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**A. P. I.  
LINE PIPE  
SPECIFICATIONS**



**AMERICAN PETROLEUM INSTITUTE**  
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New York City

Issued By

**Division of Standardization**  
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## **SPECIFICATIONS FOR STEEL AND IRON PIPE FOR LINE PIPE PURPOSES**

**Adopted by the Board of Directors of the  
AMERICAN PETROLEUM INSTITUTE**

**December 6, 1927.**

### **FOREWORD:**

These specifications were prepared jointly by the Special A. P. I. Committee on the Standardization of Specifications for Steel and Iron Pipe for Oil Country Tubular Goods, and the Technical Committee of the Natural Gas Association of America. The purpose of the joint work by these two Committees was to formulate specifications for line pipe which would fill the requirements of both the oil and natural gas industries.

The first draft was prepared by the N. G. A. Technical Committee in conjunction with representatives of the pipe manufacturers and submitted to the A. P. I. Pipe Committee, which, in turn, gave it wide circulation throughout the oil industry, particularly oil pipe line companies. As a result of this review, and subsequent revisions by the N. G. A. Technical Committee, tentative specifications were adopted at the June, 1927, meeting of the A. P. I. Pipe Committee at Colorado Springs, Colo., and finally approved at Chicago, Dec. 6, 1927.

### **MATERIAL COVERED**

1. These specifications apply to welded and seamless steel, and welded iron tubular goods for line pipe purposes, commonly used to convey gas, water, or oil.

## SECTION I.

## MANUFACTURE

## Process.

2-a. The steel for welded line pipe shall be of good welding quality made by the Bessemer, Open Hearth or Electric process. The steel for all seamless line pipe shall be made by the Electric or Open Hearth process.

2-b. The wrought iron shall be made from muck bars made entirely from puddled pig iron, free from any admixture of iron scrap or steel. The term iron scrap applies only to foreign or bought scrap and does not include local mill products free from foreign or bought scrap.

2-c. Welded pipe 3" or under, in nominal diameter, may be butt welded unless otherwise specified. Welded pipe over 3" in nominal diameter shall be lap welded.

2-d. Open Hearth Iron.

## SECTION II.

## CHEMICAL PROPERTIES AND TESTS

3-a. The steel from ladle analysis shall conform to the following requirements as to chemical composition:

	Bessemer O. H. Welded		Seamless		
	Welded	Class I Class II (Rephos.)	Grade A	Grade B	Grade C
Manganese	.30-.60	.30-.60	.30-.60	.35-1.50	.35-1.50
Phosphorus,					
Not over,	.11	.045	.04	.04	.04
Not less than	---	.045	---	---	---
Sulphur,					
Not over,	.065	.06	.06	.06	.06

Foot Note—Rephosphorized open hearth pipe shall be marked by the letter "R" stamped with a steel stencil directly alongside the A. P. I. Monogram, the size of the letter to be the same as the A. P. I. Monogram.

It will be noted in the table under "Physical Properties and Tests" that rephosphorized open hearth welded pipe has higher tensile strength and higher yield point than Class I open hearth welded pipe, and as a consequence is probably somewhat harder to bend. It probably has better threading and lap welding properties.

3-b. Open Hearth Iron shall not contain a total impurity content of more than 16/100 of one per cent considering the elements carbon, sulphur, phosphorus, silicon, copper and manganese as impurities.

## Check Analysis.

4-a. Analyses of two lengths of pipe in each lot of 400 or less of each size 2" up to, but not including,

6", and in each lot of 200 or less of each size 6", or over, may be made by the purchaser from the finished pipe. By agreement between the manufacturer and the purchaser, the analyses may be taken from the skelp, the number of analyses shall be determined in the same manner as when taken from the finished pipe.

4-b. If the analysis of only one length of pipe or skelp does not conform to the requirements specified, analyses of two additional lengths from the same lot shall be made, each of which shall conform to the requirements specified.

4-c. Drillings for analyses shall be taken from several points around each length of pipe, or across each length of skelp, selected for test.

4-d. When requested by the purchaser, ladle analyses of each heat of Open Hearth steel and such analyses as the manufacturer may make of Bessemer steel, shall be furnished by the manufacturer.

### SECTION III.

#### PHYSICAL PROPERTIES AND TESTS

##### Tension Tests.

5-a. The material shall conform to the following minimum requirements as to tensile properties:

##### STEEL

	Bessemer Welded	O. H. Welded		Seamless		
		Class I (Rephos.)	Class II	Grade A	Grade B	Grade C
Tensile Strength, lbs. per sq. in.	50,000	45,000	48,000	48,000	70,000	75,000
Yield Point, lbs. per sq. in.	30,000	25,000	28,000	30,000	40,000	45,000
Elongation in 8", per cent	20	22	20	---	---	---
Elongation in 2", per cent	---	---	---	40	25	20

##### WROUGHT IRON

Tensile Strength, lbs. per sq. in. 42,000  
 Yield Point, lbs. per sq. in. 24,000  
 Elongation in 8", per cent 12

##### OPEN HEARTH IRON

Tensile Strength, lbs. per sq. in. 42,000  
 Yield Point, lbs. per sq. in. 24,000  
 Elongation in 8", per cent 20

5-b. The yield point shall be determined by the drop of the beam of testing machine, by dividers, or any other approved method.

##### Hydrostatic Tests.

6-a. Each length of pipe shall be tested at the mill to the hydrostatic pressures specified in the

tables appended. (See Tables 1, 2 and 3). Lap welded pipe shall be struck near both ends, while under pressure, a blow with a two-pound hammer or its equivalent and the hydrostatic pressure specified shall be maintained for not less than five seconds.

6-b. The test pressure on sizes or weights of lap welded pipe of diameters 2" and larger and not listed should not exceed those required by the formula:

$$P = \frac{2 S t}{D}$$

in which

P equals the pressure in pounds per square inch.

S equals allowable fiber stress of 16,000 lbs. per sq. in. to 14,000 lbs. per sq. in. for Lap Welded Steel and Grade A Seamless Pipe; 20,000 lbs. per sq. in. to 18,000 lbs. per sq. in. for Grades B and C Seamless Pipe; and 14,000 lbs. per sq. in. to 12,500 lbs. per sq. in. for Wrought Iron and Open Hearth Iron Pipe; but no pressure need exceed 2500 lbs.

t equals thickness of the wall in inches.

D equals outside diameter in inches.

### Flattening Tests.

7-a. The crop end cut from each end of each length of steel or open hearth iron lap welded pipe shall be flattened between parallel plates with the lap weld at the point of maximum bending until opposite walls of the pipe meet. No opening in the weld shall take place until the distance between the plates is less than 2/3 of the original outside diameter of the pipe. No cracks or breaks in the metal elsewhere than in the lap weld shall occur until the distance between the plates is less than 1/3 of the original outside diameter of the pipe. Evidence of laminations or burnt material shall not develop during the entire flattening process. If any section fails to meet these requirements, another piece may be cut. If the second test fails, additional tests may be made until the requirements are met or the length rejected, except that the finished pipe shall not be shorter than 80% of its length after the first crop was cut. Precautions shall be taken so that crop ends can be identified with respect to the length from which they are cut.

7-b. The crop ends cut from each length of lap welded wrought iron pipe shall be flattened until broken. The test shall be made with weld approximately 45 degrees from the point of maximum bend. The test piece must show a good weld and the fracture shall have a fibrous appearance. If any section fails to meet these requirements, other pieces from the length may be cut until satisfactory tests are obtained, otherwise the length shall be rejected. Precautions shall be taken so that crop ends can be identified with respect to the length from which they are cut.

7-c. For butt welded steel or open hearth iron pipe over 2" in diameter, a section of pipe 6" long shall be flattened between parallel plates until the distance between the plates is 60 per cent of the outside diameter of the pipe with the weld located 45 degrees from the point of maximum bend, without developing cracks. In the case of butt welded wrought iron pipe over 2" in diameter, a section of pipe 6" long shall be flattened until broken. The test piece must show a good weld and the fracture shall have a fibrous appearance.

#### Bend Tests.

8. For butt welded steel pipe 2" or under in diameter, a sufficient length of pipe shall stand being bent cold through 90 degrees around a cylindrical mandrel, the diameter of which is 12 times the nominal diameter of the pipe, without developing cracks at any portion and without opening the weld. In the case of butt welded iron pipe, the cylindrical mandrel for this test may be 15 times the nominal diameter of the pipe. The weld shall be placed approximately 45 degrees from the inside radius of the axis of bending.

#### Test Specimens.

9-a. Tension test specimens, when the pipe is not pulled in full section, shall consist of strips cut longitudinally from either end of the pipe. They shall not be flattened before testing. The specimens from welded pipe shall be taken from a point approximately 90 degrees from the weld. By agreement between the manufacturer and purchaser, the tensile test specimens for welded pipe may be taken from the skelp.

9-b. All testing shall be done cold.

#### Number of Tests.

10. One of each of the tests specified in Paragraph 5-a may be made on a length in each lot of

400 or less, of each size under 6 inches, and in each lot of 200 or less, of each size 6 inches or over. When taken from the skelp the number of tests shall be determined in the same manner as when taken from the finished pipe. One each of the tests specified in Paragraphs 7-c and 8 may be made on a length in each lot of 400 or less, of each size.

**Retests.**

11-a. If the results of the physical tests of any lot do not conform to the requirements specified in Paragraphs 5-a, 7-c and 8, retests of two additional lengths from the same lot shall be made, each of which shall conform to the requirements specified.

11-b. If any specimen shows defective machining and develops flaws, it may be discarded and another specimen substituted. If the elongation of any tension test specimen is less than that specified and any part of the fracture is outside of the middle third of the gauge length as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

**SECTION IV.**

**STANDARD WEIGHTS AND LENGTHS**

12-a. The standard sizes and weights for line pipe are given in tables appended. (See Tables 1, 2 and 3).

**Permissible Variations.**

12-b. The weight of any length of pipe listed in Tables 1 and 2 shall not vary more than 3½ per cent under or 10 per cent over that specified. The weight of any length of pipe listed in Table 3 shall not vary more than 5 per cent under or 10 per cent over that specified. Unless otherwise agreed upon, pipe sizes 4" and larger shall be weighed separately. Sizes smaller than 4" may be weighed in convenient lots. In the case of threaded line pipe, the pipe will be weighed with coupling screwed on but with thread protectors removed.

**Lengths.**

13-a. Unless otherwise specified threaded line pipe in standard weights and thicknesses, as listed in Table 1, shall be furnished with not over 5 per cent under 18 ft. in length, with a minimum of 16 ft. for the length of any joint. On this class of goods, jointers (two short lengths connected by a coupling), the minimum length of the shorter piece

to be 5 feet, may be shipped to a maximum of 5 per cent of the order.

13-b. Unless otherwise specified, plain end line pipe as listed in Table 2 shall have an average length of not less than 17 ft. 6 in. and no length shorter than 9 ft. may be shipped. Plain end pipe as listed in Table 3 in sizes up to 20" O. D. shall have an average length of not less than 17 ft. and no length shorter than 9 ft. may be shipped. On sizes larger than 20" O. D. the minimum and average lengths shall be furnished as agreed upon between purchaser and manufacturer at time of purchase.

## SECTION V.

### WORKMANSHIP AND FINISH

14-a. All skelp entering into lap welded line pipe must be scarfed.

14-b. For pipe 1½" or under in nominal inside diameter, the outside diameter at any point shall not vary more than 1/64" over nor more than 1/32" under the standard size. For pipe 2" or over in nominal inside diameter, the outside diameter shall not vary more than 1 per cent over or under the standard size. The wall thickness of welded and seamless pipe shall not be more than 12½% under the nominal wall thickness at any point.

14-c. The finished pipe shall be reasonably straight and free from injurious defects, such as burnt material, bad welds, sand pits, ball cuts, pits, cinder spots, liquor marks, blisters, slivers, and laminations. Seamless pipe shall also be free from injurious seams. When the depth of sand pits, liquor marks and cinder spots is in excess of 12½% of the nominal wall thickness they shall be considered injurious defects; welding of such defects will be permitted at the discretion of the manufacturer, provided the depth of such holes does not exceed 33⅓% of the nominal wall thickness, and provided the holes being repaired are not closer than one inch to the lap weld. It should be understood that hydrostatic tests made on pipe repaired in this manner shall be made on the finished pipe. The threading on the pipe must be free from tears, shoulders, cuts or any defects which may break the continuity of the thread.



## Ends.

15-a. Unless otherwise specified, pipe shall conform to the following regular practice:

15-b. Each end of threaded pipe shall be reamed to remove all burrs. Plain end pipe for use with the Dresser or Dayton type coupling shall be reamed both inside and outside just sufficiently to remove any burrs or shall be beveled on the outside to an angle of  $45^\circ$  and with an average width of flat at the end of pipe of  $\frac{1}{16}'' \pm 1/32''$ . All such pipe shall be sufficiently free from indentations, projections or roll marks for a distance of 8" from the end of the pipe to make a tight joint with the rubber gasket type of coupling. All plain end line pipe intended for Dresser or Dayton type joints, or for welding sizes  $10\frac{3}{4}''$  O. D. and smaller, shall not be more than  $1/64''$  smaller than the nominal outside diameter for a distance of 8" from the end of the pipe and shall permit the passing for a distance of 8" of a ring gage which has a bore  $1/16''$  larger than the nominal O. D. of the pipe. Sizes larger than  $10\frac{3}{4}''$  O. D. shall not be more than  $1/32''$  smaller than the nominal outside diameter for a distance of 8" from the end of the pipe and shall permit the passing for a distance of 8" of a ring gage which has a bore  $3/32''$  larger than the nominal O. D. of the pipe.

15-c. Plain end pipe for welding, unless otherwise specified, shall be beveled to an angle of 45 degrees, and with a width of flat at the end of the pipe  $1/16'' \pm 1/32''$ . This class of material shall be reamed inside at the ends sufficiently to remove all burrs. Where material is ordered beveled to any other than a 45 degree angle, it shall be understood that the angle is to be measured from a line drawn perpendicular to the axis of the pipe. This means that a greater amount of material is removed with a 60 degree angle, than with a 45 degree angle.

## Threads and Gages.

16. When threaded line pipe is ordered, as specified in Table 1, the threads shall be in accordance with Table 1-A and cut so as to make a tight joint when the pipe is tested at the mill to the specified internal hydrostatic pressure. The variation from the standard, when tested with the standard working gage, shall not exceed a maximum of one and one-half turns either way.

17. Threads in couplings and on pipe shall be so nearly alike in form and size, and so well finished, that joints can be screwed together with suit-

able lubricant, far enough to make a tight joint, and unscrewed four times without injury to the threads. At the discretion of the Inspector, where the purchaser is represented by an Inspector, one joint of sizes 2" and larger may be so tested out of a lot of 100 or more after joints have been made up in the coupling screwing machine.

18. Pipe shall not be rounded out by hammering in order to get a full thread. There shall not be more than 3 black threads among the perfect threads, (See Dimension "E" in various A. P. I. thread tables). Black threads should not be confused with imperfect threads such as torn, shaven or broken threads.\*

19. Each manufacturer of A. P. I. threaded line pipe shall provide himself with plug and ring reference gages which have been manufactured in accordance with the gage tables appended, (See Table 1-B) except that gages may be used which have been manufactured in accordance with the American Engineering Standards for pipe threads as outlined in Bulletin No. 3—1919, in which case the additional length of thread specified for line pipe will project through the American Engineering Standards ring gage; provided that such existing gages are certified by the Bureau of Standards, Washington, D. C., to be in accordance with gage tables appended, before their use is authorized under this specification. New gages should be made in exact accordance with the information given in Table 1-B. All reference gages are to be checked and certified by the Bureau of Standards at Washington, or the National Physical Laboratory, Teddington, Middlesex, England. Each certificate shall identify a particular gage by a serial number, and the date of certificate shall be marked on the gage. The certificate shall state any errors of pitch diameter lead, taper, or angle of thread. The reference gage will be a taper threaded plug gage. The errors on new reference gages shall not exceed the limit contained in gage specifications appended.

20. A worn gage which is within these limits except for pitch diameter, which varies from the table by not more than one turn may be used provided such error is marked on the gage and proper allowance made for such error when using gage. Form of thread for gages, etc., shall conform to the practice specified in gage Table 1-B appended. Gaging shall be done to conform with A. P. I. Pipe gaging practice.

\*Par. 18 subject to revision.

### Taper Tests.

21-a. The taper of threads on both pipe and couplings shall be tested by approved methods at intervals sufficient to insure that taps and dies are in proper adjustment.

21-b. The variations in taper\* shall not exceed the following limits:

Maximum taper 13/16".

Minimum taper 23/32".

### Thread Protectors.

22. Solid tapped rings or split couplings, or other protectors to be approved by the American Petroleum Institute, shall be provided as thread protectors on all sizes 2" and larger, and shall be made and finished so as to prevent water from accumulating around the threads on the pipe. The thickness of the protectors shall be approximately that of the pipe on which they are used, unless of such form and make as to give equal or greater protection to the end of the pipe and to the thread. On sizes under 2" for export shipment, the ends shall be wrapped with a suitable fabric protection.

### Couplings.

23. Each length of threaded pipe shall be provided with one coupling, having clean cut threads of such a pitch diameter as to give a tight joint. Couplings may be made of wrought iron or steel, seamless or welded, and shall be free from blisters, pits, cinder marks and any other injurious defects that would impair the efficiency of the coupling and break the continuity of the thread. When couplings are made of steel, sizes 2" and larger shall be electroplated on the threads, heat treated or treated by some other method of manufacture which will minimize the chance of galling.

24. No tapers of couplings to be secured by expanding.

25. When couplings are screwed on at the mill a high grade lubricant shall be applied to coupling and pipe threads before making up the joint; and to prevent rust, all exposed threads, unless otherwise specified, shall be thoroughly greased.

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### Alignment Test.

26. The couplings shall be tapped concentric so that the axes of the threads of the two ends are

\* "Taper" as used herein means "Total," or measured on the diameter.

closely in line. Couplings on sizes 6" and larger shall be tested for alignment by screwing onto a threaded piece carefully centered in a lathe; in the outer end of coupling is screwed a lathe turned piece which will give a measured length of about one foot on which the alignment of the coupling threads may be determined by an alignment indicator when rotated in the lathe. Other approved means of measuring alignment may be used. Couplings shall be in line within  $\frac{3}{4}$ " in a length of 20 ft. One coupling may be tested from each lot of 100 or less, but the question of whether or not this test will be made shall be left to the discretion of the Inspector, where the purchaser is represented by an Inspector. In case this coupling fails, two more couplings may be taken from the same lot, each of which must be within the alignment specified, otherwise the lot shall be rejected. In any case the manufacturer may test rejected couplings individually if desired.

### Marking.

27. The length, the test pressure in pounds, and class of material shall be stenciled on each length of pipe, sizes 2" and larger, and on sizes 4" and larger, except dipped or coated pipe, the weight of each length shall be stenciled. Approved abbreviations may be used. The A. P. I. monogram shall be stamped with steel stencil on each joint, sizes 2" and larger, one foot from couplings on the shop end of threaded line pipe and about one foot from either end on plain end line pipe. The A. P. I. monogram shall also be stamped with steel stencil on all couplings for pipe sizes 2" and larger. The size of monogram to be  $\frac{1}{4}$ " high on all sizes of pipe;  $\frac{3}{8}$ " high on couplings for pipe sizes from 2" to 6", inclusive, and  $\frac{1}{2}$ " high on couplings for pipe sizes over 6". (The upper and lower cross bar on the letter "I" in the A. P. I. monogram may be omitted). On pipe sizes smaller than 2", which are regularly bundled, the A. P. I. monogram will not be stamped on either the pipe or the couplings but will be stamped on the metal measurement tag which is attached to each bundle. In addition to the above markings and in letters of similar size, the grades A, B and C of seamless pipe shall be stamped with a steel stencil.

28. All pipe manufactured in accordance with these specifications shall be marked, by stamping or rolling, with the manufacturer's private identifying mark. On bundled pipe this mark may be stamped on the metal tag.

## SECTION VI.

### INSPECTION AND REJECTION

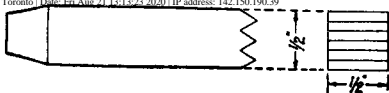
#### Inspection.

29-a. The Inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which will concern the manufacture of the pipe ordered. The manufacturer shall afford the Inspector, free of charge, all reasonable facilities to satisfy him that the pipe is being furnished in accordance with these specifications. All tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

29-b. Where Inspector representing purchaser desires to witness these tests, reasonable notice shall be given of the time at which the run is to be made.

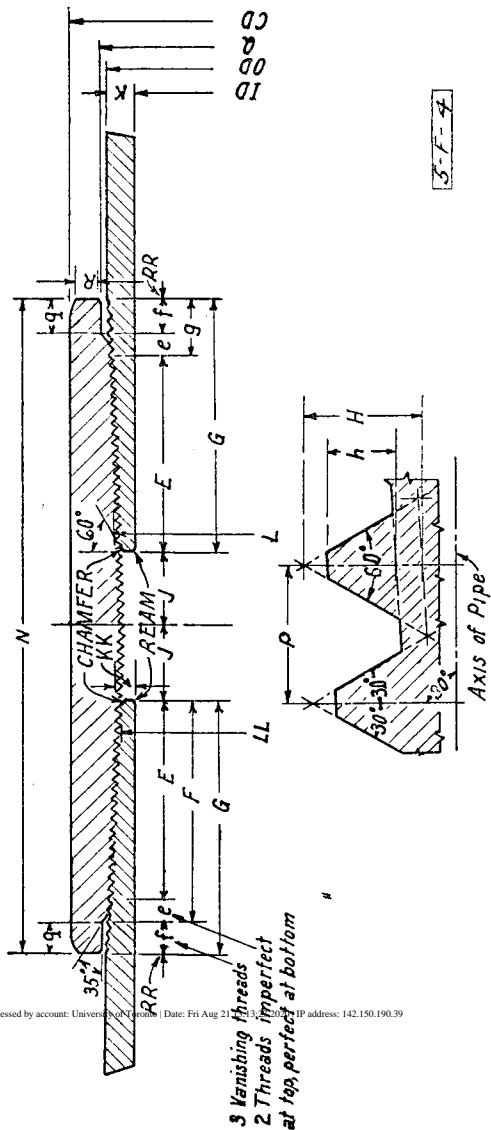
#### Rejection.

30. Material which shows injurious defects subsequent to acceptance at manufacturer's works, or which proves defective when properly applied in service, may be rejected, and the manufacturer shall be notified. No rejections, under these or any other specifications, are to be stamped with the A. P. I. monogram or sold as A. P. I. pipe, except where said pipe fails to comply with the weight specifications alone, in which case it may be sold under weight specifications with which it does comply. When pipe stamped with the A. P. I. monogram is rejected, a cancelling stencil, one-half inch square, per following figure, shall be applied to such monogram in the following manner; the cancelling stencil shall be applied twice, first with the lines of the stencil parallel to the axis of the pipe, the stencil then turned 90 degrees, and applied the second time.



**Cancelling Stencil**

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## TABLE 1-A—THREADS AMERICAN PETROLEUM INSTITUTE LINE PIPE

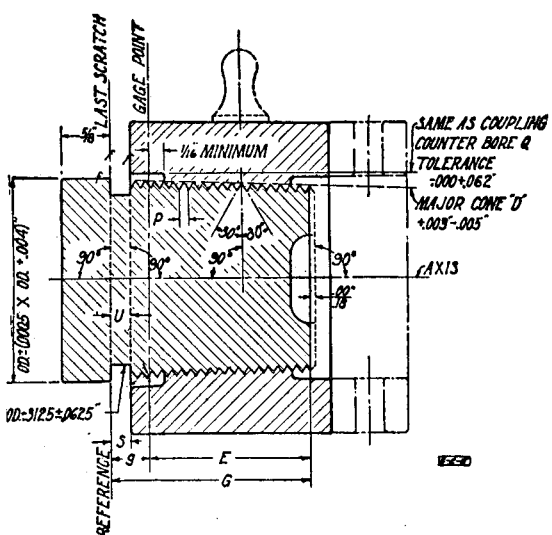
See Fig. 1.

All dimensions in inches at 68 degrees Fahr.

Size	Pipe			Threads					Diameter of Pipe at Root of Threads "L, L."	Diameter of Pipe at Top of Threads "I, I."	End of Pipe to Center of Coupling Made up "J"	Distance End of Coupling Beyond Last Scratch Made up "R, R."	Stand-off of Coupling at Hand-tight fit "A"	
	External Diameter "O. D."	Weight per foot Comp.	No. per inch: "B"	Taper, inches per foot "b"	Length of Perfect "E"	Number of Perfect	Effective Length "F"	Total Length "G"						Ht. of Thread Truncated "h"
1/8	.405		27	3/4	.18978	5.12400	.26885	.37496	.02963	.33888	.39314	.187	.000	-----
1/4	.540		18	3/4	.29067	5.23200	.40178	.56844	.04444	.48294	.52188	.119	.000	-----
3/8	.675		18	3/4	.40778	7.84000	.51889	.68556	.04444	.56063	.64951	.126	.000	-----
1/2	.840		14	3/4	.42386	5.93400	.56671	.78100	.05714	.69922	.81351	.156	.000	-----
3/4	1.050		14	3/4	.54571	7.64000	.68857	.90286	.05714	.09161	1.01589	.159	.000	-----
1	1.315		11-1/2	3/4	.56522	6.50000	.73913	1.00000	.06957	1.14054	1.27967	.187	.000	-----
1-1/4	1.660		11-1/2	3/4	.70678	8.12800	.88070	1.14157	.06957	1.47670	1.61583	.295	.000	-----
1-1/2	1.900		11-1/2	3/4	.72348	8.32000	.89739	1.15826	.06957	1.71565	1.85478	.279	.000	-----
2	2.375		11-1/2	3/4	.93043	10.70000	1.10435	1.36522	.06957	2.17772	2.31685	.447	.000	-----
2-1/2	2.875		8	3/4	.95000	7.60000	1.20000	1.57500	.10000	2.61563	2.81563	.487	.000	-----
3	3.500		8	3/4	.95000	7.60000	1.20000	1.57500	.10000	3.24063	3.44063	.487	.000	-----
3-1/2	4.000		8	3/4	1.17500	9.40000	1.42500	1.80000	.10000	3.72656	3.92656	.512	.000	-----
4	4.500		8	3/4	1.17500	9.40000	1.42500	1.80000	.10000	4.22656	4.42656	.512	.000	-----
5	5.563		8	3/4	1.40630	11.25040	1.65630	2.03130	.10000	5.27511	5.47511	.531	.000	-----
6	6.625		8	3/4	1.51250	12.10000	1.76250	2.13750	.10000	6.33047	6.53047	.424	.000	-----
8	8.625	All	8	3/4	1.71250	13.70000	1.96250	2.33750	.10000	8.31797	8.51797	.724	.000	-----
10	10.750	All	8	3/4	1.92500	15.40000	2.17500	2.55000	.10000	10.42969	10.62969	.762	.000	-----
12	12.750	All	8	3/4	2.12500	17.00000	2.37500	2.75000	.10000	12.41719	12.61719	.562	.000	-----
14 O.D.	14.000		8	3/4	2.25000	18.00000	2.50000	2.87500	.10000	13.65938	13.85938	.687	.000	-----
15 O.D.	15.000		8	3/4	2.35000	18.80000	2.60000	2.97500	.10000	14.65313	14.85313	.587	.000	-----
16 O.D.	16.000		8	3/4	2.45000	19.60000	2.70000	3.07500	.10000	15.64688	15.84688	.487	.000	-----
17 O.D.	17.000		8	3/4	2.45000	19.60000	2.70000	3.07500	.10000	16.64688	16.84688	.487	.000	-----
18 O.D.	18.000		8	3/4	2.45000	19.60000	2.70000	3.07500	.10000	17.64688	17.84688	.487	.000	-----
20 O.D.	20.000		8	3/4	2.60000	20.80000	2.85000	3.22500	.10000	19.63750	19.83750	.587	.000	-----

American Petroleum Institute

### LINE PIPE GAGES



- (a) All measurements referred to shoulder marked "last scratch."
- (b) The small end of gages are not measuring planes, but are finished square with axis to assist certification.
- (c) All dimensions are in inches Std. at 68 degrees Fahr.
- (d) The lengths of the gages from the last scratch are unimportant within the tolerances shown.
- (e) The length of the threads in the ring gage should not be less than ("E" minus 1 1/2 pitches.)
- (f) The ring gage may be extended as shown to provide sockets for make-up bar.
- (g) The crests of the threads on gages shall be truncated as indicated in column "h" in gage table. (See page 35 for definition of "h" value as applied to gages.) The roots of the threads on gages shall be cut to a sharp V, or when ground, shall be undercut to prevent the gage from bearing on crest or root of the thread on the product.
- (h) See pages 28 and 29 for permissible tolerances, etc.

Foot Note to Table 1-B

\*The purchaser may specify the "S" dimension to suit his requirements, ignoring the values given. In the absence of definite specifications for "S" from the purchaser, the values given in Table 1-B will be used. The calibrated value of "S" in any case must be stamped on the ring gage. Fitting plates may be added to gages if desired.

Fig. 2.

**TABLE 1**  
**A. P. I. LINE PIPE (THREADED)**

See Fig. 1.

All dimensions in inches at 68 degrees Fahr.

Nominal Size	Diameters		Thick-ness "K"	Weight per foot, pounds			Test Pressure Lbs./Sq. In.				Coupling				Working Pressure Lap-welded Steel Pipe Lbs./Sq. In.			
	External "OD"	Internal "ID"		Plain Ends	Threads and Couplings	Threads per inch "P"	Steel			Length "N"	Outside Diam. "CD"	Depth Recess "q"	Diam. of Recess "Q"	Calc. Weight of Coup- ling, Lbs.	Fiber Stress 12500 #/E" Safety Factor of 4	Fiber Stress 10000 #/E" Safety Factor of 5	Fiber Stress 8333 #/E" Safety Factor of 6†	
							Butt* Weld	Lap Weld and Grade A Seamless	Grades B and C Seam- less									O. H. Iron and Wrt. Iron Lap Weld
1/8	.405	.269	.068	.244	.250	27	700	-----	-----	-----	1-1/8	.582	1/16	.467	.045	-----	-----	-----
1/4	.540	.364	.088	.424	.430	18	700	-----	-----	-----	1-3/8	.724	1/8	.602	.073	-----	-----	-----
3/8	.675	.493	.091	.567	.570	18	700	-----	-----	-----	1-5/8	.898	1/8	.737	.133	-----	-----	-----
1/2	.840	.622	.109	.850	.860	14	700	-----	-----	-----	1-7/8	1.085	1/8	.902	.218	-----	-----	-----
3/4	1.050	.824	.118	1.130	1.140	14	700	-----	-----	-----	2-1/8	1.316	1/8	1.112	.384	-----	-----	-----
1	1.315	1.049	.133	1.678	1.700	8	700	-----	-----	-----	2-3/8	1.575	1/8	1.377	.470	-----	-----	-----
1-1/4	1.660	1.380	.140	2.272	2.300	11-1/2	1200	2500	2500	2200	2-7/8	2.054	1/4	1.722	1.036	2108	1686	1405
1-1/2	1.900	1.610	.145	2.717	2.750	11-1/2	1200	2300	2500	2000	2-7/8	2.294	1/4	1.962	1.170	1907	1526	1271
2	2.375	2.067	.154	3.652	3.750	11-1/2	1200	2000	2500	1700	3-5/8	2.870	1/4	2.469	2.174	1621	1296	1080
2-1/2	2.875	2.469	.203	5.793	5.900	8	1200	2100	2500	1800	4-1/8	3.389	3/8	2.969	3.433	1765	1412	1176
3	3.500	3.068	.216	7.575	7.700	8	1200	1900	2300	1600	4-1/8	4.014	3/8	3.594	4.131	1542	1234	1028
3-1/2	4.000	3.548	.226	9.109	9.250	8	-----	1700	2100	1500	4-5/8	4.628	3/8	4.094	6.289	1412	1130	941
4	4.500	4.026	.237	10.790	11.000	8	-----	1600	2000	1400	4-5/8	5.216	3/8	4.594	8.155	1316	1053	877
5	5.563	5.047	.258	14.617	15.000	8	-----	1500	1800	1200	5-1/8	6.420	3/8	5.656	12.870	1159	927	772
6	6.625	6.065	.230	18.974	19.450	8	-----	1500	1600	1100	5-1/8	7.482	3/8	6.719	15.176	1056	845	704
8	8.625	8.071	.277	24.696	25.550	8	-----	1000	1200	850	6-1/8	9.593	3/8	8.719	26.626	802	642	535
8	8.625	7.981	.322	28.554	29.350	8	-----	1200	1400	1000	6-1/8	9.593	3/8	8.719	26.626	933	746	622
10	10.750	10.192	.279	31.201	32.750	8	-----	800	1000	700	6-5/8	11.958	3/8	10.844	44.156	648	519	432
10	10.750	10.136	.307	34.240	35.750	8	-----	900	1100	750	6-5/8	11.958	3/8	10.844	44.156	713	571	475
10	10.750	10.020	.365	40.483	41.850	8	-----	1000	1300	900	6-5/8	11.958	3/8	10.844	44.156	848	679	565
12	12.750	12.090	.330	43.773	45.450	8	-----	800	1000	700	6-5/8	13.958	3/8	12.844	51.991	647	517	431
12	12.750	12.000	.375	49.562	51.150	8	-----	900	1100	750	6-5/8	13.958	3/8	12.844	51.991	735	588	490
14 OD	14.000	13.250	.375	54.568	57.000	8	-----	800	-----	700	7-1/8	15.446	3/8	14.094	72.280	669	535	446
15 OD	15.000	14.250	.375	58.573	61.150	8	-----	750	-----	650	7-1/8	16.446	3/8	15.094	77.221	625	500	416
16 OD	16.000	15.250	.375	62.579	65.800	8	-----	700	-----	600	7-1/8	17.446	3/8	16.094	82.162	585	468	390
17 OD	17.000	16.214	.393	69.704	73.200	8	-----	750	-----	600	7-1/8	18.683	3/8	17.094	99.628	577	462	385
18 OD	18.000	17.182	.409	76.840	81.200	8	-----	700	-----	600	7-1/8	19.921	3/8	18.094	119.145	568	454	378
20 OD	20.000	19.182	.409	85.577	90.000	8	-----	650	-----	550	7-5/8	21.706	3/8	20.094	127.850	511	409	340

\* Standard test pressures for butt weld pipe are not figured by formula.

† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.



**TABLE 1-B—A. P. I. LINE PIPE GAGES**

See Fig. 2.

See Table 1-A for Thread Lengths, "E" and "G".

See Table 1 for Diameter of Coupling Recess "Q".

Nominal Size	Outside Diameter "O.D."	No. of Threads per inch "B"	Included Taper Inches per foot "b"	Pitch Dia. at Gage Point "C"	Major Dia. at Gage Point "D"	Dist. from Gage Point to Last Scratch "g"	Width of Notch "U"	Height of Thread (Truncated) "h"	Pitch "P"	Standoff "S"
1/8	.405	27	3/4	.37537	.40004	.185	.111±.100	.02467	.0370370	.111±.10
1/4	.540	18	3/4	.49556	.58256	.278	.167±.100	.03700	.0555555	.167±.10
3/8	.675	18	3/4	.63056	.66756	.278	.167±.100	.03700	.0555555	.167±.10
1/2	.840	14	3/4	.78286	.83043	.357	.214±.100	.04757	.0714285	.214±.10
3/4	1.050	14	3/4	.99286	1.04043	.357	.214±.100	.04757	.0714285	.214±.10
1	1.315	11-1/2	3/4	1.24548	1.30335	.435	.261±.100	.05792	.0869565	.261±.10
1-1/4	1.660	11-1/2	3/4	1.59043	1.64835	.435	.261±.100	.05792	.0869565	.261±.10
1-1/2	1.900	11-1/2	3/4	1.83043	1.88835	.435	.261±.100	.05792	.0869565	.261±.10
2	2.375	11-1/2	3/4	2.30548	2.36335	.435	.261±.100	.05792	.0869565	.261±.10
2-1/2	2.875	8	3/4	2.77500	2.85825	.625	.375±.100	.08325	.1250000	.375±.10
3	3.500	8	3/4	3.40000	3.48325	.625	.375±.100	.08325	.1250000	.375±.10
3-1/2	4.000	8	3/4	3.90000	3.98325	.625	.375±.100	.08325	.1250000	.375±.10
4	4.500	8	3/4	4.40000	4.48325	.625	.375±.100	.08325	.1250000	.375±.10
5	5.563	8	3/4	5.46300	5.54625	.625	.375±.100	.08325	.1250000	.375±.10
6	6.625	8	3/4	6.52500	6.60825	.625	.375±.100	.08325	.1250000	.375±.10
8	8.625	8	3/4	8.52500	8.60825	.625	.375±.100	.08325	.1250000	.375±.10
10	10.750	8	3/4	10.65000	10.73325	.625	.375±.100	.08325	.1250000	.375±.10
12	12.750	8	3/4	12.65000	12.73325	.625	.375±.100	.08325	.1250000	.375±.10
14 O.D.	14.000	8	3/4	13.90000	13.98325	.625	.375±.100	.08325	.1250000	.375±.10
15 O.D.	15.000	8	3/4	14.90000	14.98325	.625	.375±.100	.08325	.1250000	.375±.10
16 O.D.	16.000	8	3/4	15.90000	15.98325	.625	.375±.100	.08325	.1250000	.375±.10
17 O.D.	17.000	8	3/4	16.90000	16.98325	.625	.375±.100	.08325	.1250000	.375±.10
18 O.D.	18.000	8	3/4	17.90000	17.98325	.625	.375±.100	.08325	.1250000	.375±.10
20 O.D.	20.000	8	3/4	19.90000	19.98325	.625	.375±.100	.08325	.1250000	.375±.10

\*See Note to Table 1-B on page 20.

All dimensions in inches at 68 degrees Fahr.

TABLE 2

A. P. I. OUTSIDE DIAMETER PLAIN END LINE  
PIPE

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Safety Factor of 4		
			Lap Weld and Grade "A" Seamless	Grades "B" and "C" Seamless	O. H. Iron and Wrt. Iron, Lap Weld	Fiber Stress 12,500 #/□ Safety Factor of 4	Fiber Stress 10,000 #/□ Safety Factor of 5	8,333 #/□ Safety Factor of 6† Fiber Stress
3-1/2	.216	7.575	1900	2300	1600	1542	1234	1028
	.241	8.388	2000	2500	1800	1721	1377	1147
	.254	8.805	2200	2500	1900	1814	1451	1209
	.289	9.910	2500	2500	2200	2064	1651	1376
	.300	10.252	2500	2500	2300	2142	1714	1428
4	.226	9.109	1700	2100	1500	1412	1130	941
	.318	12.505	2500	2500	2100	1987	1590	1325
4-1/2	.237	10.790	1600	2000	1400	1316	1053	877
	.255	11.561	1800	2200	1500	1416	1133	944
	.271	12.240	1800	2300	1600	1505	1204	1003
	.3125	13.975	2000	2500	1800	1736	1389	1157
	.337	14.983	2200	2500	2000	1872	1497	1248
5-9/16	.258	14.617	1500	1800	1200	1159	927	772
	.304	17.074	1600	2100	1400	1366	1092	910
	.3125	17.523	1700	2100	1500	1404	1123	936
	.375	20.778	2000	2500	1800	1685	1348	1123
6-5/8	.280	18.974	1500	1600	1100	1056	845	704
	.288	19.491	1500	1600	1200	1086	869	724
	.292	19.750	1500	1600	1200	1101	881	734
	.343	23.012	1600	2000	1400	1294	1035	862
	.352	23.582	1600	2000	1400	1328	1062	885
	.385	25.658	1700	2100	1500	1452	1162	968
	.417	27.648	1900	2300	1700	1573	1258	1049
	.432	28.573	2000	2500	1800	1630	1304	1086
8-5/8	.277	24.696	1000	1200	850	802	642	535
	.304	27.016	1100	1300	1000	881	704	587
	.311	27.615	1200	1400	1000	901	721	600
	.322	28.554	1200	1400	1000	933	746	622
	.340	30.084	1200	1500	1000	985	788	657
	.352	31.101	1300	1500	1100	1020	816	680
	.375	33.041	1300	1700	1100	1086	869	724
	.400	35.137	1400	1700	1200	1159	927	772
	.425	37.220	1500	1800	1300	1231	985	821
	.4375	38.256	1500	1900	1300	1268	1014	845
	.487	42.327	1700	2100	1500	1411	1129	941
	.500	43.388	1700	2200	1500	1449	1159	966

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† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

TABLE 2 (Cont'd)

## A. P. I. OUTSIDE DIAMETER PLAIN END LINE PIPE

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Steel		
			Lap Weld and Grade "A", Seamless	Grades "B" and "C", Seamless	O. H. Iron and Wrt. Iron Lap Weld	Fiber Stress 12,500 #/□" Safety Factor of 4	Fiber Stress 10,000 #/□" Safety Factor of 5	Fiber Stress 8,333 #/□" Safety Factor of 6†
10-3/4	.279	31.201	800	1000	700	648	519	432
	.307	34.240	900	1000	750	713	571	475
	.348	38.661	1000	1200	850	809	647	539
	.365	40.483	1000	1300	900	848	679	565
	.395	43.684	1100	1400	1000	918	734	612
	.400	44.215	1100	1400	1000	930	744	620
	.424	46.760	1200	1500	1100	986	788	657
	.450	49.502	1300	1500	1100	1046	837	697
	.483	52.962	1300	1700	1200	1123	898	748
.495	54.214	1400	1700	1200	1151	920	767	
.500	54.735	1400	1800	1200	1162	930	775	
12-3/4	.330	43.773	800	1000	700	647	517	431
	.34375	45.547	800	1000	700	674	539	449
	.375	49.562	900	1100	750	735	588	490
	.500	65.415	1100	1500	1050	980	784	653
14	.375	54.568	800	.....	700	669	535	446
	.40625	58.980	900	.....	750	725	580	483
	.4375	63.371	900	.....	800	781	625	520
	.46875	67.741	1000	.....	900	837	669	558
15	.375	58.573	750	.....	650	625	500	416
	.40625	63.319	800	.....	700	677	541	451
	.4375	68.044	900	.....	750	729	583	486
	.46875	72.748	900	.....	800	781	625	520
	.500	77.431	1000	.....	900	833	666	555
.5625	86.734	1100	.....	1000	937	750	625	
16	.375	62.579	700	.....	600	585	468	390
	.401	66.806	800	.....	650	626	501	417
	.4375	72.716	900	.....	800	683	546	455
	.495	81.969	1000	.....	900	773	618	515
	.500	82.771	1000	.....	900	781	625	520
17	.393	69.704	750	.....	600	577	462	385
	.40625	71.997	750	.....	600	597	477	398
	.4375	77.389	800	.....	650	643	514	428
	.46875	82.760	850	.....	700	689	551	459
	.500	88.111	900	.....	750	735	588	490
	.5625	98.749	1000	.....	850	827	661	551
18	.409	76.840	700	.....	600	568	454	378
	.4375	82.061	700	.....	650	607	486	405
	.46875	87.767	750	.....	700	651	520	434
	.500	93.451	800	.....	750	694	555	462
	.5625	104.757	950	.....	800	781	625	520
20	.409	85.577	650	.....	550	511	409	340
	.4375	91.407	650	.....	550	546	437	364
	.500	104.131	750	.....	650	625	500	416

† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

TABLE 3

### A. P. I. OUTSIDE DIAMETER PLAIN END LINE PIPE (LIGHT WEIGHT) OR SPECIAL DIAMETERS

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Steel		
			Lap Weld and Grade "A" Seamless	Grades "B" and "C" Seamless	O. H. Iron and Wrt. Iron Lap Weld	Fiber Stress 12,500 #/□" Safety Factor of 4	Fiber Stress 10,000 #/□" Safety Factor of 5	Fiber Stress 8,333 #/□" Safety Factor of 6†
3-1/2	.125	4.505	1100	1400	900	892	714	595
	.1875	6.633	1600	2000	1400	1339	1071	892
4	.134	5.532	1000	1300	900	837	670	558
	.1875	7.634	1400	1800	1200	1171	937	781
4-1/2	.142	6.609	1000	1200	800	788	631	525
	.165	7.639	1100	1400	1000	916	733	611
	.1875	8.635	1200	1600	1100	1041	833	694
	.205	9.403	1400	1700	1200	1138	911	759
4-3/4	.145	7.131	900	1200	800	763	610	508
	.193	9.393	1200	1500	1100	1015	812	677
	.250	12.015	1600	2000	1400	1315	1052	877
	.3125	14.810	2000	2500	1800	1644	1315	1096
	.384	15.752	2100	2500	1900	1757	1406	1171
5	.152	7.870	900	1200	800	760	608	506
	.165	8.520	1000	1300	850	825	660	550
	.1875	9.637	1100	1400	1000	937	750	625
	.203	10.400	1200	1500	1100	1015	812	676
	.220	11.231	1400	1700	1200	1100	880	733
	.253	12.826	1500	1900	1300	1265	1012	843
	.296	14.870	1800	2200	1500	1480	1184	986
	.3125	15.644	1800	2400	1600	1562	1250	1041
	.355	17.611	2100	2500	1800	1775	1420	1183
5-1/4	.153	8.328	900	1100	750	728	582	485
	.182	9.851	1050	1300	900	866	693	577
	.241	12.892	1400	1700	1200	1147	918	765
	.301	15.909	1700	2200	1500	1433	1146	955
	.3125	16.479	1800	2300	1600	1488	1190	992
5-1/2	.154	8.792	850	1100	750	700	559	466
	.1875	10.638	1000	1300	900	852	681	568
	.228	12.837	1200	1600	1100	1036	829	690
	.250	14.017	1400	1700	1200	1136	909	757
	.304	16.870	1700	2100	1400	1381	1105	921
	.3125	17.313	1700	2200	1500	1420	1136	946
	.361	19.813	2000	2500	1700	1640	1312	1093
5-9/16	.1875	10.764	1000	1300	900	842	674	561

† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

TABLE 3 (Cont'd)

### A. P. I. OUTSIDE DIAMETER PLAIN END LINE PIPE (LIGHT WEIGHT) OR SPECIAL DIAMETERS

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Steel		
			Lap Weld and Grade "A" Seamless	Grades "B" and "C" Seamless	O. H. Iron and Wrt. Iron Lap Weld	Fiber Stress 12,500 #/□" Safety Factor of 4	Fiber Stress 10,000 #/□" Safety Factor of 5	Fiber Stress 8,833 #/□" Safety Factor of 6†
6	.164	10.222	850	1000	700	688	546	455
	.180	11.188	900	1100	800	750	600	500
	.190	11.789	950	1200	800	791	633	527
	.21875	13.506	1100	1400	1000	911	729	607
	.224	13.818	1100	1400	1000	933	746	622
	.238	14.646	1200	1500	1100	991	793	661
	.250	15.352	1300	1600	1100	1041	833	694
	.275	16.814	1350	1700	1200	1145	916	763
	.324	19.641	1600	2100	1400	1350	1080	900
	.359	21.628	1800	2300	1600	1495	1196	997
6-5/8	.169	11.652	750	900	700	637	510	425
	.185	12.724	850	1100	750	698	558	465
	.21875	14.966	1000	1300	900	825	660	550
	.238	16.234	1100	1400	1000	898	718	598
	.245	16.694	1100	1400	1000	924	739	616
	.259	17.609	1200	1500	1000	977	781	651
7	.174	12.685	750	900	650	621	497	414
	.1875	13.642	800	1000	700	669	535	446
	.21875	15.842	1000	1200	800	781	625	520
	.231	16.699	1000	1300	850	825	660	550
	.250	18.022	1100	1400	900	892	714	595
	.272	19.544	1200	1500	1000	971	777	647
	.28125	20.181	1200	1500	1100	1004	803	669
	.3000	21.467	1300	1600	1100	1071	857	714
	.332	23.643	1400	1800	1200	1185	948	790
	.362	25.663	1600	2000	1400	1292	1034	861
	.393	27.731	1700	2100	1500	1403	1122	935
.423	29.712	1800	2300	1600	1510	1208	1007	
8	.186	15.522	700	900	600	581	465	387
	.21875	18.179	800	1000	700	633	546	455
	.236	19.569	900	1100	800	737	590	491
	.250	20.692	1000	1200	800	781	625	520
	.28125	23.185	1100	1300	900	878	703	585
	.307	25.223	1200	1500	1000	959	767	639
	.3125	25.657	1200	1500	1000	976	781	651
	8-5/8	.188	16.940	700	800	600	544	435
.217		19.486	800	1000	700	628	503	419
.238		21.318	900	1100	700	689	551	459
.250		22.361	900	1100	750	724	579	483
.264		23.574	900	1200	800	765	612	510

† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

TABLE 3 (Cont'd)

### A. P. I. OUTSIDE DIAMETER PLAIN END LINE PIPE (LIGHT WEIGHT) OR SPECIAL DIAMETERS

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Steel		
			Lap Weld and Grade "A," Seamless	Grades "B" and "C," Seamless	O. H. Iron and Wrt. Iron Lap Weld	Fiber Stress 12,500#/□ Safety Factor of 4	Fiber Stress 10,000#/□ Safety Factor of 5	Fiber Stress 8,333#/□ Safety Factor of 6†
9	.196	18.429	650	800	600	544	435	362
	.21875	20.515	750	900	650	607	486	405
	.238	22.271	800	1000	700	661	528	440
	.250	23.362	800	1100	700	694	555	462
	.28125	26.189	900	1200	800	781	625	520
	.300	27.875	1000	1300	900	833	666	555
	.355	32.777	1200	1500	1100	986	788	657
	.402	36.914	1300	1700	1200	1116	893	744
	.425	38.922	1400	1700	1200	1180	944	787
	.484	44.020	1600	2000	1400	1344	1075	896
10	.209	21.855	600	800	550	522	418	348
	.21875	22.851	700	800	600	546	437	364
	.238	24.813	750	900	650	595	476	396
	.250	26.032	750	1000	650	625	500	416
	.270	28.057	800	1000	700	675	540	450
	.283	29.369	900	1100	750	707	566	471
	.308	31.881	1000	1200	800	770	616	513
	.3125	32.332	1000	1200	800	781	625	520
	.340	35.077	1100	1300	900	850	680	566
10-3/4	.220	24.741	600	800	550	511	409	341
	.250	28.035	700	900	600	581	465	387
11	.224	25.780	600	800	550	509	407	339
	.250	28.702	700	900	600	568	454	378
	.28125	32.196	800	1000	700	639	511	426
	.3125	35.670	900	1100	750	710	568	473
	.340	38.709	900	1200	800	772	618	515
11-3/4	.375	45.557	1000	1200	800	797	638	531
	.435	52.568	1100	1400	1000	925	740	617
12	.243	30.512	600	800	550	506	405	337
	.250	31.372	600	800	550	520	416	347
	.28125	35.200	700	900	600	585	468	390
	.308	38.460	800	1000	700	641	513	427
	.320	39.918	800	1000	700	666	533	444
	.34375	42.793	900	1100	750	716	572	477
	.375	46.558	900	1200	800	781	625	520
12-3/4	.250	33.375	600	700	500	490	392	326
	.259	34.552	600	800	550	507	406	338
	.28125	37.453	700	800	600	551	441	367
	.3125	41.510	750	900	650	612	490	408

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† To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

TABLE 3 (Cont'd)

### A. P. I. OUTSIDE DIAMETER PLAIN END LINE PIPE (LIGHT WEIGHT) OR SPECIAL DIAMETERS

All dimensions in inches at 68 degrees Fahr.

External Diameter	Thickness	Weight per ft. Plain Ends, Lbs.	Test Pressures Lbs./Sq. In.			Working Pressures Lapweld Steel Pipe Lbs./Sq. In.		
			Steel			Steel		
			Lap Weld and Grade "A" Seamless	Grades "B" and "C" Seamless	O. H. Iron and Wrt. Iron Lap Weld	Fiber Stress 12,500 #/□ Safety Factor of 4	Fiber Stress 10,000 #/□ Safety Factor of 5	Fiber Stress 8,333 #/□ Safety Factor of 6†
13	.250	34.043	600	.....	500	480	384	320
	.259	35.243	600	.....	550	498	398	332
	.281	38.171	700	.....	600	540	432	360
	.320	43.335	800	.....	650	615	492	410
	.340	45.971	800	.....	700	653	523	435
	.359	48.467	900	.....	700	690	552	460
	.380	52.523	1000	.....	800	750	600	500
14	.250	36.713	550	.....	450	446	357	297
	.276	40.454	600	.....	500	492	394	328
	.284	41.602	600	.....	550	507	405	338
	.310	45.325	700	.....	600	553	442	369
	.328	47.894	700	.....	600	585	468	390
	.34375	50.136	750	.....	650	613	491	409
15	.250	39.383	500	.....	450	416	333	277
	.291	45.714	600	.....	500	485	388	323
	.320	50.171	650	.....	550	533	426	355
	.34375	53.807	700	.....	600	572	458	381
16	.250	42.053	450	.....	400	390	312	260
	.302	50.632	550	.....	500	471	377	314
	.3125	52.357	600	.....	500	488	390	325
	.34375	57.478	650	.....	550	537	429	358
17	.3125	55.695	550	.....	500	459	367	306
	.340	60.496	600	.....	550	500	400	333
	.34375	61.160	600	.....	550	505	404	337
	.375	66.584	650	.....	600	551	441	367
18	.3125	59.032	500	.....	450	434	347	289
	.34375	64.821	550	.....	500	477	381	318
	.375	70.589	600	.....	550	520	416	347
20	.375	78.599	600	.....	500	468	375	312
22	.4375	100.752	600	.....	500	497	397	331
	.46875	107.792	600	.....	550	532	426	355
	.500	114.811	650	.....	600	568	454	378
24	.4375	116.703	550	.....	500	455	364	303
	.46875	117.805	550	.....	500	488	391	325
	.500	125.491	600	.....	550	520	416	347

†To obtain the working pressure for other factors of safety, multiply the pressure shown in this column by 6 and divide by the safety factor desired.

## SPECIFICATION FOR A. P. I. TUBULAR GAGES (Line Pipe)

(See Fig. 2, page 20.)

### Plug.

1. The certified master plug shall be the control and shall be a physical reproduction of the thread on the pipe. A Plug gage, within the following limits, shall be considered satisfactory. The lead and taper shall be measured over a length of axis beginning and ending not less than one full thread in from the ends of the threaded portion on gages up to two inches nominal size, inclusive, and not less than two full threads in from the ends of the threaded portion on gages over two inches nominal size.

Pitch	Lead	Taper	Pitch Diameter	$\frac{1}{2}$ Thread Angle
27	$\pm .0002''$	$+.0003''$ $-.0000''$	$\pm .0002''$	$\pm 15'$
18	$\pm .0002''$	$+.0004''$ $-.0000''$	$\pm .0004''$	$\pm 15'$
14	$\pm .0003''$	$+.0006''$ $-.0000''$	$\pm .0006''$	$\pm 10'$
$11\frac{1}{2}$	$\pm .0004''$	$+.0008''$ $-.0000''$	$\pm .0007''$	$\pm 10'$
8	$\pm .0005''$	$+.0010''$ $-.0000''$	$\pm .0010''$	$\pm 10'$

2. The above tolerances are subject to the additional condition that the cumulative error must not exceed one-third turn for gages of  $3/4''$  taper per foot. This means that if the error in any element exceeds the specified unit tolerance some other element or elements must be a sufficient amount inside of the specified tolerance to compensate for the excess error.

### Ring.

1. The ring is not standard and its definition of size is obtained by calibration from the certified master plug. To be a reliable transfer medium it must be certified for lead, taper and form of thread. A ring gage, within the following limits, shall be considered satisfactory. The lead and taper shall be measured over a length of axis beginning and ending



not less than one full thread in from the ends of the threaded portion on gages up to two inches nominal size, inclusive, and not less than two full threads in from the ends of the threaded portion on gages over two inches nominal size.

Pitch	Lead	Taper	$\frac{1}{2}$ Thread Angle
27	$\pm .0004''$	$-.0002''$ $-.0006''$	$\pm 20'$
18	$\pm .0004''$	$-.0002''$ $-.0007''$	$\pm 20'$
14	$\pm .0006''$	$-.0002''$ $-.0009''$	$\pm 15'$
$11\frac{1}{2}$	$\pm .0008''$	$-.0002''$ $-.0012''$	$\pm 15'$
8	$\pm .0010''$	$-.0002''$ $-.0014''$	$\pm 15'$

2. The above tolerances are subject to the additional condition that the cumulative error must not exceed one-third turn for gages of  $3/4''$  taper per foot. This means that if the error in any element exceeds the specified unit tolerance, some other element or elements must be a sufficient amount inside of the specified tolerance to compensate for the excess error.

### General.

1. Certified master plugs should preferably be of hardened and ground alloy steel properly heat treated and aged to prevent secular change of size.

2. Transfer ring gages up to seven inches pitch diameter may be of soft steel with chased thread.

3. Transfer ring gages over seven inches pitch diameter should preferably be of hardened and ground alloy steel. If the transfer ring is solid (not built up), a fitting plate may be attached to the large end face. If the transfer ring is solid and no fitting plate is attached the dimension "S" need not be held closely to a defined size. When fitting plate is used, the value "S" may be specified as an absolute amount at the option of the purchaser. In any case, the value "S," after calibration with the master plug, shall be stamped on the ring gage.

## AMERICAN PRACTICE FOR GAGING A. P. I. TUBULAR GOODS (1926)

(See Fig. 3)

### FOREWORD:

The Committee, (on recommendations from the A. P. I. Correlating Committee on Gages and Gaging Practice), has adopted a type of gage and a system of gaging tubular material, developed by the National Tube Company, which it is believed will eventually enable the Committee to specify the standoff of the coupling on the pipe at hand tight fit, referred to as "A" in these specifications.

As the matter now stands, this dimension "A" involves several variables; i. e., accuracy of threading on both the pipe and the coupling, material in pipe and coupling, and weight and thickness of pipe.

For example, 8-1/8" A. P. I. casing varies from .32" thick to .47" thick, or about 50 per cent increase in thickness, with a further provision that the ends of the pipe may be upset. In this case, upsetting gives a thickness at the end of the pipe more than twice the wall thickness of the .32" thick pipe. Assuming the accuracy of threading to be the same, and the couplings made from the same material, it has been found in practice that the coupling becomes tight on the heavy weight pipe much quicker than on the lighter weight pipe. To establish a definite dimension for "A" at this time does not appear to be feasible. It is hoped, however, as a result of experience, that definite values can eventually be assigned for "A" in the various thread tables contained herein.

The new type of gage is based on the fact that the plug is the master and the ring gage is only a transfer medium. The ring may be made similar to a coupling as to outside diameter, form, depth of recess, etc. The imperfect or vanishing threads of the pipe are eliminated on this type of plug gage, and instead a groove is cut, in width approximating the vanishing threads, to a depth slightly below the root of the thread on the plug gage, and the inside edge of the groove of the collar represents the last scratch of thread on the pipe and gage.

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The plug gage, being the master, is made to specified dimensions regarding outside diameter, pitch diameter, taper, form of thread, etc., and is to be certified by the Bureau of Standards at Washington. The ring, to be a reliable transfer medium, should be certified by the Bureau of Standards for

lead, taper and form of thread. The "standoff" ("S") of the ring gage from the "last scratch" on the plug gage may be specified by the purchaser as the amount equal to what he considers necessary to screw up by power and make a joint of the greatest possible strength, in which case the "S" value would be equivalent to the "A" value referred to above. The "standoff" value ("S") should in all cases be stamped on the certified ring gage after calibration by the Bureau of Standards.

Definite values have been given for the "stand-off" ("S") on certified plug and ring gages in the gage tables contained herein, to permit the stocking of master gages by gage manufacturers. There are also many manufacturers catering to a varied market, who supply couplings with various "A" values to suit the requirements of their customers, and for whom only one set of certified plug and ring gages, with definite "S" values, are necessary to maintain uniform working plug gages.

It should be borne in mind by the purchaser, however, that the "S" values as given for certified plug and ring gages, are not compulsory, and do not apply when gaging the product, as the "standoff" "A" (which applies only to the product) is still undetermined on all grades of tubular goods except on drill pipe, for which definite "A" values have been included in the drill pipe thread tables.

### Gaging Pipe.

1. The certified master plug gage represents the A. P. I. Standard dimensions.

2. The distance "g" from last scratch (Fig. 2) of thread to gage point is fixed by the standardization as equal to the imperfect threads.

3. The ring gage has no standardized effective size. It has only its comparative step value "S" (Fig. 3) which may be determined to suit the gage user.

4. The certified transfer ring gage shall stand off from the last scratch of thread on the pipe an amount equal to the distance "S" (as determined from the certified Master plug, Detail 4, Fig. 3), plus or minus the allowable tolerance for the product; this insures that the pipe or working Plug Gage is a duplication of the master plug thread.

5. A coupling or working ring gage shall stand off from the last scratch of thread on the pipe an amount equal to the distance "A" (as determined from the certified Master plug, Detail 3, Fig. 3),

plus or minus the allowable tolerance for the product. Distance "A" in this case is the number of threads exposed beyond end of coupling, hand tight, desired by manufacturer to suit his material.

6. In case of dispute, no readings of thread size will be acceptable unless the transfer from the certified master plug is accomplished by a ring gage with Bureau of Standards certification of lead, angle and taper as specified.

### Gaging Couplings.

1. The effective diameter of the thread of the coupling, except for drill pipe, is not standardized. Each manufacturer of couplings shall determine what value of stand-off "A" is best suited to his material and methods of manufacture, basing his value "A" to produce a tight and full strength joint when the last scratch of thread of the Standard Pipe is buried the required distance under the end of his coupling.

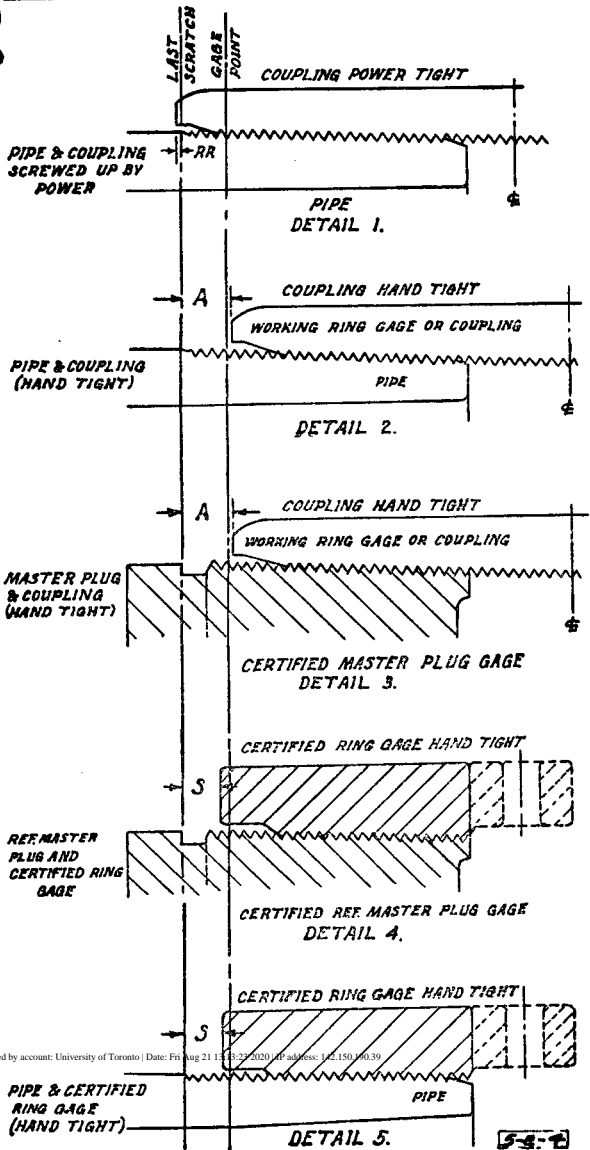
2. A certified master plug shall stand out of the coupling or working ring gage an amount equal to the determinate distance "A" (Detail 3, Fig. 3), plus or minus the allowable tolerance on the product.

3. A working plug gage shall be calibrated by a ring transfer from a certified master plug gage (Detail 5, Fig. 3). The working plug gage shall stand out of the coupling an amount equal to the determinate distance "A" (Detail 2, Fig. 3), plus the working gage calibration plus or minus the allowable tolerance on the product.

4. The manufacturer shall furnish on request to purchasers of his product the nominal value of the determinate "A" (Detail 3, Fig. 3).

5. In case of dispute no readings will be acceptable other than those determined from a certified master plug gage as in Detail 3, Fig. 3.

**SPECIAL NOTE:** *After sufficient experience has been obtained by this method of gaging, it is contemplated that definite values may be assigned to dimension "A" as applied to line pipe.*



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Fig. 3.  
AMERICAN PRACTICE FOR GAGING OF A. P. I. TUBULAR GOODS.

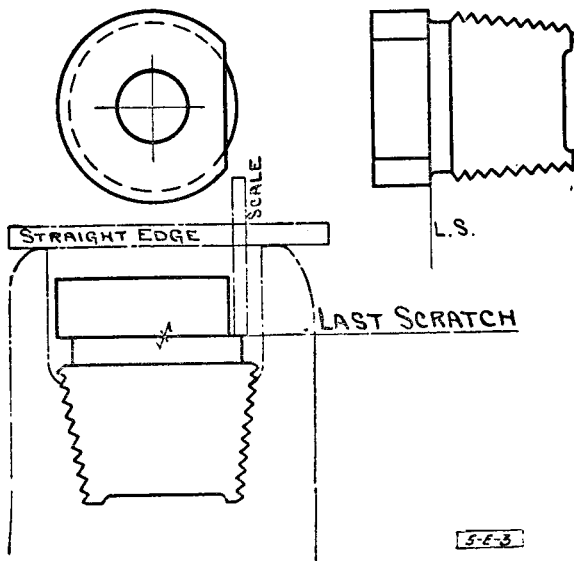
GAGING PRODUCTS USED WITH A. P. I.  
TUBULAR GOODS

Fig. 4.

1. For the gaging of products used with A. P. I. Tubular Goods other than standard couplings, it may be desirable to represent the last scratch of thread on the master plug by a male step. A permissible method is shown in Fig. 4.

## DIMENSIONAL SYMBOLS FOR TUBULAR GOODS

All Dimensions Expressed in Inches at 68  
Degrees Fahr.

**A**=Stand-off of coupling from last scratch at hand-tight fit. (Product only.)

### Threads

**B**=Number of threads per inch. (Gages or product.)

**b**=Included taper; inches per foot. (Gages or product.)

**C**=Pitch diameter at gage point; equals "D" minus "h." (Gages or product.) (See Special Note.)

**D**=Major or crest diameter of thread at gage point (after truncation); equal to "C" plus "h." (Gages or product.) (By "truncation" is meant the flattening or rounding of thread root and thread crest, as distinguished from the sharp "V" crest and root.) (See Special Note.)

**d**=Minor or root diameter of thread at gage point (after truncation.) (Gages or product.) (See Special Note.)

**E**=Length of perfect threads. (Gages or product.)

**e**=Length of thread imperfect at top and perfect at bottom.

**F**=Effective length of thread; equal to "E" plus "e." (Gages or product.)

**f**=Length of vanishing threads.

**G**=Total length of threads.

**g**=Length of vanishing threads plus imperfect threads; equal to "G" minus "E." (Product only.)

**G.P.**=Gage Point. (Gages or product.) Location at "G" minus "g."

**H**=Theoretical height of thread (before truncation). Measured perpendicular to the axis.

**h**=Height of thread after truncation; or equal to  $(D-d)/2$  on the product. On gages it is measured from the crest of the thread on the plug to the crest of the thread on the ring at any given diameter. (See Special Note, page 36).

**P**=Pitch, equals distance between corresponding points on any two consecutive (perfect) threads, measured parallel to the axis; equal to  $1/B$ .

### Dimensions of Product

- O.D.=Outside diameter of pipe. (Product only.)  
 I.D.=Inside diameter of pipe. (Product only.)  
 U.D.=Outside diameter of external upset. (Product only.)  
 M.D.=Inside diameter at end of internal upset. (Product only.)  
 N.D.=Inside diameter, full, of internal upset. (Product only.)  
 J=Distance of end of pipe from center of coupling, made up. (Product only.)  
 K=Wall thickness. (Product only.)  
 K.K.=Thickness of wall at end of pipe, to top of thread. (Product only.)  
 L=Diameter at end of pipe at crest of threads. (Product only.)  
 L.L.=Diameter at end of pipe at root of threads; equal to "L" minus "2h." (Product only.)  
 M=Length of upset. (Product only.)  
 m=Length of taper on upset. (Product only.)  
 N=Length of Coupling. (Product only.)  
 O=  
 P=Pitch. (See above.)  
 C.D.=Outside diameter of coupling. (Product only.)  
 Q=Diameter of recess in coupling. (Product only.)  
 q=Depth of recess in coupling. (Product only.)  
 R=Width of bearing face on coupling. (Product only.)  
 R.R.=Distance, end of coupling beyond last scratch, made up by power. (Product only.)

### Gage Dimensions

- S=Stand-off or step value of ring gage from last scratch at hand tight fit. (Gage only.)  
 T.P.=Total length of plug gage. (Gage only.)  
 T.R.=Total length of ring gage. (Gage only.)  
 T=  
 U=Width of notch in A. P. I. Gages. (Gages only.)

SPECIAL NOTE: Symbols "D", "h", and "d" can be used on either gages or product, but the numerical value of the dimensions may vary between the gages and the product, inasmuch as the height of thread "h" (which influences the major diameter "D" and minor diameter "d") is truncated a larger amount on the gage than on the product, in order to avoid interference.



## APPENDIX

The foregoing specifications are for the use of all manufacturers desiring to use them.

Manufacturers desiring to warrant that articles manufactured or sold by them conform with these specifications may under certain conditions obtain the license to use the Official A. P. I. monogram.

The following resolutions adopted by the Board of Directors of the American Petroleum Institute on Oct. 20, 1924, embody the purpose and conditions under which such official monogram may be used.

WHEREAS, There has been a movement in the petroleum industry to simplify, standardize and improve oil country drilling equipment and methods; and

WHEREAS, The co-operation of the American Petroleum Institute was sought in order that there might be a national forum for the discussion, consideration and adoption or rejection of such proposed standards; and

WHEREAS, It appears desirable that the American Petroleum Institute adopt an official monogram to be used for identifying materials that comply with such standards or specifications (where such specifications or standards call for the use of such monogram), that may hereafter be adopted by the Board of Directors of the American Petroleum Institute; and

WHEREAS, It also appears desirable that the use of such monogram be encouraged wherever and whenever possible to inform the public that material so marked is manufactured in accordance with such specifications;

NOW, THEREFORE, BE IT RESOLVED, That the following monogram is hereby adopted as the official monogram of the American Petroleum Institute; and be it further



RESOLVED, That the words "Official Publication" shall be incorporated with said monogram on all such standards and specifications that may hereafter be adopted and published by the American Petroleum Institute, as follows:



BE IT FURTHER RESOLVED, That the General Secretary or Assistant General Secretary be and they are hereby directed to authorize anyone desiring to do so to use such monogram under the following conditions:

Anyone desiring to use the monogram of the American Petroleum Institute shall apply to the American Petroleum Institute, 250 Park Ave., New York City, using the form shown below, entitled: "Application to use official monogram of the American Petroleum Institute." Upon receipt of this application, properly acknowledged, the General Secretary or Assistant General Secretary shall issue a certificate of authority to use the said monogram in the form shown below, entitled: "Certificate of Authority to use official monogram of the American Petroleum Institute."

BE IT FURTHER RESOLVED, That the Board of Directors of the American Petroleum Institute reserves the right to modify or change the said monogram and to revoke the right or license to use it on the part of any manufacturer for any reason satisfactory to the Board of Directors.

**APPLICATION TO USE OFFICIAL MONOGRAM OF THE  
AMERICAN PETROLEUM INSTITUTE**

The American Petroleum Institute,  
250 Park Ave., New York City\*.

Gentlemen:

In consideration of the American Petroleum Institute granting us (me) the right to use the official monogram of the American Petroleum Institute in the manufacturing of..... we (I) agree that the use of this monogram is a representation that material so marked complies with all of the conditions and specifications contained in the official publication of the Institute entitled .....

.....including any amendments or modifications that may hereafter be adopted.

We (I) further agree that no material which fails to comply with such specifications shall be so marked.

.....  
(Name of Company)

.....  
(Authorized Agent or Officer)

State of..... }  
County of..... } ss:

Acknowledged and sworn before me

this.....day of.....19.....

Notary Public

— 0 —

**CERTIFICATE OF AUTHORITY TO USE OFFICIAL  
MONOGRAM OF THE AMERICAN PETROLEUM  
INSTITUTE**

The American Petroleum Institute hereby grants to.....

.....the right to use the following monogram as specified in official publication of the American Petroleum Institute entitled ....., adopted by the Board of Directors, on....., including any amendments or modifications that may hereafter be adopted, with the understanding that the use of this monogram is a representation that the material so marked complies with the said specifications, and provided further, that no material which fails to comply with the said specifications shall be so marked.



The American Petroleum Institute reserves the right to revoke this license to use the above monogram for any reason satisfactory to the Board of Directors of the American Petroleum Institute.

Issued at New York....., 192.....

**AMERICAN PETROLEUM INSTITUTE,**

**(SEAL)**

**Assistant General Secretary.**

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\* NOTE: To save time, applications to use the A. P. I. monogram should be mailed to the Division of Standardization, American Petroleum Institute, 1508 Kirby Building, Dallas, Texas.

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