

NOPHADRAIN®

GREEN ROOF INNOVATORS



NOPHADRAIN ROOF DECKS

THE INVERTED ROOF, A SOUND
CONSTRUCTION FOR ROOF DECKS

GREEN ROOFS
PODIUM ROOF DECKS
PARKING ROOF DECKS

1 INTRODUCTION

Introduction

Today, architects and town planners are making practical use of flat roofs and maximising available space by designing contemporary green roofs (for example; to enhance the appearance of a building with "terrace" decks).

Flat roofs may be used to provide planted or landscaped areas which can offer a valuable amenity within the built environment. Such green roofs can enhance the appearance of the building and provide additional outdoor facilities for building users or enable use for both pedestrian and vehicle traffic.

The Design

When designing a flat roof, attention has to be paid to the choice of roof construction. There are two insulated flat roof systems; a "warm" roof where the waterproof membrane is applied above the insulation and an "inverted" roof. The inverted roof is where the waterproofing membrane is protected from damage by the insulation and is suitably loaded to prevent flotation and wind uplift.

Building Physics

The inverted roof system is well proven, highly durable and ideally suited to the insulation of flat roofs. The inverted roof construction can significantly reduce the risk of condensation in an existing building by keeping the roof structure and the waterproofing layer above the dewpoint temperature.

Although the waterproofing membrane takes the function of the vapour check, attention shall be paid to install a diffusion open layer on the insulation to avoid condensation in the insulation.

Construction build-up

The waterproofing membrane, which prevents the ingress of water, should be fully adhered to the roof substrate. Extruded Polystyrene (XPS) boards, the only material suitable for an inverted roof (with a minimum compressive strength of 300kN/m²) is installed. The Nophadrain membrane is placed directly on top of the XPS insulation. The core of this membrane is perforated making it vapour permeable thereby guaranteeing long term insulation performance. A growing medium layer is then applied, the thickness of which is dependent on the desired planting scheme:

- extensive: moss, Sedum, herbaceous plants and grasses
- intensive: lawn, perennials, shrubs and trees.

For projects involving hard-landscaping for foot or vehicular traffic, a sub-base should be installed over the Nophadrain membrane, followed by laying a course onto which the flexible paving can be laid.

Determining the thermal efficiency of the inverted roof

The requirement for limiting the heat loss through the building fabric can be satisfied if the U values of the building elements (including thermal bridging) do not exceed the maximum values in the relevant Elemental Methods given in the national Building Regulations: England and Wales: Approved documents L1 & L2, Table 1. Scotland: Technical Standards, Northern Ireland: Technical Booklet F.

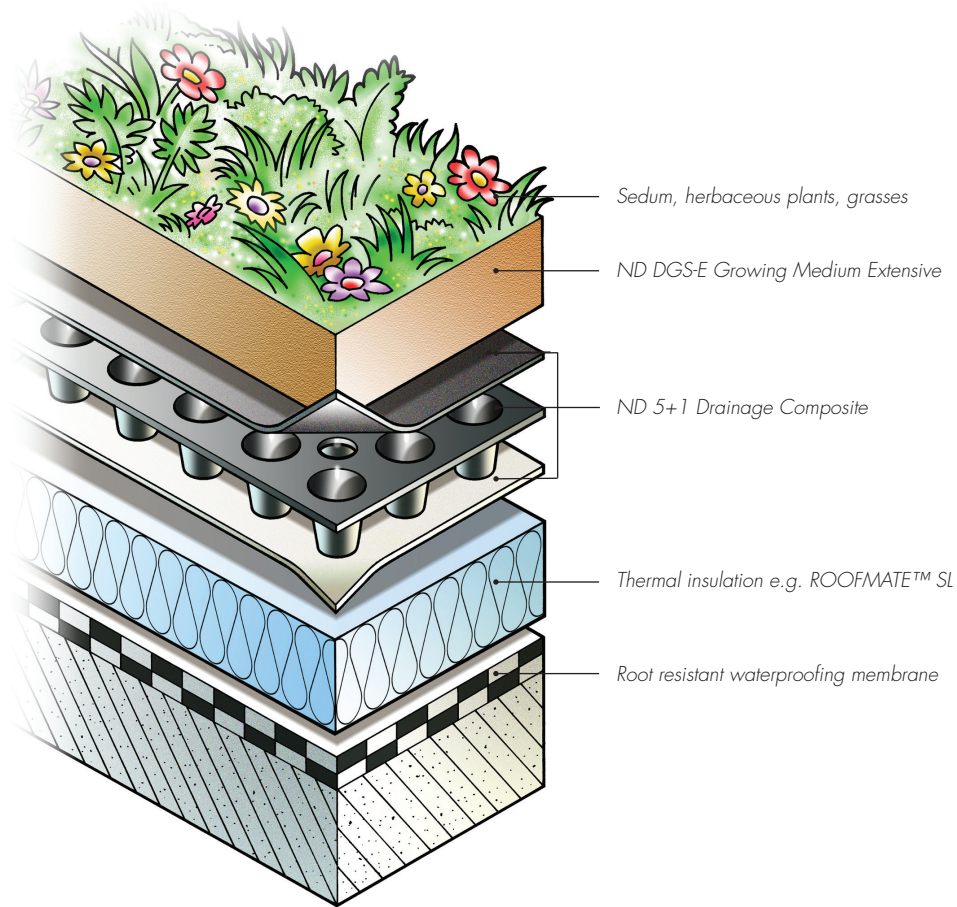
The U-value of roofs can be calculated using BS EN ISO 6946 (including the correction for rainwater cooling). For green roofs ignore the effect of soil, vegetation etc. Dow Building Solutions offer a technical service to calculate the required U-values for an inverted roof. Tel: 0870 7104553 (UK).

Advantages of the inverted roof system:

- Well proven, highly durable form of roof construction;
- Insulation provides excellent protection of the waterproofing membrane;
- Excellent thermal performance – for the lifetime of the structure;
- Lightweight;
- Significantly reduces the risk of condensation.



2 NOPHADRAIN EXTENSIVE GREEN ROOF SYSTEM



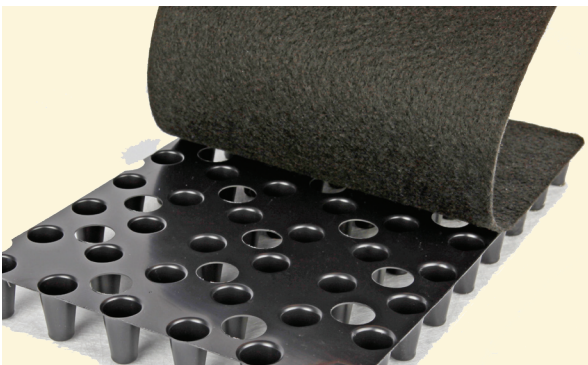
Characteristics of the Nophadrain Extensive Green Roof System (extensive planting scheme):

- Excellent protection of the waterproofing membrane;
- Vegetation: moss, Sedum, herbaceous plants and grasses;
- Minimal load: from 30kg/m² (including vegetation);
- Limited build-up: from 70mm;
- Low costs: both in terms of installation and maintenance;
- Average annual water retention capacity 50%*;
- Run-off coefficient $C \geq 0.5^{**}$.

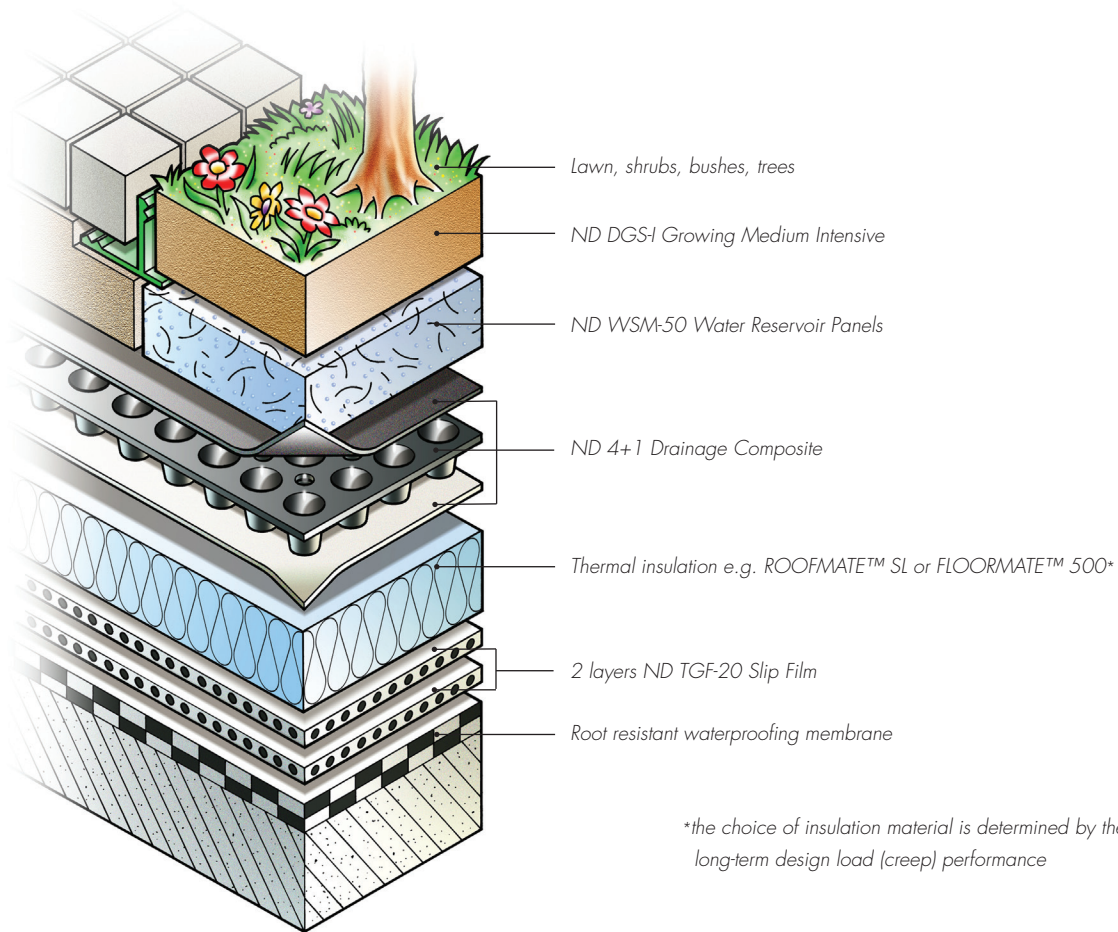
More information on construction and choice of materials for extensive green roof systems can be found in the Nophadrain brochure entitled "Extensive Green Roofs – design and installation manual".

*average annual precipitation 650-800mm, depth growing medium $\leq 100\text{mm}$

**rainfall intensity of $i^{1.5} = 0.03 \text{ l/(s.m}^2\text{)}$, depth growing medium $\leq 100\text{mm}$



3 NOPHADRAIN INTENSIVE GREEN ROOF SYSTEM



**the choice of insulation material is determined by the long-term design load (creep) performance*

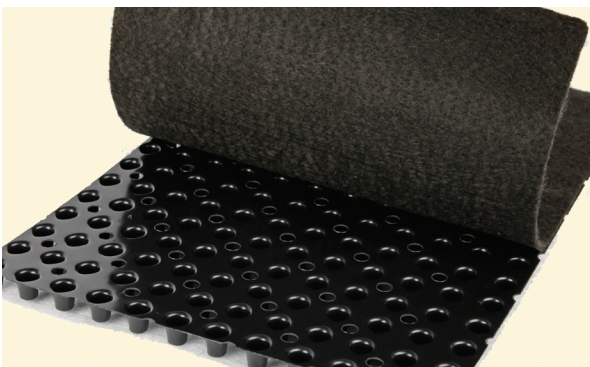
Characteristics of the Nophadrain Intensive Green Roof System (intensive planting scheme):

- Excellent protection of the waterproofing membrane;
- Enhanced choice of plants and layout;
- High water retention capacity;
- Can be combined with hard-landscaping for foot or vehicular traffic;
- High load: from 280kg/m² (including vegetation/lawn);
- Build-up: from 210mm;
- High costs (installation and maintenance);
- Average annual water retention capacity $\geq 70\%$ **
- Run-off coefficient $C \leq 0.2$ ***

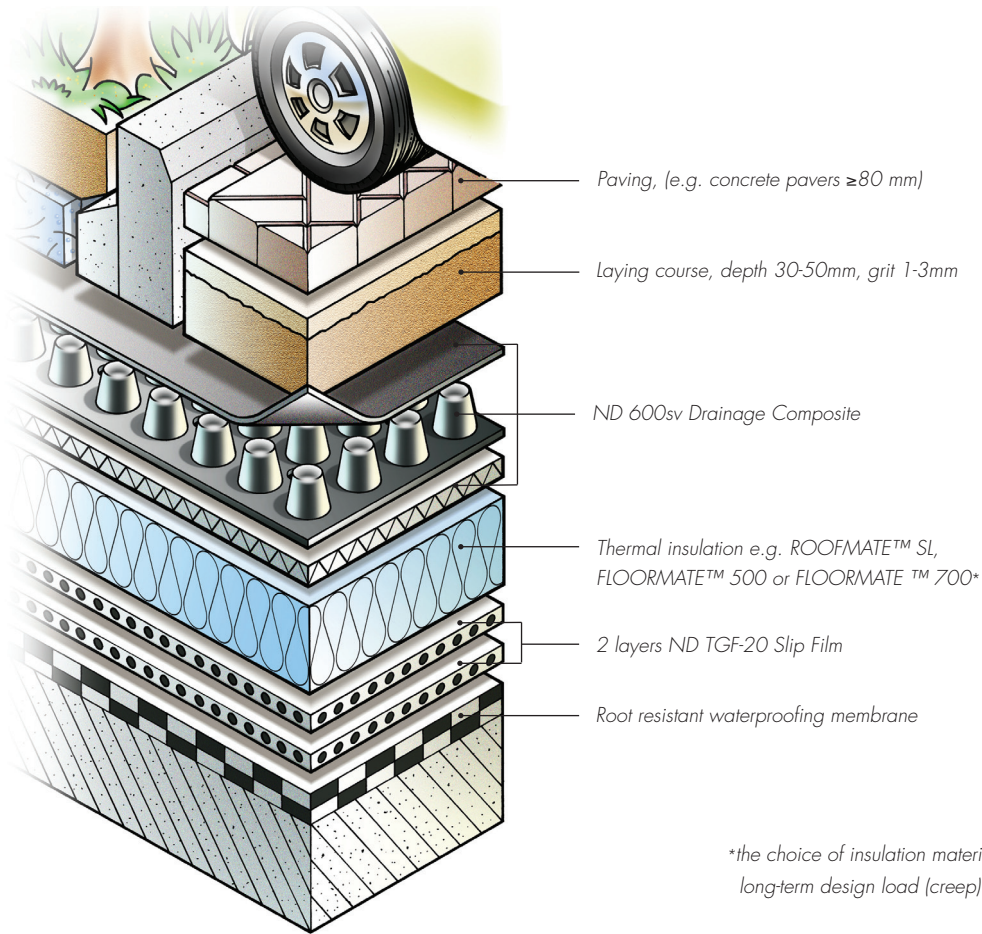
More information on construction and choice of materials for intensive green roof systems can be found in the Nophadrain brochure entitled "Intensive Green Roofs – design and installation manual".

**average annual precipitation 650-800mm , depth growing medium 250-500mm

***rainfall intensity of $i^{15} = 0.03 \text{ l/(s.m}^2)$, depth growing medium 250-500mm



4 NOPHADRAIN PODIUM DECK AND PARKING DECK SYSTEM



Characteristics of the Nophadrain Podium Deck and Parking Deck System:

- Excellent protection of the waterproofing membrane;
- Can be combined with an intensive green roof;
- Limited build-up;
- Stable sub-base for pavement;
- Both pedestrian and trafficked paving (emergency services access);
- Proven functionality by means of dynamic load tests (TU-Munich, D).

More information on construction and choice of materials for podium deck and parking deck systems can be found in the Nophadrain brochure entitled "Podium Roof Decks, Parking Roof Decks – design and installation guide".



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