GREENWALL

PVC SHEET PILE

MADE IN ITALY

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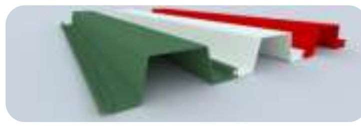
GreenWall Vinyl Sheet Pile originates from a collaboration of two Italian companies which both bring more than 50 years of technical skills and experience from their respective industry sectors (extrusion and driving /marketing of sheet piles).
GreenWall Vinyl sheet pile is the only one manufactured from start to finish in Italy and it is made using an extrusion/co-extrusion process.
The manufacturing process is guaranteed and monitored according to ISO 9001:2015 procedures with specific control during all the stages of manufacturing (from the raw material through to tests on the product).

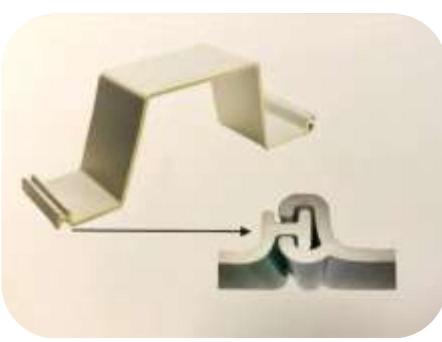


The combination of different types of raw materials and the manufacturing technique (co-extrusion) ensure that GreenWall sheet piles have excellent features: they are resistant to UV rays and to corrosive chemicals.
All GreenWall sheet piles have a high quality PVC surface layer ensuring they are wear resistant and that they have a low impact on the environment while the inner core is made of recycled materials.



GREENWALL products are ideal for carrying out work by rivers or the sea and on environmental reclamation thanks to their flexibility and long service life, without maintenance needs.
Currently, most siding, bulkheads and water control structures are made of steel, concrete or wood.

These traditional products are expensive and require constant maintenance.
GreenWall products are available in three basic colours: Light Grey, Dark Grey ,Green , Brown and Sand .



GREENWALL
PVC SHEET PILE

GREENWALL products are extremely versatile and can be used in various applications :

- Erosion protection for rivers, streams and canals
- Flood protection
- Cut-Off projects
- Embankments for irrigation channels
- Reclamation of polluted land
- River canalization
- Culverts
- Reinforced embankments with hydraulic barrier
- Barrier against the undermining of foundations
- Artificial lakes
- Water conservation reservoirs
- Supporting walls
- Containment walls
- Creation of green spaces
- Urban design

The main competitive advantages of GreenWall sheet piles are as follows:

- Competitive price
- Reduced weight
- Reduced transportation costs
- Exceptional duration
- No maintenance
- Ecological
- 100% recyclable
- Impact resistant
- Excellent mechanical performance
- Pollution resistant
- UV resistant
- Corrosion resistant
- Easy to install
- Driving with standard equipment
- Safety on site
- Excellent environmental and aesthetic impact





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GreenWall sheet piling is mainly installed/driven using a vibratory hammer, a method commonly used for steel sheet piles.

Based on the type of soil and the type of work to be carried out, we recommend using a “lead” sheet pile (metal guide) for driving.
By using a sheet pile metal guide, GreenWall sheet piling is completely protected from breakages when driven into hard and difficult ground.

The main advantages of driving using a sheet pile metal guide are as follows:

- Ensures sheet piles can be driven into difficult and hard ground
- Allows installation of sheet piles up to a depth of 13 meters
- Prevents sheet piles being broken by removing obstacles in the subsurface
- Allows perpendicular pile driving
- Speeds up and eases the time taken to drive in piles

If necessary, GreenWall can hire the sheet pile metal guide and if required we can offer technical assistance, instructing personnel on installation procedures.








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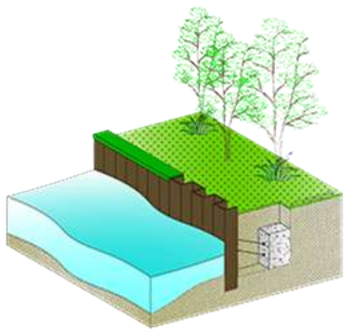
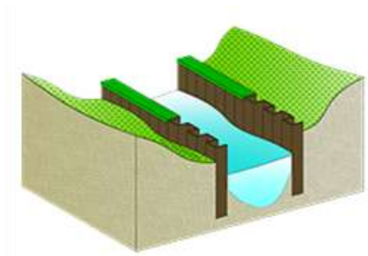
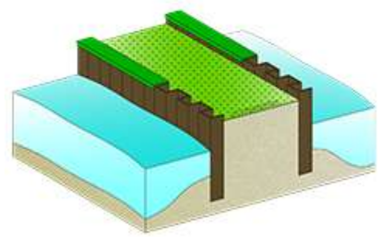
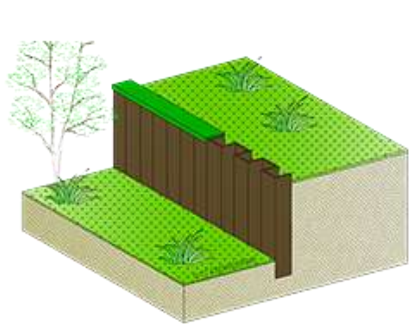
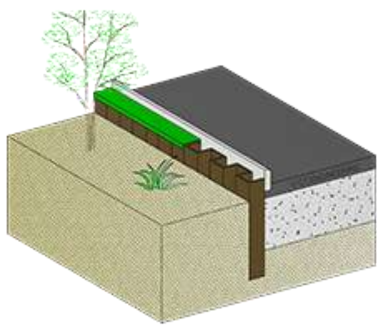
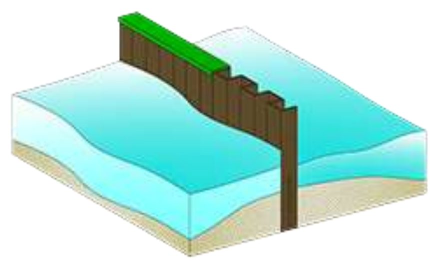
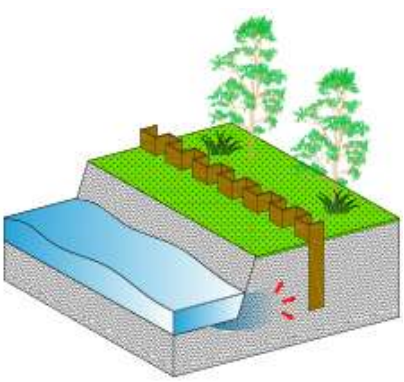
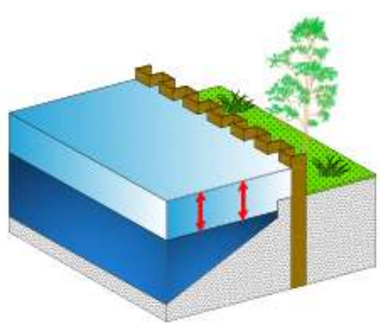
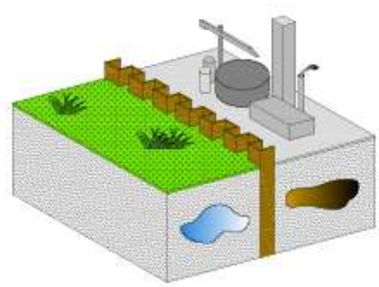
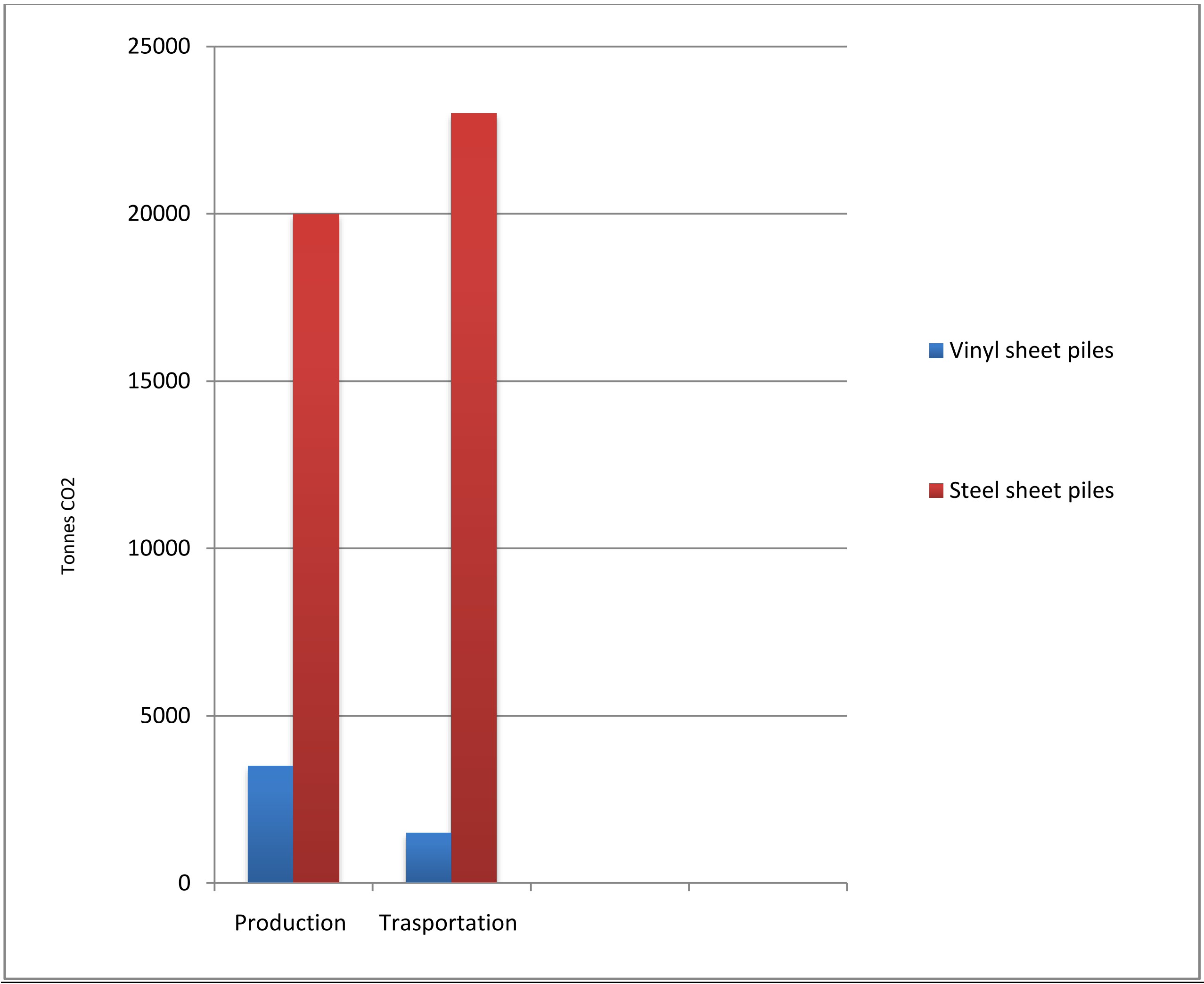
APPLICATIONS

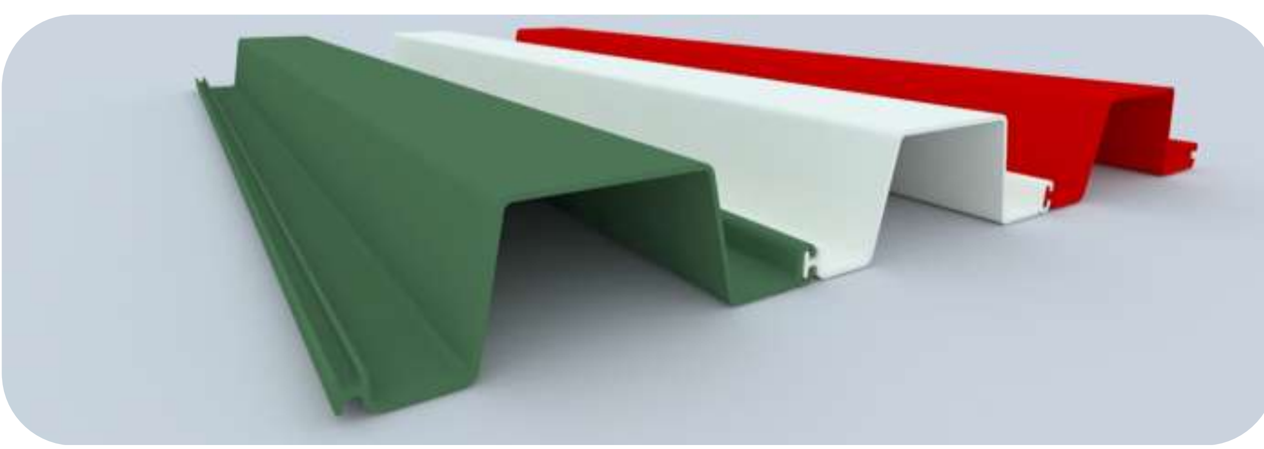




CARBON COMPARISON - CO_2
VINYL SHEET PILES vs STEEL SHEET PILES





INTERLOCK SEALANT

ADEKA ULTRA SEAL® P-201

ADEKA ULTRASEAL® P-201 is a water-swelling,single component, elastic sealant. P-201
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WATERSTOP FOR:

* Sheet pile interlock sealant
* Cold/construction/control joints
* Expanded metal forms
* Piping penetrations
* Crack / joint repair
* Precast segment sealant

P-201 is used as a waterstop in new construction and in repair applications.
P-201 will expand up to 2 times (100%) by volume in the presence of water. It will expand in the direction of least resistance.
When expansion is inhibited, the product will produce expansion pressure against the resisting substance. This expansion pressure will effectively seal off water penetration.
The amount of concrete coverage required depends on bead size.

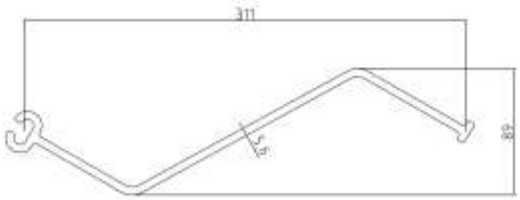
* Maximum expansion of two times by volume.
* Adheres to concrete, PVC , metals, glass, etc.
* Can be used in damp conditions.
* Applicable to uneven or rough surfaces.
* Excellent chemical contaminant resistance.
* Use in the presence of water contaminated by gasoline, fuel oil, and other hydrocarbons..
* Excellent for piping penetrations.

Use P-201 to seal PVC and AZ sheet pile interlocks. AZ sheet piles are treated with P-201 “Roxan System”.

GREENWALL
PVC SHEET PILE

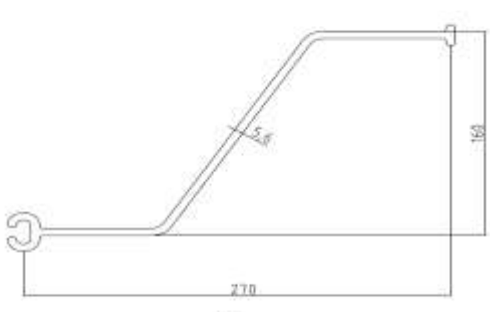
PVC SHEET PILES SECTIONS

GW 270 WAVE SECTION



BENDING MOMENT (M)	1,72 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	3,44 kNm/m
SECTION MODULUS - W_{el}	80,51 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

GW 270 TRAPEZOID SECTION

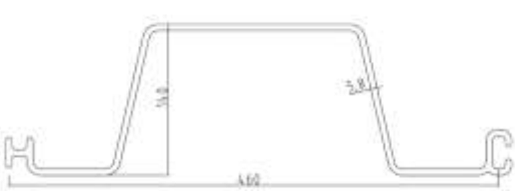


BENDING MOMENT (M)	9,03 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	18,06 kNm/m
SECTION MODULUS - W_{el}	451,57 cm^3 / m
MOMENT OF INERTIA - J_y	3612,54 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	160 mm
THICKNESS	5,6 mm
EFFECTIVE SECTION WIDTH	270 mm +/-15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

GW 450 U SECTION

BENDING MOMENT (M)	5,47 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	10,94 kNm/m
SECTION MODULUS - W_{el}	273 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

GW 460 U SECTION

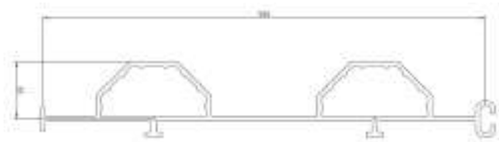


BENDING MOMENT (M)	7,94 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	15,88 kNm/m
SECTION MODULUS - W_{el}	397 cm^3 / m
MOMENT OF INERTIA - J_y	2976 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	140 mm
THICKNESS	5.8 mm
EFFECTIVE SECTION WIDTH	460 mm +/-15
WEIGHT PER LINEAR METER	7.2 Kg
WEIGHT SQUARE METER	15.70 Kg / mq

PVC SHEET PILE

PVC SHEET PILES SECTIONS

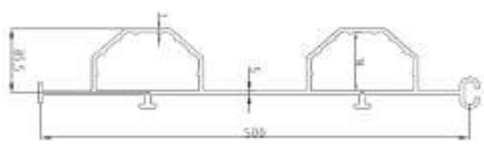
GW 500 FLAT SECTION



BENDING MOMENT (M)	3,26 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	6.52 kNm/m
SECTION MODULUS - W_{el}	136 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

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

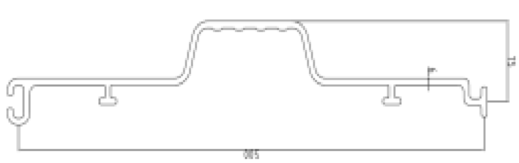
GW 500 BIS FLAT SECTION



BENDING MOMENT (M)	4,04 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	8.08 kNm/m
SECTION MODULUS - W_{el}	202 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

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

GW 550 FLAT SECTION

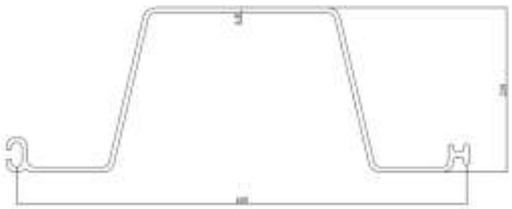


BENDING MOMENT (M)	2,30 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	4,60 kNm/m
SECTION MODULUS - W_{el}	114.30 cm^3 / m
MOMENT OF INERTIA - J_y	554,43 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	75 mm
THICKNESS	6 mm
EFFECTIVE SECTION WIDTH	500 mm +/-15
WEIGHT PER LINEAR METER	7.1 Kg
WEIGHT SQUARE METER	14.2 Kg / mq

GREENWALL PVC SHEET PILE

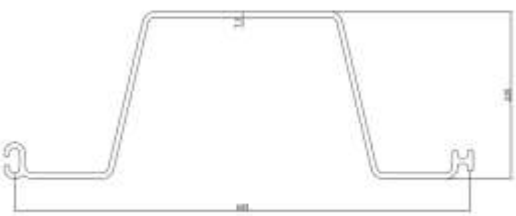
PVC SHEET PILES SECTIONS

GW 590 U SECTION



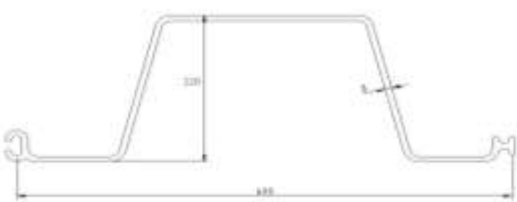
BENDING MOMENT (M)	15,06 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	30,12 kNm/m
SECTION MODULUS - W_{el}	753 cm^3 / m
MOMENT OF INERTIA - J_y	9034 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	220 mm
THICKNESS	6.8 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	11.30 Kg
WEIGHT SQUARE METER	18.80 Kg / mq

GW 595 U SECTION



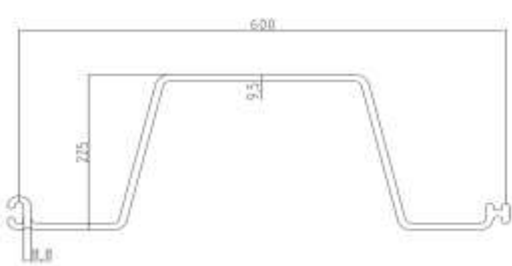
BENDING MOMENT (M)	15.50 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	31,00 kNm/m
SECTION MODULUS - W_{el}	772.76 cm^3 / m
MOMENT OF INERTIA - J_y	9041.5 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	220 mm
THICKNESS	7.1 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	11.8 Kg
WEIGHT SQUARE METER	19.70 Kg / mq

GW 600 U SECTION



BENDING MOMENT (M)	19.34 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	38.68 kNm/m
SECTION MODULUS - W_{el}	967 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

GW 620 U SECTION

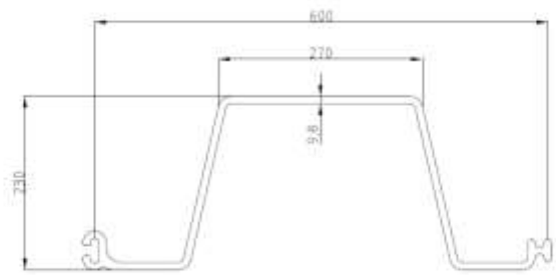


BENDING MOMENT (M)	21,00 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	42.00 kNm/m
SECTION MODULUS - W_{el}	1046.90 cm^3 / m
MOMENT OF INERTIA - J_y	12730 cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	225 mm
THICKNESS	9.5 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	15 Kg
WEIGHT SQUARE METER	25 Kg / mq

GREENWALL

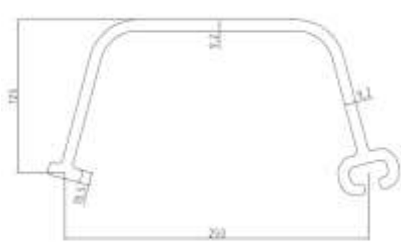
PVC SHEET PILE

GW 622 U SECTION



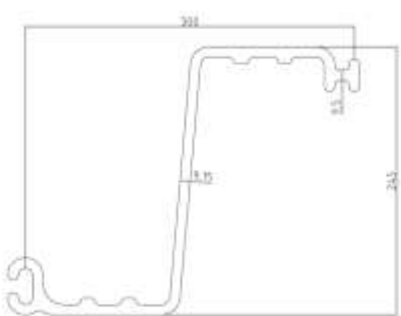
BENDING MOMENT (M)	22,59 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	45.18 kNm/m
SECTION MODULUS - W_{el}	1129.72 cm^3 / m
MOMENT OF INERTIA - J_y	14021cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	230 mm
THICKNESS	9.8 mm
EFFECTIVE SECTION WIDTH	600 mm +/-15
WEIGHT PER LINEAR METER	15.2 Kg
WEIGHT SQUARE METER	25.35 Kg / mq

GW 250 U SECTION



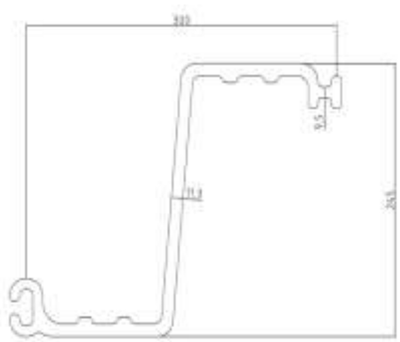
BENDING MOMENT (M)	21.45 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	42.90 kNm/m
SECTION MODULUS - W_{el}	1072.28 cm^3 / m
MOMENT OF INERTIA - J_y	13403,54cm^4 / m
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	125 mm
THICKNESS	9.2 mm
EFFECTIVE SECTION WIDTH	250 mm +/-15
WEIGHT PER LINEAR METER	7.4 Kg
WEIGHT SQUARE METER	29.60 Kg / mq

GW 630/9 Z SECTION



BENDING MOMENT (M)	32,76 kNm /m
FACTOR OF SAFETY USED	2
ULTIMATE MOMENT	65.52 kNm/m
SECTION MODULUS - W_{el}	1638.40 cm^3 / m
MOMENT OF INERTIA - J_y	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 / mq

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 - W_{el}	1867.81 cm^3 / m
MOMENT OF INERTIA - J_y	22880,73cm^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 / mq

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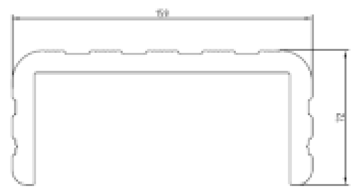
ACCESSORIES

GW 001 CORNER

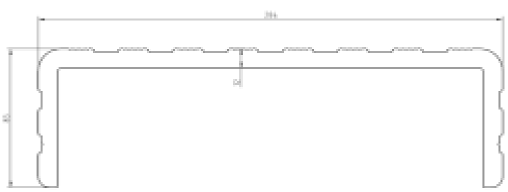
TENSILE MODULUS OF ELASTICITY	2600 MPa
TENSILE STRENGTH	40 MPa
SECTION DEPTH	55 mm
THICKNESS	9 mm
EFFECTIVE SECTION WIDTH	110 mm +/-15

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 285 mm



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

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

EXAMPLES OF HOW TO USE
GREENWALL PVC SHEET PILES

With regard to different possible soil types, 6 examples are shown below of how to use GreenWall PVC sheet piles for two different soil structures: coherent (clay) and non-coherent (sand), considering a single soil layer.

PVC sheet piles from 4.0 to 6.0 meters in length have been taken into consideration.

In the examples shown below, the excavation depth should be considered as **the maximum possible safe excavation depth**.

In particular, the maximum excavation depth is equal to the depth resulting in a displacement, at the top, which is less than the minimum of the following values:

2.54 cm (1")
1/200 sheet pile depth **= 2.0 cm** for sheet pile of H = 4.0 m
= 3.0 cm for sheet pile of H = 6.0 m
= 4.0 cm for sheet pile of H = 8.0 m

This minimum value is considered compatible with safety requirements and the functionality of the support structure, irrespective of the allowable moment value which, obviously must be greater than the moment applied to the bulkhead resulting from the calculation.

CALCULATION METHODS AND TESTING

Testing of the sections' resistance is carried out in accordance with the previsions of the applicable "*Construction Standards*" pursuant to Ministerial Decree 14.02.2008 and related ministerial circular no. 617 dated 02.02.2009, applying a semi probabilistic approach to *Limit States*. The analysis of stress parameters is carried out on the basis of different combinations of extreme load conditions.
The study of structures is carried out according to the methods of Construction Science assuming elastic, uniform and isotropic materials.

In the examples examined, reference is made to Construction type 1 – provisional structures (see table no. 2.4.I of the Construction Standards) with a nominal life (V_N) **less than 2 years**.
On the basis of the specifications in note (1) of table no. 2.4.I of the Construction Standards, **it is possible to omit seismic testing** for this type of structure.
For definitive structures, seismic testing is required using the site's seismic parameters.

With regard to the dimensions of a PVC GreenWall sheet pile wall and relevant testing, piling which is neither fixed at the base or the top has been taken into account.
With regard to the type of ground taken into consideration, testing has been carried out in long term **drained conditions**.

During testing, overloading on the landward or upper side has not been considered.

WATER LEVELS

The height of groundwater has been assumed as being at – 0.5 m relative to the top of the sheet piles and at – 0.1 m below the level of the planned excavation.

PVC MATERIAL CHARACTERISTICS

The following values are assumed for the materials considered:

Profile	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 computer programme "SPW Sheet Pile Wall design 2012", developed and provided by **Geostru** Software has been used for the analyses and structural testing.
The algorithms used are shown in detail in the manual for RC-Sec, a program developed by the same software house.

SOIL CHARACTERISTICS

With regard to soil characteristics, geotechnical parameters of deformation resistance, considered to be prudent, are shown below.

For **coherent soils** (medium clays):

γ [kN/m^3]	γ_{sat} [kN/m^3]	C' [kN/m^2]	Ø' [degrees]	E_{ode} [kN/m^2]
20.0	22.0	15.0	18.0	4000.0

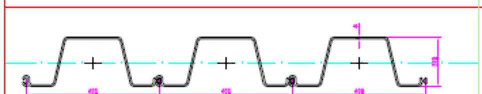
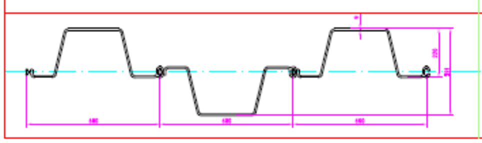
For **non-coherent soils** (medium dense sands):

γ [kN/m^3]	γ_{sat} [kN/m^3]	C' [kN/m^2]	Ø' [degrees]	E_{ode} [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;
E_{ode}	= oedometric modulus;

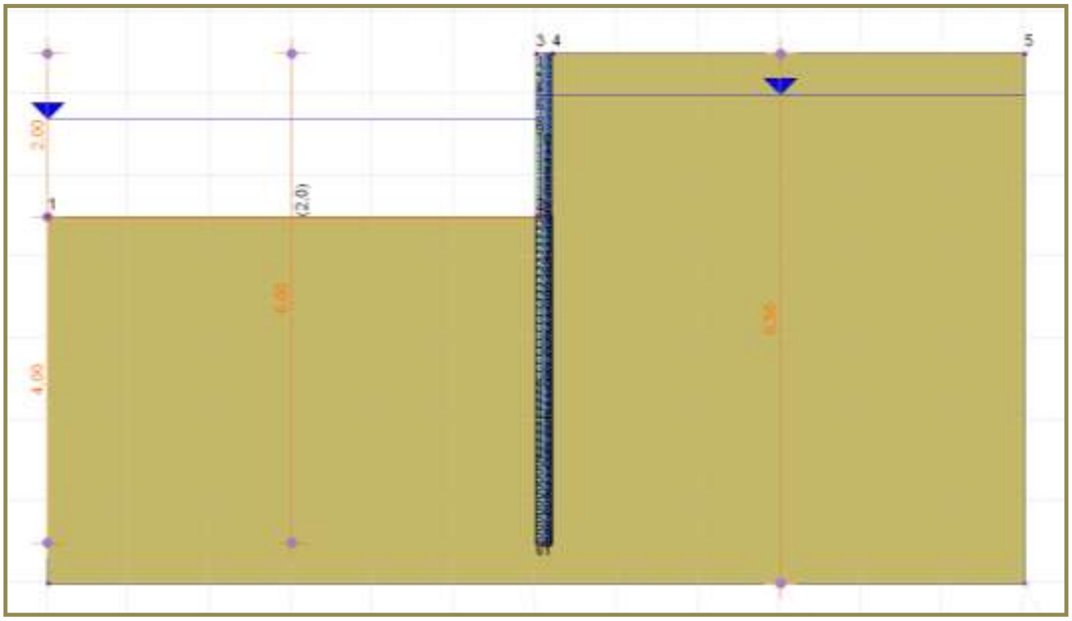
GREENWALL PVC SHEET PILE CHARACTERISTICS

	$W_{y\,el}$ (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				

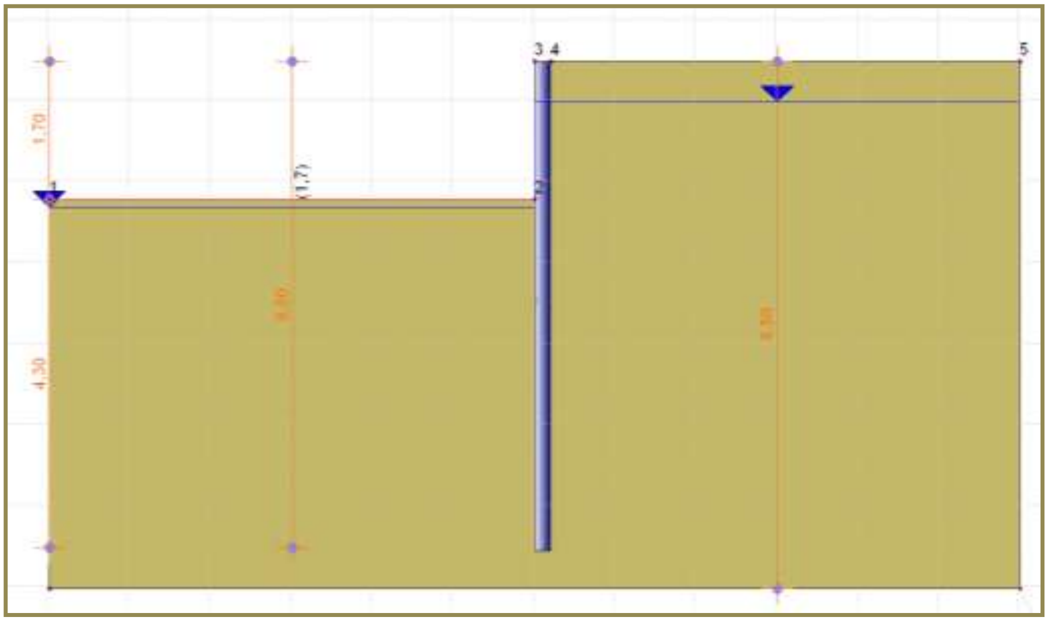
Where:

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				

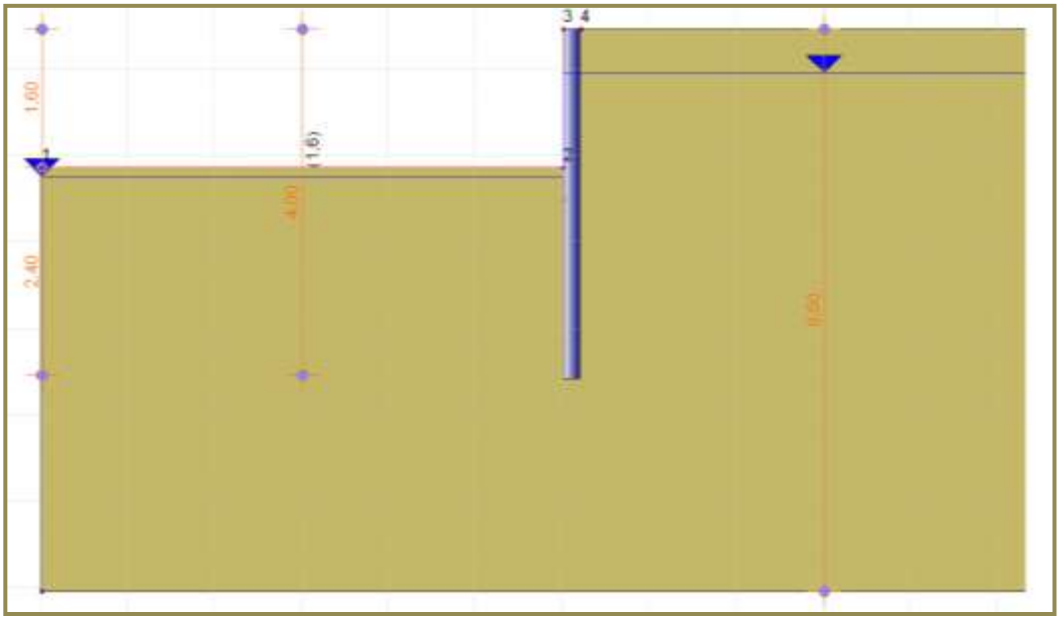
Where:

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				

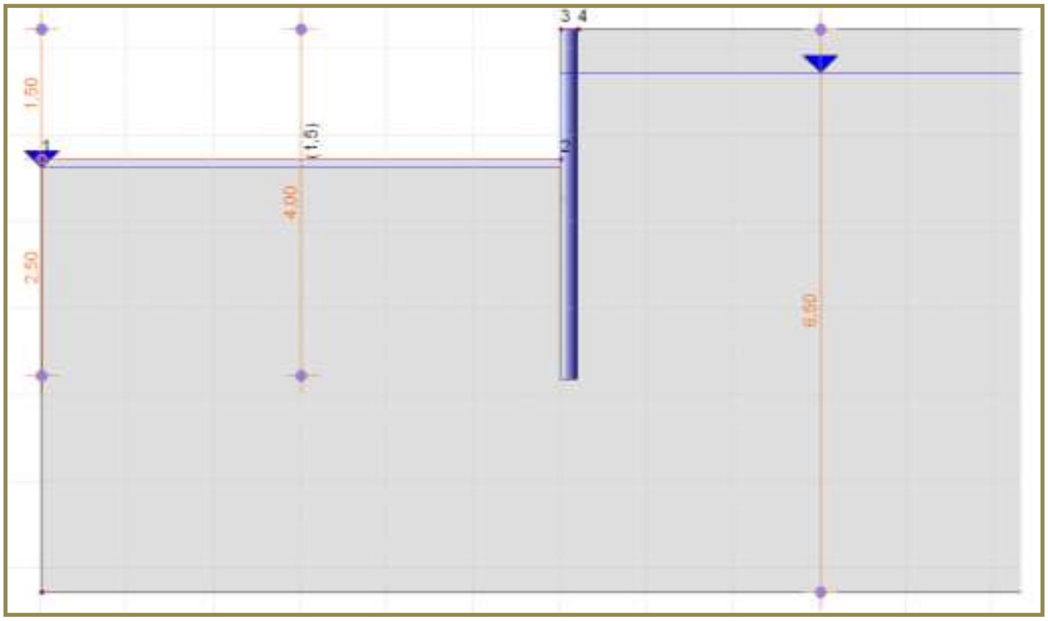
Where:

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				

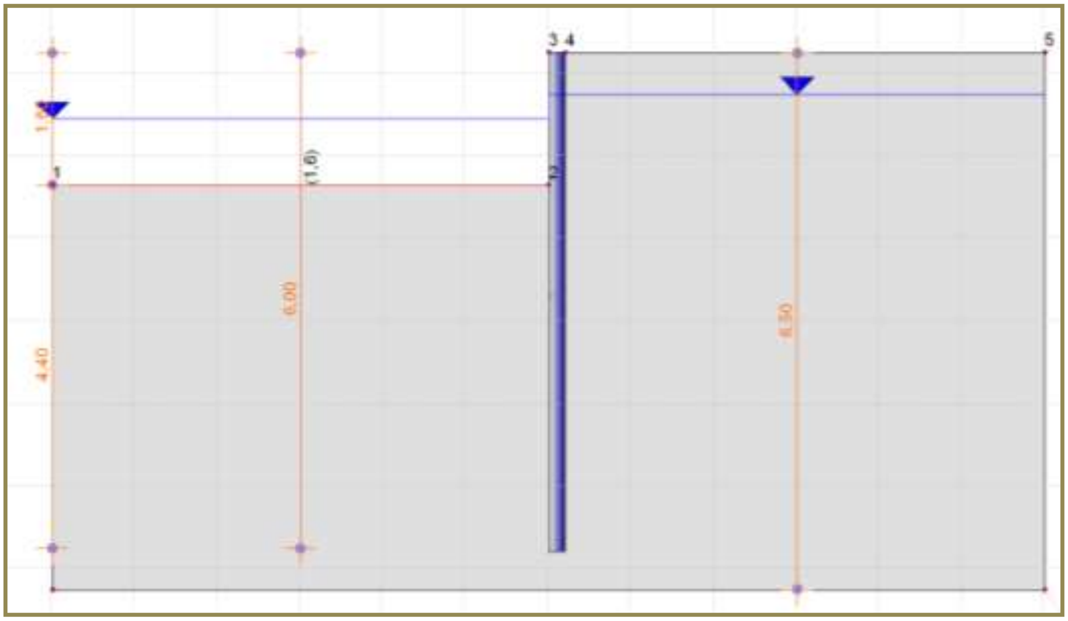
Where:

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				

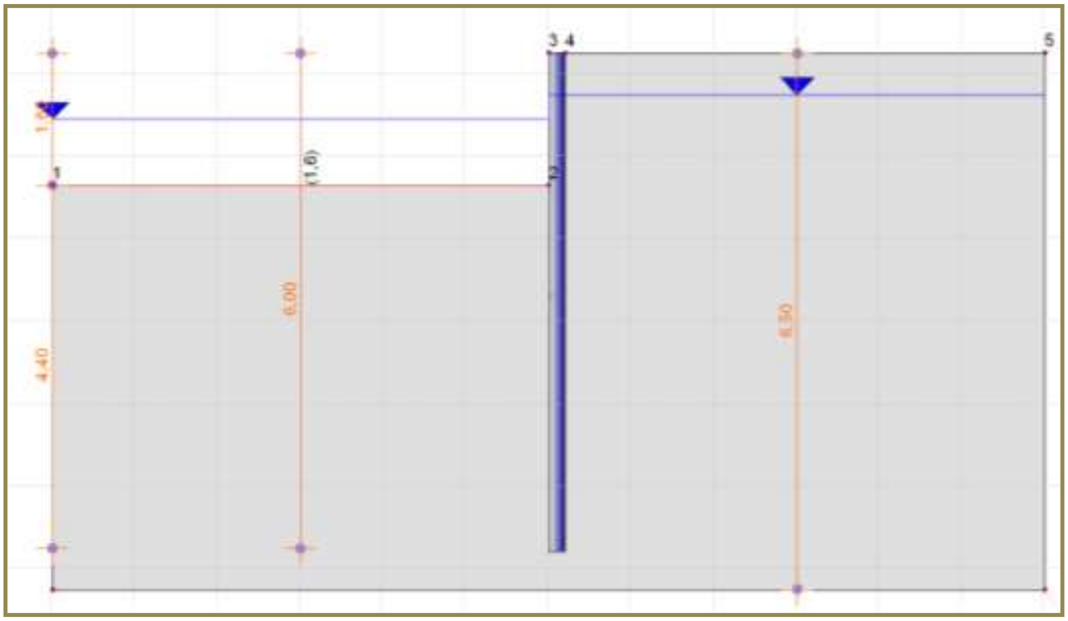
Where:

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				

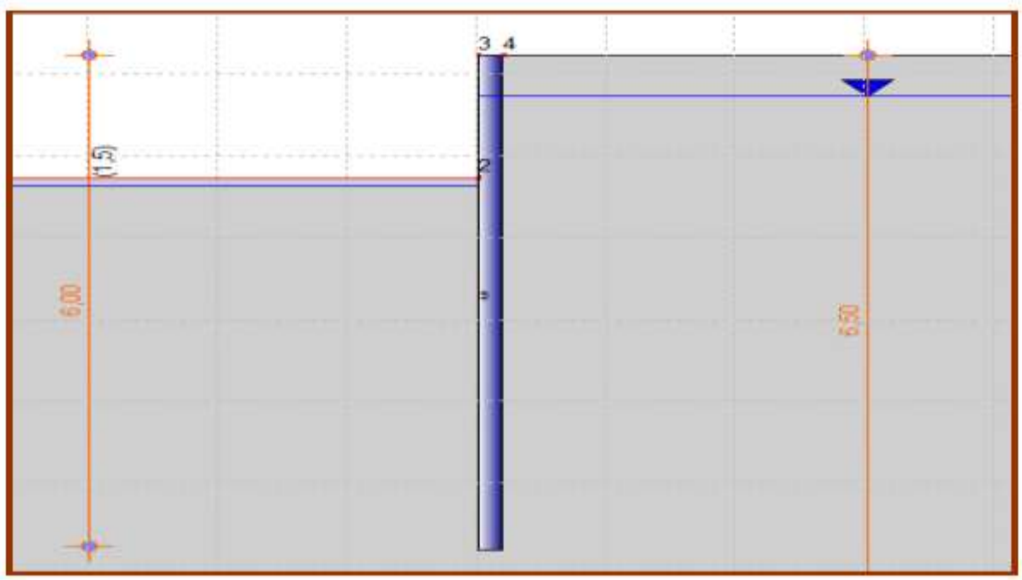
Where:

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

Toscany 1200 mq– (Italy)

Venice 3000 mq (Italy)

Toscany –6000 mq (Italy) -

Toscany –8500 mq (Italy)

Venezia -1800 mq (Italy)

Venice – 1250 mq (Italy)

Netherlands - 4200 sqm

Mantova -Italy

Netherlands 2200 mq

France 2750 mq

France 2592 mq

Mantova – 680 mq (Italy) -

Netherlands


Piacenza – (Italy)


Netherlands 2500 sqm


GREENWALL
PVC SHEET PILE

Netherlands

Bucarest -Romania -8000 mq

Bucarest -Romania 8000 mq

GREENWALL

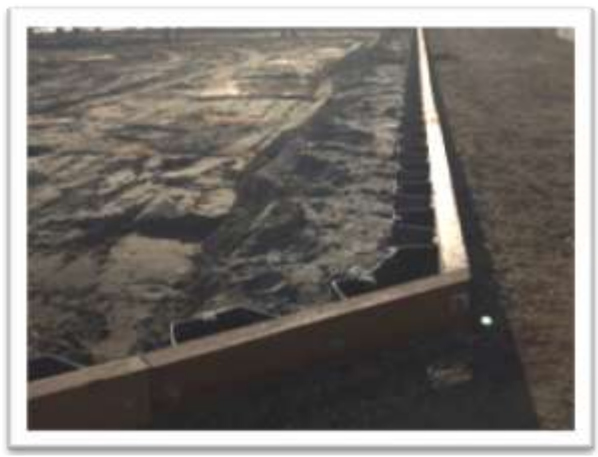
PVC SHEET PILE

Bucarest -Romania -8000 mq- Retaining Wall

GREENWALL PVC SHEET PILE

Netherlands - 6000 mq – Cut-Off

Denmark -3000 mq



Norwey – 300 mq

GREENWALL PVC SHEET PILE

Netherlands 1200 mq – Flood Protection

Netherlands 1500 mq

Bio Park Delta del Po – Italy 850 mq

GREENWALL PVC SHEET PILE

Sweden - 13000 mq Cut-Off

Gabon – 1850 mq – Retaining Wall

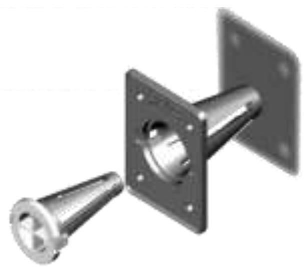
Austria 2500 mq – Flood Protection

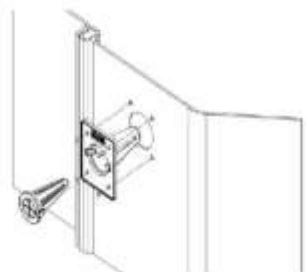
Roma 11000 mq – Italy – Cut-Off

GREENWALL
PVC SHEET PILE

SHEET PILE FILTERS

GreenWall Filters – Jet Filters are used to alleviate water pressure and enable sheet pile drainage, saving time and money on wide surfaces. The drain holes allow a reduction in hydrostatic pressure which inevitably builds up behind sheet piling/ sheet pile walls.
Featuring an extractible internal filter, GreenWall filters – Jet Filters can be changed and cleaned easily and quickly (if necessary), since the internal filter is placed at the front of the ground containment structure, without dredging from behind.
GreenWall filters can also be used on traditional steel sheet pile walls and on concrete structures.
The drain holes must be periodically cleaned of any blockages to ensure they work correctly.



GREENWALL
PVC SHEET PILE

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