

APPENDIX D

PIPE, CASING, AND TUBING

D - 1. Pipe, Casing, and Tubing.

1. Seamed and Seamless Steel Pipe.
2. Pipe Schedules for Surface Construction.
3. Lengths or Classes of Pipe.
4. Sizes of Pipe.
5. Tubing
6. Casing.

The Lease Pumper's Handbook

Appendix D Pipe, Casing, and Tubing

Section 1

PIPE, CASING, AND TUBING

This appendix has been designed to give the lease pumper a basic knowledge of the use of oilfield production pipe and fittings, casing, and tubing.

D1-1. Seamed and Seamless Steel Pipe.

Iron in its pure form has limited use in manufacturing pipe. After it has been combined with one or more other metals, a new compound called *steel* is formed. Steel is much stronger than iron, and steel pipe has been used in oilfield construction since the first wells were drilled.

Through the history of oil production, efforts have been made to improve steel pipe to make it more resistant to deterioration due to corrosion and the action of acids and salt found in hydrocarbons.

Pipe is available in both welded and seamless manufacture. The seamless pipe is more expensive but is stronger and more resistant to problems. Welded pipe is fused with heat and electricity applied to the parent materials without using welding rod.

D1-2. Pipe Schedules for Surface Construction.

Pipe that is purchased for surface construction is available in several wall thicknesses and quality ratings. This is referred to as the pipe *schedule number*.

Pipe schedule numbers range from the lightest weight, 10, to a maximum weight of

160. From 10 to 40, it is numbered in 10-point increments. From 40 to 160, it is numbered in 20-point increments. Thus, the schedule increments are 10, 20, 30, 40, 60, 80, 100, 120, 140, and 160.

Many pipe suppliers stock pipe 4-6 inches in diameter in schedule 40 for low- and medium-pressure installations, schedule 80 for high-pressure use, and schedule 160 for extra high-pressure applications. In larger sized pipe applications, all of the scheduled weights are available on order.

D1-3. Length or Classes of Pipe.

Pipe in common use in the oilfield is not always the same length as pipe purchased at the local hardware or lumber store for typical commercial use. Pipe for oilfield use is usually purchased from the local oilfield supply store. Some pipe bought at either place may be of the same quality, but some is not. Lengths of small pipe at the hardware store will probably be available in lengths of 21 feet. The oilfield supply store may have pipe up to 2 inches in diameter available only in 21-foot lengths. Two-inch to 4-inch pipe is usually available in 25-foot lengths.

D1-4. Sizes of Pipe.

Pipe is sized by its diameter. There are many sizes of pipe with the sizes ranging from 1/8 inch up to several feet in diameter. Pipe used for surface applications such as

flow lines and tank battery construction is measured by inside diameter and is usually referred to as *line pipe*. These lines are usually 2 inch and generally no larger than 4 inch.

The sizes of line pipe used in tank battery construction varies. Flow lines and the oil lines at the tank battery are usually 2-inch, and water drain lines may be any size from 2-4 inches. General use is as follows:

Table D-2. SIZES OF FIELD CONSTRUCTION PIPE

Pipe Size (inches)	Threads per Inch	Joint Length (feet)	Weight per Foot (pounds)	General Use
1/8	27	21		Special application
1/4	18	21		Highly used
3/8	18	21		Special application
1/2	14	21		Highly used
3/4	14	21		Special application
1	11 1/2	21		Highly used
1 1/4	11 1/2	21		Special application
1 1/2	11 1/2	21		Special application
2	11 1/2	21/25	4.7	Highly used
2 1/2	8	25	6.	Special application
3	8	25		General use
4	8	25	11	General use

The 1/16 inch size tap and die is readily available but the pipe and fittings are not. Thus, for practical purposes, the smallest size included in this listing is 1/8 inch and up.

D1-5. Tubing.

Tubing is the moveable string in the oil well. Tubing is manufactured in various different mixtures of steel. The stronger the steel is, the higher its tensile strength and the more each joint costs. The lowest grade or class of tubing is called H-40. This tubing is approved for use in shallow wells. For deeper wells, tubing of higher grades must be used, selected to match the well depth. The

general classes of tubing most commonly used for oil production include:

- H-40 Shallow wells
- J-55
- C-75 Deeper wells
- N-80
- P-105 Deep wells

Tubing is available with inside diameters of 1-4 inches but tubing size is measured by

outside diameter. The two most common sizes are 2-3/8" O.D. and 2-7/8" O.D.

Tubing comes in random lengths of 28-32 feet long. Standard well tubing comes with upset ends. The joints within the string, other than possibly the bottom mud anchor, are installed without cutting and threading. Joints less than full length are called *pup joints* and are available in 2-foot increments from 2-12 feet. Lengths in the 18-24 foot range may be available on special order.

Upset tubing must be installed to an exact depth from the braiden head or the top of the wellhead downhole to the tubing perforations. By measuring and selecting tubing of required lengths, a tubing string can be made up to an exact depth.

Accurate records must be kept listing every joint of tubing in every well. These records must show the type, size, and length of every joint in order of installation.

Table 2. TUBING SIZE (EXTERNAL UPSET END)

OD	Weight	I.D.	Cu. Ft /Ft	Ft/Cu. Ft	Bbl/Ft	Ft/Bbl
1.050	1.20	0.824	0.00370	270.270	0.00066	1515.152
1.315	1.80	1.049	0.00600	166.667	0.00107	934.579
1.315	2.25	0.957	0.00500	200.000	0.00089	1123.596
1.660	2.40	1.380	0.01039	96.246	0.00185	540.541
1.900	2.90	1.610	0.01414	70.721	0.00252	396.825
2.375	4.10	2.041	0.02272	44.014	0.00405	246.914
2.375	4.70	1.995	0.02171	46.062	0.00387	258.398
2.375	5.95	1.867	0.01901	52.604	0.00334	294.985
2.875	6.50	2.441	0.03250	30.769	0.00579	172.712
2.875	8.70	2.259	0.02783	35.932	0.00496	201.613
3.500	8.50	3.018	0.04968	19.478	0.00870	112.994
3.500	9.30	2.992	0.04882	20.483	0.00870	114.943
3.500	12.95	2.750	0.04125	24.242	0.00735	136.054
4.000	9.50	3.548	0.06866	14.565	0.01223	81.766
4.500	12.75	3.958	0.08544	11.704	0.01522	65.703

D1-6. Casing.

Casing is the fixed or cemented string of pipe in oil and gas wells and is measured by outside diameter. Sizes for land wells may be as small as 4½ inches. As the well gets deeper, the surface casing gets much larger. Tubing and casing are measured by the diameter of the lifting tools or elevators. With oilfield pipe strength ratings, even as the pipe wall increases in thickness so that

the pipe will be stronger, the outside diameter remains the same size so that the lifting and makeup tools continue to fit. This means, of course, that the higher strength pipe will have a smaller inside diameter than a lower rated pipe with the same outside diameter.

Perforating casing. When an oilwell is perforated, the shooting of the jet gun causes a shock to the joint being perforated. For

this reason, the perforation joint or joints may be heavier pipe to try to prevent problems that would result if lighter pipe were perforated. This means that they are at or near the bottom of the string and have a smaller inside diameter.

Because of problems caused in casing strings with a smaller inside diameter, such

as having tools get stuck near the bottom of the hole, the top joint of casing is always the same size on the inside as the smallest inside diameter joint. By adopting this practice, any tool that will go through the first joint will go through any joint in the string, including the perforated joint.