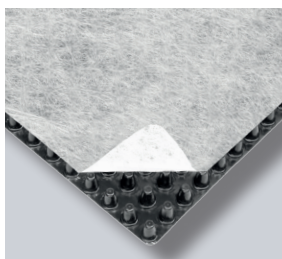


## TECHNICAL DATA SHEET

### ND 200 Drainage System



ND 200 Drainage System

High-performance CE-marked drainage system with an innovative dimple design made out of recycled high impact polystyrene. The core of the ND Drainage System is a dimpled sheet with a high compressive strength, an excellent creep resistance guaranteeing a consistent long term drainage capacity and a construction height of approx. 12.5 mm.

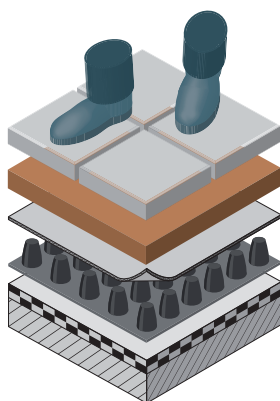
A non-woven geotextile is bonded to each dimple as a filter layer. The geotextile is glued and not thermally bonded to the dimpled core to avoid damage to the mechanical and hydraulic properties of the geotextile and the drainage system. It also prevents the geotextile to be pushed in between the dimples obstructing the drainage capacity.

#### Application

The ND 200 Drainage System is a component of the Nophadrain Podium Deck System that acts as a filter, drainage and protection layer.

#### Properties

- Material dimpled sheet: high impact polystyrene (HIPS)
- Material geotextile filter: polypropylene (PP)
- Build-up height: approx. 12.5 mm
- Compressive strength: approx. 700 kPa
- Weight: approx. 908 g/m<sup>2</sup>
- Drainage capacity  $i = 1$  at 20 kPa: approx. 5.29 l/(s.m)
- Drainage capacity fall ratio 2 % at 20 kPa: approx. 0.60 l/(s.m)



Composition Nophadrain Podium Deck System

Product	Dimensions (L x W)	Packaging
ND 200 Drainage System	approx. 32 x 1.25 m	approx. 40 m <sup>2</sup> , roll

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SMART GREEN ROOF SYSTEMS

#### Nophadrain BV

Mercuriusstraat 10  
6468 ER Kerkrade  
The Netherlands

+31 (0)45 535 50 30  
info@nophadrain.com

[www.nophadrain.com](http://www.nophadrain.com)

**Data sheet**

**DoP200-007**

**ND 200**

Material Properties	Standard	Unit	Performance
Core	-	-	HIPS
Filter geotextile	-	-	PP/PE
Separation film	-	-	-
Separation geotextile	-	-	-
<b>Mechanical Properties (mean values)</b>			
Compressive strength	hEN ISO 25619-2	kPa	700
Compressive strength at 10 % deformation	hEN ISO 25619-2	kPa	650
Deformation at 1 mPa	hEN ISO 25619-2	%	-
Tensile strength <sup>1</sup> (MD/CMD) <sup>2</sup>	hEN ISO 10319	kN/m	8/8
CBR puncture resistance <sup>1</sup>	hEN ISO 12236	kN	1.5
Dynamic performance (cone drop)	hEN ISO 13433	mm	38
Resistance to weathering <sup>3</sup>	hEN ISO 12224	%	60/80
<b>Physical Properties</b>			
Construction height at 2 kPa	-	mm	12.5
Dimple height at 2 kPa	-	mm	12
Perforations per m <sup>2</sup>	-	-	-
Diameter perforations	-	mm	-
Water reservoir	-	l/m <sup>2</sup>	-
Material dimensions (L x W)	-	m	32 x 1.25
Mass per unit area	-	g	908
Surface area per roll	-	m <sup>2</sup>	40
Roll diameter	-	cm	70
Roll weight	-	kg	36
<b>Hydraulic Properties (mean values)</b>			
Opening size O <sub>90</sub> <sup>1</sup>	hEN ISO 12956	µm	150
Water permeability H <sub>50</sub> <sup>1</sup>	hEN ISO 11058	mm/s	100
<b>Drainage Capacity (mean values)</b>			
<b>Vertical drainage / Wall - gradient i=1</b>			
<b>Surface load</b>	<b>Build-in-depth</b>		
20 kPa	2.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.29
30 kPa	3.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.25
50 kPa	5.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.02
100 kPa	10.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 4.31
200 kPa	Exceptional	hEN ISO 12958 <sup>4</sup>	l/(s.m) 3.69
<b>Horizontal drainage / Roof</b>			
<b>Fall = 0 % - Exceptional case</b>			
≤ 2 kPa - extensive green roof		FH Karlsruhe (D) <sup>5</sup>	l/(s.m) -
≤ 10 kPa - intensive green roof		FH Karlsruhe (D) <sup>5</sup>	l/(s.m) -
<b>Fall = 1 % - Exceptional case</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.43
≤ 20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.43
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.30
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.22
<b>Fall = 1.5 %</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.55
≤ 20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.55
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.38
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.33
<b>Fall = 2 %</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.66
≤ 20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.60
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.44
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.39
<b>Fall = 2.5 %</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.72
≤ 20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.69
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.49
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.43
<b>Fall = 3 %</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.82
≤ 20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.72
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.54
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.47

<sup>1</sup> Performance expressed on the filter/geotextile only

<sup>2</sup> MD = Machine direction / CMD = Cross Machine Direction

<sup>3</sup> Material has to be completely covered within 14 days after installation

<sup>4</sup> hEN ISO 12958 tested hard/soft

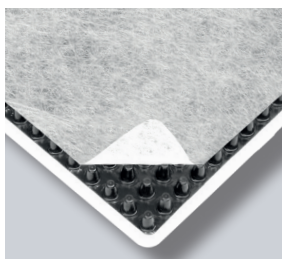
<sup>5</sup> FH Karlsruhe (D) tested hard/hard

The values correspond to average results obtained in our laboratories and outside institutes and are indicative. The right is reserved to make changes at any time without notice. Standard variations in mechanical properties of 15 % and in hydraulic properties of 20 % and in physical properties of 5 % are normal.

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V01.2019

## TECHNICAL DATA SHEET

### ND 220 Drainage System



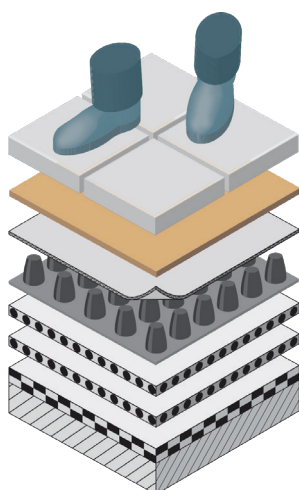
ND 220 Drainage System

High-performance CE-marked drainage system with an innovative dimple design made out of recycled high impact polystyrene. The core of the ND Drainage System is a dimpled sheet with a high compressive strength, an excellent creep resistance guaranteeing a consistent long term drainage capacity and a construction height of approx. 12.5 mm.

A non-woven geotextile is bonded to each dimple as a filter layer. The geotextile is glued and not thermally bonded to the dimpled core to avoid damage to the mechanical and hydraulic properties of the geotextile and the drainage system. It also prevents the geotextile to be pushed in between the dimples obstructing the drainage capacity. An additional pressure-dividing slip film is glued to the back of the dimpled sheet that acts as the first smooth, non-sticky surface of the slip layer and as an additional protection layer of the waterproofing membrane.

#### Application

The ND 220 Drainage System is a component of the Nophadrain Podium Deck System that acts as a filter, drainage and protection layer.



Composition Nophadrain Podium Deck System

#### Properties

- Material dimpled sheet: recycled high impact polystyrene (HIPS)
- Material geotextile filter: polypropylene (PP) and polyethylene (PE)
- Material pressure-dividing slip film: polypropylene (PP)
- Construction height: approx. 12.5 mm
- Compressive strength: approx. 700 kPa
- Weight: approx. 949 g/m<sup>2</sup>
- Drainage capacity at  $i = 1$  at 20 kPa: approx. 5.29 l/(s.m)
- Drainage capacity at fall ratio 2 % at 20 kPa: approx. 0.60 l/(s.m)

Product	Dimensions (L x W)	Packaging
ND 220 Drainage System	approx. 32 m x 1.25 m	approx. 40 m <sup>2</sup> , roll

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6468 ER Kerkrade  
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**Data sheet**

**DoP220-007**

**ND 220**

Material Properties	Standard	Unit	Performance
Core	-	-	HIPS
Filter geotextile	-	-	PP/PE
Separation film	-	-	PP
Separation geotextile	-	-	-
<b>Mechanical Properties (mean values)</b>			
Compressive strength	hEN ISO 25619-2	kPa	700
Compressive strength at 10 % deformation	hEN ISO 25619-2	kPa	650
Deformation at 1 mPa	hEN ISO 25619-2	%	-
Tensile strength <sup>1</sup> (MD/CMD) <sup>2</sup>	hEN ISO 10319	kN/m	8/8
CBR puncture resistance <sup>1</sup>	hEN ISO 12236	kN	1.5
Dynamic performance (cone drop)	hEN ISO 13433	mm	38
Resistance to weathering <sup>3</sup>	hEN ISO 12224	%	60/80
<b>Physical Properties</b>			
Construction height at 2 kPa	-	mm	12.5
Dimple height at 2 kPa	-	mm	12
Perforations per m <sup>2</sup>	-	-	-
Diameter perforations	-	mm	-
Water reservoir	-	l/m <sup>2</sup>	-
Material dimensions (L x W)	-	m	32 x 1.25
Mass per unit area	-	g	949
Surface area per roll	-	m <sup>2</sup>	40
Roll diameter	-	cm	70
Roll weight	-	kg	38
<b>Hydraulic Properties (mean values)</b>			
Opening size O <sub>90</sub> <sup>1</sup>	hEN ISO 12956	µm	150
Water permeability H <sub>50</sub> <sup>1</sup>	hEN ISO 11058	mm/s	100
<b>Drainage Capacity (mean values)</b>			
<b>Vertical drainage / Wall - gradient i=1</b>			
<b>Surface load</b>	<b>Build-in-depth</b>		
20 kPa	2.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.29
30 kPa	3.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.25
50 kPa	5.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 5.02
100 kPa	10.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m) 4.31
200 kPa	Exceptional	hEN ISO 12958 <sup>4</sup>	l/(s.m) 3.69
<b>Horizontal drainage / Roof</b>			
<b>Fall = 0 % - Exceptional case</b>			
≤ 2 kPa - extensive green roof		FH Karlsruhe (D) <sup>5</sup>	l/(s.m) -
≤ 10 kPa - intensive green roof		FH Karlsruhe (D) <sup>5</sup>	l/(s.m) -
<b>Fall = 1 % - Exceptional case</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.43
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200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.22
<b>Fall = 1.5 %</b>			
≤ 10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m) 0.55
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<b>Fall = 2 %</b>			
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<sup>1</sup> Performance expressed on the filter/geotextile only

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<sup>5</sup> FH Karlsruhe (D) tested hard/hard

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V03.2020