

# nophADRAIN®

SMART GREEN ROOF SYSTEMS

0.7

## Technical data sheet

ND Drainage Systems



ND Drainage System			ND 100 / 120	ND 200 / 220	ND 200h / 220h	ND 200sv	ND 600 / 620	ND 600sv	ND 600hdsv	ND 620hd	ND 800	ND 4+1	ND 4+1h	ND 5+1	ND 6+1v	
<b>Material properties</b>			<b>Standard</b>	<b>Unit</b>												
Core	-	-	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS	HIPS
Filter geotextile	-	-	PP, PE	PP, PE	PP, PE	PP, PE	PP-woven	PP-woven	PP-woven	PP-woven	PP, PE	PP	PP	PP	PP	PP, PE
Separation film	-	-	- / PP	- / PP	- / PP	-	- / PP	-	-	PP	-	-	-	-	-	-
Separation geotextile	-	-	-	-	-	PP, PE	-	PP, PE	PP, PE	-	-	PP, PE	PP, PE	PP, PE	PP, PE	PP, PE
<b>Mechanical properties (mean values)</b>																
Compressive strength	hEN ISO 25619-2	kPa	500	700	450	700	900	900	1,200	1,200	500	700	450	500	300	
Deformation at 1 MPa	hEN ISO 25619-2	%	-	-	-	-	-	-	9	9	-	-	-	-	-	
Compressive strength at 10 % deformation	hEN ISO 25619-2	kPa	450	650	450	650	800	800	1,000	1,000	500	650	450	500	300	
Tensile strength <sup>1</sup> (MD / CMD) <sup>2</sup>	hEN ISO 10319	kN/m	8 / 8	8 / 8	8 / 8	8 / 8	44 / 52	44 / 52	44 / 52	44 / 52	8 / 8	9 / 10	9 / 10	9 / 10	8 / 8	
CBR puncture resistance <sup>1</sup>	hEN ISO 12236	kN	1.5	1.5	1.5	1.5	4	4	4	4	1.5	1.6	1.6	1.6	1.5	
Dynamic perforation <sup>1</sup> (cone drop)	hEN ISO 13433	mm	38	38	38	38	9	9	9	9	38	28	28	28	38	
Resistance to weathering <sup>3</sup>	hEN ISO 12224	%	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	60 / 80	
<b>Physical properties (typical values)</b>																
Construction height at 2 kPa	-	mm	8	12.5	16	13	12.5	13	13	12.5	26.5	13.5	17	27.5	27	
Dimple height at 2 kPa	-	mm	7.5	12	15.5	12	12	12	12	12	26	12	15.5	26	26	
Perforations per m <sup>2</sup>	-	-	-	-	-	1,540	-	1,540	1,540	-	-	1,540	1,540	575	-	
Diameter perforations	-	mm	-	-	-	6.3	-	6.3	6.3	-	-	6.3	6.3	15.8	-	
Water reservoir	-	l/m <sup>2</sup>	-	-	-	-	-	-	-	-	-	3.6	4.3	5.8	7.6	
Material dimensions (L x B)	-	m	32 x 1.25	32 x 1.25	30 x 1.25	32 x 1.25	32 x 1.25	32 x 1.25	32 x 1.25	32 x 1.25	20 x 1.25	32 x 1.25	30 x 1.25	20 x 1.25	20 x 1.20	
Mass	-	g/m <sup>2</sup>	653 / 695	908 / 949	908 / 949	990	1,239 / 1,281	1,315	1,476	1,450	1,226	1,010	1,010	1,243	1,353	
Surface area per roll	-	m <sup>2</sup>	40	40	37.5	40	40	40	40	40	25	40	37.5	25	24	
Roll diameter	-	cm	60	70	85	70	75	75	75	75	83	75	85	83	85	
Roll weight	-	kg	26 / 28	36 / 38	34 / 36	40	50 / 51	53	59	58	31	40	38	31	32	
<b>Hydraulic properties (mean values)</b>																
Opening size O <sub>90</sub> <sup>1</sup>	hEN ISO 12956	µm	150	150	150	150	187	187	187	187	150	100	100	100	150	
Water permeability H <sub>50</sub> <sup>1</sup>	hEN ISO 11058	mm/s	100	100	100	100	44	44	44	44	100	95	95	95	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)	2.97	5.29	7.38	5.29	5.27	5.27	5.36	5.36	14.15	5.60	7.61	15.70	9.29
30 kPa	3.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m)	2.94	5.25	7.22	5.25	5.19	5.19	5.26	5.26	14.11	5.54	7.53	15.55	8.89
50 kPa	5.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m)	2.70	5.02	6.82	5.02	4.97	4.97	4.97	4.97	13.78	5.48	7.49	15.53	8.12
100 kPa	10.0 m	hEN ISO 12958 <sup>4</sup>	l/(s.m)	2.30	4.31	6.08	4.31	4.51	4.51	4.47	4.47	12.33	5.25	7.25	14.25	6.05
200 kPa	Exceptional case	hEN ISO 12958 <sup>4</sup>	l/(s.m)	1.75	3.69	4.54	3.69	3.74	3.74	3.86	3.86	10.40	5.03	6.44	11.75	-
<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)	-	-	-	-	-	-	-	-	0.36	-	-	0.36	-
≤ 10 kPa - intensive green roof		FH Karlsruhe (D) <sup>5</sup>	l/(s.m)	-	-	-	-	-	-	-	-	0.30	-	-	0.30	-
<b>Fall = 1 % - exceptional case</b>																
10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.20	0.43	0.82	0.43	0.54	0.54	0.56	0.56	1.60	0.46	0.87	1.67	0.99
20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.20	0.43	0.78	0.43	0.49	0.49	0.51	0.51	1.54	0.45	0.80	1.61	0.86
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.16	0.30	0.61	0.30	0.36	0.36	0.39	0.39	1.19	0.43	0.74	1.44	0.47
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.10	0.22	0.51	0.22	0.28	0.28	0.32	0.32	1.07	0.39	0.69	1.19	-
<b>Fall = 1.5 %</b>																
10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.30	0.55	0.93	0.55	0.71	0.71	0.71	0.71	1.76	0.60	0.97	1.98	1.15
20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.30	0.55	0.90	0.55	0.63	0.63	0.64	0.64	1.70	0.58	0.96	1.88	1.05
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.19	0.38	0.68	0.38	0.48	0.48	0.49	0.49	1.33	0.54	0.86	1.70	0.51
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.11	0.33	0.55	0.33	0.38	0.38	0.42	0.42	1.15	0.51	0.75	1.45	-
<b>Fall = 2 %</b>																
10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.36	0.66	1.14	0.66	0.80	0.80	0.79	0.79	2.20	0.68	1.21	2.22	1.39
20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.36	0.60	1.04	0.60	0.72	0.72	0.74	0.74	2.09	0.68	1.19	2.14	1.22
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.20	0.44	0.81	0.44	0.52	0.52	0.57	0.57	1.62	0.61	0.99	1.91	0.73
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.13	0.39	0.66	0.39	0.44	0.44	0.47	0.47	1.34	0.56	0.97	1.55	-
<b>Fall = 2.5 %</b>																
10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.43	0.72	1.15	0.72	0.85	0.85	0.86	0.86	2.34	0.72	1.23	2.45	1.50
20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.43	0.69	1.07	0.69	0.82	0.82	0.84	0.84	2.17	0.72	1.19	2.34	1.28
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.25	0.49	0.85	0.49	0.56	0.56	0.62	0.62	1.73	0.70	0.99	2.04	0.78
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.13	0.43	0.70	0.43	0.48	0.48	0.51	0.51	1.49	0.63	0.97	1.70	-
<b>Fall = 3 %</b>																
10 kPa - extensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.48	0.82	1.20	0.82	0.95	0.95	0.95	0.95	2.58	0.84	1.34	2.60	1.70
20 kPa - intensive green roof		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.45	0.72	1.19	0.72	0.91	0.91	0.94	0.94	2.47	0.84	1.34	2.50	1.54
100 kPa - podium roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.25	0.54	1.02	0.54	0.62	0.62	0.74	0.74	1.91	0.75	1.01	2.21	0.89
200 kPa - parking roof deck		hEN ISO 12958 <sup>4</sup>	l/(s.m)	0.15	0.47	0.77	0.47	0.51	0.51	0.57	0.57	1.57	0.70	0.98	1.83	-

<sup>1</sup> Performance expressed of 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 soft / hard  
<sup>5</sup> FH Karlsruhe (D) tested hard / hard


Applications	ND 100 / 120	ND 200 / 220	ND 200h / 220h	ND 200sv	ND 600 / 620	ND 600sv	ND 600hdsv	ND 620hd	ND 800	ND 4+1 / 4+1h	ND 5+1	ND 6+1v
<b>Basements / retaining walls</b>	Standard											
<b>Extensive green roofs</b>												
- Roof pitch $\geq 15^\circ$	Standard											
- Roof fall $\geq 1\%$										Standard		
- Roof fall $< 1\%$											Standard	
- Inverted roof										Standard		
<b>Intensive green roofs</b>												
- Roof fall $\geq 1\%$										Standard		
- Roof fall $< 1\%$											Standard	
- Inverted roof										Standard		
<b>Podium roof decks</b>												
- Roof fall $\geq 1\%$		Standard										
- Roof fall $< 1\%$									Standard			
- Inverted roof												
<b>Parking roof decks (cars)</b>												
- Roof fall $\geq 1\%$					Standard							
- Roof fall $< 1\%$					Standard							
- Inverted roof						Standard						
<b>Parking roof decks (heavy goods vehicles)</b>												
- Roof fall $\geq 1\%$								Standard				
- Roof fall $< 1\%$								Standard				
- Inverted roof							Standard					


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