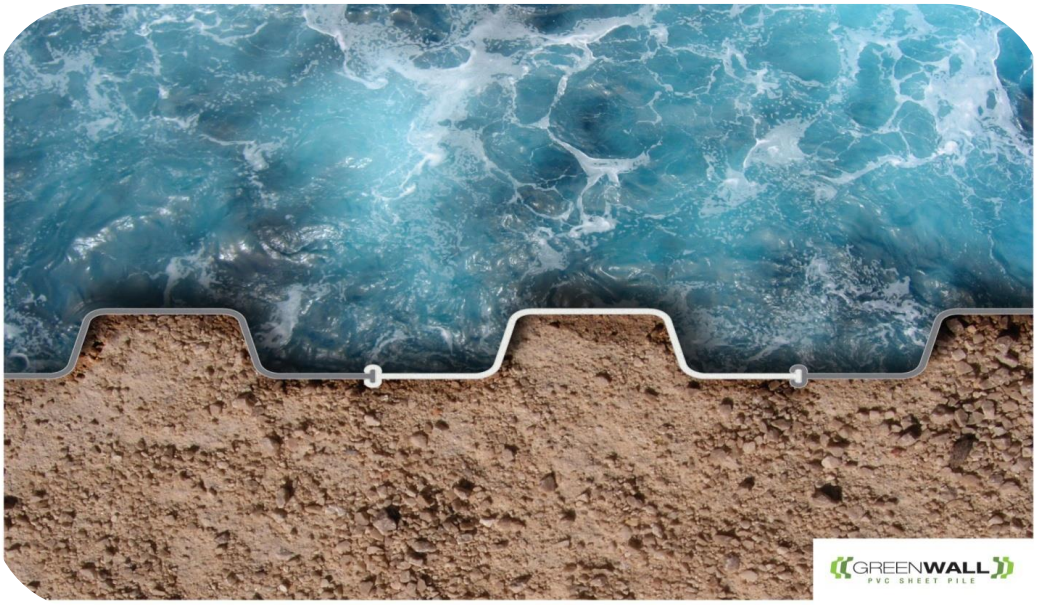
NEW

GREENWALL
PVC SHEET PILE

MADE IN ITALY



DISTRIBUTED BY :

SYSTÈME DE PALPLANCHES

PURE PVC

SHEET PILES SYSTEM

140 Jacques-Bibeau Street, Rouyn-Noranda (Quebec) J9Y 0A3
(819) 550-9950
info@purepvc.com
purepvc.com

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Daniel Vanier
Sales Director

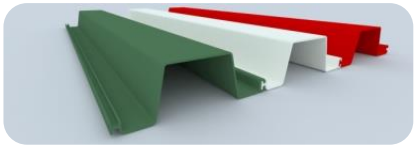
Linked in

Sylvain Dallaire - Shareholder
Business Development Director

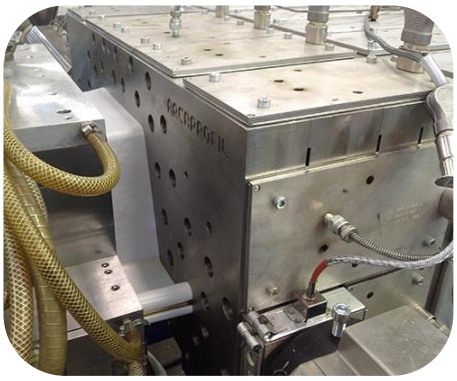
GREENWALL
PVC SHEET PILE

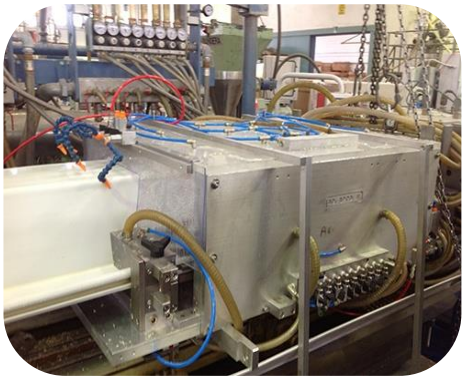
SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

GreenWall PVC sheet piling is the result of the synergy and experience of two Italian companies with over 50 years' experience in their respective sectors (extrusion and driving/marketing sheet piling). GreenWall PVC sheet piling is the only product of its kind to be manufactured entirely in Italy, using an extrusion / co-extrusion process. The production process is guaranteed and monitored in compliance with ISO 9001:2015 standards and specific control procedures for all phases of the production process in accordance with DIN 16456-01 (from raw materials to product testing).



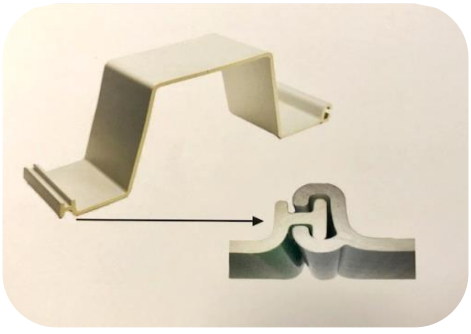
The combination of different types of raw materials and the production technique (co-extrusion) gives GreenWall PVC sheet piling excellent characteristics, high resistance to UV rays and corrosive chemical agents. All GreenWall PVC sheet piling consists of a top layer of top-quality PVC for excellent wear resistance and reduced environmental impact, and an inner layer of recycled building materials.

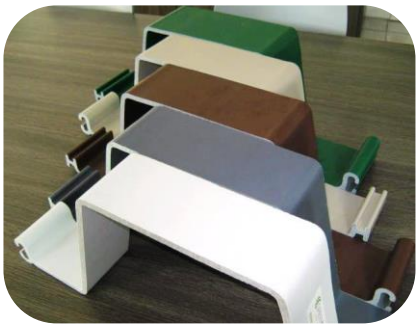




At present, most embankments, curtains, and cofferdams are made of steel, concrete or wood. These traditional products are costly and require constant maintenance. GreenWall products are ideal for river and marine structures and environmental enhancement work, thanks to their flexibility and long service life without the need for ongoing maintenance.

GreenWall products are supplied in five basic colors: light gray, dark gray, green, brown and sand.





GREENWALL CERTIFICATE

GreenWall PVC sheet piling has been awarded DIN 16456-01 certification (the only current legislation available to produce PVC sheet piling in Europe), as well as the TÜV SÜD certification mark, which ensures that the use of GreenWall PVC sheet piling in marshy environments complies with regional, national and international regulations.

In 2020, GreenWall is the only European manufacturer to have begun the process of drafting the EAD (European Evaluation Document) for the CE marking of GreenWall PVC sheet piling.

DIN 16456-01

BESCHEINIGUNG ◆ ATTESTATION ◆ 证明书 ◆ СВИДЕТЕЛЬСТВО ◆ CONSTANCIA ◆ ATTESTAZIONE

TÜV SÜD Industrie Service

Attestation based on DIN 16456-1:2017-10

ARCAPROFIL S.p.A
Via Bedesco 22
24033 CALUSCO D'ADDA BG
ITALY

Attestation-No IS-AN5-MUC-2010-5010798731-001

We hereby confirm that the sheet piling manufactured by the above company was tested with reference to DIN 16456-1:2017-10 and approved. Details are outlined in the pertinent assessment report.

Requirement:

The product fulfils the requirements with reference to DIN 16456-1:2017-10. The conformity assessment procedure was carried out in accordance with DIN 18200:2018-09 system C.

For the following plastic sheet piling:

– GREENWALL PVC SHEET PILING

Product description:

The above GREENWALL PVC SHEET PILING is made of unplasticised polyvinyl chloride (PVC) plastic (filled) and used to separate, support and seal abrupt topographical changes, excavations or water areas. The results with reference to DIN 16456-1:2017-10, taking into account the assessment of conformity according to DIN 18200:2018-09 system C, were verified with a positive result.

This attestation is valid to October 2023.

Munich, 19 October 2020

TÜV SÜD Industrie Service GmbH
Institute for Plastics

i. A. Schweizer

TÜV®

OKTAGONAL MARK

ZERTIFIKAT ◆ CERTIFICATE ◆ 证书 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

TÜV SÜD Industrie Service

Arcaprofil S.p.A.
Via Bedesco
24033 Calusco D'Adda

The above organisation is hereby entitled, on the basis of certificate No. 20 09 90323 001 and the appendant test report No. 3154948, to affix the certification body's certification mark shown below to the following product (see description below).

Plastic sheet piling
- Mechanical and physical properties
- Chemical and environmental resistance
- Materials analysis

Requirement:

The product satisfies the requirements of the TÜV SÜD test programme in accordance with QA work instruction MUC-KSP-A 1045.

Testing of the quality of Greenwall sheet piling:
- In a bog environment
- Ageing performance

For the following plastic sheet piling:
- GREENWALL PVC SHEET PILING

Product description:

The above Greenwall sheet piling is made from a PVC plastic (filled) and is used to separate, support and seal abrupt topographical changes, excavations or water areas.

This certificate is valid to September 2023.
Product monitoring is carried out at annual intervals.

Munich, 22 September 2020

TÜV SÜD Industrie Service GmbH
Institute for Plastics

i. A. Schweizer

TÜV®

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

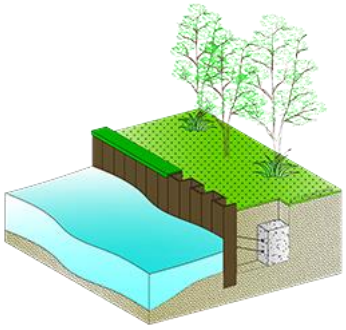
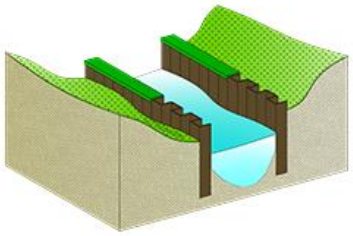
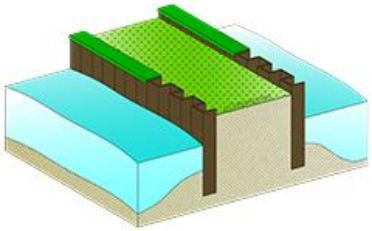
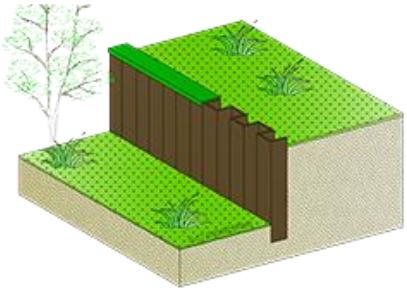
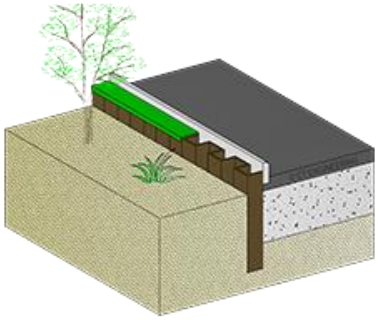
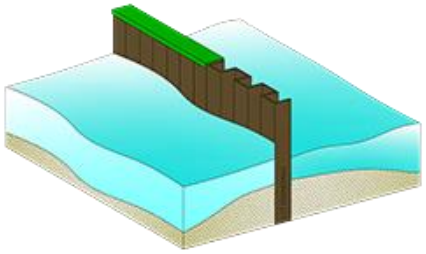
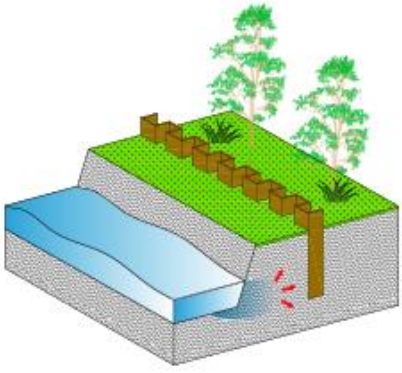
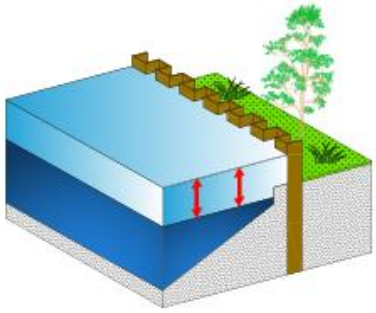
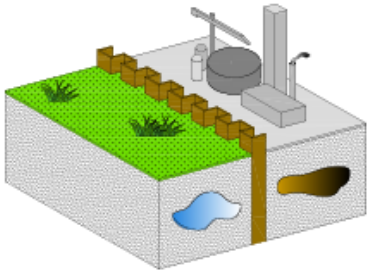
GreenWall products are extremely versatile and can be used for a variety of applications:

- Erosion protection for rivers, streams and canals
- Flood protection
- Irrigation canal banks
- Containment of polluted areas
- River pipelines
- Underground pipelines
- Bank reinforcement with hydraulic barrier
- Foundation scour barriers
- Artificial basins
- Water réservoirs
- Retaining walls
- Containment walls
- Creation of green spaces
- Urban furnishings

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

APPLICATIONS

ADVANTAGES

Benefits of using GreenWall PVC sheet piling:

- Competitive prices compared to traditional products
- Fast delivery times (2-3 weeks)
- Lightweight products
- Reduced transport costs
- Exceptional service life
- Maintenance-free
- Environmentally friendly
- 100% recyclable
- Impact resistance
- Excellent mechanical performance
- Resistance to pollutants
- UV resistance
- Corrosion resistance
- Easy to install
- Sinking with standard equipment
- On-site safety
- Excellent environmental and aesthetic impact

SHEET PILE INSTALLATION

The main method for installing / driving GreenWall PVC sheet piling is the same as for steel sheet piling, i.e. vibratory driving.

Depending on the type of terrain and the type of work to be carried out, it is advisable to use a (metal) guide sheet pile during jacking. Thanks to the use of guide rails/guide sheet piles, GreenWall sheet piles are fully protected against the risk of breakage during jacking in hard or difficult terrain.

The main advantages of driving with guide sheet piles are:

- Easier driving of sheet piles in very difficult or hard terrain
- Allows sheet piles to be installed at heights of up to 12 to 13 meters
- Prevent sheet pile breakage by eliminating obstacles in the subsoil
- Allow perpendicular driving
- Reduce driving time and facilitate execution

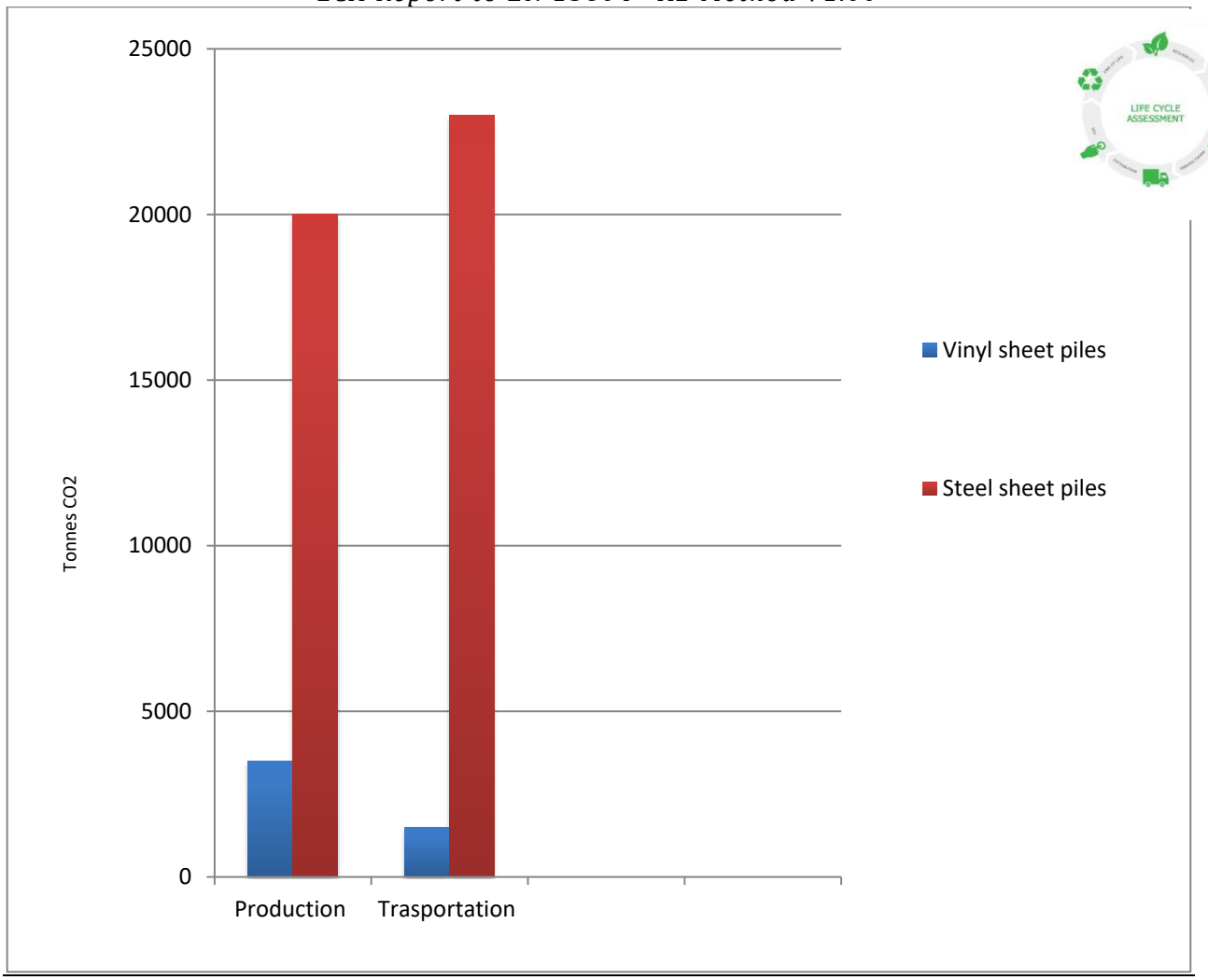


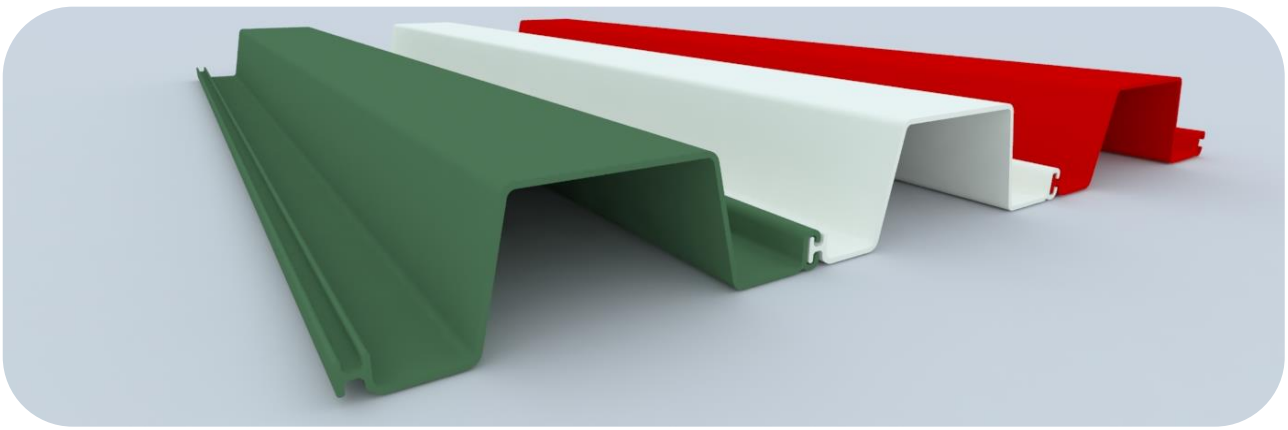





CO^2 EMISSIONS COMPARISON TABLE
PVC SHEET PILING VS STEEL SHEET PILING

GreenWall completed LCA report on 2021
LCA Report to EN 15804 +A2 Method V1.00



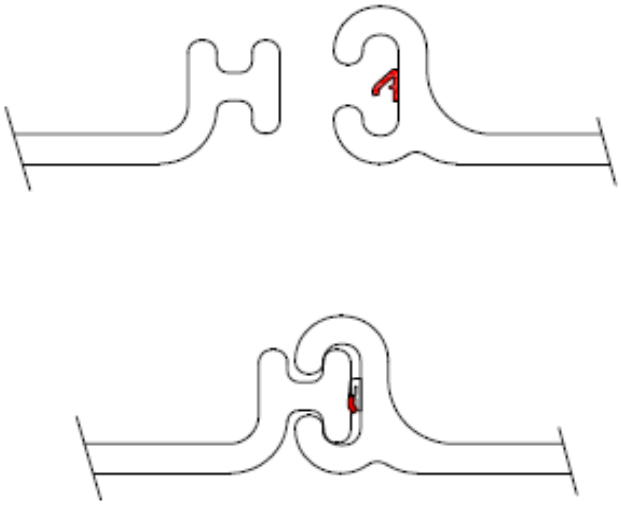


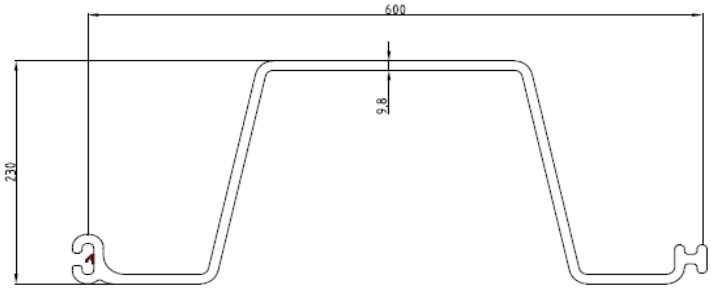
GREENWALL ULTRA SEALING

Through continuous research and development, GreenWall has designed a watertight seal inside the interlock, called Ultra Sealing. This seal enables GreenWall PVC sheet piling to achieve a high level of watertightness, without the use of sealants or bentonite.

The innovative Ultra Sealing system gives GreenWall PVC sheet piling an excellent permeability value of 8.803 E-12 m/s, with a constant pressure tightness of approx. 2.1 Bar.

Thanks to these results, GreenWall PVC sheet piling can be used for the containment of polluted sites, urban waste dumps and chemical products, as well as for dike infiltration barriers, underground waterproofing barriers and expansion reservoirs.

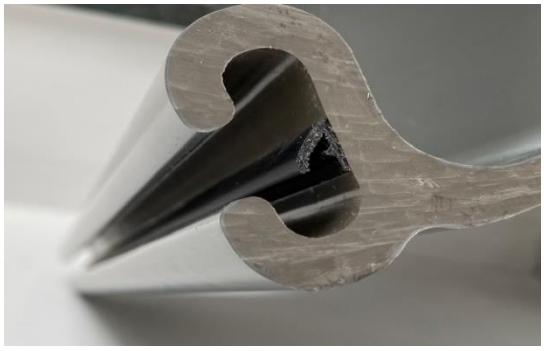




GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

GREENWALL ULTRA SEALING



GREENWALL ULTRA SEALING
PERMEABILITY CERTIFICATE

POLITECNICO MILANO 1863 TEXTILESHUB

TEXTILES HUB
The Inter-Departmental Laboratory of Textile Materials and Polymers at POLIMI

Client Cod. *Codice cliente* 2020_TH_2020_F05_01 GREENWALL 01
TEST REPORT *RAPPORTO DI PROVA* TH 2020_Test report_02
Milan *Milano:* **29/09/2020**

CLIENT: Arcaprofil S.p.A.
ADDRESS *INDIRIZZO* via Bedesco, 22
CALUSCO D'ADDA, 24033 BG

TEST REPORT | *RAPPORTO DI PROVA*

Prove di permeabilità di giunti di palancole in PVC Greenwall | *Permeability tests of Greenwall PVC sheet pile joints*

Client: ARCAPROFIL S.p.A.

Contract responsible *Responsabile della commessa*:	prof. Alessandra Zanelli (Dip. Architettura, Ing. delle Costruzioni e Ambiente Costruito), Politecnico di Milano
Technical responsibles *Responsabili Tecnici*:	prof. Valter Carvelli (Dip. ABC), Politecnico di Milano prof. Carol Monticelli (Dip. ABC), Politecnico di Milano
Test operator *Operatore di prova*:	prof. Valter Carvelli, valter.carvelli@polimi.it

The report contains the following information:
A) the test samples;
B) the sampling scheme used;
C) the number of tests;
D) the test procedure;
E) the date of the test.

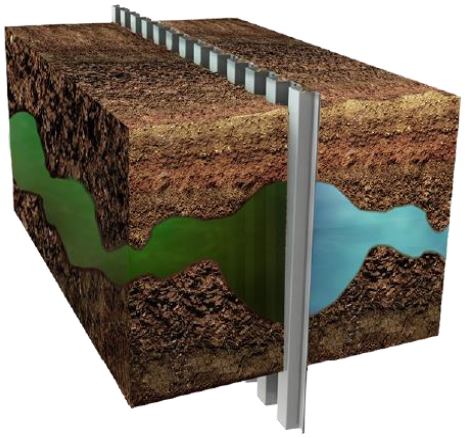
This test report consists of pages n. 7
All the pages are identified by: TH 2020_Test Report 02

The following results relate only to the tested objects, as received by the customer.
This test report may only be reproduced in full and must be subject to stamp duty in case of use under D.P.R. 642/72.
Digitally signed with reference to: D. Lgs. 82/2005.

I rapporto contiene le seguenti informazioni:
A) l'oggetto della prova;
B) lo schema di prova;
C) il numero dei provini testati;
D) la procedura di prova;
E) la data delle prove.

Questo rapporto di prova consiste di pagine n. 7
Tutte le pagine sono identificate: TH 2020_Test Report 02

I risultati seguenti sono relativi ai soli oggetti testati, così come ricevuti dal cliente.
Questo rapporto prova può essere riprodotto solo in toto e deve riportare la marca da bollo prevista dal D.P.R 642/72.
Firmato digitalmente ai sensi del D. Lgs. 82/2005.



POLITECNICO MILANO 1863 TEXTILESHUB

TEXTILES HUB
The Inter-Departmental Laboratory of Textile Materials and Polymers at POLIMI

CONFORMITY

The tests related on above results were performed in conformity with the internal procedure, created for this specific test campaign.

The samples, made of two elements of GreenWall sheet piles and a special soft PVC gasket co-extruded inside the Interlock Waterproof (produced by Arcaprofil S.p.A.), tested at a constant pressure tightness of about 2.06 Bar, were assessed waterproof, not showing looses of liquids.

CONFORMITA

Le prove, i cui risultati sono sopra descritti, sono state condotte in conformità con la procedura interna messa a punto per la specifica campagna di prove.

I campioni, costituiti da due elementi di palancole GreenWall e una speciale guarnizione in PVC morbido co-estrusa internamente al giunto (prodotti da Arcaprofil S.p.A.), testati in una condizione di tenuta stagna a una pressione costante di circa 2.06 Bar, sono risultati impermeabili, non hanno mostrato perdite di liquido.

Responsabile Lab	*Lab Responsible*	**RAQ**	*Quality Assessment Responsible*	**Responsabile della prova**	*Test Responsible*
Prof.ssa Alessandra Zanelli		Prof.ssa Carol Monticelli		Prof. Valter Carvelli	
APPROVATO / Approved		VERIFICATO / Verified		VERIFICATO / Verified	
Firmato digitalmente da:ALESSANDRA ZANELLI Organizzazione:POLITECNICO DI MILANO/80057930150 Note:		Firmato digitalmente da:CAROL MONTICELLI Organizzazione:POLITECNIC O DI MILANO/80057930150 Note:		Firmato digitalmente da:VALTER CARVELLI Organizzazione:POLITECNIC O DI MILANO/80057930150 Note:	

END OF THE TESTS' REPORT — FINE DEL RAPPORTO DI PROVA

POLITECNICO DI MILANO | Textiles HUB | Padiglione ClusTEX
Cluster di ricerca multidisciplinare sui TESSILI INNOVATIVI - *Multidisciplinary research Cluster on INNOVATIVE TEXTILES*
Edificio 14A – *Building 14A*, Via Ponzio 31-33, 20133 Milano, Tel. sala prove biassiali 02 23995145

GREENWALL
PVC SHEET PILE

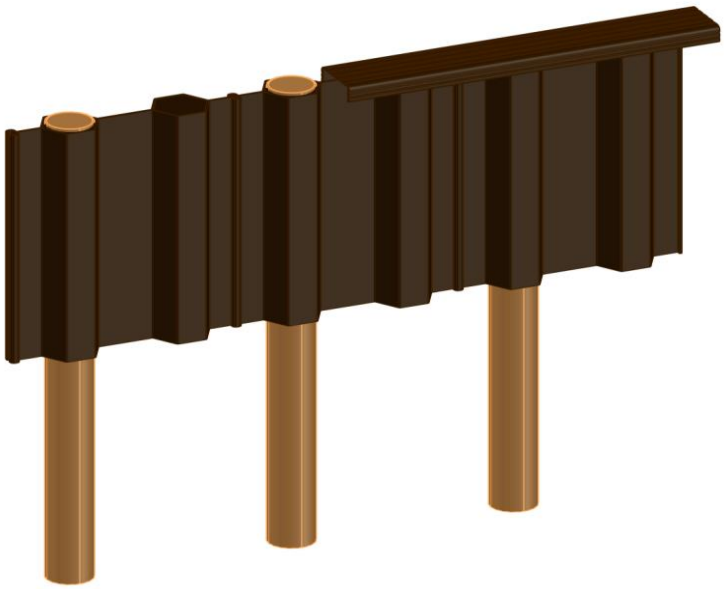
SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

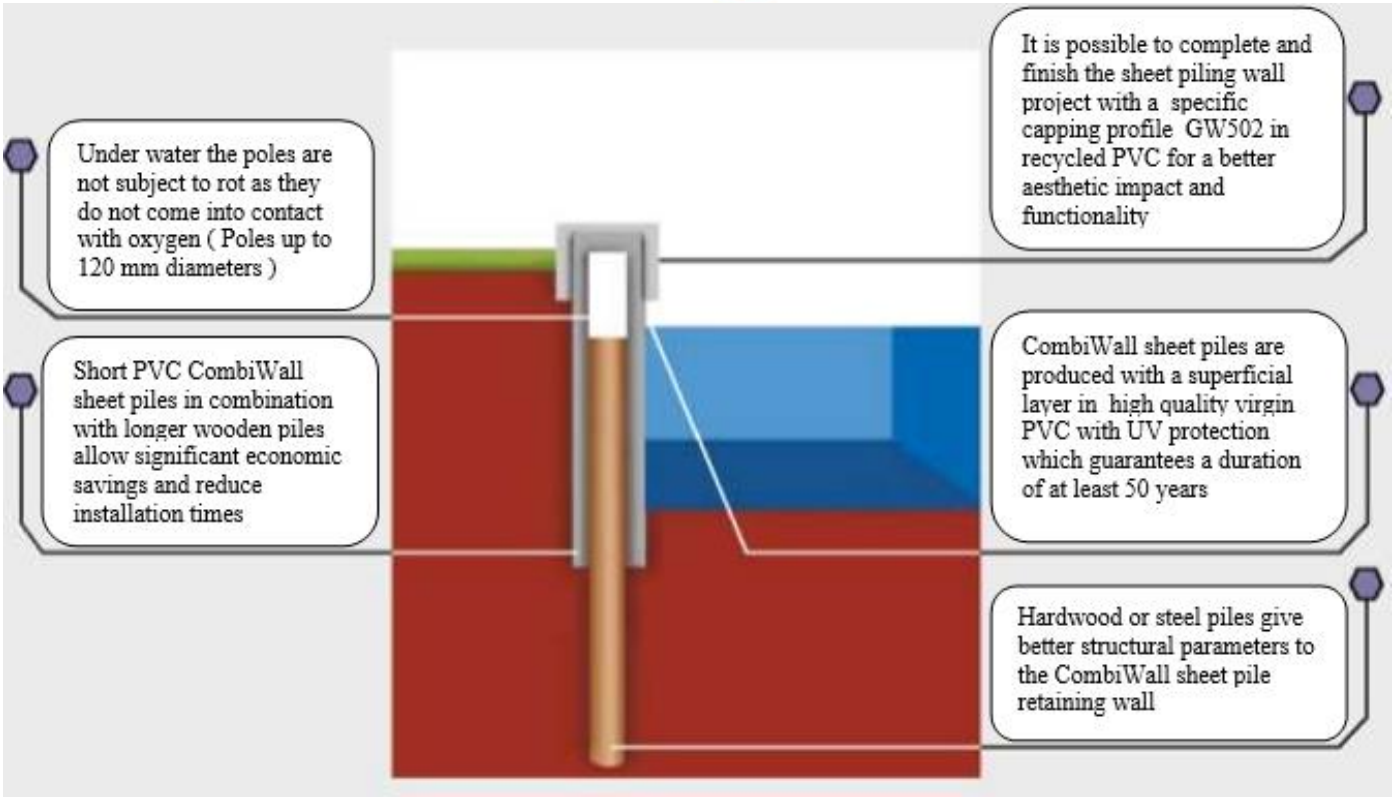
NEW! COMBIWALL SYSTEM GW 560

The COMBIWALL System presents itself as an ingenious and economically advantageous system thanks to the combination of recycled PVC panels/bulkheads and wooden or iron poles up to 120 mm diameters. The extruded PVC panels have the task of retaining the ground or waterways, while Wooden or iron poles give excellent mechanical resistance to the entire project. The combination of different types of raw materials and the production technique (co-extrusion) gives GreenWall sheet piles excellent characteristics, resistance to exposure to UV rays and to corrosive chemical agents and are **GUARANTEED FOR 50 YEARS.**

COMBIWALL SYSTEM ADVANTAGES

- ✓ **ECOLOGICAL AND LASTING**
- ✓ **EXCELLENT WATERPROOFNESS**
- ✓ **COMPETITIVE PRICE**
- ✓ **50 YEAR GUARANTEE**
- ✓ **MADE IN ITALY**
- ✓ **LOW CO2 EMISSIONS**
- ✓ **SIMPLE INSTALLATION**
- ✓ **INNOVATIVE AND DUCTILE**
- ✓ **LIGHT AND SAFE**
- ✓ **RESISTANT TO UV RAYS**
- ✓ **CORROSION RESISTANT**



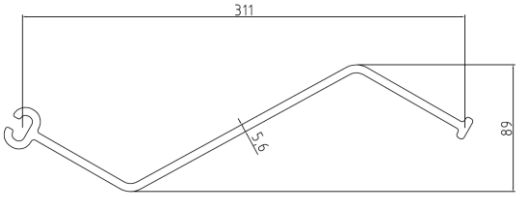


GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

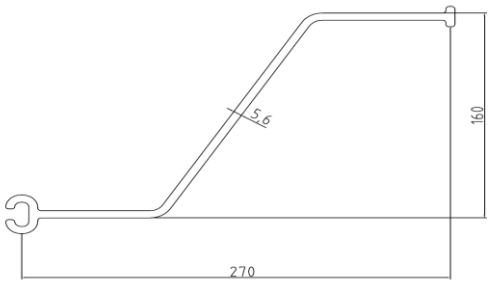
PVC SHEET PILING

GW 270 WAVE SECTION



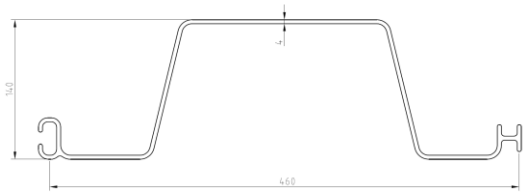
BENDING MOMENT (M)	1,72 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	3,44 kNm /m
SECTION MODULUS - Wel	80,51 cm^3 / m
MOMENT OF INERTIA - Jy	358,26 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	89 mm
THICKNESS	5,6 mm
EFFECTIVE SECTION WIDTH	311 mm +/-15
WEIGHT PER LINEAR METER	3,6 Kg
WEIGHT SQUARE METER	11,50 Kg

GW 270 TRAPEZOIDAL SECTION



BENDING MOMENT (M)	9,03 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	18,06 kNm / m
SECTION MODULUS - W_{el}	451,57 cm^3 / m
MOMENT OF INERTIA - J_y	3612,54 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	160 mm
THICKNESS	5,6 mm
EFFECTIVE SECTION WIDTH	270 mm +/-15
WEIGHT PER LINEAR METER	3,6 Kg
WEIGHT SQUARE METER	13,30 Kg

GW 450 U SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	5,47 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	10,94 kNm / m
SECTION MODULUS - Wel	273 cm^3 / m
MOMENT OF INERTIA - Jy	2107 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	140 mm
THICKNESS	4 mm
EFFECTIVE SECTION WIDTH	460 mm +/-15
WEIGHT PER LINEAR METER	5,05 Kg
WEIGHT SQUARE METER	10,90 Kg

GW 460 U SECTION

ULTRA SEALING VERSION AVAILABLE

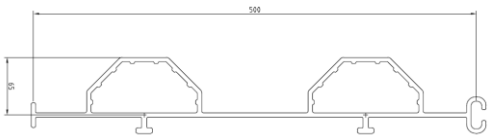
BENDING MOMENT (M)	7,94 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	15,88 kNm / m
SECTION MODULUS - Wel	397 cm^3 / m
MOMENT OF INERTIA - Jy	2976 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	140 mm
THICKNESS	5,8 mm
EFFECTIVE SECTION WIDTH	460 mm +/-15
WEIGHT PER LINEAR METER	7.2 Kg
WEIGHT SQUARE METER	15,70 Kg

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

PVC SHEET PILING

GW 500 FLAT SECTION

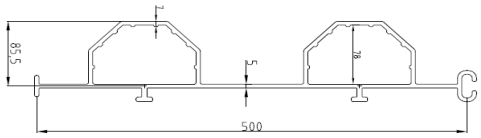


ULTRA SEALING VERSION AVAILABLE

GW 500 can be sold in all the Countries Except : BE-DE-DK-FI-FR-GB-NL-SE-PL

BENDING MOMENT (M)	3,26 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	6,52 kNm / m
SECTION MODULUS - Wel	136 cm^3 / m
MOMENT OF INERTIA - Jy	676 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	65 mm
THICKNESS	5 mm
EFFECTIVE SECTION WIDTH	500 mm +/-15
WEIGHT PER LINEAR METER	8,4 Kg
WEIGHT SQUARE METER	16,80 Kg

GW 500 BIS FLAT SECTION

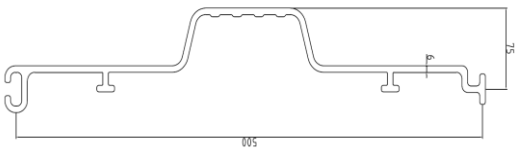


ULTRA SEALING VERSION AVAILABLE

GW 500 can be sold in all the Countries Except : BE-DE-DK-FI-FR-GB-NL-SE-PL

BENDING MOMENT (M)	4,04 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	8.08 kNm / m
SECTION MODULUS - Wel	202 cm^3 / m
MOMENT OF INERTIA - Jy	1268 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	85.5 mm
THICKNESS	5 mm
EFFECTIVE SECTION WIDTH	500 mm +/-15
WEIGHT PER LINEAR METER	9.2 Kg
WEIGHT SQUARE METER	18.4 Kg

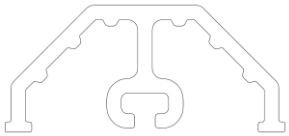
GW 550 FLAT SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	2,30 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	4,60 kNm / m
SECTION MODULUS - Wel	114,30 cm^3 / m
MOMENT OF INERTIA - Jy	554,43 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	75 mm
THICKNESS	6 mm
EFFECTIVE SECTION WIDTH	500 mm +/-15
WEIGHT PER LINEAR METER	7,1 Kg
WEIGHT SQUARE METER	14,20 Kg

GW 501 PVC PILE



TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	65 mm
THICKNESS	8 mm
EFFECTIVE SECTION WIDTH	130 mm +/-15

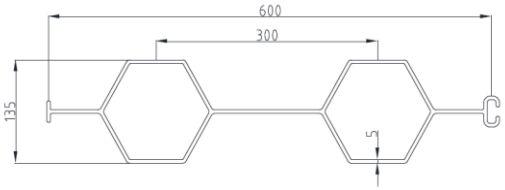
GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

PVC SHEET PILING

GW 560 U SECTION

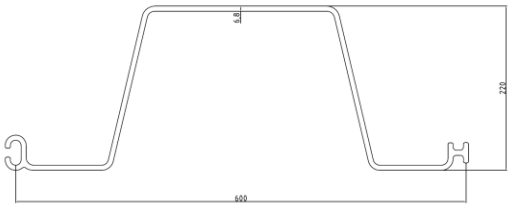
NEW!



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	4,92 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	9,84 kNm / m
SECTION MODULUS	245,96 cm^3 / m
MOMENT OF INERTIA - Jy	1352,87 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	135 mm
THICKNESS	5 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	9,6 Kg
WEIGHT SQUARE METER	16 Kg

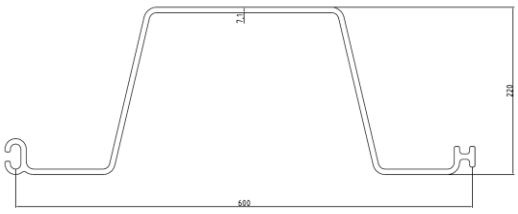
GW 590 U SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	15,06 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	30,12 kNm / m
SECTION MODULUS	753 cm^3 / m
MOMENT OF INERTIA - Jy	9034 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	220 mm
THICKNESS	6,8 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	11,30 Kg
WEIGHT SQUARE METER	18,80 Kg

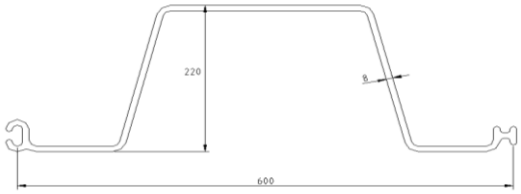
GW 595 U SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	15,50 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	31,00 kNm / m
SECTION MODULUS	772,76 cm^3 / m
MOMENT OF INERTIA - Jy	9041,50 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	220 mm
THICKNESS	7.1 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	11,80 Kg
WEIGHT SQUARE METER	19.70 Kg

GW 600 U SECTION



ULTRA SEALING VERSION AVAILABLE

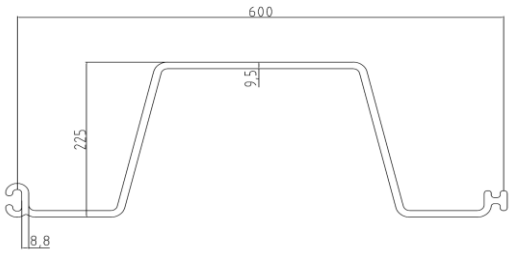
BENDING MOMENT (M)	19.34 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	38,68 kNm / m
SECTION MODULUS	967 cm^3 / m
MOMENT OF INERTIA - Jy	10633 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	220 mm
THICKNESS	8 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	13.50 Kg
WEIGHT SQUARE METER	23 Kg

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

PVC SHEET PILING

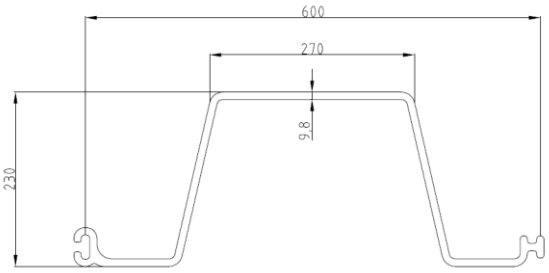
GW 620 U SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	21,00 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	42,00 kNm /m
SECTION MODULUS	1046.90 cm^3 / m
MOMENT OF INERTIA - Jy	12730 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	225 mm
THICKNESS	9,5 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	15 Kg
WEIGHT SQUARE METER	25 Kg

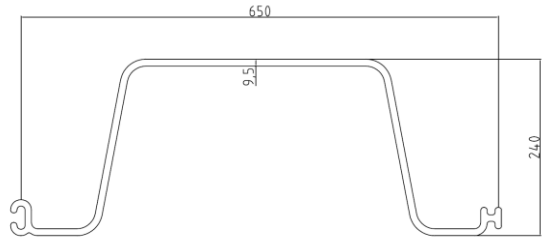
GW 622 U SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	22,59 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	45.18 kNm / m
SECTION MODULUS	1129.72 cm^3 / m
MOMENT OF INERTIA - Jy	14021cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	230 mm
THICKNESS	9.8 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
POIDS EN MÈTRE LINÉAIRE	15.2 Kg
WEIGHT SQUARE METER	25.35 Kg

GW 625 U SECTION

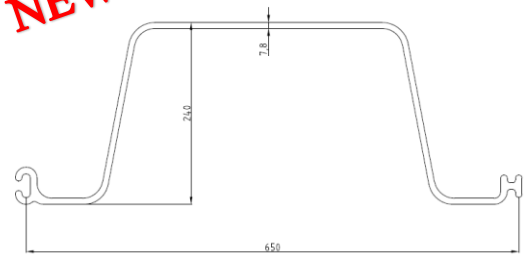


ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	24,90 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	49.80 kNm / m
SECTION MODULUS	1244,70 cm^3 / m
MOMENT OF INERTIA - Jy	14992cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	240 mm
THICKNESS	9,5 mm
EFFECTIVE SECTION WIDTH	650 mm +/-15
WEIGHT PER LINEAR METER	16,2 Kg
WEIGHT SQUARE METER	25 Kg

GW 635 U SECTION

NEW!



ULTRA SEALING VERSION AVAILABLE

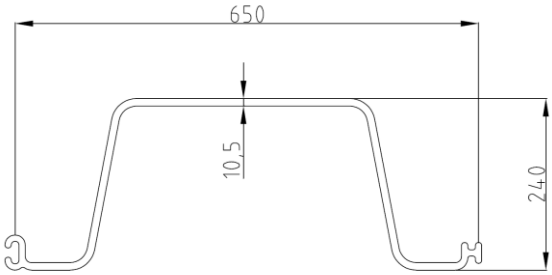
BENDING MOMENT (M)	23,43 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	48,86 kNm / m
SECTION MODULUS - Wel	1065 cm^3 / m
MOMENT OF INERTIA - Jy	12891 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	44 MPa
SECTION DEPTH	240 mm
THICKNESS	7,8 mm
EFFECTIVE SECTION WIDTH	650 mm +/-15
WEIGHT PER LINEAR METER	14 Kg
WEIGHT SQUARE METER	21,50 Kg

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

PVC SHEET PILING

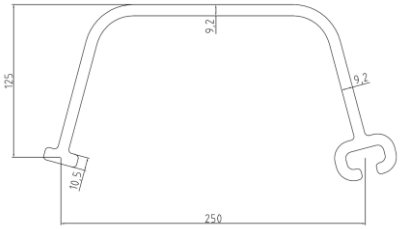
GW 650 U SECTION



ULTRA SEALING VERSION AVAILABLE

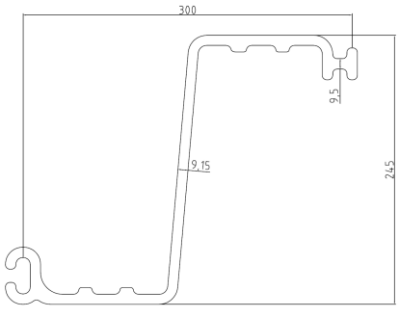
BENDING MOMENT (M)	27,33 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	54.66 kNm / m
SECTION MODULUS - Wel	1366,50 cm^3 / m
MOMENT OF INERTIA - Jy	16180 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	240 mm
THICKNESS	10,50 mm
EFFECTIVE SECTION WIDTH	650 mm +/-15
WEIGHT PER LINEAR METER	17.12 Kg
WEIGHT SQUARE METER	26.34 Kg

GW 250 U SECTION



BENDING MOMENT (M)	21,45 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	42,90 kNm / m
SECTION MODULUS - Wel	1072,28 cm^3 / m
MOMENT OF INERTIA - Jy	13403,54cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	125 mm
THICKNESS	9,2 mm
EFFECTIVE SECTION WIDTH	250 mm +/-15
WEIGHT PER LINEAR METER	7,4 Kg
WEIGHT SQUARE METER	29.60 Kg

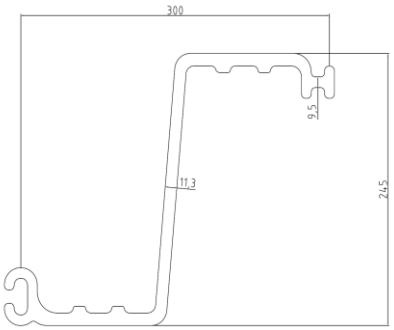
GW 630/9 Z SECTION



ULTRA SEALING VERSION AVAILABLE

BENDING MOMENT (M)	32,76 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	65,52 kNm / m
SECTION MODULUS - Wel	1638,40 cm^3 / m
MOMENT OF INERTIA - Jy	20066 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	245 mm
THICKNESS	9,15 mm
EFFECTIVE SECTION WIDTH	300 mm +/-15
WEIGHT PER LINEAR METER	10 Kg
WEIGHT SQUARE METER	33,33 Kg

GW 630/11 Z SECTION



BENDING MOMENT (M)	37,36 kNm / m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	74,72 kNm / m
SECTION MODULUS - Wel	1867,81 cm^3 / m
MOMENT OF INERTIA - Jy	22880,73 cm^4 /m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	245 mm
THICKNESS	11,30 mm
EFFECTIVE SECTION WIDTH	300 mm +/-15
WEIGHT PER LINEAR METER	11,60 Kg
WEIGHT SQUARE METER	34,80 Kg

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

ACCESSORIES

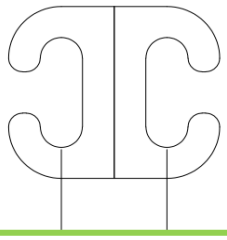
GW 001
UNIVERSAL JOINT

ULTRA SEALING VERSION AVAILABLE

TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	55 mm
THICKNESS	9 mm
EFFECTIVE SECTION WIDTH	110 mm +/-15

GW 002
CONNECTION

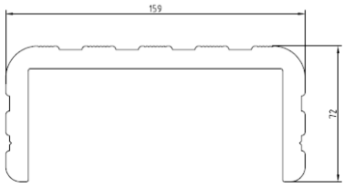
NEW!



ULTRA SEALING VERSION AVAILABLE

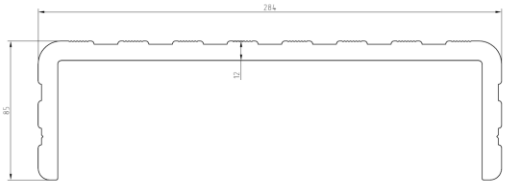
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	30 mm
THICKNESS	9 mm

GW 502
CAPPING 159 mm



TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	72 mm
THICKNESS	8 mm
EFFECTIVE SECTION WIDTH	159 mm +/-15

GW 503
CAPPING 284 mm



TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	85 mm
THICKNESS	12 mm
EFFECTIVE SECTION WIDTH	284 mm +/-15

EXAMPLES OF USE
PVC SHEET PILING GREENWALL

Depending on the type of soil, we've provided 6 examples of how GreenWall PVC sheet piling can be used in two different soil conditions: cohesive (clay) and non-cohesive (sand), using a single layer of soil.
Nous avons en outre pris en compte des palplanches en PVC de 4,0 m et 6,0 m de hauteur.

In the following examples, the excavation depth must be the maximum possible excavation depth **under safe conditions.**

We consider the maximum excavation depth that results in a head displacement of less than the minimum of the following values:

2,54 cm (1")
1/200 sheet pile height **= 2,0 cm** for sheet piles H = 4,0 m
= 3,0 cm for sheet piles H = 6,0 m
= 4,0 cm for sheet piles H = 8,0 m

This minimum value is compatible with the safety and functional requirements of the retaining structure, irrespective of the value of the permissible moment which, of course, must be greater than the moment applied to the sheet pile curtain resulting from the calculation.

CALCULATION AND VERIFICATION METHODS

Cross-section resistance checks are carried out in accordance with the " *Technical Building Standards*" (TBS), including the Italian Ministerial Decree of 14.02.2008 and the corresponding Ministerial Circular n. 617 of 02.02.2009, using the semi-probabilistic limit state method. Stress parameters are analyzed according to the heaviest load conditions in various combinations. Structures are designed according to building science methods, assuming that materials are elastic, homogeneous, and isotropic.

he examples examined refer to type of construction 1 - temporary structures (cfr. table n.2.4.I of the TBS) with a normal life (VN) **of less than 2 years.**

As specified in note (1) of table 2.4.I of the NTC, **seismic checks can be omitted** for this type of structure.

For defined structures, seismic tests will be carried out using the seismic parameters of the site.

For the design and verification of the GreenWall PVC sheet piling curtain, we have considered sheet piling that is not fixed either at the foot or at the head. Depending on the type of soil considered, checks will be carried out under long-term drainage conditions.

We have not taken upstream overloads into account in our checks.

WATER LEVEL

The height of the water table is - 0.5 m above the head of the sheet piles, and - 0.1 m above the proposed excavation level.

PVC MATERIAL CHARACTERISTICS

The values considered for the materials considered are as follows:

Profil	Es [MPa]	fyk [MPa]	fyd [MPa]	ftk [MPa]	ftd [MPa]	ep_tk	epd_ult
PVC	3060	40	20	34	17	1.3	1.0

The "PARATIE 2012 SPW" calculation program developed and supplied by **Geostru Software** was used for structural analysis and verification. The algorithms used are described in detail in the manual for the RC-Sec program developed by the same software company.

SOIL CHARACTERISTICS

For soils, we have considered the geotechnical parameters of strength and deformability, considered as precautionary, and indicated below.

For cohesive soils (medium clay):

γ [kN/m^3]	γ_{sat} [kN/m^3]	C' [kN/m^2]	Ø' [Degré]	M_o [kN/m^2]
20,0	22,0	15,0	18,0	4000,0

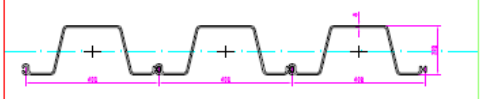
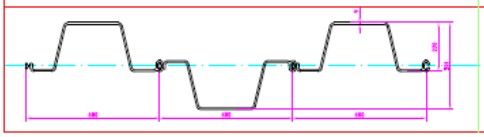
For non-cohesive soils (medium-density sands):

γ [kN/m^3]	γ_{sat} [kN/m^3]	C' [kN/m^2]	Ø' [Degré]	M_o [kN/m^2]
18,0	20,0	0,0	32,0	30000,0

Where :

- H = thickness of the soil layer;
- γ = natural weight per unit volume of the soil layer;
- γ_{sat} = specific weight of the submerged soil layer;
- C = effective cohesion;
- ø = effective angle of internal friction;
- Eode = oedometricmodulus;

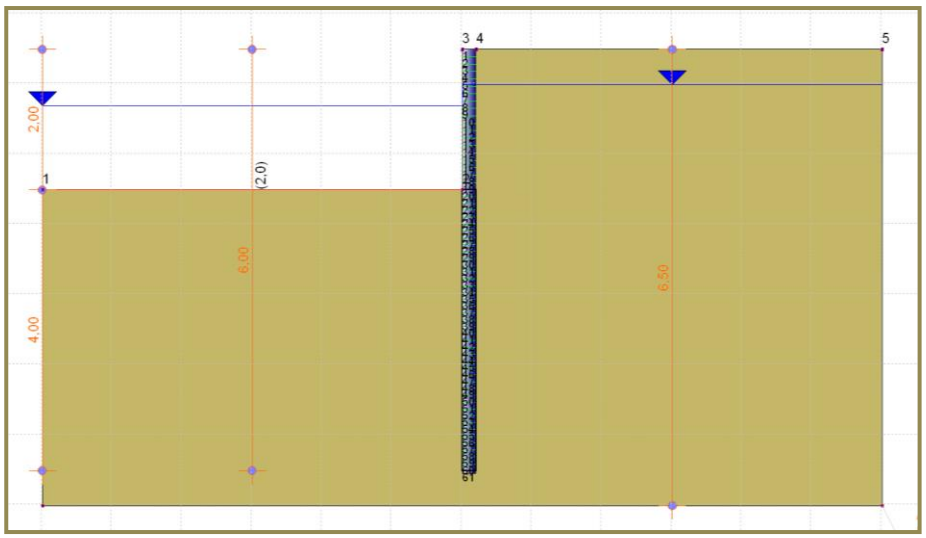
GREENWALL PVC SHEET PILE CHARACTERISTICS

	$W_{y\,el}$ (cm^3)	$W_{y\,pl}$ (cm^3)	I_y (cm^4)	Area (cm^2)
Singola palancola	510	663	6352	85,80
	912 967 (h=11)	1186 1257 (h=11)	10586	142,50
	945	1228	18476	142,50

EXAMPLE 1 - GW 600

PROJECT PARAMETERS

Type of soil	**Coherent (medium clay)**
Base level of excavation	**- 2.00 m**
Depth of sheet pile	**6.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**4.00 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 0.80 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.26**			
s_{max} (cm)	**2.26**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**3.96**	**3.79**	**19.34**
T_{max} (kN/m)		**4.65**	**5.21**	
Results of stress-deformation analyses				

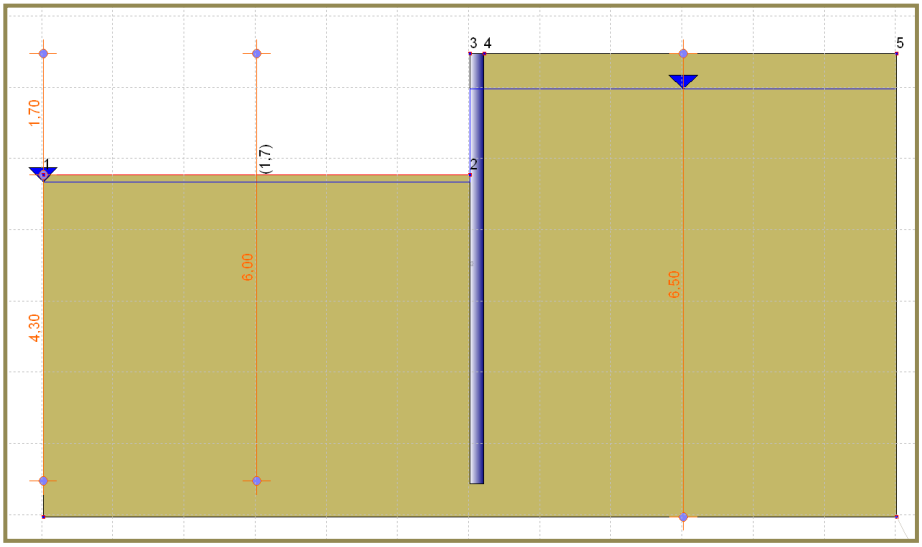
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 2- GW 600

PROJECT PARAMETERS

Type of soil	**Coherent (medium clay)**
Base level of excavation	**- 1.70 m**
Depth of sheet pile	**6.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**4.30 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 1.80 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1) to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.25**			
s_{max} (cm)	**2.25**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**4.75**	**3.91**	**19.34**
T_{max} (kN/m)		**7.89**	**6.58**	
Results of stress-deformation analyses				

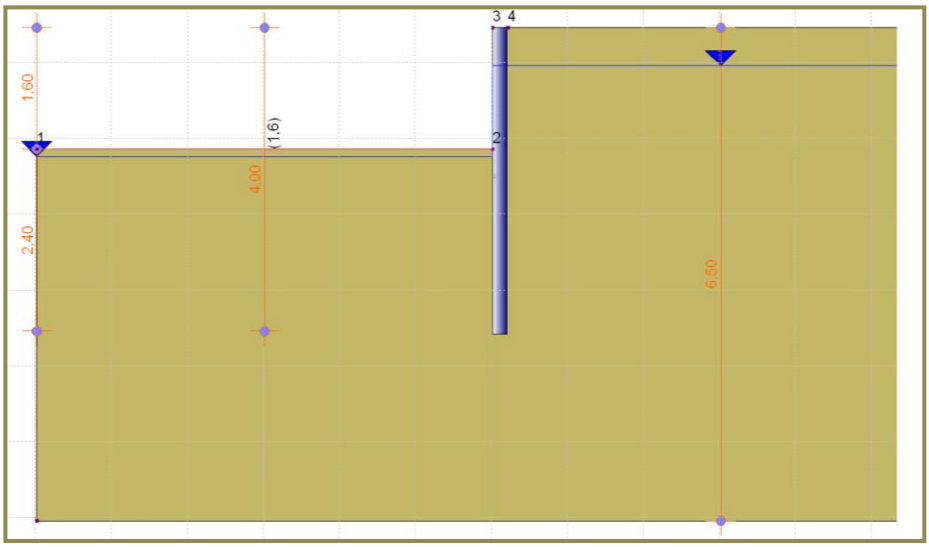
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 3 – GW 600

PROJECT PARAMETERS

Type of soil	**Coherent (medium clay)**
Base level of excavation	**- 1.60 m**
Depth of sheet pile	**4.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**2.40 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 1.70 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**1.69**			
s_{max} (cm)	**1.69**			
s_{piede} (cm)	**0.005**			
M_{max} (kNm/m)		**3.77**	**3.04**	**19.34**
T_{max} (kN/m)		**6.60**	**5.27**	
Results of stress-deformation analyses				

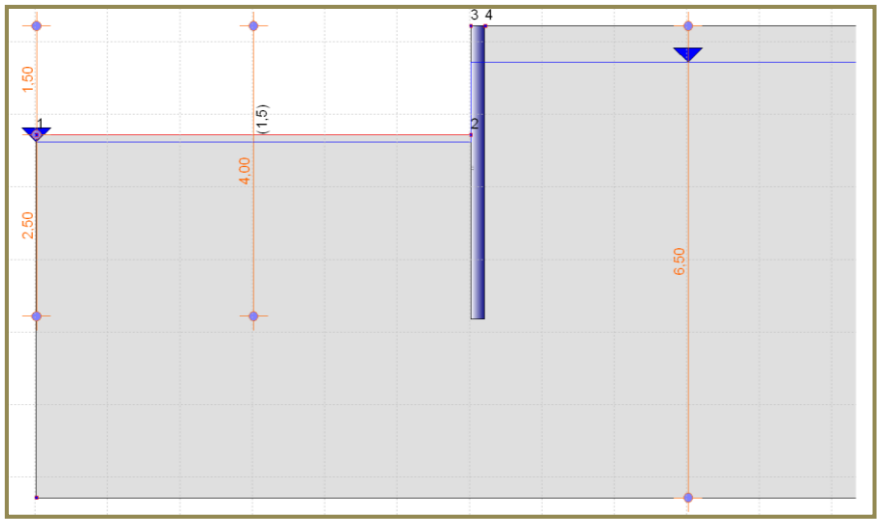
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 4 – GW 600

PROJECT PARAMETERS

Type of soil	**Non-coherent (medium sand)**
Base level of excavation	**- 1.50 m**
Depth of sheet pile	**4.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**2.50 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 1.60 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.20**			
s_{max} (cm)	**2.20**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**6.05**	**5.56**	**19.34**
T_{max} (kN/m)		**9.75**	**8.64**	
Results of stress-deformation analyses				

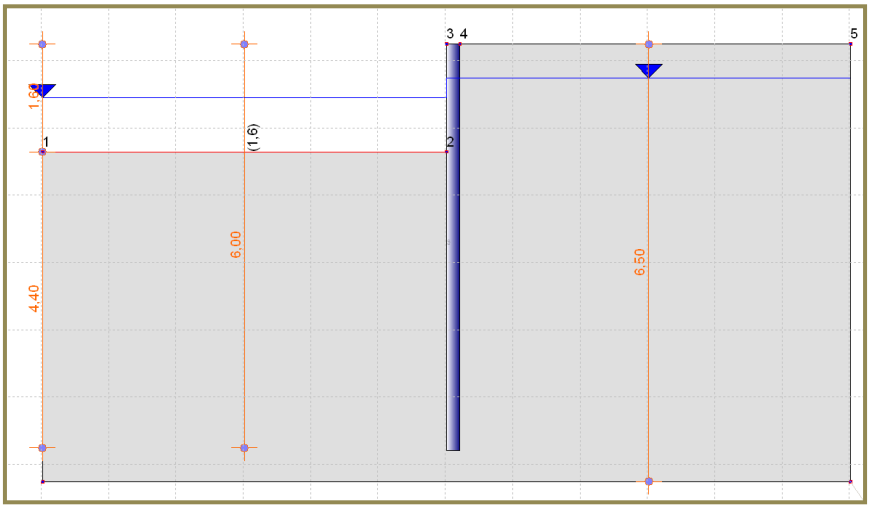
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 5- GW 600

PROJECT PARAMETERS

Type of soil	**Non-coherent (medium sand)**
Base level of excavation	**- 1.60 m**
Depth of sheet pile	**6.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**4.40 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 0.80 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.32**			
s_{max} (cm)	**2.32**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**5.88**	**5.54**	**19.34**
T_{max} (kN/m)		**8.12**	**7.48**	
Results of stress-deformation analyses				

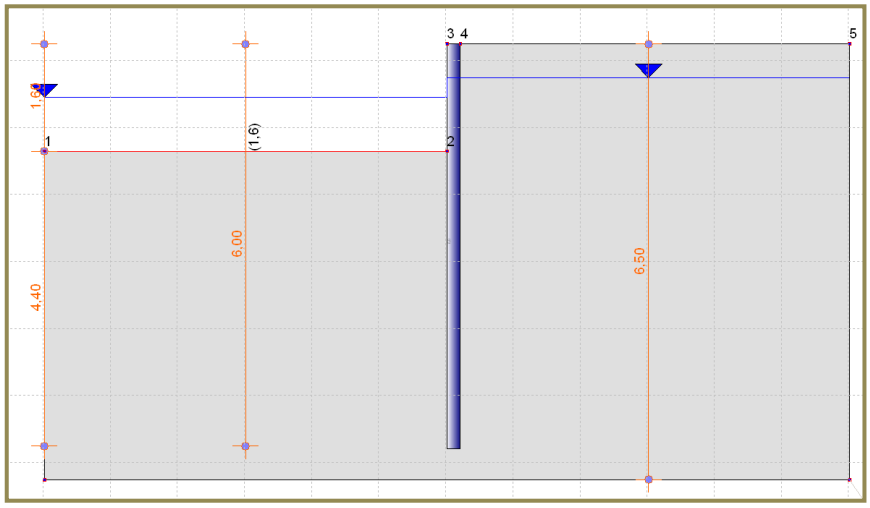
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 6 – GW 460

PROJECT PARAMETERS

Type of soil	**Non-coherent (medium sand)**
Base level of excavation	**- 1.40 m**
Depth of sheet pile	**6.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**4.60 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 0.80 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.36**			
s_{max} (cm)	**2.36**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**1.98**	**1.60**	**7.94**
T_{max} (kN/m)		**4.09**	**3.22**	
Results of stress-deformation analyses				

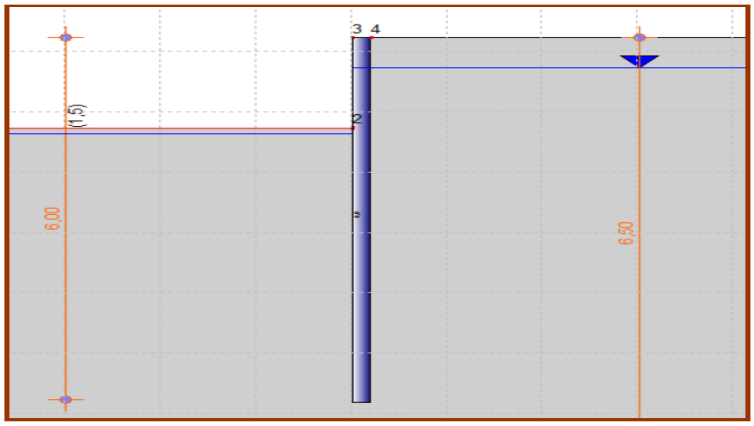
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

EXAMPLE 7- GW 620

PROJECT PARAMETERS

Type of soil	**Non-coherent (medium sand)**
Base level of excavation	**- 1.50 m**
Depth of sheet pile	**6.00 m**
Level of top of sheet pile	**± 0.00 m**
Toothing	**4.50 m**
Water level on upper side	**- 0.50 m**
Water level on lower side	**- 1.60 m**



RESULTS

The limit analysis of the structure has been carried out considering the combinations (A1+M1+R1) and (A2+M2+R1), to which the Serviceability Limit State (SLS) has been added.

	SLS [RARA]	ULS [A1+M1+R1]	ULS [A2+M2+R1]	M_{amm}
s_{testa} (cm)	**2.30**			
s_{max} (cm)	**2.30**			
s_{piede} (cm)	**0.000**			
M_{max} (kNm/m)		**6.13**	**5.65**	**21.00**
T_{max} (kN/m)		**9.83**	**8.68**	
Results of stress-deformation analyses				

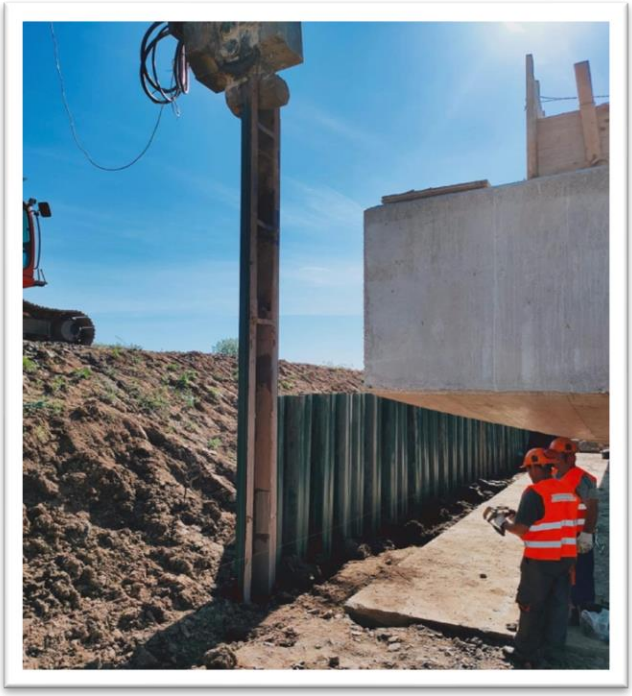
Where:

- s_{testa} = horizontal displacement at the reference level ± 0.00
- s_{max} = maximum horizontal displacement
- s_{piede} = horizontal displacement at the base
- M_{max} = maximum bending moment
- T_{max} = maximum shear
- M_{amm} = allowable moment

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Finlande - 1100 m^2



GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Lituanie - 4500 m^2

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Pays-Bas - 2200 m^2

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Pays Baltes - 6000 m^2

Toscane (Italie) - 1200 m^2

Toscane (Italie) – 3000 m^2

Venise (Italie) – 6000 m^2

GREENWALL
PVC SHEET PILE

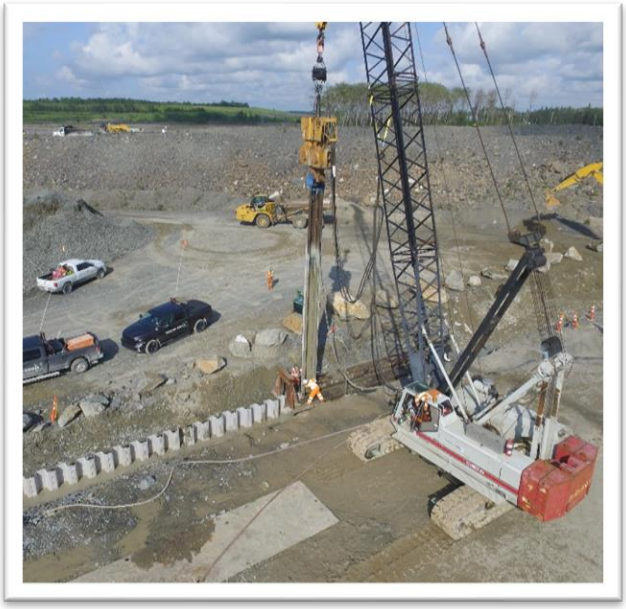
SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Roumanie – 2000 m^2

Toscane (Italie) - 8500 m^2

Venise (Italie) -1800 m^2

Ontario (Canada) 1700 m^2



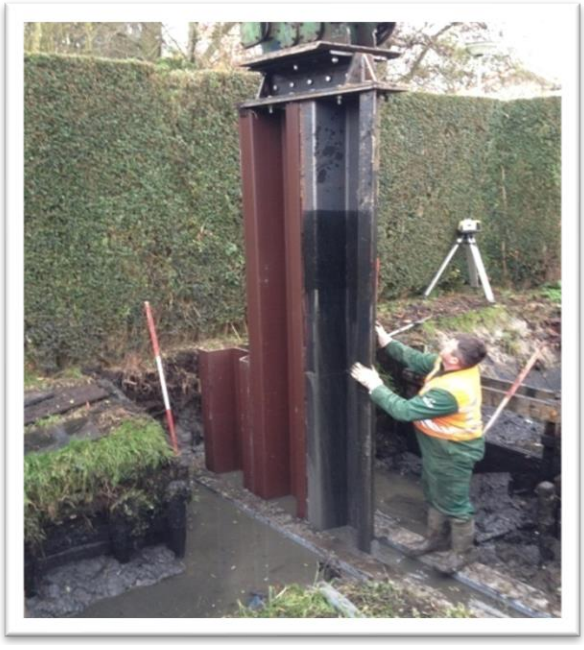
Pays Baltes -5000 m2

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Pays-Bas - 4200 m^2

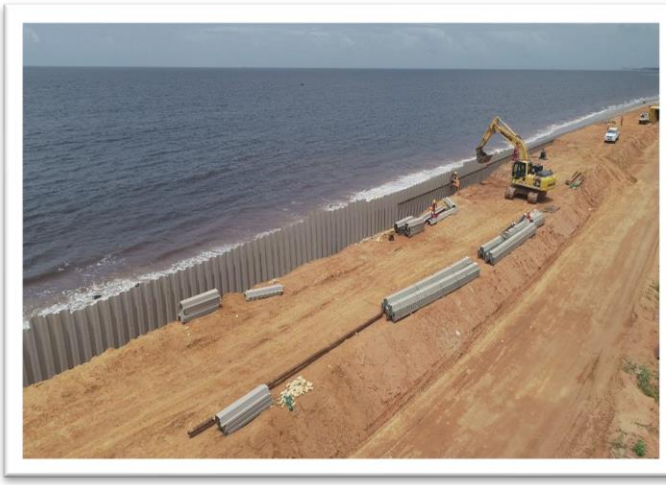
Pays-Bas - 2200 m^2



GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Congo - 16.000 m^2



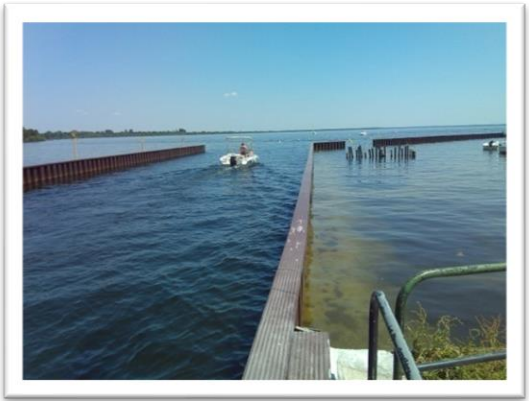
France - 2750 m^2

Pays-Bas

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

France - 2592 m^2




Mantoue (Italie) – 680 m^2




GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Bucarest (Roumanie) -8000 m^2

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

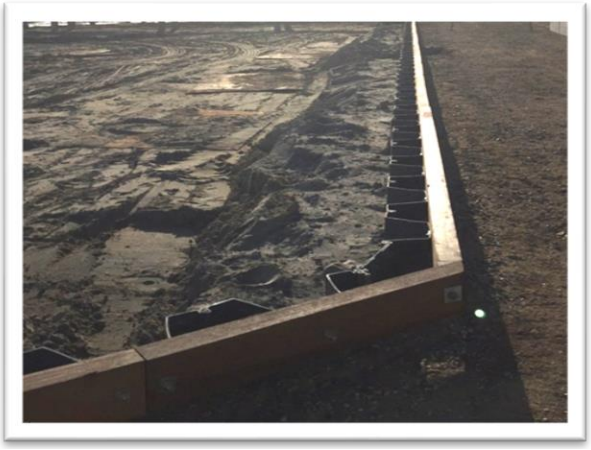
Pays-Bas - 6000 m^2– sealing wall (cut-off wall)

GREENWALL
PVC SHEET PILE

SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Danemark - 3000 m^2



Norvège - 300 m^2


Pays-Bas – 1200 m2 – flood protection

Pays-Bas - 1500 m^2

Delta du Pô Regional Park (Venetie Region, Italie) - 850 m^2

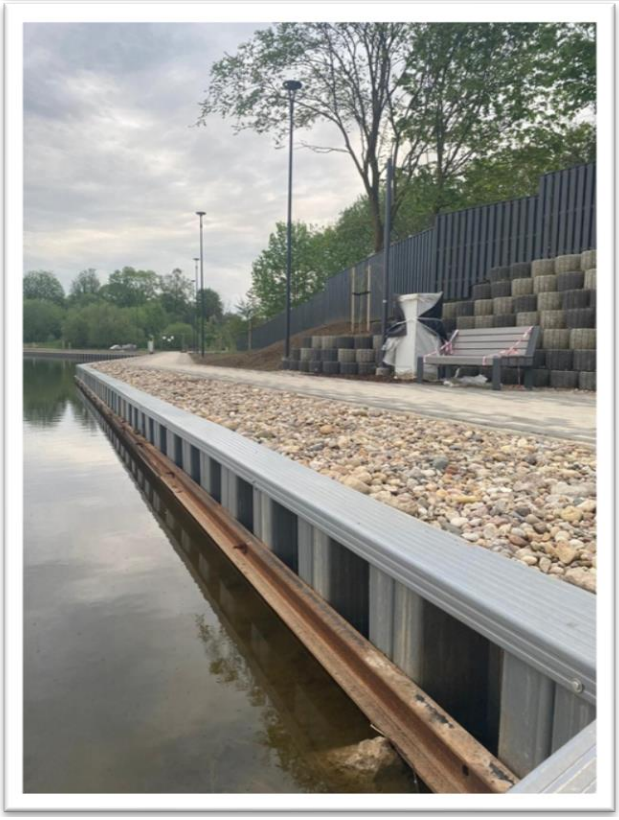
Suède – 13000 m^2 – sealing wall (cut-off wall)

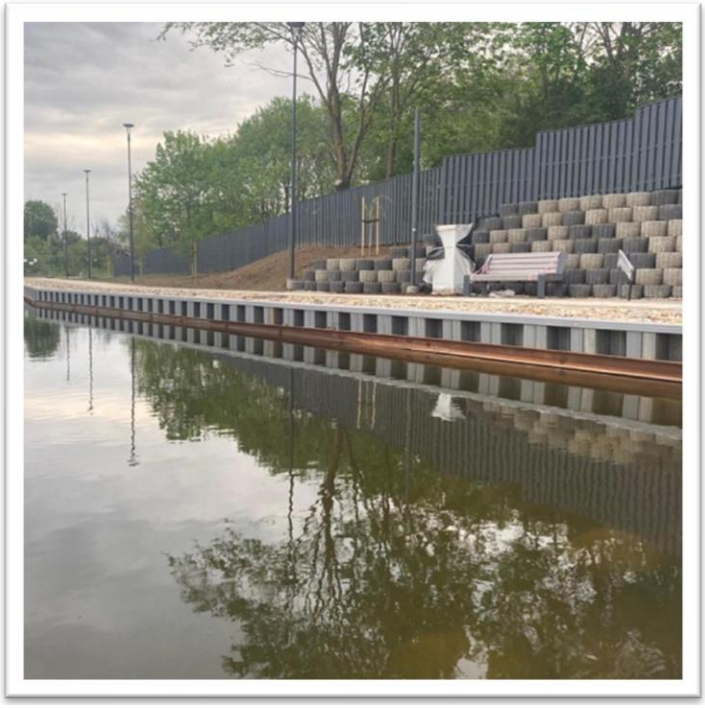
Autriche – 2500 m^2 – flood protection

GREENWALL
PVC SHEET PILE

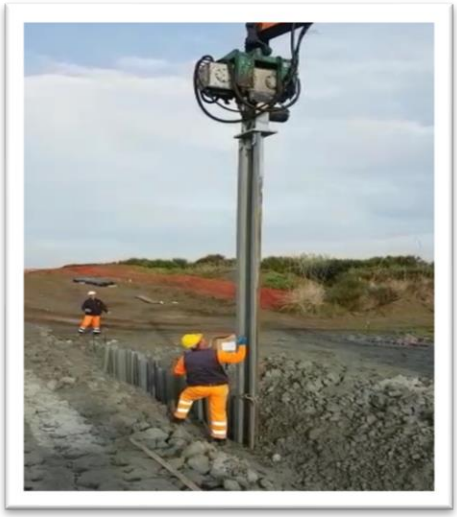
SYSTÈME DE PALPLANCHES
PURE PVC
SHEET PILES SYSTEM

Lettonie – 7000 m^2





Rome (Italie) – 11000 m^2 – sealing wall (cut-off wall)



GREENWALL PVC SHEET PILE

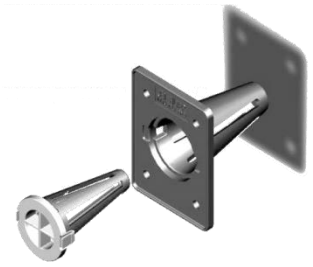
SYSTÈME DE PALPLANCHES PURE PVC SHEET PILES SYSTEM

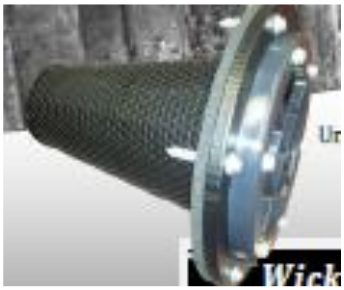
DRAIN

Jet Filters drains are used to reduce water pressure and allow drainage of sheet piles, saving time and money on large surfaces. Drainage holes reduce the hydrostatic pressure that inevitably builds up behind sheet pile walls.

Featuring a retractable internal filter, Pure PVC's Jet Filters are easy to change and clean, as the internal filter is located at the front of the ground containment structure, without the need for rear dredging.

Jet Filters can also be used on traditional steel sheet pile walls and concrete structures. Drainage holes must be periodically cleaned of any clogging to ensure proper operation.





Daniel Vanier

Sylvain Dallaire