

Case Study: SAFRAIL™, STRONGRAIL® and DURADEK®

Fiberglass Eases Traditional Metal Handrail Challenges

Pacific Gas and Electric Company (PG&E), the largest private owner of hydroelectric facilities in the United States, is a utility company which provides natural gas and electricity to most of the northern two-thirds of California. PG&E wanted to improve worker safety and cut maintenance costs by replacing corroded steel access handrails at Kerckhoff 1, one of its remotely located power houses. Strongwell distributor, San Diego Plastics, utilized TTR Substations, Inc., to assist PG&E with their design and installation of the SAFRAIL™ fiberglass handrail. More than 1,500 lineal feet of fiberglass handrail was installed on five different levels of severely uneven and steep terrain with as much as a 45% grade.

This installation was a major achievement in illustrating how versatile composite products can be within the construction industry regarding on-site fabrication, electrical conductivity concerns and the challenging environment of installations in remote locations and difficult terrain.

An alternate post design for the SAFRAIL™ fiberglass handrail system dramatically reduced the installation time normally required. The 2-3/8" handrail pre-routed posts were field fitted and installed on-site by TTR with 2" x 2" top/mid-rails, kick plates, 90 degree connectors, rivets, split tubes, and adjustable connectors to ensure a perfect fit and finish.

In the areas where separation between the walkways from the transformers was required, a barrier fence was installed. For this, STRONGRAIL® fiberglass railing was installed with its 4" x 4" square



post and attached base plate joined vertically to a panel of I-6000 1" DURADEK® grating.

The inherent non-conductivity of fiberglass eliminates the possibility of touch potential and therefore makes it safer to work around electrical stations with no grounding requirements. This product will improve aesthetic and safety values, virtually eliminate maintenance and easily double its metal counterpart's life expectancy. ●



Literature Updates:

Product Availability List

FRP Specifications:

- SAFDECK®
- SAFPLANK®
- SAFRAIL™
- STRONGDEK™

Flyers:

- DURAGRID® R-7300, I-6500, R-8300
- SAFPLATE®
- STRONGDEK™

Brochures:

- DURAGRID® Phenolic
- Fiberglass Grating (I & M)
- Fiberglass Decking Systems
- Fiberglass Structures & Systems
- SAFRAIL™ Ladder and Cage Systems & Handrail

Design Manual Sections:

12 (I & M), 13 (I & M), 16 (I & M)

Company Portfolio

Visit www.strongwell.com for all of the most up-to-date resources.

Corporate Offices and Bristol Manufacturing Location
400 Commonwealth Ave., P.O. Box 580
Bristol, VA 24203-0580 USA
(276) 645-8000, FAX (276) 645-8132

Chatfield Location
1610 Highway 52 South
Chatfield, MN 55923-9799 USA
(507) 867-3479, FAX (507) 867-4031

Highlands Location
26770 Newbanks Road
Abingdon, VA 24210 USA

www.strongwell.com



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FRP/Fiberglass
Structures and Systems

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Case Study: EXTREN®

Fiberglass Cover Puts a Lid on Corrosion Issues

The annual direct cost of corrosion, according to NACE International, is \$276 billion, or approximately 3.1% of the U.S. Gross Domestic Product (GDP). Although corrosion is an expected process, it is possible to control by utilizing proper building materials/engineering for each sector. In wastewater and potable water systems, the annual cost of corrosion is attributed to \$48 billion annually or 35% of overall total corrosion related costs in that industry.

With that in mind, Doug and Dan Todd from Infinite Composites designed and fabricated all-fiberglass covers and access hatches to contain harmful fumes and greenhouse gases such as sulphuric acid, methane gas, nitrous oxide, and carbon dioxide. Traditional covers are manufactured using painted aluminum or galvanized steel. Both weight and corrosion issues caused these hatches to fail through the leakage of corrosive and harmful fumes which attribute to air pollution and nuisance issues.

The challenge by Infinite Composites was to design, fabricate and install a tight-fitted cover to contain harmful emissions and odors. The covers also must be capable of meeting or exceeding the various mechanical performance standards set by the aluminum or galvanized steel counterparts.

These hatches are comprised of pultruded fiberglass/polyester EXTREN® Series 525 structural shapes. Mechanical and epoxy based connections were utilized in this design to provide years of lightweight, corrosion-free operation. Each FRP hatch can be prefabricated or assembled on site, virtually eliminating the need for welding or specialty tools. ●



Update: State-of-the-Art Bridge Provides Link for National Forest

Over 5 million visitors explore Daniel Boone National Forest annually, making it one of the most heavily used forests in the south. In Bath County, Kentucky, visitors have been unknowingly using a high-tech link to a major hiking trail for almost 20 years. A 60' clear span bridge connecting the Clear Creek Furnace Picnic Area to the Sheltower Trace Trail was the first hybrid fiber reinforced composite I-girder bridge. An FRP hybrid composite I-beam (24" x 7-1/2" x 3/4"), pultruded by Strongwell, provides the main load carrying members. The addition of carbon fiber to the flanges of the I-beam substantially increases the bending stiffness. The hybrid beam demonstrates a modulus of elasticity of 6.0×10^6 psi (compared to 2.8×10^6 psi for the typical FRP beam without the additional carbon fibers).

Pultruded grating from Strongwell-Chatfield was used for the walkway and fiberglass sucker rods (produced at Strongwell-Bristol) were anchored to the abutment for post tensioning. The bridge is designed in accordance with AASHTO "Standard Specifications of Pedestrian Bridges," with live loads of 85 psf and allowable deflection of $L/180$ (4 inches over 60 feet).

The work was completed as part of a Technology Reinvestment Project, sponsored by the Department of Defense, Advanced Research Projects Agency (ARPA) to demonstrate low cost/high volume

manufacturing of high performance composite material structures for infrastructure applications.

The total design, fabrication and testing of the bridge and its components were accomplished by researchers at the University of Kentucky (under the direction of Dr. Issam Harik). The Great Lakes Composites Consortium, Wisconsin, and Basic Industry Research Laboratory (BIRL) at Northwestern University, Illinois were instrumental in the analysis, design and construction techniques of the composite components. ●



1996



Today

Strongwell's PULSTAR® Technology a Key Component of New Composites Initiative

On January 12, 2015, President Obama announced the \$259 million advanced composites manufacturing consortium project known as the Institute for Advanced Composites Manufacturing Innovation (IACMI) to be led by the University of Tennessee, Knoxville. The 122-member IACMI will focus on innovation in the manufacturing of composites used in automobiles, wind turbines and compressed gas storage tanks.

The consortium provided \$189 million in funding with a matching grant of \$70 million from the US Department of Energy's Office of Energy Efficiency and Renewable Energy. Traditionally, demand for high performance composites has been for low-volume, high-value industries such as aerospace. A major goal for IACMI

is to reduce carbon fiber prices by almost fifty percent, while training a future high tech workforce.

It is expected pultrusion will be one of the primary manufacturing processes used by

the IACMI to yield constant cross section parts in the most efficient manner. Pultrusion has a proven history of more than 60 years as a process to produce high volume, high quality



U.S. DEPARTMENT OF ENERGY

composites by combining polymer resins with strong reinforcing fibers (typically glass or carbon) to create a strong, lightweight finished product.

Strongwell is a key manufacturing partner in the initiative. Its PULSTAR® pultrusion technology, equipment and technical expertise in pultrusion production will produce efficiency in processes, lower overall manufacturing costs and enable broader use of composites in high-volume, cost-sensitive markets such as those in the focus of IACMI.

IACMI's estimates that composites materials usage could grow by 200 percent globally by 2020 due to composites having a longer lifespan, while decreasing the overall carbon footprint.

Other large manufacturing participants in this initiative include: Volkswagen, Ford Motor Company, Dow Chemical, DOWAKsa, Boeing, Lockheed Martin, Dassault Systemes Americas Corp and Local Motors. ●

Pulling Ahead and Setting Records

Strongwell built Pultrusion Machine (PM) 90 in 1998 as the world's largest pultrusion machine. Today, Strongwell is pleased to announce that title will be shared with the newly-completed PM 91. PM 91 was completed in the Bristol facility and delivered to the Highlands facility on December 11, 2013. In November of 2014, its roving racks and machinery peripherals were installed and brought online. Weighing in at 48,800 lbs. and coupled with 60,000 lbs. of pull strength, PM 91 is capable of manufacturing even the largest of pultruded fiberglass parts with widths up to 60 inches and 30 inches in height. Its 40 horsepower motor is able to pultrude parts at speeds ranging between 4 and 25 inches per minute. Over 4,000 glass fiber rovings can be easily accommodated with its state-of-the-art two-level catwalk roving rack system complimented with SAFRAIL™ industrial handrail. A new user interface system and control system has also been introduced, allowing easier maintenance access and functionality amongst its operators.

The impressive statistics of PM91 require PM90 to share certain aspects of its title of world's largest pultrusion machine. With machines 90 and 91 in its fleet, Strongwell continues to boast unmatched capabilities and capacity for pultruding the world's leading fiber reinforced polymers. ●





STRONGWELL - CORPORATE OFFICES
400 COMMONWEALTH AVE, P.O. BOX 580
BRISTOL, VA 24203-0580 USA

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Literature Updates



New Faces at Strongwell (Below)

SPRING 2015

PROFILE

Strongwell News & Applications



Raymond Clark
*Environmental Health & Safety Coordinator
- Bristol*

Raymond Clark has accepted the position of Environmental Health & Safety Coordinator. Raymond will be responsible for the daily functions within the EH&S department, including collecting and organizing data and providing assistance regarding OSHA and EPA compliance. Raymond brings to this role over 25 years of valuable manufacturing experience.



Antonio Garza
*Plant Manager
- Strongwell Mexico*

Antonio Garza has joined Strongwell as the Plant Manager for STRONGWELL Mexico. Antonio will work closely with all support functions to oversee the construction, set-up and daily operation of the Mexico facility.

Antonio holds a Mechanical Administrative Engineer and Masters Degree in Administration from Nuevo Leon State Univ. along with 14 years of experience.



Brian Godwin
*Digital Media Specialist
- Bristol*

Brian Godwin has joined Strongwell as Digital Media Specialist. Brian will develop and maintain Strongwell print, web, video and other marketing content.

Brian holds a Bachelor of Fine Arts degree in Graphic Design from East Tennessee State University and has five years of professional graphic design experience with various firms.



Josh Goulds
*Estimator
- Bristol*

Josh Goulds has joined Strongwell as an Estimator in the Bristol Fabrication Sales Department after serving as a contract employee for the past six months.

Josh holds a Bachelor's degree in Construction Engineering Technology from East Tennessee State University and worked nine years in construction prior to joining the Strongwell team.



Jason Haga
*Senior Process Engineer
- Bristol*

Jason Haga has joined Strongwell in the position of Senior Process Engineer. He brings 17 years of experience to the Strongwell team.

Jason has a M.S. in Engineering Technology and a B.S. in Manufacturing Technology from East Tennessee State University, as well as an Applied Associate in Drafting and Design from Virginia Highlands Community College.



Mark Haynes
Manager, Virginia Operations Logistics & Highlands Manufacturing

Mark Haynes has been promoted to Manager, Virginia Operations Logistics & Highlands Manufacturing. Mark will be responsible for all Virginia Operations logistics as well as oversight of manufacturing at the Highlands facility.

Since his hire in 1995, Mark has held responsibilities in numerous areas of the company in both Bristol and Highlands.



Geoff Newman
Corporate Contracts and Customer Relations Manager - Bristol

Geoff Newman has joined Strongwell as Corporate Contracts and Customer Relations Manager. Geoff will oversee and direct all corporate activities related to contracts and agreements as well as other assigned projects.

Along with several years of experience, Geoff holds a B.S. from UNC-Chapel Hill and an MBA from Cornell University's Johnson School of Management.

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Editor: Barry Myers
Reporting/Production:
Brian Godwin & Tekai Shu