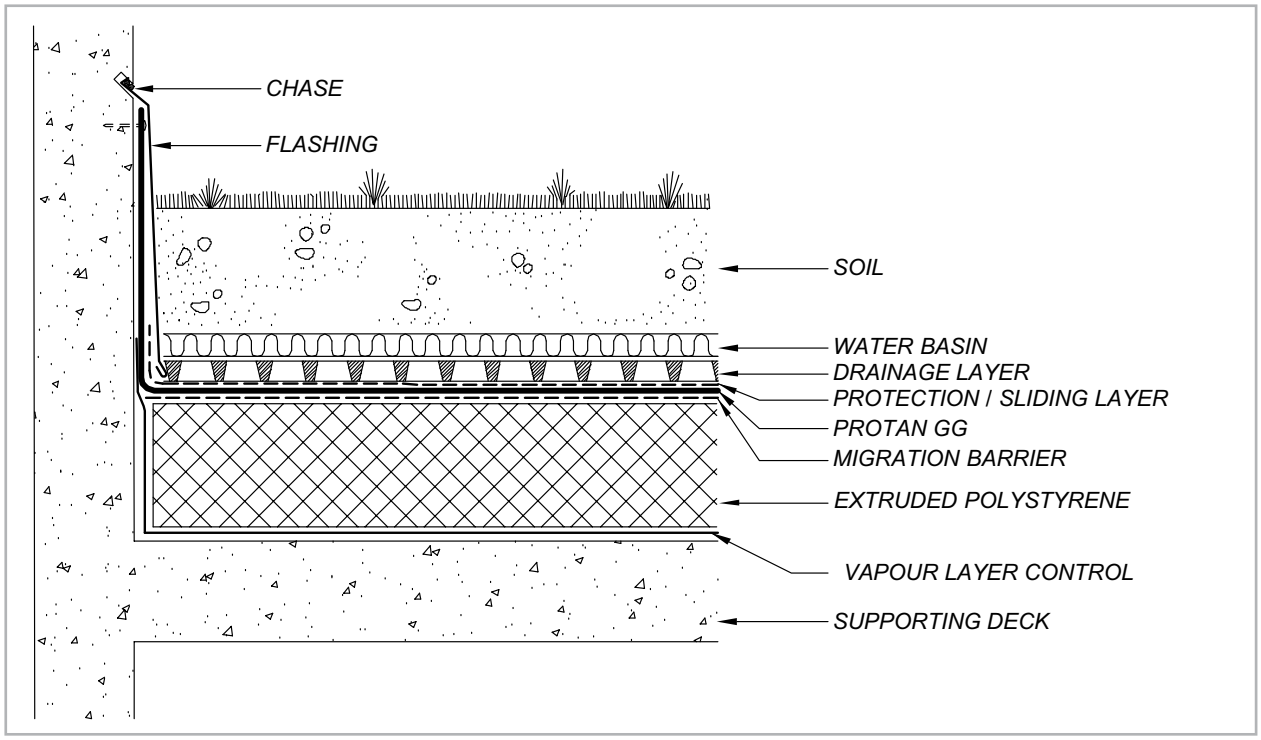
Intensive green roofs, in contrast, require a soil depth of at least 300mm in order to create a more traditional roof garden, with large tress, shrubs, and other manicured landscapes. Intensive green roofs add considerable load to a structure and require significant maintenance. The roof gardens, however, are designed to be accessible and can be used for outdoor activities – a tremendous advantage in urban locations.

A drainage and protection layer (Nophadrain) is recommended on top of the membrane, and in addition a water magazine layer (Grodan) between the soil and the water drainage. These are to secure efficient drainage and the plants water supply during drought.

Intensive green roof is a well-proven construction that allows applying the membrane in larger sheets without any mechanical fasteners in the field. It provides then easy and efficient installation, and requires no mechanical anchoring of the membrane along upstands and terminations. Neither flutter due to wind uplift or thermal contraction are normally expected in such constructions.

The difficult access to the membrane when the green roof is installed, requires extraordinary quality control and inspection before the covering is applied.

Recommended membrane for intensive green roof is Protan GG 2,0mm, see product specifications in Protan Specification Manual chapter 14. Protan GG is designed to withstand heavy loads and pressure from water and roots, and exhibits excellent ageing properties under these circumstances. Protan GG must be separated from EPS- and XPS- panels by a migration barrier.



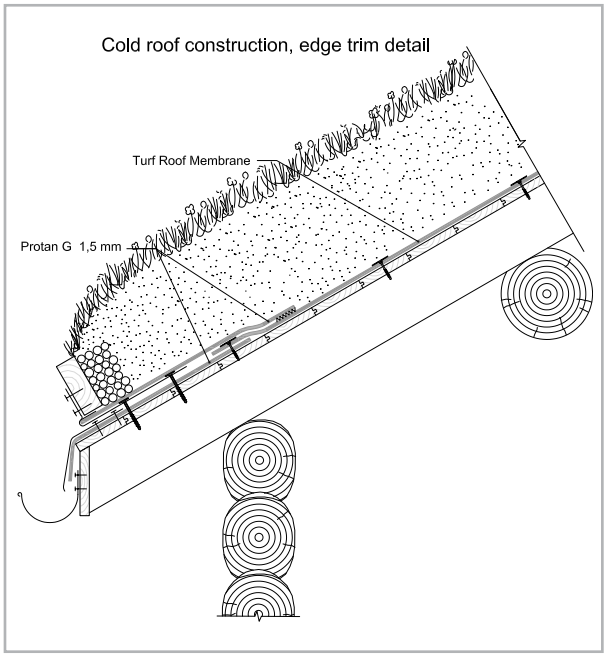
Turf Roof, sloped

Turf roof is a special variant of extensive green roof, and is widely used on pitched, smaller roof surfaces in the Scandinavian countries, mostly on cottages in suburban areas.

The way of building culture and progress often requires that the membrane has to withstand wind loads in longer periods before the turf can be applied. In such cases the membrane must be fastened mechanically as a normal roofing material in accordance with national requirements for wind uplift. The membrane should be fastened to the supporting system in accordance with the requirements for temporary structures, ie. fastening must be dimensioned to accommodate a load equivalent to 65 % of the design load for the location.

Recommended membrane for turf roof is normally Protan EX 1,6mm, see Protan Product Specifications. Protan EX is stabilized to withstand UV-radiation and heat. It is polyester reinforced and designed to transfer wind load forces, and is classified to resist external fire spread in accordance to test norms described in ENV 1187.
Polyester felt is laminated to the under side of the Protan EX membrane to prevent mechanical stress from rough and uneven substrates.
Generally no other protection or drainage layer is required in this type of roof construction.

For insulated Turf roof constructions other membranes may be selected in consultation with Protan Technical Service. To prevent the turf sliding of, special arrangements are to be made, see drawings.

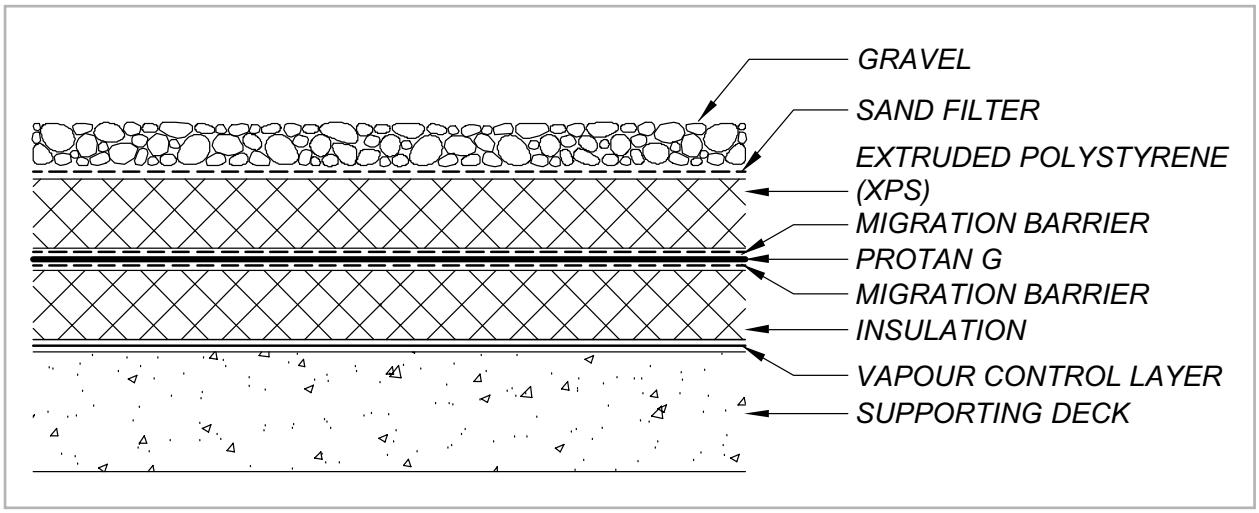


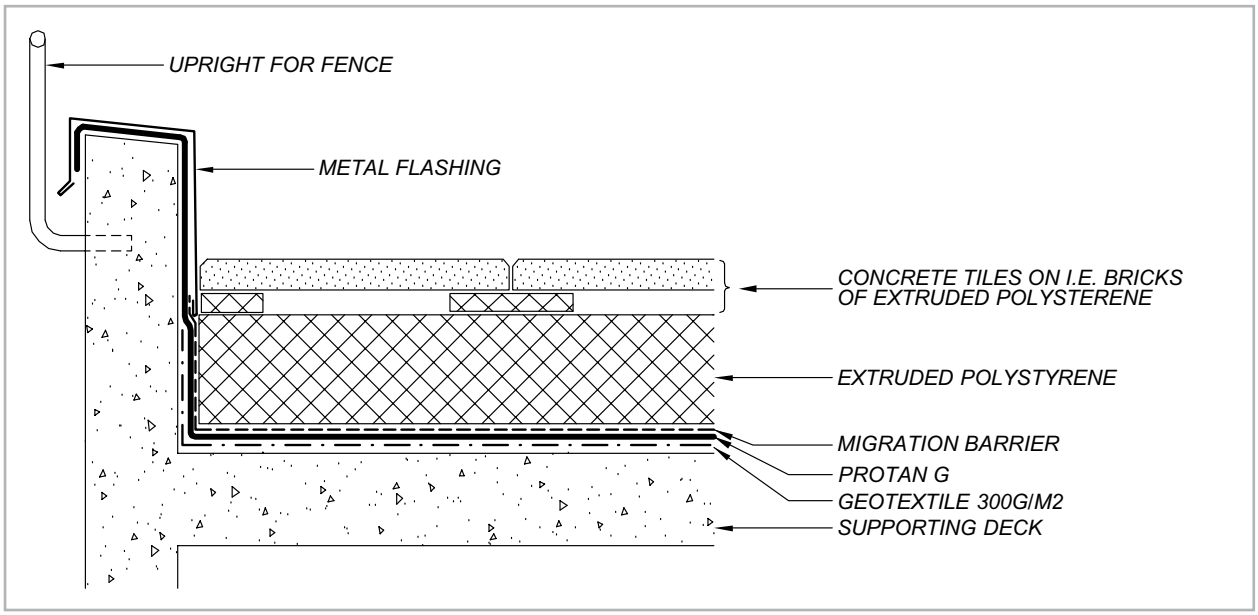
Invert and Duo Roof

These are both variants of the traditional insulated, protected roof constructions, where the membrane is placed under or in between the insulation panels.
Vapour resistant insulation made from extruded polystyrene (XPS) on top of the membrane provides additional protection from temperature and mechanical stresses.
The insulation panels are installed with overlapping rebated edges or in two layers.

To stop fines and sharps from penetrating into insulation and membrane layer, a polyester felt is to be installed on top of the insulation. Protan G and GG must be separated from EPS- and XPS- panels by a migration barrier.

The wind uplift forces and flotation of insulation from rainwater panels must be compensated by sufficient gravel or ballast thickness.





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