

Verti-Drain®

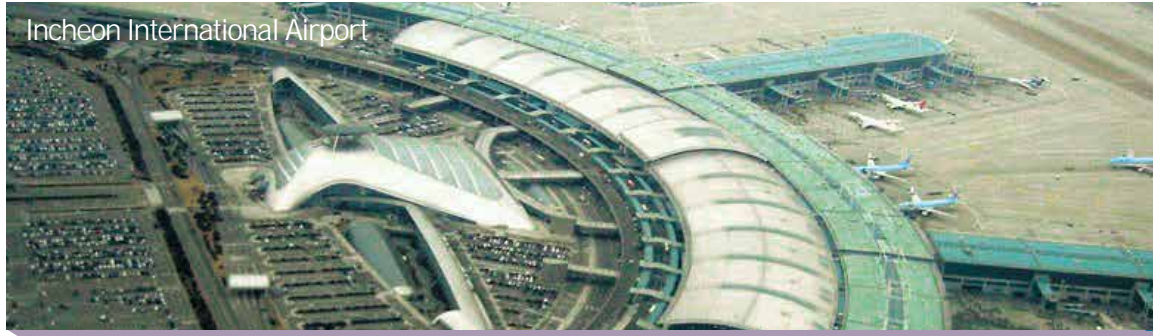
Prefabricated Vertical Drain for Soft Ground Improvement

Verti-Drain® is DAEHAN's registered trademark.



DAEHAN *i.m.* Co.,Ltd.

Since 1987



What is Verti-Drain®?

Verti-Drain® is a prefabricated pocket-style vertical drain (PVD) for the improvement of soft ground made from a mechanically strong PP core and a nonwoven filter jacket specialized as PVD filter material.

Verti-Drain® significantly reduces the time needed for construction by discharging pore water in the ground and therefore speeding up soil consolidation. Verti-Drain® allows for the safe construction of seaports, airports, roads, embankments, railways, water supply facilities, tunnels and many other mega-scaled structures.

Since Verti-Drain® is produced with filter materials having AOS in the range of $50\mu\text{m}$ ~ $90\mu\text{m}$, which is suited for the improvement of soft soil, filter clogging can be prevented over a long term.

Verti-Drain® has an excellent resistance to friction and scratching caused during its installation and also has a physically durable structure with a high strength.

Verti-Drain® has a high resistance to bacteria and chemicals. Verti-Drain® is materially and ecologically stable.



VDeK703 / VDeK706



VD707



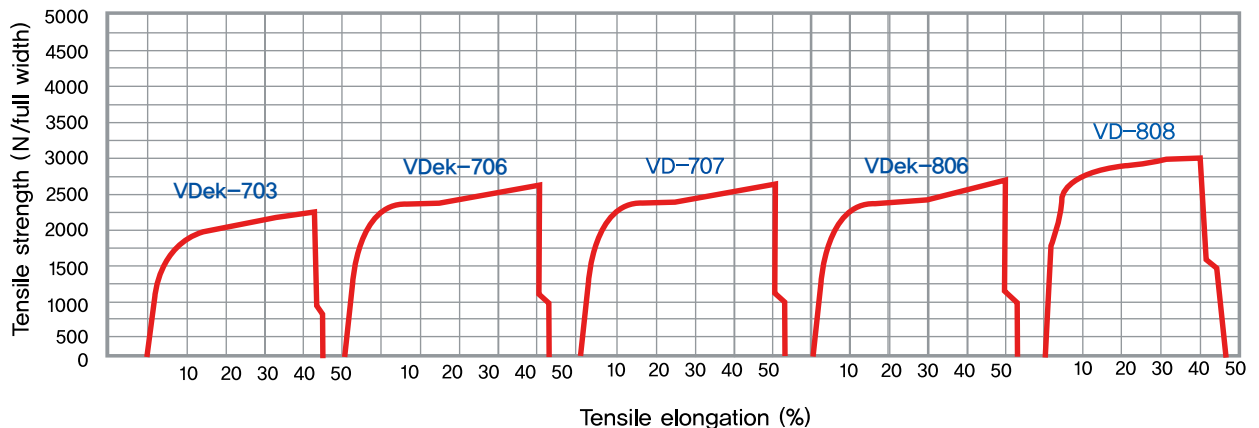
VDeK803 / VDeK806



VD808 / VD849



Bio Verti-Drain



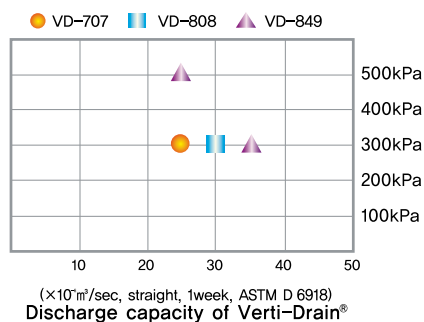
Tensile strength and elongation of Verti-Drain®



Busan Newport

Since the filter material of Verti-Drain® has a high rigidity, it is not inserted to the water channels of a core board after installation in the ground. Verti-Drain® does not increase 'well resistance' caused by reduced discharge capacity.

Verti-Drain® has achieved CE mark and the product reliability certification, R-mark. R-mark of Verti-Drain® is the certification which is related to a long-term performance and durability of PVD products issued by Korean Government. It was first time these two certificates for PVD products have been achieved in Korea.



Application of Verti-Drain®

Verti-Drain® is applied to reduce construction time and speed up the consolidation of soft ground for the following work :

- ➡ Improvement of dredged clay fill
- ➡ Road, railway & airport construction
- ➡ Development of building & industrial complex sites
- ➡ Development of seaport area
- ➡ Bank revetment
- ➡ Construction of gas & oil storage facilities







Drain systems for soft ground improvement of DAEHAN

As the world leading manufacturer of Prefabricated Vertical Drain (PVD), DAEHAN i.m. Co., Ltd. is also supplying horizontal drains, Hori-Drain®, which provide outstanding technical properties for a horizontal drainage of soft ground improvement and the excellent competitiveness in the product quality and price as well.

For more detailed information of Hori-Drain®, please contact our Seoul office at any time.



Standard specifications

Physical & Mechanical Properties	Test Method	Unit	VDek-703	VDek-706	VD-707	VDek-803	VDek-806	VD-808
Drain								
Core configuration								
Core material			PP	PP	PP	PP	PP	PP
Width	ISO 22198	mm (inch)	100±5 (4.0±0.2)	100±5 (4.0±0.2)	100±5 (4.0±0.2)	100±5 (4.0±0.2)	100±5 (4.0±0.2)	100±5 (4.0±0.2)
Thickness	ISO 9863-1	mm (inch)	3.0 (0.12)	3.0 (0.12)	3.0 (0.12)	4.0±0.5 (0.16±0.02)	4.0±0.5 (0.16±0.02)	4.0±0.5 (0.16±0.02)
Tensile strength, full width	ISO 10319	kN (lbs)	2.0 (450)	2.5 (562)	2.5 (562)	2.4 (540)	2.5 (562)	2.5 (562)
Tensile strength at 10% strain	ISO 10319	kN (lbs)	1.5 (337)	2.0 (450)	2.0 (450)	2.0 (450)	2.0 (450)	2.0 (450)
Discharge capacity, q_w , 350kPa, $i=0.5$	ASTM D 4716	cm ³ /s (gpm)	80 (1.27)	80 (1.27)	80 (1.27)	90 (1.43)	90 (1.43)	90 (1.43)
Filter								
Wide width tensile strength, MD	ISO 10319	kN/m (lbs/ft)	6.0 (411)	7.0 (480)	7.0 (480)	6.0 (411)	7.0 (480)	7.0 (480)
Grab tensile strength, MD	ASTM D 4632	N (lbs)	450 (101)	500 (112)	500 (112)	450 (101)	500 (112)	500 (112)
Coefficient of permeability, k	ISO 11058	cm/s	1×10^{-2}	1×10^{-2}	1×10^{-2}	1×10^{-2}	1×10^{-2}	1×10^{-2}
Apparent opening size, O_{90}	ISO 12956	µm	< 75	< 75	< 75	< 75	< 75	< 75
Trapezoid tear strength, MD	ASTM D 4533	N (lbs)		100 (23)	100 (23)		100 (23)	100 (23)
Puncture resistance	ASTM D 4833	N (lbs)		100 (23)	100 (23)		100 (23)	100 (23)
Mullen burst strength	ASTM D 3786	kPa (psi)		900 (131)	900 (131)		900 (131)	900 (131)
Nominal Dimensions & Transportation Details								
Roll length		m (ft)	350 (1148)	350 (1148)	350 (1148)	250 (820)	250 (820)	250 (820)
Outside diameter of roll – approx.		m (ft)	1.10 (3.6)	1.10 (3.6)	1.10 (3.6)	1.10 (3.6)	1.10 (3.6)	1.10 (3.6)
Inside diameter of roll – approx.		m (ft)	0.15 (0.5)	0.15 (0.5)	0.15 (0.5)	0.15 (0.5)	0.15 (0.5)	0.15 (0.5)
20ft loading capacity – approx.		m (ft)	60,000 (196,850)	60,000 (196,850)	60,000 (196,850)	50,000 (164,042)	50,000 (164,042)	50,000 (164,042)
40ft loading capacity – approx.		m (ft)	163,800 (537,402)	163,800 (537,402)	163,800 (537,402)	125,000 (410,105)	125,000 (410,105)	125,000 (410,105)

Notes:

- 1) Discharge capacity, q_w , is based on index test with rigid-rigid bedding condition and calculated based on $q_w = Q/iR_r$, where Q is the flow rate per each unit of time(m³/s), i is hydraulic gradient and R_r is the temperature correction coefficient.
- 2) The values given are indicative and correspond to average test results obtained in our laboratory and independent authorized institutes. The above information may be subject to revision according to new developments and findings.
- 3) **Various specifications of PVD are available upon customer's demand.**

Major Projects

DAEHAN has supplied more than 1 billion linear meters of Verti-Drain® since 1987.

1995	Noksan Industrial Complex Poseung Industrial Complex	1,500,000m 1,700,000m
1996	Changi International Airport in Singapore Busan Newport – Container Terminal Phase 4	25,000,000m 7,500,000m
1997	Yulchon Industrial Complex Phase 1 Gunsan Miryung Region Building Site Development	2,000,000m 1,737,000m
1998	Incheon New Airport Land Development Section 4, 6	5,000,000m
1999	Noksan Industrial Complex Phase 2 Section 1&5 Changi International Airport in Singapore	3,000,000m 5,000,000m
2000	Yangsan ICD Access Railway Gwangyang Port Container Terminal Phase 2	1,300,000m 4,800,000m
2001	Incheon Song-Do Newtown Development Busan Gyeongnam Race Park	1,800,000m 15,000,000m
2002	Busan Newport North Container Terminal Pyungtaek LNG Production Complex	28,000,000m 6,500,000m
2003	Namak Newtown Development Section 1-1 Busan Newport Support Area Section 1	11,000,000m 17,000,000m
2004	Busan Newport Support Area Section 3 Gwangyang Port Phase 3 Stage 2	8,500,000m 20,000,000m
2005	Yangsan Mulgeum Building Site Development Phase 3 Busan Newport South Container Terminal Section 2-2	19,600,000m 9,200,000m
2006	Gwangyang Port West Access Railway Yeochun National Ind. Complex Extension Section 1	5,000,000m 12,000,000m
2007	Busan Newport Support Area Section 2 F-1 Race Track Construction	5,000,000m 9,500,000m
2008	Busan Newport South Container Terminal Section 2-3 Gwangyang Port West Support Area Section 1	24,500,000m 9,000,000m
2009	Vietnam Cai Mep Container Terminal Busan Newport Ungdong Support Area Section 1, 2	2,500,000m 35,000,000m
2010	Masan Marine City Development Vietnam POSCO projects	2,750,000m 2,600,000m
2011	Vietnam GemaLink Container Terminal, Phase 1 Vietnam Hanoi-Haiphong Expressway Package Ex-7	11,000,000m 3,600,000m
2012	Vietnam Formosa Steel Plant project, Phase 1 Kuwait Mubarak Al Kabeer Seaport Phase 1 Stage 1	8,500,000m 20,000,000m
2013	Vietnam Steel Structure Fabrication Plant II A, Dinh Vu Industrial Park Kuwait Causeway Temporary Zetty	2,630,000m 2,500,000m
2014	Vietnam Lach Huyen Port Infrastructure Project Singapore Reclamation at Jurong Island Westward Expansion Ph 1, Ph 2	8,000,000m 20,000,000m
2015	Kuwait Sheikh Jaber Al-Ahmad Al-sabah Causeway Project Singapore Tuas Terminal Ph 1	19,800,000m 32,000,000m
2016	Indonesia Cirebon II Power Plant Industrial Area Port Said East, Egypt	8,254,233m 47,010,600m
2017	Tunis Bay Project Hong Kong Airport 3RS Project	3,300,000m 23,700,000m
2018	Singapore Construction of Polder at Pulau Tekong Reclamation at Ayer Merbau Phase2	30,000,000m 10,000,000m

※ For more detailed information of the projects supplied with Verti-Drain®, please contact our Seoul office.

Verti-Drain® throughout the World

DAEHAN exports its quality PVD, PHD and geosynthetic products to many overseas countries including countries of Southeast Asia, Oceania, Europe, Middle East, North and South America.



DAEHAN *i. m.* Co.,Ltd.

Since 1987

4F Howon Art Hall, 30, Seongan-ro, Gangdong-gu, Seoul, 05406 Korea

Tel. +82-2-456-4900 Fax. +82-2-456-7210

Website: www.geosko.com E-mail: daehan@geosko.com