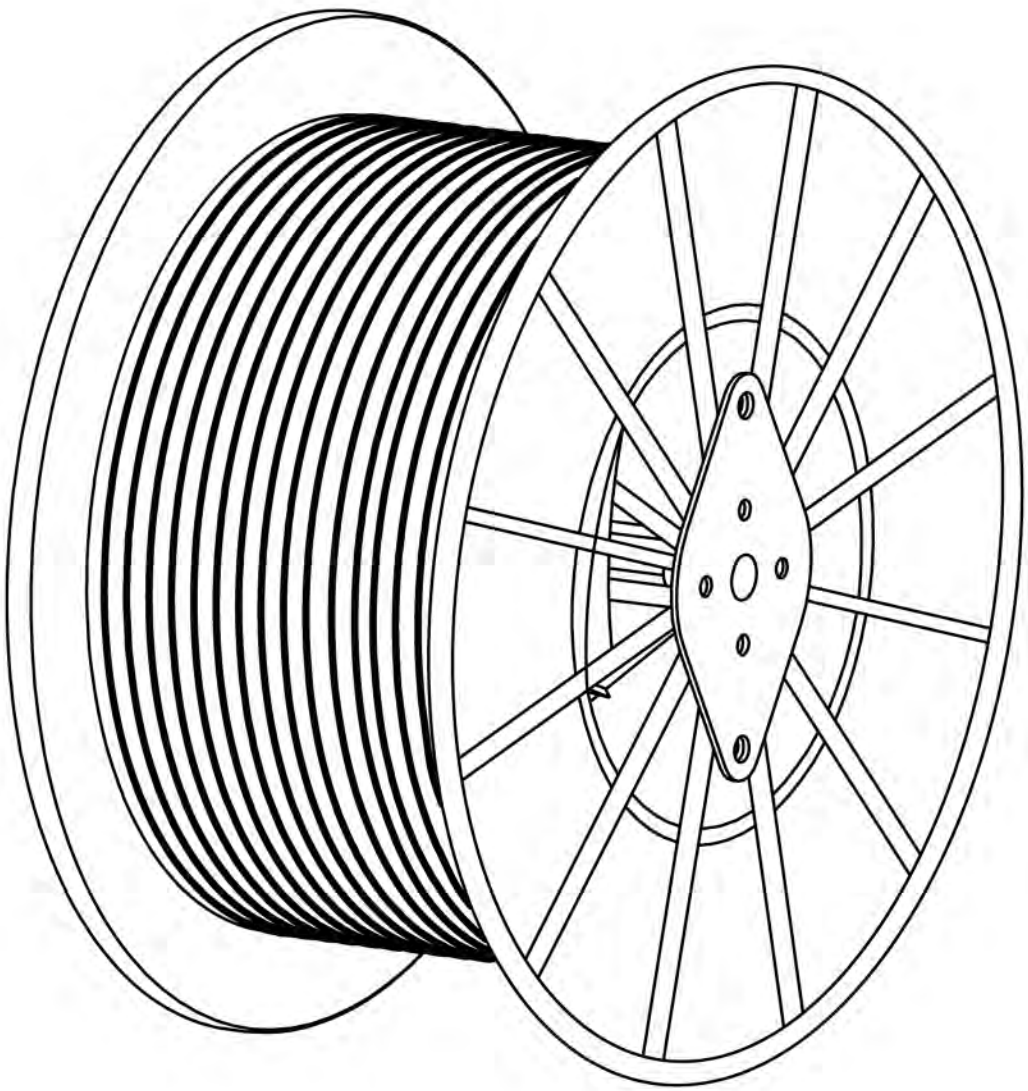
JASON COILED TUBING TECHNICAL MANUAL



JASON ENERGY TECHNOLOGIES CO., LTD.

MAKE EVERY INCH OF COILED TUBING WITH ALL OUR EFFORTS

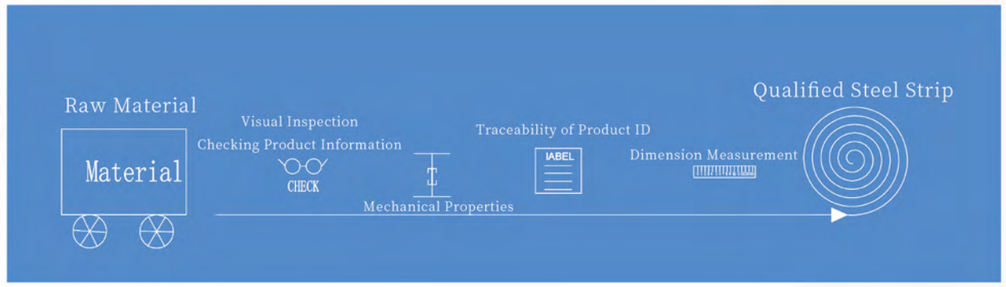
Make Energy Exploration Efficient and Safe

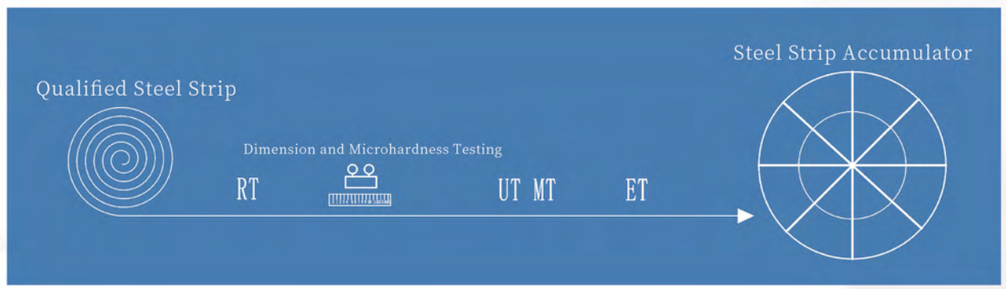
Table of Contents

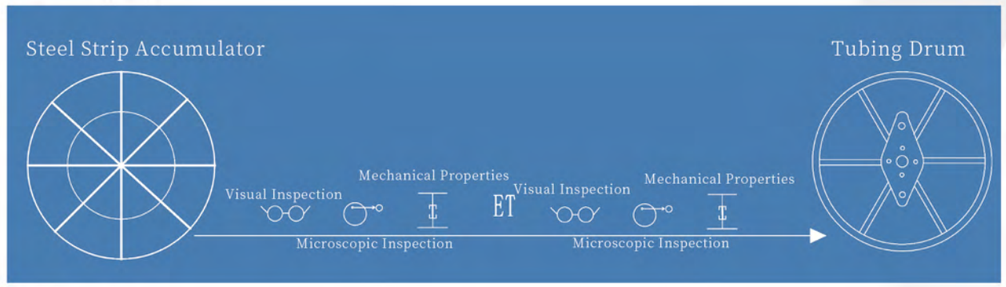
About Jason

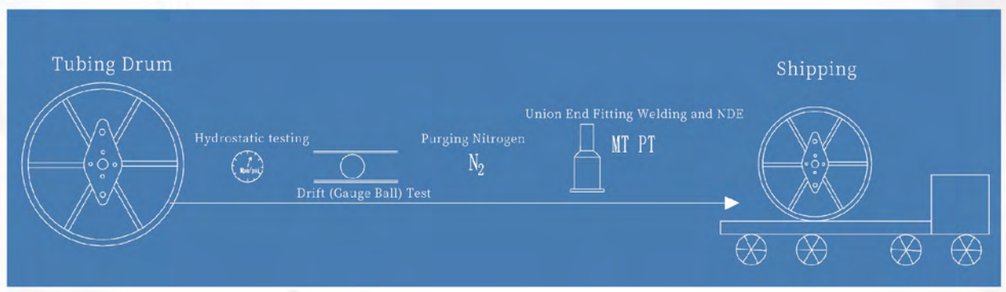
Jason Energy Technologies Co., Ltd., a world leading coiled tubing manufacturer,is dedicated to producing the best coiled tubing and aims to make energy exploration efficient and safe.

We specialize in the design, development and manufacture of coiled tubing products and are committed to technology R&D and continuous increasing products' core competitiveness. We focus on our customers' needs and make every inch of coiled tubing with all our efforts. We provide our customers with high quality, various and individual coiled tubing string design, logging cable injection and flash-in removal service as well as tube-to-tube butt welding service, which can satisfy the different needs of our customers.









Quality Control

Our quality management system is in accordance with API Q1 requirements and all processes are based on the relevant standards. The products are up to the requirements in API 5ST.

Our rigorous quality control system, advanced production equipment, high production processes and expert technical team with more than 30 years' experience in coiled tubing enable us to continuously provide products meeting the standards and the customers' requirements.

QHSE Policy

Products and Services

- Conventional Coiled Tubing
- RC Series Coiled Tubing
- Corrosion-resistant Alloy Coiled Tubing
- Logging Cable Injection Service (In & Out)
- Weld Flash-in Removal
- String Design of Taper Coiled Tubing

Fig.: Coiled Tubing Containing Logging Cable Injection

Fig.: Step-taper String

Fig.: True-taper String

Patents

To protect our research findings and emphasize intellectual property protection (IPR), we have applied for more than 40 patents.

SPE

We and Ken Newman, a wellknown coiled tubing expert from North America, collaborated and researched the influence of internal pressure and angle change on fatigue life during coiled tubing operation. The research result, which were published in SPE-189948, is significant for the study of CT fatigue life simulation.

SPE-189948-MS

Rotation and Diameter Growth of Coiled Tubing

P. E. Ken Newman and Patrick Kelleher, Athena Engineering Services; David Rain and Charlie Cai, Jason O&G

This paper was prepared for presentation at the SPE/ICoTA Coiled Tubing & Well Intervention Conference & Exhibition held in The Woodlands, TX, USA, 27-28 March 2018.

Abstract

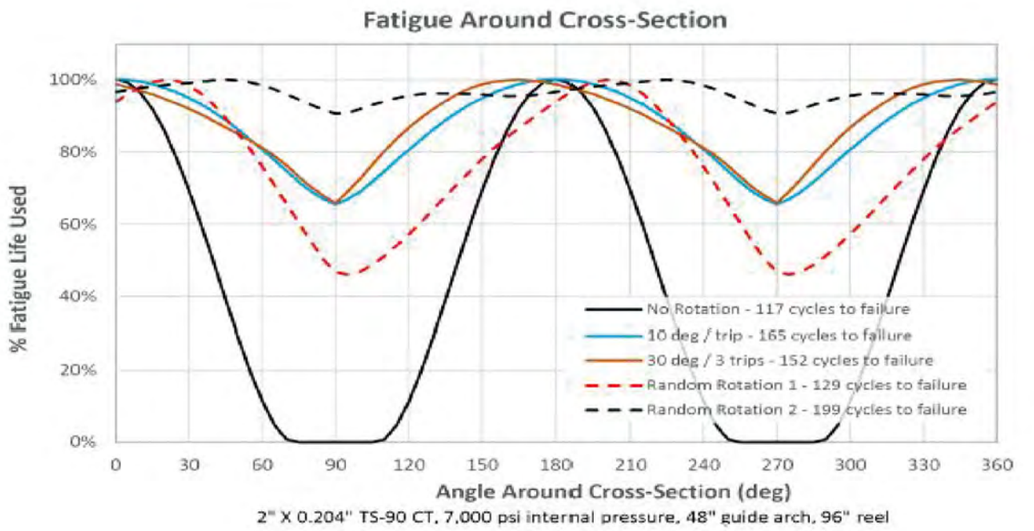
The fact that coiled tubing (CT) rotates when used is not currently included in CT fatigue models. The CT also experiences diametrical growth and elongation. Almost all fatigue testing is done without rotating the CT sample. Diameter growth models based on these fatigue tests have over predicted the amount of diametrical growth.

This ongoing work has already shown that rotation affects the fatigue life. Fatigue life calculations without rotation are usually conservative. It has also shown that rotation does not explain the over prediction of diametrical growth. It is currently believed that the axial force (weight) in the CT causes elongation and a diametrical decrease, which reduces the diametrical growth. It is also possible that the injector chains cause some reduction in diameter. The fatigue/plasticity model being developed will attempt to answer more of these questions. This paper presents fatigue testing with rotation and with varying pressures, which is being used to validate the model. Lab measurements made with a rotation measuring device are also presented.

Introduction

CT Rotation

When CT is manufactured, a continuous strip of steel is rolled so that the edges come together to form a tube. The two edges are welded together at the top of the tube, causing a continuous seam weld. After the welding process there is a seam weld anneal process, in which the seam weld is heated and then cooled. The CT tends to twist or rotate between the welding station and the seam weld annealing station. For the rest of this paper the term "rotate" will be used when referring to this twisting motion. Care must be taken to prevent the CT from rotating too far, making the seam weld annealing ineffective. Figure 2 shows pictures



The results of bursting test indicate that the strength of the weld is significantly higher than that of the tubing body. JASON is using the latest generation of coiled tubing production and testing equipment from Europe and the United States, and the advanced heat treatment technology ensures the strength of tubing welds.

Qualification Certificates

We follow standards of oil and gas industry and has successfully obtained API 5ST, ISO 9001, ISO 14001, ISO 45001 certificates. Our excellent technical team, rigorous quality management system and advanced processes and equipment ensure superior products and services that we offer our customer.


DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

Jason Energy Technologies Co., Ltd.

No.3001 Jindoushan Road, Laishan District, Yantai, Shandong Province, P.R. China , 264000

has been found to conform to the Quality Management System standard:
GB/T 19001-2016/ISO 9001:2015

This certificate is valid for the following scope:
Manufacturing of Coiled Tubing


DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

Jason Energy Technologies Co., Ltd.

No.3001 Jindoushan Road, Laishan District, Yantai, Shandong Province, P.R. China , 264000

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:
Manufacturing of Coiled Tubing


DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

Jason Energy Technologies Co., Ltd.

No.3001 Jindoushan Road, Laishan District, Yantai, Shandong Province, P.R. China , 264000

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Manufacturing of Coiled Tubing


ДОБРОВОЛЬНАЯ СЕРТИФИКАЦИЯ ГОСТ Р

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ РОСС RU.04СПВ.01067

Срок действия с 08.09.2022 по 07.09.2025

№ 98153

ОРГАН ПО СЕРТИФИКАЦИИ

ПРОДУКЦИЯ

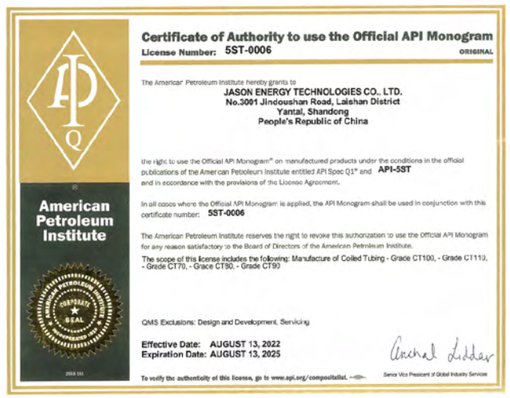
СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ НОРМАТИВНЫХ ДОКУМЕНТОВ

ИЗГОТОВИТЕЛЬ

СЕРТИФИКАТ ВЫДАН

НА ОСНОВАНИИ

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ


Certificate of Authority to use the Official API Monogram

License Number: 5ST-0006 ORIGINAL

The American Petroleum Institute hereby grants to

JASON ENERGY TECHNOLOGIES CO., LTD.
No.3001 Jindoushan Road, Laishan District
Yantai, Shandong
People's Republic of China

the right to use the Official API Monogram® on manufactured products under the conditions in the official publications of the American Petroleum Institute entitled API Spec Q1® and **API-5ST** and in accordance with the provisions of the License Agreement.

In all cases where the Official API Monogram is applied, the API Monogram shall be used in conjunction with this certificate number: **5ST-0006**

The American Petroleum Institute reserves the right to revoke this authorization to use the Official API Monogram for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

The scope of this license includes the following: Manufacture of Coiled Tubing - Grade CT100, - Grade CT110, - Grade CT70, - Grade CT80, - Grade CT90

QMS Exclusions: Design and Development, Servicing

Effective Date: AUGUST 13, 2022
Expiration Date: AUGUST 13, 2025

To verify the authenticity of this license, go to www.api.org/compositelist.

Senior Vice President of Global Industry Services

American Petroleum Institute

50+

Products are being used in over 50 countries and regions.

6

Business covers 6 continents around the world.

4

4 service bases.

Our Customers

Our products have been exported to more than 50 countries and are widely used in North America, Asian - Pacific area, MENA, China and countries in CIS.
Close to seaport, airport, railway and highway, we can deliver the products in a shorter lead time.


Turkmenistan


Canada


Wushenqi, China


Chongqing, China


Canada


Mexico

Jason Around the World

Our advantages include advanced and reliable production equipment, a professional technical team, excellent product performance, strict quality control, convenient transportation and faster delivery and our products are widely used in Canada, Australia, UAE, Oman, Russia, Italy, UK, Algeria, Nigeria, Indonesia, Malaysia, China, etc. The sales are rapidly increasing and the products have been exported to over 50 countries.

Our coiled tubing products are used in different working environments with high H2S and CO2 content. The excellent product quality helps us win the recognition and respect of our customers around the world and encourages us to produce coiled tubing with pride.


Daqing, China


Xinjiang, China


Chongqing, China


Guizhou, China


Kuwait


Canada


Algeria

ICoTA

- Yantai, China
  May 22-23, 2015
- Yantai, China
  January 7-8, 2016

- Chengdu, China
  September 22-23, 2016
- Beijing, China
  September 7-8, 2017

- Wuhan, China
  September 5-6, 2018
- Chongqing, China
  September 4-5, 2019

- Yantai, China
  October 14-15, 2020

ICoTA
Intervention & Coiled Tubing Association

www.icota.com

The International Coiled Tubing Association (ICoTA) was founded in 1994. As an international organization specializing in well intervention and coiled tubing, ICoTA is engaged in promoting communication among enterprises, sharing technical experience, organizing technical training and boosting global technological development.
ICoTA involves manufacturers, suppliers, service providers and end users of coiled tubing, hydraulic workover and pumping equipment in the discussion of related topics. ICoTA has global chapter and regional chapter.

ICoTA
Intervention & Coiled Tubing Association

www.icotachina.com

In May 2015, the ICoTA China Chapter was established in Yantai, China. The top-notch experts in coiled tubing technology from the USA, Canada and China delivered speeches and exchanged in-depth ideas with the attendees on extensive topics of anti-corrosion analysis, fatigue life management, drilling process and coiled tubing application.

Technical Data

Chemical Composition (Mass Percent)

Grade	C	Mn	P	S	Si
	Maximum	Maximum	Maximum	Maximum	Maximum
TS-70	0.16	1.20	0.025	0.005	0.50
TS-80	0.16	1.20	0.020	0.005	0.50
TS-90	0.16	1.20	0.020	0.005	0.50
TS-100	0.16	1.65	0.025	0.005	0.50
TS-110	0.16	1.65	0.025	0.005	0.50
TS-130	0.16	1.90	0.025	0.005	0.50

Tensile Requirements

Grade	Yield Strength				Tensile Strength		Hardness Max.
	MIN		MAX		MIN		Tubing Body and Weld
	psi	MPa	psi	MPa	psi	MPa	HRC
TS-70	70000	483	80000	552	80000	552	22
TS-80	80000	552	90000	621	88000	607	22
TS-90	90000	621	100000	689	97000	669	22
TS-100	100000	689	-- --	-- --	108000	745	28
TS-110	110000	758	-- --	-- --	115000	793	30
TS-130	130000	896	-- --	-- --	135000	931	36

TS-70 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	16,190	18,500	330	10500	9500	9710	5740	3930	2430	4140	2830	1750	0.79
	0.087	0.082	0.826	17,470	19,960	350	11480	10300	10540	6440	4410	2730	4710	3220	2000	0.85
	0.095	0.090	0.810	18,910	21,610	380	12600	11300	11470	7260	4970	3080	5390	3690	2280	0.92
	0.102	0.097	0.796	20,140	23,020	400	13580	12200	12260	7980	5460	3380	5990	4100	2540	0.98
	0.109	0.104	0.782	21,360	24,410	410	14560	13100	13050	8700	5960	3690	6610	4520	2800	1.04
	0.118	0.110	0.764	22,890	26,160	440	15400	13900	13710	9330	6390	3960	7140	4890	3030	1.11
	0.125	0.117	0.750	24,050	27,490	450	16380	14700	14460	10060	6890	4270	7770	5320	3300	1.17
	0.134	0.126	0.732	25,520	29,170	470	17640	15000	15420	11010	7540	4670	8600	5890	3650	1.24
1.250	0.080	0.075	1.090	20,580	23,520	540	8400	7600	6780	4010	2750	1700	2840	1940	1200	1.00
	0.087	0.082	1.076	22,250	25,430	580	9180	8300	7970	4670	3200	1980	3320	2270	1410	1.08
	0.095	0.090	1.060	24,130	27,580	620	10080	9100	9330	5440	3720	2310	3900	2670	1650	1.17
	0.102	0.097	1.046	25,750	29,430	660	10860	9800	10020	6000	4110	2540	4350	2980	1840	1.25
	0.109	0.104	1.032	27,350	31,260	690	11650	10500	10680	6560	4490	2780	4810	3290	2040	1.33
	0.118	0.110	1.014	29,370	33,570	730	12320	11100	11240	7050	4830	2990	5220	3570	2210	1.43
	0.125	0.117	1.000	30,930	35,340	760	13100	11800	11880	7630	5220	3230	5690	3900	2410	1.50
	0.134	0.126	0.982	32,890	37,580	800	14110	12700	12690	8370	5730	3550	6320	4330	2680	1.60
	0.145	0.137	0.960	35,240	40,270	840	15340	13800	13660	9290	6360	3940	7100	4860	3010	1.71
	0.156	0.148	0.938	37,530	42,890	880	16580	14900	14610	10210	6990	4330	7900	5410	3350	1.82
	0.165	0.157	0.920	39,370	44,990	910	17580	15000	15380	10970	7510	4650	8570	5860	3630	1.91
	0.175	0.167	0.900	41,370	47,280	940	18700	15000	16210	11810	8080	5010	9310	6370	3950	2.01
1.500	0.087	0.082	1.326	27,030	30,900	870	7650	6900	5650	3400	2330	1440	2390	1640	1020	1.31
	0.095	0.090	1.310	29,350	33,550	930	8400	7600	6780	4010	2750	1700	2840	1940	1200	1.43
	0.102	0.097	1.296	31,360	35,840	990	9050	8100	7770	4560	3120	1930	3240	2220	1370	1.52
	0.109	0.104	1.282	33,340	38,110	1,040	9710	8700	8760	5110	3500	2170	3650	2500	1550	1.62
	0.118	0.110	1.264	35,860	40,990	1,110	10270	9200	9510	5570	3810	2360	4000	2740	1700	1.74
	0.125	0.117	1.250	37,800	43,200	1,160	10920	9800	10070	6040	4130	2560	4380	3000	1860	1.84
	0.134	0.126	1.232	40,250	46,000	1,220	11760	10600	10770	6640	4550	2820	4880	3340	2070	1.96
	0.145	0.137	1.210	43,210	49,380	1,290	12790	11500	11620	7390	5060	3140	5500	3760	2330	2.10
	0.156	0.148	1.188	46,110	52,690	1,350	13810	12400	12450	8150	5580	3460	6130	4200	2600	2.24
	0.165	0.157	1.170	48,440	55,360	1,410	14650	13200	13120	8774	6010	3720	6660	4560	2830	2.35
	0.175	0.167	1.150	50,990	58,280	1,460	15590	14000	13850	9470	6480	4020	7260	4970	3080	2.48
	0.188	0.180	1.124	54,240	61,990	1,530	16800	15000	14780	10380	7100	4400	8050	5510	3410	2.64
	0.204	0.196	1.092	58,140	66,450	1,600	18290	15000	15900	11500	7870	4880	9030	6180	3830	2.83
1.750	0.095	0.090	1.560	34,580	39,520	1,310	7200	6500	4960	3030	2080	1290	2130	1460	900	1.68
	0.102	0.097	1.546	36,970	42,250	1,390	7760	7000	5810	3490	2390	1480	2460	1680	1040	1.80
	0.109	0.104	1.532	39,340	44,950	1,460	8320	7500	6660	3950	2700	1670	2790	1910	1180	1.91
	0.118	0.110	1.514	42,350	48,400	1,560	8800	7900	7390	4350	2980	1840	3080	2110	1310	2.06
	0.125	0.117	1.500	44,670	51,050	1,630	9360	8400	8240	4820	3300	2040	3430	2350	1460	2.17
	0.134	0.126	1.482	47,620	54,420	1,720	10080	9100	9330	5440	3720	2310	3900	2670	1650	2.31
	0.145	0.137	1.460	51,180	58,490	1,830	10960	9900	10100	6070	4150	2570	4410	3020	1870	2.49
	0.156	0.148	1.438	54,680	62,500	1,930	11840	10700	10840	6700	4590	2840	4930	3370	2090	2.66
	0.165	0.157	1.420	57,510	65,730	2,010	12560	11300	11430	7230	4950	3060	5360	3670	2270	2.80
	0.175	0.167	1.400	60,610	69,270	2,090	13360	12000	12090	7820	5350	3310	5850	4010	2480	2.95
	0.188	0.180	1.374	64,580	73,800	2,200	14400	13000	12920	8590	5880	3640	6500	4450	2760	3.14
	0.204	0.196	1.342	69,360	79,260	2,320	15680	14100	13920	9540	6530	4050	7320	5010	3100	3.37
	0.224	0.216	1.302	75,170	85,910	2,460	17280	15000	15150	10740	7350	4550	8360	5720	3550	3.65
	0.236	0.228	1.278	78,580	89,800	2,540	18240	15000	15860	11460	7840	4860	9000	6160	3820	3.82
	0.250	0.242	1.250	82,470	94,250	2,620	19360	15000	16680	12300	8420	5220	9750	6670	4130	4.01
2.000	0.109	0.104	1.782	45,330	51,800	1,960	7280	6600	5080	3100	2120	1310	2180	1490	920	2.20
	0.118	0.110	1.764	48,840	55,810	2,090	7700	6900	5720	3440	2350	1460	2420	1660	1030	2.37
	0.125	0.117	1.750	51,540	58,910	2,190	8190	7400	6460	3840	2630	1630	2710	1860	1150	2.51
	0.134	0.126	1.732	54,990	62,840	2,310	8820	7900	7420	4360	2990	1850	3090	2120	1310	2.67
	0.145	0.137	1.710	59,150	67,600	2,460	9590	8600	8590	5020	3430	2130	3580	2450	1520	2.88
	0.156	0.148	1.688	63,260	72,300	2,610	10360	9300	9590	5640	3860	2390	4060	2780	1720	3.08
	0.165	0.157	1.670	66,580	76,100	2,720	10990	9900	10130	6090	4170	2580	4420	3030	1880	3.24
	0.175	0.167	1.650	70,230	80,270	2,840	11690	10500	10710	6590	4510	2800	4840	3310	2050	3.41
	0.188	0.176	1.624	74,910	85,620	2,990	12320	11100	11240	7050	4830	2990	5220	3570	2210	3.64

TS-70 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	80,570	92,080	3,170	13440	12100	12150	7870	5390	3340	5900	4040	2500	3.92
	0.224	0.212	1.552	87,490	99,980	3,370	14840	13400	13270	8910	6100	3780	6780	4640	2880	4.25
	0.236	0.224	1.528	91,550	104,630	3,490	15680	14100	13920	9540	6530	4050	7320	5010	3100	4.45
	0.250	0.238	1.500	96,210	109,960	3,620	16660	15000	14680	10280	7030	4360	7960	5450	3370	4.68
	0.276	0.261	1.448	104,640	119,590	3,840	18270	15000	15890	11490	7860	4870	9020	6170	3830	5.09
	0.281	0.266	1.438	106,230	121,400	3,880	18620	15000	16140	11750	8040	4980	9250	6330	3920	5.16
2.375	0.109	0.104	2.157	54,320	62,080	2,830	6130	5500	3330	2170	1480	920	1530	1050	650	2.64
	0.118	0.110	2.139	58,570	66,940	3,030	6480	5800	3870	2450	1680	1040	1730	1180	730	2.85
	0.125	0.117	2.125	61,850	70,690	3,180	6900	6200	4500	2790	1910	1180	1960	1340	830	3.01
	0.134	0.126	2.107	66,040	75,470	3,370	7430	6700	5300	3220	2200	1360	2260	1550	960	3.21
	0.145	0.137	2.085	71,110	81,270	3,600	8080	7300	6290	3750	2570	1590	2640	1810	1120	3.46
	0.156	0.148	2.063	76,130	87,000	3,820	8720	7800	7270	4280	2930	1820	3030	2080	1290	3.70
	0.165	0.157	2.045	80,190	91,650	3,990	9250	8300	8080	4730	3240	2010	3370	2300	1430	3.90
	0.175	0.167	2.025	84,670	96,760	4,180	9840	8900	8970	5230	3580	2220	3740	2560	1590	4.12
	0.188	0.176	1.999	90,420	103,340	4,410	10370	9300	9610	5650	3870	2400	4070	2780	1720	4.40
	0.204	0.192	1.967	97,400	111,310	4,690	11320	10200	10400	6320	4330	2680	4620	3160	1960	4.73
	0.224	0.212	1.927	105,960	121,100	5,020	12500	11300	11380	7180	4910	3050	5320	3640	2260	5.15
	0.236	0.224	1.903	111,010	126,870	5,210	13200	11900	11960	7700	5270	3270	5760	3940	2400	5.40
	0.250	0.238	1.875	116,830	133,520	5,420	14030	12600	12620	8310	5690	3520	6270	4290	2660	5.68
	0.276	0.261	1.823	127,400	145,600	5,780	15390	13900	13690	9320	6380	3950	7130	4880	3020	6.19
	0.281	0.266	1.813	129,400	147,880	5,850	15680	14100	13920	9540	6530	4050	7320	5010	3100	6.29
	0.300	0.285	1.775	136,900	156,450	6,090	16800	15000	14780	10380	7100	4400	8050	5510	3410	6.65
2.625	0.145	0.137	2.335	79,080	90,380	4,470	7310	6600	5120	3120	2140	1320	2190	1500	930	3.84
	0.156	0.148	2.313	84,700	96,800	4,750	7890	7100	6010	3600	2460	1530	2530	1730	1070	4.12
	0.165	0.157	2.295	89,260	102,010	4,970	8370	7500	6740	3990	2730	1690	2820	1930	1200	4.34
	0.175	0.167	2.275	94,290	107,760	5,210	8910	8000	7550	4440	3040	1880	3150	2150	1330	4.58
	0.188	0.176	2.249	100,750	115,150	5,520	9390	8500	8280	4840	3310	2050	3450	2360	1460	4.90
	0.204	0.192	2.217	108,610	124,130	5,880	10240	9200	9490	5550	3800	2360	3990	2730	1690	5.28
	0.224	0.212	2.177	118,270	135,170	6,300	11310	10200	10390	6320	4320	2680	4610	3150	1950	5.75
	0.236	0.224	2.153	123,990	141,700	6,550	11950	10800	10930	6780	4640	2880	4990	3420	2120	6.03
	0.250	0.238	2.125	130,570	149,230	6,820	12690	11400	11540	7320	5010	3110	5440	3720	2310	6.35
	0.276	0.261	2.073	142,570	162,940	7,310	13920	12500	12540	8230	5630	3490	6200	4240	2630	6.93
	0.281	0.266	2.063	144,850	165,540	7,400	14190	12800	12750	8430	5770	3570	6370	4360	2700	7.04
	0.300	0.285	2.025	153,390	175,300	7,720	15200	13700	13550	9180	6280	3890	7010	4800	2970	7.46
2.875	0.145	0.137	2.585	87,050	99,490	5,440	6670	6000	4160	2610	1780	1110	1840	1260	780	4.23
	0.156	0.148	2.563	93,280	106,600	5,790	7210	6500	4970	3040	2080	1290	2140	1460	910	4.53
	0.165	0.157	2.545	98,330	112,380	6,060	7650	6900	5630	3390	2320	1440	2390	1640	1010	4.78
	0.175	0.167	2.525	103,910	118,750	6,360	8130	7300	6370	3790	2600	1610	2680	1830	1130	5.05
	0.188	0.176	2.499	111,090	126,960	6,740	8570	7700	7040	4160	2840	1760	2940	2010	1250	5.40
	0.204	0.192	2.467	119,830	136,940	7,190	9350	8400	8220	4810	3290	2040	3420	2340	1450	5.82
	0.224	0.212	2.427	130,590	149,240	7,730	10320	9300	9560	5610	3840	2380	4040	2760	1710	6.35
	0.236	0.228	2.403	136,960	156,530	8,040	11100	10000	10220	6170	4220	2620	4490	3070	1900	6.67
	0.250	0.238	2.375	144,320	164,930	8,400	11590	10400	10630	6520	4460	2770	4780	3270	2030	7.02
	0.276	0.261	2.323	157,750	180,280	9,020	12710	11400	11560	7340	5020	3110	5450	3730	2310	7.67
	0.281	0.266	2.313	160,300	183,200	9,130	12950	11700	11750	7510	5140	3190	5600	3830	2370	7.79
	0.300	0.285	2.275	169,880	194,150	9,550	13880	12500	12500	8200	5610	3480	6170	4230	2620	8.26
3.500	0.156	0.148	3.188	114,720	131,110	8,840	5920	5300	3050	2010	1370	850	1430	980	610	5.58
	0.165	0.157	3.170	121,010	138,300	9,270	6280	5700	3410	2240	1530	950	1590	1090	670	5.88
	0.175	0.167	3.150	127,960	146,240	9,750	6680	6000	4170	2610	1790	1110	1840	1260	780	6.22
	0.188	0.176	3.124	136,930	156,490	10,360	7040	6300	4720	2910	1990	1230	2040	1400	870	6.66
	0.204	0.192	3.092	147,870	168,990	11,080	7680	6900	5690	3420	2340	1450	2410	1650	1020	7.19
	0.224	0.212	3.052	161,380	184,430	11,960	8480	7600	6900	4080	2790	1730	2890	1970	1220	7.84
	0.236	0.224	3.028	169,400	193,600	12,470	8960	8100	7630	4480	3070	1900	3180	2180	1350	8.23
	0.250	0.238	3.000	178,680	204,200	13,050	9520	8600	8480	4960	3390	2100	3530	2420	1500	8.69
	0.276	0.261	2.948	195,680	223,640	14,080	10440	9400	9660	5700	3900	2420	4100	2810	1740	9.51
	0.281	0.266	2.938	198,920	227,340	14,270	10640	9600	9830	5840	4000	2480	4220	2890	1790	9.67
	0.300	0.285	2.900	211,120	241,270	14,990	11400	10300	10470	6380	4370	2710	4660	3190	1980	10.26

TS-80 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	18,500	20,350	380	12000	10800	11100	6560	4490	2780	4730	3240	2010	0.79
	0.087	0.082	0.826	19,960	21,960	400	13120	11800	12040	7360	5040	3120	5380	3680	2280	0.85
	0.095	0.090	0.810	21,610	23,770	430	14400	13000	13100	8290	5680	3520	6150	4210	2610	0.92
	0.102	0.097	0.796	23,020	25,320	450	15520	14000	14010	9120	6240	3870	6840	4680	2900	0.98
	0.109	0.104	0.782	24,410	26,850	470	16640	14900	14910	9950	6810	4220	7550	5170	3200	1.04
	0.118	0.110	0.764	26,160	28,770	500	17600	15000	15660	10660	7300	4520	8160	5580	3460	1.11
	0.125	0.117	0.750	27,490	30,240	520	18720	15000	16530	11500	7870	4880	8890	6080	3770	1.17
	0.134	0.126	0.732	29,170	32,080	540	20160	15000	17620	12580	8610	5340	9830	6730	4170	1.24
1.250	0.080	0.075	1.090	23,520	25,880	620	9600	8600	7450	4510	3080	1910	3200	2190	1360	1.00
	0.087	0.082	1.076	25,430	27,970	670	10500	9500	8830	5270	3600	2230	3760	2570	1590	1.08
	0.095	0.090	1.060	27,580	30,330	710	11520	10400	10400	6150	4210	2610	4420	3020	1870	1.17
	0.102	0.097	1.046	29,430	32,370	750	12420	11200	11450	6860	4690	2910	4970	3400	2110	1.25
	0.109	0.104	1.032	31,260	34,380	790	13310	12000	12200	7500	5130	3180	5500	3760	2330	1.33
	0.118	0.110	1.014	33,570	36,930	840	14080	12700	12840	8060	5520	3420	5960	4080	2530	1.43
	0.125	0.117	1.000	35,340	38,880	870	14980	13500	13570	8720	5960	3700	6510	4450	2760	1.50
	0.134	0.126	0.982	37,580	41,340	910	16130	14500	14500	9570	6550	4060	7220	4940	3060	1.60
	0.145	0.137	0.960	40,270	44,300	960	17540	15000	15610	10610	7260	4500	8120	5560	3440	1.71
	0.156	0.148	0.938	42,890	47,180	1,010	18940	15000	16700	11670	7990	4950	9030	6180	3830	1.82
	0.165	0.157	0.920	44,990	49,490	1,040	20100	15000	17570	12540	8580	5320	9790	6700	4150	1.91
	0.175	0.167	0.900	47,280	52,010	1,080	21380	15000	18520	13500	9240	5720	10640	7280	4510	2.01
1.500	0.087	0.082	1.326	30,900	33,990	990	8750	7800	6140	3800	2600	1610	2690	1840	1140	1.31
	0.095	0.090	1.310	33,550	36,900	1,070	9600	8600	7450	4510	3080	1910	3200	2190	1360	1.43
	0.102	0.097	1.296	35,840	39,420	1,130	10350	9300	8600	5140	3520	2180	3660	2510	1550	1.52
	0.109	0.104	1.282	38,110	41,920	1,190	11090	10000	9740	5780	3950	2450	4140	2830	1750	1.62
	0.118	0.110	1.264	40,990	45,080	1,260	11730	10500	10730	6330	4340	2690	4560	3120	1930	1.74
	0.125	0.117	1.250	43,200	47,520	1,320	12480	11300	11510	6900	4720	2930	5010	3430	2120	1.84
	0.134	0.126	1.232	46,000	50,600	1,390	13440	12100	12310	7590	5200	3220	5570	3820	2360	1.96
	0.145	0.137	1.210	49,380	54,320	1,470	14610	13100	13280	8450	5780	3580	6280	4300	2670	2.10
	0.156	0.148	1.188	52,690	57,960	1,550	15790	14200	14230	9310	6380	3950	7010	4800	2970	2.24
	0.165	0.157	1.170	55,360	60,900	1,610	16750	15000	14990	10030	6860	4250	7620	5210	3230	2.35
	0.175	0.167	1.150	58,280	64,100	1,670	17810	15000	15830	10820	7410	4590	8300	5680	3520	2.48
	0.188	0.180	1.124	61,990	68,190	1,750	19200	15000	16900	11860	8120	5030	9200	6300	3900	2.64
	0.204	0.196	1.092	66,450	73,090	1,830	20910	15000	18170	13140	9000	5570	10320	7070	4380	2.83
1.750	0.095	0.090	1.560	39,520	43,470	1,490	8230	7400	5340	3370	2300	1430	2390	1630	1010	1.68
	0.102	0.097	1.546	42,250	46,470	1,580	8870	8000	6330	3900	2670	1650	2760	1890	1170	1.80
	0.109	0.104	1.532	44,950	49,450	1,670	9510	8600	7310	4430	3030	1880	3140	2150	1330	1.91
	0.118	0.110	1.514	48,400	53,240	1,780	10060	9100	8150	4890	3350	2070	3480	2380	1480	2.06
	0.125	0.117	1.500	51,050	56,160	1,860	10700	9600	9130	5440	3720	2300	3880	2660	1650	2.17
	0.134	0.126	1.482	54,420	59,870	1,970	11520	10400	10400	6150	4210	2610	4420	3020	1870	2.31
	0.145	0.137	1.460	58,490	64,340	2,090	12530	11300	11550	6940	4750	2940	5040	3450	2140	2.49
	0.156	0.148	1.438	62,500	68,750	2,200	13530	12200	12390	7660	5240	3250	5630	3850	2390	2.66
	0.165	0.157	1.420	65,730	72,300	2,290	14350	13000	13070	8260	5650	3500	6127	4190	2600	2.80
	0.175	0.167	1.400	69,270	76,200	2,390	15270	13800	13810	8930	6110	3790	6690	4580	2840	2.95
	0.188	0.180	1.374	73,800	81,180	2,510	16460	14900	14760	9810	6710	4160	7430	5090	3150	3.14
	0.204	0.196	1.342	79,260	87,190	2,650	17920	15000	15910	10900	7460	4620	8370	5730	3550	3.37
	0.224	0.216	1.302	85,910	94,500	2,810	19750	15000	17310	12270	8400	5200	9560	6540	4050	3.65
	0.236	0.228	1.278	89,800	98,780	2,900	20850	15000	18130	13100	8970	5560	10290	7040	4360	3.82
	0.250	0.242	1.250	94,250	103,670	3,000	22130	15000	19070	14060	9620	5960	11140	7630	4720	4.01
2.000	0.109	0.104	1.782	51,800	56,980	2,240	8320	7500	5480	3440	2360	1460	2440	1670	1030	2.20
	0.118	0.110	1.764	55,810	61,400	2,390	8800	7900	6220	3840	2630	1630	2720	1860	1150	2.37
	0.125	0.117	1.750	58,910	64,800	2,500	9360	8500	7080	4310	2950	1830	3050	2090	1300	2.51
	0.134	0.126	1.732	62,840	69,130	2,650	10080	9100	8190	4910	3360	2080	3500	2390	1480	2.67
	0.145	0.137	1.710	67,600	74,360	2,810	10960	9900	9540	5660	3880	2400	4050	2770	1720	2.88
	0.156	0.148	1.688	72,300	79,530	2,980	11840	10600	10890	6430	4400	2730	4630	3170	1960	3.08
	0.165	0.157	1.670	76,100	83,710	3,110	12560	11300	11990	7060	4830	3000	5110	3500	2170	3.24
	0.175	0.167	1.650	80,270	88,290	3,250	13360	12100	12240	7530	5160	3200	5530	3780	2340	3.41
	0.188	0.176	1.624	85,620	94,180	3,420	14080	12700	12840	8060	5520	3420	5960	4080	2530	3.64

TS-80 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	92,080	101,290	3,620	15360	13900	13890	9000	6160	3820	6750	4620	2860	3.92
	0.224	0.212	1.552	99,980	109,980	3,850	16960	15000	15160	10190	6970	4320	7750	5300	3290	4.25
	0.236	0.224	1.528	104,630	115,090	3,990	17920	15000	15910	10900	7460	4620	8370	5730	3550	4.45
	0.250	0.238	1.500	109,960	120,950	4,130	19040	15000	16770	11740	8040	4980	9090	6220	3860	4.68
	0.276	0.261	1.448	119,590	131,550	4,380	20880	15000	18160	13130	8980	5570	10310	7060	4370	5.09
	0.281	0.266	1.438	121,400	133,540	4,430	21280	15000	18450	13430	9190	5690	10570	7240	4480	5.16
2.375	0.109	0.104	2.157	62,080	68,280	3,240	7010	6300	3530	2370	1620	1010	1700	1160	720	2.64
	0.118	0.110	2.139	66,940	73,630	3,460	7410	6700	4090	2690	1840	1140	1920	1310	810	2.85
	0.125	0.117	2.125	70,690	77,750	3,640	7880	7100	4810	3080	2110	1310	2190	1500	930	3.01
	0.134	0.126	2.107	75,470	83,020	3,850	8490	7700	5740	3580	2450	1520	2540	1740	1080	3.21
	0.145	0.137	2.085	81,270	89,390	4,110	9230	8300	6880	4200	2870	1780	2980	2040	1260	3.46
	0.156	0.148	2.063	87,000	95,700	4,360	9970	9000	8020	4820	3300	2040	3430	2350	1450	3.70
	0.165	0.157	2.045	91,650	100,810	4,560	10580	9500	8950	5330	3650	2260	3810	2610	1620	3.90
	0.175	0.167	2.025	96,760	106,440	4,770	11250	10200	9980	5910	4050	2510	4240	2900	1800	4.12
	0.188	0.176	1.999	103,340	113,670	5,040	11860	10700	10920	6440	4410	2730	4640	3180	1970	4.40
	0.204	0.192	1.967	111,310	122,440	5,360	12930	11600	11890	7230	4950	3070	5280	3610	2240	4.73
	0.224	0.212	1.927	121,100	133,210	5,740	14280	12900	13010	8210	5620	3480	6080	4160	2580	5.15
	0.236	0.224	1.903	126,870	139,560	5,950	15090	13600	13670	8800	6020	3730	6580	4500	2790	5.40
	0.250	0.238	1.875	133,520	146,870	6,190	16030	14400	14430	9500	6500	4030	7170	4900	3040	5.68
	0.276	0.261	1.823	145,600	160,160	6,610	17580	15000	15650	10650	7290	4520	8150	5580	3460	6.19
	0.281	0.266	1.813	147,880	162,670	6,690	17920	15000	15910	10900	7460	4620	8370	5730	3550	6.29
	0.300	0.285	1.775	156,450	172,100	6,970	19200	15000	16900	11860	8120	5030	9200	6300	3900	6.65
2.625	0.145	0.137	2.335	90,380	99,420	5,110	8350	7600	5530	3470	2370	1470	2460	1680	1040	3.84
	0.156	0.148	2.313	96,800	106,480	5,430	9020	8100	6560	4020	2750	1710	2850	1950	1210	4.12
	0.165	0.157	2.295	102,010	112,220	5,680	9570	8600	7400	4480	3070	1900	3180	2180	1350	4.34
	0.175	0.167	2.275	107,760	118,530	5,960	10180	9200	8340	5000	3420	2120	3560	2430	1510	4.58
	0.188	0.176	2.249	115,150	126,660	6,300	10730	9600	9180	5460	3740	2320	3900	2670	1660	4.90
	0.204	0.192	2.217	124,130	136,540	6,710	11700	10500	10680	6310	4320	2670	4540	3110	1920	5.28
	0.224	0.212	2.177	135,170	148,690	7,200	12920	11600	11880	7220	4940	3060	5270	3610	2230	5.75
	0.236	0.224	2.153	141,700	155,870	7,480	13650	12300	12490	7750	5300	3290	5700	3900	2420	6.03
	0.250	0.238	2.125	149,230	164,150	7,800	14510	13100	13190	8370	5730	3550	6220	4260	2640	6.35
	0.276	0.261	2.073	162,940	179,240	8,350	15910	14300	14330	9410	6440	3990	7090	4850	3010	6.93
	0.281	0.266	2.063	165,540	182,090	8,450	16210	14600	14570	9630	6590	4080	7280	4980	3090	7.04
	0.300	0.285	2.025	175,300	192,830	8,830	17370	15000	15490	10490	7180	4450	8010	5490	3400	7.46
2.875	0.145	0.137	2.585	99,490	109,440	6,220	7620	6800	4420	2870	1960	1220	2040	1400	870	4.23
	0.156	0.148	2.563	106,600	117,260	6,620	8240	7400	5360	3370	2310	1430	2390	1640	1010	4.53
	0.165	0.157	2.545	112,380	123,620	6,930	8740	7800	6130	3790	2590	1610	2680	1840	1140	4.78
	0.175	0.167	2.525	118,750	130,630	7,270	9290	8400	6980	4250	2910	1800	3010	2060	1280	5.05
	0.188	0.176	2.499	126,960	139,660	7,710	9790	8800	7750	4670	3200	1980	3320	2270	1410	5.40
	0.204	0.192	2.467	136,940	150,640	8,220	10690	9600	9120	5430	3710	2300	3880	2650	1640	5.82
	0.224	0.212	2.427	149,240	164,170	8,840	11800	10600	10830	6390	4370	2710	4600	3150	1950	6.35
	0.236	0.224	2.403	156,530	172,180	9,190	12470	11200	11850	6980	4780	2960	5050	3460	2140	6.67
	0.250	0.238	2.375	164,930	181,430	9,600	13250	11900	12150	7450	5100	3160	5460	3740	2310	7.02
	0.276	0.261	2.323	180,280	198,310	10,300	14530	13100	13210	8390	5740	3560	6230	4260	2640	7.67
	0.281	0.266	2.313	183,200	201,520	10,440	14800	13300	13430	8590	5880	3640	6400	4380	2710	7.79
	0.300	0.285	2.275	194,150	213,570	10,920	15860	14300	14290	9370	6410	3970	7060	4830	2990	8.26
3.500	0.156	0.148	3.188	131,110	144,220	10,100	6770	6100	3290	2220	1520	940	1590	1090	680	5.58
	0.165	0.157	3.170	138,300	152,130	10,600	7180	6500	3700	2480	1700	1050	1780	1220	760	5.88
	0.175	0.167	3.150	146,240	160,870	11,140	7630	6800	4430	2870	1970	1220	2050	1400	870	6.22
	0.188	0.176	3.124	156,490	172,140	11,840	8050	7200	5060	3210	2200	1360	2280	1560	970	6.66
	0.204	0.192	3.092	168,990	185,890	12,670	8780	7900	6190	3820	2620	1620	2710	1850	1150	7.19
	0.224	0.212	3.052	184,430	202,870	13,670	9690	8700	7590	4580	3140	1940	3260	2230	1380	7.84
	0.236	0.224	3.028	193,600	212,960	14,250	10240	9200	8430	5050	3450	2140	3600	2460	1520	8.23
	0.250	0.238	3.000	204,200	224,620	14,910	10880	9800	9420	5590	3830	2370	4000	2740	1700	8.69
	0.276	0.261	2.948	223,640	246,000	16,090	11930	10700	11030	6510	4450	2760	4690	3210	1990	9.51
	0.281	0.266	2.938	227,340	250,070	16,310	12160	11000	11240	6670	4570	2830	4820	3300	2050	9.67
	0.300	0.285	2.900	241,270	265,400	17,130	13030	11700	11970	7300	4990	3090	5330	3650	2260	10.26

TS-90 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	20,810	22,430	430	13500	12200	12250	7320	5010	3100	5290	3620	2240	0.79
	0.087	0.082	0.826	22,460	24,210	450	14760	13300	13550	8280	5670	3510	6060	4150	2570	0.85
	0.095	0.090	0.810	24,310	26,200	480	16200	14600	14740	9330	6390	3960	6920	4740	2940	0.92
	0.102	0.097	0.796	25,900	27,910	510	17460	15000	15770	10260	7020	4350	7700	5270	3270	0.98
	0.109	0.104	0.782	27,460	29,600	530	18720	15000	16770	11190	7660	4750	8490	5810	3600	1.04
	0.118	0.110	0.764	29,430	31,720	560	19800	15000	17620	12000	8210	5090	9180	6280	3890	1.11
	0.125	0.117	0.750	30,930	33,330	580	21060	15000	18600	12940	8860	5490	10000	6840	4240	1.17
	0.134	0.126	0.732	32,810	35,360	610	22680	15000	19820	14160	9690	6000	11060	7570	4690	1.24
1.250	0.080	0.075	1.090	26,460	28,520	700	10800	9700	8060	4980	3410	2110	3550	2430	1510	1.00
	0.087	0.082	1.076	28,610	30,830	750	11810	10600	9620	5840	4000	2480	4180	2860	1770	1.08
	0.095	0.090	1.060	31,020	33,440	800	12960	11700	11410	6840	4680	2900	4930	3370	2090	1.17
	0.102	0.097	1.046	33,110	35,680	850	13970	12600	12880	7710	5280	3270	5590	3830	2370	1.25
	0.109	0.104	1.032	35,160	37,900	890	14980	13500	13730	8440	5780	3580	6190	4230	2620	1.33
	0.118	0.110	1.014	37,770	40,710	940	15840	14300	14450	9070	6210	3850	6710	4590	2840	1.43
	0.125	0.117	1.000	39,760	42,850	980	16850	15000	15270	9810	6710	4160	7320	5010	3100	1.50
	0.134	0.126	0.982	42,280	45,570	1,030	18140	15000	16320	10770	7370	4560	8130	5560	3450	1.60
	0.145	0.137	0.960	45,300	48,830	1,080	19730	15000	17570	11940	8170	5070	9140	6250	3870	1.71
	0.156	0.148	0.938	48,250	52,010	1,130	21310	15000	18790	13130	8990	5570	10160	6950	4310	1.82
	0.165	0.157	0.920	50,620	54,560	1,170	22610	15000	19770	14100	9650	5980	11010	7540	4670	1.91
	0.175	0.167	0.900	53,190	57,330	1,210	24050	15000	20840	15190	10390	6440	11970	8190	5080	2.01
1.500	0.087	0.082	1.326	34,760	37,460	1,120	9840	8900	6570	4170	2850	1770	2970	2030	1260	1.31
	0.095	0.090	1.310	37,740	40,670	1,200	10800	9700	8060	4980	3410	2110	3550	2430	1510	1.43
	0.102	0.097	1.296	40,320	43,450	1,270	11640	10500	9360	5700	3900	2420	4070	2790	1730	1.52
	0.109	0.104	1.282	42,870	46,200	1,340	12480	11200	10670	6420	4400	2720	4610	3160	1960	1.62
	0.118	0.110	1.264	46,110	49,690	1,420	13200	11900	11780	7050	4830	2990	5090	3480	2160	1.74
	0.125	0.117	1.250	48,600	52,380	1,490	14040	12600	12940	7760	5310	3290	5630	3860	2390	1.84
	0.134	0.126	1.232	51,750	55,780	1,560	15120	13600	13850	8540	5850	3620	6270	4290	2660	1.96
	0.145	0.137	1.210	55,550	59,870	1,650	16440	14800	14940	9510	6510	4030	7070	4840	3000	2.10
	0.156	0.148	1.188	59,280	63,890	1,740	17760	15000	16010	10480	7170	4440	7890	5400	3340	2.24
	0.165	0.157	1.170	62,280	67,130	1,810	18840	15000	16870	11280	7720	4780	8570	5860	3630	2.35
	0.175	0.167	1.150	65,560	70,660	1,880	20040	15000	17810	12180	8330	5160	9340	6390	3960	2.48
	0.188	0.180	1.124	69,740	75,160	1,960	21600	15000	19010	13350	9130	5660	10350	7080	4390	2.64
	0.204	0.196	1.092	74,750	80,570	2,060	23520	15000	20450	14790	10120	6270	11620	7950	4930	2.83
1.750	0.095	0.090	1.560	44,450	47,910	1,680	9260	8300	5660	3670	2510	1560	2620	1800	1110	1.68
	0.102	0.097	1.546	47,530	51,220	1,780	9980	9000	6780	4280	2930	1810	3050	2090	1290	1.80
	0.109	0.104	1.532	50,570	54,510	1,880	10700	9600	7900	4890	3350	2070	3490	2390	1480	1.91
	0.118	0.110	1.514	54,450	58,680	2,000	11310	10200	8860	5420	3710	2300	3870	2650	1640	2.06
	0.125	0.117	1.500	57,430	61,900	2,100	12030	10800	9970	6040	4130	2560	4330	2960	1830	2.17
	0.134	0.126	1.482	61,230	65,990	2,210	12960	11700	11410	6840	4680	2900	4930	3370	2090	2.31
	0.145	0.137	1.460	65,800	70,920	2,350	14090	12700	12990	7800	5340	3310	5660	3880	2400	2.49
	0.156	0.148	1.438	70,310	75,780	2,480	15220	13700	13940	8620	5900	3650	6330	4340	2690	2.66
	0.165	0.157	1.420	73,940	79,700	2,580	16150	14500	14700	9290	6360	3940	6890	4720	2920	2.80
	0.175	0.167	1.400	77,930	83,990	2,690	17180	15000	15540	10050	6880	4260	7520	5150	3190	2.95
	0.188	0.180	1.374	83,030	89,490	2,820	18510	15000	16610	11040	7550	4680	8360	5720	3550	3.14
	0.204	0.196	1.342	89,170	96,110	2,980	20160	15000	17900	12270	8390	5200	9410	6440	3990	3.37
	0.224	0.216	1.302	96,650	104,170	3,160	22220	15000	19470	13810	9450	5850	10750	7360	4560	3.65
	0.236	0.228	1.278	101,030	108,880	3,260	23450	15000	20400	14740	10090	6250	11570	7920	4910	3.82
	0.250	0.242	1.250	106,030	114,280	3,370	24890	15000	21450	15820	10830	6710	12530	8580	5310	4.01
2.000	0.109	0.104	1.782	58,280	62,810	2,510	9360	8400	5820	3760	2570	1590	2680	1840	1140	2.20
	0.118	0.110	1.764	62,790	67,670	2,690	9900	8900	6660	4210	2880	1790	3010	2060	1270	2.37
	0.125	0.117	1.750	66,270	71,420	2,810	10530	9500	7640	4750	3250	2010	3390	2320	1440	2.51
	0.134	0.126	1.732	70,700	76,200	2,980	11340	10200	8900	5440	3720	2310	3890	2660	1650	2.67
	0.145	0.137	1.710	76,050	81,970	3,170	12330	11100	10430	6290	4310	2670	4520	3090	1920	2.88
	0.156	0.148	1.688	81,340	87,660	3,350	13320	12000	11970	7160	4900	3040	5170	3540	2190	3.08
	0.165	0.157	1.670	85,610	92,270	3,500	14130	12700	13230	7880	5400	3340	5720	3910	2420	3.24
	0.175	0.167	1.650	90,300	97,320	3,650	15030	13500	13770	8480	5800	3590	6220	4260	2640	3.41
	0.188	0.176	1.624	96,320	103,810	3,840	15840	14300	14450	9070	6210	3850	6710	4590	2840	3.64

TS-90 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	103,590	111,650	4,070	17280	15000	15620	10120	6930	4290	7590	5190	3220	3.92
	0.224	0.212	1.552	112,480	121,230	4,340	19080	15000	17060	11460	7840	4860	8720	5970	3700	4.25
	0.236	0.224	1.528	117,710	126,860	4,480	20160	15000	17900	12270	8400	5200	9410	6440	3990	4.45
	0.250	0.238	1.500	123,700	133,320	4,650	21420	15000	18870	13210	9040	5600	10230	7000	4340	4.68
	0.276	0.261	1.448	134,540	145,000	4,930	23490	15000	20420	14760	10100	6260	11600	7940	4920	5.09
	0.281	0.266	1.438	136,580	147,200	4,980	23940	15000	20760	15100	10340	6410	11900	8140	5050	5.16
2.375	0.109	0.104	2.157	69,840	75,270	3,640	7880	7100	3760	2580	1770	1100	1870	1280	790	2.64
	0.118	0.110	2.139	75,300	81,160	3,900	8340	7500	4230	2880	1970	1220	2080	1430	880	2.85
	0.125	0.117	2.125	79,520	85,710	4,090	8870	8000	5060	3340	2290	1420	2400	1640	1020	3.01
	0.134	0.126	2.107	84,910	91,510	4,330	9550	8600	6110	3920	2680	1660	2800	1910	1190	3.21
	0.145	0.137	2.085	91,430	98,540	4,620	10380	9300	7410	4620	3160	1960	3300	2260	1400	3.46
	0.156	0.148	2.063	97,880	105,490	4,910	11220	10100	8700	5330	3650	2260	3810	2610	1620	3.70
	0.165	0.157	2.045	103,100	111,120	5,130	11900	10700	9760	5920	4050	2510	4240	2900	1800	3.90
	0.175	0.167	2.025	108,860	117,320	5,370	12660	11400	10940	6580	4500	2790	4730	3240	2010	4.12
	0.188	0.176	1.999	116,250	125,290	5,670	13340	12000	12000	7180	4910	3040	5180	3550	2200	4.40
	0.204	0.192	1.967	125,220	134,960	6,030	14550	13100	13380	8130	5570	3450	5940	4060	2520	4.73
	0.224	0.212	1.927	136,230	146,830	6,450	16070	14500	14630	9230	6320	3910	6840	4680	2900	5.15
	0.236	0.224	1.903	142,730	153,830	6,690	16980	15000	15380	9900	6780	4200	7400	5070	3140	5.40
	0.250	0.238	1.875	150,210	161,890	6,970	18040	15000	16230	10680	7310	4530	8060	5520	3420	5.68
	0.276	0.261	1.823	163,800	176,540	7,440	19780	15000	17610	11980	8200	5080	9170	6280	3890	6.19
	0.281	0.266	1.813	166,370	179,310	7,520	20160	15000	17900	12270	8390	5200	9410	6440	3990	6.29
	0.300	0.285	1.775	176,010	189,700	7,840	21600	15000	19010	13350	9130	5660	10350	7080	4390	6.65
2.625	0.145	0.137	2.335	101,670	109,580	5,750	9390	8500	5870	3790	2590	1610	2700	1850	1150	3.84
	0.156	0.148	2.313	108,900	117,370	6,110	10150	9100	7040	4420	3030	1880	3150	2160	1340	4.12
	0.165	0.157	2.295	114,770	123,690	6,390	10770	9700	8000	4950	3390	2100	3530	2420	1500	4.34
	0.175	0.167	2.275	121,230	130,660	6,700	11450	10300	9070	5530	3790	2350	3960	2710	1680	4.58
	0.188	0.176	2.249	129,540	139,620	7,090	12070	10900	10030	6070	4150	2570	4350	2980	1840	4.90
	0.204	0.192	2.217	139,640	150,500	7,550	13170	11900	11730	7020	4810	2980	5060	3470	2150	5.28
	0.224	0.212	2.177	152,070	163,890	8,100	14540	13100	13360	8120	5560	3440	5930	4060	2510	5.75
	0.236	0.224	2.153	159,410	171,810	8,420	15360	13800	14050	8720	5970	3700	6420	4390	2720	6.03
	0.250	0.238	2.125	167,880	180,940	8,770	16320	14700	14840	9420	6450	3990	7000	4790	2970	6.35
	0.276	0.261	2.073	183,310	197,570	9,400	17900	15000	16120	10580	7240	4490	7970	5460	3380	6.93
	0.281	0.266	2.063	186,230	200,720	9,510	18240	15000	16390	10830	7410	4590	8190	5600	3470	7.04
	0.300	0.285	2.025	197,210	212,550	9,930	19540	15000	17420	11800	8080	5010	9020	6170	3820	7.46
2.875	0.145	0.137	2.585	111,920	120,630	7,000	8580	7700	4600	3090	2110	1310	2220	1520	940	4.23
	0.156	0.148	2.563	119,930	129,260	7,440	9270	8300	5670	3680	2520	1560	2630	1800	1110	4.53
	0.165	0.157	2.545	126,430	136,260	7,800	9830	8800	6550	4160	2840	1760	2960	2030	1260	4.78
	0.175	0.167	2.525	133,600	143,990	8,180	10460	9400	7520	4680	3210	1990	3340	2290	1420	5.05
	0.188	0.176	2.499	142,830	153,940	8,670	11020	9900	8400	5170	3530	2190	3690	2520	1560	5.40
	0.204	0.192	2.467	154,060	166,050	9,250	12020	10800	9950	6020	4120	2550	4320	2950	1830	5.82
	0.224	0.212	2.427	167,900	180,960	9,940	13270	11900	11900	7120	4870	3020	5140	3520	2180	6.35
	0.236	0.224	2.403	176,090	189,790	10,340	14020	12600	13060	7790	5330	3300	5640	3860	2390	6.67
	0.250	0.238	2.375	185,550	199,980	10,790	14900	13400	13670	8390	5740	3560	6140	4200	2600	7.02
	0.276	0.261	2.323	202,820	218,590	11,590	16340	14700	14860	9430	6460	4000	7010	4800	2970	7.67
	0.281	0.266	2.313	206,100	222,130	11,740	16650	15000	15110	9660	6610	4100	7200	4930	3050	7.79
	0.300	0.285	2.275	218,420	235,410	12,280	17840	15000	16070	10540	7210	4470	7940	5430	3370	8.26
3.500	0.156	0.148	3.188	147,500	158,970	11,360	7610	6800	3480	2410	1650	1020	1740	1190	740	5.58
	0.165	0.157	3.170	155,590	167,690	11,920	8070	7300	3950	2710	1850	1150	1960	1340	830	5.88
	0.175	0.167	3.150	164,520	177,320	12,540	8590	7700	4620	3100	2120	1310	2230	1530	950	6.22
	0.188	0.176	3.124	176,050	189,750	13,320	9050	8100	5340	3500	2390	1480	2500	1710	1060	6.66
	0.204	0.192	3.092	190,110	204,900	14,250	9870	8900	6620	4190	2870	1780	2990	2050	1270	7.19
	0.224	0.212	3.052	207,480	223,620	15,380	10900	9800	8220	5070	3470	2150	3620	2470	1530	7.84
	0.236	0.224	3.028	217,800	234,740	16,030	11520	10400	9170	5590	3830	2370	4000	2740	1700	8.23
	0.250	0.238	3.000	229,730	247,600	16,780	12240	11000	10290	6210	4250	2630	4460	3050	1890	8.69
	0.276	0.261	2.948	251,590	271,160	18,100	13420	12100	12130	7250	4960	3070	5240	3580	2220	9.51
	0.281	0.266	2.938	255,750	275,640	18,350	13680	12300	12530	7480	5120	3170	5410	3700	2290	9.67
	0.300	0.285	2.900	271,430	292,550	19,270	14660	13200	13460	8210	5620	3480	6000	4100	2540	10.26

TS-100 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	23,120	24,970	470	15000	13500	13340	8060	5520	3420	5840	4000	2480	0.79
	0.087	0.082	0.826	24,950	26,950	500	16400	14800	15060	9200	6300	3900	6730	4610	2850	0.85
	0.095	0.090	0.810	27,010	29,170	540	18000	15000	16380	10370	7100	4400	7690	5270	3260	0.92
	0.102	0.097	0.796	28,780	31,080	570	19400	15000	17520	11400	7800	4830	8560	5860	3630	0.98
	0.109	0.104	0.782	30,510	32,950	590	20800	15000	18640	12440	8510	5270	9430	6450	4000	1.04
	0.118	0.110	0.764	32,700	35,310	620	22000	15000	19580	13330	9120	5650	10200	6980	4330	1.11
	0.125	0.117	0.750	34,360	37,110	650	23400	15000	20660	14380	9840	6100	11110	7600	4710	1.17
	0.134	0.126	0.732	36,460	39,370	670	25200	15000	22020	15730	10760	6670	12290	8410	5210	1.24
1.250	0.080	0.075	1.090	29,410	31,760	780	12000	10800	8630	5430	3720	2300	3890	2670	1650	1.00
	0.087	0.082	1.076	31,790	34,330	830	13120	11800	10390	6400	4380	2720	4600	3150	1950	1.08
	0.095	0.090	1.060	34,470	37,230	890	14400	13000	12400	7530	5150	3190	5440	3720	2300	1.17
	0.102	0.097	1.046	36,790	39,730	940	15520	14000	14160	8530	5840	3620	6190	4240	2630	1.25
	0.109	0.104	1.032	39,070	42,200	990	16640	15000	15260	9380	6420	3980	6870	4700	2910	1.33
	0.118	0.110	1.014	41,960	45,320	1,050	17600	15000	16050	10070	6890	4270	7450	5100	3160	1.43
	0.125	0.117	1.000	44,180	47,710	1,090	18720	15000	16970	10900	7460	4620	8130	5570	3450	1.50
	0.134	0.126	0.982	46,980	50,740	1,140	20160	15000	18130	11960	8190	5070	9030	6180	3830	1.60
	0.145	0.137	0.960	50,340	54,360	1,200	21920	15000	19520	13270	9080	5630	10150	6950	4300	1.71
	0.156	0.148	0.938	53,620	57,910	1,260	23680	15000	20880	14590	9990	6190	11290	7730	4790	1.82
	0.165	0.157	0.920	56,240	60,740	1,300	25120	15000	21960	15670	10720	6640	12230	8370	5190	1.91
	0.175	0.167	0.900	59,100	63,830	1,350	26720	15000	23150	16870	11550	7150	13300	9100	5640	2.01
1.500	0.087	0.082	1.326	38,620	41,710	1,240	10930	9800	6950	4510	3090	1910	3240	2220	1370	1.31
	0.095	0.090	1.310	41,930	45,290	1,330	12000	10800	8630	5430	3720	2300	3890	2670	1650	1.43
	0.102	0.097	1.296	44,800	48,380	1,410	12930	11600	10090	6240	4270	2650	4480	3070	1900	1.52
	0.109	0.104	1.282	47,630	51,440	1,490	13870	12500	11560	7060	4830	2990	5080	3480	2160	1.62
	0.118	0.110	1.264	51,230	55,330	1,580	14670	13200	12820	7770	5320	3290	5610	3840	2380	1.74
	0.125	0.117	1.250	54,000	58,320	1,650	15600	14000	14280	8600	5890	3650	6250	4270	2650	1.84
	0.134	0.126	1.232	57,510	62,110	1,740	16800	15000	15390	9490	6500	4030	6970	4770	2960	1.96
	0.145	0.137	1.210	61,720	66,660	1,840	18270	15000	16600	10560	7230	4480	7860	5380	3330	2.10
	0.156	0.148	1.188	65,870	71,140	1,930	19730	15000	17790	11640	7970	4940	8760	6000	3720	2.24
	0.165	0.157	1.170	69,200	74,740	2,010	20930	15000	18740	12530	8580	5320	9520	6520	4040	2.35
	0.175	0.167	1.150	72,850	78,670	2,090	22270	15000	19790	13530	9260	5740	10370	7100	4400	2.48
	0.188	0.180	1.124	77,490	83,690	2,180	24000	15000	21120	14830	10150	6290	11500	7870	4880	2.64
	0.204	0.196	1.092	83,060	89,700	2,290	26130	15000	22720	16430	11250	6970	12910	8830	5470	2.83
1.750	0.095	0.090	1.560	49,390	53,350	1,870	10290	9300	5930	3950	2700	1670	2850	1950	1210	1.68
	0.102	0.097	1.546	52,810	57,030	1,980	11090	10000	7190	4640	3180	1970	3330	2280	1410	1.80
	0.109	0.104	1.532	56,190	60,690	2,090	11890	10700	8450	5330	3650	2260	3820	2620	1620	1.91
	0.118	0.110	1.514	60,500	65,340	2,230	12570	11300	9520	5930	4060	2510	4250	2910	1800	2.06
	0.125	0.117	1.500	63,810	68,920	2,330	13370	12000	10780	6620	4530	2810	4760	3260	2020	2.17
	0.134	0.126	1.482	68,030	73,470	2,460	14400	13000	12400	7530	5150	3190	5440	3720	2300	2.31
	0.145	0.137	1.460	73,110	78,960	2,610	15660	14100	14370	8650	5920	3670	6290	4300	2670	2.49
	0.156	0.148	1.438	78,120	84,370	2,750	16910	15000	15480	9570	6550	4060	7040	4820	2980	2.66
	0.165	0.157	1.420	82,160	88,730	2,870	17940	15000	16330	10320	7070	4380	7660	5240	3250	2.80
	0.175	0.167	1.400	86,590	93,520	2,990	19090	15000	17260	11160	7640	4730	8360	5720	3540	2.95
	0.188	0.180	1.374	92,250	99,640	3,140	20570	15000	18460	12270	8400	5200	9290	6360	3940	3.14
	0.204	0.196	1.342	99,080	107,010	3,310	22400	15000	19890	13630	9330	5780	10460	7160	4430	3.37
	0.224	0.216	1.302	107,390	115,980	3,510	24690	15000	21640	15340	10500	6510	11950	8180	5070	3.65
	0.236	0.228	1.278	112,250	121,230	3,620	26060	15000	22660	16370	11210	6940	12860	8800	5450	3.82
	0.250	0.242	1.250	117,810	127,230	3,740	27660	15000	23830	17570	12030	7450	13930	9530	5900	4.01
2.000	0.109	0.104	1.782	64,750	69,930	2,790	10400	9400	6110	4050	2770	1720	2920	2000	1280	2.20
	0.118	0.110	1.764	69,770	75,350	2,980	11000	9900	7050	4570	3130	1940	3280	2240	1430	2.37
	0.125	0.117	1.750	73,630	79,520	3,130	11700	10500	8150	5170	3540	2190	3710	2540	1610	2.51
	0.134	0.126	1.732	78,550	84,840	3,310	12600	11300	9570	5950	4070	2520	4270	2920	1850	2.67
	0.145	0.137	1.710	84,500	91,260	3,520	13700	12300	11300	6910	4730	2930	4980	3410	2140	2.88
	0.156	0.148	1.688	90,370	97,600	3,720	14800	13300	13030	7890	5400	3340	5700	3900	2460	3.08
	0.165	0.157	1.670	95,120	102,730	3,880	15700	14100	14440	8690	5950	3690	6320	4320	2680	3.24
	0.175	0.167	1.650	100,330	108,360	4,060	16700	15000	15310	9420	6450	4000	6910	4730	2930	3.41
	0.188	0.176	1.624	107,020	115,580	4,270	17600	15000	16050	10070	6890	4270	7450	5100	3160	3.64

TS-100 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	115,100	124,310	4,520	19200	15000	17360	11250	7700	4770	8430	5770	3580	3.92
	0.224	0.212	1.552	124,980	134,980	4,820	21200	15000	18950	12730	8710	5400	9690	6630	4110	4.25
	0.236	0.224	1.528	130,790	141,250	4,980	22400	15000	19890	13630	9330	5780	10460	7160	4440	4.45
	0.250	0.238	1.500	137,450	148,440	5,170	23800	15000	20970	14680	10050	6220	11370	7780	4820	4.68
	0.276	0.261	1.448	149,480	161,440	5,480	26100	15000	22690	16400	11230	6960	12880	8820	5460	5.09
	0.281	0.266	1.438	151,750	163,890	5,540	26600	15000	23060	16780	11480	7120	13220	9050	5600	5.16
2.375	0.109	0.104	2.157	77,600	83,800	4,040	8760	7900	3940	2770	1900	1170	2020	1390	860	2.64
	0.118	0.110	2.139	83,670	90,360	4,330	9260	8300	4460	3100	2120	1320	2260	1550	960	2.85
	0.125	0.117	2.125	88,360	95,430	4,540	9850	8900	5250	3570	2440	1510	2590	1770	1100	3.01
	0.134	0.126	2.107	94,340	101,890	4,820	10610	9500	6440	4230	2900	1790	3040	2080	1290	3.21
	0.145	0.137	2.085	101,580	109,710	5,140	11540	10400	7900	5030	3440	2130	3610	2470	1530	3.46
	0.156	0.148	2.063	108,750	117,450	5,450	12460	11200	9350	5830	3990	2470	4180	2860	1770	3.70
	0.165	0.157	2.045	114,560	123,720	5,700	13220	11900	10540	6490	4440	2750	4660	3190	1980	3.90
	0.175	0.167	2.025	120,950	130,630	5,970	14060	12700	11870	7230	4950	3070	5210	3570	2210	4.12
	0.188	0.176	1.999	129,170	139,500	6,300	14820	13300	13060	7900	5410	3350	5720	3910	2420	4.40
	0.204	0.192	1.967	139,140	150,270	6,700	16170	14600	14860	9040	6180	3830	6590	4510	2800	4.73
	0.224	0.212	1.927	151,370	163,480	7,170	17850	15000	16260	10260	7020	4350	7600	5200	3220	5.15
	0.236	0.224	1.903	158,590	171,280	7,440	18860	15000	17080	11000	7530	4660	8220	5630	3490	5.40
	0.250	0.238	1.875	166,900	180,250	7,740	20040	15000	18030	11870	8120	5030	8960	6130	3800	5.68
	0.276	0.261	1.823	182,000	196,560	8,260	21980	15000	19560	13310	9110	5650	10190	6970	4320	6.19
	0.281	0.266	1.813	184,860	199,640	8,360	22400	15000	19890	13630	9330	5780	10460	7160	4430	6.29
	0.300	0.285	1.775	195,560	211,210	8,710	24000	15000	21120	14830	10150	6290	11500	7870	4880	6.65
2.625	0.145	0.137	2.335	112,970	122,010	6,390	10440	9400	6170	4080	2790	1730	2940	2010	1250	3.84
	0.156	0.148	2.313	121,000	130,680	6,790	11280	10200	7490	4810	3290	2040	3450	2360	1460	4.12
	0.165	0.157	2.295	127,520	137,720	7,100	11960	10800	8570	5400	3700	2290	3870	2659	1640	4.34
	0.175	0.167	2.275	134,700	145,470	7,450	12720	11400	9760	6060	4150	2570	4350	2980	1840	4.58
	0.188	0.176	2.249	143,930	155,450	7,880	13410	12100	10840	6660	4560	2820	4790	3280	2030	4.90
	0.204	0.192	2.217	155,160	167,570	8,390	14630	13200	12760	7730	5290	3280	5590	3820	2370	5.28
	0.224	0.212	2.177	168,960	182,480	9,000	16150	14500	14850	9020	6180	3830	6580	4510	2790	5.75
	0.236	0.224	2.153	177,120	191,290	9,350	17070	15000	15610	9690	6630	4110	7130	4880	3020	6.03
	0.250	0.238	2.125	186,530	201,460	9,750	18130	15000	16490	10460	7160	4440	7770	5320	3300	6.35
	0.276	0.261	2.073	203,680	219,970	10,440	19890	15000	17910	11760	8050	4990	8860	6060	3760	6.93
	0.281	0.266	2.063	206,930	223,480	10,570	20270	15000	18210	12040	8240	5100	9100	6230	3860	7.04
	0.300	0.285	2.025	219,130	236,660	11,040	21710	15000	19360	13120	8980	5560	10020	6860	4250	7.46
2.875	0.145	0.137	2.585	124,360	134,310	7,780	9530	8600	4740	3280	2250	1390	2390	1640	1020	4.23
	0.156	0.148	2.563	133,260	143,920	8,270	10300	9300	5950	3960	2710	1680	2860	1950	1210	4.53
	0.165	0.157	2.545	140,480	151,710	8,660	10920	9800	6930	4500	3080	1910	3230	2210	1370	4.78
	0.175	0.167	2.525	148,440	160,320	9,090	11620	10500	8020	5100	3490	2160	3660	2500	1550	5.05
	0.188	0.176	2.499	158,700	171,400	9,630	12240	11000	9010	5640	3860	2390	4050	2770	1720	5.40
	0.204	0.192	2.467	171,180	184,880	10,280	13360	12000	10760	6610	4520	2800	4750	3250	2020	5.82
	0.224	0.212	2.427	186,560	201,480	11,050	14750	13300	12940	7840	5360	3320	5670	3880	2400	6.35
	0.236	0.224	2.403	195,660	211,310	11,490	15580	14000	14260	8590	5880	3640	6240	4270	2640	6.67
	0.250	0.238	2.375	206,170	222,660	11,990	16560	14900	15190	9320	6380	3950	6820	4670	2890	7.02
	0.276	0.261	2.323	225,350	243,380	12,880	18160	15000	16510	10480	7170	4440	7790	5330	3300	7.67
	0.281	0.266	2.313	229,000	247,320	13,040	18500	15000	16790	10740	7350	4550	8000	5480	3390	7.79
	0.300	0.285	2.275	242,690	262,100	13,650	19830	15000	17860	11710	8020	4970	8820	6040	3740	8.26
3.500	0.156	0.148	3.188	163,890	177,000	12,620	8460	7600	3640	2580	1760	1090	1890	1290	800	5.58
	0.165	0.157	3.170	172,870	186,700	13,250	8970	8100	4160	2910	1990	1230	2130	1460	900	5.88
	0.175	0.167	3.150	182,800	197,430	13,930	9540	8600	4760	3290	2250	1400	2400	1640	1020	6.22
	0.188	0.176	3.124	195,610	211,260	14,800	10060	9100	5570	3750	2570	1590	2710	1860	1150	6.66
	0.204	0.192	3.092	211,240	228,140	15,830	10970	9900	7010	4540	3110	1930	3260	2230	1380	7.19
	0.224	0.212	3.052	230,540	248,980	17,080	12110	10900	8800	5530	3780	2340	3960	2710	1680	7.84
	0.236	0.224	3.028	242,000	261,360	17,810	12800	11500	9880	6120	4190	2600	4400	3010	1860	8.23
	0.250	0.238	3.000	255,260	275,680	18,640	13600	12200	11140	6820	4670	2890	4910	3360	2080	8.69
	0.276	0.261	2.948	279,550	301,910	20,120	14910	13400	13200	7990	5470	3390	5780	3960	2450	9.51
	0.281	0.266	2.938	284,170	306,900	20,390	15200	13700	13650	8240	5640	3490	5970	4090	2530	9.67
	0.300	0.285	2.900	301,590	325,720	21,410	16290	14700	14960	9120	6240	3870	6660	4560	2830	10.26

TS-110 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	25,430	26,590	520	16500	14900	14380	8790	6020	3820	6380	4360	2700	0.79
	0.087	0.082	0.826	27,450	28,700	560	18040	15000	16560	10120	6930	4290	7400	5070	3140	0.85
	0.095	0.090	0.810	29,710	31,060	590	19800	15000	18020	11400	7810	4840	8460	5790	3590	0.92
	0.102	0.097	0.796	31,650	33,090	620	21340	15000	19270	12540	8580	5320	9410	6440	3990	0.98
	0.109	0.104	0.782	33,560	35,090	650	22880	15000	20500	13680	9360	5800	10380	7100	4400	1.04
	0.118	0.110	0.764	35,970	37,600	690	24200	15000	21540	14660	10040	6220	11220	7680	4760	1.11
	0.125	0.117	0.750	37,800	39,520	710	25740	15000	22730	15820	10830	6710	12220	8360	5180	1.17
	0.134	0.126	0.732	40,100	41,920	740	27720	15000	24230	17300	11840	7340	13520	9250	5730	1.24
1.250	0.080	0.075	1.090	32,350	33,820	860	13200	11900	9130	5860	4010	2490	4220	2890	1790	1.00
	0.087	0.082	1.076	34,970	36,560	920	14430	13000	11090	6950	4750	2950	5010	3430	2120	1.08
	0.095	0.090	1.060	37,920	39,640	980	15840	14300	13330	8200	5610	3480	5930	4060	2520	1.17
	0.102	0.097	1.046	40,470	42,300	1,030	17070	15000	15290	9310	6370	3950	6770	4630	2870	1.25
	0.109	0.104	1.032	42,980	44,930	1,090	18300	15000	16780	10310	7060	4370	7560	5170	3210	1.33
	0.118	0.110	1.014	46,160	48,260	1,150	19360	15000	17660	11080	7590	4700	8200	5610	3480	1.43
	0.125	0.117	1.000	48,600	50,810	1,200	20590	15000	18660	11980	8200	5080	8950	6120	3790	1.50
	0.134	0.126	0.982	51,680	54,030	1,260	22180	15000	19940	13160	9000	5580	9930	6800	4210	1.60
	0.145	0.137	0.960	55,370	57,890	1,320	24110	15000	21470	14600	9990	6190	11160	7640	4730	1.71
	0.156	0.148	0.938	58,980	61,660	1,390	26050	15000	22960	16050	10980	6800	12420	8500	5270	1.82
	0.165	0.157	0.920	61,870	64,680	1,430	27630	15000	24160	17240	11800	7310	13460	9210	5710	1.91
	0.175	0.167	0.900	65,010	67,970	1,480	29390	15000	25470	18560	12700	7870	14630	10010	6200	2.01
1.500	0.087	0.082	1.326	42,480	44,410	1,370	12030	10800	7270	4830	3310	2050	3490	2390	1480	1.31
	0.095	0.090	1.310	46,130	48,220	1,470	13200	11900	9130	5860	4010	2490	4220	2890	1790	1.43
	0.102	0.097	1.296	49,280	51,520	1,550	14230	12800	10770	6770	4630	2870	4880	3340	2070	1.52
	0.109	0.104	1.282	52,400	54,780	1,640	15250	13700	12400	7670	5250	3250	5540	3790	2350	1.62
	0.118	0.110	1.264	56,360	58,920	1,740	16130	14500	13800	8460	5790	3590	6130	4200	2600	1.74
	0.125	0.117	1.250	59,400	62,100	1,820	17160	15000	15430	9390	6430	3980	6830	4670	2900	1.84
	0.134	0.126	1.232	63,260	66,130	1,910	18480	15000	16930	10440	7150	4430	7670	5250	3250	1.96
	0.145	0.137	1.210	67,900	70,980	2,020	20090	15000	18260	11620	7950	4930	8640	5910	3660	2.10
	0.156	0.148	1.188	72,450	75,750	2,130	21710	15000	19560	12810	8760	5430	9640	6600	4090	2.24
	0.165	0.157	1.170	76,120	79,580	2,210	23030	15000	20620	13790	9440	5850	10470	7170	4440	2.35
	0.175	0.167	1.150	80,130	83,770	2,300	24490	15000	21770	14880	10190	6310	11410	7810	4840	2.48
	0.188	0.180	1.124	85,240	89,110	2,400	26400	15000	23230	16310	11160	6920	12650	8660	5360	2.64
	0.204	0.196	1.092	91,360	95,520	2,520	28750	15000	24990	18070	12370	7660	14200	9720	6020	2.83
1.750	0.095	0.090	1.560	54,330	56,800	2,050	11310	10200	6130	4190	2870	1780	3050	2090	1290	1.68
	0.102	0.097	1.546	58,090	60,730	2,180	12190	11000	7530	4970	3400	2110	3600	2460	1520	1.80
	0.109	0.104	1.532	61,810	64,620	2,300	13070	11800	8930	5750	3940	2440	4140	2840	1760	1.91
	0.118	0.110	1.514	66,550	69,570	2,450	13830	12400	10130	6410	4390	2720	4620	3160	1960	2.06
	0.125	0.117	1.500	70,200	73,390	2,560	14710	13200	11530	7190	4920	3050	5190	3550	2200	2.17
	0.134	0.126	1.482	74,830	78,230	2,700	15840	14300	13330	8200	5610	3480	5930	4060	2520	2.31
	0.145	0.137	1.460	80,420	84,080	2,870	17220	15000	15530	9450	6460	4010	6870	4700	2910	2.49
	0.156	0.148	1.438	85,930	89,840	3,030	18610	15000	17030	10530	7210	4470	7740	5300	3280	2.66
	0.165	0.157	1.420	90,380	94,480	3,150	19740	15000	17970	11360	7770	4820	8420	5770	3570	2.80
	0.175	0.167	1.400	95,250	99,580	3,290	20990	15000	18990	12280	8410	5210	9200	6290	3900	2.95
	0.188	0.180	1.374	101,480	106,090	3,450	22630	15000	20300	13490	9230	5720	10220	6990	4330	3.14
	0.204	0.196	1.342	108,990	113,940	3,640	24640	15000	21880	14990	10260	6360	11500	7870	4880	3.37
	0.224	0.216	1.302	118,130	123,500	3,860	27150	15000	23800	16880	11550	7160	13140	9000	5570	3.65
	0.236	0.228	1.278	123,480	129,090	3,990	28660	15000	24930	18010	12330	7640	14140	9680	6000	3.82
	0.250	0.242	1.250	129,590	135,480	4,120	30420	15000	26220	19330	13230	8200	15320	10480	6500	4.01
2.000	0.109	0.104	1.782	71,230	74,470	3,070	11440	10300	6330	4300	2950	1830	3130	2140	1330	2.20
	0.118	0.110	1.764	76,740	80,230	3,280	12100	10900	7380	4890	3350	2070	3540	2420	1500	2.37
	0.125	0.117	1.750	80,990	84,680	3,440	12870	11600	8610	5570	3810	2360	4020	2750	1700	2.51
	0.134	0.126	1.732	86,410	90,340	3,640	13860	12500	10180	6440	4410	2730	4640	3180	1970	2.67
	0.145	0.137	1.710	92,950	97,180	3,870	15070	13600	12110	7510	5140	3190	5420	3710	2300	2.88
	0.156	0.148	1.688	99,410	103,930	4,090	16280	14700	14030	8590	5880	3640	6230	4260	2640	3.08
	0.165	0.157	1.670	104,630	109,390	4,270	17270	15000	15610	9490	6500	4020	6910	4730	2930	3.24
	0.175	0.167	1.650	110,370	115,390	4,460	18370	15000	16840	10360	7090	4390	7600	5200	3220	3.41
	0.188	0.176	1.624	117,720	123,070	4,700	19360	15000	17660	11080	7590	4700	8200	5610	3480	3.64

TS-110 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	126,610	132,370	4,980	21120	15000	19090	12370	8470	5250	9270	6350	3930	3.92
	0.224	0.212	1.552	137,480	143,730	5,300	23320	15000	20850	14010	9590	5940	10660	7290	4520	4.25
	0.236	0.224	1.528	143,860	150,400	5,480	24640	15000	21880	14990	10260	6360	11500	7870	4880	4.45
	0.250	0.238	1.500	151,190	158,060	5,680	26180	15000	23060	16140	11050	6850	12500	8560	5300	4.68
	0.276	0.261	1.448	164,430	171,910	6,030	28710	15000	24960	18050	12350	7650	14170	9700	6010	5.09
	0.281	0.266	1.438	166,930	174,510	6,090	29260	15000	25370	18460	12630	7830	14540	9950	6170	5.16
2.375	0.109	0.104	2.157	85,360	89,230	4,450	9630	8700	4100	2940	2010	1250	2170	1490	920	2.64
	0.118	0.110	2.139	92,040	96,220	4,760	10190	9200	4670	3310	2270	1400	2440	1670	1030	2.85
	0.125	0.117	2.125	97,190	101,610	5,000	10840	9800	5380	3760	2580	1600	2760	1890	1170	3.01
	0.134	0.126	2.107	103,770	108,490	5,300	11670	10500	6700	4510	3090	1910	3270	2240	1390	3.21
	0.145	0.137	2.085	111,740	116,820	5,650	12690	11400	8320	5410	3700	2300	3900	2670	1660	3.46
	0.156	0.148	2.063	119,630	125,060	6,000	13710	12300	9940	6310	4320	2680	4540	3110	1930	3.70
	0.165	0.157	2.045	126,010	131,740	6,270	14540	13100	11270	7050	4820	2990	5080	3480	2150	3.90
	0.175	0.167	2.025	133,050	139,090	6,560	15470	13900	12740	7870	5380	3340	5690	3890	2410	4.12
	0.188	0.176	1.999	142,090	148,540	6,930	16300	14700	14070	8610	5900	3650	6240	4270	2650	4.40
	0.204	0.192	1.967	153,050	160,010	7,370	17790	15000	16350	9940	6800	4220	7250	4960	3080	4.73
	0.224	0.212	1.927	166,510	174,080	7,890	19640	15000	17880	11280	7720	4780	8360	5720	3550	5.15
	0.236	0.224	1.903	174,450	182,380	8,180	20750	15000	18790	12100	8280	5130	9040	6190	3840	5.40
	0.250	0.238	1.875	183,590	191,930	8,510	22050	15000	19840	13060	8940	5540	9850	6740	4180	5.68
	0.276	0.261	1.823	200,200	209,300	9,090	24180	15000	21520	14650	10020	6210	11210	7670	4750	6.19
	0.281	0.266	1.813	203,340	212,580	9,190	24640	15000	21880	14990	10260	6360	11500	7870	4880	6.29
	0.300	0.285	1.775	215,120	224,900	9,580	26400	15000	23230	16310	11160	6920	12650	8660	5360	6.65
2.625	0.145	0.137	2.335	124,270	129,920	7,030	11480	10300	6400	4340	2970	1840	3160	2160	1340	3.84
	0.156	0.148	2.313	133,100	139,150	7,470	12400	11200	7870	5160	3530	2190	3730	2550	1580	4.12
	0.165	0.157	2.295	140,270	146,650	7,810	13160	11800	9070	5830	3990	2470	4200	2870	1780	4.34
	0.175	0.167	2.275	148,170	154,900	8,190	14000	12600	10400	6560	4490	2780	4730	3240	2000	4.58
	0.188	0.176	2.249	158,330	165,520	8,670	14750	13300	11600	7230	4950	3070	5210	3570	2210	4.90
	0.204	0.192	2.217	170,670	178,430	9,230	16090	14500	13730	8420	5760	3570	6100	4180	2590	5.28
	0.224	0.212	2.177	185,860	194,310	9,900	17770	15000	16330	9930	6790	4210	7240	4960	3070	5.75
	0.236	0.224	2.153	194,840	203,690	10,290	18770	15000	17170	10650	7290	4520	7840	5370	3330	6.03
	0.250	0.238	2.125	205,190	214,510	10,720	19950	15000	18140	11510	7880	4880	8550	5850	3630	6.35
	0.276	0.261	2.073	224,050	234,230	11,490	21870	15000	19700	12930	8850	5480	9740	6670	4130	6.93
	0.281	0.266	2.063	227,620	237,960	11,630	22290	15000	20030	13240	9060	5610	10010	6850	4240	7.04
	0.300	0.285	2.025	241,040	252,000	12,140	23890	15000	21290	14430	9870	6120	11020	7540	4670	7.46
2.875	0.145	0.137	2.585	136,800	143,010	8,550	10480	9400	4980	3510	2400	1490	2580	1770	1090	4.23
	0.156	0.148	2.563	146,580	153,240	9,100	11330	10200	6150	4200	2880	1780	3060	2090	1300	4.53
	0.165	0.157	2.545	154,520	161,550	9,530	12010	10800	7250	4818	3297	2043	3486	2386	1478	4.78
	0.175	0.167	2.525	163,280	170,710	10,000	12780	11500	8460	5490	3760	2330	3960	2710	1680	5.05
	0.188	0.176	2.499	174,570	182,500	10,600	13470	12100	9560	6100	4170	2590	4390	3010	1860	5.40
	0.204	0.192	2.467	188,300	196,860	11,310	14690	13200	11510	7180	4910	3040	5180	3540	2200	5.82
	0.224	0.212	2.427	205,210	214,540	12,150	16220	14600	13940	8540	5850	3620	6190	4240	2620	6.35
	0.236	0.224	2.403	215,230	225,010	12,640	17140	15000	15400	9370	6410	3970	6820	4670	2890	6.67
	0.250	0.238	2.375	226,780	237,090	13,190	18210	15000	16700	10250	7010	4350	7510	5140	3180	7.02
	0.276	0.261	2.323	247,890	259,160	14,170	19970	15000	18160	11530	7890	4890	8570	5860	3630	7.67
	0.281	0.266	2.313	251,900	263,340	14,350	20350	15000	18470	11810	8080	5010	8800	6020	3730	7.79
	0.300	0.285	2.275	266,960	279,090	15,010	21810	15000	19650	12880	8820	5460	9700	6640	4110	8.26
3.500	0.156	0.148	3.188	180,270	188,470	13,890	9300	8400	3760	2720	1860	1150	2010	1380	850	5.58
	0.165	0.157	3.170	190,160	198,810	14,570	9870	8900	4340	3097	2120	1313	2282	1562	968	5.88
	0.175	0.167	3.150	201,080	210,220	15,320	10500	9500	4990	3520	2410	1490	2590	1770	1100	6.22
	0.188	0.176	3.124	215,170	224,960	16,270	11060	10000	5730	3970	2710	1680	2900	1980	1230	6.66
	0.204	0.192	3.092	232,360	242,920	17,420	12070	10900	7330	4860	3330	2060	3520	2410	1490	7.19
	0.224	0.212	3.052	253,590	265,120	18,790	13330	12000	9330	5970	4090	2530	4300	2940	1820	7.84
	0.236	0.224	3.028	266,200	278,300	19,590	14080	12700	10530	6640	4540	2810	4780	3270	2030	8.23
	0.250	0.238	3.000	280,780	293,540	20,500	14960	13500	11930	7410	5070	3140	5350	3660	2270	8.69
	0.276	0.261	2.948	307,500	321,480	22,130	16410	14800	14230	8710	5960	3690	6310	4320	2680	9.51
	0.281	0.266	2.938	312,590	326,800	22,430	16720	15000	14730	8990	6150	3810	6530	4470	2770	9.67
	0.300	0.285	2.900	331,750	346,830	23,550	17910	15000	16460	10030	6870	4250	7330	5020	3110	10.26

TS-130 1.000"-2.000"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
1.000	0.080	0.075	0.840	30,060	31,210	620	19500	15000	16350	10210	6990	4330	7440	5090	3150	0.79
	0.087	0.082	0.826	32,440	33,690	660	21320	15000	19320	11900	8140	5040	8710	5960	3690	0.85
	0.095	0.090	0.810	35,110	36,460	700	23400	15000	21290	13480	9220	5710	10000	6840	4240	0.92
	0.102	0.097	0.796	37,410	38,850	740	25220	15000	22770	14810	10140	6280	11120	7610	4720	0.98
	0.109	0.104	0.782	39,660	41,190	770	27040	15000	24230	16170	11060	6860	12270	8390	5200	1.04
	0.118	0.110	0.764	42,510	44,140	810	28600	15000	25450	17330	11860	7350	13260	9080	5620	1.11
	0.125	0.117	0.750	44,670	46,390	840	30420	15000	26860	18690	12790	7930	14440	9880	6120	1.17
	0.134	0.126	0.732	47,390	49,220	880	32760	15000	28630	20450	13990	8670	15970	10930	6770	1.24
1.250	0.080	0.075	1.090	38,230	39,700	1010	15600	14000	10000	6650	4550	2820	4850	3320	2050	1.00
	0.087	0.082	1.076	41,320	42,910	1080	17060	15000	12370	7980	5460	3380	5790	3970	2460	1.08
	0.095	0.090	1.060	44,810	46,540	1160	18720	15000	15080	9490	6500	4030	6900	4730	2930	1.17
	0.102	0.097	1.046	47,820	49,660	1220	20180	15000	17460	10830	7420	4590	7910	5410	3350	1.25
	0.109	0.104	1.032	50,790	52,750	1280	21630	15000	19830	12190	8340	5170	8940	6120	3790	1.33
	0.118	0.110	1.014	54,550	56,650	1360	22880	15000	20870	13100	8960	5550	9690	6630	4110	1.43
	0.125	0.117	1.000	57,430	59,640	1420	24340	15000	22060	14160	9690	6010	10570	7240	4480	1.50
	0.134	0.126	0.982	61,070	63,420	1480	26210	15000	23570	15550	10640	6590	11740	8040	4980	1.60
	0.145	0.137	0.960	65,440	67,950	1560	28500	15000	25370	17250	11810	7310	13190	9030	5590	1.71
	0.156	0.148	0.938	69,700	72,380	1640	30780	15000	27140	18970	12980	8040	14680	10040	6220	1.82
	0.165	0.157	0.920	73,120	75,930	1690	32660	15000	28550	20370	13940	8640	15910	10890	6740	1.91
	0.175	0.167	0.900	76,830	79,790	1750	34740	15000	30100	21930	15010	9300	17290	11830	7330	2.01
1.500	0.087	0.082	1.326	50,210	52,140	1610	14210	12800	7740	5380	3680	2280	3950	2710	1680	1.31
	0.095	0.090	1.310	54,510	56,610	1730	15600	14000	10000	6650	4550	2820	4850	3320	2050	1.43
	0.102	0.097	1.296	58,240	60,480	1840	16810	15000	11980	7760	5310	3290	5640	3860	2390	1.52
	0.109	0.104	1.282	61,920	64,300	1930	18030	15000	13950	8860	6060	3760	6440	4410	2730	1.62
	0.118	0.110	1.264	66,600	69,160	2050	19070	15000	15650	9810	6720	4160	7140	4890	3030	1.74
	0.125	0.117	1.250	70,200	72,890	2150	20280	15000	17630	10930	7480	4640	7980	5460	3380	1.84
	0.134	0.126	1.232	74,760	77,630	2260	21840	15000	20010	12340	8450	5230	9060	6200	3840	1.96
	0.145	0.137	1.210	80,240	83,330	2390	23750	15000	21580	13730	9400	5820	10210	6990	4330	2.10
	0.156	0.148	1.188	85,630	88,920	2510	25650	15000	23120	15140	10360	6420	11390	7800	4830	2.24
	0.165	0.157	1.170	89,960	93,420	2610	27210	15000	24370	16300	11150	6910	12380	8470	5250	2.35
	0.175	0.167	1.150	94,700	98,340	2710	28950	15000	25720	17590	12040	7460	13480	9230	5720	2.48
	0.188	0.180	1.124	100,740	104,610	2840	31200	15000	27460	19280	13190	8170	14950	10230	6340	2.64
	0.204	0.196	1.092	107,980	112,130	2980	33970	15000	29530	21360	14620	9060	16780	11480	7110	2.83
1.750	0.095	0.090	1.560	64,210	66,680	2430	13370	12000	6380	4590	3140	1940	3410	2330	1450	1.68
	0.102	0.097	1.546	68,650	71,290	2570	14410	13000	8070	5560	3810	2360	4080	2790	1730	1.80
	0.109	0.104	1.532	73,050	75,860	2720	15450	13900	9760	6520	4460	2760	4750	3250	2010	1.91
	0.118	0.110	1.514	78,650	81,670	2890	16340	14700	11210	7330	5020	3110	5330	3650	2260	2.06
	0.125	0.117	1.500	82,960	86,150	3030	17380	15000	12910	8280	5670	3510	6010	4110	2550	2.17
	0.134	0.126	1.482	88,440	91,840	3200	18720	15000	15080	9490	6500	4030	6900	4730	2930	2.31
	0.145	0.137	1.460	95,050	98,700	3390	20350	15000	17750	11000	7530	4660	8030	5500	3410	2.49
	0.156	0.148	1.438	101,560	105,460	3580	21990	15000	20130	12450	8520	5280	9150	6260	3880	2.66
	0.165	0.157	1.420	106,810	110,920	3730	23330	15000	21230	13420	9190	5690	9960	6810	4220	2.80
	0.175	0.167	1.400	112,570	116,900	3890	24810	15000	22440	14510	9930	6150	10870	7440	4610	2.95
	0.188	0.180	1.374	119,930	124,540	4080	26740	15000	23990	15940	10910	6760	12080	8270	5120	3.14
	0.204	0.196	1.342	128,810	133,760	4310	29120	15000	25860	17720	12130	7510	13600	9310	5770	3.37
	0.224	0.216	1.302	139,600	144,970	4560	32090	15000	28130	19950	13650	8460	15530	10630	6590	3.65
	0.236	0.228	1.278	145,930	151,540	4710	33870	15000	29460	21290	14570	9030	16710	11440	7090	3.82
	0.250	0.242	1.250	153,150	159,040	4870	35950	15000	30980	22850	15640	9690	18100	12390	7680	4.01
2.000	0.109	0.104	1.782	84,180	87,420	3630	13520	12200	6610	4720	3230	2000	3500	2400	1490	2.20
	0.118	0.110	1.764	90,700	94,190	3880	14300	12900	7880	5460	3730	2310	4010	2740	1700	2.37
	0.125	0.117	1.750	95,720	99,400	4070	15210	13700	9370	6300	4310	2670	4600	3140	1950	2.51
	0.134	0.126	1.732	102,120	106,050	4300	16380	14700	11270	7360	5040	3120	5350	3660	2270	2.67
	0.145	0.137	1.710	109,850	114,080	4570	17810	15000	13600	8660	5930	3670	6290	4310	2670	2.88
	0.156	0.148	1.688	117,480	122,000	4840	19240	15000	15930	9970	6820	4230	7260	4970	3080	3.08
	0.165	0.157	1.670	123,660	128,410	5050	20410	15000	17840	11050	7560	4690	8070	5520	3420	3.24
	0.175	0.167	1.650	130,440	135,450	5270	21710	15000	19900	12250	8380	5190	8980	6150	3810	3.41
	0.188	0.176	1.624	139,130	144,480	5550	22880	15000	20870	13100	8960	5550	9690	6630	4110	3.64

TS-130 2.000"-3.500"

Outside Diameter	Wall Thickness		Calculated Inside Diameter	Tube Body Load		Torsional Yield Strength	Minimum Internal Yield Strength	Hydro Test Pressure	Collapse Pressure Tensile Load							Mass per Unit Length
	Specified	Minimum		Minimum Yield Strength	Minimum Tensile Strength				Ovality(Dmax)-Dmin)/D							
									0	0.02			0.05			
O.D.	t	tmin	I.D.						L=0	L=0	L=Ly/2	L=3Ly/4	L=0	L=Ly/2	L=3Ly/4	
in	in	in	in	Lb	Lb	Lb-ft	psi	psi	psi	psi	psi	psi	psi	psi	psi	Lb/ft
2.000	0.204	0.192	1.592	149,630	155,390	5880	24960	15000	22560	14620	10010	6200	10960	7500	4650	3.92
	0.224	0.212	1.552	162,470	168,720	6260	27560	15000	24640	16550	11330	7020	12600	8620	5340	4.25
	0.236	0.224	1.528	170,020	176,560	6480	29120	15000	25860	17720	12130	7510	13600	9310	5770	4.45
	0.250	0.238	1.500	178,680	185,550	6720	30940	15000	27260	19080	13060	8090	14780	10110	6270	4.68
	0.276	0.261	1.448	194,330	201,800	7120	33930	15000	29500	21330	14600	9040	16750	11460	7100	5.09
	0.281	0.266	1.438	197,280	204,860	7200	34580	15000	29980	21820	14930	9250	17180	11760	7290	5.16
2.375	0.109	0.104	2.157	100,870	104,750	5260	11390	10300	4280	3200	2190	1360	2410	1650	1020	2.64
	0.118	0.110	2.139	108,770	112,950	5630	12040	10800	4970	3660	2500	1550	2740	1880	1160	2.85
	0.125	0.117	2.125	114,860	119,280	5910	12810	11500	5780	4190	2870	1780	3120	2140	1320	3.01
	0.134	0.126	2.107	122,640	127,360	6260	13790	12400	7060	4980	3410	2110	3680	2520	1560	3.21
	0.145	0.137	2.085	132,060	137,140	6680	15000	13500	9020	6100	4180	2590	4460	3050	1890	3.46
	0.156	0.148	2.063	141,380	146,810	7090	16200	14600	10980	7200	4930	3050	5240	3580	2220	3.70
	0.165	0.157	2.045	148,930	154,650	7410	17190	15000	12590	8100	5540	3430	5880	4030	2490	3.90
	0.175	0.167	2.025	157,240	163,280	7760	18280	15000	14370	9090	6220	3860	6610	4520	2800	4.12
	0.188	0.176	1.999	167,920	174,380	8190	19270	15000	15980	10000	6840	4240	7280	4980	3090	4.40
	0.204	0.192	1.967	180,880	187,830	8710	21020	15000	18830	11620	7950	4930	8500	5820	3600	4.73
	0.224	0.212	1.927	196,780	204,350	9320	23210	15000	21140	13340	9130	5660	9880	6770	4190	5.15
	0.236	0.224	1.903	206,170	214,100	9670	24520	15000	22210	14300	9790	6060	10690	7320	4530	5.40
	0.250	0.238	1.875	216,970	225,310	10060	26050	15000	23440	15430	10560	6540	11640	7970	4940	5.68
	0.276	0.261	1.823	236,600	245,700	10740	28570	15000	25430	17310	11850	7340	13240	9060	5620	6.19
	0.281	0.266	1.813	240,310	249,560	10860	29120	15000	25860	17720	12130	7510	13600	9310	5770	6.29
	0.300	0.285	1.775	254,230	264,010	11320	31200	15000	27460	19280	13190	8170	14950	10230	6340	6.65
2.625	0.145	0.137	2.335	146,860	152,510	8310	13570	12200	6690	4770	3260	2020	3540	2420	1500	3.84
	0.156	0.148	2.313	157,300	163,350	8820	14660	13200	8470	5790	3960	2460	4240	2900	1800	4.12
	0.165	0.157	2.295	165,770	172,150	9230	15550	14000	9920	6610	4520	2800	4810	3290	2040	4.34
	0.175	0.167	2.275	175,100	181,840	9680	16540	14900	11530	7510	5140	3180	5460	3730	2310	4.58
	0.188	0.176	2.249	187,110	194,310	10240	17430	15000	12990	8320	5700	3530	6040	4140	2560	4.90
	0.204	0.192	2.217	201,710	209,460	10910	19020	15000	15570	9770	6690	4140	7110	4860	3010	5.28
	0.224	0.212	2.177	219,650	228,100	11700	21000	15000	18790	11590	7940	4920	8480	5810	3600	5.75
	0.236	0.224	2.153	230,260	239,120	12160	22190	15000	20730	12710	8700	5390	9330	6390	3960	6.03
	0.250	0.238	2.125	242,490	251,820	12670	23570	15000	22990	14020	9600	5950	10350	7080	4390	6.35
	0.276	0.261	2.073	264,780	274,960	13570	25850	15000	26700	16230	11110	6880	12080	8260	5120	6.93
	0.281	0.266	2.063	269,000	279,350	13740	26350	15000	27510	16710	11440	7090	12460	8530	5280	7.04
	0.300	0.285	2.025	284,860	295,820	14350	28230	15000	30570	18580	12720	7880	13950	9550	5910	7.46
2.875	0.145	0.137	2.585	161,670	167,890	10110	12390	11200	5340	3900	2670	1650	2910	1990	1240	4.23
	0.156	0.148	2.563	173,230	179,890	10750	13380	12000	6390	4590	3140	1950	3420	2340	1450	4.53
	0.165	0.157	2.545	182,620	189,640	11260	14200	12800	7260	5170	3540	2190	3840	2630	1630	4.78
	0.175	0.167	2.525	192,970	200,390	11820	15100	13600	9190	6200	4240	2630	4520	3100	1920	5.05
	0.188	0.176	2.499	206,310	214,240	12520	15920	14300	10520	6940	4750	2940	5050	3460	2140	5.40
	0.204	0.192	2.467	222,530	231,090	13360	17360	15000	12870	8260	5650	3500	6000	4100	2540	5.82
	0.224	0.212	2.427	242,520	251,850	14360	19170	15000	15820	9910	6780	4200	7210	4940	3060	6.35
	0.236	0.224	2.403	254,360	264,140	14940	20260	15000	17590	10910	7470	4630	7960	5450	3380	6.67
	0.250	0.238	2.375	268,020	278,330	15590	21520	15000	19650	12090	8270	5130	8860	6060	3760	7.02
	0.276	0.261	2.323	292,960	304,230	16740	23600	15000	23040	14050	9620	5960	10370	7100	4400	7.67
	0.281	0.266	2.313	297,690	309,140	16960	24060	15000	23780	14490	9920	6140	10710	7330	4540	7.79
	0.300	0.285	2.275	315,500	327,630	17740	25770	15000	26570	16150	11050	6850	12020	8220	5100	8.26
3.500	0.156	0.148	3.188	213,050	221,250	16410	10990	9900	3860	2920	2000	1240	2220	1520	940	5.58
	0.165	0.157	3.170	224,740	233,380	17220	11660	10500	4570	3390	2320	1440	2550	1750	1080	5.88
	0.175	0.167	3.150	237,640	246,780	18110	12410	11200	5360	3910	2680	1660	2920	2000	1240	6.22
	0.188	0.176	3.124	254,300	264,080	19230	13070	11800	6070	4380	3000	1860	3260	2230	1380	6.66
	0.204	0.192	3.092	274,610	285,170	20580	14260	12800	7820	5420	3710	2300	3980	2730	1690	7.19
	0.224	0.212	3.052	299,700	311,230	22210	15750	14200	10240	6790	4650	2880	4940	3380	2100	7.84
	0.236	0.224	3.028	314,600	326,700	23160	16640	15000	11700	7600	5200	3220	5520	3780	2340	8.23
	0.250	0.238	3.000	331,830	344,590	24230	17680	15000	13390	8550	5850	3620	6210	4250	2630	8.69
	0.276	0.261	2.948	363,410	377,390	26150	19390	15000	16170	10110	6920	4290	7360	5040	3120	9.51
	0.281	0.266	2.938	369,420	383,630	26510	19760	15000	16780	10450	7150	4430	7620	5210	3230	9.67
	0.300	0.285	2.900	392,070	407,150	27840	21170	15000	19080	11760	8050	4990	8610	5890	3650	10.26

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