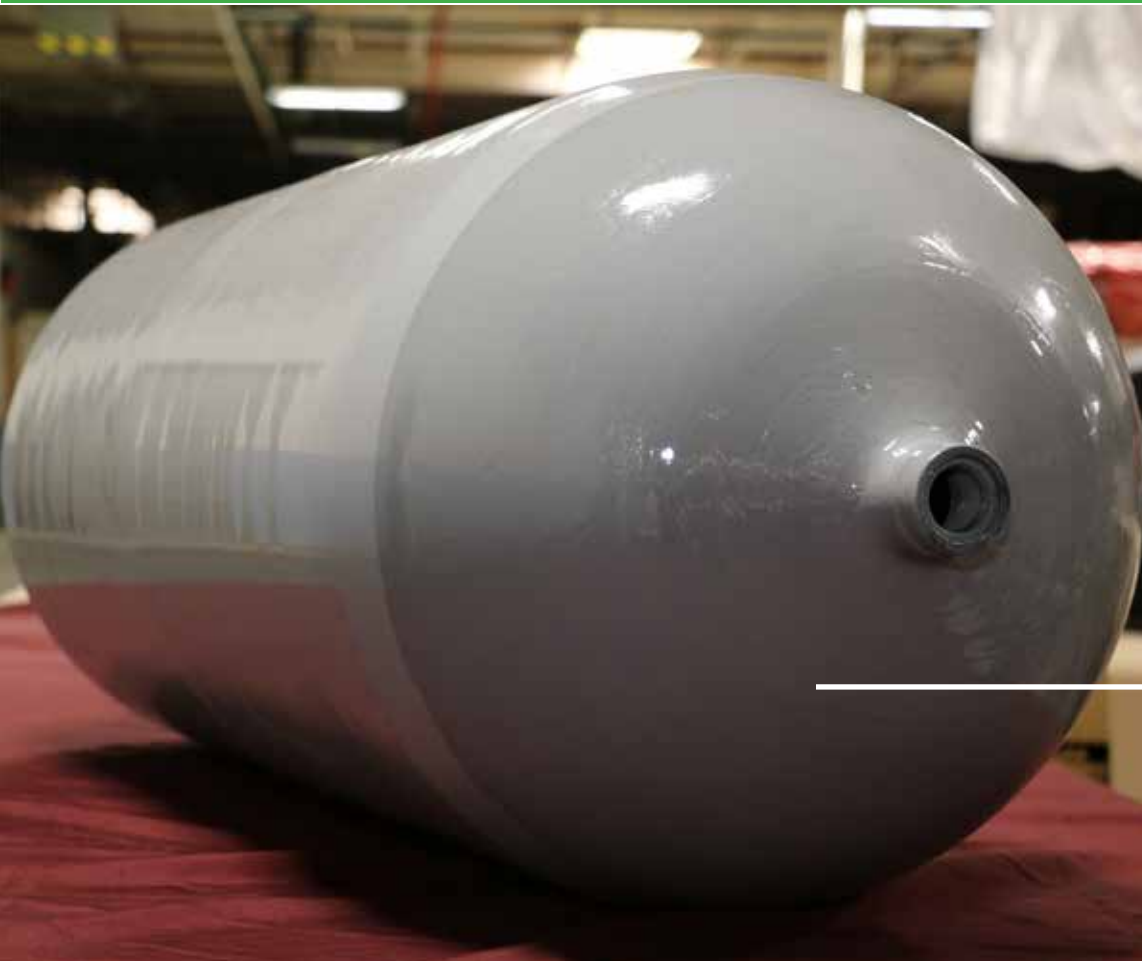


**WIRE TOUGH**

Cylinders LLC

# TYPE II-S CYLINDERS

Stronger, lighter, safe and cost effective  
CNG & Hydrogen storage

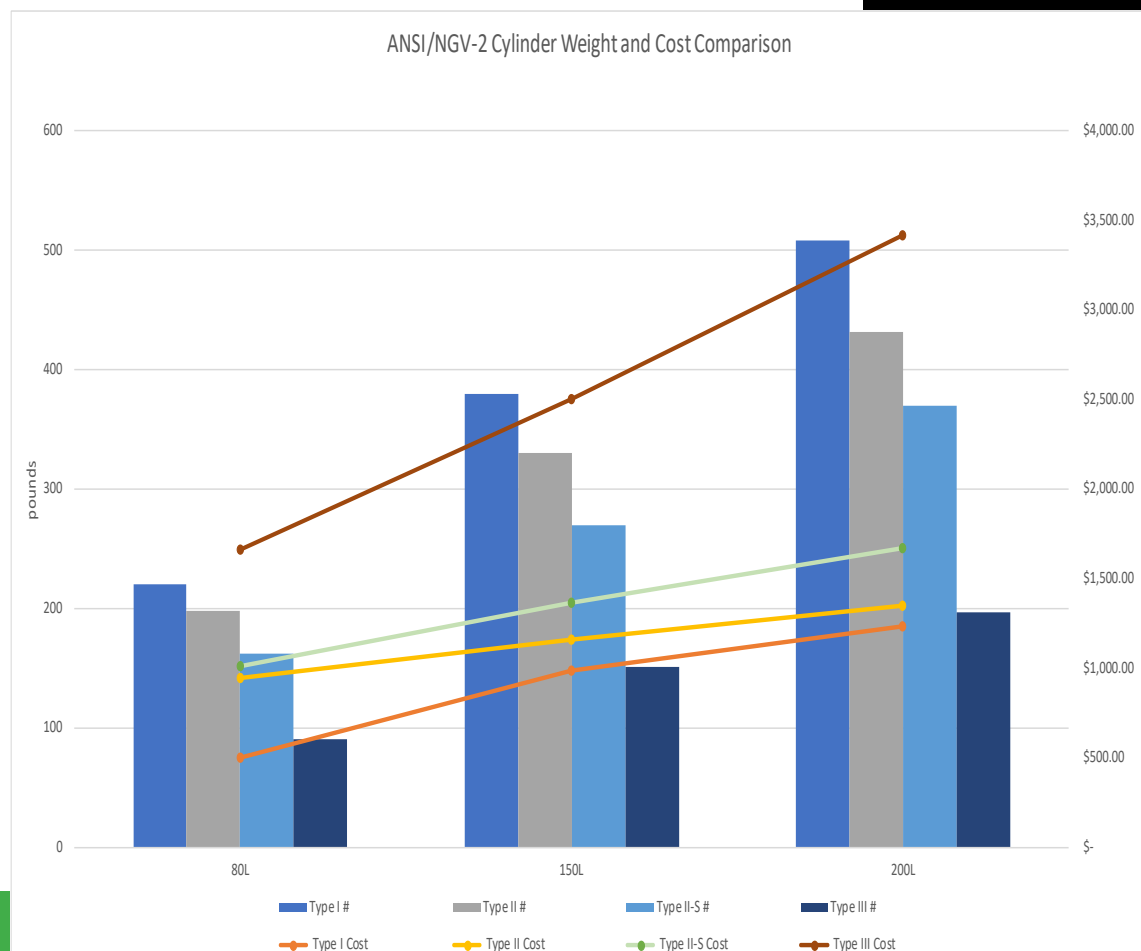


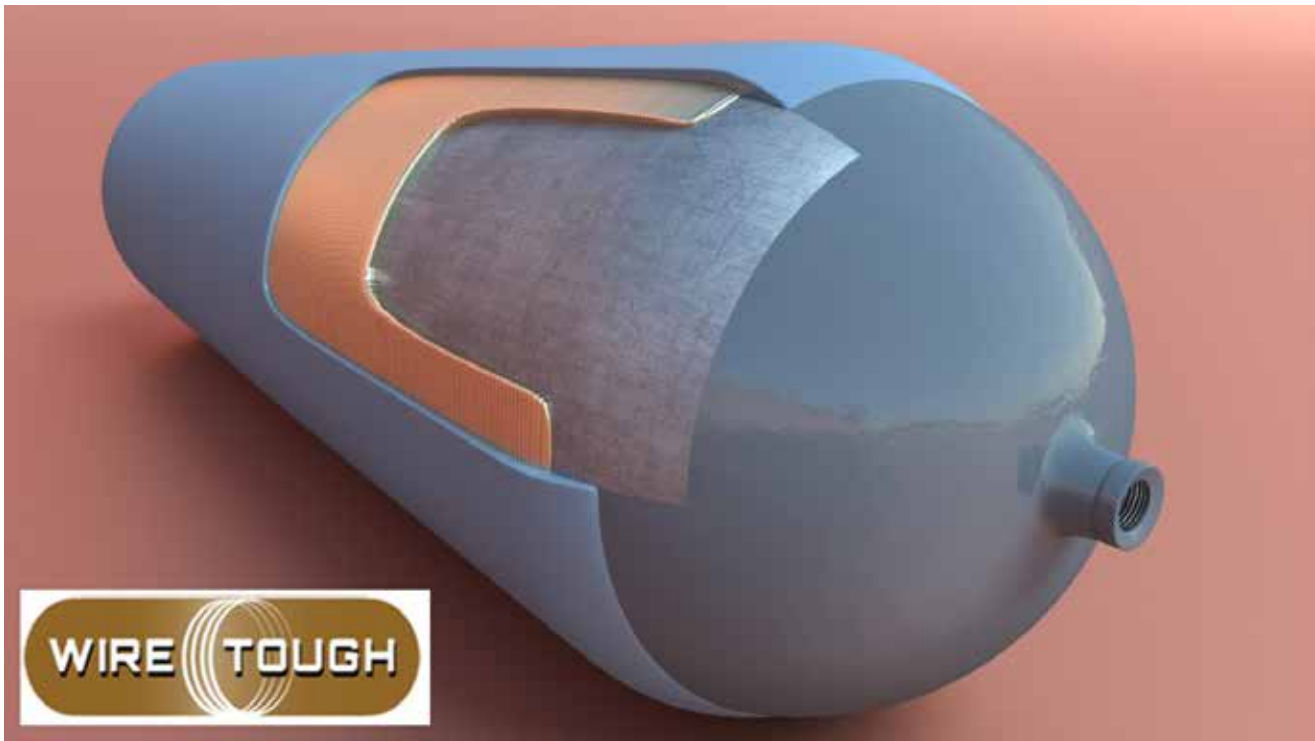
# Type II-S

## What is it?

WireTough has designated their cylinders as Type II-S to differentiate them from Type II cylinders wrapped with fiberglass or carbon fiber. WireTough's Type II-S cylinders are over 25% lighter than a Type I Cylinder, 20% lighter than a standard Type II Cylinder, and over 40% cheaper than a Type III Cylinder. Stronger, more durable and extremely safe.

WireTough's Type II-S cylinder design uses a standard seamless steel liner that is wrapped with several layers of very high strength steel wire filaments, held together by epoxy. WireTough's technology is patented and proprietary. The high ductility of steel wires (>15%) in the wrap allows the cylinders to be pressurized to greater than two-times of their maximum allowable pressure during service. This over-pressurization process is called "autofrettage" and it causes plastic flow in the liner and locks high compressive stresses in the entire cross-section of the liner considerably enhancing the tank's fatigue life during service. Fatigue life is a key issue in storing all gases, particularly corrosive gases like hydrogen.





## Type II-S Advantages

Steel liners wrapped with carbon or glass fiber are limited in their ability to sustain high autofrettage pressures because of their low ductility. Hence, they do not bring the benefits of long cycle life that WireTough's cylinders offer. Type II-S wire-wound steel cylinders were first introduced in 2011 as onboard CNG storage tanks in vehicles. Extensive testing has been conducted to demonstrate the superior resistance to impact if accidentally dropped, ballistic testing, salt-water corrosion resistance, and fire as seen in the pictures below.



(Left) Picture showing the performance of the WireTough Type II-S tank in a ballistic test involving 50 caliber gun fire. The damage from a 30-caliber test was minimal. (Right) The exterior surface condition of the Type II-S cylinder after a bonfire test showing that the steel wrap was still intact.



Exterior surface of the Type II-S tank after exposure to salt-water for 28 days while being cycled for 3,200 cycles. Note that a crack like notch was machined in the cylinder prior to the exposure to salt-water

# Type II-S

## Quick Reference



### Lighter in Weight

WireTough Type II-S cylinders are on average 20% lighter than standard Type II cylinders, 40% lighter than Type I cylinders.



### Cost to Weight Ratio

WireTough Type II-S cylinders are three to four times less expensive per pound than a Type III cylinder, thus making WireTough Type II-S cylinders a viable option to save on both weight and budget.



### Certified & Safe

All WireTough cylinders meet and exceed testing requirements per the standard. Every order comes with required documentation and owner's manual.



### Warranty

WireTough warrants that new products of its own manufacture will be free from defects in material and workmanship and will be in compliance with specifications set forth in the accompanying Purchase Order at the time of shipment and subject to all other provisions and limitations herein after set forth for one (1) year from date of shipment, provided equipment is installed, operated and maintained in accordance with its intended use and WireTough's written performance specifications.



# WireTough

## Product Line



### **ANSI/NGV-2 Type II-S Cylinders**

#### **57L ANSI/NGV-2 Cylinder**

Tank Length: 31" (787 mm)  
Outside Diameter: 14.3" (363 mm)  
Weight in lbs: 132 lb  
Neck Thread: 1-1/8"UNF  
Number of Necks: 1  
Service Life: 20 years  
Service Pressure Rating: 3,600 psi  
Product ID: WT14031057

#### **80L ANSI/NGV-2 Cylinders**

Tank Length: 31.7" (805 mm)  
Outside Diameter: 16.5" (419 mm)  
Weight in lbs: 162 lb  
Neck Thread: 1-1/8"UNF  
Number of Necks: 1  
Service Life: 20 years  
Service Pressure Rating: 3,600 psi  
Product ID: WT341632

#### **150L ANSI/NGV-2 Cylinders**

Tank Length: 55" (1397 mm)  
Outside Diameter: 16.5" (363 mm)  
Weight in lbs: 270 lb  
Neck Thread: 1-1/8"UNF  
Number of Necks: 2  
Service Life: 20 years  
Service Pressure Rating: 3,600 psi  
Product ID: WT341659

### **200L ANSI/NGV-2 Cylinders**

Tank Length: 74.5" (1892 mm)  
Outside Diameter: 16.5" (419 mm)  
Weight in lbs: 410 lb  
Neck Thread: 1-1/8"UNF  
Number of Necks: 2  
Service Life: 20 years  
Service Pressure Rating: 3,600 psi  
Product ID: WT14031057

### **ASME Type II-S Ground Storage Cylinder**

#### **200L ASME Cylinders**

Tank Length: 77.5" (1968 mm)  
Outside Diameter: 16.5" (419 mm)  
Weight in lbs: 577 lb  
Neck Thread: 1-1/8"UNF  
Number of Necks: 2  
Service Pressure Rating: 4,500 psi  
Product ID: WA341675

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