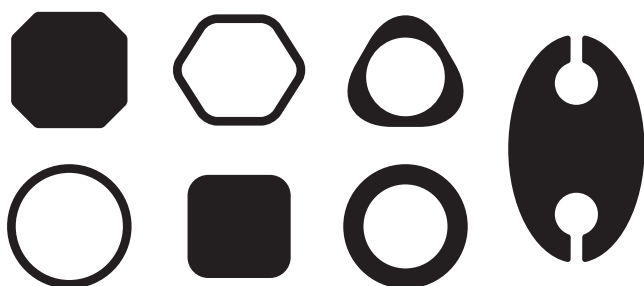




# FIBERGLASS TOOL HANDLES



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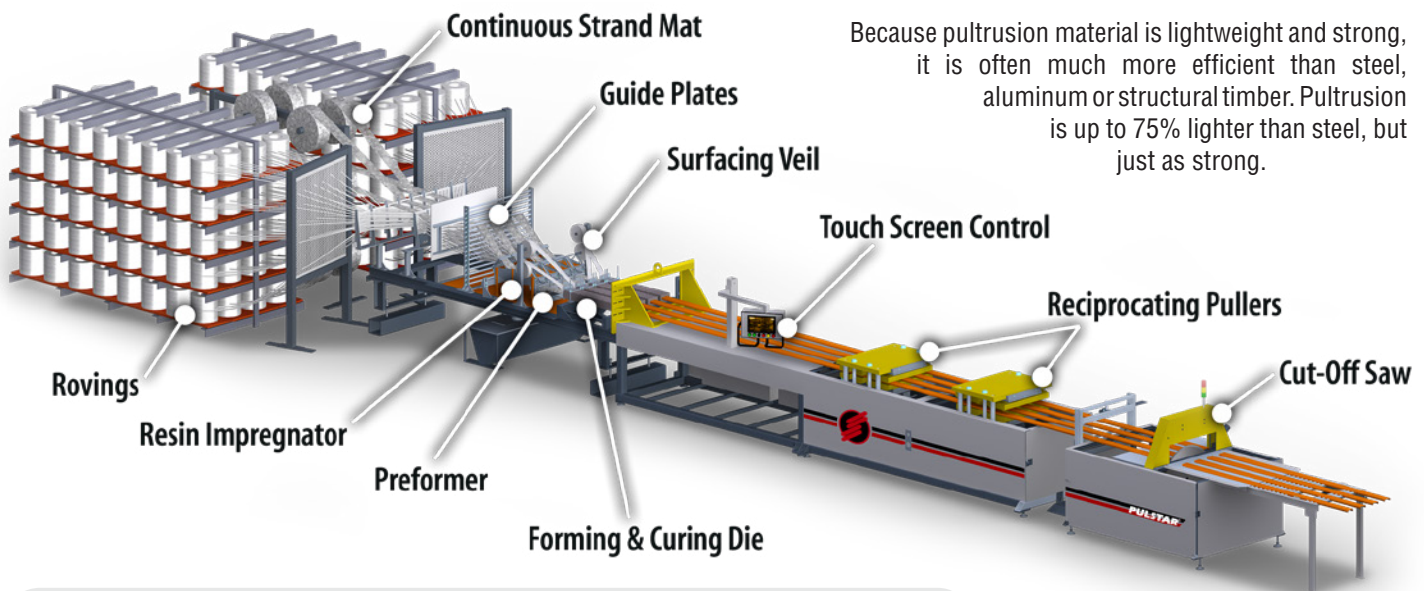
## Manufacturing Process

Strongwell manufactures a wide variety of quality solid and hollow, standard sized and custom-shaped fiber reinforced polymer (FRP) tubes and rods for tool handles. Profiles can be round, square, oval or a variety of custom shapes. Strongwell's FRP handles are manufactured to be corrosion resistant, non-conductive and non-magnetic, among other features. Handles can also be made to be fire retardant.

Each pultruded FRP handle profile can be produced using a wide range of resin systems, glass matrix options and colors. Strongwell's on-staff engineers can help design your handle profile to maximize strength while reducing weight and cost.

All of Strongwell's FRP tubes and rods are produced using the pultrusion process, which is easier to design with, longer lasting and a safer product for the end user than with other alternative materials, like steel and aluminum.

Because pultrusion material is lightweight and strong, it is often much more efficient than steel, aluminum or structural timber. Pultrusion is up to 75% lighter than steel, but just as strong.



## BENEFITS OF PULTRUDED FIBER REINFORCED POLYMER COMPOSITES



### Corrosion Resistance

Superior resistance to a broad range of chemicals. Unaffected by moisture or immersion in water when sealed. Will not rust like metal and will not rot like wood.



### High Strength

Stronger than steel and aluminum, pound-for-pound in lengthwise direction. This makes holding, using and transporting tools easier.



### Lightweight

Pultruded fiberglass shapes generally weigh 75-80% less than similar steel shapes and 30% less than similar aluminum shapes.



### Durability & Weatherability

Resists impact, non-denting and hard to break. Pigmented resin, surfacing veil and UV-Inhibitors prevent moisture absorption and warping.



### Low Conductivity

Low electrical and thermal conductivity properties and high dielectric capability. This means it won't spark or conduct electricity, nor will it transmit cold or heat to the hands.



### Virtually Maintenance Free

Will not permanently deform under impact. Corrosion resistance eliminates need for constant painting and upkeep. Provides long-term, cost effective solutions with lower life cycle costs.



### Versatility

FRP can be pultruded in a wide variety of profiles for many different markets. Multiple resin types and custom color options are available.



### Easy Installation

Can be field fabricated using simple carpenter tools and is easily lifted into place during installation.



For over 60 years Strongwell has been the world leader in the FRP pultrusion industry. With more than 60 pultrusion machines and three separate manufacturing locations to serve customers, Strongwell delivers quality products, service and technical support. Strongwell's engineers, technical and production staff, along with in-house Quality Assurance and Customer Service teams provide prompt and professional assistance with your fiberglass tool handle needs.



If you are not sure what you need, Strongwell's expert staff can assist you in the design of your specific product need and see it through the entire manufacturing process. Contact Strongwell to get started or for a price quote.

Strongwell currently has tooling for approximately 180 different tube and 70 different solid rod profiles, which can save customers on tooling costs, time and money. When it comes to tool handle applications, Strongwell has the most popular shapes and sizes already tooled for you. Additionally, many tube sizes can be nested to create telescoping poles.

Left: Tool Handle pultrusion

## Die and Mandrel Combination Chart

- This combination is invalid, contact Strongwell to discuss options
- This combination is in active production
- Available combination

		Mandrel Size (ID)																																				
		0.410	0.505	0.531	0.550	0.688	0.720	0.750	0.751	0.780	0.787	0.792	0.802	0.840	0.850	0.864	0.875	0.942	0.949	0.962	1.000	1.005	1.030	1.044	1.045	1.054	1.094	1.125	1.250	1.300	1.345	1.510	1.546	1.748	1.756	2.496		
Die Size (OD)	0.507	●																																				
	0.750				●																																	
	0.755		●																																			
	0.879					●																																
	0.942									●																												
	0.956							●																														
	0.962						●			●																												
	0.998														●																							
	1.004							●					●	●	●	●																						
	1.014													●																								
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	1.050								●	●						●																						
	1.068			●													●	●																				
	1.108																●																					
	1.131					●		●										●																				
	1.210																		●	●	●		●				●											
	1.250																●	●				●	●		●		●	●										
	1.261							●													●	●		●	●			●										
	1.266																					●	●		●		●											
	1.291																										●											
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	1.500																					●								●								
	1.503							●													●	●									●	●	●					
	1.756																																	●	●			
	1.916																																		●			
	2.006																																			●		
	2.649																																				●	

## Color Options

Pigmenting the resin in the pultrusion process produces the bright, attractive colors of FRP tool handles. Because the color is consistent throughout the finished part, no painting is needed, so concerns with chipping and peeling are eliminated.

Strongwell offers several standard colors. Special color requests can be considered and targeted for approximate color requirements. Pantone and RAL color chips are used as reference standards for color development.

Yellow	Safety Flo-Green	Light Gray	Non-Pigmented	Orange	White
Safety Yellow	Green	Slate Gray	Light Blue	Red	Beige
Honey Mustard	Olive Green	Black	Dark Blue		

*Colors may not be accurate representations of finished products.*

## Standard Resin Options

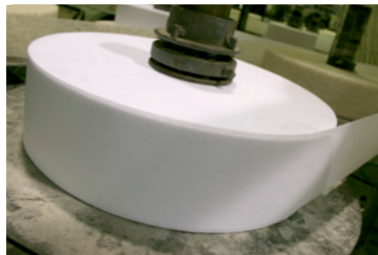
Fiberglass reinforcements are saturated in a resin mixture which is cured and hardened using a heated forming die. Standard resin options are:

- Polyester
- Polyester Fire Retardant
- Vinyl Ester
- Vinyl Ester Fire Retardant
- Epoxy



## Surface Veil Options

All Strongwell tool handles include a polyester or nylon surfacing veil to provide UV resistance and a smooth, consistent finished surface. Custom veil options are available upon request.



## Typical tolerances for Tool Handle profiles *(Contact for specific tolerances per profile shape and size.)*

Outside Dimension	$\pm 0.020$ "	General tolerance, contact Strongwell for specifics
Inside Dimension	$\pm 0.010$ "	General tolerance, contact Strongwell for specifics
Wall thickness (minimum)	Nominal - 20%	Specified by Strongwell
Straightness over length	0.030" per foot of length	Weight assisted
Angularity of end cuts	$\pm 2^\circ$	
Pultruded lengths	12" up to 288"	Length tolerances: Strongwell specification ES0108
Secondary cut lengths	$\pm 0.063$ "	Minimum length tolerance
Visual Specification	Tool Handles	Strongwell specification ES0105

## Telescoping Poles

Strongwell is the leader in FRP tool handle quality. Consistency in nominal dimensions is key when manufacturing tubes for telescoping poles and handles. Strongwell maintains a rigorous quality program and all tool handle manufacturing facilities are ISO-9001 certified. This attention to quality allows Strongwell to provide profiles that can be nested to create telescoping poles.

# TESTING & QUALITY ASSURANCE

## Overview

Strongwell follows a stringent quality process to ensure strength and consistency in finished tool handles. During each manufacturing run, parts undergo first article and intermediate testing based on manufacturing control plans and ISO standards. In addition, each finished tool handle is inspected during the manufacturing process by a skilled operator.

All Strongwell tool handles are manufactured in the U.S.A. in facilities that are ISO-9001 certified. This certification supports assurance of the highest quality of manufacture and on-time shipments.

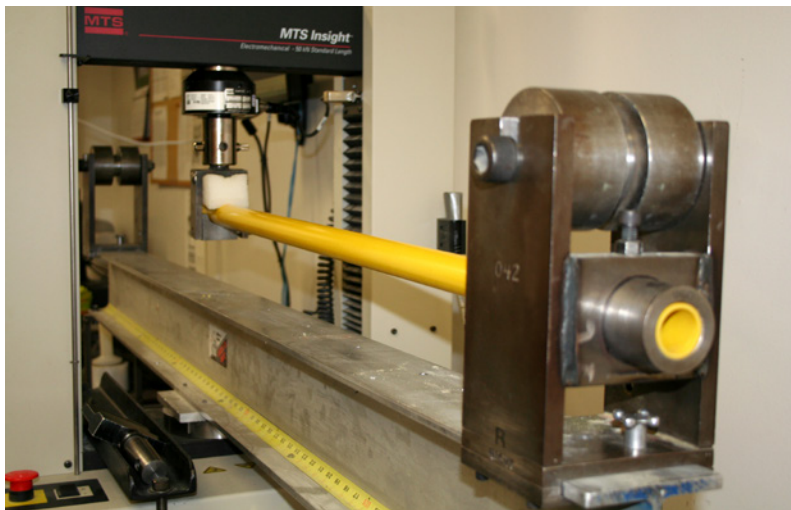
Below are some of the tests performed to ensure Strongwell tool handles meet specification and will perform as expected.



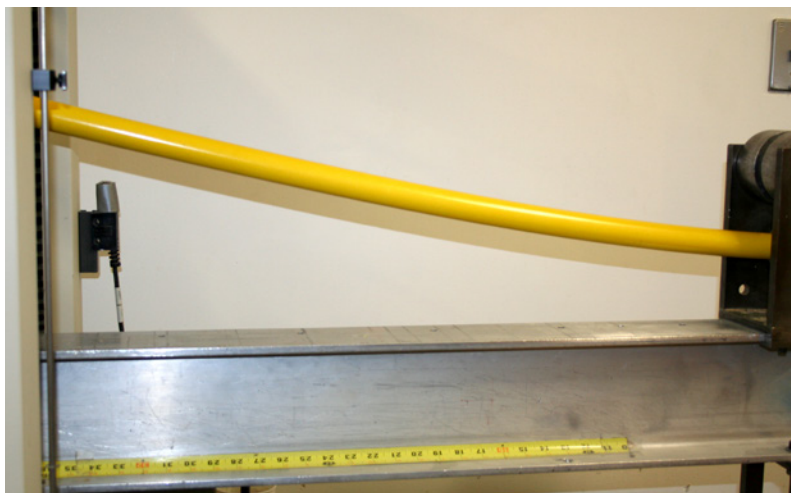
## Cantilever Test

As seen below, one end of the tube sample is placed in an appropriate-sized collar while the other is clamped into a saddle which applies a load at a predetermined span distance.

The resultant cantilever strength may be communicated as either an ultimate load (total load expressed in pounds) or as a span-load calculation (strength expressed as the product of span and load).



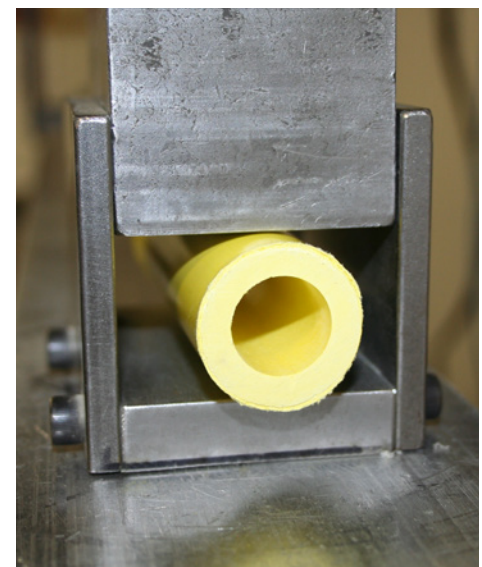
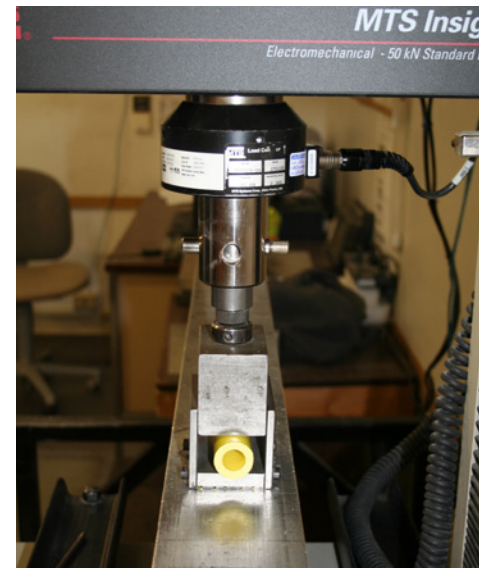
*End View Cantilever*



*Side View Cantilever*

## Crush Test

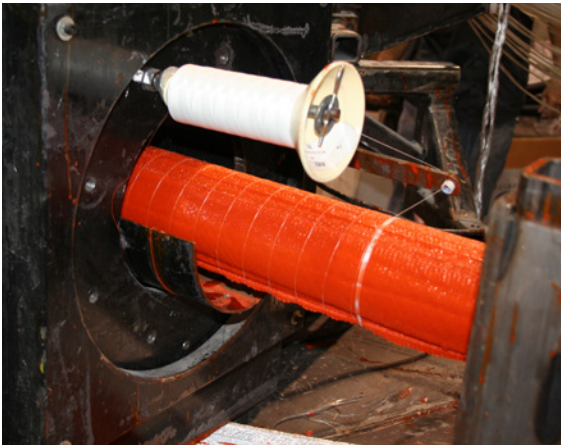
As seen below, a tube sample is placed in a test jig where the load is applied, crushing the sample to failure.





## SPECIAL PULTRUSION PROCESSES

- Foam-filled and plastic core (*Right*): Many tool handles utilize a foam or plastic core to offer additional crush strength or improve connection points for tool heads or screw attachments, etc.)
- Circumferential wrap pultrusion (*Below-Left*): Adds reinforcements in the 90° direction adds crosswise strength to pultruded tubes, which can be useful for screw strength improvement.
- Printed Veil (*Below-Right*): Permanent text or graphics (including patterns, such as camouflage) can be “printed” on pultruded parts during the manufacturing process utilizing a custom polyester or nylon veil.

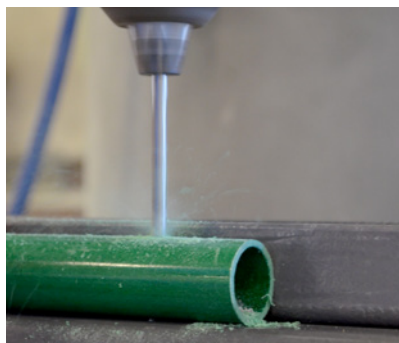


## FABRICATION, ASSEMBLY & LABELING

In addition to its full manufacturing capabilities, Strongwell can fabricate any of the tool handles it manufactures. Common operations for tool handle profiles include:

- drilling
- chamfering
- pointing
- mitering
- slotting
- routing
- custom labeling
- other operations based on customer requirements

If your application requires fabrication of parts, Strongwell has the experience and capacity to meet your needs.





# WHY CHOOSE STRONGWELL?

Strongwell is the world's largest pultrusion company and the recognized leader in the pultrusion industry. Strongwell has pultruded fiber reinforced polymer (FRP) composite structural products since 1956 and today offers unequaled capacity, versatility and flexibility to meet the needs of its customers and allied partners. Here are a few specific reasons you should select Strongwell as your manufacturer of choice:

- **Reliable, Long-Term Supplier:** Strongwell has an outstanding track record of stable ownership and management, excellent debt-free financial strength and a well-branded business reputation.
- **Manufacturing Capacity and Pultrusion Expertise:** Strongwell has more capacity than any other pultrusion company, owning more than 60 pultrusion machines and over 645,000 square feet of manufacturing space. Strongwell designs and builds its own machinery, dies and auxiliary tooling, which offers great flexibility to its customers based on demand.
- **Value-Added Capabilities:** In addition to pultrusion, Strongwell offers in-house structural fabrication, a machine shop, and numerous other value-added operations up to and including assembling finished products.
- **Assurance of Quality:** All three Strongwell tool handle manufacturing locations hold ISO-9001 certification which supports assurance of quality and on-time shipments.
- **Materials, Process Technology and Engineering Support:** Strongwell has a 10,000 square-foot, fully-staffed laboratory capable of conducting nearly all ASTM or other mechanical testing on its products. Technical support is offered from design, process and structural engineers to assist in technology advancement and product development.

Strongwell also has working relationships with multiple academic engineering partners.

- **Materials Technology:** Strongwell has ongoing joint development programs with first class raw material suppliers for both specific and general improvements to pultrusion raw materials. Often something learned in developing a raw material for one product proves broadly and specifically applicable to other products in cradle-to-grave life cycle analysis.

- **Green Commitment:** As a responsible corporate citizen, Strongwell continually seeks to improve its manufacturing practices to further protect the environment, while providing essential, environmentally friendly products to its customers.

- **Made in the U.S.A.:** When you order a tool handle from Strongwell, you will receive a product made exclusively in the U.S.A. by workers who take pride in the products they make. Strongwell is proud its tool handles have been used in the building of America.

- **Longevity:** Strongwell has been manufacturing FRP through pultrusion since 1956, and has been manufacturing its line of tough, long-lasting fiberglass tool handles since 1972.

The company is financially strong, total quality oriented, technically advanced, and customer focused. Strongwell's customers include Fortune 500 industrial and commercial firms, major architectural and engineering firms, leading contractors and distributors, and many other companies - both large and small - in a variety of markets.

Learn more by visiting [www.strongwell.com](http://www.strongwell.com).





**CHATFIELD LOCATION**

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