

EcoLock

VINYL SHEET PILES

An ecological and cheap, maintenance-free solution,
designed for many years of use.

10/2014



Pietrucha
Established 1960

About us

The Pietrucha Group consists of one trading company and three plastics processing plants. The plants are located in three locations and employ over 300 employees. Despite its size, the company still remains a family business, it is run by the third generation of the family. Our story begins at a time difficult for private business - in the year 1960, in Błaszki, the Fur Tanning Shop - Stanislaw Pietrucha is established. In 1979, the son of Stanislaw - Andrzej joins the company, which completely changes the face of the plant, starting the production of PVC window frames in 1992. Only 3 years later the production of PVC profiles for the construction industry is set up, which makes us one of the largest manufacturers of this type of assortment in Europe. The years 2006 (the commencement of production of vinyl sheet piling in Ksawerów) and 2010 (production of geogrids in Błaszki) were very important for our existing operations. These are the products that made us visible on the civil engineering market, offering modern plastic products.



Manufacturing plant in Ksawerów, Poland.

Our commitment to continuous development is demonstrated by our presence on 5 continents, in 34 countries, where we serve nearly 3,500 customers. In Europe, we have an efficient and extensive sales chain, but our attention is now focusing on Eastern Europe and the developing countries of Asia and Africa, where our sales offices have been set up. It turned out that there are plenty of possibilities to make a name for ourselves in our sector in African markets, both with the POLGRID products for soil stabilization, and vinyl sheet piles. Our interest in Africa also resulted in our participation in the POLANDAFRICA congress in Lodz, which was a great opportunity to make new business contacts.



The high quality of the piles is the result of not only a modern machine park, but also 20 years of experience in plastics processing. Production of PVC sheet piling is a process that requires the utmost care. Application of the **ISO 9001:2008** standard has enabled us to provide and maintain the production of high quality products, and the introduction of procedures has systematized our operations in the company, becoming its integral part. The whole process, starting from the selection of suppliers, through production and distribution, has been well documented. These activities aim to continuously improve the quality of our products for the sake of our customers.



Manufacturing room



Individual stages have been improved, so we can clearly monitor the whole process. We cooperate exclusively with contractors offering the highest quality goods and services. Each transport is supervised, and suppliers of raw production materials confirm its quality parameters in a declaration of quality, detailing all packaging, which is further verified by a quality control department employee. Unambiguous identification of the

material allows to track it and easily determine the source of the material the sheet piling profile was made of.

The course of manufacturing is fully monitored, the important parameters which influence the ultimate parameters of the profiles are checked and stored. By keeping strict procedural rules, we are able to guarantee high and consistent quality of our products. Several times a day, samples are taken for ongoing testing - a quality control department employee checks whether the properties of the finished product deviate from the norm, thus confirming the grade of the raw material used and the application of the appropriate production parameters. Once again, the dimensions of the profiles are checked. Only after such a thorough quality control, the products are submitted to the warehouse and for distribution. The quality and the strength parameters of our sheet piles are periodically validated by accredited laboratories, institutes and technical universities.



Lodz
University
of Technology



Warsaw
University
of Technology



Pro-Lab sp. z o.o.



Road and Bridge
Research Institute



Building Research
Institute



Institute
of Technology
and Life Sciences




Institute of Polymer
Materials & Dyes
Engineering



Textile
Research
Institute

EcoLock vinyl sheet piles

Vinyl sheet piles  are made from rigid polyvinyl chloride modified with agents facilitating processing, impact resistance modifying agents, thermal and UV stabilising agents and mineral filling materials. The sheet piles are manufactured by applying the extrusion moulding method as monolithic profiles or the co-extrusion moulding method with the core made from the material obtained through recycling construction type PCV, covered with a layer of the primary plastic material. The standard colour range includes grey, olive and brown. There is a possibility to order sheet piles in RAL colours.



Light and easy to install with the use of standard tools,



Cheap – savings of up to 40% on materials, installation and transport services



Long-term protection without the need for maintenance due to the material being completely resistant to:

- bio-corrosion
- rust
- cracking
- scratching
- abrasion
- sea water
- harmful UV rays



Warranty of up to 50 years – extraordinary durability, very good mechanical and endurance parameters,



Ecological solution – the product contains material obtained from the recycling of structural PVC with the possibility for further processing,



Lock connections ensure leakproofness of the walls,



Clean, simple and aesthetic appearance is made possible thanks to practically invisible coupling,

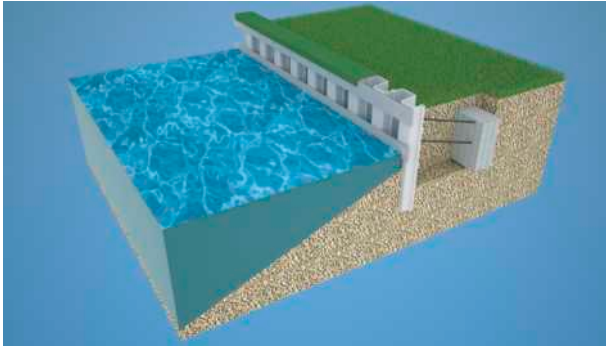


Simpler installation compared to other sheet piles of this type thanks to the unique flat-surface project,

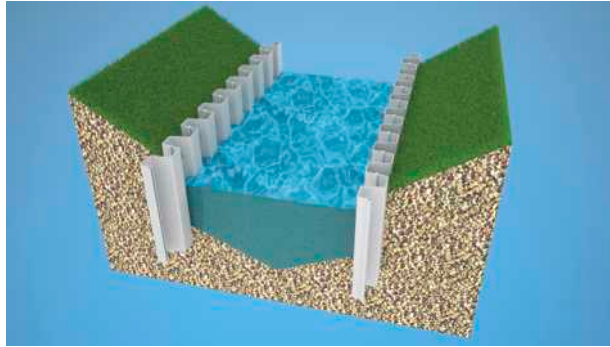


Easy to form interior and exterior curves matching the natural shore lines, e.g. in river engineering.

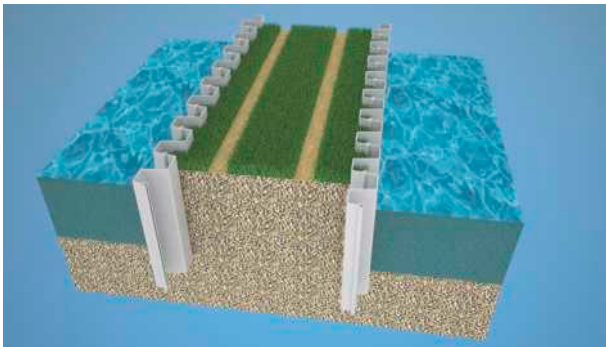
Possibilities for vinyl sheet piles application



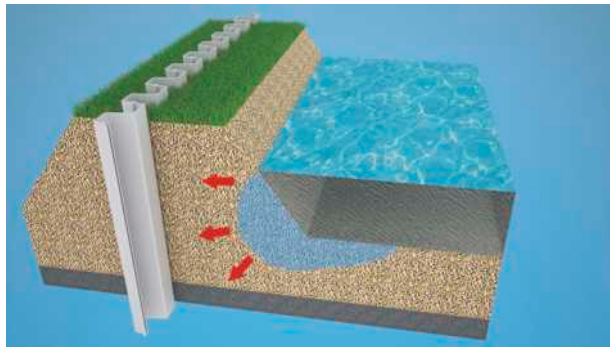
- 1** Sheet pilings and cut-off walls (with or without propping) to secure the banks of water channels and reservoir.



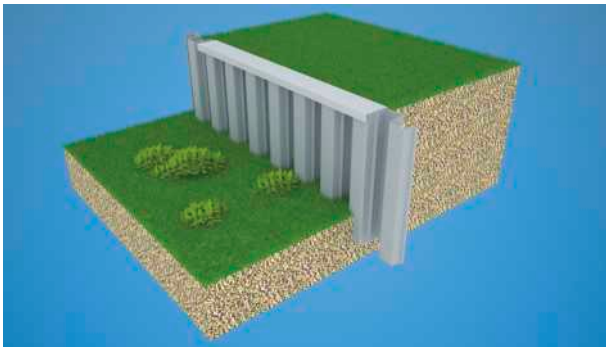
- 2** Regulation of beds of rivers, canals (i.e. irrigation channels), reservoirs.



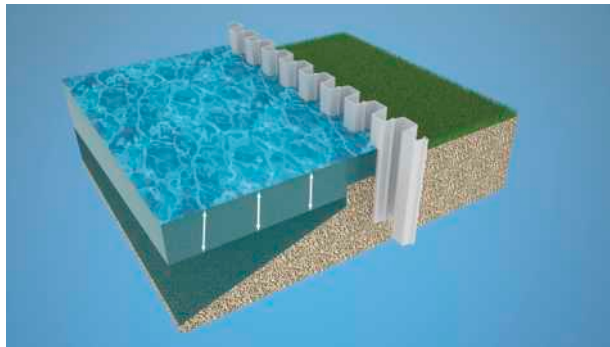
- 3** Building and improving dykes.



- 4** Securing flood banks.



- 5** Retaining walls.
Securing excavations, landslides and slopes.



- 6** Securing places with a variable water level.



- 7** Cut-off walls.
Shields limiting groundwater infiltration.



- 8** Cut-off walls in ecologically vulnerable areas.

1

Driving

The most commonly used method, in which sheet piles are mechanically pressed into the soil with the use of vibratory hammers along the pre-installed templates. In order to fully protect the piling against damage, light equipment with small impact energy is used. The type of the equipment used is dependent on the type of soil, the depth of the cavity and the durability of the sheet pile. The key to a successful **installation in hard, dense surfaces**, and in **ramming long elements**, is the use of special guide bars called **mandrels**. Side or front mandrels work best. You can also use multiple mandrels that allow you to mount several pilings at the same time. This is a steel element in the shape reflecting the rammed vinyl sheet pile. Mandrel length must match the length of the rammed PVC elements.

Advantages of using mandrels:

- enables ramming sheet piles in very difficult soil environments (compact silt, clay, gravel)
- enables installation of long profiles, even up to 12 m
- prevents sheet piles from cracking while being driven
- removes obstacles found in soil (roots, stones)
- helps to maintain straight lines
- ensures pre-loosening of soil
- multiple mandrels significantly accelerate installation work

2

Jetting

A method used in the installation of sheet piles in very cohesive or heavily compacted soils. The jetting technique aims to create pressure directly under the foot of the sheet pile, which will loosen and remove the ground under the profile.

3

Trenching

A method used in the construction of a pile wall with a small cavity. Sheet piles are installed in the previously dug out trench, which is then filled on both sides of the wall with a ballast selected in the design.



Technical conditions of application

The application of vinyl sheet piles in construction should be in compliance with technical documentation drawn up in accordance with the binding norms and provisions and approved in the prescribed mode. Safeguarding made from vinyl sheet piles should be made precisely in accordance with the designer's guidelines and the manufacturer's recommendations.

Installation services and the lease of equipment

We offer a comprehensive customer service: from manufacturing sheet piles, through logistics to the lease of equipment and the installation service. As part of our cooperation with a contractor, our technical advisors offer their visits to building sites where they provide professional consulting, technical assistance in connecting and operating a hammer as well as training in sheet pile installation. Our offer ensures the lease of light hammers and vibratory hammers fitted onto diggers.



We offer to your disposal among others:

Light hammers:

- Collins VSPH101, CPH0306, CPH0203, Atlas COPCO

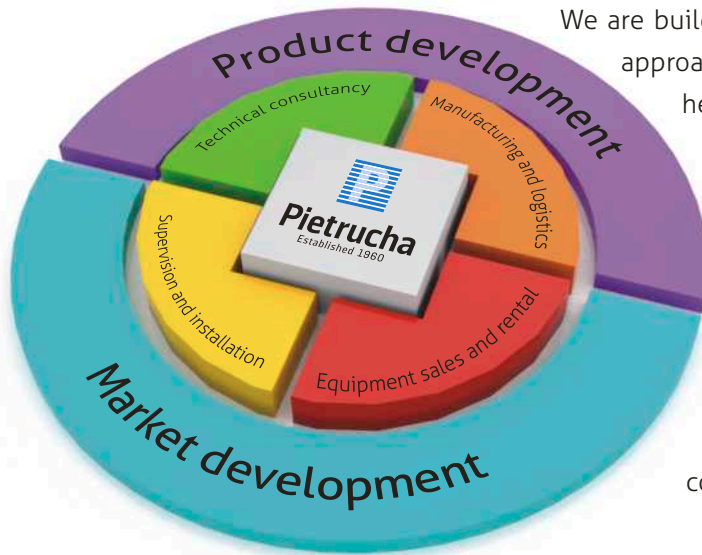
Vibrohammers:

- Dawson EMV300
- Müller MS-1 HFB
- MGF RBH 401b
- Movax ML-15



One-Stop-Shop

We are constantly developing our products in response to new challenges and market demand. PVC profiles find more and more applications in maritime engineering and we try to improve and develop them by improving their properties.



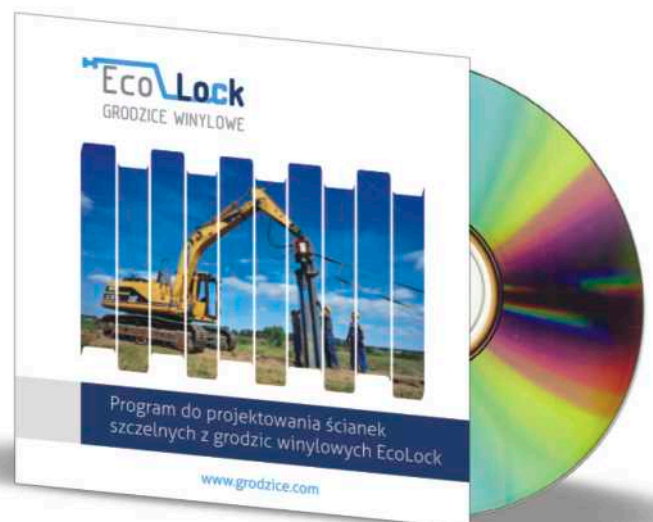
We are building a competitive advantage through a comprehensive approach to the problems of our customers by offering them our help at every stage - from technical consultancy and design support from our engineers, to the execution in the field of piling immersion or supervision of installation works. To contractors we offer rental and sales service of specialist equipment necessary for ramming (vibrohammers, pneumatic hammers, mandrels) along with training in the field of their use and the most effective utilization. As a manufacturing facility we offer not only the sale of a product, but we also deliver it to the construction site in accordance with the schedule.

Calculations and support for designers

One of our major activities is support, through the provision of reliable information and consultancy, conducted by our engineers-designers. We also actively support engineers, designers and contractors by regularly organizing conferences, seminars and trainings, broadening the expertise, improving skills, the knowledge of our products and methods of their use

To the advantage of our proprietary computer software, whose task is to simplify the calculations and shorten the time needed for the preparation of the design documentation. Among others, it allows to:

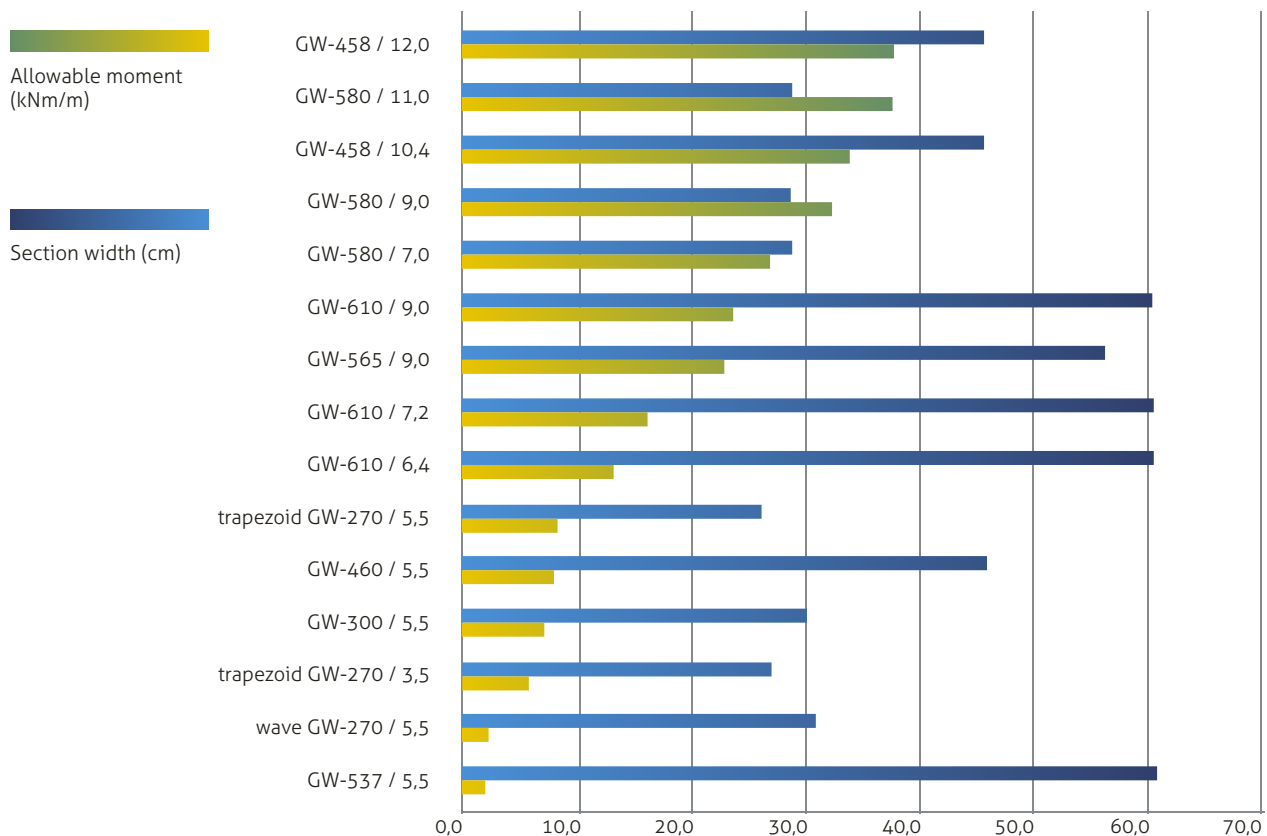
- calculate and model the structures use vinyl sheet piling,
- create graphs based on the results of calculations: displacement, rotation angle, bending moments, shearing forces, soil reaction,
- the graphs show the relationship between individual values and the depth of submersion of the sheet piling,
- calculation and modeling of the use of ground anchors (length, required axial force).



The EcoLock vinyl sheet piles produced by us have various profiles and various uses, but all of them are made of the same high quality material. It is the use of the right raw material that determines some of the relevant physico-chemical parameters. The following table shows the characteristics of all types of profiles excluding the bumper:

	unit	standard	value
Density	kg/m ³	PN-EN ISO 1183-3:2003	1400 – 1480
Charpy impact test	kJ/m ²	PN-EN ISO 179-1:2004	≥30
Shore durometer	Shore'a D	PN-EN ISO 868:2005	≥75
Softening point Vicat method	°C	PN-EN ISO 306:2004	≥77
Tensile strength	MPa	PN-EN ISO 527-2:1998	≥44
Tensile modulus of elasticity	MPa	PN-EN ISO 527-2:1998	≥2600
Bending modulus of elasticity	MPa	PN-EN ISO 178:2006	≥2600
Bending strength: - before thermal ageing - after thermal ageing (20 h, 100 °C)	MPa	PN-EN ISO 178:2006	≥65
Resistance of climatic ageing, after energy 2,6 GJ/m ² radiation: - resistance of changing dye - change of Charpy impact	%	PN-EN 513:2002 PN-EN ISO 4892-2 met. A PN-EN 20105-A03:1996 PN-EN ISO 179-1:2004	not less than 4 in gray scale ≤30

Comparison of key parameters of the EcoLock sheet piles



The quality and parameters of our products are confirmed by certificates and approbations.



Technical Approbation

Conformity Certificate
National Institute of Public Health

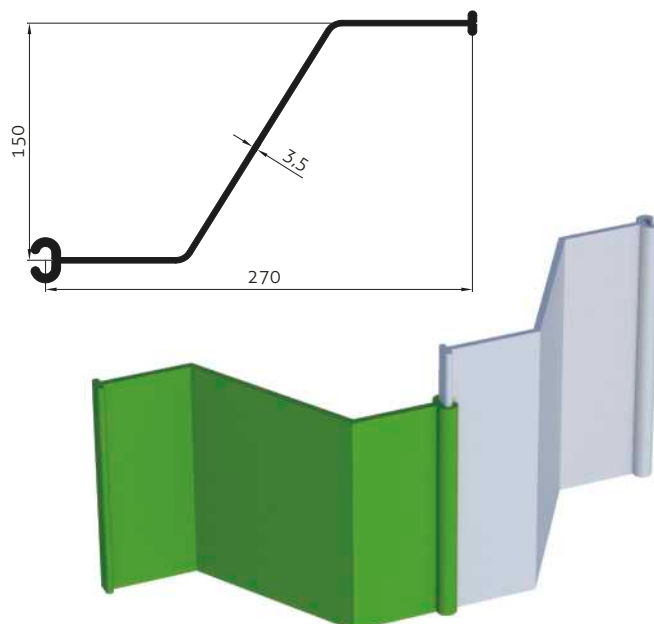
ISO 9001:2008 id 9105076957

Conformity Certificate
National Institute of Hygiene

Trapezoid shape

	unit	value
Section width	mm	270
Section depth	mm	150
Thickness	mm	3,5
Section modulus	cm ³ /m	254
Moment of inertia	cm ⁴ /m	2327
Allowable moment*	kNm/m	5,6
Ultimate moment	kNm/m	11,2

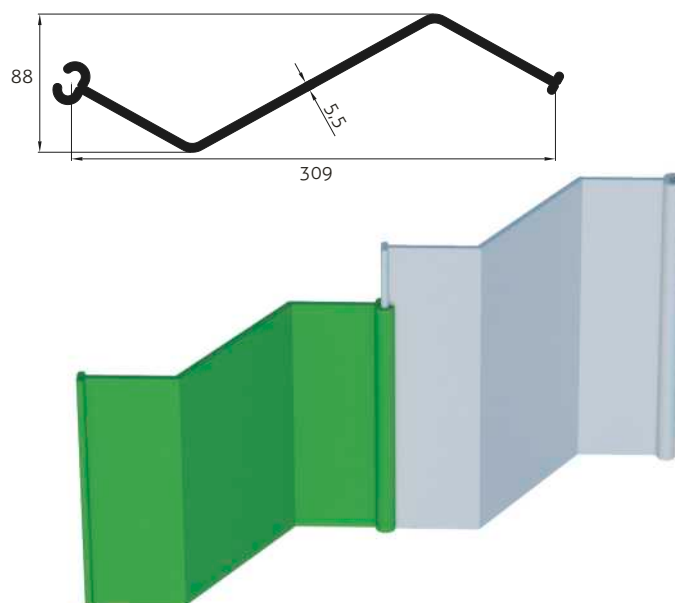
* Safety factor = 2



Wave shape

	unit	value
Section width	mm	309
Section depth	mm	88
Thickness	mm	5,5
Section modulus	cm ³ /m	87,3
Moment of inertia	cm ⁴ /m	385
Allowable moment*	kNm/m	1,9
Ultimate moment	kNm/m	3,8

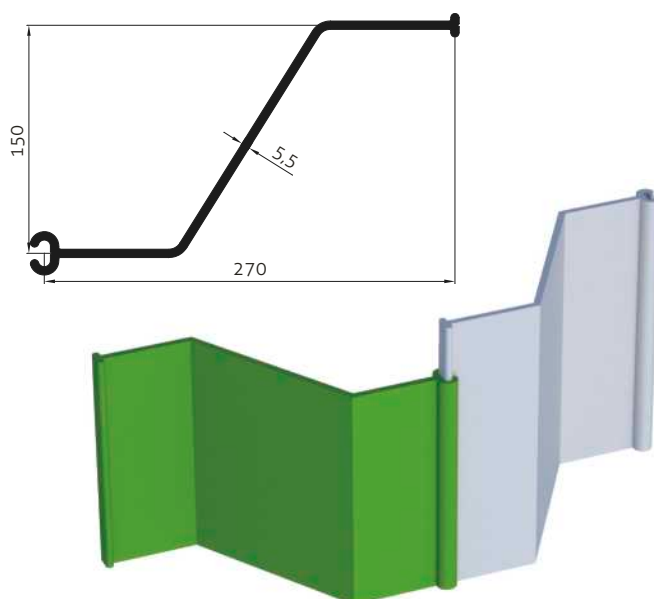
* Safety factor = 2



Trapezoid shape

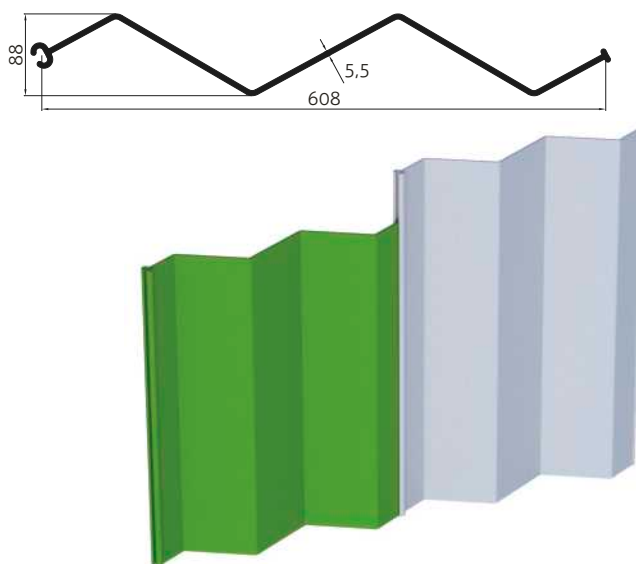
	unit	value
Section width	mm	270
Section depth	mm	150
Thickness	mm	5,5
Section modulus	cm ³ /m	369,5
Moment of inertia	cm ⁴ /m	3266
Allowable moment*	kNm/m	8,1
Ultimate moment	kNm/m	16,3

* Safety factor = 2



	unit	value
Section width	mm	608
Section depth	mm	88
Thickness	mm	5,5
Section modulus	cm ³ /m	86,6
Moment of inertia	cm ⁴ /m	382
Allowable moment*	kNm/m	1,9
Ultimate moment	kNm/m	3,8

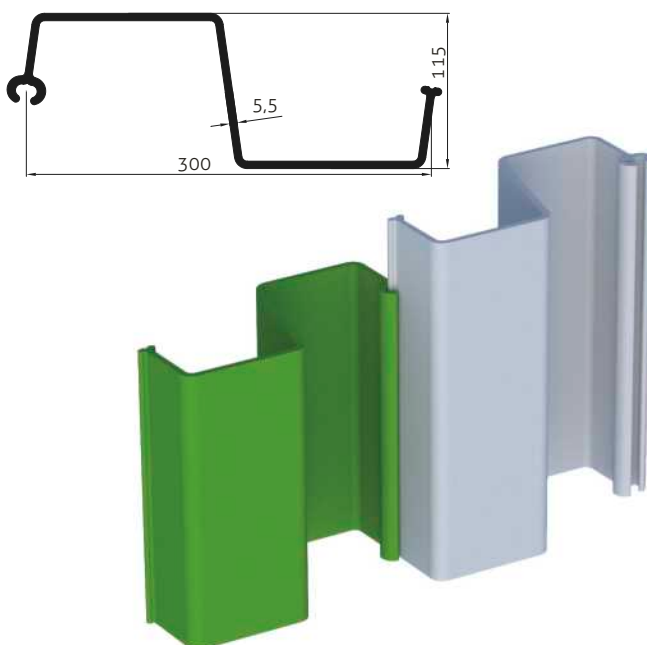
* Safety factor = 2



GW-537/5,5

	unit	value
Section width	mm	300
Section depth	mm	115
Thickness	mm	5,5
Section modulus	cm ³ /m	320
Moment of inertia	cm ⁴ /m	1842
Allowable moment*	kNm/m	7,0
Ultimate moment	kNm/m	14,1

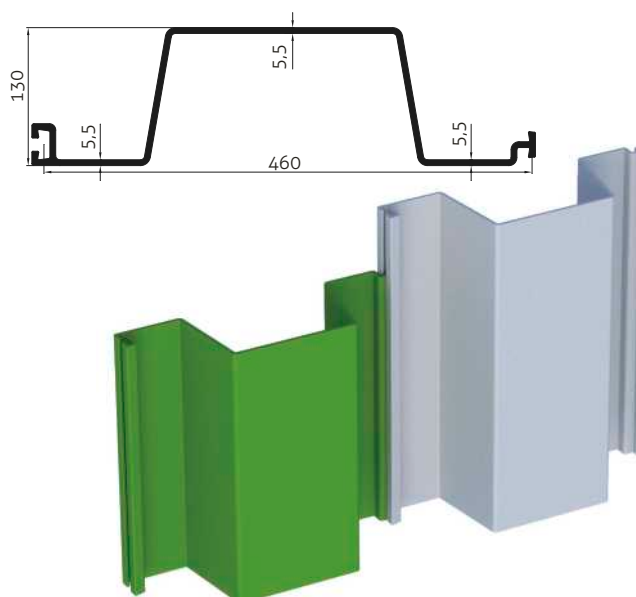
* Safety factor = 2



GW-300 / 5,5

	unit	value
Section width	mm	460
Section depth	mm	130
Thickness	mm	5,5
Section modulus	cm ³ /m	360
Moment of inertia	cm ⁴ /m	2527
Allowable moment*	kNm/m	7,9
Ultimate moment	kNm/m	15,8

* Safety factor = 2

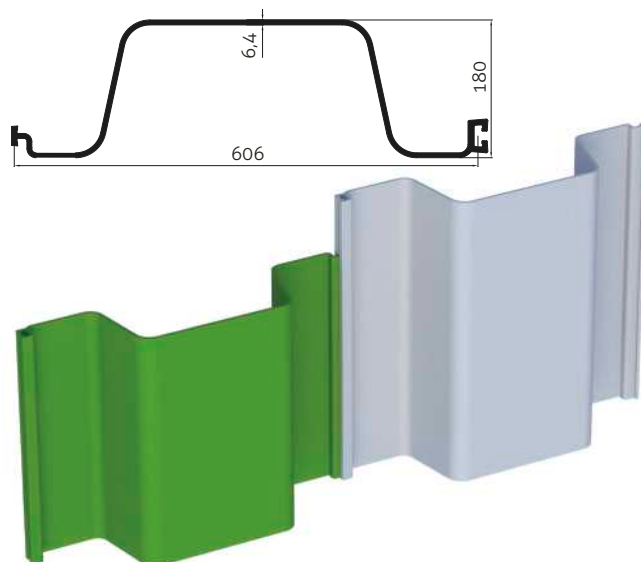


GW-460 / 5,5

GW-610 / 6,4

	unit	value
Section width	mm	606
Section depth	mm	180
Thickness	mm	6,4
Section modulus	cm ³ /m	589,7
Moment of inertia	cm ⁴ /m	5325
Allowable moment*	kNm/m	13,0
Ultimate moment	kNm/m	25,9

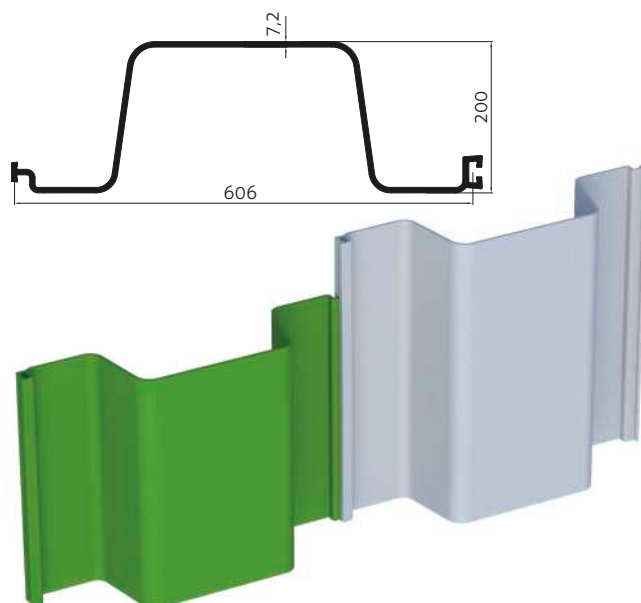
* Safety factor = 2



GW-610 / 7,2

	unit	value
Section width	mm	606
Section depth	mm	200
Thickness	mm	7,2
Section modulus	cm ³ /m	728,7
Moment of inertia	cm ⁴ /m	7724
Allowable moment*	kNm/m	16,0
Ultimate moment	kNm/m	32,1

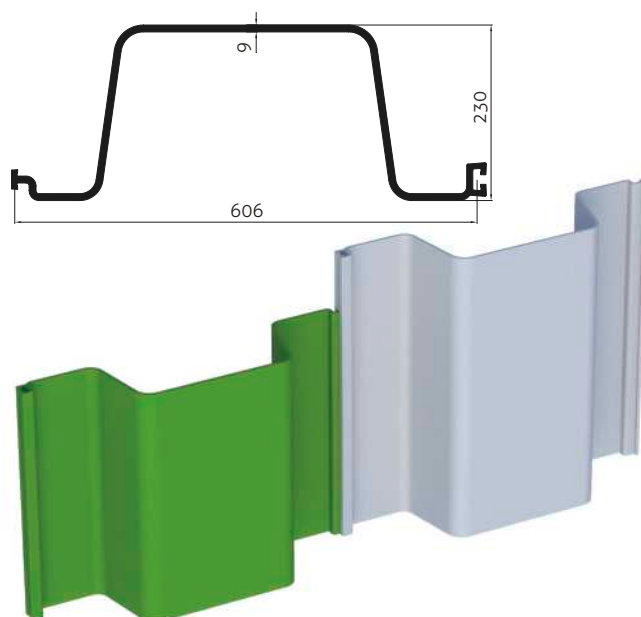
* Safety factor = 2



GW-610 / 9,0

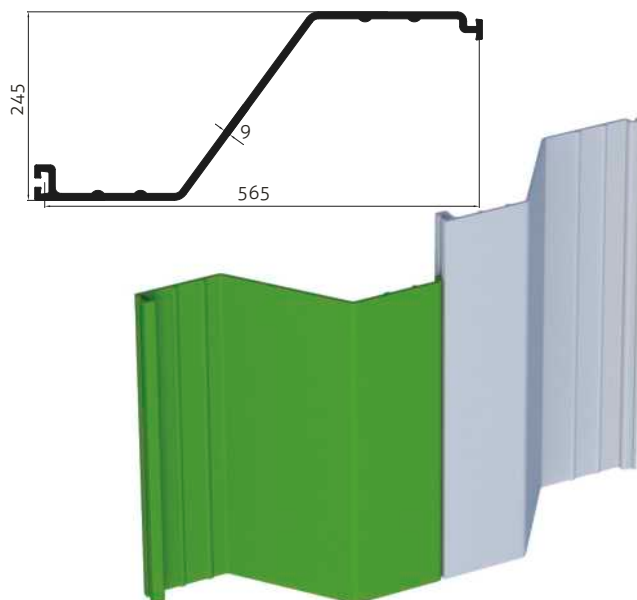
	unit	value
Section width	mm	606
Section depth	mm	230
Thickness	mm	9
Section modulus	cm ³ /m	1076,8
Moment of inertia	cm ⁴ /m	12766
Allowable moment*	kNm/m	23,7
Ultimate moment	kNm/m	47,4

* Safety factor = 2



	unit	value
Section width	mm	565
Section depth	mm	245
Thickness	mm	9,0
Section modulus	cm ³ /m	1042
Moment of inertia	cm ⁴ /m	12768
Allowable moment*	kNm/m	22,9
Ultimate moment	kNm/m	45,8

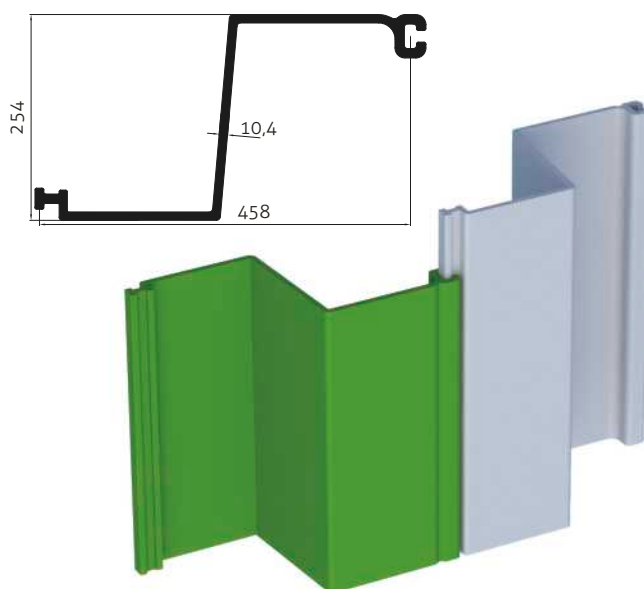
* Safety factor = 2



GW-565 / 9,0

	unit	value
Section width	mm	458
Section depth	mm	254
Thickness	mm	10,4
Section modulus	cm ³ /m	1541,5
Moment of inertia	cm ⁴ /m	20718
Allowable moment*	kNm/m	33,9
Ultimate moment	kNm/m	67,8

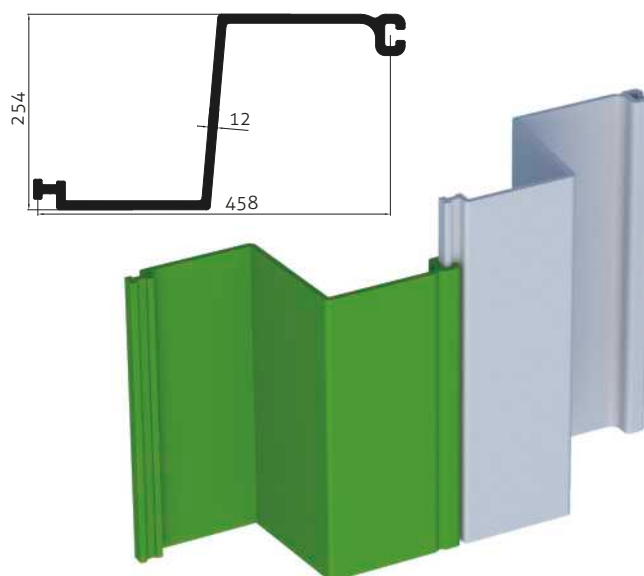
* Safety factor = 2



GW-458 / 10,4

	unit	value
Section width	mm	458
Section depth	mm	254
Thickness	mm	12
Section modulus	cm ³ /m	1717
Moment of inertia	cm ⁴ /m	22937
Allowable moment*	kNm/m	37,8
Ultimate moment	kNm/m	75,5

* Safety factor = 2

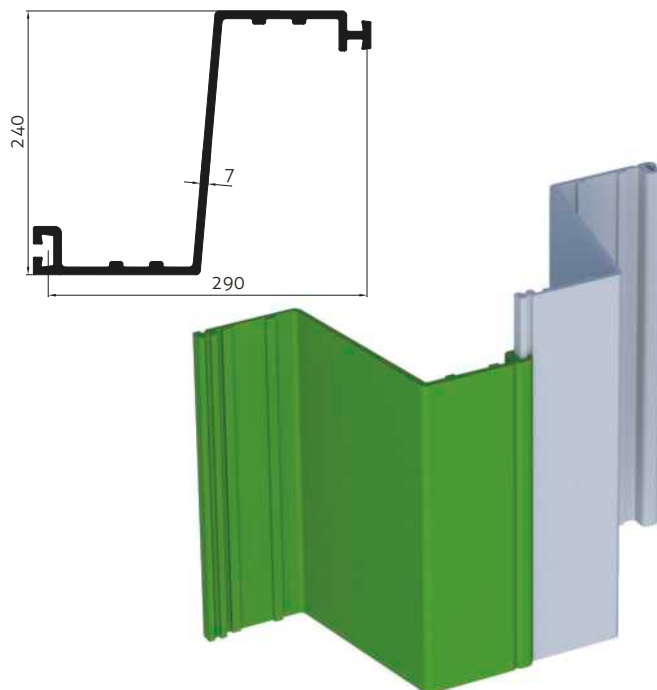


GW-458 / 12,0

GW-580 / 7,0

	unit	value
Section width	mm	290
Section depth	mm	240
Thickness	mm	7,0
Section modulus	cm ³ /m	1228,3
Moment of inertia	cm ⁴ /m	15429
Allowable moment*	kNm/m	27,0
Ultimate moment	kNm/m	54,0

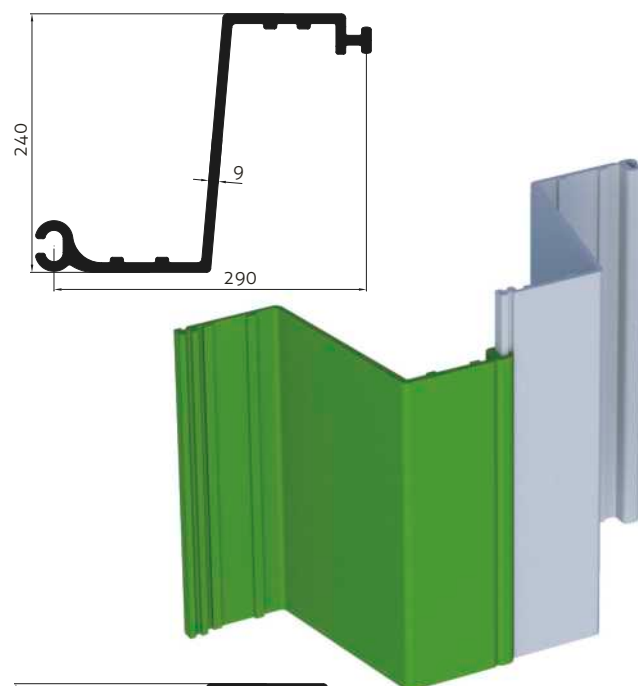
* Safety factor = 2



GW-580 / 9,0

	unit	value
Section width	mm	290
Section depth	mm	240
Thickness	mm	9,0
Section modulus	cm ³ /m	1461,6
Moment of inertia	cm ⁴ /m	18739
Allowable moment*	kNm/m	32,2
Ultimate moment	kNm/m	64,3

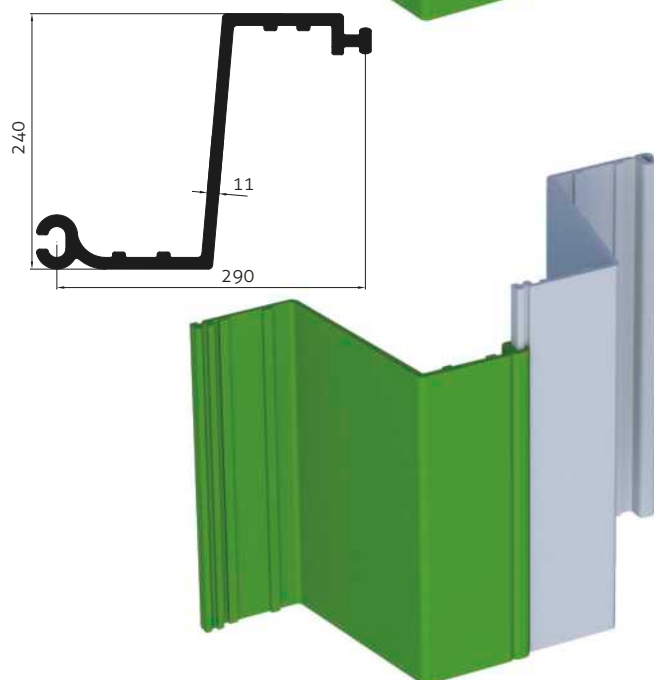
* Safety factor = 2



GW-580 / 11,0

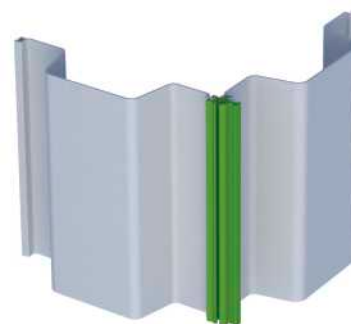
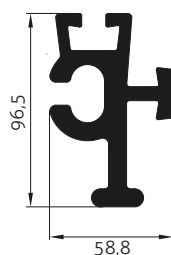
	unit	value
Section width	mm	290
Section depth	mm	240
Thickness	mm	11
Section modulus	cm ³ /m	1711
Moment of inertia	cm ⁴ /m	21851
Allowable moment*	kNm/m	37,6
Ultimate moment	kNm/m	75,3

* Safety factor = 2



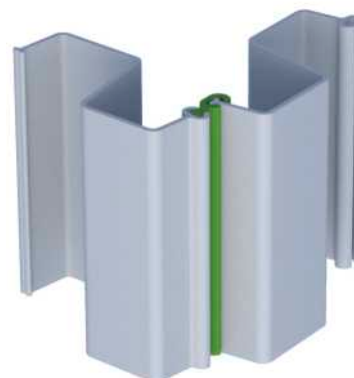
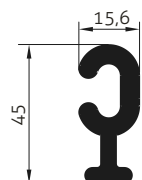
Corner 610/580

	unit	value
Section width	mm	96,50
Section depth	mm	58,80



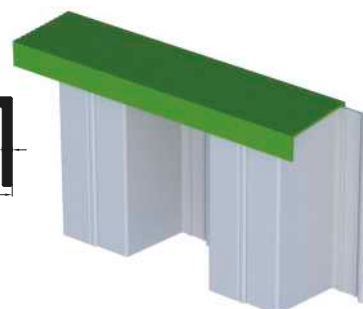
Corner 300

	unit	value
Section width	mm	45,00
Section depth	mm	15,60



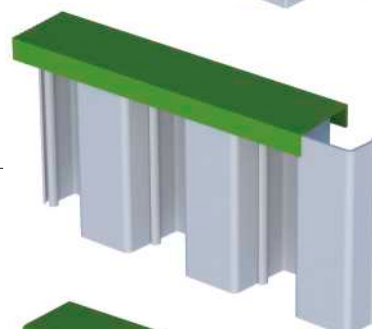
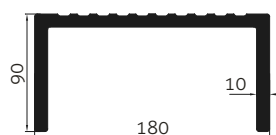
Cap 290

	unit	value
Section width exterior	mm	290
Section depth exterior	mm	90
Thickness	mm	10



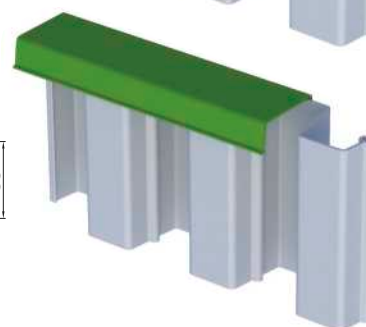
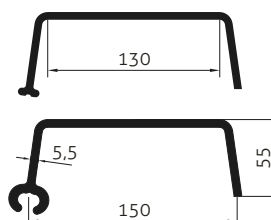
Cap 180

	unit	value
Section width exterior	mm	180
Section depth exterior	mm	90
Thickness	mm	10



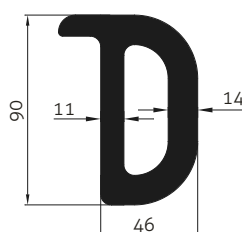
Cap 150

	unit	value
Section width interior	mm	130
Section depth interior	mm	55
Thickness	mm	5,5



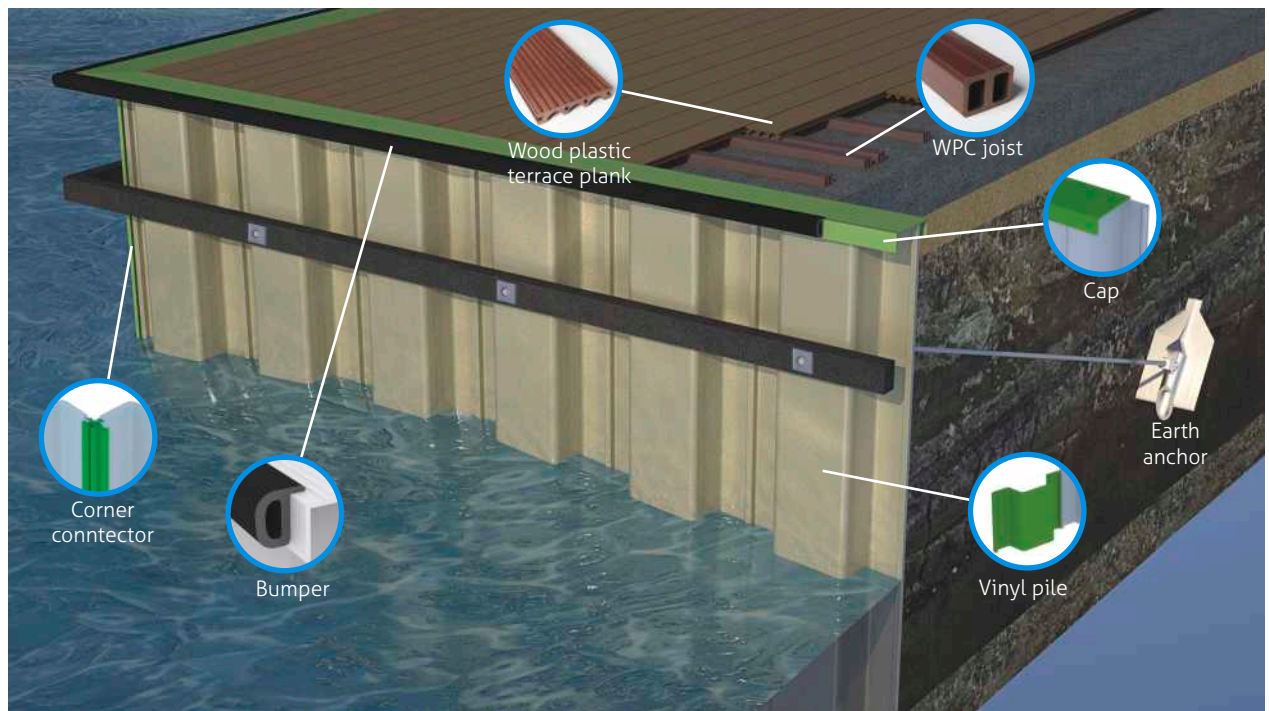
Bumper

	unit	value
Section width	mm	46
Section depth	mm	90




A complete system

An important advantage of the EcoLock sheet piles is that they form a complete system allowing full and comprehensive utilization. The system consists of as many as 15 types of sheet piles for various purposes, and accessories such as corner connectors, allowing connection to the wall at 90 degrees, a top plate protecting the wall from the top, and a flexible fender, often used in canoeing marinas. The entire system is complemented by anchors.



TerraDeck WPC System

The system of vinyl sheet piles is supplemented by composite planks  TerraDeck. Their essential advantage is the possibility of using them in unfavourable weather conditions where water resistance is one of the key parameters. The planks are made from wood flour and PVC which allows them to combine the aesthetics of natural wood with functionality and endurance of plastic material. Using both EcoLock and TerraDeck systems ensures achieving excellent effects when building tourist and utility wharves, piers and private yacht marinas. Read more at www.terradeck.pl

TerraDeck planks are characterised by:

- very high load resistance
- resistance to exterior factors, e.g. sunshine and water which prevents planks from cracking and rotting,
- complete resistance to insects and rodents,
- non existent problems with fungus or rotting



Europe's largest investment using vinyl sheet piles

One of the most responsible functions of the EcoLock vinyl sheet piling is to prevent the erosion impacts of groundwater on the structure of flood banks. In 2012, the company S i A Pietrucha sp. z o.o. delivered approximately **72 400 m²** (15690 m length, which is almost **16 kilometers!**) of vinyl sheet piling, which were used in the construction of the anti-filtration barrier for the **"Flood Protection of the Gardno polder V-VI"**. The function of the barrier is the extension of the filtration route of groundwater, as well as the increase of the stability factor of the embankment structure itself. The investment includes partial reconstruction of the existing embankments, as well as the creation of new ones. The structure was included in Class IV of the validity of hydro-technical facilities and it will protect an area of 918 hectares against flooding.

The main problem encountered by engineers and designers during the planning of the investment had been the weak subsoil of the embankment, mostly consisting of peat. Therefore, there was a high probability of earth settlement of the embankment structure. To prevent uncontrolled settling and erosion of the embankment shafts, it has been agreed to apply **GW 270/5.5** profiles of vinyl EcoLock of hard PVC sheet piles. They serve a dual role in the structure: an anti-filtration barrier to prevent leaching and undercutting of the embankment by groundwater and, thanks to a proper length (2.0 - 9.0 m), they reach the roof of fine sands, forming a support for the soil embankment body, improving its stability. The construction of the body used a mix of peat and sand, and only sand in such a way as to achieve (according to the class of validity of the object) an elevation of the crown of embankments equal to 0.5 m above the reliable water level (state). In addition, thanks to a suitably deep (in the layer of sands) vinyl sheet piling foundation pit, during the observation of the natural settling of the soil body, it will be possible to accurately measure these phenomena.



To illustrate the number of GW-270 / 5.5 sheet piles, amounting to as much as 72000 m², this value can be compared to the area of 11 football fields, making it the biggest investment of its kind in Europe!

72.400 m²



11



Implemented investments

The Pietrucha company has been manufacturing sheet piles for almost 10 years. We can boast a high sales growth year to year. A large part of our production is exported. We have customers in locations varying from South America, through Europe, Eastern Europe to the Far East. Our products are valued not only for global quality, which is confirmed by the parameters, but also competitive prices.



Stare Kolnie, Poland. GW 270 / 5,5
Adjustment of the bank of the river and strengthening of the waterfront.



Pokój, Poland. GW-300 / 5,5
Regulation of the bed of water canal.



Sieradz, Poland. GW-300 / 5,5
Sealing of the flood embankment.



Kowal, Poland. GW-580 / 7,0
Retention tank by the A1 motorway.



Szczecin, Poland. GW-300 / 5,5
Wharf reinforcement.



Warsaw, Poland. GW-300 / 5,5
Water culvert.



Blans, Denmark. GW-580 / 11,0
Yacht harbour.



Padang, Indonesia. GW-610 / 9,0
Anti-erosion protection of the river-bed.



Padang, Indonesia. GW-610 / 9,0
Anti-erosion protection of the river-bed.



South Korea. GW-580 / 7,0
Flood banks protection.



Biełstrzynnik, Poland. GW-580 / 11,0
Water threshold.



Łunawy Wielkie, Poland. GW-300 / 5,5
Securing foundation of a hydroelectric power plant.



Warta, Poland, Jeziorsko Reservoir. GW-580 / 7,0
Kayak Marina.



Jelcz-Laskowice, Poland. GW-610 / 9,0
Modernization of embankments.



Utrecht, Holland. GW-610 / 9,0
Regulation of the bed of river.



Pruszków, Poland. GW-610 / 9,0
Modernization of the railway line.



Scott's Point, Australia. GW-610 / 9,0
Protection of the seawall.