



Sireg Geotech S.r.l.

Sireg Geotech is a manufacturer of specialized products in **thermoplastic, thermosetting, and composite materials** for applications in **Geotechnics and Civil Engineering**.

Our operations are centralized in Italy, with two production facilities near Milano, and a distribution affiliate in Colombia.

Our commercial department sells to designers, developers, contractors, and industrial clients, both public and private, in over **60 countries**.

With **over 40 years of experience in the sector**, our products are used in important infrastructure projects around the world.



Sireg's headquarters in Arcore, Italy.



Sireg's distribution network.

A story of diversification and innovation driven by market and technological changes



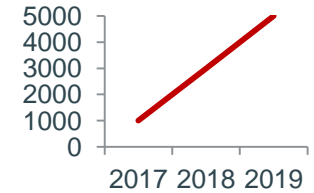
Sireg is founded by Cav. Emilio Blanc in Arcore. The company regenerates rubber from used tires



Production of plastic pipes and special profiles for geotechnical applications



Acquisition of the glass fiber division of Akzo Nobel. Production of GFRP bars, followed by other composite materials



Increase in GFRP annual processing capacity to 5,000 tons



Manufacturing of PVC sheets for stationary and traction batteries



Sireg enters the water treatment sector



New commercial affiliate in Medellin, Colombia



2017
New production facility in Agrate, doubles GFRP production capacity

The divisions of Sireg are today dedicated industrial companies

Sireg Geotech s.r.l.



Plastic and composite material products for Geotechnics and Civil Engineering

Sireg Hydros s.r.l.



Primary water treatment plants for civil and industrial applications

Sireg Polyvinyl s.r.l.



PVC calendered sheets for stationary and traction batteries

Other ventures

Today, **Sireg Geotech** is a privately owned specialized manufacturer of products for geotechnics and civil engineering

Company

2 productive facilities in Italy:

- Arcore (Headquarters)
- Agrate (second GFRP plant)

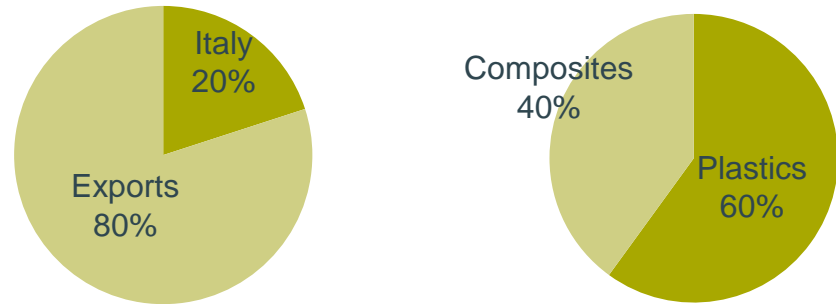
1 Commercial affiliate:

Sireg Latinoamerica
Medellin, Colombia

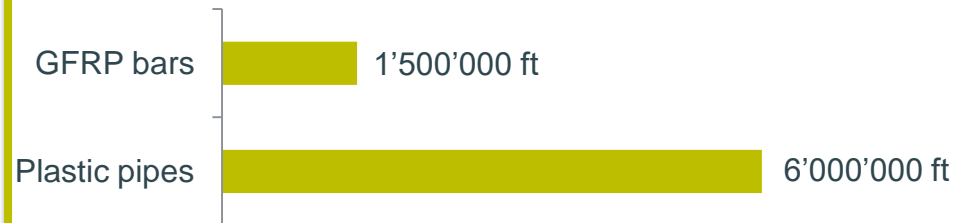
Staff: 50+ people

CEO: Sonja Blanc

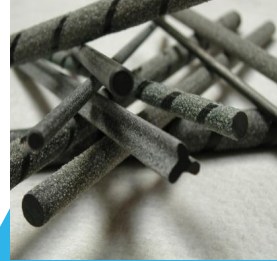
Turnover



Annual production



THE SIREG APPROACH



**FRP
PULTRUSION
LINES**

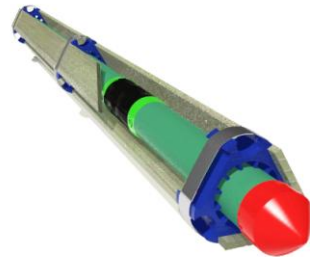
SIREG'S R&D + CONSULTANTS

UNIVERSITIES' R&D

**ENGINEERED
PRODUCT**



**INJECTION
MOLDING**



**THERMO-
PLASTIC
EXTRUDERS**



Durglass® ground anchors and nails



Durglass® cages and piles



Durvinil® RSI grouting pipes



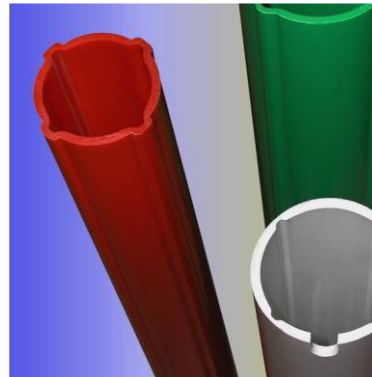
Flexvinil® waterstop joints



Durvinil® drainage pipes



Inclinometer casings



Durotene® ducts and fittings for anchors



Durvinil® Sonic log casings



Glassfree® rebars



Glassfree® cages and piles



Glassfree® meshes



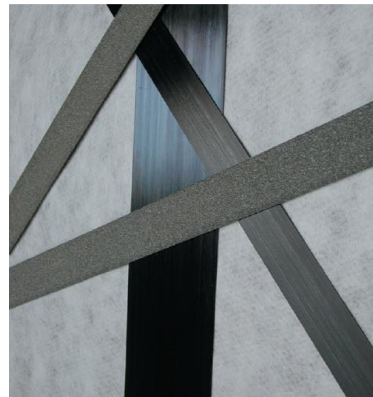
Glassfree® short fibers



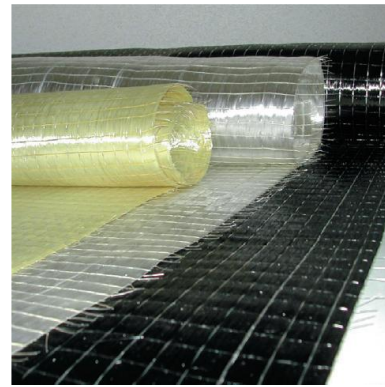
Carbopree® rebars



Carbopree® laminates



Carbopree® and Glassfree® sheets



Arapree® rebars



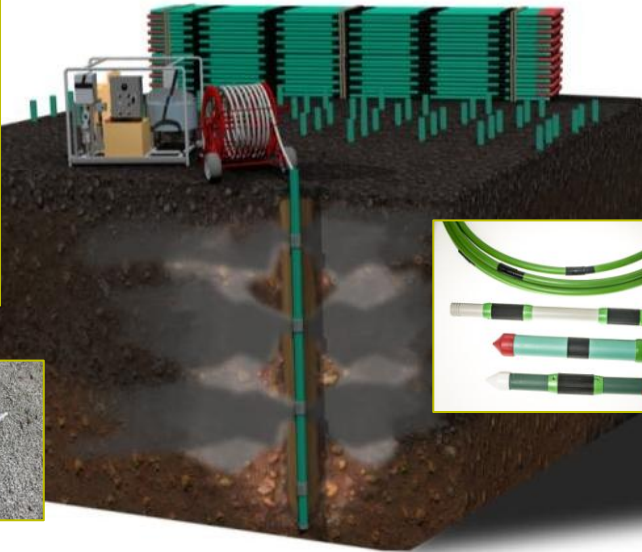
Our goal is to provide our customers with the best quality products and services in terms of performance and efficiency

We care about the **quality of our products**. We use the best available raw materials, maintain our production processes lean and flexible, our quality controls strict and our standards high.

We aim for the best **technical performance and efficiency**. We constantly invest in research and innovation, developing and testing new materials and designs, trying to offer our clients always the best performing, practical, easy to use and cost-efficient products.

We put our **expertise and know-how** at the service of our clients. Our professional team provides consulting services to stay at the client side **from project design to installation**.

RSI (REPEATED AND SELECTIVE INJECTION) GROUTING SYSTEM: from pump to ground + services



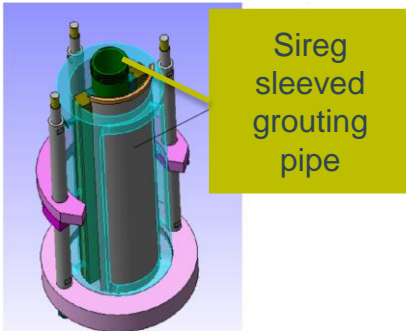
- We can start by analyzing the ground conditions and designing the proper solution
- We have the ability to customize based on specific requests
- We offer on-site support all around the world



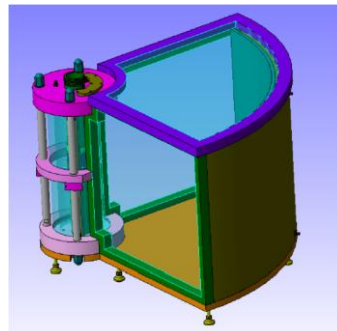
UNIVERSITÀ DEGLI STUDI
DI MILANO
BICOCCA



POLITECNICO
MILANO 1863



Sireg
sleeved
grouting
pipe



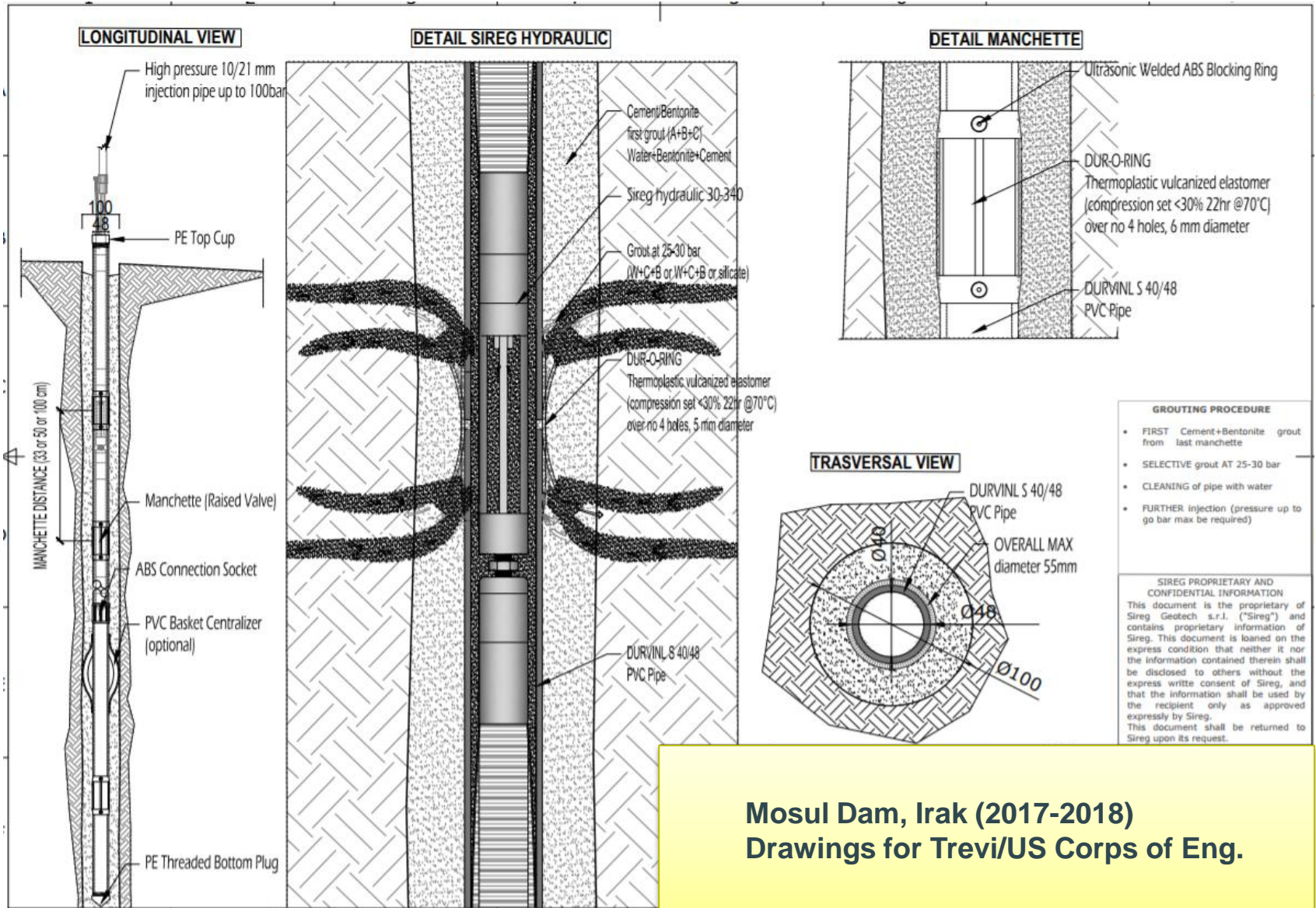
System to test the injection of cementitious mixes into sand through Sireg's Durvinil® sleeved grouting pipes.

Next stop:

Grouting Course at Austin, Feb 2018

Invited for Field Demonstration

System approach example: Mosul Dam grouting project



Mosul Dam, Irak (2017-2018)
Drawings for Trevi/US Corps of Eng.

TECHNICAL NOTE

BENEFITS AND MERITS OF THE USAGE OF GFRP FOR TUNNEL SOIL IMPROVEMENT

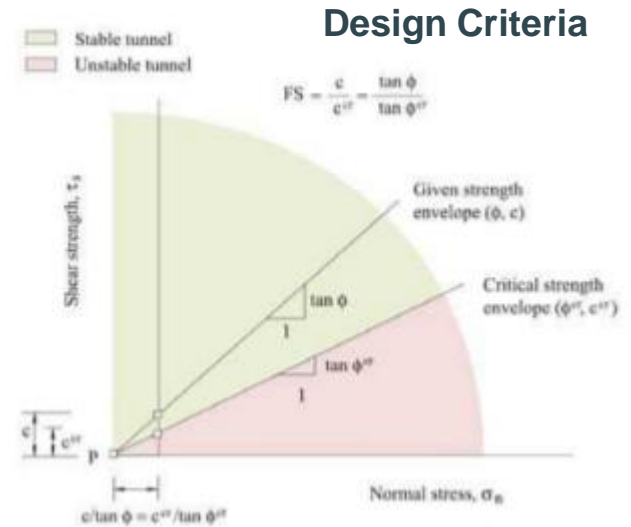
Issue 09.2017
Rev 00/09.2017

INTRODUCTION

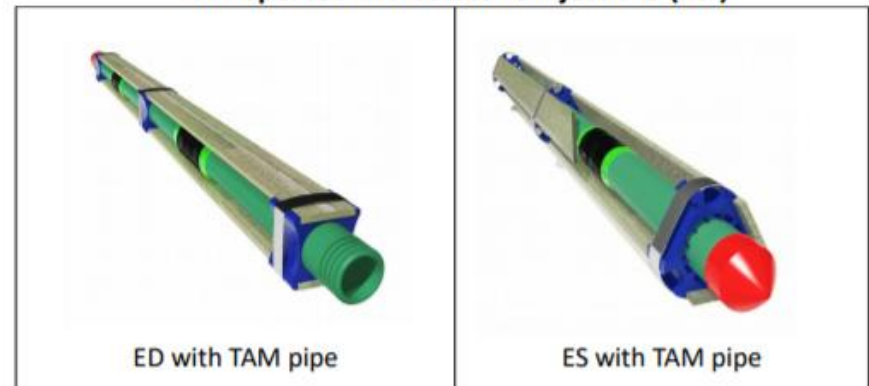
Soil improvement and drainage works may be deemed necessary in order to ease tunnel excavation, particularly along the sections of the tunnel's alignment where challenging conditions are expected. Generally, such conditions consist of the presence of blocky and highly fractured rock, and/or a variety of mixed soil and rock (from highly to completely decomposed rock or Grade V granite to mixed soils with core-stones and residual soil). Particularly unfavorable conditions may occur where very closely jointed rock mass is present, and where soil-like materials (such as fault gouge) could be prone to loosening and to collapse in the absence of effective supports and ground consolidation treatments.



Pre-confinement of excavation front with Durglass GFRP structural elements



Durglass Structural Elements with Sleeved Grouting Pipes for Repeated and Selective Injections (RSI)



Injection modality

Grout injection properties		
Cubic compression resistance	Rck [MPa]	25,0
Injection influence ratio	ii [-]	1
Curing factor	yc [-]	1,0
Material's safety factor	yF [-]	1,6
Mortar's possion ratio	vc [-]	0,2
Elastic module of mortar	Ec [GPa]	20
Grout-soil bond	ta [kPa]	100
Injection penetrability coeff.	al [-]	1
ULS resistance of mortar	oc [-]	15,6

Face bolt (Durglass) properties		
Tensile resistance of bar	ob [MPa]	850
Tensile resistance at joint	oj [MPa]	850
Shear resistance of bar	ot [MPa]	150
Drilling diameter	Ødril [mm]	100
Durglass strip type	[mm]	40x9
Number of strip per Structural element	[-]	3
Overlapping length	LLAP [m]	6,0
Joint step	ijoint [m]	18,0
Resistance area of single bar	Ab [mm ²]	1080,0

Improved face properties

Shear force resist. of bars	Tt [kN]	162,0
Tensile force resist. of bars	TT [kN]	918,0
Pull-out resistance of bars	TF [kN]	188,5
Max. resistance offered by bars	Tmax [kN]	188,5

Adopted number of bars	Nb [-]	20
N° of bars for unit of area	nb [m ⁻²]	0,31
Confining pressure	Δσ3 [kPa]	58,90
Increment of cohesion	Δc' [kPa]	46,23
Improved cohesion at face	c'eq [kPa]	56,23

Prismatic volume properties

Aver. weight of load mass	γp [kNm ⁻³]	20
Aver. cohesion of load mass	c'p [kPa]	10
Aver. friction of load mass	φ'p [°]	25

Aver. weight of Excav. Layers	γE [kNm ⁻³]	20,0
Aver. cohesion of Excav. Layers	C'E [kPa]	10,0
Aver. friction of load mass	φ'E [°]	25,0

Effective soil press. at crown	σ'v [kPa]	250
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hydraulic press. at crown	u [kPa]	250
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Shear resistance and Safety factor (B)

Shear resistance (prism 3)	τm3 [kPa]	58
Shear resistance (prisms 1-2)	τm2 [kPa]	45

Safety factor (prism 3)	FS3	6,54
Safety factor (MZFR/MSFA)	FSp	1,61

Permitted free span length	a _{max} [m]	3,8
Pressure on primary supports	P _s [kPa]	318
Required pressure at face	P _f [kPa]	0

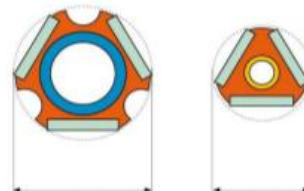
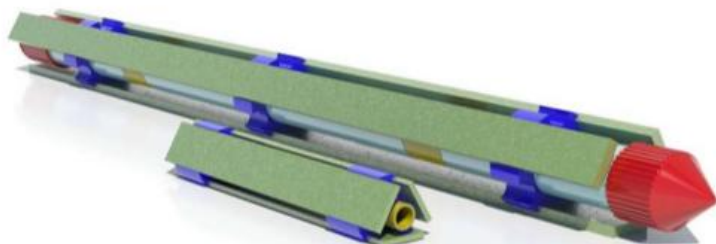
Obtained safety factor	SF	1,61
Requested safety factor	SF _R	1,5



Radial consolidation (RUI)



Tunnel excavation for highway construction (GUI)





System approach: soil nailing

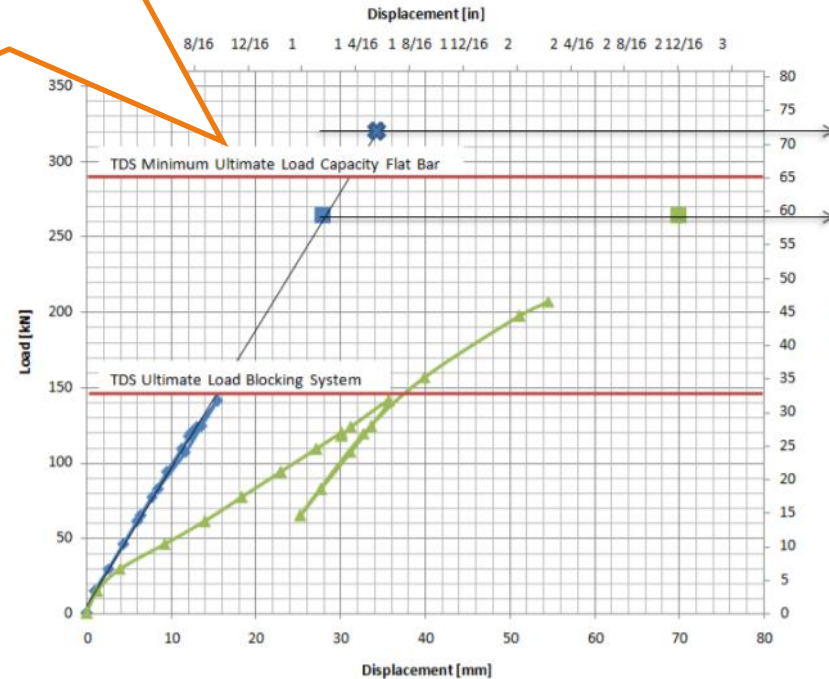
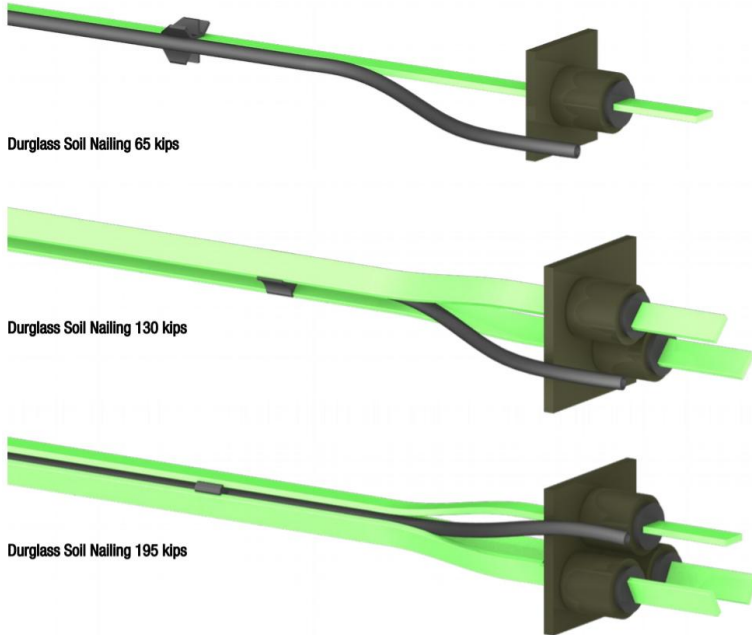


PACKAGING

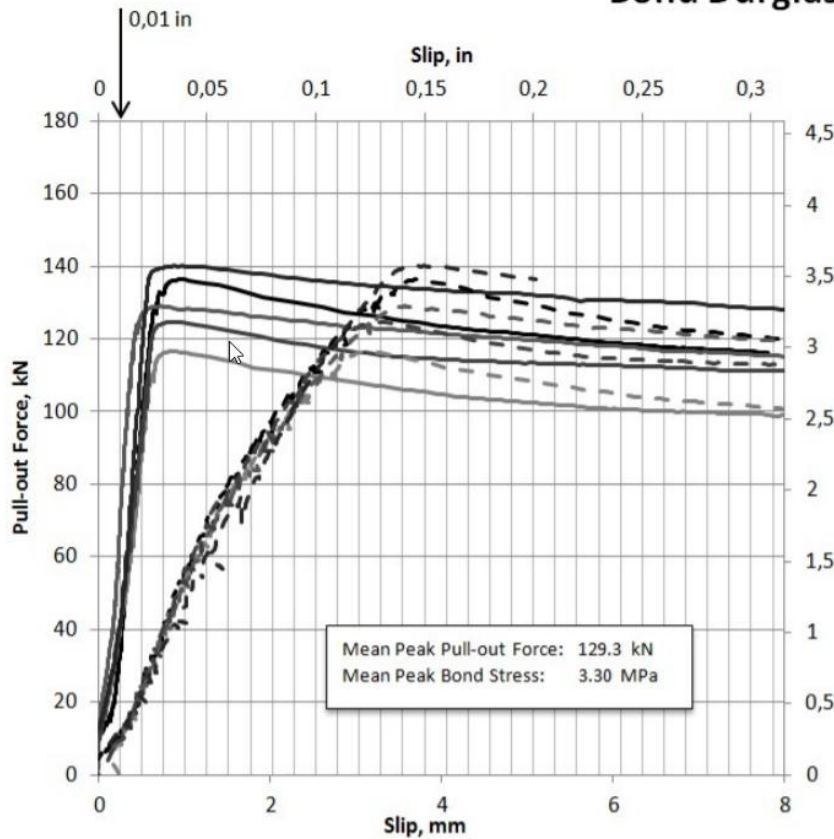
Glass Fiber Stripes:
 Rolls of 350 ft (107 m).
 Box 20': 80 rolls – 28'000 ft
 Box 40': 160 rolls – 56'000 ft



Durglass FL 40x9 mm + Blocking System 82



Bond Durglass 40x9 mm



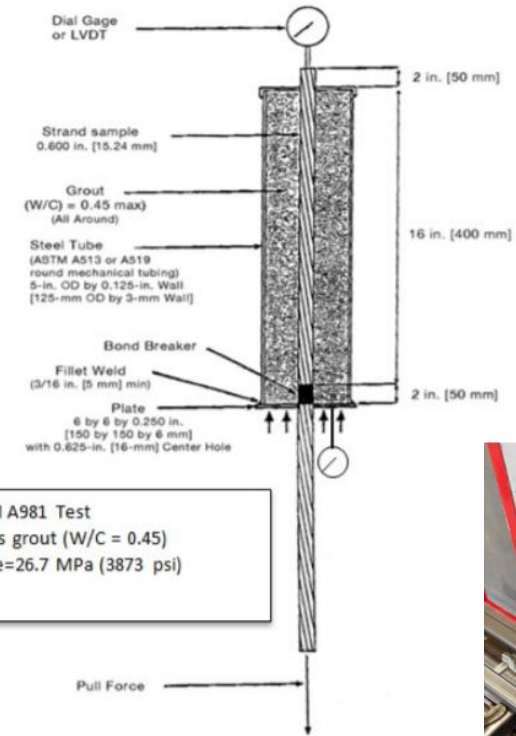
— M1.FreeEnd

— M2.FreeEnd

— M3.FreeEnd

— M4.FreeEnd

— M5.FreeEnd



ASTM A981 Test
5 days grout (W/C = 0.45)
 $f_{c,ave} = 26.7 \text{ MPa}$ (3873 psi)



In conformity with ASTM A981M

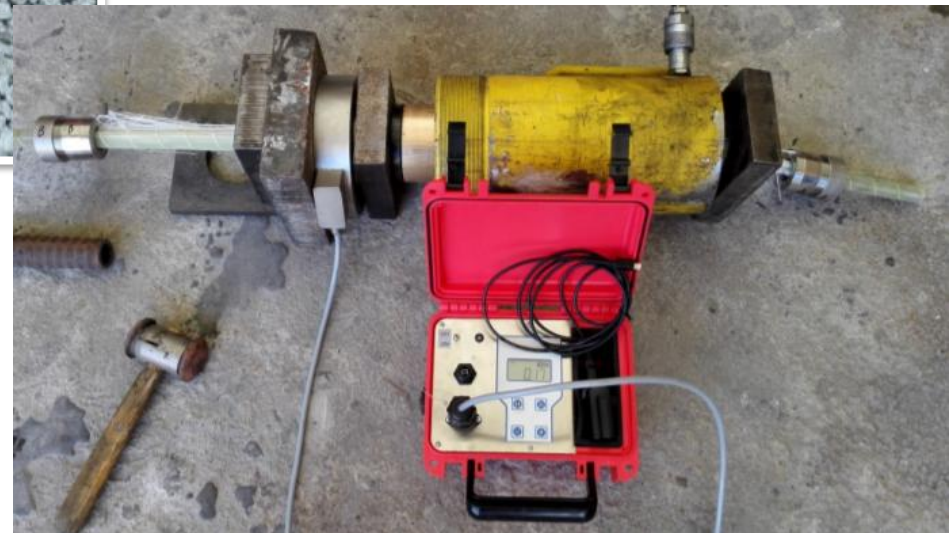
System approach: soil nailing



ACCESSORIES

- (A) Durglass or Glassree Rebar
- (B) ABS Cap: (GE261000008)
- (C) Alluminum Threaded SB Cup
- (D) SB available in Galvanized Steel or Aisi Inox 303
- (E) Synthetic Plate (GE279000116)
- (F) Extra: nr 3 AISI 304 threaded plugs fitted in synthetic plate and ABS cup (B) with 3 holes

Load verification at the jobsite






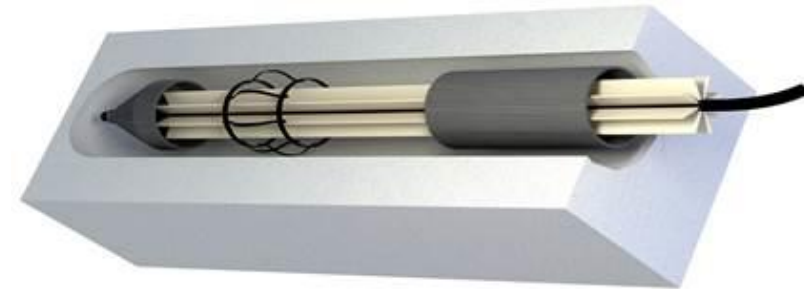
Underwater permanent application



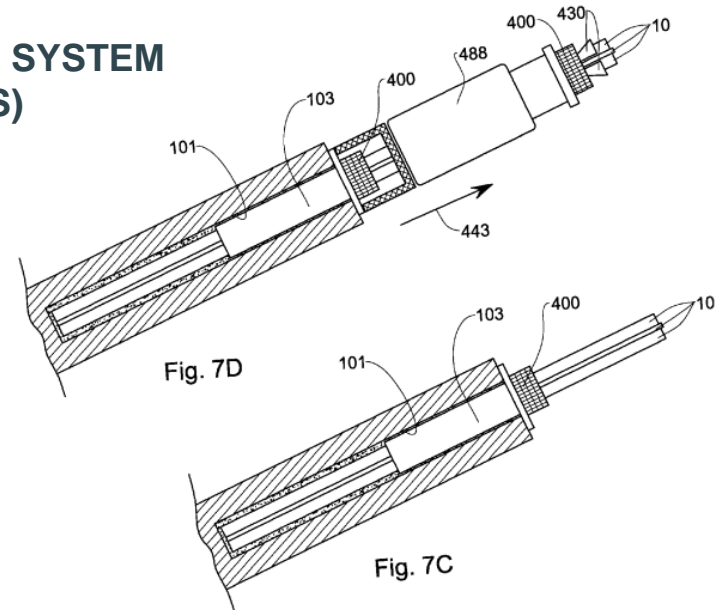
System approach: Polymer anchors

Multi-straps active Polymer Anchor

Test Load	112 kips	146 kips	191 kips
Temporary Service Load	90 kips	112 kips	157 kips
Elastic Modulus	40 Gpa	40 Gpa	40 Gpa
Head Length	1 ft	1 ft	1 ft
GFRP configuration	4 strap	6 strap	8 strap
			

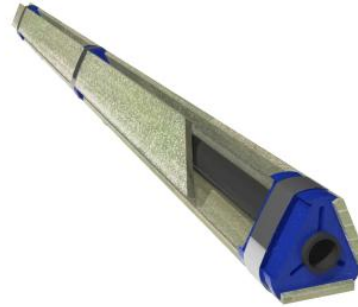


PATENTED SYSTEM (US)

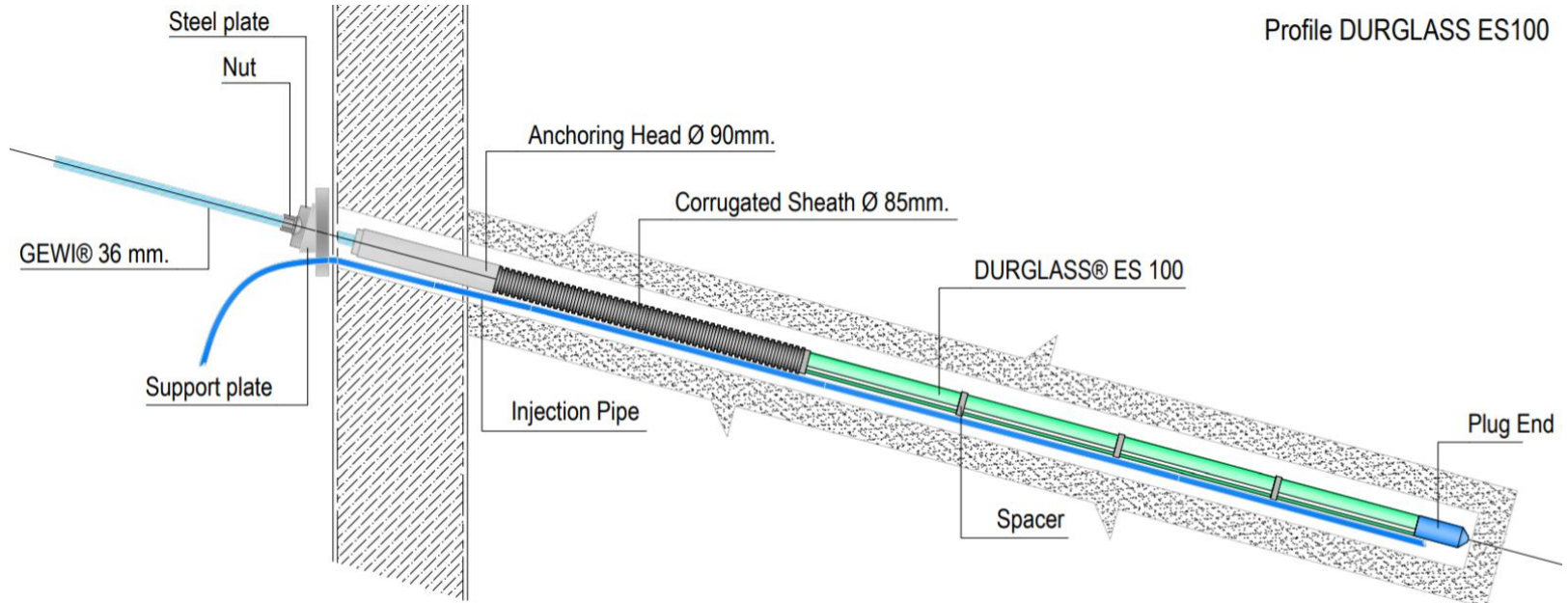


Structural Element GFRP Active Anchor

Ultimate Load	155 kips	165 kips
Test Load	100 kips	125 kips
Temporary Service Load	80 kips	100 kips
Elastic Modulus	40 Gpa	40 Gpa
Head Length	2 ft	2 ft
GFRP configuration	3 strap	3 strap



Profile DURGLASS ES100



Glasspree® is a proven alternative for permanent concrete reinforcement in civil infrastructure and for the restoration of buildings

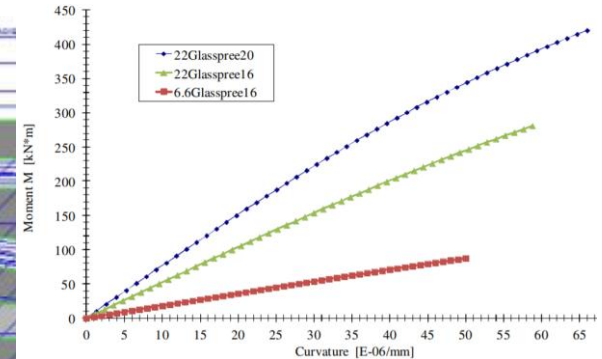
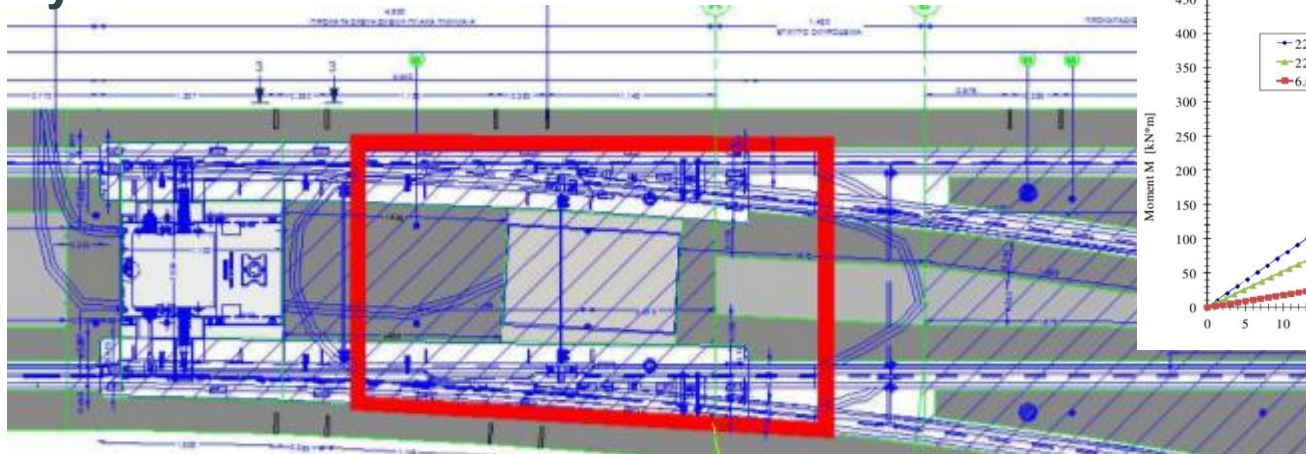


Corrosion of internal reinforcing steel deteriorates concrete structures shortening their service life

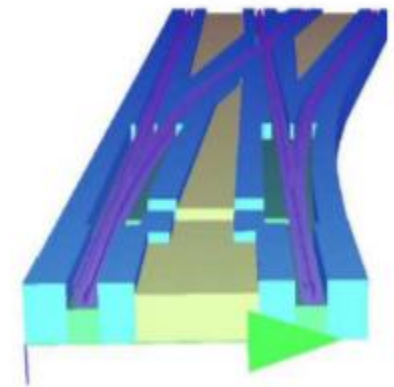
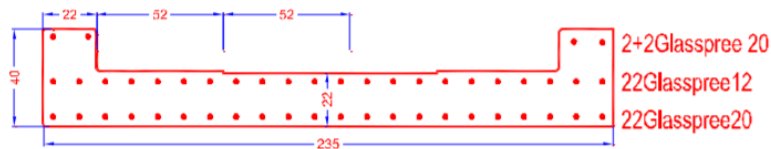


Glasspree® reinforcements are corrosion free, do not need to be removed as they do not leave steel underground, and can be easily cut by common equipment if required for future works.

Glasspree® reinforcements: an optimal long-term solution for “train detection systems” in the Athens tram network



EQUIVALENT LONGITUDINAL GLASSPREE RODS



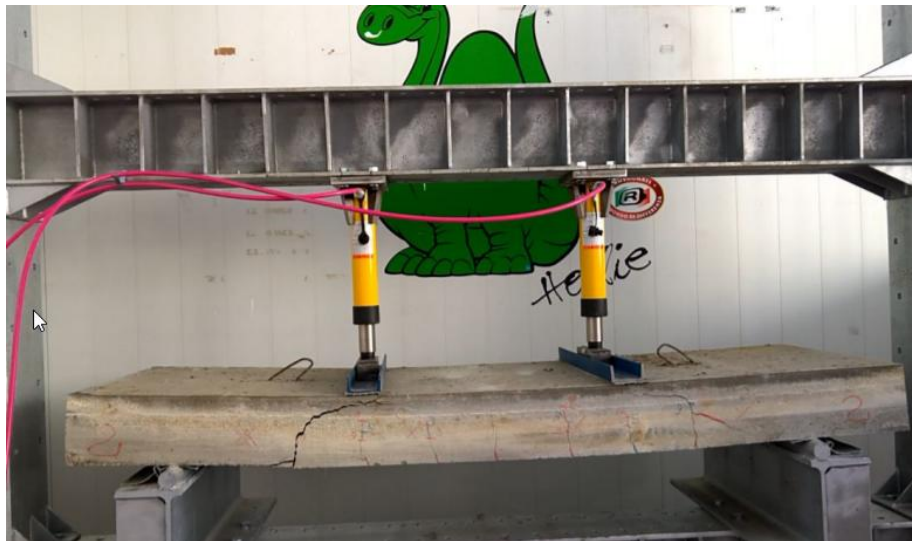
Input Data and Design proces

Fig. 2 - Glasspree equivalent ULS design

System approach: permanent concrete slab



Experimental test program



EQUIVALENT TRANSVERSAL GLASSPREE RODS

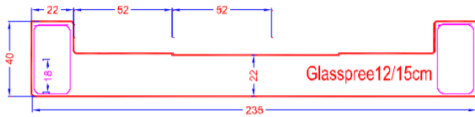


Fig. 7 - Glasspree12 for stirrups

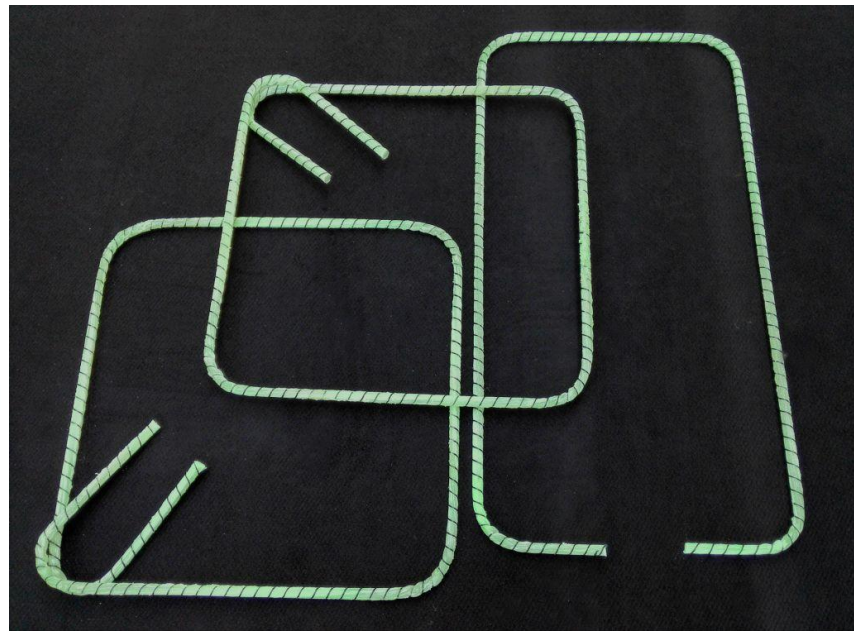
Details are important:
Closed Stirrup according to Eurocode (FIRE)



Type 2



Type 3



Glasspree® reinforcements: an optimal long-term solution for “train detection systems” in the Athens tram network

- “Mass detection systems” installed in the RC track beds operate through an electric oscillating circuit.
- **Permanent non-metallic reinforcements** are required not to interfere with the systems in the track sections where these were installed.



Our products are used in important projects around the world, always with quality and reliability



Non-invasive soil consolidation
Louvre Museum
Paris, France



Soil reinforcement
Las Vegas, USA



Underwater slab
harbor, Italy



Soft-eye for Circle
Metro Line
Singapore



Restoration of
Minerva's temple
Rome, Italy



Soil nailing
University Link railway
Seattle, USA



Infrastructure
reinforcement
Switzerland



Soft-eye
Metro Lyon
France



Soil nailing
Blanka tunnel
Czech Republic



Inclinometer log
cases
Seattle, USA



Soil consolidation
Kuwait City



Soil consolidation
Duomo station
Napoli, Italy



Soil nailing
Downtown Tel Aviv,
Israel

We work in collaboration with **selected academic and industrial research partners** to develop new innovative solutions



*PATENTED
BIODEGRADABLE PIPE*



**Chemical
Supplier**

PATENTED BIO GROUT



Ongoing Research Agreements



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Contact us

Sireg Geotech S.r.l.

Phone: **+39 039 627021**

E-mail: **info@sireg.it**

Website: **www.sireggeotech.it**

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