STANDARD PIPE & LINE PIPE

ITT Grinnell

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Disclaimer

GENERAL INFORMATION

ITT Grinnell Products

ITT Grinnell employees are deeply committed to being easy to do business with anywhere in the world. As an industry-leading manufacturer, our focus is to offer the widest range of products and to exceed your expectations for on-time delivery, easy installation, performance and operating efficiency.

Our Mission: To be the market leader in the development, manufacture and worldwide sale of quality air moving and control equipment with total commitment to the customer. Our commitment to our customers is what drives our long-standing sustainability practices. We continuously strive to reduce energy usage and other production costs to ensure competitive prices for you and ongoing business success. We support the health, safety and training of our employees to achieve the high quality product performance you expect from ITT Grinnell — and deserve. And we take on the industry's most complex challenges by introducing innovative new product solutions to meet your future needs.

The steels of today are far more sophisticated than metals of earlier eras. The addition of alloys, plus an array of field-testing, lab-testing, melting, casting and hot-rolling practices, along with specialized heat treatments, have created steels that are precisely crafted to meet and/or exceed demanding product requirements. ITT Grinnell innovative software applications calculate, measure, test, record and analyze every aspect of the modern steelmaking process.

At ITT Grinnell , we use cutting-edge technology to manage every aspect of production. Real-time communication between control room and machine operators allows for precise regulation of each step of the process, from charging furnaces with raw ingredients to controlling temperatures, timing, alloying, flows, testing and transport.

ITT Grinnell commitment to the tubular business is even stronger today than it was when we went into the business more than a century ago. Upgrades to our facilities and investments in new technology give us the latest tools to provide our customers with consistent high-quality products.

Sizes and Grades

ITT Grinnell Products provides seamless and electric resistance welded pipe in OD sizes ranging from ١/٢ inches to ٤٨ inches. A variety of end finishes, lengths, grades and wall thicknesses are available.

To ensure the absolute highest quality, ITT Grinnell Products has implemented a Quality Management System in full compliance with API Q1 and TUV , .ITT Grinnell Products maintains API licenses to manufacture and monogram products to API specifications 5CT and 5L.

In addition, Fairfield Tubular Operations, Lorain Tubular Operations, McKeesport Tubular Operations and Texas Tubular Operations manufacturing facilities are all TUV certified.

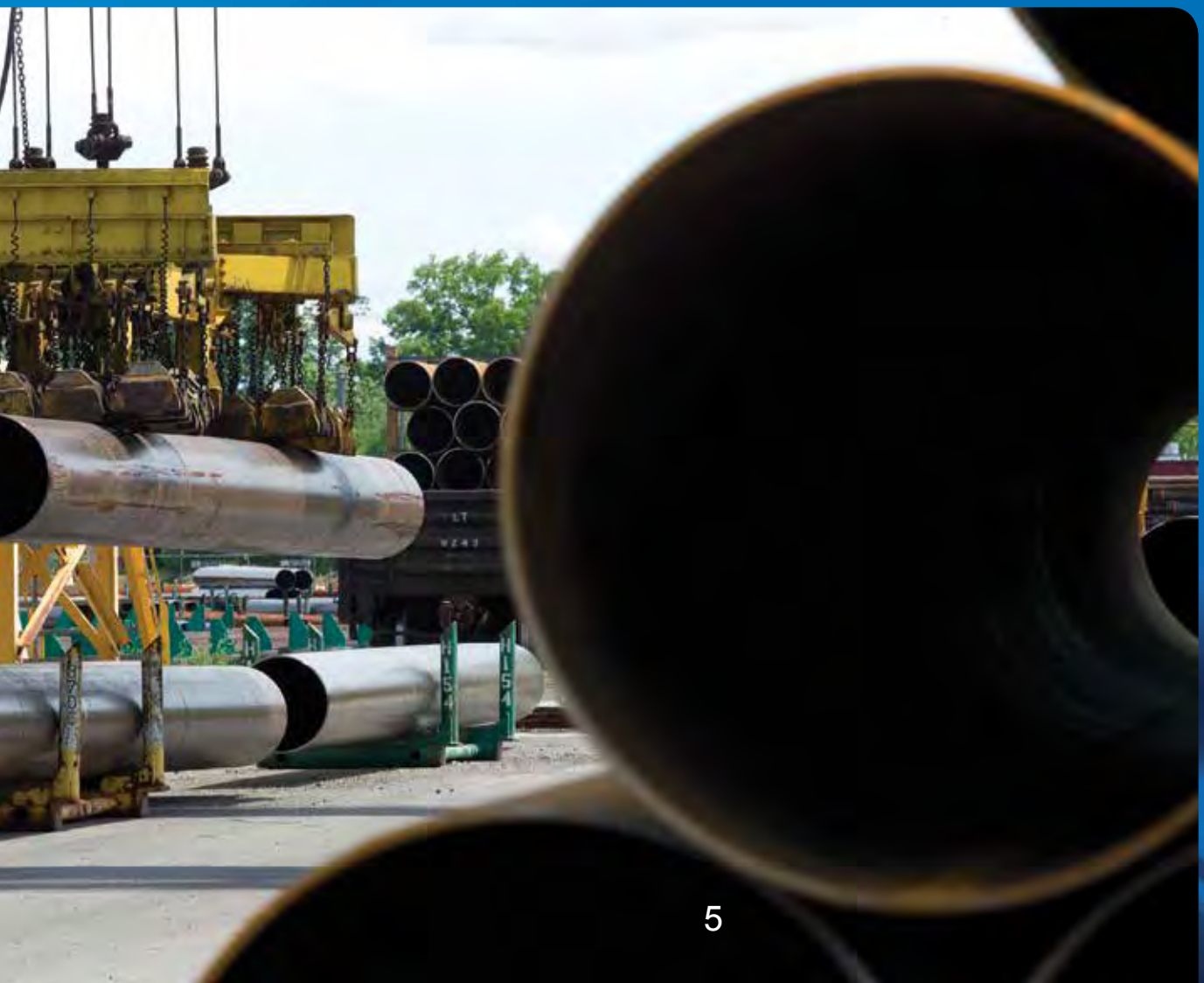
A full line of API grades and proprietary grades are produced to meet specialized customer needs, including HIC-resistant pipe for use in H_2S environments and pipe grades with superior impact properties even under extremely cold arctic conditions.

Sizes and Grades Chart

Type of Pipe Regular Mill Production	Size Range, NPS	Size Range, Inches	Wall Thickness Range, Inches	Max. Length, Feet
Seamless	1.5 - 26	1.900 - 26 OD	0.140 - 2.312	48
Electric Resistance Weld	2 - 20	2.375 - 20.000 OD	0.154 - 0.625	80

Grades of steel vary in chemical composition from simple carbon manganese to complex multi-element micro-alloyed composition. Precise control of compositions and manufacturing processes allows for the manufacture of tubular products with a wide variety of properties and attributes.

When selecting the proper Material Specification, Pipe Grade, ASTM Special Requirement, API 5L Product Service Level (PSL), API 5L Annex Requirement or CSA Z245.1 Category or Service Group, the end use and method of pipe fabrication should be considered. Various practices are employed in all phases of steel production, which determine the type and quality of the finished product.



ITT Grinnell Material Standards

ITT Grinnell material standards are specifications not covered by a society, association or other specify-ing body. The following includes the material standards used most frequently for tubular applications.

USS M1020	Plain End ERW Pipe for Water Well Applications
USS M1021	Plain End ERW Pipe for Use in Structural Applications
USS M1024	Seamless Mechanical Tubing in Sizes from NPS 2 thru 26
USS M1029	Plain End Seamless Pipe for Use in General Purpose Applications
USS M1400	Constructional Alloy Steel Seamless Mechanical Tubing – Grades USS "T-1" Type A and USS "T-1" Type B
USS M1407	ERW Pipe NPS 8 thru 12 for Lift Devices
USS M1430	Seamless Steel Slurry Pipe - Grade USS 430
USS M1431	Seamless Slurry Pipe to be Heat Treated. Primarily for Mechanical Joining
USS M1470	Seamless Steel Pipe for Fabrication into Ordinary Welding Fittings
USS M1471	Seamless Steel Pipe for Fabrication into High-Strength Welding Fittings
USS M1475	Seamless Steel Pipe for Manufacture of Cold-Formed Fittings
USS M2430	ERW Pipe Intended for Transportation of Solids in Slurry Form

Pressure Determinations

Barlow's Formula is commonly used to determine the following:

- Internal Pressure at Minimum Yield
- Ultimate Burst Pressure
- Maximum Allowable Operating Pressure, and
- Mill Hydrostatic Test Pressure

This formula is expressed as $P = \frac{2St}{D}$, where:

P = pressure, psig
t = nominal wall thickness, inches
D = outside diameter, inches
S = allowable stress, psi

To illustrate, assume a seamless piping system 8-5/8" OD x 0.375" wall specified to API 5L Grade B which has a specified minimum yield strength (SMYS) of 35,500 psi and a specified minimum tensile strength (SMTS) of 60,200 psi.

Internal Pressure at Minimum Yield

S=SMYS (35,500 psi)

and

$$P = \frac{2St}{D} = \frac{2\,(35{,}500)\,(0.375)}{8.625} = 3{,}087 \text{ or } 3{,}090 \text{ psig (rounded to nearest 10 psig)}$$

Ultimate Burst Pressure at Minimum Tensile

S = SMYS (60,200 psi)

and

$$P = \frac{2St}{D} = \frac{2\ (60{,}200)\ (0.375)}{8.625} = 5{,}234.7 \text{ psig or } 5{,}230 \text{ psig (rounded to nearest 10 psig)}$$

Maximum Allowable Operating Pressure (MAOP)

S=SMYS (35,500 psi) reduced by a design factor, for example 0.72,

and

$$P = \frac{2St}{D} = \frac{2\ (35{,}500 \times 0.72)\ (0.375)}{8.625} = 2{,}222.6 \text{ psig or } 2{,}220 \text{ psig (rounded to nearest 10 psig)}$$

Mill Hydrostatic Test Pressure

S=SMYS (35,500 psi) reduced by a factor depending on OD and grade (0.60 for 8-5/8" OD Grade B)

and

$$P = \frac{2St}{D} = \frac{2\ (35{,}500 \times 0.60)\ (0.375)}{8.625} = 1{,}852.2 \text{ psig or } 1{,}850 \text{ psig (rounded to nearest 10 psig)}$$

Some safety codes and regulatory agencies also assign a longitudinal joint factor to account for weld efficiency. The more common are 0.85 for ERW pipe and 0.60 for CW pipe. Seamless pipe enjoys a joint factor of 1.00. This means that some designers consider ERW pipe as 85 percent as efficient as seamless pipe and CW pipe only 60 percent as efficient for the same application. Therefore, for a given application, ERW pipe would require a heavier wall than seamless pipe, and CW pipe, in turn, would require a heavier wall than ERW pipe.

Distributors who stock pipe in a combination of seamless, ERW, and CW must exercise extreme care to see that pipe with joint efficiency factors of 0.85 or 0.60 is not used on jobs which require pipe with a joint factor of 1.00.

Wall Thickness

Barlow's Formula is also useful in determining the wall thickness required for a piping system. To illustrate, assume a piping system has been designed with the following criteria:

1. A working pressure of 2,000 psig (P)
2. The pipe to be used is 8-5/8" OD (D) specified to API 5L Grade B (SMYS = 35,500 psi)

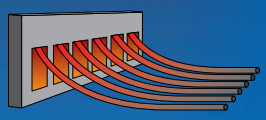
Rearranging Barlow's Formula to solve for wall thickness gives:

$$t = \frac{PD}{2S} = \frac{(2{,}000)\ (8.625)}{2\ (35{,}500)} = 0.243 \text{ wall}$$

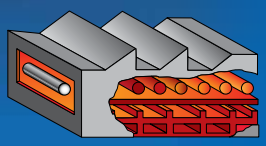
Wall thickness does not affect the outside diameter; only the inside diameter is affected. For example, the outside diameter of a one-inch extra-strong piece of pipe compared with a one-inch standard weight piece of pipe is identical; however, the inside diameter of the extra-strong is smaller than the inside diameter of the standard weight because the wall thickness is greater in the extra-strong pipe.

FACILITIES

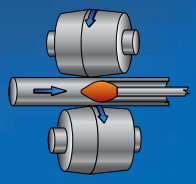
Fairfield, Alabama – 4-1/2" to 9-7/8" OD Seamless Manufacturing Process



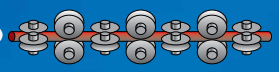
Cast Round Billets



Round Reheating

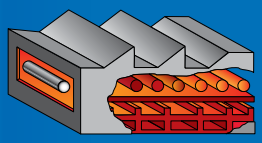


Rotary Piercing Mill (RPM)

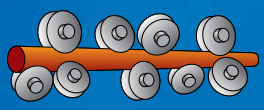


Mandrel Mill

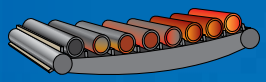
Facilities



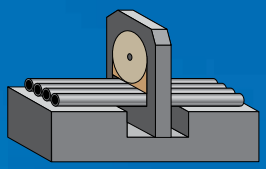
Shell Reheating



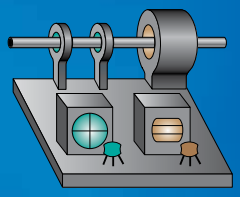
Stretch Reducing Mill



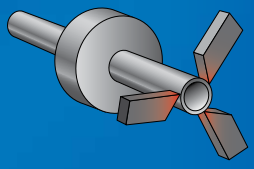
Cooling Bed



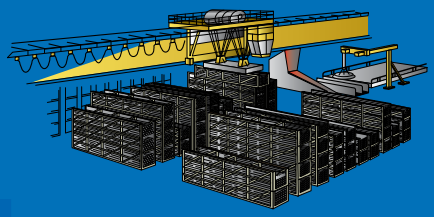
Batch Saws



NDT Inspection



Cut-Off Facilities



In-Process Storage

Facilities

Manufacturing:	Seamless
OD Range:	4-1/2" to 9-7/8"
Walls:	0.205" to 1.200"
Lengths:	SRL, DRL
Grades:	ASTM A 106B/A53 B, API5L GRADE B, X42, X52, X60, X65, X70, ASTM A333, CSA Z245.1 Grades 241 thru 483

Fairfield Tubular Operations can produce approximately 840,000 net tons of seamless tubular products every year. The process begins with solid steel rounds, or billets, being cut to a specified length and sent through a walking-beam reheat furnace, where temperatures reach nearly 2,300°F.

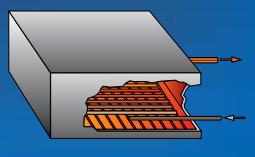
The yellow rounds are turned into a tube shell in mere seconds in the rotary piercing mill as the preheated billets are cross-rolled between two barrel-shaped rolls at a high speed.

The seamless shells enter Fairfield's seven-stand mandrel mill, where they are rolled over a retained mandrel to provide the needed OD size and wall thickness for the next process. The process is carefully monitored using a state-of-the-art hot-wall measuring system.

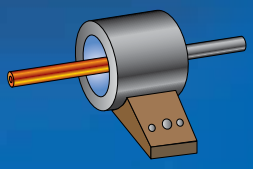
The shells are then reheated for final forming in a 24-stand stretch-reducing mill, where outside diameters are formed to customers' exacting specifications. Wall thickness is again verified using a hot-wall measuring system.

After being rotated and advanced on the walking-beam cooling bed, the pipes are batch cut and transferred to an in-process storage area, where they are handled by computer-controlled gantry cranes.

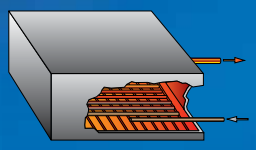
Heat Treating



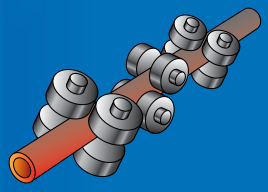
Austenitizing Furnace



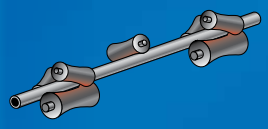
Quenching Unit



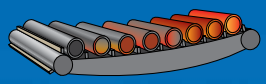
Tempering Furnace



Sizing Mill

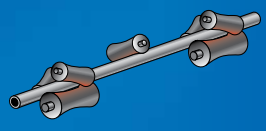


Hot Straightener

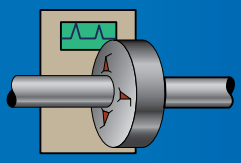


Cooling Bed

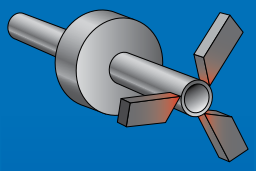
Finishing



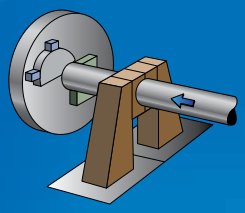
Straightening



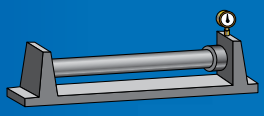
NDT Inspection



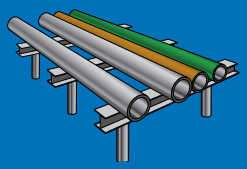
Cut-Off Facilities



Facing and Beveling



Hydrostatic Testing



Final Inspection

From this in-process storage, pipe can be delivered to one of three primary workstations: heat treating, finishing or special pipe processing.

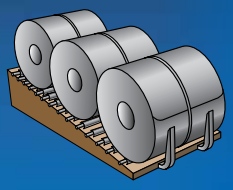
Depending on grade, pipe might undergo quenching and tempering to alter its micro-structure to improve strength or other properties. Quenching and tempering controls hardness, reduces brittleness, and brings the steel to tensile and yield strengths required for the specified grade.

Seamless pipe that has not been quenched and tempered passes initially through a straightener and then a non-destructive testing (NDT) unit. (Q&T pipe goes directly to the NDT area.)

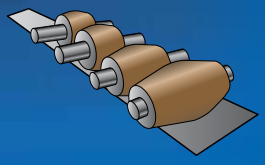
Electromagnetic inspection (EMI) detects longitudinal and transverse flaws as the pipe moves though a set of coils. Ultrasonic testing is used to verify wall thickness. Grade/composition is verified on each pipe by eddy current. All pipe is hydro-tested.

Finished pipe is weighed, measured, stenciled with a unique identification, coated and loaded onto rail cars for shipment to customers.

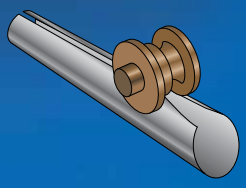
McKeesport, Pennsylvania – 8-5/8" to 20" OD Electric Resistance Weld Manufacturing Process



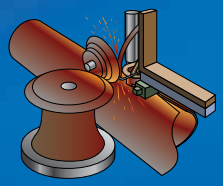
Coil Feed Ramp



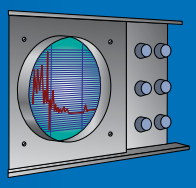
First Forming Section



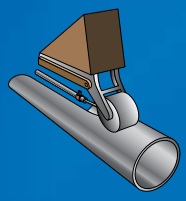
Fin Pass Section



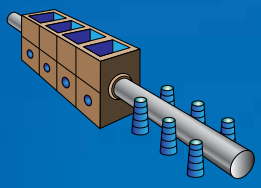
High Frequency Welder



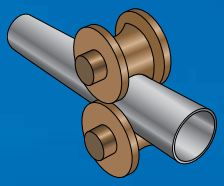
Weld Seam Ultrasonic Inspection



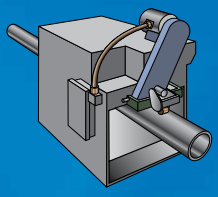
Seam Normalizer



Air Cooling & Water Cooling



Sizing Mill



Flying Cut-Off

Manufacturing:	Electric Resistance Weld
OD Range:	8-5/8" to 20"
Walls:	0.188" to 0.406"
Lengths:	SRL 18'-22'; DRL 39'-45'; TRL 33'-65'; QRL 42'-80' max
Grades:	ASTM A53 B, API5L GRADE B, X42, X52, X60, X65, X70, ASTM A523 A (cable pipe), CSA Z245.1 Grades 241 thru 483

McKeesport Tubular Operations sits on the original site of National Tube Works. McKeesport has been making tubular products since the 1870s and electric-resistance weld pipe since 1964. Steel arrives at the facility in coils that are unrolled, cut and welded into a continuous strip before entering the mill.

The strip steel passes through a series of forming rolls, which transform the strip from flat steel to a round pipe section. The fin pass section of the mill finishes the rounding process and contours the edges of the strip for seam welding.

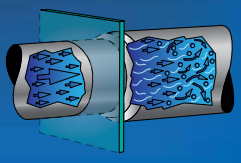
The high-frequency welder heats the edges of the rolled strip to approximately 2,600°F. Pressure rolls then squeeze the heated edges together to form a fusion weld. The weld is inspected by an ultrasonic non-destructive inspection unit.

The pipe then enters the seam normalizer where the weld area is heat treated as per API specification to remove welding stresses and produce a uniform normalized grain structure.

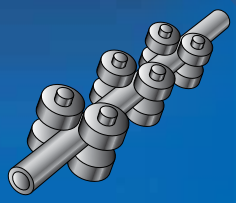
The weld is cooled in air below transformation temperature and then water-cooled to near ambient before passing through the sizing mill, where idler side-closing rolls straighten the pipe and size it to the correct outside diameter.

As the continuous length of pipe moves down the mill, the flying cut-off cuts lengths of pipe

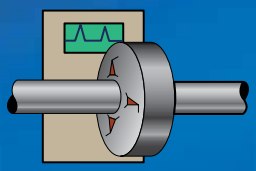
Finishing



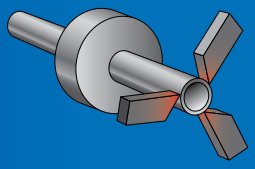
Hydrostatic Testing



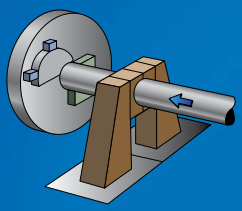
Straightening



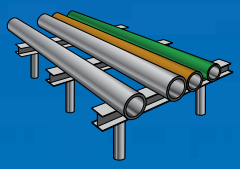
Non-Destructive Inspection



Cut-Off Facilities



Facing and Beveling

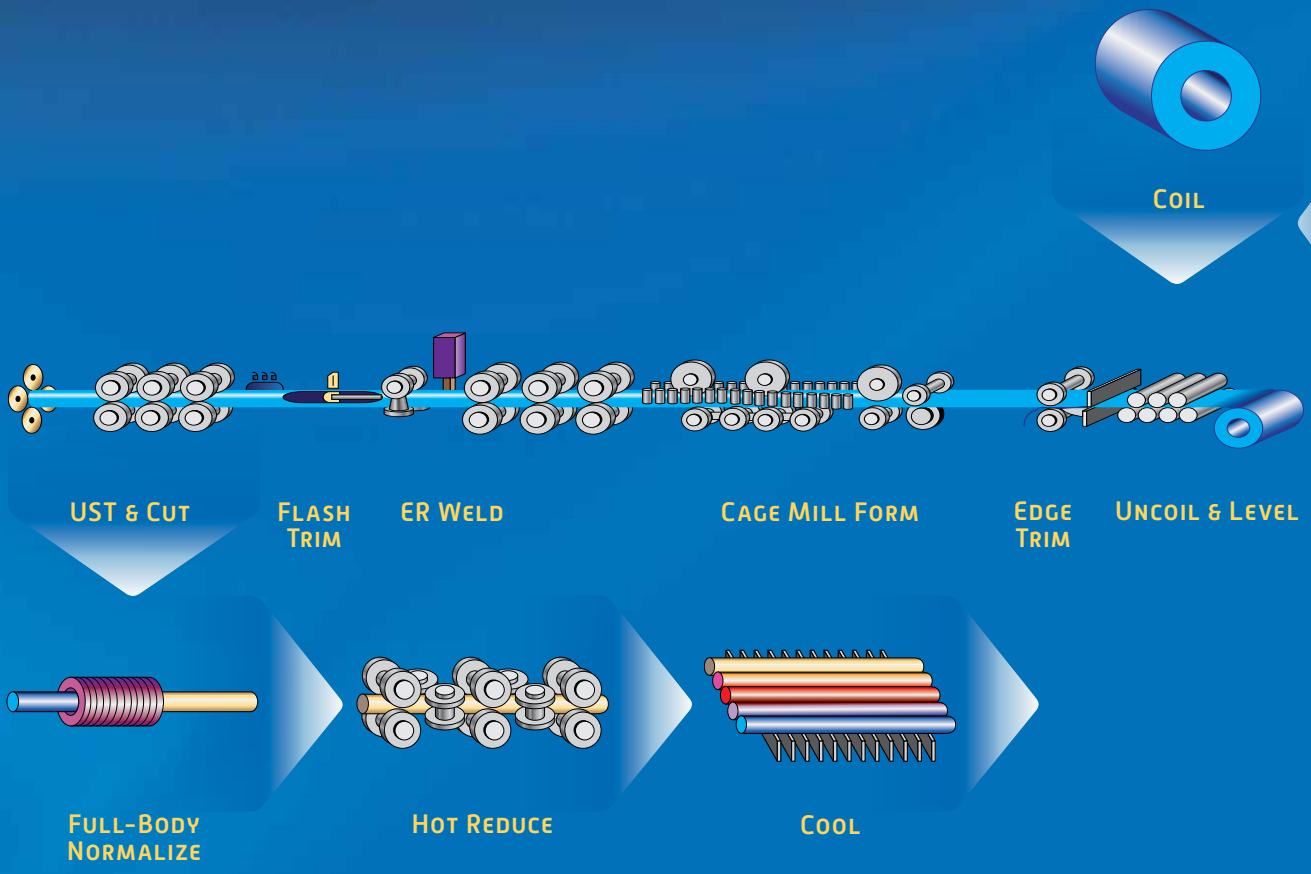


Final Inspection

without interrupting the production line. Each pipe is hydrostatic tested to ensure rated strength and weld integrity under pressure. After hydrotesting, any bow in the pipe is removed by passage through a multi-stand straightener.

The pipe enters the finishing floor where the weld is ultrasonically inspected and the pipe is examined by automated electromagnetic inspection. After being cut to customer-specified lengths, the pipe is finished and prepared for shipment.

Lone Star, Texas – Mill No. 1 – 8-5/8" to 16" OD Electric Resistance Weld Manufacturing Process



Manufacturing:	Electric Resistance Weld
OD Range:	8-5/8" to 16"
Walls:	0.250" to 0.562"
Lengths:	SRL, DRL, TRL
Grades:	ASTM A53 B, API5L GRADE B, X42, X52; Q&T Grades: X60, X65, X70, X80

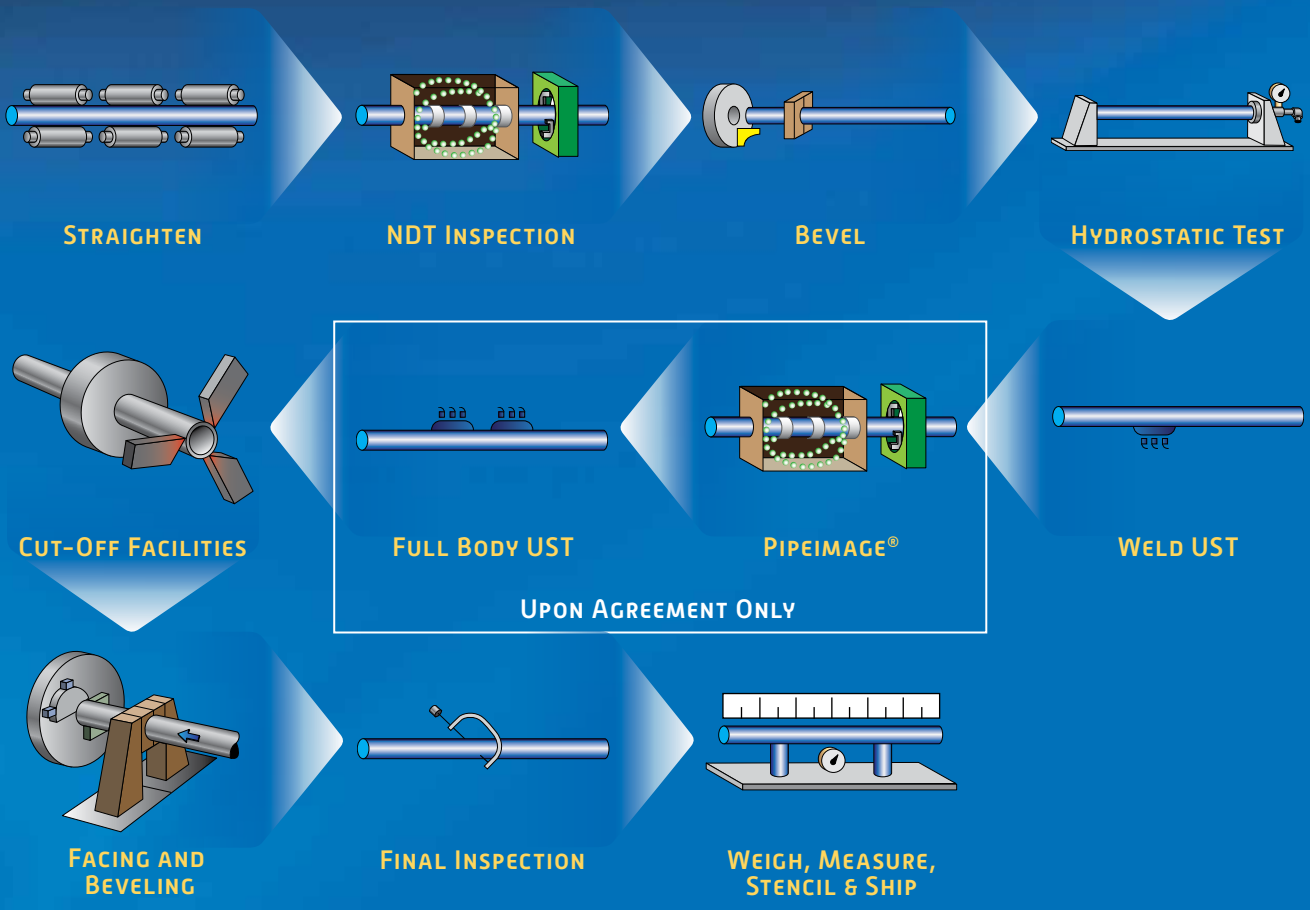
ITT Grinnell Operations Mill No. 1 manufactures high-quality ERW tubular products primarily for the oil and gas industries.

Steel arrives at the facility in coils slit to precise width before the manufacturing process begins. The strip steel is uncoiled, leveled, conveyed through a side trimmer, which shears both edges to provide proper width and clean surfaces for welding.

The strip then passes through a series of forming rolls, which transform the coil from a flat strip of steel to round pipe sections. The edges of the strip are contoured for seam welding. The weld is created by heat obtained from the pipe's resistance to the flow of electric current of the circuit of which it is part, and by applied pressure to form a forged weld. No filler metal is used in the welding process.

After the flash (metal extruded by the weld process) is removed from the pipe's inside and outside surfaces, the pipe is cut to length by a flying rotary cutoff. Weld integrity is checked by ultrasonic test equipment in line behind each welder.

The pipe passes through a series of induction heating furnaces where the entire pipe is heated to temperatures above 1,650°F and allowed to air cool. This full-body normalizing operation

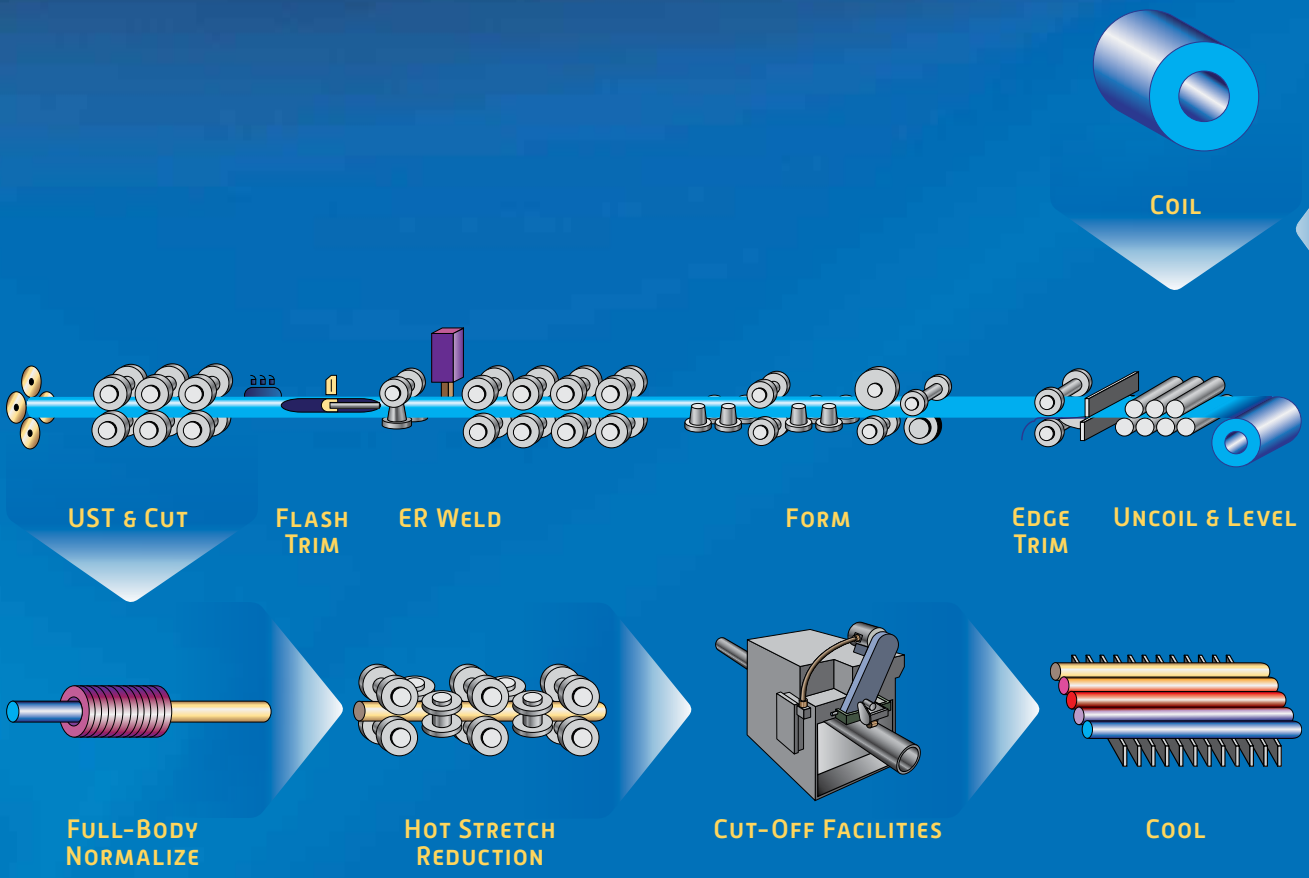


produces uniform grain structure throughout the entire pipe wall. The normalizing furnaces may also heat the pipes for diameter reduction and a more uniform finished product.

After cooling, pipe is sized, straightened, visually inspected, stenciled with the appropriate identity and queued for finishing. Laboratory tests confirm full compliance to specifications and other mechanical property requirements before the pipe is beveled, electromagnetically inspected and hydrostatically tested.

Multiple certifications are available.

Lone Star, Texas - Mill No. 2 - 2-3/8" to 6-5/8" OD Electric Resistance Weld Manufacturing Process



Manufacturing:	Electric Resistance Weld
OD Range:	2-3/8" to 6-5/8"
Walls:	0.154" to 0.531"
Lengths:	SRL, DRL
Grades:	ASTM A53 B, API5L GRADE B, X42, X52; Q&T Grades: X60, X65, X70, X80

ITT Grinnell Operations Mill No. 2 manufactures high-quality ERW tubular products primarily for the oil and gas industries.

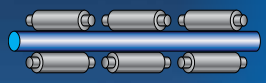
Steel arrives in coils slit to precise width. The strip steel is uncoiled, leveled, conveyed through a side trimmer, which shears both edges to provide proper width and clean surfaces for welding.

The strip then passes through a series of forming rolls, which transform the coil from a flat strip of steel to round pipe sections. The edges of the strip are contoured for seam welding. The weld is created by heat obtained from the pipe's resistance to the flow of electric current of the circuit of which it is part, and by applied pressure to form a forged weld. No filler metal is used in the welding process.

After the flash (metal extruded by the weld process) is removed from the pipe's inside and outside surfaces, the pipe is cut to length by a flying rotary cutoff. Weld integrity is checked by in-line ultrasonic test equipment.

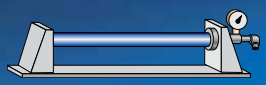
The pipe then passes through a series of induction heating furnaces where the entire pipe is heated to temperatures above 1,650°F and allowed to air cool. This full-body normalizing operation produces uniform grain structure throughout the entire pipe wall. The normalizing furnaces also heat the pipes for diameter reduction and a more uniform finished product. Grades X60 through X80 require heat treatment and quenching. (This additional process is not shown in the flow diagram.)

Finishing 2-3/8" - 4"

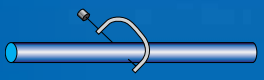


Straighten

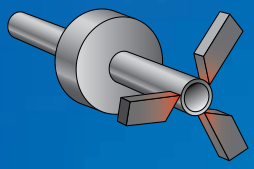
Bevel



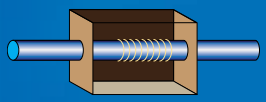
Hydrostatic Test



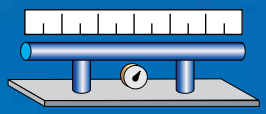
Final Inspection



Cut-Off & Re-Bevel (As Needed)

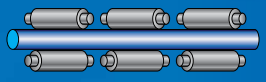


Eddy Current

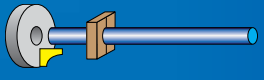


Weigh, Measure, Stencil & Ship

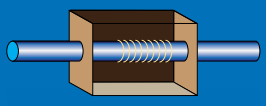
Finishing 4" - 6-5/8"



Straighten



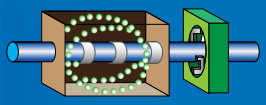
Bevel



Eddy Current

Hydrostatic Test

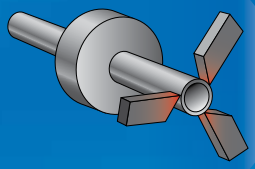
Weld UST



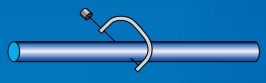
Pipeimage®

Full Body UST

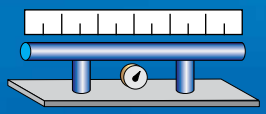
Upon Agreement Only



Cut-Off & Re-Bevel (As Needed)



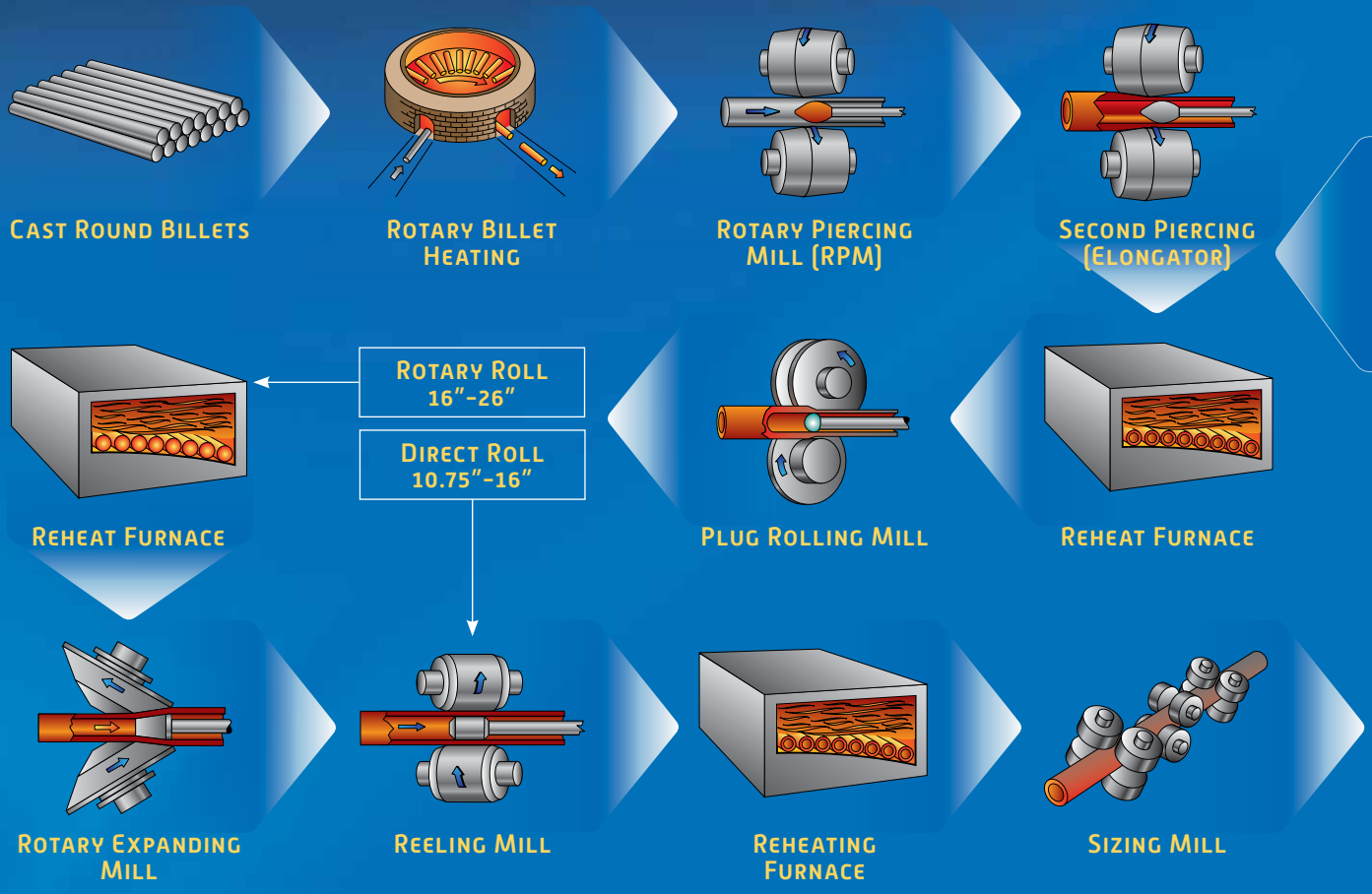
Final Inspection



Weigh, Measure, Stencil & Ship

After cooling, pipe is straightened, visually inspected, stenciled with the appropriate identity and queued for finishing. In the finishing department, the pipe is beveled, eddy current inspected and hydrostatically tested. Full-body electromagnetic and ultrasonic testing is available for pipe sizes 4" and larger. Laboratory tests confirm full compliance to specifications and other mechanical property requirements. Multiple certifications are available.

Lorain, Ohio - Mill No. 3 - 10-3/4" to 26" OD Seamless Manufacturing Process



Manufacturing:	Seamless
OD Range:	10-3/4" to 26"
Walls:	0.365" to 2.312"
Lengths:	SRL, DRL
Grades:	ASTM A 106B/A53 B, API5L GRADE B, X42, X52, X60, X65, X70, ASTM A333, CSA Z245.1 Grades 241 thru 483

Lorain Mill No. 3 manufactures superior seamless pipe, beginning with the processing of continuous cast round billets using the latest steelmaking technology. The cast round billets begin their journey in the rotary hearth furnace where temperatures exceed 2,300°F.

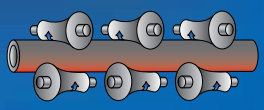
The preheated round billets are processed through a piercing mill to form a pierced billet or shell. The hot shell is then run through a second piercing mill and a plug rolling mill to increase diameter and length, and to reduce and improve the uniformity of the wall thickness. As the billet goes through the first piercer, it is gripped by rolls, which rotate and advance it over the piercer point, forming a hole through its length. The second piercing mill further increases the diameter and length of the shell and reduces the wall thickness.

The pierced hot shell passes through the plug rolling mill to again reduce the wall thickness and to increase the length. Pipe larger than 16" OD is reheated and sent through a rotary rolling mill, which uses large discs to expand the hot pipes up to 26" in diameter. Rotary rolling can produce pipe as long as 48 feet.

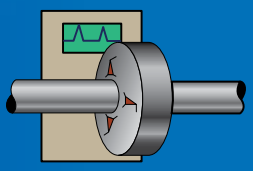
The pipe then passes through the reeling and sizing mills. The reeling mill grips the pipe and advances it over a mandrel, burnishing the inside and outside surfaces. After moving through an intermediate cooling station, the pipe proceeds on one of two paths.

Finishing

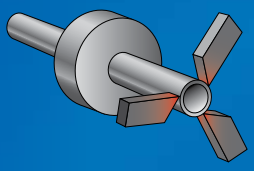
Cooling Bed



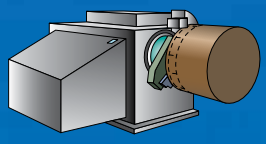
Rotary Straightener



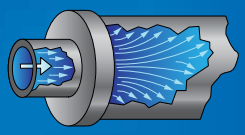
NDT Inspection



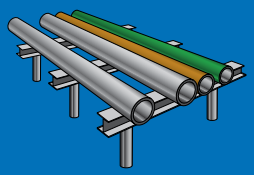
Cut-Off Facilities



Facing & Beveling



Hydrostatic Testing



Final Inspection

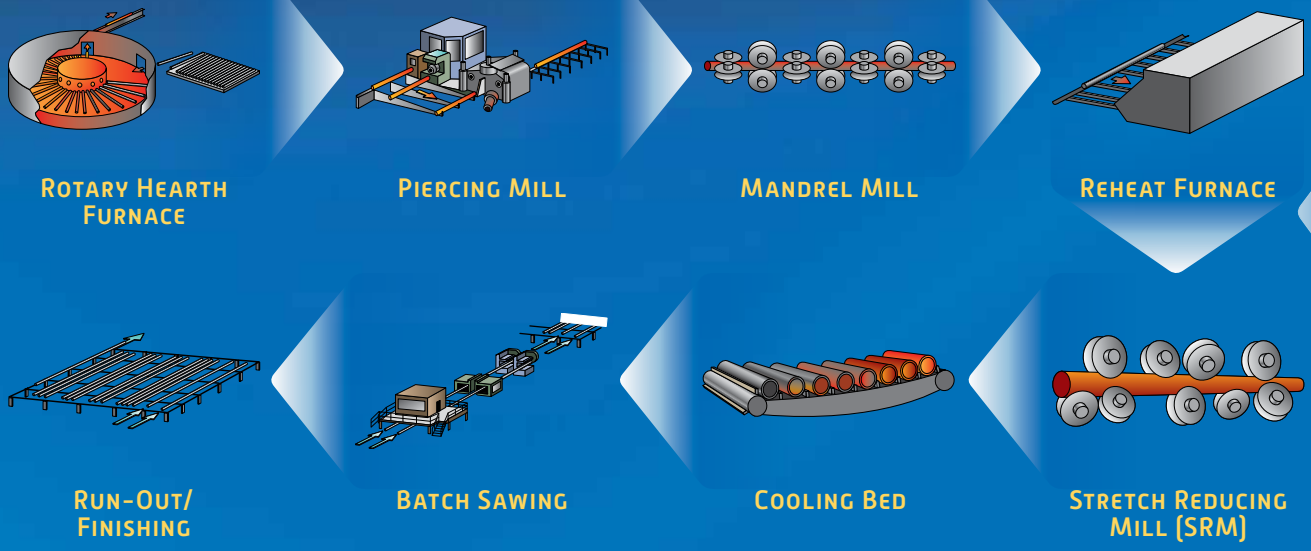
If the steel is an as-rolled carbon grade product, it is heat-equalized in a walking-beam reheat furnace and then sent through a three-stand sizing mill to reach final outside dimension. If the steel requires heat treating, the reheat furnace's temperature is raised to austenitize the pipe. The steel exits the furnace and passes through a state-of-the-art OD/OD-ID quench and walking-beam temper furnace (not pictured) before rejoining the main production line to pass through the three-stand sizing mill. After sizing, the pipe is allowed to cool on slowly moving conveyor tables in preparation for straightening. For products that require hot straightening, these cooling tables are bypassed and the pipe is sent directly from the sizer to the straightener.

The pipe is then ready for finishing. The pipe undergoes NDT inspection to detect any body wall imperfections. Any imperfections are proved up and dispositioned in accordance with specified tolerances.

After inspection, an expanding arbor holds the pipe in line while a revolving head faces and bevels the end of the pipe. The finished pipe is visually inspected and subjected to a hydrostatic test as a strength and leak check before shipping.

When required by specification or customer order requirements, the pipe is processed through one of several offline UT and special end area inspection units.

Lorain, Ohio - Mill No. 4 - 1.900" to 4-1/2" OD Seamless Manufacturing Process



Manufacturing:	Seamless
OD Range:	1.900" to 4-1/2"
Walls:	0.140" to 0.674"
Lengths:	SRL and DRL
Grades:	ASTM A 106B/A53 B, API5L GRADE B, X42, X52, X60, X65, X70, ASTM A333, CSA Z245.1 Grades 241 thru 483

The process at Lorain Mill No. 4 begins with continuous cast 6" round billets being heated in a rotary hearth furnace to proper temperature for piercing. The heated billets are center punched and pierced by advancing the billet over a piercer point in the piercing mill.

The pierced billet or shell is transferred to a mandrel mill and rolled over a solid mandrel where the OD is reduced and the length is increased. The shell is then reheated to proper rolling temperature in preparation for the final rolling process.

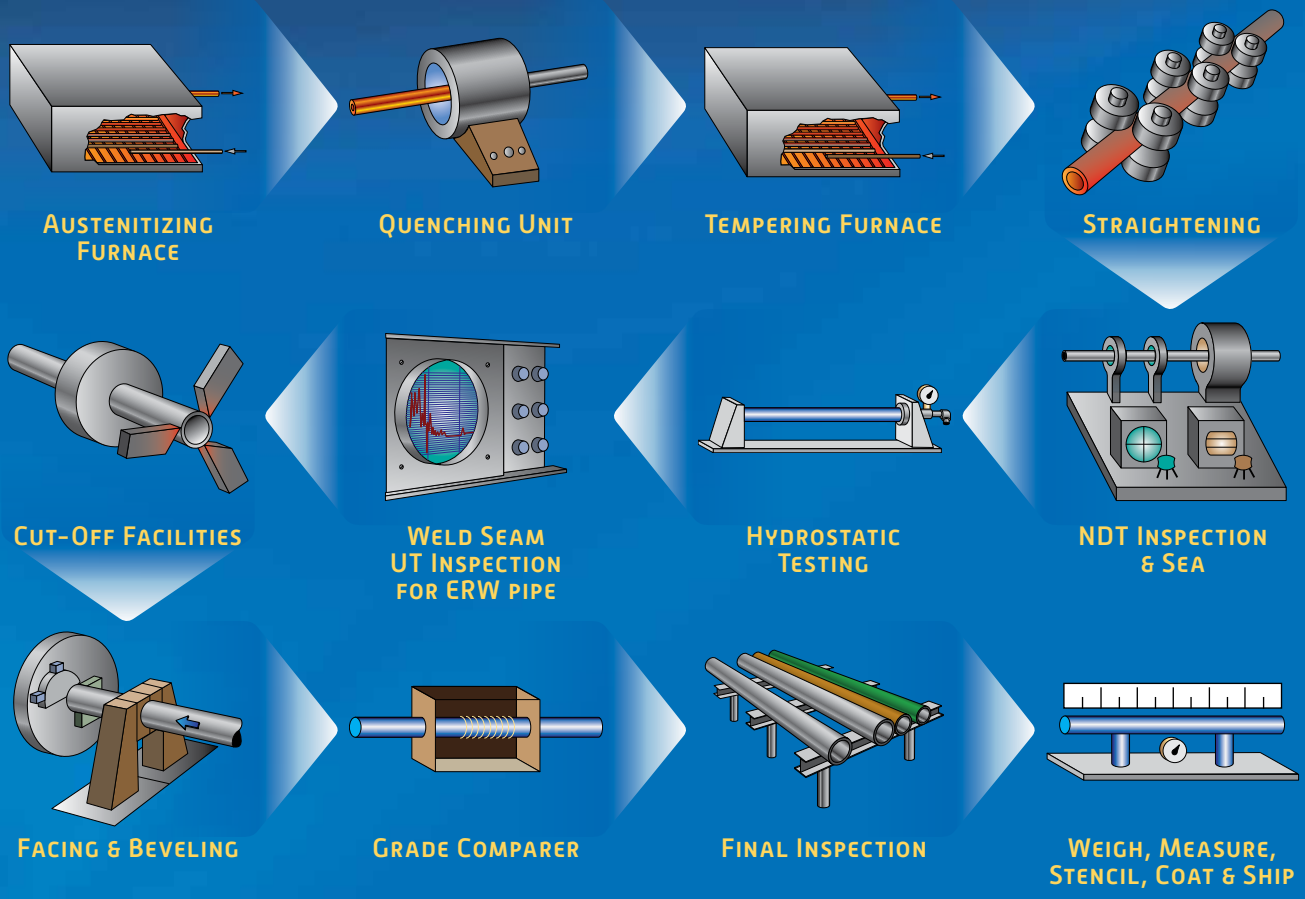
The hot shell is run through a descaling unit to prepare the OD surface for rolling and run through the stretch reducing mill. At this stage, the final OD and wall thickness are established for the pipe.

After exiting the stretch reducing mill, the pipe is allowed to cool on a walking-beam cooling bed. Sample inspections are also conducted at this point.

After cooling, the pipe is batched, stenciled and sawed to the specified length. The sawed pipe is then transferred to a run-out table and moved to finishing.

Pipe ends are faced on dual automatic facers, pipe is hydrotested and sample inspections are done. Upsetting, heat treating, additional inspection and hydrotesting are done to meet customer specifications at ITT Grinnell Houston Tubular Processing Services operation or at the Lorain No. 6 Q&T and Finishing Complex. The new No. 6 facility can heat treat and finish pipe ODs from 2.375" thru 7.625".

Lorain, Ohio - Mill No. 6 - 2-3/8" to 7-5/8" OD Quench and Temper and Finishing Process



Manufacturing:	Seamless & Electric Resistance Weld
OD Range:	2-3/8" to 7-5/8"
Walls:	0.205" to 0.812"
Lengths:	20' to 48'
Grades:	ASTM A 106B/C, A53 B, A333 Grades 1 and 6, API5L B, X42, X52, X60, X65, X70, ASTM A333, CSA Z245.1 Grades 241 thru 483

The No. 6 Quench and Temper and Finishing Facility was built in 2011. The facility processes pipe from 2.375 to 7.625 inches in outside diameter, with a wall thickness of up to 0.812 inches, and to a maximum finished pipe length of 48 feet. Green tubes to be heat treated arrive in railroad cars and are loaded on to a charge table with the use of a magnet crane. Pipe is conveyed into the austenitizing furnace, heated to the required temperature and then cooled with an OD water quench to below 200°F. After entering the tempering furnace, precise control of the temperature is used to control the mechanical properties along the length of the pipe. Pipe travels through a 100-ton, 6-roll opposing straightener and then on to a walking-beam cooling bed.

The finishing portion of the facility starts with a combination EMI/UT unit and an SEA inspection unit where longitudinal and transverse flaws can be detected and wall thickness can be verified. Each pipe is then hydrostatically tested to ensure rated strength under pressure. ERW pipe undergoes an additional test when the weld seam is inspected with an in-line UT inspection unit. After testing is complete, the pipe is sent through the finishing process. Before shipment to the customer, pipe is grade-verified, length measured, weighed, stenciled and coated.

PRODUCT PROPERTIES

PRODUCT PROPERTIES

ITT Grinnell Products manufactures both seamless and welded pipe to meet specific customer requirements. Advanced manufacturing techniques and controls ensure high quality, uniform, economical products. A complete range of ODs, end finishes and lengths are available.

Seamless Standard Pipe and Line Pipe

ITT Grinnell Products manufactures its seamless pipe by piercing solid billets of fully killed steel. This "seamless" method of manufacture is a forging operation that only the soundest, toughest steel can tolerate.

Chemical and mechanical property requirements are as prescribed by current API, ASTM, ASME and applicable CSA standards. ITT Grinnell Products is the only domestic producer of seamless pipe in the 11-3/4" to 26" OD size range. ITT Grinnell Products provides seamless Standard Pipe and Line Pipe for a wide range of applications. Our seamless pipe has an unsurpassed record of safety, and uniform strength and ductility, making it the product of choice for critical applications.

Standard Pipe is widely used primarily in the construction, refining, chemical and petrochemical industries. Line Pipe is used for the transmission of crude oil, natural gas and petroleum products as well as for water and slurry pipeline applications.

Availability – Standard Diameters and Walls

Size[1]		Wall Thickness,[2] Inches	
NPS	OD (Inches)	Lorain, OH	Fairfield, AL
1 1/2	1.900	0.140-0.281	-
2	2 3/8	0.154-0.436	-
2 1/2	2 7/8	0.160-0.552	-
3	3 1/2	0.170-0.600	-
3 1/2	4	0.180-0.650	-
4	4 1/2	0.188-0.674	0.205-0.750
5	5 9/16	-	0.250-0.750
6	6 5/8	-	0.250-0.870
8	8 5/8	-	0.250-1.200
10	10 3/4	0.307-2.000	-
12	12 3/4	0.330-2.312	-
14	14	0.375-2.000	-
16	16	0.375-2.000	-
18	18	0.375-1.562	-
20	20	0.375-1.512	-
22	22	0.375-1.375	-
24	24	0.375-1.250	-
26	26	0.375-1.125	-

1 Sizes between NPS 1 1/2 and 26 not listed subject to inquiry.

2 Maximum wall varies for grades over X42 and is subject to mill inquiry.

Electric Resistance Weld (ERW) Standard Pipe and Line Pipe

ITT Grinnell Products' ERW Standard Pipe and Line Pipe are smoothly finished, thin-walled, extra-long products produced by continuously forming coiled bands and welding the longitudinal seam using high-frequency electric resistance welding. Chemical and mechanical property requirements are as prescribed by current API 5L and applicable ASTM standards.

ERW Standard Pipe and Line Pipe are widely used throughout the oil and gas industry, as well as for pipe piling, pipe-type cable systems and hydraulic hoists.

Characteristics and Advantages

Eighty-Foot Lengths – Ultra-long lengths of ITT Grinnell Products ERW pipe, available from McKeesport Tubular Operations minimize handling time in transportation and installation, and significantly reduce field welding labor, time and costs.

Smooth Surfaces – ITT Grinnell Products hot rolled strip steel is continuously cold formed into smooth-surfaced, uniform-gage pipe for superior flow characteristics.

Stronger, Lighter Walls – The improved, higher strength, lighter gage steel bands used by ITT Grinnell Products are fused by high-frequency electric resistance welders into rugged pipe that can meet exacting tolerances and strength specifications.

Uniform Dimensions and Quality – Higher automated production, combined with continuous non-destructive and visual inspection and hydrostatic testing, assures a pipe product of excellent quality. And, because the pipe is made from flat-rolled steel, it has highly uniform wall thicknesses.

McKeesport, PA Availability (Subject to inquiry)		
Size[1]		Wall Thickness,[2] Inches
NPS	OD	
8	8 5/8	0.172-0.406
10	10 3/4	0.172-0.400
12	12 3/4	0.188-0.406
14	14	0.188-0.406
16	16	0.203-0.406
18	18	0.219-0.406
20	20	0.250-0.413

1 Sizes not listed subject to inquiry.

2 Maximum wall varies for grades over X42 and is subject to mill inquiry.

Lone Star, TX Availability (Subject to inquiry)		
Size[1]		Wall Thickness,[2] Inches
NPS	OD	
2	2 3/8	0.218-0.344
2 1/2	2 7/8	0.203-0.375
3	3 /1/2	0.216-0.300
3 1/2	4	0.226-0.318
4	4 1/2	0.237-0.531
5	5 9/16	0.258-0.500
6	6 5/8	0.280-0.432
8	8 5/8	0.250-0.438
10	10 3/4	0.279-0.500
12	12 3/4	0.250-0.500
14	14	0.312-0.562
16	16	0.375-0.562

1 Sizes not listed subject to inquiry.

2 Maximum wall varies for grades over X42 and is subject to mill inquiry.

COMPARATIVE SPECIFICATIONS

The following information is summarized from ASTM standards and API Specification 5L in effect at the time of publication. Please refer to the specific standards or specifications for more details.

A53 Seamless and Welded Standard Pipe

Specification A53 covers seamless and welded, black and hot-dipped galvanized nominal (average) wall pipe for coiling, bending, flanging and other special purposes and is suitable for welding.

Mechanical Properties – Tensile Requirements

Seamless and ERW	Grade A	Grade B
Tensile Strength, min., psi	48,000	60,000
Yield Strength, min., psi	30,000	35,000

Chemical Requirements

Seamless and ERW	C max %	Mn max %	P max %	S max %
Grade A	0.25	0.95	0.05	0.045
Grade B	0.30	1.20	0.05	0.045

Testing Requirements

Hydrostatic Testing

Hydrostatic inspection test pressures for plain end and threaded and coupled pipe are specified. Hydrostatic pressure shall be maintained for not less than 5 seconds for all sizes of Seamless and ERW pipe.

Mechanical Tests

Tensile Test – Two transverse tests required on ERW for NPS 8 and larger, one across the weld and one opposite the weld

Flattening Test – On ERW for NPS 2 and larger, STD and XS walls (not required for XXS pipe)

Bending Test (Cold) – for NPS 2 and under, XS wall and under; for NPS 1-1/4 and under, XXS wall

	Degree of Bend	Diameter of Mandrel
For Normal A53 Uses	90	12 x nom. dia of pipe
For Close Coiling	180	8 x nom. dia of pipe

Number of Tests

Seamless and Electric Resistance Weld – bending, flattening, tensile on one length of pipe from each lot of 500 lengths, or less, of each pipe size.

A53 Seamless and Welded Standard Pipe

Permissible Variations

Wall Thickness

The minimum wall thickness at any point shall not be more than 12.5% under the nominal wall thickness specified.

Weights Per Foot

Plus or minus 10%

Outside Diameter

Outside diameter at any point shall not vary from standard specified more than:

NPS	Over	Under
1 1/2 and smaller	+1/64"	-1/64"
2 and larger	+1%	-1%

Lengths

Standard Wall

Single Random – 16'-22'; (5% may be jointers); if plain ends, 5% may be 12'-16'

Double Random – Shortest length 22'; minimum average for order 35'

Extra Strong (XS) and Double Extra Strong (XXS) Walls

Single Random – 12'-22'; (5% may be 6'-12')

Double Random (XS and lighter) – Shortest length 22'; minimum average for order 35'

Lengths longer than single random with wall thicknesses heavier than XS subject to negotiation

Marking Requirements on Each Length

Rolled, Stamped or Stenciled (manufacturer's option)

- Name or brand of manufacturer
- Specification number ASTM A53
- Size (NPS and weight class, schedule number, or specified wall thickness on specified outside diameter and specified wall thickness)
- Grade A or Grade B
- Manufacturing process that is ERW (E) or Seamless (S)
- Test pressure (seamless only)
- Non-destructive electric test (seamless only)
- Length of pipe

A106 Seamless Carbon Steel Pipe

Specification A106 covers seamless carbon steel nominal wall pipe for high-temperature service, suitable for bending, flanging and similar forming operations. NPS 1-1/2 and under may be either hot finished or cold drawn. NPS 2 and larger shall be hot finished unless otherwise specified. Surface finish standards are outlined in the specification. Purchaser may specify NDE in lieu of hydrostatic test or neither. Unless otherwise specified, pipe is furnished with plain ends.

Mechanical Properties – Tensile Requirements

Seamless	Grade A	Grade B	Grade C
Tensile Strength, min., psi	58,000	70,000	70,000
Yield Strength, min., psi	36,000	50,000	40,000

Chemical Requirements

Seamless	Grade A	Grade B	Grade C
Carbon max. %	0.25	0.30	0.35
Manganese %	0.27 – 0.93	0.29 – 1.06	0.29 – 1.06
Phosphorus, max. %	0.035	0.035	0.035
Sulfur, max. %	0.035	0.035	0.035
Silicon, min. %	0.10	0.10	0.10

Testing Requirements

Hydrostatic Testing

Inspection test pressures produce a stress in the pipe wall equal to 60% of specified minimum yield strength (SMYS) at room temperature. Maximum pressures are not to exceed 2,500 psi for NPS 3 and under, and 2,800 psi for the larger sizes. Pressure is maintained for not less than 5 seconds.

Mechanical Tests

Tensile Test – NPS 8 and larger – either transverse or longitudinal acceptable

Smaller than NPS 8 – longitudinal only

Flattening Test – NPS 2 and larger

Bending Test (Cold) – NPS 2 and under

	Degree of Bend	Diameter of Mandrel
For Normal A106 Uses	90	12 x nom. dia. of pipe
For Close Coiling	180	8 x nom. dia. of pipe

Number of Tests

	NPS	On One Length From Each Lot of
Tensile	5 and smaller 6 and larger	400 or less 200 or less
Bending	2 and smaller	400 or less
Flattening	2 through 5 6 and over	400 or less 200 or less

A106 Seamless Carbon Steel Pipe

Permissible Variations

Wall Thickness

The minimum wall thickness at any point shall not be more than 12.5% under the nominal wall thickness specified.

Weights per Foot

Weight of any individual length shall not vary more than 10% over and 3.5% under that specified.

NOTE: NPS 4 and smaller – weighed in lots. Larger sizes – weighed by individual length.

Outside Diameter

Outside Diameter shall not vary from standard specified below at any point.

NPS	Over	Under
1 1/2 and smaller	+1/64"	-1/64"
2-4	+1/32"	-1/32"
5-8	+1/16"	-1/32"
10-18	+3/32"	-1/32"
20-26	+1/8"	-1/32"

Length Requirements

Lengths required shall be specified on order. No "jointers" permitted unless otherwise specified. If no definite lengths required, following practice applies:

Single Random – 16'-22' (5% may be 12'-16')

Double Random – Minimum length is 22'; minimum average is 35' (5% may be 16'-22')

Marking Requirements On Each Length

Rolled, Stamped or Stenciled (manufacturer's option)

- Manufacturer's name or brand
- A106 A, A106 B or A106 C
- Hydrostatic test pressure and/or NDE, or NH if neither is specified
- Length of pipe
- ANSI schedule number or weight class or wall thickness
- Weight per foot (NPS 4 and larger)
- Additional "S" if tested to supplementary requirements

A252 Piling Pipe

Specification A252 covers nominal (average) wall steel pipe piles of cylindrical shape and applies to pipe piles in which the steel cylinder acts as a permanent load-carrying member or as a shell to form case-in-place concrete piles. Surface imperfections exceeding 25% of the nominal wall in depth are considered defects. Defects not exceeding 33.5% of the nominal wall in depth may be repaired by welding. Before welding, the defect shall be completely removed.

Mechanical Properties – Tensile Requirements

	Grade 1	Grade 2	Grade 3
Tensile Strength, min., psi	50,000	60,000	66,000
Yield Strength, min., psi	30,000	35,000	45,000

Chemical Requirements

	Phosphorus
Seamless and Welded	Max % 0.050

Testing Requirements

Hydrostatic Testing

None specified

Mechanical Tests

Tensile Test – either longitudinal or transverse at option of manufacturer

Number of Tests

One tensile property test per 200 lengths

Permissible Variations

Wall Thickness

Not more than 12.5% under the nominal wall thickness specified

Weights per Foot

The weight of any individual length of pipe shall not vary more than 15% over or 5% under the weight specified. Each individual length shall be weighed separately.

Outside Diameter

Shall not vary more than plus or minus 1% from the diameter specified

Lengths

May be ordered in single or double random lengths or in uniform lengths.

Single Random – 16′ - 25′ inclusive

Double Random – Over 25′ with a minimum average of 35′

Uniform – Plus or minus 1″ on length specified

Marking Requirements On Each Length

Rolled, Die Stamped or Paint Stenciled (manufacturer's option)

Manufacturer's name, brand or trademark, heat number, method of pipe manufacture, size, weight, length, wall thickness and ASTM A252 and the Grade.

A501 Hot Formed Carbon Steel Structural Tubing

Specification A501 covers hot-formed, welded and seamless carbon steel square, round, rectangular, or special shape structural tubing for welded, riveted or bolted construction of bridges and buildings, and for general structural purposes. The size range for round is NPS 1/2"-24".

Mechanical Properties – Tensile Requirements

	Grade A	Grade B
Tensile Strength, min., psi	58,000	70,000
Yield Strength, min., psi	36,000	50,000
Elongation in 2 inch min.	23%	23%

Chemical Requirements

	Grade A		Grade B	
Element	**Heat Analysis**	**Product Analysis**	**Heat Analysis**	**Product Analysis**
Carbon, max %	0.26	.30	0.22 (A)	0.26 (A)
Manganese, max %	No requirement	No requirement	1.40 (A)	1.45
Phosphorus, max %	0.035	0.045	0.030	0.040
Sulfur, max %	0.035	0.045	0.020	0.030
Copper (when specified), min %	0.20	0.20	0.20	0.18

A – For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50% by heat analysis and 1.60% by product analysis.

Testing Requirements

Hydrostatic Testing
None specified

Mechanical Tests
Tensile Test
Bend Test – on square or rectangular tubing

Number of Tests
One tension test and one bend test from each lot

Permissible Variations

Wall Thickness
Not specified

Weights per foot
Shall not be less than the specified value by more than 3.5%

Outside Diameter
Round tubing

NPS	Over	Under
1-1/2 and smaller	+1/64"	-1/32"
2 and larger	+1%	-1%

A501 Hot Formed Carbon Steel Structural Tubing

Lengths

Produced in random lengths 16′–22′ or 32′–44′, in multiple lengths and in specific cut lengths

Cut Length Tolerances	Over	Under
22 feet and smaller	+1/2″	-1/4″
Over 22 feet	+3/4″	-1/4″

Marking Requirements On Each Length

Rolled, Die Stamped, Ink Printed or Paint Stenciled (manufacturer's option)

- Manufacturer's name, brand or trademark
- Size and thickness
- ASTM A501

Hot-Dipped Galvanizing

When required, weight of zinc shall comply with the requirements in the latest revision of Spec A53, with the additional provision that the manufacturer may determine the coating weight on outside surface only.

A523 Cable Circuit Piping

Specification A523 covers Seamless and Electric Resistance Welded steel pipe used as conduit for the installation of high-pressure pipe-type electrical cables. Suitable for welding and for forming operations involving flaring, belling and bending. Size Range: NPS 4-12

Mechanical Properties – Tensile Requirements

Seamless and ERW	Grade A	Grade B
Tensile Strength, min., psi	48,000	60,000
Yield Strength, min., psi	30,000	35,000

Chemical Requirements

	C max %		Mn max %		P max %		S max %	
	Heat	Product	Heat	Product	Heat	Product	Heat	Product
Grade A SMLS	0.22	0.25	0.90	0.95	0.035	0.045	0.050	0.060
Grade A ERW	0.21	0.25	0.90	0.95	0.035	0.045	0.050	0.060
Grade B SMLS	0.27	0.30	1.15	1.20	0.035	0.045	0.050	0.060
Grade B ERW	0.26	0.30	1.15	1.20	0.035	0.045	0.050	0.060

Testing Requirements

Hydrostatic Testing

Hydrostatic inspection test pressures are specified. Hydrostatic pressure to be maintained for not less than 5 seconds.

Mechanical Tests

Tensile Test – longitudinal

Weld Tensile – transverse

Flattening Test – seamless and ERW

Number of Tests

Tensile – one length from each lot of 500 or less

Flattening

Seamless – one length from each lot of 500 or less

ERW - Single lengths – crop ends from each length
Multiple lengths – crop ends from each length plus 2 intermediate rings

A523 Cable Circuit Piping

Permissible Variations

Wall Thickness

Minimum wall thickness, at any point, shall not be more than 12.5% under or more than 15.0% over the nominal wall thickness specified.

Weights per Foot

XS and lighter wall thickness: +5%
Heavier than XS wall thickness: +10%

Outside Diameter

Outside Diameter shall not vary more than +1% from specified
Outside Diameter End Tolerances (distance of 4" from each end)

NPS	Over	Under
10 and smaller	+1/15"	-1/64"
12	+3/32"	-1/32"

Lengths

Minimum permissible length – 35 ft. 0 in.

Maximum permissible length – 50 ft. 0 in.

Marking Requirements on Each Length

Roll, Stamp or Paint Stencil (manufacturer's option)

Manufacturer's name or brand, kind of pipe, i.e., Seamless (S) or ERW (E); grade, size, weight per foot or wall thickness and ASTM A523.

Coatings

Unless otherwise specified, the pipe shall not be given a mill coating of paint, oil or any other material inside or out.

A618 Hot-Formed High-Strength Low-Alloy Structural Tubing

Specifications A618 covers grades of hot-formed welded and seamless high-strength low-alloy square, rectangular, round or special shape structural tubing for welded, riveted or bolted construction of bridges and buildings and general structural purposes.

Mechanical Properties – Tensile Requirements

Seamless and ERW	Grade Ia & Ib	Grade II	Grade III
Tensile Strength, min., psi	70,000	60,000	65,000
Yield Strength, min., psi	50,000	50,000	50,000

Chemical Requirements

	Grade Ia		Grade Ib		Grade II		Grade III	
	Heat	Product	Heat	Product	Heat	Product	Heat	Product
Carbon, max. %	0.15	0.18	0.20	-	0.22	0.26	0.23	0.27
Manganese %	1.00 max.	1.04 max.	1.35 max.	1.40 max.	0.85-1.25	1.30 max.	1.35 max.	1.40 max.
Phosphorus, max %	0.15	0.16	0.025	0.035	0.025	0.035	0.025	0.035
Sulfur, max. %	0.025	0.045	0.025	0.035	0.025	0.035	0.025	0.035
Silicon, max %	-	-	-	-	0.30	0.33	0.30	0.35
Copper, min. %	0.20	0.18	0.20	0.18	0.20	0.18	-	-
Vanadium, min. %	-	-	-	-	0.02	0.01	0.02	0.01

- Grade Ia equivalent to USS COR-TEN A
- Grade Ib equivalent to USS COR-TEN B
- Grade II equivalent to USS TRI-TEN
- Grade III equivalent to USS EX-TEN 50

Testing Requirements

Hydrostatic Testing

Not specified

Mechanical Tests

Tensile (longitudinal) test

Bend test

Number of Tests

Two of each per heat

A618 Hot-Formed High-Strength Low-Alloy Structural Tubing

Permissible Variations

Wall Thickness

Not specified

Weights per Foot

Not less than the specified weight by more than 3.5%

Outside Diameter

Round tubing

NPS	Over	Under
1-1/2 and smaller	+1/64"	-1/32"
2 and larger	+1%	-1%

Lengths

Produced in random lengths 16'-22' or 32'-44', in multiple lengths and in specific cut lengths

Cut Length Tolerances	Over	Under
22 feet and smaller	+1/2"	-1/4"
Over 22 to 44 feet	+3/4"	-1/4"

Marking Requirements on Each Length

Rolled, Die Stamped, Ink Printed or Stenciled (manufacturer's option)

- Manufacturer's name, brand or trademark
- Size and wall
- Steel grade
- ASTM A618

API 5L Line Pipe

Specification API 5L covers seamless and welded pipe suitable for use in conveying gas, water, oil and other liquefied media.

Chemical Requirements

Specification	Grade	Cb	Mnb	P	S	Si	Cr	Mo	Ni	V	Cb	Ti
API 5L 44th Ed (PSL 1) Seamless	A25	.21	.60	.030	.030	-	-	-	-	-	-	-
	A	.22	.90	.030	.030	-	-	-	-	-	-	-
	B	.28	1.20	.030	.030	-	-	-	-	c,d	c,d	d
	X42	.28	1.30	.030	.030	-	-	-	-	d	d	d
	X46	.28	1.40	.030	.030	-	-	-	-	d	d	d
	X52	.28	1.40	.030	.030	-	-	-	-	d	d	d
	X56	.28	1.40	.030	.030	-	-	-	-	d	d	d
	X60	.28[e]	1.40[e]	.030	.030	-	-	-	-	f	f	f
	X65	.28[e]	1.40[e]	.030	.030	-	-	-	-	f	f	f
	X70	.28[e]	1.40[e]	.030	.030	-	-	-	-	f	f	f
API 5L 44th Ed (PSL 1) Welded	A25	.21	.60	.030	.030	-	-	-	-	-	-	-
	A	.22	.90	.030	.030	-	-	-	-	-	-	-
	B	.26	1.20	.030	.030	-	-	-	-	c,d	c,d	d
	X42	.26	1.30	.030	.030	-	-	-	-	d	d	d
	X46	.26	1.40	.030	.030	-	-	-	-	d	d	d
	X52	.26	1.40	.030	.030	-	-	-	-	d	d	d
	X56	.26	1.40	.030	.030	-	-	-	-	d	d	d
	X60	.26[e]	1.40[e]	.030	.030	-	-	-	-	f	f	f
	X65	.26[e]	1.40[e]	.030	.030	-	-	-	-	f	f	f
	X70	.26[e]	1.65[e]	.030	.030	-	-	-	-	f	f	f

a. .50% max Cu, Ni, Cr and .15 max Mo. For grades up to and including X52, Cu, Cr and Ni shall not be added intentionally.
b. For each reduction of .01% below the max C, and increase of .05% Mn is permitted up to a max of 1.65% for grades B, X42 and X52, up to 1.75% for grades >X52 and < X70, and 2.0% for X70.
c. Unless otherwise agreed Cb + V < = .15%.
d. Cb + V + Ti < = .15%.
e. Unless otherwise agreed.
f. Unless otherwise agreed the sum of Cb + V + Ti < = .15%.

Specification	Grade	Cond	Cb	Mnb	P	S	Si	V	Cb	Ti	Other	IIW	Pcm
API 5L 44th Ed (PSL 2) (Seamless & Welded)	B	R or N	.24	1.20	.025	.015	.40	c	c	.04	e	.43	.25
	X42	R or N	.24	1.20	.025	.015	.40	.06	.05	.04	e	.43	.25
	X46	N	.24	1.40	.025	.015	.40	.07	.05	.04	d, e	.43	.25
	X52	N	.24	1.40	.025	.015	.45	.10	.05	.04	d, e	.43	.25
	X56	N	.24	1.40	.025	.015	.45	.10[f]	.05	.04	d, e	.43	.25
	X60	N	.24[f]	1.40[f]	.025	.015	.45[f]	.10[f]	.05[f]	.04[f]	d, h	as agreed to	
API 5L 44th Ed (PSL 2) (Seamless & Welded)	B	Q	.18	1.40	.025	.015	.45	.05	.04	.04	e	.43	.25
	X42	Q	.18	1.40	.025	.015	.45	.06	.05	.04	e	.43	.25
	X46	Q	.18	1.40	.025	.015	.45	.07	.05	.04	e	.43	.25
	X52	Q	.18	1.50	.025	.015	.45	.10	.05	.04	e	.43	.25
	X56	Q	.18	1.50	.025	.015	.45	.10	.05	.04	d, e	.43	.25
	X60	Q	.18[f]	1.70[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			e	.4	.25
	X65	Q	.18[f]	1.70[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			h	.43	.25
	X70	Q	.18[f]	1.80[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			h	.43	.25
	X80	Q	.18[f]	1.90[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			i, j	as agreed to	

Chemical Requirements (cont)

Specification	Grade	Cond	Cb	Mnb	P	S	Si	V	Cb	Ti	Other	IIW	Pcm
API 5L 44th Ed (PSL 2) (Welded Only)	B	M	.22	1.20	.025	.015	.45	.05	.05	.04	e	.43	.25
	X42	M	.22	1.30	.025	.015	.45	.05	.05	.04	e	.43	.25
	X46	M	.22	1.30	.025	.015	.45	.05	.05	.04	e	.43	.25
	X52	M	.22	1.40	.025	.015	.45	(V + Cb + Ti < = .15)			e	.43	.25
	X56	M	.22	1.40	.025	.015	.45	(V + Cb + Ti < = .15)			e	.43	.25
	X60	M	.12[f]	1.60[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			h	.43	.25
	X65	M	.12[f]	1.60[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			h	.43	.25
	X70	M	.12[f]	1.70[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			h	.43	.25
	X80	M	.12[f]	1.85[f]	.025	.015	.45[f]	(V + Cb + Ti <= .15)			I	.43 f	.25
	X90	M	.12[f]	1.85[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			I	-	.25
	X100	M	.12[f]	1.85[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			i, j	-	.25
	X120	M	.12[f]	1.85[f]	.025	.015	.45[f]	(V + Cb + Ti < = .15)			i, j	-	.25

b. For Seamless pipe wall thickness > .787" CE shall be by agreement.
c. For each reduction of .01% below the max C, and increase of .05% Mn is permitted up to a max of 1.65% for grades B, X42 and X52, up to 1.75% for grades >X52 and < X70, and 2.0% for grades X70 and X80, 2.20 for grade > X80.
d. Unless otherwise agreed Cb + V < = .06%.
e. Cb + V + Ti < = .15%.
f. Unless otherwise agreed, .50% max Cu, .30% max Ni, .30% max CR and .15% max Mo.
g. Unless otherwise agreed.
h. Unless otherwise agreed the sum of Cb + V + Ti < = .15%.
i. Unless otherwise agreed .50% max Cu, Ni, Cr and Mo.
j. Unless otherwise agreed .50% max Cu, Cr, Mo and 1.00% max Ni.
k. .004% max B.

Tensile Properties – Tensile Requirements Seamless and Welded Pipe

Specification	Grade	Yield		Tensile		Y/T Ratio
API 5L 44th ed		Min.	Max.	Min.	Max.	Max.
PSL-1	A25	25,400	-	45,000	-	-
	A	30,500	-	48,600	-	-
	B	35,500	-	60,200	-	-
	X42	42,100	-	60,200	-	-
	X46	46,400	-	63,100	-	-
	X52	52,200	-	66,700	-	-
	X56	56,600	-	71,100	-	-
	X60	60,200	-	75,400	-	-
	X65	65,300	-	77,600	-	-
	X70	70,300	-	82,700	-	-
PSL-2	B	35,500	65,300	60,200	110,200	.93
	X42	42,100	71,800	60,200	100,200	.93
	X46	46,400	76,100	63,100	110,200	.93
	X52	52,200	76,900	66,700	110,200	.93
	X56	56,600	79,000	71,100	110,200	.93
	X60	60,200	81,900	75,400	110,200	.93
	X65	65,300	87,000	77,600	110,200	.93
	X70	70,300	92,100	82,700	110,200	.93
	X80	80,500	102,300	90,600	119,700	.93
	X90	90,600	112,400	100,800	132,700	.95
	X100	100,100	121,800	110,200	143,600	.97
	X120*	120,400	152,300	132,700	166,100	.99

*Only available as DSAW

API 5L Line Pipe

Testing Requirements

Hydrostatic Testing

Lists hydrostatic inspection test pressures for all sizes and grades covered by the specification.
Test pressures are held for not less than:

- Seamless (all sizes) – 5 seconds
- Welded (NPS 18 and smaller) – 5 seconds
  (NPS 20 and larger) – 10 seconds

Mechanical Tests

Tensile Test

- Seamless – longitudinal
- ERW – longitudinal and transverse

Charpy Tests – PSL 2

Flattening Test – ERW – All sizes

Number of Tests

Flattening – Non-expanded ERW for single lengths, crop ends from each length; for multiple lengths, crop ends from first and last pipe of each coil, plus 2 intermediate rings.

Tensile –

NPS	On One Length From Each Lot of
5 and smaller	400 or less
6 through 12	200 or less
14 and larger	100 or less

Permissible Variations

Wall Thickness

Seamless: 0.158"-0.983" wall, tolerance = -12.5 % / +15 %
> = 0.984" wall, tolerance = -0.120" / +0.146" or - /+ 10 % whichever is greater
(except if OD is >= 14" & wall is >=.984" then tolerance is -10 /+15%)

HFW: < = 0.197" wall, tolerance = - /+ .020"
= 0.198"-0.590" wall, tolerance = - /+ .10.0%"
≥ 0.591" wall, tolerance = - /+ .060"

Weights per Foot

For Single Lengths Special Plain End and Grade A25 – Not more than plus 10% minus 5%

For Single Lengths Other Pipe – Not more than plus 10% minus 3.5%

For Carload Lots – Not more than minus 1.75%

Note: NPS 4 OD and smaller may be weighed individually or in convenient lots; larger sizes by length

API 5L Line Pipe

Wall, Diameter and Out of Roundness

OD	Diameter Tolerance				Out of Round Tolerance			
	Pipe Body		Pipe Ends		Pipe Body		Pipe Ends	
	SMLS	Welded	SMLS	Welded	SMLS	Welded	SMLS	Welded
< 2.375	- 0.031 / + 0.016		- 0.016 / + 0.063		Included in the diameter tolerance			
2.375 - 6.625	-/+ 0.0075 (D)		- 0.016 / + 0.063		020 (D)		0.015 (D)	
> 6.625 - 24.00	-/+ 0.0075 (D)	-/+ 0.007 5 (D) up to -/+ 0.125	-/+ 0.005 (D) up to -/+ 0.063"		020 (D)		0.015 (D)	

Lengths

Plain End Pipe	Shortest Length in Entire Shipment	Minimum Avg. Length in Entire Shipment	Maximum Length
20' Nominal	9'0"	17'6"	22'6"
40' Nominal	14'0"	35'0"	45'0"
60' Nominal	21'0"	52'6"	65'0"
80' Nominal	28'0"	70'0"	85'0"

Marking Requirements on Each Length

Paint Stenciled or Die Stamped manufacturer's name or mark, Spec 5L, size, weight per foot, grade, process of manufacture, type of steel, length (NPS 4 and larger only). Test pressure when higher than tabulated (NPS 2 and larger only).

Supplemental Annexes

API Specification 5L contains 15 Supplemental Annexes that address special conditions and/or additional requirements.

Annex A Specification for welded jointers
Annex B Manufacturing procedure qualification for PSL 2 pipe
Annex C Treatment of surface imperfections and defects
Annex D Repair welding procedure
Annex E Non-destructive inspection for other than sour service or offshore service
Annex F Requirements for couplings (PSL 1 only)
Annex G PSL 2 pipe with resistance to ductile fracture propagation
Annex H PSL 2 pipe ordered for sour service
Annex I Pipe ordered as "Through the Flowline" (TFL) pipe
Annex J PSL 2 pipe ordered for offshore service
Annex K Non-destructive inspection for pipe ordered for sour service and/or offshore service
Annex L Steel designations
Annex M Correspondence of terminology between ISO 3183 and its source documents
Annex N Identification/Explanation of Deviations
Annex O API Monogram

API Specification 5L PSL 1 and PSL 2 Comparison

Summary of Differences Between PSL1 and PSL2			
Parameter	**PSL 1**	**PSL 2**	**Reference**
Grade Range	L175 or A25 through L485 or X70	L245 or B through L830 or X120	Table 1 Table 2
Grade Suffix	—	R, N, Q or M	Table 2 Footnote b
Type of Pipe Ends	Plain End, Belled End, Threaded , Special Coupling Pipe End	Plain End Only < = 0.125"t Square Cut >0.125" 30° Bevel Unless Otherwise Agreed	Table 2, 9.12.1.2 9.12.5, 9.12.5.3
Manufacturing Routes	Not Defined in Detail	Defined in Detail	Table 3
Manufacturing Procedure Qualification	—	If Agreed	7.2 c) 40) Annex B
Resistance to Ductile Fracture	—	If Agreed	7.2 c) 49) Annex G
For Sour Service	—	If Agreed	7.2 c) 50) Annex H
Offshore Pipe	—	If Agreed	7.2 c) 54) Annex J
Steel Making	—	Killed, Fine Grain Practice	8.3.2
Heat Treatment of Weld Seam and the HAZ of HFW Pipe	Simulate Normalizing OR by Agreement Other Methods	Heat Treated so as to Simulate Normalizing	8.8.1 - 8.8.2
Chemical Traceability of Heat Identity	Traceable Only Until All Related Chemical Tests are Performed and Conformance is Shown	Each Length of Pipe Must be Traceable Even After Completion of all Related Chemical Tests and Conformance is Shown	8.13.1 - 8.13.2
Physical Properties Traceability of Unit Identity	Traceable Only Until All Related Mechanical Tests are Performed and Conformance is Shown	Each Length of Pipe Must be Traceable Even After Completion of all Related Mechanical Tests and Conformance is Shown	8.13.1 - 8.13.2
Max C Seamless Pipe N	0.28% for Grades B - X60	0.24% for Grades B - X60	9.2.2, Table 4 & 5
Max C Seamless Pipe Q	0.28% for Grades B - X60	0.18% for Grades B - X60	Table 4 & 5
Max C Welded Pipe M	0.26% for Grades B - X70	0.22% for Grades B - X56 0.12% for Grades 60 - X70	Table 4 & 5
Max Si Seamless Pipe R	—	0.40% for Grades B - X46 0.45% for Grades 52 - X70	Table 4 & 5
Max Si Welded Pipe M	—	0.45% for Grades B - X70	Table 4 & 5
Max Mn Seamless Pipe R	1.30% for Grade X42	1.20% for Grade X42	Table 4 & 5
Max Mn Seamless Pipe N	1.30% for Grade X42	1.20% for Grade X42	Table 4 & 5
Max Mn Seamless Pipe Q	1.20% for Grade B 1.30% for Grade X42 1.40% for Grades X46 - X70	1.40% for Grades B - X42 1.50% for Grades X52 - X56 1.70% for Grades X60 - X70	Table 4 & 5
Max Mn Welded Pipe M	1.40% for Grade X42 1.40% for Grade X60 1.45% for Grade X65 1.45% for Grade X70	1.30% for Grade X42 1.60% for Grade X60 1.60% for Grade X65 1.70% for Grade X70	Table 4 & 5
Max P Seamless Pipe	0.030% for Grade B - X70	0.025% for Grade B - X70	Table 4 & 5
Max P Welded Pipe	0.030% for Grade B - X70	0.025% for Grade B - X70	Table 4 & 5
Max S Seamless Pipe	0.030% for Grade B - X70	0.015% for Grade B - X70	Table 4 & 5
Max S Welded Pipe	0.030% for Grade B - X70	0.015% for Grade B - X70	Table 4 & 5
Max V Seamless Pipe N	—	0.06% for Grade X42 0.07% for Grade X46 0.10% for Grade X52 - X60	Table 4 & 5
Max V Seamless Pipe Q	—	0.05% for Grades B - X52 0.07% for Grades X56	Table 4 & 5
Max V Welded Pipe M	—	0.05% for Grades B - X46	Table 4 & 5
Max Nb Seamless Pipe N	—	0.05% for Grades X42 - X60	Table 4 & 5
Max Nb Seamless Pipe Q	—	0.05% for Grades B - X56	Table 4 & 5
Max Nb Welded Pipe M	—	0.05% for Grades B - X46	Table 4 & 5
Max Ti Seamless Pipe N	—	0.05% for Grades B - X60	Table 4 & 5
Max Ti Seamless Pipe Q	—	0.04% for Grades B - X56	Table 4 & 5
Max Ti Welded Pipe M	—	0.04% for Grades B - X46	Table 4 & 5

API Specification 5L PSL 1 and PSL 2 Comparison (cont)

Carbon Equivalent CE	—	Maximum CE Required for Each Grade	Table 4 & 5
Low Frequency Welding LFW <70 kHz	Acceptable Process	Not an Acceptable Process	Table 2
Laser Welding LW	Acceptable Process	Not an Acceptable Process	Table 2
Yield Strength, Maximum	—	Maximum Required for Each Grade	Table 6 & 7
UTS, Maximum	—	Maximum Required for Each Grade	Table 6 & 7
Yield to Tensile Ratio Maximum	—	Maximum Required for Each Grade	Table 6 & 7
CVN Impact Toughness	—	Testing Procedures and Minimum Requirements for Each Grade	9.8, Table 8, Table 22
Drop Weight Tear Test DWT	—	By Agreement (D>=20")	7.2 c) 12), 9.9, Table 18
Inspection Document in Accordance with ISO 10474:1991 or EN 10204:2004	If Agreed	Mandatory	10.1.2
Non-destructive Inspection Full Length (100%), as Given in Table E.2	Grade L245 or B Quenched and Tempered SMLS Pipe and Other SMLA Grades if Agreed	All SMLS Pipe	E.3.1.2

Summary of Miscellaneous Pipe Specifications

ASTM A135	Two grades (A and B) of ERW pipe in NPS 3/4 to 30 with wall thickness of 0.500". The pipe is intended for conveying gas, vapor, water or other liquid.
ASTM A333	Nine grades of minimum wall thickness seamless and ERW pipe for use at low temperatures.
ASTM A513	ERW carbon and alloy mechanical tubing in a variety of grades and sizes from NPS 1/2 to 15 in walls to 0.650".
ASTM A519	Several grades of carbon and alloy steel seamless mechanical tubing in sizes to NPS 12 and under.
ASTM A589	Four types of plain end or threaded and coupled carbon steel seamless or ERW pipe for use as water well casing.
CSA Z245.1	Canadian steel pipe specification for seamless and ERW pipe that is somewhat equivalent to the API 5L Line Pipe Specification.

STANDARD PIPE & LINE PIPE TABLES

Mill hydrostatic test pressure data was calculated on the basis of a fiber stress equal to a percentage of the specified minimum yield strength for the various sizes and grades. For specific information, ASTM standards and/or API Specification 5L should be consulted. Due to limited pump capacity, maximum hydrostatic test pressures for 22", 24" and 26" OD seamless pipe are 2,700, 2,300 and 2,000 psi respectively. Some outside diameters, walls and grades are listed for information only and are not necessarily regular production items. The tables do not represent the full manufacturing capacity. Sizes, walls and grades not listed are subject to inquiry.

[1] As noted throughout the Line Pipe Tables, these grades are available in seamless only.

MEDIUM & HEAVY PIPE

GRADE C250

MANUFACTURING PROCESS

Grade C250 Pipe, for general mechanical and low pressure reticulation applications, is manufactured by cold-forming and high frequency Electric Resistance Welding. The cold-forming process enhances the strength, hardness and surface finish of the pipe and produces product to tight dimensional tolerances. Pipe is tested by using non-destructive Eddy Current methods during the process.

AUSTRALIAN STANDARDS

Grade C250 Pipe is manufactured and tested to comply with the requirements of the following specifications:

AS 1074 - Steel tubes and tubulars for ordinary service.

AS 1163 - Structural steel hollow sections (Grade C250, C250LO).

AS 4792 - Hot-dipped galvanised coating on ferrous hollow sections. Applied by a continuous or a specialised process.

LO indicates grades with guaranteed impact performances at 0°C. With impact guaranteed properties, the opportunities for the designer are now enhanced in low temperature service environments under AS 4100.

MECHANICAL PROPERTIES

Minimum Yield Strength	250 MPa
Minimum Tensile Strength	320 MPa
Minimum Elongation in $5.65\sqrt{S_o}$	22%

TOLERANCES

Straightness Thickness Tolerance Dimensional Tolerance Length	Refer to Australian Standards
Tolerance	+50mm/-0mm

If tighter tolerances are required, they must be specified at the time of order (conditions apply).

SUPPLY CONDITIONS - PAINTED FINISH

Red (Normal finish) or black (clear).

The coating thicknesses for these paints are:

Red & Black	12 microns average.

Note: Non-standard finishes, such as NOPC, are available if ordered prior to rollings. Conditions apply.

GALVANISED FINISH

Hot dipped galvanised pipe is manufactured and tested to meet the requirements of AS 4792.

Coating mass: 300 g/m^2 min average both sides.

The coating adherence of the galvanising is satisfactory for the pipe to be bent to a radius 6 times the diameter of the pipe.

STANDARD LENGTHS

(DN 20 - DN 150) Red/Black/Galvanised 6.5m
Note: DN stands for Nominal Size and replaces NB (Nominal Bore).

THICKNESS AND MARKING

Grade C250 pipe is available in medium (M) and heavy (H) wall thickness. These thicknesses are identified by the following end colour codes:

Medium (M)	Blue
Heavy (H)	Red

MEDIUM & HEAVY PIPE

WORKING PRESSURES – THREADED JOINTS TAPER/PARALLEL THREAD

TYPE OF SERVICE											
Nominal Size DN	Water & Inert Oil		L.P.G.	Fuel Oil				Other Applications (Including Steam & Compressed Air)			
	Medium	Heavy	Med. & Heavy	Medium		Heavy		Medium		Heavy	
				Press.	Temp.	Press.	Temp.	Press.	Temp.	Press.	Temp.
(mm)	kPa	kPa	kPa	kPa	°C	kPa	°C	kPa	°C	kPa	°C
15	2070	2410	140	1030	100	1210	192	1210	100	1210	192
20	2070	2410	140	1030	100	1210	192	1210	100	1210	192
25	2070	2410	140	1030	100	1210	192	1210	100	1210	192
32	1720	2070	140	1030	100	1030	192	1030	100	1030	192
40	1720	2070	140	1030	100	1030	192	1030	100	1030	192
50	1380	1720	140	860	100	860	192	860	100	860	192
65	1380	1720	–	860	100	860	192	860	100	860	192
80	1380	1720	–	860	100	860	192	860	100	860	192
100	1030	1380	–	690	100	850	192	690	100	690	192
125	1030	1380	–	–	–	–	–	–	–	–	–
150	860	1030	–	–	–	–	–	–	–	–	–

WORKING PRESSURES – WELDED JOINTS

Where AS 1074 pipe is used in pressure piping covered by AS 4041, the maximum pressure shall not exceed 1210 kPa for AS 1074 pipe up to and including DN 100 and 1030 kPa for AS 1074 pipe exceeding DN 100.

END PROCESSING OPTIONS

- Plain End
- Shouldered
- Roll Grooved
- Threaded

THREADED PIPE

Screwed on one or both ends in accordance with AS 1074.

The tapered Whitworth thread used complies with the requirements of AS 1722, Part 1 and is suitable for both parallel and taper threaded sockets.

Grade C250	MASS AND BUNDLING DATA - Calculated in accordance with AS 1163									
DIMENSIONS		BUNDLING			MASS					
Designation d_o t	Nominal Size DN	Bundle Dimensions mm	Lengths Per Bundle	Metres Per Bundle	Nominal Mass				Mass Per Bundle	
					kg/m		m/tonne		tonnes	
mm mm	mm	W x H	6.5 m	m	Black	Galv.	Black	Galv.	Black	Galv.
13.5 x 2.3	8 M	Supplied in	400	2320	0.64	0.67	1560	1490	1.49	1.55
2.9	8 H	Circular Bundles	400	2320	0.77	0.79	1310	1260	1.78	1.84
17.2 x 2.3	10 M	Supplied in	300	1950	0.84	0.88	1190	1140	1.64	1.71
2.9	10 H	Circular Bundles	300	1950	1.02	1.05	985	951	1.98	2.05
21.3 x 2.6	15 M	364 318	217	1410.5	1.21	1.25	830	798	1.70	1.77
3.2	15 H	364 318	217	1410.5	1.44	1.48	695	674	2.03	2.09
26.9 x 2.6	20 M	350 306	127	825.5	1.56	1.60	642	623	1.29	1.32
3.2	20 H	350 306	127	825.5	1.87	1.92	535	522	1.54	1.58
33.7 x 3.2	25 M	327 327	91	591.5	2.41	2.46	415	406	1.42	1.46
4.0	25 H	327 327	91	591.5	2.93	2.99	341	335	1.73	1.77
42.4 x 3.2	32 M	383 337	61	396.5	3.09	3.17	323	316	1.23	1.26
4.0	32 H	383 337	61	396.5	3.79	3.86	264	259	1.50	1.53
48.3 x 3.2	40 M	436 384	61	396.5	3.56	3.64	281	274	1.41	1.44
4.0	40 H	436 384	61	396.5	4.37	4.45	229	225	1.73	1.77
60.3 x 3.6	50 M	422 374	37	240.5	5.03	5.14	199	195	1.21	1.24
4.5	50 H	422 374	37	240.5	6.19	6.30	161	159	1.49	1.51
76.1 x 3.6	65 M	533 472	37	240.5	6.44	6.57	155	152	1.55	1.58
4.5	65 H	533 472	37	240.5	7.95	8.08	126	124	1.91	1.94
88.9 x 4.0	80 M	445 397	19	123.5	8.38	8.54	119	117	1.03	1.05
4.9	80 H	445 397	19	123.5	10.3	10.6	99	97	1.25	1.27
101.6 x 4.0	90 M	508 454	19	123.5	9.63	9.81	104	102	1.19	1.21
4.9	90 H	508 454	19	123.5	11.9	12.2	86	84	1.44	1.47
114.3 x 4.5	100 M	571 509	19	123.5	12.2	12.4	82	81	1.50	1.53
5.4	100 H	571 509	19	123.5	14.50	14.7	69	68	1.79	1.82
139.7 x 5.0	125 M	699 382	13	84.5	16.6	16.9	60	59	1.40	1.42
5.4	125 H	699 382	13	84.5	17.9	18.1	56	55	1.51	1.53
165.1 x 5.0	150 M	660 451	10	65	19.7	20.0	51	50	1.28	1.30
5.4	150 H	660 451	10	65	21.3	21.6	47	46	1.38	1.40

Notes: 1. M= Medium, H= Heavy

LIGHT AND EXTRA LIGHT PIPE

GRADE C350

Grade C350 Pipe is a lightweight, high strength pipe for general mechanical and structural applications. It is manufactured by cold forming and high frequency electric resistance welding.

C350 is available in black, painted and galvanised finishes. Also available with one or both ends swaged in sizes from 25 NB to 50 NB.

SPECIFICATIONS

Manufactured and tested to meet the requirements of the following specifications:

AS 1163 Structural Steel Hollow Sections (Grade C350, C350L0).

AS 4792 Hot-dipped galvanised coating on ferrous hollow sections. Applied by a continuous or a specialised process.

MECHANICAL PROPERTIES

Minimum Yield Strength 350 MPa
Minimum Tensile Strength 450 MPa
Minimum Elongation in $5.65\sqrt{S_o}$ 20%

SUPPLY CONDITIONS

Surface Finish Black/Painted/Galvanised
Straightness
Thickness Tolerance } Refer to Australian Standards
Dimension Tolerance

Standard Length 6.5m
Length Tolerance +50mm/-0mm

GALVANISING

Grade C350 pipe is manufactured and tested to meet the requirements of AS 4792 Galvanised coatings.

Coating Mass: 300g/m² min average both sides.

The coating adherence of the galvanising is satisfactory for the pipe to be bent to a radius 6 times the diameter of the pipe.

WELDING

The following consumables are recommended by AS 1554.1 when welding C350 sections.

Manual metal-arc (MMAW) E41XX, E48XX

Gas metal-arc (MIG) (GMAW) W50X

Grade C350	MASS AND BUNDLING DATA - Calculated in accordance with AS 1163											
DIMENSIONS		BUNDLING			MASS							
Designation d_o t	Nominal Size DN	Bundle Dimensions mm		Lengths Per Bundle	Metres Per Bundle	Nominal Mass kg/m		Nominal Mass m/tonne		Mass Per Bundle tonnes	
mm mm	mm	W x H		6.5 m	m	Black	Galv.	Black	Galv.	Black	Galv.
26.9 x 2.0	20 XL	350	306	127	825.5	1.228	1.275	814	784	1.014	1.053
2.3	20 LT	350	306	127	825.5	1.395	1.442	717	694	1.152	1.190
33.7 x 2.0	25 XL	327	327	91	591.5	1.564	1.623	640	616	0.925	0.960
2.6	25 LT	327	327	91	591.5	1.994	2.053	501	487	1.180	1.214
42.4 x 2.0	32 XL	383	337	61	396.5	1.993	2.069	502	483	0.790	0.820
2.6	32 LT	383	337	61	396.5	2.552	2.627	392	381	1.012	1.042
48.3 x 2.3	40 XL	436	384	61	396.5	2.609	2.696	383	371	1.035	1.069
2.9	40 LT	436	384	61	396.5	3.247	3.333	308	300	1.287	1.321
60.3 x 2.3	50 XL	422	374	37	240.5	3.290	3.399	304	294	0.791	0.818
2.9	50 LT	422	374	37	240.5	4.105	4.213	244	237	0.987	1.013
76.1 x 2.3	65 XL	533	472	37	240.5	4.186	4.325	239	231	1.007	1.040
3.2	65 LT	533	472	37	240.5	5.753	5.890	174	170	1.384	1.417
88.9 x 2.6	80 XL	445	397	19	123.5	5.534	5.696	181	176	0.683	0.703
3.2	80 LT	445	397	19	123.5	6.763	6.925	148	144	0.835	0.855
101.6 x 2.6	90 XL	508	454	19	123.5	6.348	6.534	158	153	0.784	0.807
3.2	90 LT	508	454	19	123.5	7.765	7.951	129	126	0.959	0.982
114.3 x 3.2	100 XL	571	509	19	123.5	8.768	8.977	114	111	1.083	1.109
3.6	100 LT	571	509	19	123.5	9.828	10.037	102	100	1.214	1.240
139.7 x 3.0	125 XL	699	382	13	84.5	10.114	10.371	99	96	0.855	0.876
3.5	125 LT	699	382	13	84.5	11.756	12.013	85	83	0.993	1.015
165.1 x 3.0	150 XL	660	451	10	65	11.993	12.298	83	81	0.780	0.799
3.5	150 LT	660	451	10	65	13.949	14.253	72	70	0.907	0.926

Notes: 1. LT= Light, XL= Extra Light. End colour codes. Light (LT) Yellow, Extra Light (XL) Green.

COMMERCIAL PIPE APPLICATION GUIDE – TYPICAL PIPING SYSTEM MAKEUP

COMMERCIAL BLACK PAINTED

PIPE GRADE	TYPICAL JOINTING METHODS	TYPICAL COMPLEMENTARY FITTINGS
Light & Extra Light	Buttweld, Flanged, Roll Grooved, Shouldered	Flanges, Roll Grooved or Shouldered Fittings
Medium	Buttweld, Flanged, Roll Grooved, Shouldered, Threaded	Buttweld Fittings, Flanges, Roll Grooved or Shouldered Fittings, Black or Galvanised Screwed Fittings (Malleable Iron or Steel)
Heavy	Buttweld, Flanged, Cut Grooved Shouldered, Threaded	Buttweld Fittings, Flanges, Roll Grooved or Shouldered Fittings, Black or Galvanised Steel Screwed Fittings
Extra Heavy	Buttweld, Flanged	Buttweld Fittings, Flanges, Socket-Weld Fittings

COMMERCIAL GALVANISED

PIPE GRADE	TYPICAL JOINTING METHODS	TYPICAL COMPLEMENTARY FITTINGS
Light & Extra Light	Roll Grooved, Shouldered	Roll Grooved or Shouldered Fittings
Medium	Roll Grooved, Shouldered, Threaded	Roll Grooved or Shouldered Fittings Galvanised Malleable or Galvanised Steel Screwed Fittings, Screwed Flanges
Heavy	Shouldered, Threaded	Shouldered Fittings, Galvanised Steel Screwed Fittings, Screwed Flanges

LINEPIPE, CARBON AND STAINLESS STEEL

PIPE GRADE	TYPICAL JOINTING METHODS	TYPICAL COMPLEMENTARY FITTINGS
Various Wall Thicknesses and Schedules	Buttwelding Socket Welding Flanged Threaded Grooved Shouldered	Buttweld Fittings, O'let Fittings Socketweld Fittings & O'lets ANSI & Australian Flanges NPT & BSP Fittings, O'lets Roll Grooved System Shouldered System

The flanges and fittings listed in these charts are all available from ITT Grinnell Piping Systems and are described in our
"Pipe Fittings" and "Stainless Steel" catalogues.

Notes: The jointing methods and fittings listed above are typical of those selected by our customers when ordering Australian Standard steel pipe for reticulation (non-structural) use. Reference should be made to relevant piping codes and standards when selecting products or materials for specific applications. These charts are offered as a guide only and does not represent or replace any of the official piping codes or standards.

LINEPIPE

OneSteel is Australia's largest stockist of seamless and welded pipes in both carbon and alloy steel.

These pipes are used in a diverse range of fluid handling and structural applications from Petroleum and Chemical Processing to the Mining and allied industries. The general stock range for seamless and welded carbon steel pipes is 8mm to 600mm nominal diameter.

ASME B36.10. WELDED AND SEAMLESS WROUGHT STEEL PIPE

ASME B36.10 covers the standardization of dimensions of welded and seamless wrought steel pipe. It shows both imperial and metric units, the metric units being **soft conversions** of the imperial units.

On pages 12 and 13 we have shown only metric dimensions to ASME B36.10 for the more popular size range. We have also included inside diameter (I.D.) and metric nominal size (DN) which are not shown in ASME B36.10.

1. **NOMINAL SIZE –** May be expressed in S.I. metric (mm) or imperial (inch) units.
2. **OUTSIDE DIAMETER –** is shown to the nearest 0.1mm for outside diameters which are 406.4mm O.D. and smaller, and to the nearest 1.0mm for outside diameters larger than 406.4mm O.D. We have shown the equivalent inch size underneath in brackets – ( ).
3. **WALL THICKNESS –** is shown rounded to the nearest 0.01mm.
4. **INSIDE DIAMETER –** is not shown in ASME B36.10, however, by using the inch measurements in ASME B36.10, we have calculated the **inside diameter** (I.D.) in inches and used the factor 25.4 to convert to millimetres to the nearest 0.1mm
5. **MASS (WEIGHT) –** is shown in kilograms per meter (kg/m) for plain end pipes. These are calculated values using the formula shown at the bottom of page 13 (taken from B36.10).
6. **WALL THICKNESS DESIGNATIONS –** The wall thickness designations "Standard WT", "Extra Strong" and "Double Extra-Strong", have been commercially used designations for many years. Schedule numbers were added as a convenient designation for use in ordering pipe. Standard WT and Schedule 40 are identical for sizes up to **NPS 10** inclusive. All larger sizes of Standard WT have 9.53mm wall thickness. Extra-Strong and Schedule 80 are identical for sizes up to **NPS 8** inclusive. All larger sizes of Extra-Strong have 12.70mm wall thickness.
7. **PIPE ENDS –** Unless otherwise specified pipe ends are normally supplied as below:-
   (a) Up to and including 48.3mm O.D. size are supplied with plain ends cut square.
   (b) Above 48.3mm O.D. sizes (except for Double Extra-Strong pipe) are supplied with plain ends bevelled.
   (c) All Double Extra-Strong pipe is supplied with plain ends cut square.
8. **END PREPARATION**
   (a) Bevelled ends for API steel linepipe are normally to API specification i.e. Angle $30^{\circ}{}^{+5^{\circ}}_{-0^{\circ}}$
   (b) Bevelled ends for steel pipe to ASTM specifications are normally to ASME B16.25 i.e. Angle $30^{\circ}{}^{+5^{\circ}}_{-0^{\circ}}$

METRIC CONVERSION TERMINOLOGY

Soft conversion is an exact mathematical equivalent using known conversion factors from imperial to metric. eg. Inch to millimetres (mm) = 1 x 25.4. Therefore 12¾ inch x 25.4 = 323.85mm.
Soft conversion can only be applied to actual measurement, it cannot be applied to nominal sizes.

Hard conversion is where pipe manufactured to imperial sizes (O.D. x WT in actual inches) is replaced by pipe manufactured to metric sizes (O.D. x WT in actual millimetres [mm]).

Pipe is only quoted as a typical material example.

METHODS OF MANUFACTURE

SEAMLESS PIPE

SPECIFICATIONS
API 5L 5LX
ASTM A53
ASTM A106
ASTM A333
ASTM A335

SIZES
UP TO 762mm O.D.

In the seamless pipe-making process tube rounds are heated in a furnace, after which they are pierced, then rolled by the **Mandrel** or **Plug-Mill** process into pipes and tubes of specified diameters and wall thicknesses.

Seamless tubular products are generally hot-rolled, but can also be supplied cold-drawn (up to 273mm O.D.) when required.

The "Push-Bench" process can also be used in the manufacture of seamless pipe. In this process, a steel billet is furnace heated to the plastic state and partly punched at one end to take a mandrel. The billet is then forced by the mandrel through a series of gradually reducing dies, until the required outside diameter has been attained, the I.D. being determined by the size of the mandrel.

ELECTRIC-RESISTANCE WELDED PIPE (E.R.W.)

In Australia, as in modern installations overseas, ERW Linepipe has gained increased acceptance, where Seamless Pipe was once considered essential, because of its uniform quality and dimensions, and its cost advantage.

The ERW manufacturing process is described below:

At the pipe mill the strip is uncoiled, levelled and crop-sheared. It is then trimmed on both sides simultaneously to correct width and immediately fed into the forming and welding line. During the process, the strip is closely checked for surface defects.

A series of cold forming rolls changes the strip progressively into tubular form with abutting edges on top. The longitudinal edges are joined by high frequency electric resistance welding. The weld is then heat treated electrically. Special devices remove inside and outside flash from the weld to give uniform wall thickness of the pipe.
The welded part is then heat-treated by post annealing to ensure adequate ductility at the weld and adjacent zone. The pipe is passed through a series of cold sizing rolls to progressively reduce the diameter to accurate size. This operation also increases strength and improves surface condition.

SPECIFICATIONS
API 5L & 5LX
ASTM A53, A135,
ASTM A252, A333

SIZES
UP TO 610mm O.D.

The pipe is then cut to specified length by a flying cut-off machine. After the straightening operation, ends of the pipe are cropped, then squared or bevelled depending on end finish requirements. The pipe is then hydrostatically tested to specified pressure. Also test specimens are taken during the process to check chemical and mechanical properties.

Each length of pipe is inspected by the ultrasonic method on the weld and checked as to diameter, wall thickness, surfaces, end finish, camber and concentricity. The length and weight of pipe is measured and recorded and protective coating is applied on the outside surface.

U.O.E. DOUBLE SUBMERGED ARC WELDED PIPE

SPECIFICATIONS
API 5L 5LX & 5LU
ASTM A53

SIZES
UP TO 1820mm O.D.

Steel plates are first U-shaped then O-formed by a hydraulic press. The seam is welded from inside and outside automatically by the submerged-arc process. Hydraulic expansion gives the pipe precise diameter and roundness and relieves residual stresses caused by forming and welding.

MATERIAL SPECIFICATIONS FOR PIPING COMPONENTS

PIPING COMPONENT SPECIFICATIONS

This page shows comparable ASTM and API specifications for the basic components of welded piping systems. Specification numbers and material grades are shown; for example, ASTM specification A106 Grade B is indicated in the table as A106-B. Other specifications exist and may be required for special piping systems. Materials shown are those most frequently used today.

Also tabulated are the permissible raw material specifications which are used in the manufacture of welding fittings. Selection from these is at the discretion of the fitting manufacturer.

MATERIAL		PIPING COMPONENTS			RAW MATERIAL FOR WELDING FITTINGS	
		Pipe	Welding Fittings *	Flanges	Pipe	Forgings
Carbon Steel	Grade B	A53-B A106-B A135-B A139-B API-5L-B	A234-WPB	A105	A106-B	A105
	Grade C	A106-C	A234-WPC	A105	A106-C	
	Low Temperature	A333-6	A420-WPL6	A350-LF2	A333-6	A350-LF2
	High Yield	A381-35	Grade WPY35 § II	A105	A106-B	A105
		API-5LX-X42, X46, X52	Grade WPY42 § II Grade WPY52 § II	A182-F1 -	A381-42 A381-52	182-F1 -
Carbon Moly-Steel	½ Mo	A155-CM70	A234-WP1	A182-F1	A335-P1	A182-F1
		A335-P1 A369-FP1				
Chrome Moly-Steel	½Cr-½Mo	A155-½CR A335-P2 A369-FP2	Grade WP2 §	A182-F2	A335-P2	A182-F2
	1Cr-½Mo	A155-1CR A335-P12 A369-FP12	A234-WP12	A182-F12	A335-P12	A182-F12
	1¼Cr-½Mo	A155-1¼CR A335-P11 A369-FP11	A234-WP11	A182-F11	A335-P11	A182-F11
	2¼Cr-1Mo	A155-2¼CR A335-P22 A369-FP22	A234-WP22	A182-F22	A335-P22	A182-F22
	5Cr-½Mo	A155-5CR A335-P5 A369-FP5	A234-WP5	A182-F5	A335-P5	A182-F5
	7Cr-½Mo	A335-P7 A369-FP7	Grade WP7	A182-F7	A335-P7	A182-F7
	9Cr-1Mo	A335-P9 A369-FP9	Grade WP9	A182-F9	A335-P9	A182-F9
Low Temp Ferritic Steel	3½Ni	A333-3	A420-WPL3	A350-LF3	A333-3	A350-LF3
	Cu-Ni Low Alloy Steel	A333-9	A420-WPL9	A350-LF9	A333-9	A350-LF9

* When fittings are of welded construction, the fitting manufacturer shall supplement the grade symbol marking with the letter "W".

§ No ASTM specification has been written. The welding fitting grade symbol is that recommended by MSS Standard SP-25, and the raw materials shown are those commonly used.

II The numerals in these grade symbols are the first two numbers of the minimum guaranteed yield strength of the fittings. Fittings having other minimum yield strengths may be similarly designated by using the applicable numerals.

Tolerances (Excerpts from API Specifications)

Tensile and Chemical Requirements (Excerpts from API Specifications, 1983 edition)

Application	Grade	Tensile Requirements						
		Yield Strength			Tensile Strength			Elongation
		psi min	MPa min	kg/mm² min	psi min	MPa min	kg/mm² min	% min
Line Pipe	API 5L Grade A	30,000	207	21.1	48,000	331	33.7	$e = \frac{625{,}000\ A^{0.2}}{U^{0.9}}$ *2
	API 5L Grade B	35,000	241	24.6	60,000	413	42.2	
	API 5L Grade X42	42,000	289	29.5	60,000	413	42.2	
	API 5L Grade X46	46,000	317	32.3	63,000	434	44.3	
	API 5L Grade X52	52,000	358	36.6	(1) 66,000 *1 (2) 72,000	(1) 455 (2) 496	46.4 50.6	
	API 5L Grade X56 *6	56,000	386	39.2	(1) 71,000 *1 (2) 75,000	(1) 489 (2) 517	49.9 52.7	
	API 5L Grade X60 *3 *6	60,000	413	42.2	(1) 75,000 *1 (2) 78,000	(1) 517 (2) 537	52.7 54.8	
	API 5L Grade X65 *6 *8 *11	65,000	448	45.7	(1) 77,000 *1 (2) 80,000	(1) 530 (2) 551	54.1 56.2	
	API 5L Grade X70 *6 *11	70,000	482	49.2	82,000	565	57.6	
	API 5LU Grade X80	80,000	551	56.2	*4 95,000/125,000	655/862	66.8/87.8	
	API 5LU Grade X100	100,000	689	70.3	*4 110,000/135,000	758/931	77.3/94.9	

*1 (1) Wall thickness > 0.375in., OD ≥ 20in.
Any wall thickness, OD < 20in.
(2) Wall thickness ≤ 0.375in., OD ≥ 20in.

*2 The minimum elongation in 2 inches (60.8 mm) shall be determined by the following formula:

$$e = 625{,}000 \frac{A^{0.2}}{U^{0.9}}$$

where:

e = minimum elongation in 2 inches (50.80 mm) in per cent rounded to the nearest 1/2 per cent.

A = cross sectional area of the tensile test specimen in square inches, based on specified outside diameter or nominal specimen width and specified wall thickness rounded to the nearest 0.01 sq. in., or 0.75 sq. in., whichever is smaller.

U = specified tensile strength, psi.

*3 The minimum tensile strength for grade X60 electric-resistance welded pipe in all sizes and wall thick-nesses shall be 75,000 psi (52.7 kg/mm²).

*4 Tensile strength means min. value/max. value

*5 Figures in parentheses are values for seamless pipe. Upper line value means non-expanded, Lowerline value means cold-expanded. In grades X42 through X65, for each reduction of 0.01 per cent below the maximum carbon content, an in-crease of 0.05 per cent manganese above the specified max-imum is permissible, up to a maximum of 1.45 per cent for X52 and lower and up to a maximum of 1.60 per cent for grades higher than X52.

*6 Other chemical analyses may be furnished by agreement between purchaser and manufacturer.

*7 Either columbium, vanadium, titanium, or a combination thereof, shall be used at the discretion of the manufacturer.

Tolerances (Excerpts from API Specifications)

Chemical Requirements for Ladle Analyses, %							
C *5	Si	Mn *5	P	S	Cb	V	Ti
max	max	max	max	max	min	min	min
0.21 (0.22)		0.90	0.04	0.05			
0.26 (0.27)		1.15	0.04	0.05			
0.28 (0.29) *13		1.25	0.04	0.05			
0.30 (0.31) 0.28 (0.29) *13		1.35 1.25	0.04	0.05			
0.30 (0.31) 0.28 (0.29) *13		1.35 1.25	0.04	0.05			
0.26		1.35	0.04	0.05	0.005 *7	0.02 *7	0.03 *7
0.26		1.35	0.04	0.05	0.005 *7	0.02 *7	0.03 *7
0.26		1.40	0.04	0.05	0.005 *9	0.02 *9	
0.23 *10		1.60 *10	0.04	0.05			
0.26 *12	0.35	1.40 *12	0.04	0.05			
0.26 *12	0.35	1.40 *12	0.04	0.05			

*8 For grades X65 in sizes 16in. and larger with wall thickness 0.500 in. and less, the chemical composition shall be as shown or as agreed upon between the purchaser and manufacturer. For other sizes and wall thicknesses the chemical composition shall be as agreed upon between the purchaser and manufacturer. (Applicable to welded pipe only.)

*9 Either columbium or vanadium or a combination of both shall be used at the discretion of the manufacturer.

*10 For each reduction of 0.01 per cent below the specified maximum carbon content, an increase of 0.05 per cent manganese above the specified maximum is permissible.

*11 For seamless pipe of grades X65 and X70, the chemical composition shall be agreed upon between the purchaser and manufacturer.

*12 For each reduction of 0.01% below the specified maximum carbon content, an increase of 0.05% manganese above the specified maximum is permissible, up to a maximum of 1.50%.

*13 For cold expanded seamless pipe in size 20 in, and larger, the maximum carbon content shall be 0.28 percent.

Tolerances (Excerpts from API Specifications)

Mechanical Values					Chemical Analysis							
Material	Tensile Strength N/mm2	Yield Strength (Min)	Elongation % min.	C %	Si %	Mn %	P % max.	S % max.	Mo %	Cr %	Ni %	Div %
A53-Grade A	min. 330	205	variable	max. 0.25	-	max. 0.95	0.050	0.80				
A53-Grade B	min. 415	240	variable	max. 0.30	-	max. 1.20	0.050	0.60				
A106-Grade A	min. 330	205	35	max. 0.25	min. 0.10	0.27-0.93	0.048	0.058				
A106-Grade B	min. 415	240	30	max. 0.30	min. 0.10	0.29-1.06	0.048	0.058				
A179	Hardness Rb. max. 72			0.06-0.18	-	0.27-0.63	0.048	0.058				
A333-Grade 1	min. 379	207	35	max. 0.30	-	0.40-1.06	0.050	0.60				
A333-Grade 6	min. 414	241	30	max. 0.30	min. 0.10	0.29-1.06	0.048	0.058				
A333-Grade 3	min. 448	241	30	max. 0.19	0.18-0.37	0.31-0.64	0.050	0.050			3.18-3.82	
A335-Grade P1	min. 379	207	30	0.10-0.20	0.10-0.50	0.30-0.80	0.045	0.045	0.44-0.65			
A335-Grade P5	min. 414	207	30	max. 0.15	max. 0.50	0.30-0.60	0.030	0.030	0.44-0.55	4.00-6.00		
A335-Grade P11	min. 414	207	30	max. 0.15	0.50-1.00	0.30-0.60	0.030	0.030	0.44-0.65	1.00-1.50		
A335-Grade P12	min. 414	207	30	max. 0.15	max. 0.50	0.30-0.60	0.045	0.045	0.44-0.65	0.80-1.25		
A335-Grade P22	min. 414	207	30	max. 0.15	max. 0.50	0.30-0.60	0.030	0.030	0.87-1.13	1.90-2.60		
API-5L-Grade A	min. 331	207	variable	max. 0.22	-	max. 0.90	0.040	0.050				
API-5L-Grade B	min. 413	241	variable	max. 0.27	-	max. 1.15	0.040	0.050				
API-5L-Grade X42	min. 413	289	variable	max. 0.29	-	max. 1.25	0.040	0.050				
API-5L-Grade X46	min. 434	317	variable	max. 0.29	-	max. 1.35	0.040	0.050				
API-5L-Grade X52	min. 455	358	variable	max. 0.31	-	max. 1.35	0.040	0.050				
API-5L-Grade X56	min. 489	386	variable	max. 0.26	-	max. 1.35	0.040	0.050				
API-5L-Grade X60	min. 517	413	variable	max. 0.26	-	max. 1.35	0.040	0.050				
BS3059/1-320	320-480	195	25	max. 0.16	-	min. 0.30	0.050	0.050				
BS3059/2-360	360-500	215	24	max. 0.17	max. 0.35	0.40-0.80	0.045	0.045				
BS3601-ERW320	320-440	195	25	max. 0.16	-	0.30-0.70	0.050	0.050				
BS3601-ERW360	360-480	215	24	max. 0.17	max. 0.35	0.40-0.80	0.045	0.045				
BS3602-ERW/SAW410	410-530	235	22	max. 0.21	max. 0.35	0.40-1.20	0.050	0.050				
BS3601-S360 BS3601-	360-480	215	24	max. 0.17	max. 0.35	0.40-0.80	0.050	0.050				
S410 BS3602/1-360	410-530	235	22	max. 0.21	max. 0.35	0.40-1.20	0.050	0.050				
BS3602/1-410	360-500	215	24	max. 0.17	max. 0.35	0.40-0.80	0.045	0.045				
BS3602/1-490Nb	410-550	245	22	max. 0.21	max. 0.35	0.40-1.20	0.045	0.045				
BS3602/2-410	490-630	340	20	max. 0.23	max. 0.35	0.80-1.50	0.045	0.045				Nb 0.01-0.10
	410-550	245	24	max. 0.20	max. 0.35	0.50-1.30	0.040	0.040				
BS3603-410	410-530	235	22	max. 0.20	max. 0.35	0.60-1.20	0.045	0.045				
BS3603-503	440-590	245	16	max. 0.15	0.15-0.35	0.30-0.80	0.025	0.020			3.25-3.75	
BS3604-620	440-590	290	22	0.10-0.18	0.10-0.35	0.40-0.70	0.050	0.050	0.45-0.65	0.70-1.10		
BS3604-622	440-640	275	20	0.08-0.15	max. 0.50	0.40-0.70	0.040	0.040	0.90-1.20	2.00-2.50		
BS3604-625	450-600	170	20	max. 0.15	max. 0.50	0.30-0.60	0.040	0.040	0.45-0.65	4.00-6.00		
BS4360-50D	490-640	355	20	max. 0.20	max. 040	max. 1.40	0.040	0.040				Nb 0.003-0.10 V0.0003-0.1

Tolerances (Excerpts from API Specifications)

Technical Standards			Comparable Qualities					
Material	Specification Standard	Dimensional Standard	ASTM	API	BS	DIN	Euro Standard EU 25-72	DIV
A53	A53	ANSI-B36.10		API-5L-Gr.A	3601-320/360	St. 37.0	FE 310	
A53	A53	ANSI-B36.10		API-5L-Gr.B	3601-410	St. 44.0	Fe 360B/430B	BS4360-43B/C
A106/A530	A106/A530	ANSI-B 36.10		API-5L-Gr.A	3602-S360	St. 35.8		
A106/A530	A106/A530	ANSI-B 36.10		API-5L-Gr.B	3602-S410	St. 45.8		
A179/A450	A179/A450	ANSI-B 36.10			3059-320/360	St. 35.8		
A333/A530	A333/A530	ANSI-B 36.10			360 1HFS27LT50	TT St.35N		
A333/A530	A333/A530	ANSI-B 36.10			3603HFS503LT100	TT St.35V		
A333/A530	A333/A530					10 Ni 14		
A335/A530	A335/A530	ANSI-B 36.10				15 Mo 3/16 Mo 5		
A335/A530	A335/A530	ANSI-B 36.10			3604-625	12 Cr Mo 19.5		
A335/A530	A335/A530	ANSI-B 36.10			3604-620-440-46	13 Cr Mo 44		
A335/A530	A335/A530	ANSI-B 36.10			0	13 Cr Mo 44		
A335/A530	A335/A530	ANSI-B 36.10			3604-620-440-46	10 Cr Mo 910		
API-5L	API-5L	API-5L	A53 Gr.A		0 3604-620-440 3601-320/360	St. 37.0	Fe 310	St.E 210.7
API-5L	API-5L	API-5L	A53 Gr.B		3601-410-4360-43B/C	St. 44.0	Fe 360B/430B	St E 240.7
API-5L	API-5L	API-5L			4360-43 B/C	St. E 290.7	Fe 430B	
API-5L	API-5L	API-5L				St. E 320.7		
API-5L	API-5L	API-5L			4360-50 B/C/D	St. E 360.7	Fe510B/C/D	St. E 355
API-5L	API-5L	API-5L				St. E 385.7		
API-5L	API-5L	API-5L				St. E 415.7		
BS3059 part1	BS3059 part1	BS3059 part1	A179			St.35.8/St.37.8		
BS3059 part2	BS3059 part2	BS3059 part2	A179			St.35.8/St.37.8		
BS3601	BS3601	BS1600/BS3600	A53 Gr.A	5L-Gr.A		St. 33	Fe 310	
BS3601	BS3601	BS1600/BS3600	A53 Gr.B	5L-Gr.B		St.37.0/St.37.2	Fe 360B	A672-B60
BS3601	BS3601	BS1600/BS3600	A53 Gr.B	5L-Gr.B	4360-43B/C	St.44.0/St.44.3	Fe430B/C	A672-B65/C65
BS3601	BS3601	BS1600/BS3600	A106 Gr.B	5L-Gr.B		St.37.0/St.37.2	Fe 360B	
BS3601	BS3601	BS1600/BS3600	A106 Gr.B	5L-Gr.B		St.44.0/St.44.3		
BS3602 part1	BS3602 part1	BS1600/BS3600	A106 Gr.B	5L-Gr.B		St.35.8/St.37.8		
BS3602 part1	BS3602 part1	BS1600/BS3600	A106 Gr.B	5L-Gr.B		St.45.8		
BS3602 part1	BS3602 part1	BS1600/BS3600		5L-Gr.X52	4360-50 B/C/D	St.52/St52.3	Fe510 B/C/D	
BS3602 part2	BS3602 part2	BS1600/BS3600	A672 B65/C65	5L-Gr.B	4360-43 B/C	St. E240.7	Fe 430 B/C	
BS3603	BS3603	BS1600/BS3600	A333 Gr.6			TT St. 35V		
BS3603	BS3603	BS1600/BS3600	A333 Gr.3			10 Ni 14		
BS3604	BS3604	BS1600/BS3600	A335 P12			13 Cr Mo 44		
BS3604	BS3604	BS1600/BS3600	A335 P22			10 Cr Mo 910		
BS3604	BS3604	BS1600/BS3600	A335 P5			12 Cr Mo 195		
BS4360	BS4360	BS1600	A671 CC70	5L-X52		St. 52-3	Fe 510D	St. E 555

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure										
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX						
									A		B		X42	X46	X52	X56	X60	X65	X70
Nominal Size	in	mm	Sch. No.	in	mm				Std.	Alt.	Std.	Alt.							
⅛	0.405	10.3	40(Std)	0.068	1.73	0.24	0.36	-	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.096	2.41	0.31	0.45	-	850	-	850	-	-	-	-	-	-	-	-
¼	0.540	13.7	40(Std)	0.088	2.24	0.42	0.63	-	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.119	3.02	0.54	0.80	-	850	-	850	-	-	-	-	-	-	-	-
⅜	0.675	17.1	40(Std)	0.091	2.31	0.57	0.85	-	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.126	3.20	0.74	1.10	-	850	-	850	-	-	-	-	-	-	-	-
½	0.840	21.3	40(Std)	0.109	2.77	0.85	1.27	-	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.147	3.73	1.09	1.62	-	850	-	850	-	-	-	-	-	-	-	-
			(XXS)	0.294	7.47	1.71	2.55	-	1000	-	1000	-	-	-	-	-	-	-	-
¾	1.050	26.7	40(Std)	0.113	2.87	1.13	1.68	-	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.154	3.91	1.47	2.19	-	850	-	850	-	-	-	-	-	-	-	-
			(XXS)	0.308	7.82	2.44	3.63	-	1000	-	1000	-	-	-	-	-	-	-	-
1	1.315	33.4	40(Std)	0.133	3.38	1.68	2.50	0.76	700	-	700	-	-	-	-	-	-	-	-
			80(XS)	0.179	4.55	2.17	3.23	0.99	850	-	850	-	-	-	-	-	-	-	-
			160	0.250	6.35	2.84	4.23	1.29	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.358	9.09	3.66	5.45	1.66	1000	-	1000	-	-	-	-	-	-	-	-
1¼	1.660	42.2	40(Std)	0.140	3.56	2.27	3.38	1.03	1200	-	1300	-	-	-	-	-	-	-	-
			80(XS)	0.191	4.85	3.00	4.47	1.36	1800	-	1900	-	-	-	-	-	-	-	-
			160	0.250	6.35	3.76	5.60	1.71	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.382	9.70	5.21	7.76	2.37	2200	-	2300	-	-	-	-	-	-	-	-
1½	1.900	48.3	40(Std)	0.145	3.68	2.72	4.05	1.23	1200	-	1300	-	-	-	-	-	-	-	-
			80(XS)	0.200	5.08	3.63	5.41	1.65	1800	-	1900	-	-	-	-	-	-	-	-
			160	0.281	7.14	4.86	7.24	2.21	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.400	10.16	6.41	9.55	2.91	2200	-	2300	-	-	-	-	-	-	-	-
2	2⅜t	60.3		0.083	2.11	2.03	3.02	0.92	1260	-	1470	-	1760	1930	2180	2350	2520	2730	2940
				0.109	2.77	2.64	3.93	1.20	-	-	-	-	2310	2530	2860	3000	3000	3000	3000
				0.125	3.18	3.00	4.47	1.36	-	-	-	-	2650	2910	3000	3000	3000	3000	3000
				0.141	3.58	3.36	5.00	1.53	-	-	-	-	2990	3000	3000	3000	3000	3000	3000
			40(Std)	0.154	3.91	3.65	5.44	1.66	2330	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.172	4.37	4.05	6.03	1.84	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.188	4.78	4.39	6.54	1.99	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			80(XS)	0.218	5.54	5.02	7.48	2.28	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.250	6.35	5.67	8.45	2.57	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.281	7.14	6.28	9.35	2.85	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			160	0.344	8.74	7.46	11.11	3.39	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.436	11.07	9.03	13.45	4.10	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
2½	2⅞	73.0		0.083	2.11	2.47	3.68	1.12	1040	-	1040	-	1460	1590	1800	1940	2080	2250	2430
				0.109	2.77	3.22	4.80	1.46	-	-	-	-	1910	2090	2370	2550	2730	2960	3000
				0.125	3.18	3.67	5.47	1.67	-	-	-	-	2190	2400	2710	2920	3000	3000	3000
				0.141	3.58	4.12	6.14	1.87	-	-	-	-	2470	2710	3000	3000	3000	3000	3000
				0.156	3.96	4.53	6.75	2.06	1950	-	2280	-	2730	3000	3000	3000	3000	3000	3000
				0.172	4.37	4.97	7.40	2.26	2150	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.188	4.78	5.40	8.04	2.45	2350	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			40(Std)	0.203	5.16	5.79	8.62	2.63	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.216	5.49	6.13	9.13	2.78	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.250	6.35	7.01	10.44	3.18	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			80(XS)	0.276	7.01	7.66	11.41	3.48	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			160	0.375	9.52	10.01	14.91	4.54	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.552	14.02	13.69	20.39	6.22	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
3	3½	88.9		0.083	2.11	3.03	4.51	1.38	850	-	1000	-	1200	1310	1480	1590	1710	1850	1990
				0.109	2.77	3.95	5.88	1.79	-	-	-	-	1570	1720	1940	2090	2240	2430	2620
				0.125	3.18	4.51	6.72	2.05	1290	-	1500	-	1800	1970	2230	2400	2570	2790	3000
				0.141	3.58	5.06	7.54	2.30	-	-	-	-	2030	2220	2510	2710	2900	3000	3000
				0.156	3.96	5.57	8.30	2.53	1600	-	1870	-	2250	2460	2780	3000	3000	3000	3000
				0.172	4.37	6.11	9.10	2.77	1770	-	2060	-	2480	2710	3000	3000	3000	3000	3000
				0.188	4.78	6.65	9.91	3.02	1930	-	2260	-	2710	2970	3000	3000	3000	3000	3000
			40(Std)	0.216	5.49	7.58	11.29	3.44	2220	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.250	6.35	8.68	12.93	3.94	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
				0.281	7.14	9.66	14.39	4.39	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			80(XS)	0.300	7.62	10.25	15.27	4.65	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
			160	0.438	11.13	14.32	21.33	6.50	-	-	-	-	-	-	-	-	-	-	-
			(XXS)	0.600	15.24	18.58	27.67	8.44	2500	-	2500	-	3000	3000	3000	3000	3000	3000	3000
3½	4	101.6		0.083	2.11	3.47	5.17	1.58	750	-	870	-	1050	1150	1290	1390	1490	1620	1740
				0.109	2.77	4.53	6.75	2.06	980	-	1140	-	1370	1500	1700	1830	1960	2130	2290
				0.125	3.18	5.17	7.70	2.35	1120	-	1310	-	1580	1720	1950	2100	2250	2440	2630
				0.141	3.58	5.81	8.65	2.64	1270	-	1480	-	1700	1950	2200	2370	2540	2750	2960
				0.156	3.96	6.40	9.53	2.91	1400	-	1640	-	1970	2150	2430	2620	2810	3000	3000
				0.172	4.37	7.03	10.47	3.19	1550	-	1810	-	2170	2370	2680	2890	3000	3000	3000
				0.188	4.78	7.65	11.39	3.47	1690	-	1970	-	2370	2590	2930	3000	3000	3000	3000
			40(Std)	0.226	5.74	9.11	13.57	4.14	2030	-	2370	-	2850	3000	3000	3000	3000	3000	3000
				0.250	6.35	10.01	14.91	4.54	2250	-	2620	-	3000	3000	3000	3000	3000	3000	3000
				0.281	7.14	11.16	16.62	5.07	2530	-	2800	-	3000	3000	3000	3000	3000	3000	3000
			80(XS)	0.318	8.08	12.50	18.62	5.68	2800	-	2800	-	3000	3000	3000	3000	3000	3000	3000

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness						API 5L				API 5LX			
									A		B					
Nominal Size	in	mm	Sch No	in	mm	lb/ft	kg/m	kg/ft	Std.	Alt.	Std.	Alt.	X42	X46	X52	X56
4	4½	114.3		0.083	2.11	3.92	5.84	1.78	660	.....	770	.....	930	1020	1150	1240
				0.109	2.77	5.11	7.61	2.32	870	.....	1020	.....	.....	.....	.....	.....
				0.125	3.18	5.84	8.70	2.65	1000	.....	1170	.....	1400	1530	1730	1870
				0.141	3.58	6.56	9.77	2.98	1130	- - -	1320	.....	1580	1730	1960	2110
				0.156	3.96	7.24	10.78	3.29	1250	.....	1460	.....	1750	1910	2160	2330
				0.172	4.37	7.95	11.84	3.61	1380	.....	1610	.....	1930	2110	2390	2570
				0.188	4.78	8.66	12.90	3.93	1500	.....	1750	.....	2110	2310	2610	2810
				0.203	5.16	9.32	13.88	4.23	1620	.....	1890	.....	2270	2490	2810	3000
				0.219	5.56	10.01	14.91	4.54	1750	.....	2040	.....	2450	2690	3000	3000
			40(Std)	0.237	6.02	10.79	16.07	4.90	1900	- - -	2210	- - -	2650	2910	3000	3000
				0.250	6.35	11.35	16.91	5.15	2000	.....	2330	.....	2800	3000	3000	3000
			60	0.281	7.14	12.66	18.86	5.75	2250	.....	2620	.....	3000	3000	3000	3000
				0.312	7.92	13.96	20.79	6.34	2500	.....	2800	.....	3000	3000	3000	3000
			80(XS)	0.337	8.56	14.98	22.31	6.80	2700	.....	2800	.....	3000	3000	3000	3000
			120	0.438	11.13	19.00	28.30	8.63	2800	.....	2800	.....	3000	3000	3000	3000
			160	0.531	13.49	22.51	33.53	10.22	2800	.....	2800	.....	3000	3000	3000	3000
			(XXS)	0.674	17.12	27.54	41.02	12.50	2800	.....	2800	.....	3000	3000	3000	3000
5	5 9/16	141.3		0.083	2.11	4.86	7.24	2.21	540	.....	630	.....	.....	.....	.....	.....
				0.125	3.18	7.26	10.81	3.30	810	.....	940	.....	.....	.....	.....	.....
				0.156	3.96	9.01	13.42	4.09	1010	.....	1180	.....	.....	.....	.....	.....
				0.188	4.78	10.79	16.07	4.90	1220	.....	1420	.....	.....	.....	.....	.....
				0.219	5.56	12.50	18.62	5.68	1420	.....	1650	.....	.....	.....	.....	.....
			40(Std)	0.258	6.55	14.62	21.76	6.63	1670	.....	1950	.....	.....	.....	.....	.....
				0.281	7.14	15.85	23.61	7.20	1820	.....	2120	.....	.....	- - -	.....	.....
				0.312	7.92	17.50	26.05	7.94	2020	.....	2360	.....	.....	.....	.....	.....
				0.344	8.74	19.17	28.55	8.70	2230	.....	2600	.....	.....	.....	.....	.....
			80(XS)	0.375	9.52	20.78	30.94	9.43	2430	.....	2800	.....	.....	.....	.....	.....
			120	0.500	12.70	27.03	40.26	12.27	2800	.....	2800	.....	.....	.....	.....	.....
			160	0.625	15.88	32.96	49.08	14.96	2800	.....	2800	.....	.....	.....	.....	.....
			(XXS)	0.750	19.05	38.55	57.41	17.50	2800	.....	2800	.....	.....	.....	.....	.....
6	6⅝	168.3		0.083	2.11	5.80	8.64	2.63	450	560	530	660	790	860	980	1050
				0.109	2.77	7.59	11.31	3.45	590	740	690	860	1040	1140	1280	1380
				0.125	3.18	8.68	12.93	3.94	680	850	790	990	1190	1300	1470	1580
				0.141	3.58	9.76	14.54	4.43	770	960	890	1120	1340	1470	1660	1790
				0.156	3.96	10.78	16.06	4.89	850	1060	990	1240	1480	1620	1840	1980
				0.173	4.37	11.85	17.65	5.38	930	1170	1090	1360	1640	1790	2030	2180
				0.188	4.78	12.92	19.24	5.87	1020	1280	1190	1490	1790	1960	2210	2380
				0.203	5.16	13.92	20.73	6.32	1100	1380	1290	1610	1930	2110	2390	2579
				0.219	5.56	14.98	22.31	6.80	1190	1490	1390	1740	2080	2280	2580	2780
			30	0.250	6.35	17.02	25.35	7.73	1360	1700	1580	1980	2380	2600	2940	3000
			40(Std)	0.280	7.11	18.97	28.26	8.61	1520	1900	1790	2220	2660	2920	3000	3000
				0.312	7.92	21.04	31.34	9.55	1700	2120	1980	2470	2970	3000	3000	3000
				0.344	8.74	23.08	34.38	10.48	1870	2340	2180	2730	3000	3000	3000	3000
				0.375	9.52	25.03	37.28	11.36	2040	2550	2380	2800	3000	3000	3000	3000
			80(XS)	0.432	10.97	28.57	42.56	12.97	2350	2800	2740	2800	3000	3000	3000	3000
				0.500	12.70	32.71	48.72	14.85	2720	2800	2800	2800	3000	3000	3000	3000
			120	0.562	14.27	36.39	54.20	16.52	2800	2800	2800	2800	3000	3000	3000	3000
				0.625	15.88	40.05	59.65	18.18	2800	2800	2800	2800	3000	3000	3000	3000
			160	0.719	18.26	45.35	67.55	20.59	2800	2800	2800	2800	3000	3000	3000	3000
			(XXS)	0.864	21.95	53.16	79.18	24.13	2800	2800	2800	2800	.....	.....	.....	.....
8	8⅝	219.1		0.125	3.18	11.35	16.91	5.15	520	650	610	760	910	1000	1130	1220
				0.156	3.96	14.11	21.02	6.41	650	810	760	950	1140	1250	1410	1520
				0.188	4.78	16.94	25.23	7.69	780	980	920	1140	1370	1500	1700	1830
				0.203	5.16	18.26	27.20	8.29	.....	.....	.....	.....	1480	1620	1840	2000
				0.219	5.56	19.66	29.28	8.93	910	1140	1070	1330	1600	1750	1980	2130
			20	0.250	6.35	22.36	33.31	10.15	1040	1300	1220	1520	1830	2000	2260	2430
			30	0.277	7.04	24.70	36.79	11.21	1160	1450	1350	1690	2020	2220	2510	2700
				0.312	7.92	27.70	41.26	12.58	1300	1630	1520	1900	2280	2500	2820	3000
			40(Std)	0.322	8.18	28.55	42.53	12.96	1340	1680	1570	1960	2350	2580	2910	3000
				0.344	8.74	30.42	45.31	13.81	1440	1790	1680	2090	2510	2750	3000	3000
				0.375	9.52	33.04	49.21	15.00	1570	1960	1830	2280	2740	3000	3000	3000
			60	0.406	10.31	35.64	53.09	16.18	.....	.....	.....	.....	.....	.....	.....	.....
				0.438	11.13	38.30	57.05	17.39	1830	2290	2130	2670	3000	3000	3000	3000
			80(XS)	0.500	12.70	43.39	64.63	19.70	2090	2610	2430	2800	3000	3000	3000	3000
				0.562	14.27	48.40	72.09	21.97	2350	2800	2740	2800	3000	3000	3000	3000
			100	0.594	15.09	50.95	75.89	23.13	.....	.....	.....	.....	.....	.....	.....	.....
				0.625	15.88	53.40	79.54	24.24	2610	2800	2800	2800	3000	3000	3000	3000
			120	0.719	18.26	60.71	90.43	27.56	2800	2800	2800	2800	3000	3000	3000	3000
			140	0.812	20.62	67.76	100.93	30.76	.....	.....	.....	.....	.....	.....	.....	.....
			(XXS)	0.875	22.22	72.42	107.87	32.88	2800	2800	2800	2800	.....	.....	.....	.....
			160	0.906	23.01	74.69	111.25	33.91	.....	.....	.....	.....	.....	.....	.....	.....

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B		X42	X46	X52	X56
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.				
10	10¾	273.0		0.156	3.96	17.65	26.29	8.01	520	650	610	760	1040	1130	1280	1380
				0.188	4.78	21.21	31.59	9.63	630	790	730	920	1250	1370	1550	1660
				0.203	5.16	22.87	34.06	10.38	.....	.....	.....	.....	1350	1480	1670	1800
				0.219	5.56	24.63	36.69	11.18	730	920	860	1070	1450	1590	1800	1940
			20	0.250	6.35	28.04	41.77	12.73	840	1050	980	1220	1660	1820	2060	2210
				0.279	7.09	31.20	46.47	14.16	930	1170	1090	1360	1850	2030	2290	2470
			30	0.307	7.80	34.24	51.00	15.54	1030	1290	1200	1500	2040	2230	2520	2720
				0.344	8.74	38.23	56.94	17.36	1150	1440	1340	1680	2280	2500	2830	3000
			40(Std)	0.365	9.27	40.48	60.29	18.38	1220	1530	1430	1780	2420	2660	3000	3000
				0.438	11.13	48.24	71.85	21.90	1470	1830	1710	2140	2910	3000	3000	3000
			60(XS)	0.500	12.70	54.74	81.54	24.85	1670	2090	1950	2440	3000	3000	3000	3000
				0.562	14.27	61.15	91.08	27.76	1880	2350	2200	2740	3000	3000	3000	3000
			80	0.594	15.09	64.43	95.97	29.25	.....	.....	.....	.....	.....	.....	.....	.....
				0.625	15.88	67.58	100.66	30.68	2090	2620	2440	2800	3000	3000	3000	3000
			100	0.719	18.26	77.03	114.74	34.97	2410	2800	2800	2800	3000	3000	3000	3000
				0.812	20.62	86.18	128.37	39.13	2720	2800	2800	2800	.....	.....	.....	.....
			120	0.844	21.44	89.29	133.00	40.54	.....	.....	.....	.....	.....	.....	.....	.....
			140	1.000	25.40	104.13	155.10	47.28	.....	.....	.....	.....	.....	.....	.....	.....
12	12¾	323.8		0.172	4.37	23.11	34.42	10.49	490	610	570	710	960	1050	1190	1280
				0.188	4.78	25.22	37.57	11.45	530	660	620	770	1050	1150	1300	1400
				0.203	5.16	27.20	40.51	12.35	.....	.....	.....	.....	1140	1250	1410	1520
				0.219	5.56	29.31	43.66	13.31	620	770	720	900	1230	1340	1520	1640
			20	0.250	6.35	33.38	49.72	15.15	710	880	820	1030	1400	1530	1730	1870
				0.281	7.14	37.42	55.74	16.99	790	990	930	1160	1570	1720	1950	2100
				0.312	7.92	41.45	61.74	18.82	880	1100	1030	1280	1750	1910	2160	2330
			30	0.330	8.38	43.77	65.20	19.87	930	1160	1090	1360	1850	2020	2290	2460
				0.344	8.74	45.58	67.89	20.69	970	1210	1130	1420	1930	2110	2390	2570
			(Std)	0.375	9.52	49.56	73.82	22.50	1060	1320	1240	1540	2100	2300	2600	2800
			40	0.406	10.31	53.52	79.72	24.30	.....	.....	.....	.....	2270	2490	2810	3000
				0.438	11.13	57.59	85.78	26.15	1240	1550	1440	1800	2450	2690	3000	3000
			(XS)	0.500	12.70	65.42	97.44	29.70	1410	1760	1650	2060	2800	3000	3000	3000
			60	0.562	14.27	73.15	108.96	33.21	1590	1980	1850	2310	3000	3000	3000	3000
				0.625	15.88	80.93	120.55	36.74	1760	2210	2060	2570	3000	3000	3000	3000
			80	0.688	17.48	88.63	132.01	40.24	1940	2430	2270	2800	3000	3000	3000	3000
				0.750	19.05	96.12	143.17	43.64	2120	2650	2470	2800	3000	3000	3000	3000
				0.812	20.62	103.53	154.21	47.00	2290	2800	2670	2800	3000	3000	3000	3000
			100	0.844	21.44	107.32	159.86	48.72	.....	.....	.....	.....	.....	.....	.....	.....
				0.875	22.22	110.97	165.29	50.38	2470	2800	2800	2800	3000	3000	3000	3000
			120	1.000	25.40	125.49	186.92	56.97	.....	.....	.....	.....	.....	.....	.....	.....
14	14	355.6		0.188	4.78	27.73	41.30	12.59	480	600	560	700	960	1050	1190	1280
				0.203	5.16	29.91	44.55	13.58	520	650	610	760	.....	.....	.....	.....
			10	0.210	5.33	30.93	46.07	14.04	.....	.....	.....	.....	1070	1170	1330	1430
				0.219	5.56	32.23	48.01	14.63	.....	.....	.....	.....	1120	1220	1380	1490
				0.250	6.35	36.71	54.68	16.67	640	800	750	940	1280	1400	1580	1700
				0.281	7.14	41.17	61.32	18.69	720	900	840	1050	1430	1570	1770	1910
			20	0.312	7.92	45.61	67.94	20.71	800	1000	940	1170	1590	1740	1970	2120
				0.344	8.74	50.17	74.73	22.78	880	1110	1030	1290	1750	1920	2170	2340
			30(Std)	0.375	9.52	54.57	81.28	24.77	960	1210	1120	1410	1910	2090	2370	2550
				0.406	10.31	58.94	87.79	26.76	.....	.....	.....	.....	2070	2270	2560	2760
			40	0.438	11.13	63.44	94.49	28.80	1130	1410	1310	1640	2230	2450	2770	2980
				0.469	11.91	67.78	100.96	30.77	.....	.....	.....	.....	2390	2620	2960	3000
			(XS)	0.500	12.70	72.09	107.38	32.73	1290	1610	1500	1880	2550	2790	3000	3000
				0.562	14.27	80.66	120.14	36.62	1450	1810	1690	2110	2870	3000	3000	3000
			60	0.594	15.09	85.05	126.68	38.61	.....	.....	.....	.....	.....	.....	.....	.....
				0.625	15.88	89.28	132.98	40.53	1610	2010	1880	2340	3000	3000	3000	3000
				0.688	17.48	97.81	145.69	44.41	1770	2210	2060	2580	3000	3000	3000	3000
			80	0.750	19.05	106.13	158.08	48.18	1930	2410	2250	2800	3000	3000	3000	3000
				0.812	20.62	114.37	170.35	51.92	2090	2610	2440	2800	3000	3000	3000	3000
				0.875	22.22	122.65	182.69	55.68	2250	2800	2520	2800	3000	3000	3000	3000
			100	0.938	23.83	130.85	194.90	59.41	2410	2800	2800	2800	3000	3000	3000	3000
				1.000	25.40	138.54	206.80	63.03	.....	.....	.....	.....	.....	.....	.....	.....
16	16	406.4		0.188	4.78	31.75	47.29	14.40	420	530	490	620	840	920	1040	1120
				0.203	5.16	34.25	51.02	15.54	460	570	530	670	910	990	1120	1210
				0.219	5.56	36.91	54.98	16.74	490	620	570	720	980	1070	1210	1300
			10	0.250	6.35	42.05	62.63	19.07	560	700	660	820	1120	1220	1380	1490
				0.281	7.14	47.17	70.26	21.40	630	790	740	920	1250	1370	1550	1670
			20	0.312	7.92	52.27	77.86	23.71	700	880	820	1020	1390	1520	1720	1860
				0.344	8.74	57.52	85.68	26.09	770	970	900	1130	1540	1680	1900	2050
			30(Std)	0.375	9.52	62.58	93.21	28.39	840	1050	980	1230	1670	1830	2070	2230
				0.406	10.31	67.62	100.72	30.67	.....	.....	.....	.....	1810	1980	2240	2420

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B		X42	X46	X52	X56
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.				
16	16	406.4	40(XS)	0.438	11.13	72.80	108.44	33.02	990	1230	1150	1440	1950	2140	2420	2610
				0.469	11.91	77.79	115.87	35.29	.....	.....	.....	.....	2090	2290	2590	2790
				0.500	12.70	82.77	123.29	37.54	1120	1410	1310	1640	2230	2440	2760	2980
				0.562	14.27	92.66	138.02	42.03	1260	1580	1480	1840	2510	2750	3000	3000
			60	0.625	15.88	102.63	152.87	46.55	1410	1760	1640	2050	2790	3000	3000	3000
				0.656	16.66	107.50	160.12	48.80	.....	.....	.....	.....	.....	.....	.....	.....
				0.688	17.48	112.51	167.58	51.03	1550	1940	1810	2260	3000	3000	3000	3000
				0.750	19.05	122.15	181.94	55.41	1690	2110	1970	2460	3000	3000	3000	3000
				0.812	20.62	131.71	196.18	59.74	1830	2280	2130	2660	3000	3000	3000	3000
			80	0.844	21.44	136.61	203.48	62.02	.....	.....	.....	.....	.....	.....	.....	.....
				0.875	22.22	141.34	210.53	64.11	1970	2460	2300	2800	3000	3000	3000	3000
				0.938	23.83	150.89	224.75	68.44	2110	2640	2460	2800	3000	3000	3000	3000
				1.000	25.40	160.20	238.62	72.67	2250	2800	2620	2800	3000	3000	3000	3000
				1.062	26.97	169.43	252.37	76.85	2390	2800	2790	2800	3000	3000	3000	3000
				1.125	28.58	178.72	266.20	81.07	2530	2800	2800	2800	3000	3000	3000	3000
18	18	457.2		0.188	4.78	35.76	53.26	16.22	380	470	440	550	750	820	920	990
				0.219	5.56	41.59	61.95	18.87	440	550	510	640	870	950	1080	1160
			10	0.250	6.35	47.39	70.59	21.50	500	620	580	730	990	1090	1230	1320
				0.281	7.14	53.18	79.21	24.12	560	700	660	820	1110	1220	1380	1490
			20	0.312	7.92	58.94	87.79	26.74	620	780	730	910	1240	1360	1530	1650
				0.344	8.74	64.87	96.62	29.43	690	860	800	1000	1360	1490	1690	1820
				0.375	9.52	70.59	105.14	32.02	750	940	880	1090	1490	1630	1840	1980
				0.406	10.31	76.29	113.63	34.61	.....	.....	.....	.....	1610	1760	1990	2150
			30	0.438	11.13	82.15	122.36	37.26	880	1100	1020	1280	1740	1900	2150	2320
				0.469	11.91	87.81	130.79	39.83	.....	.....	.....	.....	1860	2040	2300	2480
				0.500	12.70	93.45	139.19	42.39	1000	1250	1170	1460	1980	2170	2460	2640
			40	0.562	14.27	104.67	155.91	47.48	1120	1400	1310	1640	2230	2440	2760	2970
				0.625	15.88	115.98	172.75	52.61	1250	1560	1460	1820	2480	2720	3000	3000
				0.688	17.48	127.21	189.48	57.70	1380	1720	1610	2010	2730	2990	3000	3000
			60	0.750	19.05	138.17	205.80	62.67	1500	1880	1750	2190	2980	3000	3000	3000
				0.812	20.62	149.06	222.02	67.61	1620	2030	1890	2370	3000	3000	3000	3000
				0.875	22.22	160.03	238.36	72.59	1750	2190	2040	2550	3000	3000	3000	3000
			80	0.938	23.83	170.92	254.59	77.53	1880	2340	2190	2740	3000	3000	3000	3000
				1.000	25.40	181.56	270.43	82.36	2000	2500	2330	2800	3000	3000	3000	3000
				1.062	26.97	192.11	286.15	87.14	2120	2660	2480	2800	3000	3000	3000	3000
				1.125	28.58	202.75	302.00	91.97	2250	2800	2620	2800	3000	3000	3000	3000
				1.187	30.15	213.14	317.47	96.68	2370	2800	2770	2800	.....	.....	.....	.....
				1.188	30.18	213.31	317.73	96.76	.....	.....	.....	.....	3000	3000	3000	3000
				1.250	31.75	223.61	333.07	101.43	2500	2800	2800	2800	3000	3000	3000	3000
20	20	508.0		0.219	5.56	46.27	68.92	20.99	390	490	460	570	830	910	1020	1100
			10	0.250	6.35	52.73	78.54	23.92	450	560	520	660	940	1040	1170	1260
				0.281	7.14	59.18	88.15	26.84	510	630	590	740	1060	1160	1320	1420
				0.312	7.92	65.60	97.71	29.76	560	700	660	820	1180	1290	1460	1570
				0.344	8.74	72.21	107.56	32.75	620	770	720	900	1300	1420	1610	1730
			20	0.375	9.52	78.60	117.07	35.65	680	840	790	980	1420	1550	1760	1890
				0.406	10.31	84.96	126.55	38.54	.....	.....	.....	.....	1530	1680	1900	2050
				0.438	11.13	91.51	136.30	41.51	790	990	920	1150	1660	1810	2050	2210
				0.469	11.91	97.83	145.72	44.38	.....	.....	.....	.....	1770	1940	2190	2360
			30	0.500	12.70	104.13	151.10	47.23	900	1120	1050	1310	1890	2070	2340	2520
				0.562	14.27	116.67	173.78	52.92	1010	1260	1180	1480	2120	2330	2630	2750
				0.625	15.88	129.33	192.64	58.66	1120	1410	1310	1640	2360	2590	2750	2750
				0.688	17.48	141.90	211.36	64.37	1240	1550	1440	1810	2600	2750	2750	2750
				0.750	19.05	154.19	229.67	69.94	1350	1690	1580	1970	2750	2750	2750	2750
			60	0.812	20.62	166.40	247.85	75.48	1460	1830	1710	2130	2750	2750	2750	2750
				0.875	22.22	179.72	266.20	81.07	1580	1970	1840	2300	2750	2750	2750	2750
				0.938	23.83	190.96	284.43	86.62	1690	2110	1970	2460	2750	2750	2750	2750
				1.000	25.40	202.92	302.25	92.04	1800	2250	2100	2620	2750	2750	2750	2750
				1.062	26.97	214.80	319.94	97.43	1910	2390	2230	2750	2750	2750	2750	2750
				1.125	28.58	226.78	337.79	102.87	2020	2530	2360	2750	2750	2750	2750	2750
				1.187	30.15	238.50	355.25	108.18	2140	2670	2490	2750	.....	.....	.....	.....
				1.188	30.15	238.68	.....	.....	.....	.....	.....	.....	2750	2750	2750	2750
				1.250	31.76	250.31	372.84	113.54	2250	2760	2620	2750	2750	2750	2750	2750
				1.312	33.32	261.86	390.04	118.78	2360	2750	2750	2750	2750	2750	2750	2750
				1.375	34.92	273.51	407.39	124.06	2480	2750	2750	2750	2750	2750	2750	2750
22	22	558.8		0.219	5.56	50.94	75.88	23.11	360	450	420	520	750	820	930	1000
			10	0.250	6.35	58.07	86.50	26.34	410	510	480	600	860	940	1060	1150
				0.281	7.14	65.18	97.09	29.57	460	570	540	670	970	1060	1200	1290
				0.312	7.92	72.27	107.65	32.78	510	640	600	740	1070	1170	1330	1430
				0.344	8.74	79.56	118.50	36.09	560	700	660	820	1180	1290	1460	1580
			20	0.375	9.52	6.61	129.01	39.29	610	770	720	890	1290	1410	1600	1720

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B		X42	X46	X52	X56
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.				
22	22	558.8	30	0.406	10.31	93.63	139.46	42.47	.....	.....	.....	.....	1400	1530	1730	1860
				0.438	11.13	100.86	150.23	45.75	720	900	840	1050	1510	1650	1860	2010
				0.469	11.91	107.85	160.64	48.92	.....	.....	.....	.....	1610	1770	2000	2150
				0.500	12.70	114.81	171.01	52.08	820	1020	950	1190	1720	1880	2130	2290
				0.562	14.27	128.67	191.65	58.36	920	1150	1070	1340	1930	2120	2390	2500
				0.625	15.88	142.68	212.52	64.72	1020	1280	1190	1490	2150	2350	2500	2500
				0.688	17.48	156.60	233.26	71.03	1130	1410	1310	1640	2360	2500	2500	2500
				0.750	19.05	170.21	253.53	77.21	1230	1530	1430	1790	2500	2500	2500	2500
				0.812	20.62	183.75	273.70	83.35	1330	1660	1550	1940	2500	2500	2500	2500
			60	0.875	22.22	197.41	294.02	89.55	1430	1790	1670	2090	2500	2500	2500	2500
				0.938	23.83	211.00	314.28	95.71	1530	1920	1790	2240	2500	2500	2500	2500
				1.000	25.40	224.28	334.07	101.73	1640	2050	1910	2390	2500	2500	2500	2500
				1.062	26.97	237.48	353.73	107.72	1740	2170	2030	2500	2500	2500	2500	2500
			80	1.125	28.58	250.81	373.58	113.77	1840	2300	2150	2500	2500	2500	2500	2500
				1.188	30.15	263.85	393.00	119.68	1940	2430	2270	2500	2500	2500	2500	2500
				1.250	31.75	277.01	412.61	125.65	2050	2500	2390	2500	2500	2500	2500	2500
				1.312	33.32	289.88	431.78	129.22	2150	2500	2500	2500	2500	2500	2500	2500
			100	1.375	34.92	302.88	451.14	137.39	2250	2500	2500	2500	2500	2500	2500	2500
				1.437	36.50	315.58	470.06	143.15	2350	2500	2500	2500	.....	.....	.....	.....
				1.438	36.53	.....	.....	.....	.....	.....	.....	.....	2500	2500	2500	2500
				1.500	38.10	328.41	489.17	148.97	2450	2500	2500	2500	2500	2500	2500	2500
24	24	609.6	10	0.250	6.35	63.41	94.45	28.76	380	470	440	550	790	860	980	1050
				0.281	7.14	71.18	106.02	32.29	420	530	490	610	890	970	1100	1180
				0.312	7.92	78.93	117.57	35.80	470	580	550	680	980	1080	1220	1310
				0.344	8.74	86.91	129.45	39.42	520	640	600	750	1080	1190	1340	1440
			20	0.375	9.52	94.62	140.94	42.92	560	700	660	820	1180	1290	1460	1580
				0.406	10.31	102.31	152.39	46.41	.....	.....	.....	.....	1280	1400	1580	1710
				0.438	11.13	110.22	164.17	50.00	660	820	770	960	1380	1510	1710	1840
				0.469	11.91	117.86	175.55	53.46	.....	.....	.....	.....	1480	1620	1830	1970
				0.500	12.70	125.49	186.92	56.92	750	940	880	1090	1580	1720	1950	2100
			30	0.562	14.27	140.68	209.54	63.81	840	1050	980	1230	1770	1940	2190	2300
				0.625	15.88	156.03	232.41	70.78	940	1170	1090	1370	1970	2160	2300	2300
			40	0.688	17.48	171.29	255.14	77.70	1030	1290	1200	1500	2170	2300	2300	2300
				0.750	19.05	186.23	277.39	84.47	1120	1410	1310	1640	2300	2300	2300	2300
				0.812	20.62	201.09	299.52	91.21	1220	1520	1420	1780	2300	2300	2300	2300
				0.875	22.22	216.10	321.88	98.02	1310	1640	1530	1910	2300	2300	2300	2300
				0.938	23.83	231.03	344.12	104.80	1410	1760	1640	2050	2300	2300	2300	2300
				1.000	25.40	245.64	365.88	111.42	1500	1880	1750	2190	2300	2300	2300	2300
				1.062	26.97	260.12	387.52	118.01	1590	1990	1860	2300	2300	2300	2300	2300
				1.125	28.58	274.84	409.37	124.65	1690	2110	1970	2300	2300	2300	2300	2300
				1.187	30.15	289.20	430.76	131.18	1780	2230	2080	2300	.....	.....	.....	.....
				1.188	30.18	289.44	.....	.....	.....	.....	.....	.....	2300	2300	2300	2300
				1.250	31.75	303.71	452.38	137.76	1880	2300	2190	2300	2300	2300	2300	2300
				1.312	33.32	317.91	473.53	144.20	1970	2300	2300	2300	2300	2300	2300	2300
				1.375	34.92	332.25	494.89	150.71	2060	2300	2300	2300	2300	2300	2300	2300
				1.437	36.50	346.28	515.78	157.07	2160	2300	2300	2300	.....	.....	.....	.....
				1.438	36.53	346.50	.....	. ....	.....	.....	.....	.....	2300	2330	2300	2300
				1.500	38.10	360.45	536.89	163.50	2250	2300	2300	2300	2300	2300	2300	2300
				1.562	39.67	374.31	557.53	169.79	2300	2300	2300	2300	2300	2300	2300	2300
26	26	660.4	10	0.250	6.36	68.75	102.40	31.19	350	430	400	500	730	800	900	970
				0.281	7.14	77.18	114.96	35.01	390	490	450	570	820	890	1010	1090
				0.312	7.92	85.60	127.50	38.83	430	540	500	630	910	990	1120	1210
				0.344	8.74	94.26	140.40	42.76	480	600	560	690	1000	1100	1240	1330
				0.375	9.52	102.63	152.87	46.55	520	650	610	760	1090	1190	1350	1450
			20	0.406	10.31	110.98	165.30	50.34	.....	.....	.....	.....	1180	1290	1460	1570
				0.438	11.13	119.57	178.10	54.24	610	760	710	880	1270	1390	1580	1700
				0.469	11.91	127.88	190.48	58.01	.....	.....	.....	.....	1360	1490	1690	1820
				0.500	12.70	136.17	202.83	61.77	690	870	810	1010	1450	1590	1800	1940
				0.562	14.27	152.68	227.42	69.26	780	970	910	1130	1630	1790	2000	2000
				0.625	15.88	169.38	252.29	76.83	870	1080	1010	1260	1820	1990	2000	2000
				0.688	17.48	185.99	277.03	84.37	950	1190	1110	1390	2000	2000	2000	2000
				0.750	19.05	202.25	301.25	91.74	1040	1300	1210	1510	2000	2000	2000	2000
				0.812	20.62	218.43	325.35	99.08	1120	1410	1310	1640	2000	2000	2000	2000
				0.875	22.22	234.79	349.72	106.50	1210	1510	1410	1770	2000	2000	2000	2000
				0.938	23.83	251.07	373.97	113.89	1300	1620	1520	1890	2000	2000	2000	2000
				1.000	25.40	267.00	397.70	121.11	1380	1730	1620	2000	2000	2000	2000	2000
28	28	711.2	10	0.250	6.35	74.09	110.36	33.61	320	400	370	470	680	740	840	900
				0.281	7.14	83.19	123.91	37.73	360	450	420	530	760	830	940	1010
				0.312	7.92	92.26	137.42	41.85	400	500	470	580	840	920	1040	1120

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B		X42	X46	X52	X56
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.				
28	28	711.2		0.344	8.74	101.61	151.35	46.09	.....	.....	.....	.....	930	1020	1150	1240
				0.375	9.52	110.64	164.80	50.19	480	600	560	700	1010	1110	1250	1350
				0.406	10.31	119.65	178.22	54.27	.....	.....	.....	.....	1100	1200	1360	1450
				0.438	11.13	128.93	192.04	58.48	560	700	660	820	1180	1300	1460	1580
				0.469	11.91	137.90	205.40	62.55	.....	.....	.....	.....	1270	1390	1570	1690
			20	0.500	12.70	146.85	218.73	66.61	640	800	750	940	1350	1480	1670	1800
				0.562	14.27	164.69	245.31	74.70	720	900	840	1050	1520	1660	1880	2020
			30	0.625	15.88	182.73	272.18	82.89	800	1000	940	1170	1690	1850	2090	2250
				0.688	17.48	200.68	298.91	91.03	880	1100	1030	1290	1860	2030	2300	2480
				0.750	19.05	218.27	325.11	99.01	960	1210	1120	1410	2020	2220	2510	2700
				0.812	20.62	235.78	351.19	106.95	1040	1300	1220	1520	2190	2400	2710	2920
				0.875	22.22	253.58	377.56	114.98	1120	1410	1310	1640	2360	2590	2920	3000
				0.938	23.83	271.10	403.80	122.97	1210	1510	1410	1760	2530	2770	3000	3000
				1.000	25.40	288.36	429.51	130.80	1290	1610	1500	1880	2700	2960	3000	3000
30	30	762.0		0.250	6.35	79.43	118.31	36.03	300	370	350	440	630	690	780	840
				0.281	7.14	89.19	132.85	40.46	340	420	390	490	710	780	880	940
			10	0.312	7.92	98.93	147.36	44.87	370	470	440	550	790	860	970	1050
				0.344	8.74	108.95	162.28	49.42	.....	.....	.....	.....	870	950	1070	1160
				0.375	9.52	118.65	176.73	53.82	450	560	520	660	940	1040	1170	1260
				0.406	10.31	128.32	191.13	58.21	.....	.....	.....	.....	1020	1120	1270	1360
				0.438	11.13	138.29	205.98	62.73	530	660	610	770	1100	1210	1370	1470
				0.469	11.91	147.92	220.33	67.10	.....	.....	.....	.....	1180	1290	1460	1580
			20	0.500	12.70	157.53	234.64	71.46	600	750	700	880	1260	1380	1560	1680
				0.562	14.27	176.69	263.18	80.15	670	840	790	980	1420	1550	1750	1890
			30	0.625	15.88	196.08	292.06	88.94	750	940	880	1090	1580	1720	1950	2100
				0.688	17.48	215.38	320.81	97.70	830	1030	960	1200	1730	1900	2150	2310
				0.750	19.05	234.29	348.97	106.27	900	1120	1060	1310	1890	2070	2340	2520
				0.812	20.62	253.12	377.02	114.82	970	1220	1140	1420	2050	2240	2530	2730
				0.875	22.22	272.17	405.40	123.46	1050	1310	1220	1530	2200	2420	2730	2940
				0.938	23.83	291.14	433.65	132.06	1130	1410	1310	1640	2360	2590	2930	3000
				1.000	25.40	309.72	461.33	140.49	1200	1500	1400	1750	2520	2760	3000	3000
				1.062	26.97	328.22	488.88	148.88	1270	1590	1490	1860	2680	2930	3000	3000
				1.125	28.58	346.93	516.75	157.37	1350	1690	1580	1970	2840	3000	3000	3000
				1.188	30.18	365.56	544.60	165.82	1430	1780	1660	2080	2990	3000	3000	3000
				1.250	31.75	383.81	571.68	174.10	1500	1880	1750	2190	3000	3000	3000	3000
32	32	812.8		0.250	6.35	84.77	126.26	38.45	280	350	330	410	590	650	730	790
				0.281	7.14	95.19	141.79	43.18	320	400	370	460	660	730	820	890
			10	0.312	7.92	105.59	157.28	47.90	350	440	410	510	740	810	910	980
				0.344	8.74	116.30	173.23	52.75	.....	.....	.....	.....	810	890	1010	1080
				0.375	9.52	126.66	188.66	57.45	420	530	490	620	890	970	1100	1180
				0.406	10.31	136.99	204.05	62.14	.....	.....	.....	.....	960	1050	1190	1280
				0.438	11.13	147.64	219.91	66.97	490	620	570	720	1030	1130	1280	1380
				0.469	11.91	157.94	235.25	71.64	.....	.....	.....	.....	1110	1210	1370	1480
			20	0.500	12.70	168.21	250.55	76.30	560	700	660	820	1180	1290	1460	1580
				0.562	14.27	188.70	281.07	85.58	530	790	740	920	1330	1450	1640	1770
			30	0.625	15.88	209.43	311.95	95.00	700	880	820	1030	1480	1620	1830	1970
			40	0.688	17.48	230.08	342.70	104.36	770	970	900	1130	1630	1780	2010	2170
				0.750	19.05	250.31	372.84	113.54	840	1050	980	1230	1770	1940	2190	2360
				0.812	20.62	270.47	402.87	122.69	910	1140	1070	1330	1920	2100	2380	2560
				0.875	22.22	290.86	433.24	131.93	980	1230	1150	1440	2070	2260	2560	2760
				0.938	23.83	311.17	463.49	141.15	1060	1320	1230	1540	2220	2430	2740	2950
				1.000	25.40	331.08	493.14	150.18	1120	1410	1310	1640	2360	2590	2920	3000
				1.062	26.97	350.90	522.74	159.17	1190	1490	1390	1740	2510	2750	3000	3000
				1.125	28.58	370.96	552.54	168.27	1270	1580	1480	1850	2660	2910	3000	3000
				1.188	30.18	390.94	582.31	177.33	1340	1670	1560	1950	2810	3000	3000	3000
				1.250	31.75	410.51	611.45	186.21	1410	1760	1640	2050	2950	3000	3000	3000
34	34	863.6		0.250	6.35	90.11	134.22	40.87	260	330	310	390	560	610	690	740
				0.281	7.14	101.19	150.72	45.90	300	370	350	430	620	680	770	830
				0.312	7.92	112.25	167.20	50.92	330	410	390	480	690	760	860	920
			10	0.344	8.74	123.65	184.18	56.09	.....	.....	.....	.....	760	840	950	1020
				0.375	9.52	134.67	200.59	61.09	400	500	460	580	830	910	1030	1110
				0.406	10.31	145.67	216.98	66.08	.....	.....	.....	.....	900	990	1120	1200
				0.438	11.13	157.00	233.85	71.22	460	580	540	680	970	1070	1210	1300
				0.469	11.91	167.95	250.16	76.18	.....	.....	.....	.....	1040	1140	1290	1390
			20	0.500	12.70	178.89	266.46	81.14	530	660	620	770	1110	1220	1380	1480
				0.562	14.27	200.70	298.94	91.04	600	740	690	870	1250	1370	1550	1670
			30	0.625	15.88	222.78	331.83	101.05	660	830	770	970	1390	1520	1720	1850
			40	0.688	17.48	244.77	364.58	111.03	730	910	850	1060	1530	1680	1890	2040
				0.750	19.05	266.32	396.70	120.81	790	990	930	1160	1670	1830	2060	2220
				0.812	20.62	287.81	428.69	130.55	860	1070	1000	1250	1810	1980	2240	2410

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B					
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.	X42	X46	X52	X56
34	34	863.6		0.875	22.22	309.55	461.07	140.41	930	1160	1080	1350	1950	2130	2410	2590
				0.938	23.83	331.21	493.34	150.24	990	1240	1160	1450	2090	2280	2580	2780
				1.000	25.40	352.44	524.96	162.13	1060	1320	1240	1540	2220	2440	2750	2960
				1.062	26.97	373.59	556.46	169.46	1120	1410	1310	1650	2360	2590	2920	3000
				1.125	28.58	394.99	588.34	179.17	1190	1490	1390	1740	2500	2740	3000	3000
				1.188	30.18	416.31	620.09	188.84	1260	1570	1470	1830	2640	2890	3000	3000
				1.250	31.75	437.21	651.22	198.32	1320	1650	1540	1930	2780	3000	3000	3000
36	36	914.4		0.250	6.35	95.45	142.17	43.30	250	310	290	360	520	580	650	700
				0.281	7.14	107.20	159.67	48.63	280	350	330	410	590	650	730	790
			10	0.312	7.92	118.92	177.13	53.94	310	390	360	450	660	720	810	870
				0.344	8.74	131.00	195.12	59.42	.....	.....	.....	.....	720	790	890	960
				0.375	9.52	142.68	212.52	64.72	380	470	440	550	790	860	980	1050
				0.406	10.31	154.34	229.89	70.01	.....	.....	.....	.....	850	930	1060	1140
				0.438	11.13	166.35	247.78	75.46	440	550	510	640	920	1010	1140	1230
				0.469	11.91	177.97	265.09	80.73	.....	.....	.....	.....	980	1080	1220	1310
			20	0.500	12.70	189.57	282.36	85.99	500	620	580	730	1050	1150	1300	1400
				0.562	14.27	212.70	316.82	96.48	560	700	660	820	1180	1290	1460	1570
			30	0.625	15.88	236.12	351.72	107.11	620	780	730	910	1310	1440	1620	1750
				0.688	17.48	259.42	386.48	117.70	690	860	800	1000	1440	1580	1790	1930
			40	0.750	19.05	282.35	420.56	128.07	750	940	880	1090	1580	1720	1950	2100
				0.812	20.62	305.16	454.54	138.42	810	1020	950	1180	1710	1870	2110	2270
				0.875	22.22	328.24	488.91	148.89	880	1090	1020	1280	1840	2010	2280	2450
				0.938	23.83	351.25	523.19	159.33	940	1170	1090	1370	1970	2160	2440	2630
				1.000	25.40	373.80	556.78	169.56	1000	1250	1170	1460	2100	2300	2600	2800
				1.062	26.97	396.27	590.24	179.75	1060	1330	1240	1550	2230	2440	2760	2970
				1.125	28.68	419.02	624.13	190.07	1130	1410	1310	1640	2360	2590	2930	3000
				1.188	30.18	441.69	657.90	200.35	1190	1480	1390	1730	2490	2730	3000	3000
				1.250	31.75	463.91	690.99	210.43	1250	1560	1460	1820	2630	2870	3000	3000
38	38	965.2		0.312	7.92	125.58	187.05	56.96	300	370	340	430	620	680	770	830
				0.344	8.74	138.35	206.07	62.76	330	410	380	480	680	750	850	910
				0.375	9.52	150.69	224.45	68.35	360	440	410	520	750	820	920	990
				0.406	10.31	163.01	242.80	73.94	380	480	450	560	810	880	1000	1080
				0.438	11.13	175.71	261.72	79.70	410	520	480	610	870	950	1080	1160
				0.469	11.91	187.99	280.01	85.27	440	560	520	650	930	1020	1160	1240
				0.500	12.70	200.25	298.27	90.83	470	590	550	690	990	1090	1230	1330
				0.562	14.27	224.71	334.71	101.93	530	670	620	780	1120	1220	1380	1490
				0.625	15.88	249.48	371.60	113.16	590	740	690	860	1240	1360	1540	1560
				0.688	17.48	274.16	408.36	124.36	650	810	760	950	1370	1500	1690	1830
				0.750	19.05	298.37	444.42	135.34	710	890	830	1040	1490	1630	1850	1990
				0.812	20.62	322.50	480.36	146.29	770	960	900	1120	1620	1770	2000	2150
				0.875	22.22	346.93	516.75	157.37	830	1040	970	1210	1740	1910	2160	2320
				0.938	23.83	371.28	553.02	168.41	890	1110	1040	1300	1870	2040	2310	2490
				1.000	25.40	395.16	588.59	179.24	950	1180	1110	1380	1990	2180	2460	2650
				1.062	26.97	418.96	624.04	190.04	1010	1260	1170	1470	2110	2310	2620	2820
				1.125	28.58	443.05	659.92	200.97	1070	1330	1240	1550	2240	2450	2770	2980
				1.188	30.18	467.06	695.69	211.86	1130	1410	1310	1640	2360	2590	2930	3000
				1.250	31.75	490.61	730.76	222.54	1180	1480	1380	1730	2490	2720	3000	3000
40	40	1016.0		0.312	7.92	132.25	196.99	59.99	280	350	330	410	590	650	730	790
				0.344	8.74	145.69	217.01	66.08	310	390	360	450	650	710	800	870
				0.375	9.52	158.70	236.38	71.99	340	420	390	490	710	780	880	940
				0.406	10.31	171.68	255.72	77.87	370	460	430	530	770	840	950	1020
				0.438	11.13	185.06	275.65	83.94	390	490	460	570	830	910	1020	1100
				0.469	11.91	198.01	294.94	89.82	420	530	490	620	890	970	1100	1180
				0.500	12.70	210.93	314.18	95.68	450	560	520	660	940	1040	1170	1260
				0.562	14.27	236.71	352.58	107.37	510	630	590	740	1060	1160	1320	1420
				0.625	15.88	262.83	391.49	119.22	`560	700	660	820	1180	1290	1460	1580
				0.688	17.48	288.86	430.25	131.03	620	770	720	900	1300	1420	1610	1730
				0.750	19.05	314.39	468.28	142.61	680	840	790	980	1420	1550	1760	1890
				0.812	20.62	339.84	506.19	154.15	730	910	850	1070	1530	1680	1900	2050
				0.875	22.22	365.62	544.59	165.85	790	980	920	1150	1650	1810	2050	2200
				0.938	23.83	391.32	582.87	177.50	840	1060	980	1230	1770	1940	2190	2360
				1.000	25.40	416.52	620.41	188.93	900	1120	1050	1310	1890	2070	2340	2520
				1.062	26.97	441.64	657.82	200.33	960	1190	1120	1390	2010	2200	2490	2680
				1.125	28.58	467.08	695.72	211.87	1010	1270	1180	1480	2130	2330	2630	2830
				1.188	30.18	492.44	733.49	223.37	1070	1340	1250	1560	2250	2460	2780	2990
				1.250	31.75	517.31	770.53	234.65	1130	1410	1310	1640	2360	2590	2930	3000
42	42	1066.8		0.344	8.74	153.04	227.95	69.42	290	370	340	430	620	680	770	830
				0.375	9.52	166.71	248.31	75.62	320	400	380	470	680	740	840	900
				0.406	10.31	180.35	268.63	81.81	350	430	410	510	730	800	900	970
				0.438	11.13	194.42	289.59	88.19	380	470	440	550	790	860	980	1060

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness			lb/ft	kg/m	kg/ft	API 5L				API 5LX			
									A		B		X42	X46	X52	X56
Nominal Size	in	mm	Sch No	in	mm				Std.	Alt.	Std.	Alt.				
42	42	1066.8		0.469	11.91	208.03	309.86	94.36	400	500	470	590	840	920	1050	1130
				0.500	12.70	221.61	330.09	100.52	430	540	500	520	900	990	1110	1200
				0.562	14.27	248.72	370.47	112.82	480	600	560	700	1010	1110	1250	1350
				0.625	15.88	276.18	411.37	125.28	540	670	620	780	1120	1230	1390	1500
				0.688	17.48	303.55	452.14	137.69	590	740	690	860	1240	1360	1530	1650
				0.750	19.05	330.41	492.15	149.87	640	800	750	940	1350	1480	1670	1800
				0.812	20.62	357.19	532.03	162.02	700	870	810	1020	1460	1600	1810	1950
				0.876	22.22	384.31	572.43	174.32	750	940	880	1090	1580	1720	1950	2100
				0.938	23.83	411.35	612.	186.59	800	1000	940	1170	1690	1850	2090	2250
				1.000	25.40	437.88	71	198.62	860	1070	1000	1250	1800	1970	2230	2400
				1.062	26.97	464.32	652.22	210.62	910	1140	1060	1330	1910	2090	2370	2550
				1.125	28.58	491.11	691.60	222.77	960	1210	1130	1410	2030	2220	2510	2700
				1.188	30.18	517.82	731.51	234.88	1020	1270	1190	1480	2140	240	2650	2850
				1.250	31.75	544.01	771.29	246.76	1070	1340	1250	1560	2250	2460	2790	3000
44	44	1117.6		0.344	8.74	160.39	810.30	72.75	280	350	330	410	590	650	730	790
				0.375	9.52	174.72	260.25	79.26	310	380	360	450	640	710	800	860
				0.406	10.31	189.03	281.56	85.74	330	420	390	480	700	760	860	930
				0.438	11.13	203.78	303.53	92.43	360	450	420	520	750	820	930	1000
				0.469	11.91	218.04	324.77	98.90	380	480	450	560	810	880	1000	1070
				0.500	12.70	232.29	346.00	105.37	410	510	480	600	860	940	1060	1150
				0.562	14.27	260.72	388.34	118.26	460	570	540	670	970	1060	1200	1290
				0.625	15.88	289.53	431.25	131.33	510	640	600	750	1070	1180	1330	1430
				0.688	17.48	318.25	474.03	144.36	560	700	660	820	1180	1290	1460	1580
				0.750	19.05	346.43	516.01	157.14	610	770	720	890	1290	1410	1600	1720
				0.812	20.62	374.53	557.86	169.89	660	830	780	970	1400	1530	1730	1860
				0.875	22.22	403.00	600.27	182.80	720	890	840	1040	1500	1650	1860	2000
				0.938	23.83	431.39	642.56	195.68	770	960	900	1120	1610	1770	2000	2150
				1.000	25.40	459.24	684.04	208.31	820	1020	950	1190	1720	1880	2130	2290
				1.062	26.97	487.01	725.40	220.92	870	1090	1010	1270	1820	2000	2260	2430
				1.125	28.58	515.14	767.30	233.67	920	1150	1070	1340	1930	2120	2390	2580
				1.188	30.18	543.19	809.08	246.39	970	1210	1130	1420	2040	2240	2530	2720
				1.250	31.75	570.71	850.07	258.87	1020	1280	1190	1490	2150	2350	2660	2860
46	46	1168.4		0.344	8.74	167.74	249.85	76.09	270	340	310	390	570	620	700	750
				0.375	9.52	182.73	272.18	82.89	290	370	340	430	630	680	760	820
				0.406	10.31	197.70	294.47	89.68	320	400	370	460	670	730	830	890
				0.438	11.13	213.13	317.46	96.68	340	430	400	500	720	790	890	960
				0.469	11.91	228.06	339.70	103.45	370	460	430	540	770	840	950	1030
				0.500	12.70	242.97	361.90	110.21	390	490	460	570	820	900	1020	1100
				0.562	14.27	272.73	406.23	123.71	440	550	510	640	920	1010	1140	1230
				0.625	15.88	302.88	451.14	137.39	490	610	570	710	1030	1120	1270	1370
				0.688	17.48	332.95	495.93	151.03	540	670	630	790	1130	1240	1400	1510
				0.750	19.05	362.45	539.87	164.41	590	730	680	860	1230	1350	1530	1640
				0.812	20.62	391.88	383.71	177.76	640	790	740	930	1330	1460	1650	1780
				0.875	22.22	421.69	628.11	191.28	680	860	800	1000	1440	1580	1780	1920
				0.938	23.83	451.42	672.39	204.76	730	920	860	1070	1540	1690	1910	2060
				1.000	25.40	480.60	715.85	218.00	780	980	910	1140	1640	1800	2030	2190
				1.062	26.97	509.69	759.18	231.20	830	1040	970	1210	1750	1910	2160	2330
				1.125	28.58	539.17	803.09	244.57	880	1100	1030	1280	1850	2020	2290	2470
				1.188	30.18	568.57	846.89	257.90	930	1160	1080	1360	1950	2140	2420	2600
				1.250	31.75	597.41	889.84	270.99	980	1220	1140	1430	2050	2250	2540	2740
48	48	1219.2		0.344	8.74	175.08	260.78	79.42	260	320	300	380	540	590	670	720
				0.375	9.52	190.74	284.11	86.52	280	350	330	410	590	650	730	790
				0.406	10.31	206.37	307.39	93.61	300	380	360	440	640	700	790	850
				0.438	11.13	222.49	331.40	100.92	330	410	380	480	690	760	850	920
				0.469	11.91	238.08	354.62	107.99	350	440	410	510	740	810	910	980
				0.500	12.70	254.65	377.81	115.06	380	470	440	550	790	860	980	1050
				0.562	14.27	284.73	424.11	129.15	420	530	490	610	890	970	1100	1180
				0.625	15.88	316.23	471.02	143.44	470	590	550	680	980	1080	1220	1310
				0.688	17.48	347.64	517.81	157.69	520	640	600	750	1080	1190	1340	1440
				0.750	19.05	378.47	563.73	171.67	560	700	660	820	1180	1290	1460	1580
				0.812	20.62	409.22	609.53	185.62	610	760	710	890	1280	1400	1580	1710
				0.875	22.22	440.38	655.95	199.76	660	820	770	960	1380	1510	1710	1840
				0.938	23.87	471.46	702.24	213.85	700	880	820	1030	1480	1620	1830	1970
				1.000	25.40	501.96	747.67	227.69	750	940	880	1090	1580	1720	1950	2100
				1.062	26.97	532.38	792.98	241.49	800	1000	930	1160	1670	1830	2070	2230
				1.125	28.58	563.20	838.89	255.47	840	1050	980	1230	1770	1940	2190	2360
				1.188	30.18	593.94	884.67	269.41	890	1110	1040	1300	1870	2050	2320	2490
				1.250	31.75	624.11	929.61	283.10	940	1170	1090	1370	1970	2160	2440	2620

STANDARD PIPE & LINE PIPE TABLES

Size						Weight			Hydrostatic Test Pressure							
Outside Diameter			Wall Thickness						API 5L				API 5LX			
									A		B					
in	in	mm	Sch No	in	mm	lb/ft	kg/m	kg/ft	Std.	Alt.	Std.	Alt.	X42	X46	X52	X56
52	52	1320.8		0.375	9.52	206.76	307.97	93.79	.....	.....	.....	.....	.....	.....	.....	.....
				0.406	10.31	223.72	333.23	101.48	.....	.....	.....	.....	.....	.....	.....	.....
				0.438	11.13	241.20	359.27	109.41	300	380	350	440	640	700	790	850
				0.469	11.91	258.11	384.45	117.08	320	410	380	470	680	750	840	910
				0.500	12.70	275.01	409.63	124.74	350	430	400	500	730	800	900	970
				0.562	14.27	308.74	459.87	140.04	390	490	450	570	820	890	1010	1090
				0.625	15.88	342.93	510.79	155.55	430	540	500	630	910	1000	1130	1210
				0.688	17.48	377.03	561.69	171.02	480	600	560	690	1000	1100	1240	1330
				0.750	19.05	410.51	611.45	186.21	520	650	610	760	1090	1190	1350	1450
				0.812	20.62	443.91	661.20	201.36	560	700	660	820	1180	1290	1460	1570
				0.875	22.22	477.76	711.62	216.71	610	760	710	880	1270	1390	1580	1700
				0.938	23.83	511.53	761.92	232.03	650	810	760	950	1360	1490	1690	1820
				1.000	25.40	544.68	811.30	247.07	690	870	810	1010	1450	1590	1800	1940
				1.062	26.97	577.75	860.56	262.07	740	920	860	1070	1540	1690	1910	2060
				1.125	28.58	611.26	910.47	277.27	780	970	910	1140	1640	1790	2030	2180
				1.188	30.18	644.69	960.27	292.43	820	1030	960	1200	1730	1890	2140	2300
				1.250	31.75	677.51	1009.15	307.32	870	1080	1010	1260	1820	1990	2250	2420
56	56	1422.4		0.375	9.52	222.78	340.77	101.05	.....	.....	.....	.....	.....	.....	.....	.....
				0.406	10.31	241.06	359.06	109.34	.....	.....	.....	.....	.....	.....	.....	.....
				0.438	11.13	259.91	387.14	117.90	280	350	330	410	590	650	730	790
				0.469	11.91	278.15	414.30	126.17	300	380	350	440	630	690	780	840
				0.500	12.70	296.37	441.44	134.43	320	400	380	470	680	740	840	900
				0.562	14.27	332.75	495.63	150.94	360	450	420	530	760	830	940	1010
				0.625	15.88	369.63	550.56	167.66	400	500	470	590	840	920	1040	1120
				0.688	17.48	406.42	60.536	184.35	440	550	520	650	930	1020	1150	1240
				0.750	19.05	442.55	659.18	200.74	480	600	560	700	1010	1110	1250	1350
				0.812	20.62	478.60	712.87	217.09	520	650	610	760	1100	1200	1360	1460
				0.875	22.22	515.14	767.30	233.67	560	700	660	820	1180	1290	1460	1570
				0.938	23.83	551.60	821.61	250.21	600	750	700	880	1270	1390	1570	1690
				1.000	25.40	587.40	874.93	266.44	640	800	750	940	1350	1480	1670	1800
				0.062	26.97	623.12	928.14	282.65	680	850	800	1000	1430	1570	1780	1910
				1.125	28.58	659.32	982.06	299.07	720	900	840	1050	1520	1660	1880	2020
				1.188	30.18	695.45	1035.87	315.46	760	950	890	11110	1600	1760	1990	2140
				1.250	31.75	730.91	1088.69	331.54	800	1000	940	1170	1690	1850	2090	2250
60	60	1524.0		0.375	9.52	238.80	355.69	108.32	.....	.....	.....	.....	.....	.....	.....	.....
				0.406	10.31	258.40	384.89	117.21	.....	.....	.....	.....	.....	.....	.....	.....
				0.438	11.13	278.62	415.00	126.38	.....	.....	.....	.....	.....	.....	.....	.....
				0.469	11.91	298.19	444.15	135.26	.....	.....	.....	.....	.....	.....	.....	.....
				0.500	12.70	317.73	473.26	144.12	300	380	350	440	639	690	780	840
				0.562	14.27	356.76	531.39	161.83	340	420	390	490	710	780	880	940
				0.625	15.88	396.33	590.33	179.78	380	470	440	550	790	860	980	1050
				0.688	17.48	435.71	649.14	197.68	410	520	480	600	870	950	1070	1160
				0.750	19.05	474.59	706.90	215.27	450	560	530	660	950	1030	1170	1260
				0.812	20.62	513.29	764.55	232.83	490	610	570	710	1020	1120	1270	1360
				0.875	22.22	552.52	822.98	250.62	530	660	610	770	1100	1210	1370	1470
				0.938	23.83	591.67	881.29	268.38	560	700	660	820	1180	1290	1460	1580
				1.000	25.40	630.12	938.56	285.82	600	750	700	880	1260	1380	1560	1680
				1.062	26.97	668.48	995.70	303.22	640	800	740	930	1340	1470	1660	1780
				1.125	28.58	707.38	1053.64	320.87	680	840	790	980	1420	1550	1760	1890
				1.188	30.18	746.20	1111.46	338.48	710	890	830	1040	1500	1650	1850	2000
				1.250	31.75	784.31	1168.23	355.76	750	940	880	1090	1580	1720	1950	2100
64	64	1625.6		0.375	9.52	254.82	379.55	115.59	.....	.....	.....	.....	.....	.....	.....	.....
				0.406	10.31	275.75	410.73	125.08	.....	.....	.....	.....	.....	.....	.....	.....
				0.438	11.13	297.33	442.87	134.87	.....	.....	.....	.....	.....	.....	.....	.....
				0.469	11.91	318.22	473.99	144.34	.....	.....	.....	.....	.....	.....	.....	. . .. .
				0.500	12.70	339.09	505.07	153.81	280	350	330	410	590	650	730	790
				0.562	14.27	380.76	567.14	172.71	320	400	370	460	660	730	820	890
				0.625	15.88	423.03	630.10	191.89	350	440	410	510	740	810	910	980
				0.688	17.48	464.21	692.93	211.02	390	480	450	560	810	890	1010	1080
				0.750	19.05	506.63	754.63	229.81	420	530	490	620	890	970	1100	1180
				0.812	20.62	547.98	816.22	248.56	460	570	530	670	960	1050	1190	1280
				0.875	22.22	589.90	878.66	267.58	490	620	570	720	1030	1130	1280	1380
				0.938	23.87	631.74	940.98	285.56	530	660	620	770	1110	1210	1370	1480
				1.000	25.40	672.84	1002.20	305.20	560	700	660	820	1180	1290	1460	1570
				1.062	26.97	713.85	1063.28	323.80	600	750	700	870	1250	1370	1550	1670
				1.125	28.58	755.44	1125.22	342.67	630	790	740	920	1330	1460	1650	1770
				1.188	30.18	796.65	1187.06	361.50	670	840	780	970	1400	1540	1740	1870
				1.250	31.75	837.71	124.77	379.99	700	880	820	1030	1480	1620	1830	1970

NPS Tables for Selected Pipe Sizes

(Welded & Seamless Pipe)								
			Wall Thickness Inches (mm)					
NPS	DN	OD in (mm)	Sch 5S	Sch 5	Sch 10S	Sch 10	Sch 20	Sch 30
1/8"	6	0.404 (10.26)	--	--	0.049 (1.245)	--	0.049 (1.245)	0.057 (1.448)
1/4"	8	0.540 (13.72)	--	--	0.065 (1.651)	--	0.065 (1.651)	0.073 (1.854)
3/8"	10	0.675 (17.15)	--	--	0.065 (1.651)	--	0.065 (1.651)	0.073 (1.854)
1/2"	15	0.840 (21.34)	0.065 (1.651)	0.065 (1.651)	0.083 (2.108)	--	0.083 (2.108)	0.095 (2.413)
3/4"	20	1.050 (26.67)	0.065 (1.651)	0.065 (1.651)	0.083 (2.108)	--	0.083 (2.108)	0.095 (2.413)
1"	25	1.315 (33.40)	0.065 (1.651)	0.065 (1.651)	0.109 (2.769)	--	0.109 (2.769)	0.114 (2.896)
1-1/4"	32	1.660 (42.16)	0.065 (1.651)	0.065 (1.651)	0.109 (2.769)	--	0.109 (2.769)	0.117 (2.972)
1-1/2"	40	1.900 (48.26)	0.065 (1.651)	0.065 (1.651)	0.109 (2.769)	--	0.109 (2.769)	0.125 (3.175)
2"	50	2.375 (60.33)	0.065 (1.651)	0.065 (1.651)	0.109 (2.769)	--	0.109 (2.769)	0.125 (3.175)
2-1/2"	65	2.875 (73.03)	0.083 (2.108)	0.083 (2.108)	0.120 (3.048)	--	0.120 (3.048)	0.188 (4.775)
3"	80	3.500 (88.90)	0.083 (2.108)	0.083 (2.108)	0.120 (3.048)	--	0.120 (3.048)	0.188 (4.775)
3-1/2"	90	4.000 (101.60)	0.083 (2.108)	0.083 (2.108)	0.120 (3.048)	--	0.120 (3.048)	0.188 (4.775)
4"	100	4.500 (114.30)	0.083 (2.108)	0.083 (2.108)	0.120 (3.048)	0.120 (3.048)	--	0.188 (4.775)
4-1/2"	115	5.000 (127.00)	--	--	--	--	--	--
5"	125	5.563 (141.30)	0.109 (2.769)	0.109 (2.769)	0.134 (3.404)	0.134 (3.404)	--	--
6"	150	6.625 (168.28)	0.109 (2.769)	0.109 (2.769)	0.134 (3.404)	0.134 (3.404)	--	--
7"	--	7.625 (193.68)	--	--	--	--	--	--
8"	200	8.625 (219.08)	0.109 (2.769)	0.109 (2.769)	0.148 (3.759)	0.148 (3.759)	0.250 (6.350)	0.277 (7.036)
9"	--	9.625 (244.48)	--	--	--	--	--	--
10"	250	10.75 (273.05)	0.134 (3.404)	0.134 (3.404)	0.165 (4.191)	0.165 (4.191)	0.250 (6.350)	0.307 (7.798)
12"	300	12.75 (323.85)	0.156 (3.962)	--	0.180 (4.572)	0.180 (4.572)	0.250 (6.350)	0.330 (8.382)
14"	350	14.00 (355.60)	0.156 (3.962)	--	0.188 (4.775)	0.250 (6.350)	0.312 (7.925)	0.375 (9.525)
16"	400	16.00 (406.40)	0.165 (4.191)	--	0.188 (4.775)	0.250 (6.350)	0.312 (7.925)	0.375 (9.525)
18"	450	18.00 (457.20)	0.165 (4.191)	--	0.188 (4.775)	0.250 (6.350)	0.312 (7.925)	0.437 (11.100)
20"	500	20.00 (508.00)	0.188 (4.775)	--	0.218 (5.537)	0.250 (6.350)	0.375 (9.525)	0.500 (12.700)
22"	550	22.00 (558.80)	0.188 (4.775)	--	0.218 (5.537)	0.250 (6.350)	0.375 (9.525)	0.500 (12.700)
24"	600	24.00 (609.60)	0.218 (5.537)	--	0.250 (6.350)	0.250 (6.350)	0.375 (9.525)	0.562 (14.275)
26"	650	26.00 (660.40)	--	--	--	0.312 (7.925)	0.500 (12.700)	--
28"	700	28.00 (711.20)	--	--	--	0.312 (7.925)	0.500 (12.700)	0.625 (15.875)
30"	750	30.00 (762.00)	0.250 (6.350)	--	0.312 (7.925)	0.312 (7.925)	0.500 (12.700)	0.625 (15.875)
32"	800	32.00 (812.80)	--	--	--	0.312 (7.925)	0.500 (12.700)	0.625 (15.875)
34"	850	34.00 (863.60)	--	--	--	0.312 (7.925)	0.500 (12.700)	0.625 (15.875)
36"	900	36.00 (914.40)	--	--	--	0.312 (7.925)	0.500 (12.700)	--
40"	1000	40.00 (1106.00)	--	--	--	--	--	--
42"	1050	42.00 (1066.80)	--	--	--	--	--	--
44"	1100	44.00 (1117.60)	--	--	--	--	--	--
46"	1150	46.00 (1168.40)	--	--	--	--	--	--
48"	1200	48.00 (1219.20)	--	--	--	--	--	--
52"	1300	52.00 (1320.80)	--	--	--	--	--	--
56"	1400	56.00 (1422.40)	--	--	--	--	--	--
60"	1500	60.00 (1524.00)	--	--	--	--	--	--
64"	1600	64.00 (1625.60)	--	--	--	--	--	--
68"	1700	68.00 (1727.20)	--	--	--	--	--	--
72"	1800	72.00 (1828.80)	--	--	--	--	--	--
76'	1900	76.00 (1930.40)	--	--	--	--	--	--
80"	2000	80.00 (2032.00)	--	--	--	--	--	--
88"	2200	88.00 (2235.20)	--	--	--	--	--	--

NPS Tables for Selected Pipe Sizes

(Welded & Seamless Pipe)								
					Wall Thickness Inches (mm)			
NPS	DN	OD in (mm)	Sch 40S	STD	Sch 40	Sch 60	Sch 80S	XS / XH
1/8"	6	0.404 (10.26)	0.068 (1.727)	0.068 (1.727)	0.068 (1.727)	--	0.095 (2.413)	0.095 (2.413)
1/4"	8	0.540 (13.72)	0.088 (2.235)	0.088 (2.235)	0.088 (2.235)	--	0.119 (3.023)	0.119 (3.023)
3/8"	10	0.675 (17.15)	0.091 (2.311)	0.091 (2.311)	0.091 (2.311)	--	0.126 (3.200)	0.126 (3.200)
1/2"	15	0.840 (21.34)	0.109 (2.769)	0.109 (2.769)	0.109 (2.769)	--	0.147 (3.734)	0.147 (3.734)
3/4"	20	1.050 (26.67)	0.113 (2.870)	0.113 (2.870)	0.113 (2.870)	--	0.154 (3.912)	0.154 (3.912)
1"	25	1.315 (33.40)	0.133 (3.378)	0.133 (3.378)	0.133 (3.378)	--	0.179 (4.547)	0.179 (4.547)
1-1/4"	32	1.660 (42.16)	0.140 (3.556)	0.140 (3.556)	0.140 (3.556)	--	0.191 (4.851)	0.191 (4.851)
1-1/2"	40	1.900 (48.26)	0.145 (3.683)	0.145 (3.683)	0.145 (3.683)	--	0.200 (5.080)	0.200 (5.080)
2"	50	2.375 (60.33)	0.154 (3.912)	0.154 (3.912)	0.154 (3.912)	--	0.218 (5.537)	0.218 (5.537)
2-1/2"	65	2.875 (73.03)	0.203 (5.156)	0.203 (5.156)	0.203 (5.156)	--	0.276 (7.010)	0.276 (7.010)
3"	80	3.500 (88.90)	0.216 (5.486)	0.216 (5.486)	0.216 (5.486)	--	0.300 (7.620)	0.300 (7.620)
3-1/2"	90	4.000 (101.60)	0.226 (5.740)	0.226 (5.740)	0.226 (5.740)	--	0.318 (8.077)	0.318 (8.077)
4"	100	4.500 (114.30)	0.237 (6.020)	0.237 (6.020)	0.237 (6.020)	--	0.337 (8.560)	0.337 (8.560)
4-1/2"	115	5.000 (127.00)	0.247 (6.274)	0.247 (6.274)	0.247 (6.274)	--	0.355 (9.017)	0.355 (9.017)
5"	125	5.563 (141.30)	0.258 (6.553)	0.258 (6.553)	0.258 (6.553)	--	0.375 (9.525)	0.375 (9.525)
6"	150	6.625 (168.28)	0.280 (7.112)	0.280 (7.112)	0.280 (7.112)	--	0.432 (10.973)	0.432 (10.973)
7"	--	7.625 (193.68)	0.301 (7.645)	0.301 (7.645)	0.301 (7.645)	--	0.500 (12.700)	0.500 (12.700)
8"	200	8.625 (219.08)	0.322 (8.179)	0.322 (8.179)	0.322 (8.179)	0.406 (10.312)	0.500 (12.700)	0.500 (12.700)
9"	--	9.625 (244.48)	0.342 (8.687)	0.342 (8.687)	0.342 (8.687)	--	0.500 (12.700)	0.500 (12.700)
10"	250	10.75 (273.05)	0.365 (9.271)	0.365 (9.271)	0.365 (9.271)	0.500 (12.700)	0.500 (12.700)	0.500 (12.700)
12"	300	12.75 (323.85)	0.375 (9.525)	0.375 (9.525)	0.406 (10.312)	0.562 (14.275)	0.500 (12.700)	0.500 (12.700)
14"	350	14.00 (355.60)	0.375 (9.525)	0.375 (9.525)	0.437 (11.100)	0.593 (15.062)	0.500 (12.700)	0.500 (12.700)
16"	400	16.00 (406.40)	0.375 (9.525)	0.375 (9.525)	0.500 (12.700)	0.656 (16.662)	0.500 (12.700)	0.500 (12.700)
18"	450	18.00 (457.20)	0.375 (9.525)	0.375 (9.525)	0.562 (14.275)	0.750 (19.050)	0.500 (12.700)	0.500 (12.700)
20"	500	20.00 (508.00)	0.375 (9.525)	0.375 (9.525)	0.593 (15.062)	0.812 (20.625)	0.500 (12.700)	0.500 (12.700)
22"	550	22.00 (558.80)	0.375 (9.525)	0.375 (9.525)	--	0.875 (22.225)	0.500 (12.700)	0.500 (12.700)
24"	600	24.00 (609.60)	0.375 (9.525)	0.375 (9.525)	0.687 (17.450)	0.968 (24.587)	0.500 (12.700)	0.500 (12.700)
26"	650	26.00 (660.40)	0.375 (9.525)	--	--	--	--	--
28"	700	28.00 (711.20)	0.375 (9.525)	--	--	--	--	--
30"	750	30.00 (762.00)	0.375 (9.525)	--	--	--	--	--
32"	800	32.00 (812.80)	0.375 (9.525)	--	0.688 (17.475)	--	--	--
34"	850	34.00 (863.60)	0.375 (9.525)	--	0.688 (17.475)	--	--	--
36"	900	36.00 (914.40)	0.375 (9.525)	--	--	--	--	--
40"	1000	40.00 (1106.00)	--	0.375 (9.525)	--	--	--	0.500 (12.700)
42"	1050	42.00 (1066.80)	--	0.375 (9.525)	--	--	--	0.500 (12.700)
44"	1100	44.00 (1117.60)	--	0.375 (9.525)	--	--	--	0.500 (12.700)
46"	1150	46.00 (1168.40)	--	0.375 (9.525)	--	--	--	0.500 (12.700)
48"	1200	48.00 (1219.20)	--	0.375 (9.525)	--	--	--	0.500 (12.700)
52"	1300	52.00 (1320.80)	--	?	--	--	--	?
56"	1400	56.00 (1422.40)	--	?	--	--	--	?
60"	1500	60.00 (1524.00)	--	?	--	--	--	?
64"	1600	64.00 (1625.60)	--	?	--	--	--	?
68"	1700	68.00 (1727.20)	--	?	--	--	--	?
72"	1800	72.00 (1828.80)	--	?	--	--	--	?
76'	1900	76.00 (1930.40)	--	?	--	--	--	?
80"	2000	80.00 (2032.00)	--	?	--	--	--	?
88"	2200	88.00 (2235.20)	--	?	--	--	--	?

NPS Tables for Selected Pipe Sizes

(Welded & Seamless Pipe)								
			Wall Thickness Inches (mm)					
NPS	DN	OD in (mm)	Sch 80	Sch 100	Sch 120	Sch 140	Sch 160	XXS / XXH
1/8"	6	0.404 (10.26)	0.095 (2.413)	--	--	--	--	--
1/4"	8	0.540 (13.72)	0.119 (3.023)	--	--	--	--	--
3/8"	10	0.675 (17.15)	0.126 (3.200)	--	--	--	--	--
1/2"	15	0.840 (21.34)	0.147 (3.734)	--	--	--	0.188 (4.775)	0.294 (7.468)
3/4"	20	1.050 (26.67)	0.154 (3.912)	--	--	--	0.219 (5.563)	0.308 (7.823)
1"	25	1.315 (33.40)	0.179 (4.547)	--	--	--	0.250 (6.350)	0.358 (9.903)
1-1/4"	32	1.660 (42.16)	0.191 (4.851)	--	--	--	0.250 (6.350)	0.382 (9.703)
1-1/2"	40	1.900 (48.26)	0.200 (5.080)	--	--	--	0.281 (7.137)	0.400 (10.160)
2"	50	2.375 (60.33)	0.218 (5.537)	--	0.250 (6.350)	--	0.344 (8.738)	0.436 (11.074)
2-1/2"	65	2.875 (73.03)	0.276 (7.010)	--	0.300 (7.620)	--	0.375 (9.525)	0.552 (14.021)
3"	80	3.500 (88.90)	0.300 (7.620)	--	0.350 (8.890)	--	0.438 (11.125)	0.600 (15.240)
3-1/2"	90	4.000 (101.60)	0.318 (8.077)	--	--	--	--	0.636 (16.154)
4"	100	4.500 (114.30)	0.337 (8.560)	--	0.437 (11.100)	--	0.531 (13.487)	0.674 (17.120)
4-1/2"	115	5.000 (127.00)	0.355 (9.017)	--	--	--	--	0.710 (18.034)
5"	125	5.563 (141.30)	0.375 (9.525)	--	0.500 (12.700)	--	0.625 (15.875)	0.750 (19.050)
6"	150	6.625 (168.28)	0.432 (10.973)	--	0.562 (14.275)	--	0.719 (18.263)	0.864 (21.946)
7"	--	7.625 (193.68)	0.500 (12.700)	--	--	--	--	0.875 (22.225)
8"	200	8.625 (219.08)	0.500 (12.700)	0.593 (15.062)	0.719 (18.263)	0.812 (20.625)	0.906 (23.012)	0.875 (22.225)
9"	--	9.625 (244.48)	0.500 (12.700)	--	--	--	--	--
10"	250	10.75 (273.05)	0.593 (15.062)	0.718 (18.237)	0.843 (21.412)	1.000 (25.400)	1.125 (28.575)	--
12"	300	12.75 (323.85)	0.687 (17.450)	0.843 (21.412)	1.000 (25.400)	1.125 (28.575)	1.312 (33.325)	--
14"	350	14.00 (355.60)	0.750 (19.050)	0.937 (23.800)	1.093 (27.762)	1.250 (31.750)	1.406 (35.712)	--
16"	400	16.00 (406.40)	0.843 (21.412)	1.031 (26.187)	1.218 (30.937)	1.437 (36.500)	1.593 (40.462)	--
18"	450	18.00 (457.20)	0.937 (23.800)	1.156 (29.362)	1.375 (34.925)	1.562 (39.675)	1.781 (45.237)	--
20"	500	20.00 (508.00)	1.031 (26.187)	1.280 (32.512)	1.500 (38.100)	1.750 (44.450)	1.968 (49.987)	--
22"	550	22.00 (558.80)	1.125 (28.575)	1.375 (34.925)	1.625 (41.275)	1.875 (47.625)	2.125 (53.975)	--
24"	600	24.00 (609.60)	1.218 (30.937)	1.531 (38.887)	1.812 (46.025)	2.062 (52.375)	2.343 (59.512)	--
26"	650	26.00 (660.40)	--	--	--	--	--	--
28"	700	28.00 (711.20)	--	--	--	--	--	--
30"	750	30.00 (762.00)	--	--	--	--	--	--
32"	800	32.00 (812.80)	--	--	--	--	--	--
34"	850	34.00 (863.60)	--	--	--	--	--	--
36"	900	36.00 (914.40)	--	--	--	--	--	--
40"	1000	40.00 (1106.00)	--	--	--	--	--	--
42"	1050	42.00 (1066.80)	--	--	--	--	--	--
44"	1100	44.00 (1117.60)	--	--	--	--	--	--
46"	1150	46.00 (1168.40)	--	--	--	--	--	--
48"	1200	48.00 (1219.20)	--	--	--	--	--	--
52"	1300	52.00 (1320.80)	--	--	--	--	--	--
56"	1400	56.00 (1422.40)	--	--	--	--	--	--
60"	1500	60.00 (1524.00)	--	--	--	--	--	--
64"	1600	64.00 (1625.60)	--	--	--	--	--	--
68"	1700	68.00 (1727.20)	--	--	--	--	--	--
72"	1800	72.00 (1828.80)	--	--	--	--	--	--
76'	1900	76.00 (1930.40)	--	--	--	--	--	--
80"	2000	80.00 (2032.00)	--	--	--	--	--	--
88"	2200	88.00 (2235.20)	--	--	--	--	--	--

GLOSSARY

ANSI	American National Standards Institute (Formerly the ASA – American Standards Association).
API	American Petroleum Institute.
ASME	American Society of Mechanical Engineers.
ASTM	American Society for Testing and Materials.
AWWA	American Water Works Association.
Bare	Term associated with pipe surface whereby the pipe will not be coated with a corrosion inhibitor and grease spots and cutting oil will not be removed.
Barlow's Formula	An equation which shows the relationship of internal pressure to allowable stress, nominal thickness and diameter (P = 2St/D).
Bevel	The angle formed between the prepared edge of the end of the pipe and a plane perpendicular to the surface of the member. The standard bevel for line pipe is 30 to facilitate welding.
Billet	A solid semi-finished round or square product that has been either directly cast from a strand caster or hot-worked by forging, rolling or extrusion.
BOP or BOF	Basic Oxygen Process or Basic Oxygen Furnace for steel making.
Burst Test	A destructive hydraulic test employed to determine actual yield strength and tensile (ultimate) strength of both seamless and welded pipe.
CE	Carbon Equivalent.
Charpy Test	A method for measuring the amount of energy absorbed by a notched specimen during fracture as a result of an impact load. Commonly used to measure the resistance of crack propagation of the material being tested.
Chemical Properties	Normally associated with a limited number of chemical elements. Minimum and/or maximum limits are established in most ASTM and API specifications.
Coating	The process of covering steel with another material, primarily for corrosion resistance.
Continuous Casting	The process of pouring and the solidification of steel in a continuous strand.
Continuous Weld (CW)	In common usage, a phrase for continuous butt weld.
Coupling	Threaded sleeve used to connect two lengths of pipe.
Cut Length	Pipe cut to a specific length as ordered.
DN	Diameter Nominal. A dimensionless designator for such traditional terms as "nominal diameter", "size" and "nominal size".
DRL	Double Random Length (35' minimum average or as defined in specifications).
Dry	Term associated with pipe surface whereby the pipe will not be coated with a corrosion inhibitor and all grease spots and cutting oil will be removed by washing.
DS	Dual Stencil.

Ductility	The ability of a material to deform plastically without fracturing, being measured by elongation or reductions of area in a tensile test or by other means.
Elongation	In tensile testing, the increase in the gage length, measured after fracture of the specimen within the gage length, usually expressed as a percentage of the original gage length.
ERW	Electric Resistance Weld.
Flattening Test	A quality test for a pipe in which a specimen is flattened between parallel plates that are closed to a specified distance.
Fracture Test	Breaking a piece of metal for the purpose of examining the fractured surface to determine the structure or ductile characteristics of the metal, or to detect the presence of internal defects.
Galvanized	Covering of iron or steel surfaces with a protective layer of zinc.
Grade	The term grade designates divisions within different types based on chemical or mechanical properties.
Hardenability	The property that determines the depth to which the steel will harden.
Hardness	Defined in terms of the method of measurement. (1) Usually the resistance to indentation. (2) Stiffness of temper of wrought products. (3) Machinability characteristics.
Heat	An individual batch of metal of a single chemical composition, which is produced by a single cycle of a batch melting process.
Heat Analysis (Ladle)	The term applied to the chemical analysis representative of a heat of steel. It is determined by analyzing (for such elements as have been specified) a test sample obtained during the pouring of the steel from a ladle.
HIC-Resistant Steel	Intended for use in H_2S environment (wet sour gas environment) and has resistance to hydrogen-induced cracking (HIC). United States Steel's HIC-Resistant Steel is produced using a clean steel practice with restricted sulfur levels and calcium injection for enhanced sulfide morphology. HIC testing is in accordance with NACE Standard TM-0284-00 using either the BP solution or the NACE TM-01-7 solution. Limits on CLR, CTR and CSR, along with any other restriction, are generally agreed to prior to order entry.
Hydrostatic Test	Normal mill test as required by specifications. The pipe ends are sealed, filled with water and pressurized to predetermined pressures as required by specifications.
ID	Inside Diameter of pipe.
Impact Test	A test performed at a specified temperature to determine the behavior of material when subjected to high rates of loading, usually in bending, tension or torsion. The quantity measured is the energy absorbed in breaking the specimen by a single blow, as in a Charpy test.
Inclusions	Non-metallic solid material entrapped in the weld deposit or between weld metal and base metal. Also found in base metal, and results from products of oxidation or material erosion or entrainment during the steelmaking process.
LGR	Long Random Length.
Magnetic Particle	One of several methods of non-destructive testing. A non-destructive method of inspection for determining the existence and extent of possible defects in ferromagnetic materials. Fine magnetic particles are applied to magnetized parts, which are attracted to and outline the pattern of any magnetic-leakage fields created by discontinuities.

MAOP	Maximum Allowable Operating Pressure.
Mechanical Properties	The properties of a material that reveal its elastic and inelastic behavior where force is applied, thereby indicating its suitability for mechanical applications; for example, tensile strength, elongation and harness.
NDE	Non-Destructive Examination is the utilization of non-destructive testing methods primarily, eddy current, liquid penetrant, magnetic particle, radiography and ultrasonics.
Normalizing	Heating a ferrous material to a suitable temperature above the transformation range and then cooling in air to a temperature substantially below the transformation range.
NPS	Nominal Pipe Size – A dimensionless designator for such traditional terms as "nominal diameter", "size" and "nominal size". Corresponds to actual outside diameter only in sizes 14 inches and over.
OD	Outside Diameter of pipe.
PE	Plain End.
PSC	Plain End Square Cut.
Product Analysis	A chemical analysis of the pipe.
PSI	Pounds per Square Inch.
PSIG	Pounds per Square Inch Gage.
PSL	Product Specification Level.
QS	Quad Stencil – United States Steel typical quad Stencil for seamless is ASTM A53 Grade B, ASTM A 106 Grade B, API 5L Grade B and Grade X42.
RDS	Rounds. For seamless tubular products, the round is heated and pierced to form a tube hollow.
Regular Mill Coat	Term associated with pipe surface whereby the pipe will be coated with a corrosion inhibitor.
SC	Square Cut.
Schedule Numbers	ANSI numbers assigned to pipe to designate wall thickness depending upon outside diameter.
Skelp	A plate of steel or wrought iron from which pipe or tubing is made by rolling the skelp into shape longitudinally and welding or riveting the edges together.
SMLS	Seamless.
SMTS	Specified Minimum Tensile Strength.
SMYS	Specified Minimum Yield Strength.
SRL	Single Random Length.
STD	Standard.
Stencil	Paint spray identification placed on pipe. Specification, size, wall, grade, test pressure, method of manufacture, and normal mill characters and mill identification are usually included; however, detail varies by specification.
Straightening	The removal of sweep and camber by roller straightening or by use of a gag press.
Stress	The load per unit of area. Ordinarily stress-strain curves do not show the true stress (load divided by area at that moment).

Stress Relieving	A process of reducing residual stresses in a metal object by heating the object to a suitable temperature and holding for a sufficient time, and cooling slowly. This treatment may be applied to relieve stresses induced by casting, quenching, normalizing, machining, cold working or welding.
Surface Inspection	The inspection of the surface of products for defects such as: scabs, seams, burned steel, laps, twist, guide marks, etc.
T&C	Threaded and Coupled.
TBE	Threaded Both Ends.
Tensile Strength	In tensile testing, the ratio of maximum load to original cross-sectional area. Also called ultimate strength. Usually expressed in PSI.
Toughness	Property of absorbing considerable energy before fracture; usually represented by the area under a stress-strain curve, and therefore involving both ductility and strength.
TS	Triple Stencil. United States Steel typical triple stencil for seamless is ASTM A53 Grade B, ASTM A106 Grade B and API 5L Grade B.
Ultrasonic (UT)	A non-destructive testing method of detecting, locating, and measuring both surface and subsurface defects in metals with the use of high-frequency sound.
XS	Extra Strong standard pipe weight designation. Sometimes described as XH (extra heavy).
XXS	Double Extra Strong standard pipe weight designation. Sometimes described as XXH (double extra heavy).
Yield Point	In mild- or medium-carbon steel, the stress at which a marked increase in deformation occurs without increase in load. In other steels and in nonferrous metals this phenomenon is not observed.
Yield Strength	The stress at which a material exhibits a specified deviation from proportionality of stress and strain. An offset of 0.2% is used for many materials including steel. API 5L states that the yield strength shall be the tensile stress required to produce a total elongation of 0.5% of the gage length as determined by an extensometer or by multiplying dividers. Usually expressed in PSI.

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