

Coiled Tubing for Downhole Applications



Tenaris

Tubular technologies. Innovative services.

Tenaris is the leading global manufacturer and supplier of tubular products and services used in the drilling, completion and production of oil and gas and a leading supplier of tubular products and services used in process and power plants and in specialized industrial and automotive applications.

Through our integrated global network of manufacturing, R&D and service facilities, we are working with our customers to meet their needs for the timely supply of high performance products in increasingly complex operating environments.

Coiled Tubing for Downhole Applications

Tenaris is the leading manufacturer of coiled tubing products worldwide.

At our two plants in Houston we have been producing the finest grades of downhole tubing for the oil and gas industry since 1991.

We offer a range of downhole products tailored to the specific demands of an expanding spectrum of downhole coiled tubing applications. From standard well workover and

velocity / production strings to logging, drilling and special application strings with factory installed wireline, capillary tubes, or integral tools, Tenaris designs and builds the tubing string best suited to ensure the success of the project. A sampling of products include REEL - TAPER™ tapered tubing string and FRee™ - internal flash removed coiled tubing.

Quality

Today's oil and gas industry requires that coiled tubing meet the most complete quality standards. Tenaris ensures the supply of the highest quality coiled tubing products through its Quality Assurance System, (which includes ISO-9001 certification).

▼ Coiled tubing drilling rig #1 located in Canada.





► *Slit master coils are ready for assembly.*

Applications

The use of coiled tubing for oil and gas well service operations has increased significantly over the past 10 years.

Tenaris provides coiled tubing for a variety of applications, including:

Wellbore Cleanouts: Coiled tubing can be injected and used as a siphon string to remove scale, produced sand, frac sand and debris.

Fishing: Coiled tubing is used to convey fishing tool to deliver jarring action in longer horizontal wellbore configurations.

Electric Line: A multi-electric line conductor can be pumped into the coiled tubing to act as a carrier for the electric line. Traditional logging equipment can be connected to the end of the tube to carry out logging, drilling and gather other valuable data during operations.

Fracturing: In some applications the coiled tubing can be used for high pressure pump-

ing to apply high pressure to the potential producing reservoir, causing break down near the well bore and improving permeability and improving the reservoir properties.

Velocity Strings: Coiled tubing is run into an existing producing well to reduce the effective flow area to allow the natural reservoir pressure to lift water from the reservoir allowing natural pressure to sustain production in mature producing wells.

Electrical Submersible Pump Cable Conduit: An ESP cable can be inserted into the coiled tubing prior to installation, enabling the tubing to become a support member for the ESP cable for rapid deployment and retrieval of ESPs.

Drilling: Improvements have been made in recent years using downhole motors for

drilling. Advancements have enabled new techniques for lateral wellbore drilling from a “mother bore”. Some new coiled tubing drilling rigs have the capability to drill and case well with dramatic improvements in time savings. Indications are that advancements with heavy duty coiled tubing drilling technology are leading to larger 3-1/2” and 4-1/2” tubing for drilling requirements.

Pipeline Cleanout: Coiled tubing may be used as a conduit that can be pushed into the pipeline with special tooling attached at the end. The conduit allows specialized chemicals to be pumped at pressure to remove scale and wax accumulations in the pipeline.

Setting Industry Standards

Tenaris has been setting industry records since it began producing coiled tubing.

Tenaris was the first in the industry to produce 2-7/8", 3-1/2" and 4-1/2" OD coiled tubing and the first in the world certified to ISO 9001. Tenaris has produced the world's heaviest as well as the world's longest continuously milled coiled tubing work strings.

The coiled tubing produced by Tenaris is high frequency induction welded while stainless steel products are laser welded to ensure maximum precision and durability.

Always under ISO 9000 product control, coiled tubing can be manufactured in a variety of grades and cleanliness levels with pressure ratings up to 15,000 psi. The base tube of the "laser welded" product is made from lean duplex stainless steel (HS-80 CRA) or carbon steel in continuous coils. The tube is then heat-treated, spooled and hydrotested and prepared for shipping.

| MATERIAL SPECIFICATIONS | | | | | |
|--------------------------------|-----------------------------|------------------------|------------------------|-----------------------|------------------------|
| | | HS-70 CM™ HS-70 W™ | HS-80 CM™ HS-80 W™ | HS-90 CM™ HS-90 W™ | HS-110 CM™ |
| Physical properties | Minimum Yield Strength | 70,000 psi | 80,000 psi | 90,000 psi | 108,000 psi |
| | Minimum Tensile Strength | 80,000 psi | 88,000 psi | 97,000 psi | 115,000 psi |
| | Minimum Elongation | 30% | 28% | 25% | 22% |
| | Maximum Hardness (Rockwell) | 22C | 22C | 22C | 28C |
| Chemical composition % | Carbon | 0.10 – 0.15 range | 0.10 – 0.15 range | 0.10 – 0.15 range | 0.10 – 0.15 range |
| | Manganese | 0.60 – 0.90 range | 0.60 – 0.90 range | 0.60 – 0.90 range | 1.00 max |
| | Phosphorus | 0.03 max | 0.03 max | 0.025 max | 0.02 max |
| | Sulfur | 0.005 max | 0.005 max | 0.005 max | 0.005 max |
| | Silicon | 0.30 – 0.50 range | 0.30 – 0.50 range | 0.25 – 0.40 range | 0.40 max |
| | Chromium | 0.45 – 0.70 range | 0.45 – 0.70 range | 0.55 – 0.70 range | 0.50 – 0.70 range |
| | Copper | 0.40 max | 0.40 max | 0.20 – 0.40 range | 0.40 max |
| | Aluminum | — | — | 0.040 max | — |
| | Nickel | 0.25 max | 0.25 max | 0.14 – 0.30 range | 0.30 max |
| | Molybdenum | — | — | 0.10 – 0.15 range | 0.25 – 0.45 range |
| Steel alloy description | | A-606 Type 4, Modified | A-606 Type 4, Modified | A-606 Type 4, Moly | A-606 Type 4, Moly UHS |

* NOTE: "CM™" = Continuously Milled Tubing; "W™" = Butt Welded Tube Sections

Benefits

- Allows longer coils without girth welds – up to 50,000' (15,300 m).
- Stainless steel (HS-80 CRA) or carbon steel.
- Diameters from 3/8" (9.5 mm) to 5" (127 mm) and pressure up to 15,000 psi provide many options.
- Longer lengths, quicker delivery, installs efficiently.

HS-80 CRA

Tenaris produces HS-80 CRA – a lean duplex, laser-welded product designed for completion and hang off applications while providing excellent corrosion protection in CO2 and H2S environments.

Testing has been completed in various environments to determine the operating environment in which this product is suited.

Mechanical testing has also been performed to ensure this product can be run utilizing standard coiled tubing handling and BOP equipment.

QA/QC Testing

HS-80 CRA undergoes the same quality testing that conventional coiled tubing undergoes. These tests include crush, flare, hydro

testing and tensile testing. Additionally, this material undergoes a ferrite count to ensure the ferrite and austenite microstructure ratio is within tolerance.

| STEEL SPECIFICATIONS | |
|------------------------|-------------|
| Yield Strength | 80,000 psi |
| Tensile Strength (min) | 110,000 psi |
| Elongation (%) | 25% |
| Hardness | 30 HRC Max |
| Steel Alloy Type | UNS S32001 |

| CHEMICAL COMPOSITION RANGE (%) | | | |
|--------------------------------|-----------|----|-------------|
| C | 0.3 Max | Mo | 0.6 Max |
| Mn | 4.0 – 6.0 | Ni | 1.0 – 3.0 |
| P | 0.040 Max | Cr | 19.5 – 21.5 |
| S | 0.030 Max | N | 0.05 – 0.17 |
| Cu | 1.0 Max | | |

HS 80 CRA PRODUCT SPECIFICATIONS

| DIMENSIONS (inches) | | | | NOMINAL WEIGHT (Lbs / Ft) | TUBE LOAD BODY (lbs) | | INTERNAL PRESSURE (psi) | |
|---------------------|----------------|--------------|-----------------|---------------------------|----------------------|-----------------|-------------------------|------------------------|
| O.D SPECIFIED | WALL SPECIFIED | MINIMUM WALL | I.D. CALCULATED | | YIELD MINIMUM | TONSILE MINIMUM | HYDRO TEST 90% YIELD | INTERNAL YIELD MINIMUM |
| 1.250 | 0.090 | 0.087 | 1.070 | 1.118 | 26,200 | 36,100 | 9,900 | 11,000 |
| 1.250 | 0.125 | 0.122 | 1.000 | 1.506 | 35,300 | 48,600 | 13,700 | 15,200 |
| 1.500 | 0.090 | 0.087 | 1.320 | 1.359 | 31,800 | 43,900 | 8,300 | 9,200 |
| 1.500 | 0.125 | 0.122 | 1.250 | 1.840 | 43,200 | 59,400 | 11,500 | 12,800 |
| 1.750 | 0.125 | 0.122 | 1.500 | 2.175 | 51,100 | 70,200 | 9,900 | 11,000 |
| 1.750 | 0.160 | 0.155 | 1.430 | 2.724 | 63,900 | 87,900 | 12,500 | 13,900 |
| 2.000 | 0.125 | 0.122 | 1.750 | 2.509 | 58,900 | 81,000 | 8,700 | 9,700 |
| 2.000 | 0.160 | 0.155 | 1.680 | 3.152 | 74,000 | 101,700 | 11,000 | 12,200 |



► HS 80 CRA is designed to operate in the most critical environments.

HS-70 GRADE MATERIAL

| DIMENSIONS (inches) | | NOMINAL WEIGHT (Lbs / Ft) | TUBE LOAD BODY (lbs) | | INTERNAL PRESSURE (psi) | INTERNAL CAPACITY | EXTERNAL DISPLACEMENT |
|------------------------|----------------|------------------------------|-------------------------|--------------|----------------------------|-------------------|-----------------------|
| O.D SPECIFIED | WALL SPECIFIED | | YIELD MIN. | TENSILE MIN. | INTERNAL YIELD MIN. | BBL x 1000 ft | BBL x 1000 ft |
| 1.000 | 0.087 | 0.850 | 17,500 | 20,000 | 11,400 | 0.66 | 0.97 |
| | 0.095 | 0.920 | 18,900 | 21,600 | 12,300 | 0.64 | 0.97 |
| | 0.102 | 0.981 | 20,100 | 23,000 | 13,300 | 0.62 | 0.97 |
| | 0.109 | 1.040 | 21,400 | 24,400 | 14,200 | 0.59 | 0.97 |
| 1.250 | 0.087 | 1.083 | 22,300 | 25,400 | 9,200 | 1.12 | 1.52 |
| | 0.095 | 1.175 | 24,100 | 27,600 | 9,900 | 1.09 | 1.52 |
| | 0.102 | 1.254 | 25,800 | 29,400 | 10,700 | 1.06 | 1.52 |
| | 0.109 | 1.332 | 27,400 | 31,300 | 11,400 | 1.03 | 1.52 |
| | 0.116 | 1.408 | 28,900 | 33,100 | 12,200 | 1.01 | 1.52 |
| | 0.125 | 1.506 | 30,900 | 35,300 | 12,900 | 0.97 | 1.52 |
| | 0.134 | 1.601 | 32,900 | 37,600 | 14,000 | 0.94 | 1.52 |
| | 0.145 | 1.715 | 35,200 | 40,300 | 15,000 | 0.90 | 1.52 |
| 0.156 | 1.827 | 37,500 | 42,900 | 16,000 | 0.85 | 1.52 | |
| 1.500 | 0.095 | 1.429 | 29,400 | 33,500 | 8,300 | 1.67 | 2.19 |
| | 0.102 | 1.527 | 31,400 | 35,800 | 9,000 | 1.63 | 2.19 |
| | 0.109 | 1.623 | 33,300 | 38,100 | 9,600 | 1.60 | 2.19 |
| | 0.116 | 1.719 | 35,300 | 40,300 | 10,200 | 1.56 | 2.19 |
| | 0.125 | 1.840 | 37,800 | 43,200 | 10,800 | 1.52 | 2.19 |
| | 0.134 | 1.960 | 40,300 | 46,000 | 11,700 | 1.47 | 2.19 |
| | 0.145 | 2.104 | 43,200 | 49,400 | 12,600 | 1.42 | 2.19 |
| | 0.156 | 2.245 | 46,100 | 52,700 | 13,500 | 1.37 | 2.19 |
| 0.175 | 2.483 | 51,000 | 58,300 | 15,100 | 1.28 | 2.19 | |
| 1.750 | 0.095 | 1.683 | 34,600 | 39,500 | 7,200 | 2.36 | 2.97 |
| | 0.102 | 1.800 | 37,000 | 42,200 | 7,700 | 2.32 | 2.97 |
| | 0.109 | 1.915 | 39,300 | 45,000 | 8,200 | 2.28 | 2.97 |
| | 0.116 | 2.029 | 41,700 | 47,600 | 8,800 | 2.24 | 2.97 |
| | 0.125 | 2.175 | 44,700 | 51,100 | 9,300 | 2.19 | 2.97 |
| | 0.134 | 2.318 | 47,600 | 54,400 | 10,100 | 2.13 | 2.97 |
| | 0.145 | 2.492 | 51,200 | 58,500 | 10,900 | 2.07 | 2.97 |
| | 0.156 | 2.662 | 54,700 | 62,500 | 11,600 | 2.01 | 2.97 |
| | 0.175 | 2.951 | 60,600 | 69,300 | 13,100 | 1.90 | 2.97 |
| | 0.190 | 3.173 | 65,200 | 74,500 | 14,000 | 1.82 | 2.97 |
| 0.204 | 3.377 | 69,400 | 79,300 | 15,100 | 1.75 | 2.97 | |
| 2.000 | 0.109 | 2.207 | 45,300 | 51,800 | 7,200 | 3.08 | 3.89 |
| | 0.116 | 2.340 | 48,100 | 54,900 | 7,700 | 3.04 | 3.89 |
| | 0.125 | 2.509 | 51,500 | 58,900 | 8,200 | 2.97 | 3.89 |
| | 0.134 | 2.677 | 55,000 | 62,800 | 8,900 | 2.91 | 3.89 |
| | 0.145 | 2.880 | 59,200 | 67,600 | 9,500 | 2.84 | 3.89 |
| | 0.156 | 3.080 | 63,300 | 72,300 | 10,200 | 2.77 | 3.89 |
| | 0.175 | 3.419 | 70,200 | 80,300 | 11,500 | 2.64 | 3.89 |
| | 0.190 | 3.682 | 75,600 | 86,400 | 12,300 | 2.55 | 3.89 |
| 0.204 | 3.923 | 80,600 | 92,100 | 13,300 | 2.46 | 3.89 | |
| 2.375 | 0.125 | 3.011 | 61,900 | 70,700 | 6,900 | 4.39 | 5.48 |
| | 0.134 | 3.215 | 66,000 | 75,500 | 7,500 | 4.31 | 5.48 |
| | 0.145 | 3.462 | 71,100 | 81,300 | 8,100 | 4.22 | 5.48 |
| | 0.156 | 3.706 | 76,100 | 87,000 | 8,600 | 4.13 | 5.48 |
| | 0.175 | 4.122 | 84,700 | 96,800 | 9,700 | 3.98 | 5.48 |
| | 0.190 | 4.445 | 91,300 | 104,800 | 10,500 | 3.87 | 5.48 |
| | 0.204 | 4.742 | 97,400 | 104,300 | 11,300 | 3.76 | 5.48 |
| | 0.224 | 0.224 | 106,000 | 121,100 | 12,400 | 3.61 | 5.48 |

HS-90 GRADE MATERIAL

| DIMENSIONS (inches) | | NOMINAL WEIGHT (Lbs / Ft) | TUBE LOAD BODY (lbs) | | INTERNAL PRESSURE (psi) | INTERNAL CAPACITY | EXTERNAL DISPLACEMENT |
|------------------------|----------------|------------------------------|-------------------------|--------------|----------------------------|-------------------|-----------------------|
| O.D SPECIFIED | WALL SPECIFIED | | YIELD MIN. | TENSILE MIN. | INTERNAL YIELD MIN. | BBL x 1000 ft | BBL x 1000 ft |
| 1.000 | 0.087 | 0.850 | 22,500 | 24,200 | 14,700 | 0.66 | 0.97 |
| | 0.095 | 0.920 | 24,300 | 26,200 | 15,900 | 0.64 | 0.97 |
| | 0.102 | 0.981 | 25,900 | 27,900 | 17,000 | 0.62 | 0.97 |
| | 0.109 | 1.040 | 27,500 | 29,600 | 18,200 | 0.59 | 0.97 |
| 1.250 | 0.087 | 1.083 | 28,600 | 30,800 | 11,800 | 1.12 | 1.52 |
| | 0.095 | 1.175 | 31,000 | 33,400 | 12,800 | 1.09 | 1.52 |
| | 0.102 | 1.254 | 33,100 | 35,700 | 13,080 | 1.06 | 1.52 |
| | 0.109 | 1.332 | 35,200 | 37,900 | 14,700 | 1.03 | 1.52 |
| | 0.116 | 1.408 | 37,200 | 40,100 | 15,700 | 1.01 | 1.52 |
| | 0.125 | 1.506 | 39,800 | 42,900 | 16,600 | 0.97 | 1.52 |
| | 0.134 | 1.601 | 42,300 | 45,600 | 17,900 | 0.94 | 1.52 |
| | 0.145 | 1.715 | 45,300 | 48,800 | 19,300 | 0.90 | 1.52 |
| 0.156 | 1.827 | 48,300 | 52,000 | 20,600 | 0.85 | 1.52 | |
| 1.500 | 0.095 | 1.429 | 37,700 | 40,700 | 10,700 | 1.67 | 2.19 |
| | 0.102 | 1.527 | 40,300 | 43,500 | 11,500 | 1.63 | 2.19 |
| | 0.109 | 1.623 | 42,900 | 46,200 | 12,300 | 1.60 | 2.19 |
| | 0.116 | 1.719 | 45,400 | 48,900 | 13,100 | 1.56 | 2.19 |
| | 0.125 | 1.840 | 48,600 | 52,400 | 13,900 | 1.52 | 2.19 |
| | 0.134 | 1.960 | 51,800 | 55,800 | 15,100 | 1.47 | 2.19 |
| | 0.145 | 2.104 | 55,600 | 59,900 | 16,200 | 1.42 | 2.19 |
| | 0.156 | 2.245 | 59,300 | 63,900 | 17,300 | 1.37 | 2.19 |
| 0.175 | 2.483 | 65,600 | 70,700 | 19,400 | 1.28 | 2.19 | |
| 1.750 | 0.095 | 1.683 | 44,500 | 47,900 | 9,200 | 2.36 | 2.97 |
| | 0.102 | 1.800 | 47,500 | 51,200 | 9,900 | 2.32 | 2.97 |
| | 0.109 | 1.915 | 50,600 | 54,500 | 10,600 | 2.28 | 2.97 |
| | 0.116 | 2.029 | 53,600 | 57,800 | 11,300 | 2.24 | 2.97 |
| | 0.125 | 2.175 | 57,400 | 61,900 | 12,000 | 2.19 | 2.97 |
| | 0.134 | 2.318 | 61,200 | 66,000 | 13,000 | 2.13 | 2.97 |
| | 0.145 | 2.492 | 65,800 | 70,900 | 14,000 | 2.07 | 2.97 |
| | 0.156 | 2.662 | 70,300 | 75,800 | 14,900 | 2.01 | 2.97 |
| 0.175 | 2.951 | 77,900 | 84,000 | 16,800 | 1.90 | 2.97 | |
| 2.000 | 0.109 | 2.207 | 58,300 | 62,800 | 9,300 | 3.08 | 3.89 |
| | 0.116 | 2.340 | 61,800 | 66,600 | 9,900 | 3.04 | 3.89 |
| | 0.125 | 2.509 | 66,300 | 71,400 | 10,500 | 2.97 | 3.89 |
| | 0.134 | 2.677 | 70,700 | 76,200 | 11,400 | 2.91 | 3.89 |
| | 0.145 | 2.880 | 67,100 | 82,000 | 12,300 | 2.84 | 3.89 |
| | 0.156 | 3.080 | 81,300 | 87,700 | 13,100 | 2.77 | 3.89 |
| | 0.175 | 3.419 | 90,300 | 97,300 | 14,800 | 2.64 | 3.89 |
| | 0.190 | 3.682 | 97,200 | 104,800 | 15,900 | 2.55 | 3.89 |
| 0.204 | 3.923 | 103,600 | 111,600 | 17,100 | 2.46 | 3.89 | |
| 2.375 | 0.125 | 3.011 | 79,500 | 85,700 | 8,900 | 4.39 | 5.48 |
| | 0.134 | 3.215 | 84,900 | 91,500 | 9,600 | 4.31 | 5.48 |
| | 0.145 | 3.462 | 91,400 | 98,500 | 10,400 | 4.22 | 5.48 |
| | 0.156 | 3.706 | 97,900 | 105,500 | 11,100 | 4.13 | 5.48 |
| | 0.175 | 4.122 | 108,900 | 117,300 | 12,500 | 3.98 | 5.48 |
| | 0.190 | 4.445 | 117,400 | 126,500 | 13,400 | 3.87 | 5.48 |
| | 0.204 | 4.742 | 125,200 | 135,000 | 14,500 | 3.76 | 5.48 |
| | 0.224 | 0.224 | 136,200 | 148,800 | 15,900 | 3.61 | 5.48 |

HS-110 GRADE MATERIAL

| DIMENSIONS (inches) | | NOMINAL WEIGHT (Lbs / Ft) | TUBE LOAD BODY (lbs) | | INTERNAL PRESSURE (psi) | INTERNAL CAPACITY | EXTERNAL DISPLACEMENT |
|------------------------|----------------|------------------------------|-------------------------|--------------|----------------------------|-------------------|-----------------------|
| O.D SPECIFIED | WALL SPECIFIED | | YIELD MIN. | TENSILE MIN. | INTERNAL YIELD MIN. | BBL x 1000 ft | BBL x 1000 ft |
| 1.000 | 0.109 | 1.040 | 33,000 | 35,100 | 21,900 | 0.59 | 0.59 |
| 1.250 | 0.109 | 1.332 | 42,200 | 42,200 | 17,700 | 1.03 | 1.03 |
| | 0.116 | 1.408 | 44,600 | 44,600 | 18,800 | 1.01 | 1.01 |
| | 0.125 | 1.506 | 47,700 | 47,700 | 19,900 | 0.97 | 0.97 |
| | 0.134 | 1.601 | 50,700 | 50,700 | 21,500 | 0.94 | 0.94 |
| | 0.145 | 1.715 | 54,400 | 54,400 | 23,100 | 0.90 | 0.90 |
| 1.500 | 0.156 | 1.827 | 57,900 | 57,900 | 24,700 | 0.85 | 0.85 |
| | 0.109 | 1.429 | 51,400 | 51,400 | 14,800 | 1.67 | 1.67 |
| | 0.116 | 1.527 | 54,500 | 54,500 | 15,800 | 1.63 | 1.63 |
| | 0.125 | 1.623 | 58,300 | 58,300 | 16,700 | 1.60 | 1.60 |
| | 0.134 | 1.719 | 62,100 | 62,100 | 18,100 | 1.56 | 1.56 |
| | 0.145 | 1.840 | 66,700 | 66,700 | 19,400 | 1.52 | 1.52 |
| | 0.156 | 1.960 | 71,100 | 71,100 | 20,800 | 1.47 | 1.47 |
| 1.750 | 0.175 | 2.104 | 78,700 | 78,700 | 23,300 | 1.42 | 1.42 |
| | 0.190 | 2.245 | 84,400 | 84,400 | 25,000 | 1.37 | 1.37 |
| | 0.109 | 1.915 | 60,700 | 60,700 | 12,700 | 2.28 | 2.28 |
| | 0.116 | 2.029 | 64,300 | 64,300 | 13,600 | 2.24 | 2.24 |
| | 0.125 | 2.175 | 68,900 | 68,900 | 14,400 | 2.19 | 2.19 |
| | 0.134 | 2.318 | 73,500 | 73,500 | 15,600 | 2.13 | 2.13 |
| 2.000 | 0.145 | 2.492 | 79,000 | 79,000 | 16,800 | 2.07 | 2.07 |
| | 0.156 | 2.662 | 84,400 | 84,400 | 17,900 | 2.01 | 2.01 |
| | 0.175 | 2.951 | 93,500 | 93,500 | 20,100 | 1.90 | 1.90 |
| | 0.190 | 3.173 | 100,600 | 100,600 | 21,600 | 1.82 | 1.82 |
| | 0.109 | 2.207 | 69,900 | 69,900 | 11,200 | 3.08 | 3.08 |
| | 0.116 | 2.340 | 74,200 | 74,200 | 11,900 | 3.04 | 3.04 |
| 2.375 | 0.125 | 2.509 | 79,500 | 79,500 | 12,600 | 2.97 | 2.97 |
| | 0.134 | 2.677 | 84,800 | 84,800 | 13,700 | 2.91 | 2.91 |
| | 0.145 | 2.880 | 91,300 | 91,300 | 14,700 | 2.84 | 2.84 |
| | 0.156 | 3.080 | 97,600 | 97,600 | 15,800 | 2.77 | 2.77 |
| | 0.175 | 3.419 | 108,400 | 108,400 | 17,700 | 2.64 | 2.64 |
| 2.375 | 0.190 | 3.682 | 116,700 | 116,700 | 19,000 | 2.55 | 2.55 |
| | 0.125 | 3.011 | 95,400 | 95,400 | 10,700 | 4.39 | 4.39 |
| | 0.134 | 3.215 | 101,900 | 101,900 | 11,600 | 4.31 | 4.31 |
| | 0.145 | 3.462 | 109,700 | 109,700 | 12,400 | 4.22 | 4.22 |
| | 0.156 | 3.706 | 117,500 | 117,500 | 13,300 | 4.13 | 4.13 |
| | 0.175 | 4.122 | 130,600 | 130,600 | 15,000 | 3.98 | 3.98 |
| | 0.190 | 4.445 | 140,900 | 140,900 | 16,100 | 3.87 | 3.87 |

HS-80 GRADE MATERIAL

| DIMENSIONS (inches) | | NOMINAL WEIGHT (Lbs / Ft) | TUBE LOAD BODY (lbs) | | INTERNAL PRESSURE (psi) | INTERNAL CAPACITY | EXTERNAL DISPLACEMENT |
|------------------------|----------------|------------------------------|-------------------------|--------------|----------------------------|-------------------|-----------------------|
| O.D SPECIFIED | WALL SPECIFIED | | YIELD MIN. | TENSILE MIN. | INTERNAL YIELD MIN. | BBL x 1000 ft | BBL x 1000 ft |
| 1.000 | 0.087 | 0.850 | 20,000 | 22,000 | 13,000 | 0.66 | 0.97 |
| | 0.095 | 0.920 | 21,600 | 23,800 | 14,100 | 0.64 | 0.97 |
| | 0.102 | 0.981 | 23,000 | 25,300 | 15,200 | 0.62 | 0.97 |
| | 0.109 | 1.040 | 24,000 | 26,800 | 16,200 | 0.59 | 0.97 |
| 1.250 | 0.087 | 1.083 | 25,400 | 28,000 | 10,500 | 1.12 | 1.52 |
| | 0.095 | 1.175 | 27,600 | 30,300 | 11,400 | 1.09 | 1.52 |
| | 0.102 | 1.254 | 29,400 | 32,400 | 12,200 | 1.06 | 1.52 |
| | 0.109 | 1.332 | 31,300 | 34,400 | 13,100 | 1.03 | 1.52 |
| | 0.116 | 1.408 | 33,100 | 36,400 | 13,900 | 1.01 | 1.52 |
| | 0.125 | 1.506 | 35,300 | 38,900 | 14,800 | 0.97 | 1.52 |
| | 0.134 | 1.601 | 37,600 | 41,300 | 16,000 | 0.94 | 1.52 |
| | 0.145 | 1.715 | 40,300 | 44,300 | 17,100 | 0.90 | 1.52 |
| 0.156 | 1.827 | 42,900 | 47,200 | 18,300 | 0.85 | 1.52 | |
| 1.500 | 0.095 | 1.429 | 33,500 | 36,900 | 9,500 | 1.67 | 2.19 |
| | 0.102 | 1.527 | 35,800 | 39,400 | 10,200 | 1.63 | 2.19 |
| | 0.109 | 1.623 | 38,100 | 41,900 | 11,000 | 1.60 | 2.19 |
| | 0.116 | 1.719 | 40,300 | 44,400 | 11,700 | 1.56 | 2.19 |
| | 0.125 | 1.840 | 43,200 | 47,500 | 12,400 | 1.52 | 2.19 |
| | 0.134 | 1.960 | 46,000 | 50,600 | 13,400 | 1.47 | 2.19 |
| | 0.145 | 2.104 | 49,400 | 54,300 | 14,400 | 1.42 | 2.19 |
| | 0.156 | 2.245 | 52,700 | 58,000 | 15,400 | 1.37 | 2.19 |
| 0.175 | 2.483 | 58,300 | 64,100 | 17,300 | 1.28 | 2.19 | |
| 1.750 | 0.095 | 1.683 | 39,500 | 43,500 | 8,200 | 2.36 | 2.97 |
| | 0.102 | 1.800 | 42,200 | 46,500 | 8,800 | 2.32 | 2.97 |
| | 0.109 | 1.915 | 45,000 | 49,500 | 9,400 | 2.28 | 2.97 |
| | 0.116 | 2.029 | 47,600 | 52,400 | 10,000 | 2.24 | 2.97 |
| | 0.125 | 2.175 | 51,100 | 56,200 | 10,700 | 2.19 | 2.97 |
| | 0.134 | 2.318 | 54,400 | 59,900 | 11,500 | 2.13 | 2.97 |
| | 0.145 | 2.492 | 58,500 | 64,300 | 12,400 | 2.07 | 2.97 |
| | 0.156 | 2.662 | 62,500 | 68,700 | 13,300 | 2.01 | 2.97 |
| | 0.175 | 2.951 | 69,300 | 76,200 | 14,900 | 1.90 | 2.97 |
| | 0.190 | 3.173 | 74,500 | 81,900 | 16,000 | 1.82 | 2.97 |
| 0.204 | 3.377 | 79,300 | 87,200 | 17,300 | 1.75 | 2.97 | |
| 2.000 | 0.109 | 2.207 | 51,800 | 57,000 | 8,300 | 3.08 | 3.89 |
| | 0.116 | 2.340 | 54,900 | 60,400 | 8,800 | 3.04 | 3.89 |
| | 0.125 | 2.509 | 58,900 | 64,800 | 9,400 | 2.97 | 3.89 |
| | 0.134 | 2.677 | 62,800 | 69,100 | 10,100 | 2.91 | 3.89 |
| | 0.145 | 2.880 | 67,600 | 74,400 | 10,900 | 2.84 | 3.89 |
| | 0.156 | 3.080 | 72,300 | 79,500 | 11,700 | 2.77 | 3.89 |
| | 0.175 | 3.419 | 80,300 | 88,300 | 13,100 | 2.64 | 3.89 |
| | 0.190 | 3.682 | 86,400 | 95,100 | 14,100 | 2.55 | 3.89 |
| 0.204 | 3.923 | 92,100 | 101,300 | 15,200 | 2.46 | 3.89 | |
| 2.375 | 0.125 | 3.011 | 70,700 | 77,800 | 7,900 | 4.39 | 5.48 |
| | 0.134 | 3.215 | 75,500 | 83,000 | 8,600 | 4.31 | 5.48 |
| | 0.145 | 3.462 | 81,300 | 89,400 | 9,200 | 4.22 | 5.48 |
| | 0.156 | 3.706 | 87,000 | 95,700 | 9,900 | 4.13 | 5.48 |
| | 0.175 | 4.122 | 96,800 | 106,400 | 11,100 | 3.98 | 5.48 |
| | 0.190 | 4.445 | 104,300 | 114,800 | 12,000 | 3.87 | 5.48 |
| | 0.204 | 4.742 | 111,300 | 122,400 | 112,900 | 3.76 | 5.48 |
| | 0.224 | 0.224 | 121,100 | 133,200 | 14,100 | 3.61 | 5.48 |

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