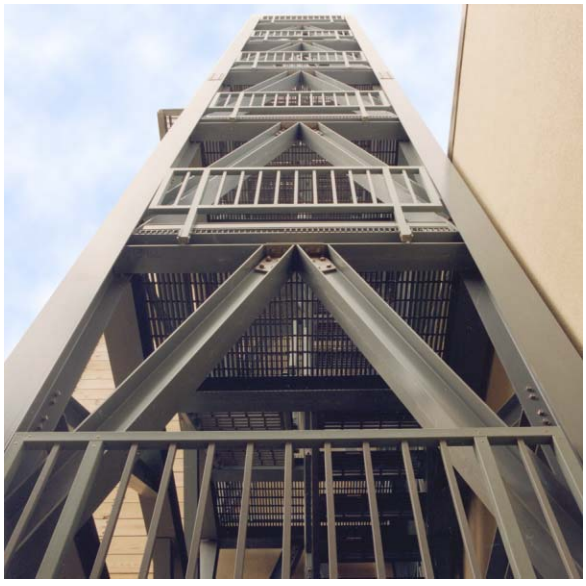
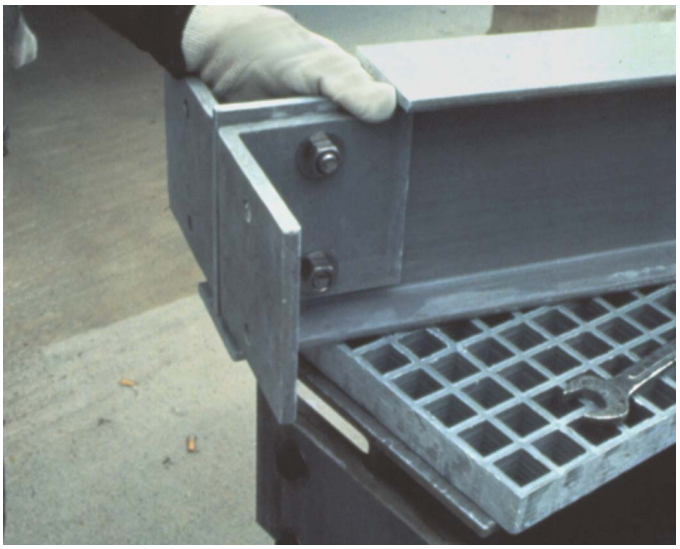
STRONGWELL

FIBERGLASS STRUCTURES

CUSTOM STRUCTURAL FABRICATION



Introduction



Strongwell is both the world's largest producer of pultruded parts and also the largest fabricator of structures utilizing pultruded components. Strongwell operates three ISO-9001 certified pultrusion manufacturing facilities with more than 60 machines and 150 pultrusion lines. Two Strongwell locations specialize in fiberglass structural fabrication: Bristol Division (Bristol, Virginia) and Chatfield Division (Chatfield, Minnesota).

Fabrication

Fiberglass materials can be used in place of, or in conjunction with aluminum, steel or stainless steel in fabricated structures. Typical fabrications include beam, column and plate structures, all-fiberglass buildings using foam-core panels, platforms and other custom fabrications involving grating and handrail. Specialized OEM type structures such as flue gas desulfurization components, computer testing facilities and wastewater structures can also be accommodated.

Engineering

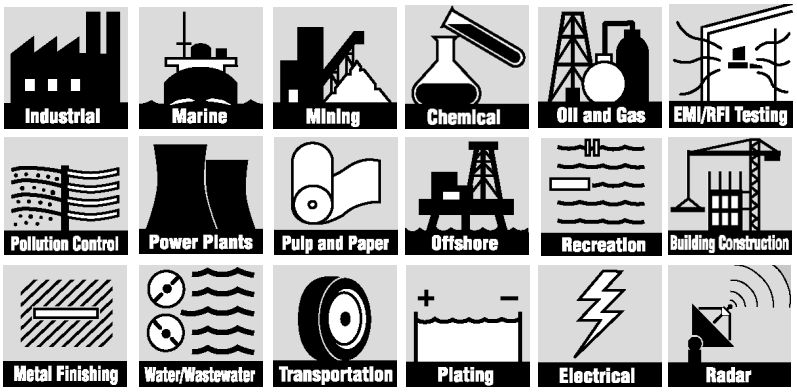
Strongwell has on staff registered professional engineers experienced in the design of fiberglass structures and systems for custom design requirements. Strongwell's extensive experience in fabrication procedures, joint design and stress analysis of the composite assemblies combined with the use of Strongwell's fiberglass products result in structures of superior, cost-effective design and structural integrity. Clear, straightforward drawings of structures are provided to the customer for approval before fabrication begins unless customer drawings are provided.

Features

The many inherent features of fiberglass can be used to an engineer's advantange in fabricated structures. Today, fiberglass fabricated structures are solving problems in a wide variety of markets and applications. Some of these features include:

- Corrosion Resistant
- Nonconductive—Thermally and Electrically
- Nonmagnetic—Electromagnetic Transparency
- Lightweight — Weighs 80% less than Steel
- High Strength
- Dimensional Stability
- Low Maintenance
- Easy Assembly

Materials of Construction



Strongwell offers the broadest range of fiberglass structural materials and systems available from a single source. A brief description of some of the products typically used in fiberglass fabrications are given below.

EXTREN® fiberglass structural shapes and plate are produced in three different series and in more than 100 shapes and sizes.

- EXTREN® 500: An all-purpose line utilizing an isophthalic polyester resin with a UV inhibitor.
- EXTREN® 525: An all-purpose line utilizing a fire retardant isophthalic polyester resin with a UV inhibitor.
- EXTREN® 625: A premium series, both fire retardant and highly corrosion resistant, utilizing a vinyl ester resin with a UV inhibitor.

High Strength Fiberglass Grating manufactured by Strongwell includes:

- **DURADEK®** — a standard line of pultruded bar-type grating with either "I" or "T" bar shapes that can be designed and used like traditional metal grates.
- **DURAGRID®** — custom grating systems offering selections of open space, bar shape, cross-rod placement, resin, color and types of grit surfacing.
- **DURAGRATE®** — a molded fiberglass grating with one-piece grating panel construction preferred for many industrial applications.

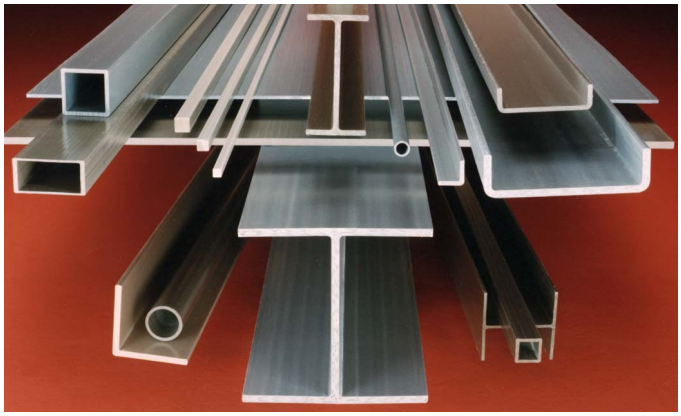
FIBREBOLT® fiberglass studs and nuts are ideal for applications requiring mechanical fasteners that must be strong, non-corrosive and/or non-conductive.

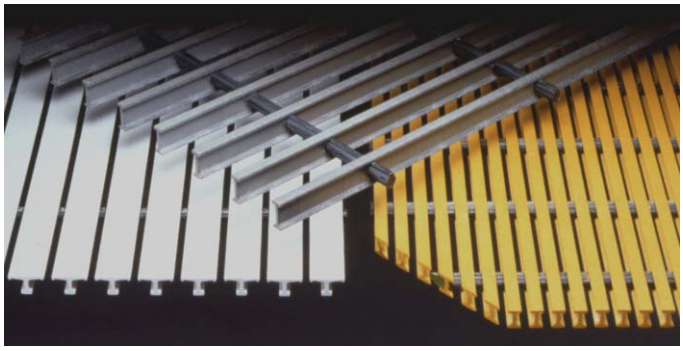
DURASHIELD® fiberglass foam core panel is a tongue-and-groove fiberglass pultruded panel comprised of a pultruded skin over foam core. The panel sizes are: 1" x 12" (R Factor 7) and 3" x 24" (R Factor 21).

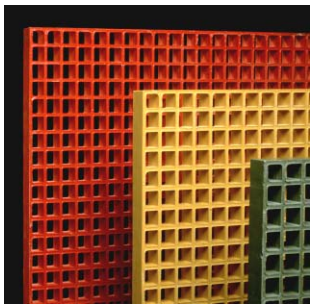
Fiberglass Flooring and Decking Systems are designed to provide a continuous solid surface for applications such as temporary flooring, covers and decking. SAFPLANK® panels interlock and SAFDECK™ panels overlap. The systems are intended to replace wood, aluminum or steel in corrosive environments.

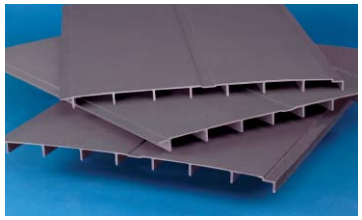
COMPOSOLITE® fiberglass building panel system is an advanced composites building panel system for structural applications. Interlocking components make it possible to design fiberglass structures at significantly lower costs for a broad range of construction applications such as bridge decks and enclosure systems, platforms and walkways, tank covers, and cellular enclosures.

(NOTE: COMPOSOLITE® is a registered trademark of Maunsell Structural Plastics, Ltd. and used by Strongwell Corporation pursuant to license.)









Fiberglass Platforms and Walkways

Above: Stairway/walkway structures of EXTREN® solve corrosion problems in chemical processing environments.

Left: A system of FRP spiral stairs and landings circle the Cordova Park Observation Tower at Red Rock Lake near Des Moint, Iowa.

Below: Expansion of the Moffat Filter Plant in Denver, Colorado included designing fiberglass platforms and walkways over three 35' high tanks.

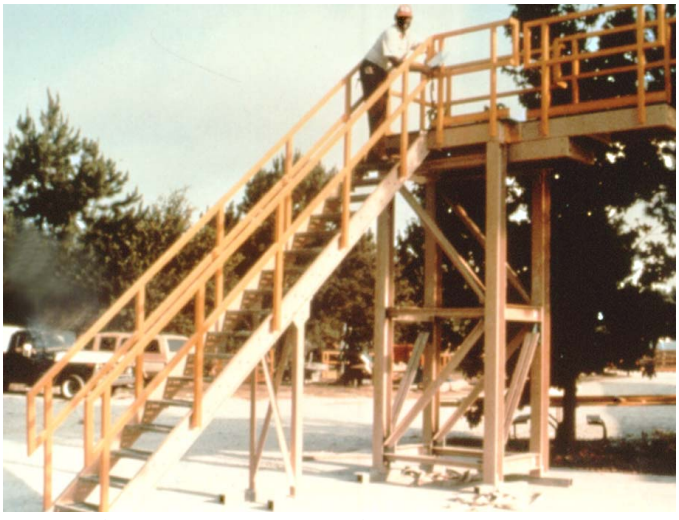
Raised Floor Systems, Custom Designed Platforms

Above: Fiberglass walkways and operating platforms are used extensively in the highly corrosive SXEW copper refinery at Minera Escondida Limitada, Chile.

Above: FRP was chosen for this three-story fire escape because fiberglass would not require painting or maintenance.

Above: A raised floor, in the processing room of a California film development laboratory, surrounds existing equipment, provides access above and below the floor, withstands the corrosive environment and provides 200 lbs/sq.ft. load capacity to support heavy machinery.

Above: This Well Bay Platform was easy to install requiring no heavy equipment, cutting torches or welding to make field modifications, thereby saving the cost of shutting wells down.



Above: All fiberglass tank car loading platform is a special cantilevered design.

Ladders, Ladder Cages, Handrail

Fiberglass ladders and ladder cages fabricated by Strongwell are in use today in a wide variety of severe environments - chemical, water/wastewater, pulp and paper, mining, plating, oil and gas, marine and general industry. Some of these installations have been in constant service for over 20 years with little or no maintenance.

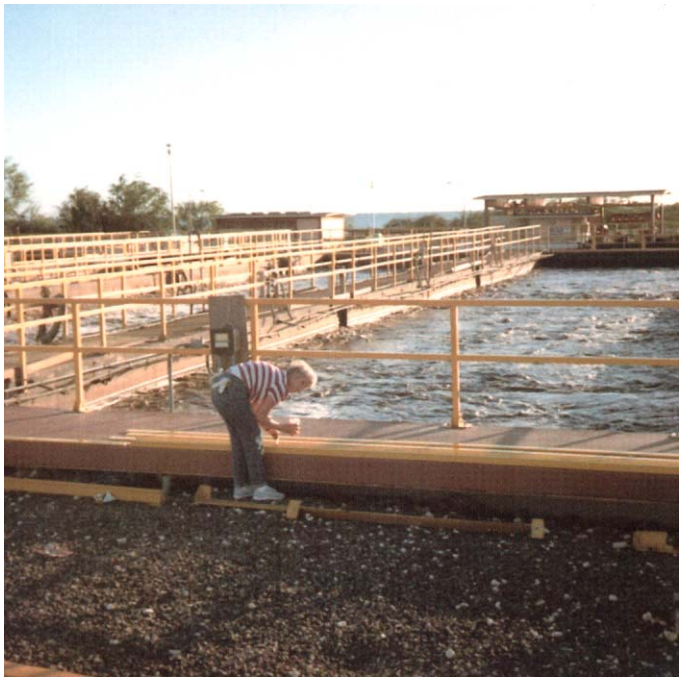
Strongwell ladders meet the requirements of OSHA 1910.27. Ladders and ladder cages manufactured from Strongwell are used in wet well applications, on the sides of chemical storage tanks, and in access and service areas throughout the country.

Both standard and custom handrail systems are manufactured by Strongwell. SAFRAIL™ fiberglass handrail is a standard system that is available for customer fabrication on site or can be prefabricated by Strongwell. Custom handrail can be designed and fabricated to suit specific customer needs.

Left: Fiberglass Access Ladders and Walkways are used throughout the service areas of Sea World, Orlando, FL to resist saltwater corrosion and reduce maintenance costs.
Top: Strongwell SAFRAIL™ handrail systems, ladders and ladder cages provide safe, corrosion-resistant walkways and work platforms around caustic chemical storage tanks in a broad range of markets and industries.
Below: Custom vertical handrail systems, such as the one designed for the City of Indianapolis Wastewater Treatment Plant, can be made to meet specific building codes and requirements.

Water/Wastewater Products - Handrails, Grating, Structures

Corrosion of metal structures in water/wastewater plants is severe. It requires constant maintenance, downtime and replacement. Low maintenance fiberglass structures are ideal for this environment because they are lightweight, corrosion resistant and easy to install.



Above: Lightweight, corrosion resistant 24" fiberglass I-beams span 45' to bridge clarifiers at the Las Rusias, Texas Waste Water Treatment Plant.
Left: 2,500' of handrail was installed at the Fort Kamehameha Wastewater Treatment Facility, Pearl Harbor Naval Base in Hawaii.

Above: Fiberglass grating was installed as media trickling filters at the Des Moines, Iowa Wastewater Treatment Plant.

Above: Low maintenance fiberglass grating provides trouble free operations for the Wastewater Treatment Plant Headworks covers and walkways in Lakewood, Colorado.

All-Fiberglass Buildings, Structures and Enclosures

All-fiberglass buildings are transparent to electro-magnetic waves, have high dielectric strength, are structurally strong and have effective insulation properties. Shielding can also be accomplished utilizing different manufacturing techniques.

Test facility fabricated of EXTREN®, DURASHIELD® and FIBREBOLT® for Compaq Computer Corporation.

EXTREN® fiberglass plate and structural shapes were used for cellular shielding that matched the style and appearance of the Santa Ana Historical building.

This all-fiberglass facility for Amador Corp. assures RFI/EMI compliance in testing computers as well as other manufactured equipment.

Architectural Applications

A 37' tall, all-fiberglass, gold leaf clad Spire, installed in 1991 atop the 55-story C&S Building is the golden high point on the Atlanta skyline. The fiberglass Spire is transparent to electromagnetic waves and houses communications antennae. Architects believe the fiberglass Spire aesthetically enhances Atlanta's tallest building — making it the city's landmark skyscraper. In addition, the Spire is extremely valuable real estate — prime antennae rental space is scarce and expensive.

Fiberglass solves corrosion and maintenance problems for hotel/motel applications. Prefabricated lightweight fiberglass structures, handrail, stairs and landings can be designed to blend into existing architecture.

Pollution Control Products

Fiberglass products are ideal for upgrades and renovations required by Clean Air Act Amendments, Water Pollution Control and Solid Waste Regulations.

Typical markets include scrubbers for coalfueled power plants, metal smelters, municipal incinerators and chemical processors. Applications for fiberglass products and structures include water/wastewater, tank covers over corrosive chemicals, roofs over corrosive processes (such as pulp and paper operations), all-fiberglass buildings that contain corrosive and toxic fumes and fiberglass grating in hazardous waste storage buildings.

Corrosion resistant, and easy to fabricate, fiberglass can be a cost effective, reliable problem solver. Increased service life and reduced maintenance costs are inherent advantages of using fiberglass systems.

Below: Mist Eliminator Vanes are assembled on an ongoing basis for ABB Environmental. The pultruded vanes are assembled to compression molded end caps and prefabricated in large sections.

Equipment/Facilities, Fiberglass Roofs and Covers

To meet EPA and OSHA standards in severly corrosive environments such as pulp and paper plants, chemical plants, and oil refineries, DURASHIELD® and EXTREN® have been fabricated into enclosures to contain corrosive and toxic fumes and solutions. In many cases, all-fiberglass containment has been the final solution to critical pollution problems that all other materials have failed to meet.

Right: A pulp plant in Canada replaced 70' x 120' corroded wooden covers over anaerobic digesters with fiberglass covers to satisfy government regulations. EXTREN® and DURASHIELD® were used to fabricate the covers. Design prefabrication and supervision of installation was completed by Strongwell.

Below: This subfloor for hazardous materials storage is specially designed with openings to allow spills to run into a containment reservoir.

Above: Trusses for this tank cover used at a Shell Oil Refinery were preassembled and shipped to the site...

... the trusses were then joined into a structural framework...

... final fabrication using EXTREN® plate and fittings was easily completed at the site.

ISO-9001 Certified Manufacturing Plants

BRISTOL DIVISION
400 Commonwealth Ave., P.O. Box 580, Bristol, VA 24201-3820 USA
(276)645-8000 FAX (276)645-8132

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

www.strongwell.com

BB10M1202