

The Doorway

A Publication of The Gill Corporation

High-Performance Composite Products Since 1945 • www.thegillcorp.com

Volume 58 • Number 1 • Winter 2022

NON-AEROSPACE SPECIALTY SOLUTIONS



ANTIMICROBIAL TREATED

While **The Gill Corporation (TGC)** is mostly known in the aerospace industry, it is a composites company whose foundation is in chemical engineering. After more than 75 years, TGC is still passionate about creating solutions using our wealth of chemical and composites knowledge. Composites have a wide range of applications beyond aerospace and, over the years, TGC has provided numerous solutions for non-aerospace applications. Here's a look at three unique examples: when a customer had a set of requirements dictating the design, when our materials and capabilities gave a customer an idea for a product, and when a customer asked us to reverse engineer an existing product. If you need a specific composite solution and we don't already manufacture it, we can invent it!

THE LARGE HADRON COLLIDER AT CERN

In 2011, TGC was asked to supply critical laminates for an experiment that would be one of the largest international scientific collaborations in history. Our high quality surface finish fiberglass laminate with a bonded copper mesh would be part of CERN's newly designed Compact Muon Solenoid (CMS) detector.

The European Organization for Nuclear Research opened the CERN laboratory in 1954 to establish world-class fundamental physics research. Today, CERN utilizes purpose-built particle accelerators and detectors to study the fundamental constituents of matter and the forces acting between them.

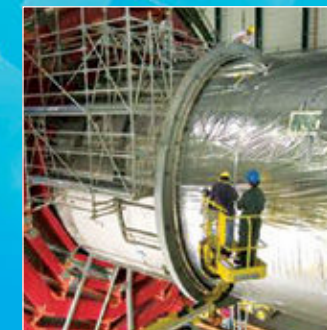
The laminates were required to meet 5520-ES-368001 Specifications from Fermi National Accelerator Laboratory and at least a UL 94 V-1 flame classification with a continuous filament glass cloth impregnated with a thermosetting epoxy resin binder. The laminate had to meet a thickness uniformity requirement of 0.059 ± 0.005 " with minimal panel warpage so it would not interfere with the Fermilab assembly.

TGC worked with several CERN scientists to design the laminate. It consisted of 9 layers of fiberglass covered with a layer of a specialized type of copper which had to meet strict purity, visual and quality requirements.



TGC quickly realized the complexity of the project and developed new procedures ensuring each part would meet the exacting specifications. Extreme care was taken to manage the details of each layer during lay-up so a perfect surface quality could be achieved.

Particles travelling through the CMS detector leave distinctive patterns or "signatures" in the different layers that can be identified. The data gleaned from the experiment was then shared with analysts throughout the relevant scientific community.



For more information on this story, please see our 2015 Winter Doorway issue: The Awe of Discovery.



CERN presented TGC with a plaque commemorating our participation.

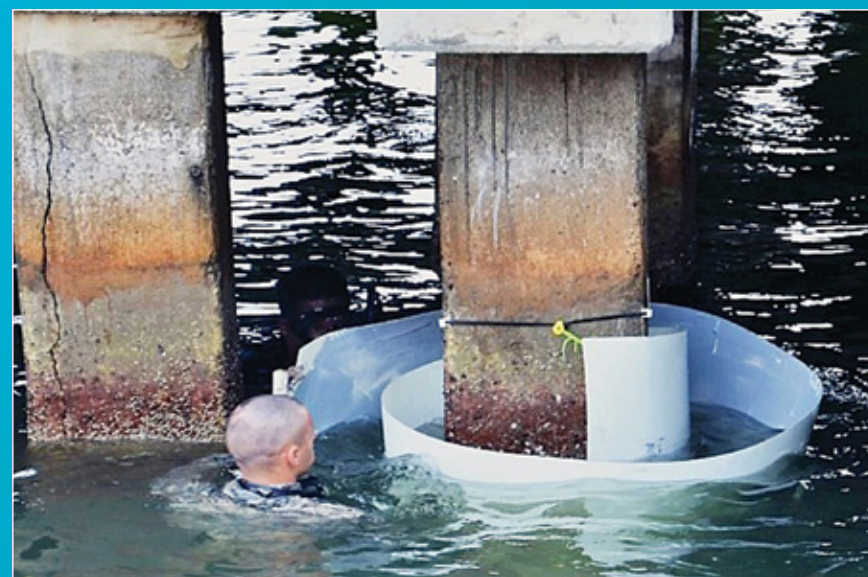
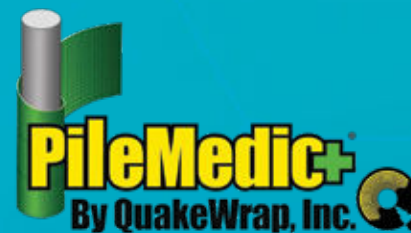


QUAKEWRAP – PILEMEDIC®

In 2009, the University of Arizona paid a visit to TGC to seek collaboration on composites research. One of the Engineering Professors on the visit also had his own business manufacturing Fiber Reinforced Plastic (FRP) products for infrastructure repair and renewal. Upon touring TGC and seeing the company's materials, processes, and capabilities, he recognized an opportunity to create a new product. After this visit, Quakewrap went to work designing a structural column, pile, and pole repair system using FRP laminate sheets.

With this product idea, Quakewrap and TGC's R&D Department started going down an iterative path to find the right combination of substrate material and resin system. The cured laminate needed to meet specific strength requirements, needed to withstand both sea water and fresh water, and be corrosion resistant. Trial parts were tested both in the longitudinal and transverse directions, measuring pounds per inch. Finally, after many experimental trials, **PileMedic®** was designed. **PileMedic®** is a laminate made with either biaxial glass or biaxial carbon reinforced with a polyester resin system.

In addition to the rounds of testing conducted in TGC's development process, Quakewrap did its own testing, an independent lab was also contracted to conduct testing, and the product was extensively tested by several governing agencies including the United States Army Corps of Engineers (USACE), California Department of Transportation (Caltrans), the National Science Foundation (NSF), as well as other states' transportation agencies. It is the **ONLY** product of its kind approved by the Army Corps of Engineers.



END RESULTS OF THE DESIGN:

- ◆ **Customizable** – Sheets can be as thin as 0.025", rolls can be cut to length and wrapped around columns, piles, or poles to create a solid seamless shell of desired shape.
- ◆ **High Strength** – Tensile strength up to 150,000 psi – 10 times higher than common fiberglass jackets and 3-4 times stronger than steel, but also flexible.
- ◆ **Efficiency** – The fastest and most economical system for strengthening columns, underwater piles, utility poles, and bridge pilings.

REQUIRED NOMINAL STRUCTURAL VALUES

FRP LAMINATE PROPERTIES

Property	Standard	Glass	Carbon
LONGITUDINAL DIRECTION			
Tensile Strength, KSI	ASTM D3039	62	101
Modulus of Elasticity, KSI	ASTM D3039	3,500	7,150
Ultimate Elongation, %	ASTM D3039	1.31	0.85
TRANSVERSE DIRECTION			
Tensile Strength, KSI	ASTM D3039	60	64
Modulus of Elasticity, KSI	ASTM D3039	3,650	2,940
Ultimate Elongation, %	ASTM D3039	1.06	1.42
OTHER PROPERTIES			
Barcol Hardness	ASTM2583	50	45
Maximum Water Absorption, %	ASTMD570	0.8	0.7
Laminate Thickness, inches		0.026	0.026



FEMA



US Army Corps of Engineers.

FIBER & LAMINATE PROPERTIES

FIBER PROPERTIES	US Units	SI Units
Tensile Strength	710 KSI	4,900 MPa
Tensile Modulus	33,400 KSI	230,000 MPa
Ultimate Elongation	2.1%	2.1%
Density	0.065 lb/in ³	1.8 g/cm ³
LAMINATE PROPERTIES		
Density	0.047 lb/in ³	1.3 g/cm ³
Tensile Strength	400 KSI	2,750 MPa
Tensile Modulus	24,000 KSI	165,000 MPa
Ultimate Elongation	1.7%	1.7%
Breaking Force	18,8000 lb/in	3,300 N/mm
Ply Thickness	0.0472 in	1.20 mm

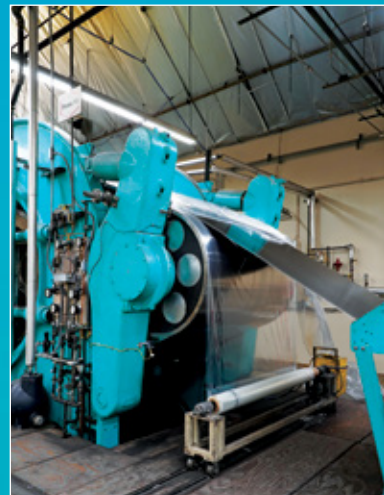
PROPRIETARY CUSTOMER

In the late 1990s, a customer with a material obsolescence issue was searching to replace its high-performing materials in a laminate used for various water control applications. By the time they found TGC they had tried a number of replacement options, none with any success. The product needed to be homogenous, chemical resistant, UV proof, have high-impact strength, no water intrusion or absorption, no coating and be able to bond with the customer's proprietary resin. It also needed to withstand 20-30 years in service. They brought a sample of their product to TGC and asked if we could provide something equivalent.

This was nothing new, TGC was built on providing custom solutions to requests like these and, in fact, a product we've been making since the early 1950s, our 990C laminates, shared these criteria. The laminates are constructed of fiberglass impregnated with polyester resin and cured uniformly with heat and pressure. They were typically used as countertops in laboratories, as they withstand harsh environments for extended periods.

TGC tested the customer's sample to compare its properties to that of our product. As it turned out, our 990Cs, designed almost 50 years prior, outperformed the customer's sample in every category. As an additional step, TGC did accelerated UV testing, since it was critical to determine the life span of the UV protection.

Pleased with the data and the laminate's performance, the customer found their replacement product. And TGC notched another win using decades of composite and chemistry knowledge.

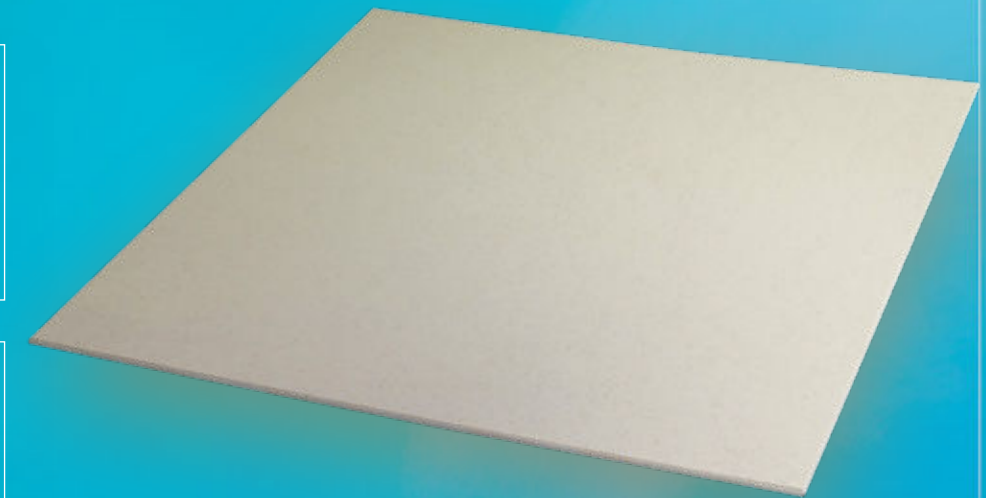
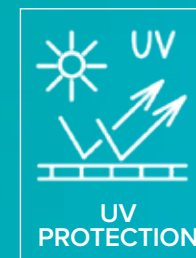


Roll using fiberglass.



Roll using carbon fiber.

For more information, please visit www.quakewrap.com and www.pilemedic.com.





Quotables

"The most difficult thing is the decision to act. The rest is merely tenacity."

- **Amelia Earhart, Aviator**

"I think we consider too much the good luck of the early bird and not enough the bad luck of the early worm."

- **President Franklin D. Roosevelt**

"I know there are people in this world who don't love their fellow man and I hate people like that."

- **Tom Lehrer, Satirist**

"I have noticed that people who are late are so often much jollier than the people who have to wait for them."

- **E. V. Lucas, Essayist**

"I don't want to play golf. When I hit a ball I want somebody else to chase it."

- **Rogers Hornsby, Baseball Player**

"Good judgement comes from experience and a lot of that comes from bad judgement."

- **Will Rogers, Humorist**

"Football is a mistake. It combines the two worst elements of American life: violence and committee meetings."

- **George Will, Journalist**

"You can't use up creativity. The more you use, the more you have."

- **Maya Angelou, Poet**

"I do not object to people looking at their watches while I am talking but I strongly object when they start shaking them to make certain they are still going."

- **Lord Birkett, Jurist**

"All I ask is a chance to prove that money can't make me happy."

- **Spike Milligan, Entertainer**

"A positive attitude may not solve all your problems but it will annoy enough people to make it worth the effort."

- **Herm Albright, Artist**

"I knew this time would come, but yesterday I didn't know it would be today."

- **Unknown**

"Deep down, we're all shallow."

- **Charles Lipmann, DiversiTech**

"As a nation we are dedicated to keeping physically fit - and parking as close to the stadium as possible."

- **Bill Vaughn, Columnist**

"Make a quality product and deliver it on time, and you'll always have customers."

- **Stephen Gill**

"I always wanted to be somebody, but now I realize I should have been more specific."

- **Lily Tomlin, Entertainer**



THE GILL CORPORATION

The Gill Corporation
International Headquarters
4056 Easy Street
El Monte, California 91731 USA
Phone: +1 626 443-6094
Email: info@thegillcorp.com


The Gill Corporation - Maryland
1502 Quarry Drive
Edgewood, Maryland 21040 USA
Phone: +1 410 676-7100
Email: info@thegillcorp.com

The Gill Corporation - France
Route de l'Aviation
7, Allée Etchecopar
64600 Anglet France
Phone: +33 (0) 5 59 41 25 25
Email: info@thegillcorp.com

The Gill Corporation - Europe
23 Enterprise Road
Bangor, Co-Down BT19 7TA
Northern Ireland, United Kingdom
Phone: +44 (0) 2891 470073
Email: info@thegillcorp.com

www.thegillcorp.com

© 2022 The Gill Corporation. All Rights Reserved. The Gill Corporation, The Gill Corporation logo, Gillfab composite, Gillcore, Gillfloor, HUSHGRID, GILIVANA, GILLFISTS, Gilliner, Gillite, PAA-CORE, DURA-CORE, Alcopan, HIGRID, SHAPEGRID, STRIKEGRID, TRUSSGRID, PLYGRID, and The Doorway are trademarks of The Gill Corporation. The Gill Corporation "Honeycomb Bee" character is a trademark character of The Gill Corporation. Nomex, Korex, Tedlar, and Kevlar are trademarks of Dupont.

 THE DOORWAY IS PRINTED ON 10% POST-CONSUMER RECYCLED PAPER AND SHOULD BE RECYCLED