Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads

API SPECIFICATION 5B
FIFTEENTH EDITION, APRIL 2008

EFFECTIVE DATE: OCTOBER 1, 2008

REAFFIRMED, APRIL 2015

AMERICAN PETROLEUM INSTITUTE

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Upstream Segment

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This fifteenth edition of API Spec 5B contains the following changes to the previous edition:

- Addendum 1, March 2004, and Errata, April 9, 1998, of the fourteenth edition are included in the text.
- Added SR22 in Appendix D.
- New metric tables added in Appendix E.
- New metric drawings added in Appendix F.
- Text formatted to a single column.
- Moved Extreme-Line Casing to Appendix G.
- Changed Pin Chamfer Angle from 65° to 60° (Agenda Item 3067).
- Additional editorial items.

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1 Scope

1.1 COVERAGE

This Specification covers dimensions and marking requirements for API Master thread gauges. Additional product threads and thread gauges as well as instruments and methods for the inspection of threads for line pipe, round thread casing, buttress casing, and extreme-line casing connections are included. It is applicable when so stipulated in the API standard governing the product. The inspection procedures for measurements of taper, lead, height, and angle of thread are applicable to threads having $11^1/2$ or less turns per in. ($11^1/2$ or less turns per 25,4 mm). All thread dimensions shown without tolerances are related to the basis for connection design and are not subject to measurement to determine acceptance or rejection of product.

By agreement between the purchaser and manufacturer, the supplemental requirements for Enhanced Leak Resistance LTC in SR22 shall apply.

1.2 INSPECTION

Thread inspection applies at the point of manufacture prior to shipment, to inspection at any intermediate point, to inspection subsequent to delivery at destination, and to inspection by inspectors representing the purchaser or the manufacturer. The manufacturer may, at his or her option, use other instruments or methods to control manufacturing operations; but acceptance and rejection of the product shall be governed solely by the results of inspection made in accordance with the requirements of this Specification.

1.3 OTHER REQUIREMENTS

The applicable product specification should be consulted for requirements not given herein.

2 References

2.1 GENERAL

This Specification includes by reference, either in total or in part, the most recent editions of the following standards.

API

RP 5A3	*Recommended Practice on Thread Compounds for Casing, Tubing and Line Pipe*
RP 5B1	*Gauging and Inspection of Casing, Tubing, and Line Pipe Threads*
RP 5C1	*Care and Use of Casing and Tubing*
Spec 5CT	*Specification for Casing and Tubing*
Spec 5L	*Specification for Line Pipe*

ASME[1]

B1.3M	*Screw Thread Gauging Systems for Dimensional Acceptability—Inch and Metric Screw Threads*

2.2 REQUIREMENTS

Requirements of other standards included by reference in this Specification are essential to the safety and interchangeability of the equipment produced.

3 Definitions

3.1 defect: Imperfection of sufficient magnitude to warrant rejection of the product based on the stipulations of the applicable specification.

3.2 imperfection: Discontinuity or irregularity in the product detected by methods outlined in the applicable specification.

3.3 may: Used to indicate that a provision is optional.

[1]ASME International, 3 Park Avenue, New York, New York 10016, www.asme.org.

3.4 shall: Used to indicate that a provision is mandatory.

3.5 should: Used to indicate that a provision is not mandatory, but recommended as good practice.

4 Thread Dimensions and Tolerances

4.1 LINE PIPE, ROUND THREAD CASING AND TUBING, AND BUTTRESS THREAD CASING

4.1.1 Thread Measurement

Thread length shall be measured parallel to the thread axis; thread height and taper diameter shall be measured approximately normal to the thread axis; lead of line pipe and round threads shall be measured parallel to the axis along the pitch cone and, for buttress threads, parallel to the thread axis, approximately along the pitch cone, for both the external and the internal thread. On line pipe and round threads, the included taper shall be measured on the diameter along the pitch cone and, for buttress threads, on the diameter along the minor cone for the external thread and the major cone for the internal thread. For gauging procedure, see Section 5.

4.1.2 Visual Inspection

Threads shall be free from visible tears, cuts, grinds, shoulders, or any other imperfections which break the continuity of the threads, within the minimum length of full crest threads from the end of pipe (L_c) and within the interval from the recess or counterbore to a plane located at distance J + one thread turn from the center of the coupling, or from the small end of the thread in the box of integral-joint tubing. Superficial scratches, minor dings and surface irregularities that do not affect the continuity of thread surfaces are occasionally encountered and may not necessarily be detrimental. Because of the difficulty in defining superficial scratches, minor dings and surface irregularities, and the degree to which they affect thread performance, no blanket waiver of such imperfections can be established. As a guide to acceptance, the most critical consideration is to ensure that there are no detectable protrusions on the threads that can peel off the protective coating on the coupling threads or score mating surfaces. Cosmetic repair of thread surfaces by hand is permitted. Imperfections between the L_c length and the vanish point are permissible providing their depth does not extend below the root cone of the thread; or extend beyond $12^1/2$% of specified pipe wall thickness (measured from the projected pipe surface), whichever is greater. Grinding to probe imperfections or to eliminate defects is also permitted in this area, with the depth of grind having the same limits as imperfections in this area. Imperfections include such other discontinuities as seams, laps, pits, tool marks, dents, handling damage, etc. Minor pitting and thread discoloration may also be encountered in any part of the threaded area and may not necessarily be detrimental. Because of the difficulty in defining pitting and discoloration and the degree to which they affect thread performance, no blanket waiver of such imperfections can be established. As a guide to acceptance, the most critical considerations are that any corrosion products protruding above the surface of the threads be removed and that no leak path exists. Filing or grinding to remove pits is not permitted.

Imperfections within the above described permissible limits shall be permitted under the following conditions:

a. If imperfections are detected at the mill, the pipe end with imperfections must be the end with the exposed pipe threads. No imperfections detected at the mill are permitted on the coupling end of the pipe, except as otherwise provided in 4.1.2c.

b. Imperfections within the above limits are acceptable on the end with the exposed pipe threads. Imperfections running under the coupling, which are detected after shipment from the mill, are not acceptable unless it can be demonstrated that the imperfection is within the above described permissible limit. If the imperfection is within the permissible limits the coupling may be reapplied and the length of pipe is an acceptable product. If the imperfection exceeds permissible limits, it shall be considered a defect and the length of pipe is rejectable, or it may be reconditioned by cutting the threads off, rethreading and reapplying the coupling.

c. Imperfections that would run under the coupling shall be removed by grinding prior to threading, provided the grind is well contoured with the circumference of the pipe and displays a high degree of workmanship. Such grinding shall not be considered an imperfection. Because of the difficulty in defining acceptable contours and a high degree of workmanship, user discretion shall govern.

Note: User discretion applies only to the contour of the grind.

4.1.3 Thread Precision

Threads shall be cut with such precision of form and dimensions and with such finish as to make a tight connection when properly made up power-tight using a high-grade thread compound. On casing and tubing, the thread compound shall meet or exceed the performance requirements of the latest edition of API RP 5A3 *Recommended Practice on Thread Compounds for Casing, Tubing and Line Pipe*. For tubing, the connection shall be capable of being made up power-tight and unscrewed four times without injury to the threads by galling. It should not be expected that threaded connections will gauge properly after being made up power-tight, therefore minor deviations from the specified tolerances should be accepted. Subsequent use of tubing is reviewed in the latest edition of API RP 5C1 *Care and Use of Casing and Tubing* (paragraphs applicable to threads).

A $^3/_8$ in. (9,52 mm) high equilateral triangle die stamp shall be placed at a distance of L_4 + $^1/_{16}$ in. (1,59 mm) from each end of size 16, 18$^5/_8$ and 20 8-round thread casing in Grades H40, J55, and K55. However, the position of the coupling with respect to the base of the triangle shall not be a basis for acceptance or rejection. For buttress casing, a triangle stamp shall be applied as indicated in Figure 5 and shall be used as a means of make-up acceptance or rejection. Unless otherwise specified on the purchase order, the triangle mark may be replaced with a transverse white paint band $^3/_8$ in. (9,52 mm) wide by 3 in. (75 mm) long.

Note: A tight connection is one which, when properly made up power-tight using a high-grade thread compound, shows no leaks at ambient temperature at any pressure up to and including the specified hydrostatic test pressure.

4.1.4 Thread Design

Threads shall be right-hand and shall conform to the dimensions and tolerances specified herein.

Note: In the design of round thread casing connections, values for total thread length L_4 are derived from calculations based on providing a theoretical wall thickness at the root of the thread at the end of the pipe as determined by the following formula:

t_o = 0.009D + 0.040 in. (0,009D + 1,02 mm) or 0.090 in. (2,29 mm), whichever is greater,

t_o = basic wall thickness at the root of the thread at the end of the pipe in inches (mm),

D = specified outside diameter of casing, in inches (mm).

The theoretical wall thickness t_0 is related to a basis of connection design only and is not a specification value. It is not subject to measurement or application of tolerances.

"p" is defined as the distance from a point on a nominal thread form to a corresponding point on the next thread, measured parallel to the axis. This value can be calculated by dividing 1 in. (25,4 mm) by the number of threads per 1 in. (25,4 mm).

4.1.5 Chamfer

The angle (60 degrees) of the outside chamfer at the end of the pipe shall be as shown in Figures 2, 3, 5 or 5M and 8 and must extend a full 360 degrees around the face of the pipe. The diameter of the chamfer shall be such that the thread root shall run out on the chamfer and not on the face of the pipe and shall not produce a feather edge.

4.1.6 Internal Thread

The root of the coupling thread shall start within the area of the ID chamfer and extend to the center of the coupling. The length of thread in the box end of integral-joint tubing shall not be less than L_4 + J from the face of the box. The internal threads within the interval from the recess or counterbore to a place located at distance J + one thread turn from the center of the coupling, or from the small end of the thread in the box of integral-joint tubing, shall conform to the requirements of Section 4.

4.1.7 Thread Finish

The threads in steel coupling for line pipe nominal sizes 2 and larger and in all sizes of casing and tubing coupling shall be zinc or tin electroplated or phosphated to minimize galling and develop the maximum leak resistance characteristics of the connection. Either the box or the pipe male end of accessories and integral-joint tubing shall be zinc or tin electroplated, or phosphated, or processed by some other acceptable method which will minimize galling and develop the maximum leak resistance characteristics of the connection. Where tin, or other ductile coating in excess of 0.001 in. (0,03 mm) are used, the thread tolerance and standoff apply only to the uncoated threads. In some instances, coatings in excess of 0.001 in. (0,03 mm) thickness are being used and accurate gauging is impractical. The maximum thickness of electroplated tin coatings shall not exceed 0.006 in. (0,15 mm). Taper, standoff and OD dimensions may be affected by power-tight make-up. Deviations from the specified tolerance for these dimensions may be expected after power-tight make-up.

4.1.8 Thread Control

All threads shall be controlled by API gauges in accordance with gauging practice requirements in Section 6.

4.1.9 Thread Elements

Thread elements for all threads except line pipe threads finer than 11 1/2 threads per in. (11 1/2 threads per 25,4 mm) shall be subject to inspection in accordance with Section 5.

Note: With respect to thread elements, line pipe threads finer than 11 1/2 threads per in. (11 1/2 threads per 25,4 mm), nominal pipe sizes smaller than size 1, only the requirements on thread length and standoff are subject to inspection.

4.1.10 Misalignment

The maximum misalignment of the axis of coupling threads measured in the plane of the coupling face shall not exceed 0.031 in. (0,79 mm) for casing and tubing couplings. The maximum angular misalignment in line pipe couplings nominal size 6 and larger and in all sizes of couplings for casing and tubing shall not exceed 3/4 in. per 20 ft (31,25 mm per 10 m) of projected axis. Concentricity and alignment tests may be made in accordance with the requirements in Section 5 or any other method giving an equal degree of accuracy may be used.

4.1.11 Misalignment Tests (Options)

If so requested by the inspector representing the purchaser, either of the methods of misalignment tests as defined in Section 5 shall be made on one coupling from each lot of 100 couplings or less of each size. If any coupling fails, two additional couplings from the same lot may be tested, both of which shall conform with the specified requirements; otherwise, the lot shall be rejected. The manufacturer may elect to test each coupling in the rejected lot. The term lot as used in this paragraph is defined as 100 consecutive pieces manufactured on the same piece of equipment.

4.1.12 Misalignment Rejects (Purchaser Option)

The purchaser shall have the right to reject pipe on which he considers the pin threads to be out of alignment to a degree which would adversely effect the performance of the pipe. The criteria for rejection shall be some demonstration that axial misalignment exceeds 0.031 in. (0,79 mm), or the angular misalignment exceeds 3/4 in. per 20 ft (31,25 mm per 10 m) of projected axis, or by a check of whether the minimum length of full crest threads (L_c) is present.

4.1.13 Full Crested Thread Length

The required minimum length of full crest threads is defined by L_c in Tables 3, 6 or 6M, 7 or 7M, 9, 12, 13, 14 and 15.

Threads that are not fully crested have historically been and continue to be referred to as “black crest threads” because the original mill surface has not been removed. The term “black crest thread” is a useful descriptive term; however, it should be pointed out that there can also be non-full crested threads that are not black crested. Threads within the L_c area that are not full crested or still show the original outside diameter of the pipe or upset surface shall not be made to appear full-crested either mechanically or by hand.

4.1.14 Hand-Tight Connection

A hand-tight connection is defined as a threaded connection that has been made up by hand without the aid of excessive force. Hand-tight standoff “A” is the nominal make-up position of two nominal parts which is achieved at initial mechanical interference.

4.1.15 Rounded Nose

In lieu of the conventional corner breaks on the ends of threaded tubing, the “Round” or “Bullet-nose” profile, specified on Table 16 may be supplied at the manufacturer's option or may be specified by the purchaser. The modified profile shall be rounded to provide for coatable service and the radius transition shall be smooth with no sharp corners, burrs, or slivers on the ID or OD chamfer surfaces. The dimensions listed in Table 16 are recommended values but are not subject to measurement to determine acceptance or rejection of the product.

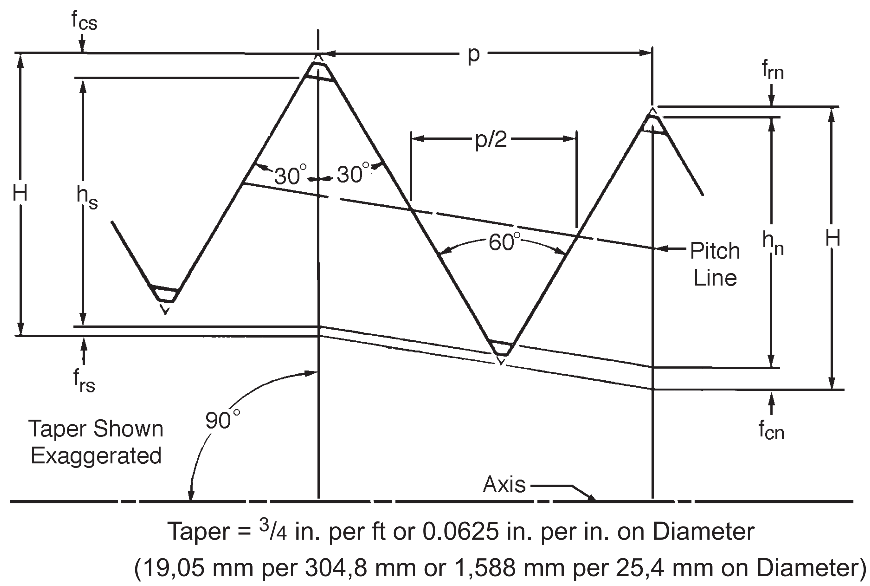


Figure 1—Line Pipe Thread Form
(See Table 1 or Table 1M for dimensions.)

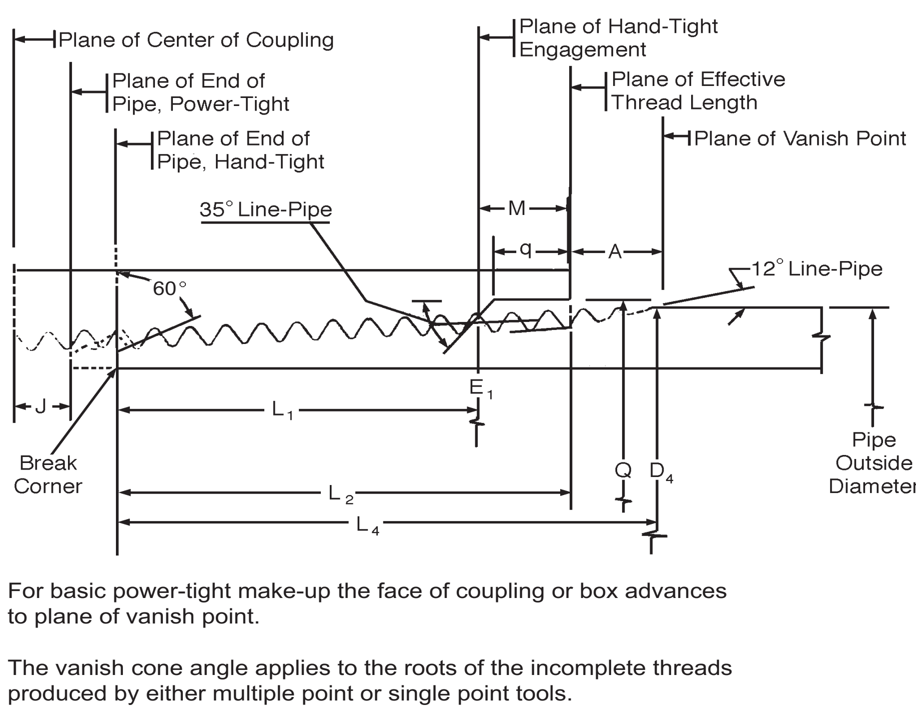


Figure 2—Basic Dimensions of Line Pipe Thread Hand-Tight Make-Up

Table 1—Line Pipe Thread Height Dimensions

All dimensions in inches. See Figure 1.

(1)	(2)	(3)	(4)	(5)	(6)
Thread Element	27 Threads per in. $p = 0.0370$	18 Threads per in. $p = 0.0556$	14 Threads per in. $p = 0.0714$	$11^{1}/_{2}$ Threads per in. $p = 0.0870$	8 Threads per in. $p = 0.1250$
$H = 0.866p$	0.0321	0.0481	0.0619	0.0753	0.1082
$h_s = h_n = 0.760p$	0.0281	0.0422	0.0543	0.0661	0.0950
$f_{rs} = f_{rm} = 0.033p$	0.0012	0.0018	0.0024	0.0029	0.0041
$f_{cs} = f_{cn} = 0.073p$	0.0027	0.0041	0.0052	0.0063	0.0091

Note: Calculations for H, h_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with 0.125 in. pitch and $^{3}/_{4}$ in. per ft taper or less.

Table 2—Tolerances on Line Pipe Dimensions[c]

(1) Element		(2) Tolerances
Taper:[d]		
	Per ft on Diameter (0.750 in.)	+0.0625 in. –0.0312 in.
	Per in. on Diameter (0.0625 in.)	+0.0052 in –0.0026 in.
Lead:[a,d]		
	Per in.	±0.003 in.
	Cumulative	±0.006 in.
Height:[d]		
	h_s and h_n	+0.002 in. –0.006 in.
Angle, included		$\pm 1^{1}/_{2}$ deg.
Length, L_4 (external thread):[b]		±1p
Chamfer:[d]		±5 deg.
Standoff, A:		See 6.1.4

[a]For pipe (external threads) the lead tolerance per in. is the maximum allowable error in any in. within the length $L_4 - g$. See Table 18 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length $L_4 - g$. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling.

[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.

[c]Tolerances apply to both external and internal threads except where otherwise indicated.

[d]Not applicable to line pipe smaller than nominal size 1.

Table 3—Line Pipe Thread Dimensions

All dimensions in inches, except as indicated. See Figure 2.

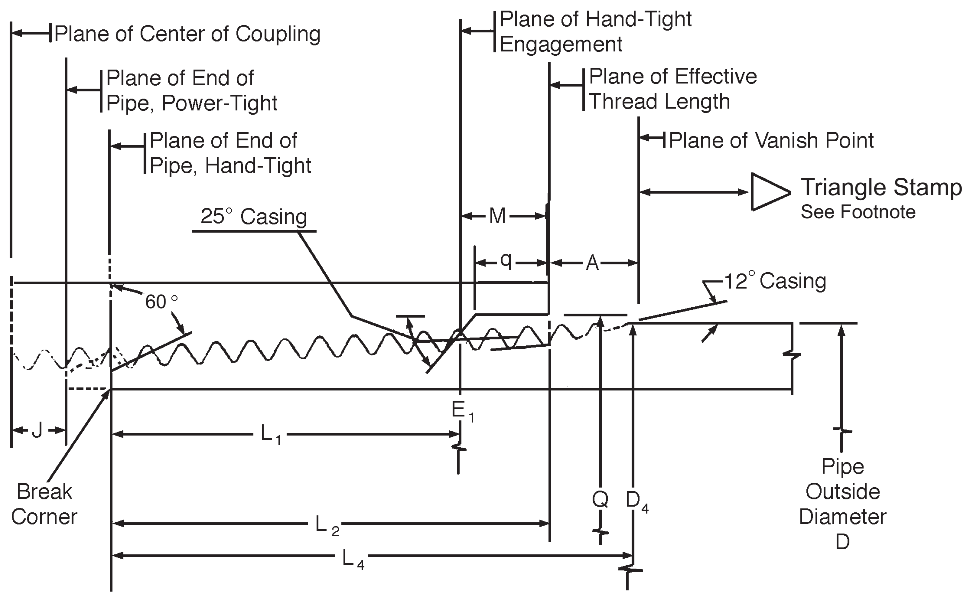
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length: Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1/8	0.405	27	0.1615	0.2639	0.3924	0.37360	0.1389	0.1198	0.468	0.0524	3	—
1/4	0.540	18	0.2278	0.4018	0.5946	0.49163	0.2179	0.2001	0.603	0.1206	3	—
3/8	0.675	18	0.240	0.4078	0.6006	0.62701	0.2119	0.1938	0.738	0.1147	3	—
1/2	0.840	14	0.320	0.5337	0.7815	0.77843	0.2810	0.2473	0.903	0.1582	3	—
3/4	1.050	14	0.339	0.5457	0.7935	0.98887	0.2690	0.2403	1.113	0.1516	3	—
1	1.315	11 1/2	0.400	0.6828	0.9845	1.23863	0.3280	0.3235	1.378	0.2241	3	0.3325
1 1/4	1.660	11 1/2	0.420	0.7068	1.0085	1.58338	0.3665	0.3275	1.723	0.2279	3	0.3565
1 1/2	1.900	11 1/2	0.420	0.7235	1.0252	1.82234	0.3498	0.3442	1.963	0.2439	3	0.3732
2	2.375	11 1/2	0.436	0.7565	1.0582	2.29627	0.3793	0.3611	2.469	0.2379	3	0.4062
2 1/2	2.875	8	0.682	1.1375	1.5712	2.76216	0.4913	0.6392	2.969	0.4915	2	0.6342
3	3.500	8	0.766	1.2000	1.6337	3.38850	0.4913	0.6177	3.594	0.4710	2	0.6967
3 1/2	4.000	8	0.821	1.2500	1.6837	3.88881	0.5038	0.6127	4.094	0.4662	2	0.7467
4	4.500	8	0.844	1.3000	1.7337	4.38712	0.5163	0.6397	4.594	0.4920	2	0.7967
5	5.563	8	0.937	1.4063	1.8400	5.44929	0.4725	0.6530	5.657	0.5047	2	0.9030
6	6.625	8	0.958	1.5125	1.9462	6.50597	0.4913	0.7382	6.719	0.5861	2	1.0092
8	8.625	8	1.063	1.7125	2.1462	8.50003	0.4788	0.8332	8.719	0.6768	2	1.2092
10	10.750	8	1.210	1.9250	2.3587	10.62094	0.5163	0.8987	10.844	0.7394	2	1.4217
12	12.750	8	1.360	2.1250	2.5587	12.61781	0.5038	0.9487	12.844	0.7872	2	1.6217
14D	14.000	8	1.562	2.2500	2.6837	13.87263	0.5038	0.8717	14.094	0.7136	2	1.7467
16D	16.000	8	1.812	2.4500	2.8837	15.87575	0.4913	0.8217	16.094	0.6658	2	1.9467
18D	18.000	8	2.000	2.6500	3.0837	17.87500	0.4788	0.8337	18.094	0.6773	2	2.1467
20D	20.000	8	2.125	2.8500	3.2837	19.87031	0.5288	0.9087	20.094	0.7490	2	2.3467

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 2.

*$L_c = L_4 - 0.652$in for 11 1/2 thread line pipe.

$L_c = L_4 - 0.937$ in. for 8 thread line pipe.



Notes:
1. For sizes 16, $18^5/_8$ and 20 grades H, J and K casing a $^3/_8$ in. equilateral triangle shall be die stamped at a distance of $L_4 + {}^1/_{16}$ in. from each end.
2. The vanish cone angle is optional for round threads on downhole tools.
3. For basic power-tight make-up, the face of coupling or box advances to plane of vanish point.
4. The vanish cone angle applies to the roots of the incomplete threads produced by either multiple point or single point tools.
5. TECL (Thread Element Control Length) is a measured dimension (actual total thread length—0.500 in.), therefore, not a basic design measurement.

Figure 3—Basic Dimensions of Casing Round Threads Hand-Tight Make-Up
(See Figure 4 for detail of thread form and dimensions.)

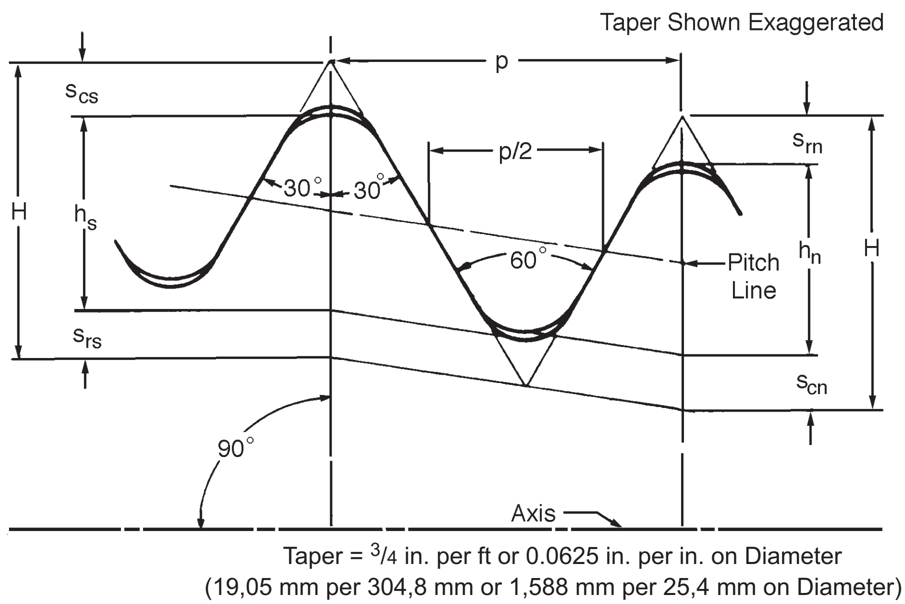


Figure 4—Casing Round Thread Form
(See Table 4 or 4M for dimensions.)

Table 4—Casing Round Thread Height Dimensions

All dimensions in inches. See Figure 4.

Thread Element	8 Threads per in. p = 0.1250 in.
$H = 0.866p$	0.10825
$H_s = h_n = 0.626p - 0.007$	0.07125
$s_{rs} = s_{rn} = 0.120p + 0.002$	0.01700
$s_{cs} = s_{cn} = 0.120p + 0.005$	0.02000

Note: Calculations for H, H_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with 0.125 in. pitch and 3/4 in. per ft taper or less.

Table 5—Tolerances on Casing Round Thread Dimensions[c]

(1)		(2)
Element		Tolerances
Taper:		
	Per ft on Diameter (0.750 in.)	+0.0625 in. –0.0312 in.
	Per in. on Diameter (0.0625 in.)	+0.0052 in. –0.0026 in.
Lead:[a]		
	Per in.	±0.003 in.
	Cumulative	±0.006 in.
Height:		
	h_s and h_n	+0.002 in. –0.004 in.
Angle, included		±1 1/2 deg.
Length, L_4 (external thread):[b]		±1p
Chamfer:		±5 deg.
Standoff, A:		See 6.1.4
Casing coupling counterbore Diameter Q, and Depth q		+0.031 in./–0.000 in.
25° angle of counterbore of bottom of coupling recess[d]		±5 deg.

[a]For pipe (external threads) the lead tolerance per in. is the maximum allowable error in any in. within the length L_4 – g. See Table 19 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 – g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling.

[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.

[c]Tolerances apply to both external and internal threads except where otherwise indicated.

[d]The criteria for rejection of the 25 degree angle at the bottom of the coupling recess shall be a demonstration that the angle exceeds the ±5 degree tolerance.

Table 6—Casing Short-Thread Dimensions

All dimensions in inches, except as indicated. See Figure 3.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Size Designation D	Major Diameter D_4	Nominal Weight: Thread and Coupling lb per ft	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length: Face of Coupling to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff, Thread Tums A	Minimum Length, Full Crest Threads from End of Pipe L_c*
$4\frac{1}{2}$	4.500	9.50	8	0.921	1.715	2.000	4.40337	1.125	0.704	$4\frac{19}{32}$	0.500	3	0.875
$4\frac{1}{2}$	4.500	Others	8	1.546	2.340	2.625	4.40337	0.500	0.704	$4\frac{19}{32}$	0.500	3	1.500
5	5.000	11.50	8	1.421	2.215	2.500	4.90337	0.750	0.704	$5\frac{3}{32}$	0.500	3	1.375
5	5.000	Others	8	1.671	2.465	2.750	4.90337	0.500	0.704	$5\frac{3}{32}$	0.500	3	1.625
$5\frac{1}{2}$	5.500	All	8	1.796	2.590	2.875	5.40337	0.500	0.704	$5\frac{19}{32}$	0.500	3	1.750
$6\frac{5}{8}$	6.625	All	8	2.046	2.840	3.125	6.52837	0.500	0.704	$6\frac{23}{32}$	0.500	3	2.000
7	7.000	17.00	8	1.296	2.090	2.375	6.90337	1.250	0.704	$7\frac{3}{32}$	0.500	3	1.250
7	7.000	Others	8	2.046	2.840	3.125	6.90337	0.500	0.704	$7\frac{3}{32}$	0.500	3	2.000
$7\frac{5}{8}$	7.625	All	8	2.104	2.965	3.250	7.52418	0.500	0.709	$7\frac{25}{32}$	0.433	$3\frac{1}{2}$	2.125
$8\frac{5}{8}$	8.625	24.00	8	1.854	2.715	3.000	8.52418	0.875	0.709	$8\frac{25}{32}$	0.433	$3\frac{1}{2}$	1.875
$8\frac{5}{8}$	8.625	Others	8	2.229	3.090	3.375	8.52418	0.500	0.709	$8\frac{25}{32}$	0.433	$3\frac{1}{2}$	2.250
$9\frac{5}{8}$	9.625	All	8	2.229	3.090	3.375	9.52418	0.500	0.709	$9\frac{25}{32}$	0.433	$3\frac{1}{2}$	2.250[a]
$9\frac{5}{8}$	9.625	All	8	2.162	3.090	3.375	9.51999	0.500	0.713	$9\frac{25}{32}$	0.433	4	2.250[b]
$10\frac{3}{4}$	10.750	32.75	8	1.604	2.465	2.750	10.64918	1.250	0.709	$10\frac{29}{32}$	0.433	$3\frac{1}{2}$	1.625[a]
$10\frac{3}{4}$	10.750	Others	8	2.354	3.215	3.500	10.64918	0.500	0.709	$10\frac{29}{32}$	0.433	$3\frac{1}{2}$	2.375[a]
$10\frac{3}{4}$	10.750	Others	8	2.287	3.215	3.500	10.64499	0.500	0.713	$10\frac{29}{32}$	0.433	4	2.375[b]
$11\frac{3}{4}$	11.750	All	8	2.354	3.215	3.500	11.64918	0.500	0.709	$11\frac{29}{32}$	0.433	$3\frac{1}{2}$	2.375[a]
$11\frac{3}{4}$	11.750	All	8	2.287	3.215	3.500	11.64499	0.500	0.713	$11\frac{29}{32}$	0.433	4	2.375[b]
$13\frac{3}{8}$	13.375	Al1	8	2.354	3.215	3.500	13.27418	0.500	0.709	$13\frac{17}{32}$	0.433	$3\frac{1}{2}$	2.375[a]
$13\frac{3}{8}$	13.375	All	8	2.287	3.215	3.500	13.26999	0.500	0.713	$13\frac{17}{32}$	0.433	4	2.375[b]
16	16.000	All	8	2.854	3.715	4.000	15.89918	0.500	0.709	$16\frac{7}{32}$	0.366	$3\frac{1}{2}$	2.875
$18\frac{5}{8}$	18.625	87.50	8	2.854	3.715	4.000	18.52418	0.500	0.709	$18\frac{27}{32}$	0.366	$3\frac{1}{2}$	2.875
20	20.000	All	8	2.854	3.715	4.000	19.89918	0.500	0.709	$20\frac{7}{32}$	0.366	$3\frac{1}{2}$	2.875[c]
20	20.000	All	8	2.787	3.715	4.000	19.89499	0.500	0.713	$20\frac{7}{32}$	0.366	4	2.875[d]

Include taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 3.

*$L_c = L_4 - 1.125$ in. for 8 round thread casing.

[a]Applicable to coupling grades lower than P110.

[b]Applicable to coupling grades P110 and higher.

[c]Applicable to coupling grades lower than J55 and K55.

[d]Applicable to coupling grades J55 and K55 and higher.

Table 7—Casing Long-Thread Dimensions

All dimensions in inches, except as indicated. See Figure 3.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation	Major Diameter	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane	Length: Effective Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter at Hand-Tight Plane	End of Pipe to Center of Coupling, Power-Tight Make-Up	Length Face of Coupling, to Hand-Tight Plane	Diameter of Coupling Recess	Depth of Coupling Recess	Hand-Tight Standoff Thread Turns	Minimum Length, Full Crest Threads from End of Pipe
D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c*
$4\frac{1}{2}$	4.500	8	1.921	2.715	3.000	4.40337	0.500	0.704	$4\frac{19}{32}$	0.500	3	1.875
5	5.000	8	2.296	3.090	3.375	4.90337	0.500	0.704	$5\frac{3}{32}$	0.500	3	2.250
$5\frac{1}{2}$	5.500	8	2.421	3.215	3.500	5.40337	0.500	0.704	$5\frac{19}{32}$	0.500	3	2.375
$6\frac{5}{8}$	6.625	8	2.796	3.590	3.875	6.52837	0.500	0.704	$6\frac{23}{32}$	0.500	3	2.750
7	7.000	8	2.921	3.715	4.000	6.90337	0.500	0.704	$7\frac{3}{32}$	0.500	3	2.875
$7\frac{5}{8}$	7.625	8	2.979	3.840	4.125	7.52418	0.500	0.709	$7\frac{25}{32}$	0.433	$3\frac{1}{2}$	3.000
$8\frac{5}{8}$	8.625	8	3.354	4.215	4.500	8.52418	0.500	0.709	$8\frac{25}{32}$	0.433	$3\frac{1}{2}$	3.375
$9\frac{5}{8}$	9.625	8	3.604	4.465	4.750	9.52418	0.500	0.709	$9\frac{25}{32}$	0.433	$3\frac{1}{2}$	3.625[a]
$9\frac{5}{8}$	9.625	8	3.537	4.465	4.750	9.51999	0.500	0.713	$9\frac{25}{32}$	0.433	4	3.625[b]
20	20.000	8	4.104	4.965	5.250	19.89918	0.500	0.709	$20\frac{7}{32}$	0.366	$3\frac{1}{2}$	4.125[c]
20	20.000	8	4.037	4.965	5.250	19.89499	0.500	0.713	$20\frac{7}{32}$	0.366	4	4.125[d]

Include taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 3.

*$L_c = L_4 - 1.125$ in. for 8 round thread casing.

[a]Applicable to coupling grades lower than P110.

[b]Applicable to coupling grades P110 and higher.

[c]Applicable to coupling grades lower than J55 and K55.

[d]Applicable to coupling grades J55 and K55 and higher.

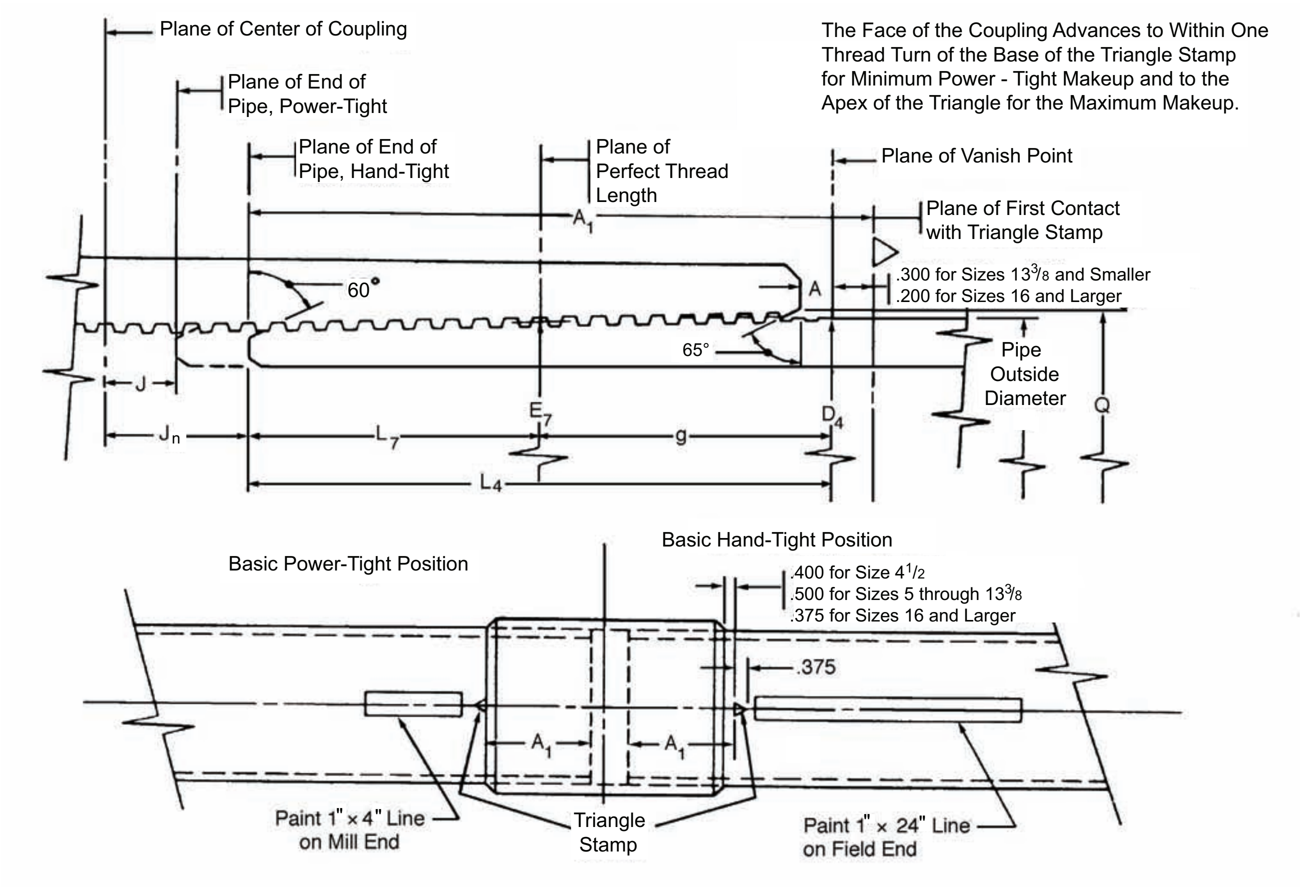


Figure 5—Basic Dimensions of Buttress Casing Threads Hand-Tight Make-Up

(See Figures 6 and 7 for detail of thread form and dimensions.)

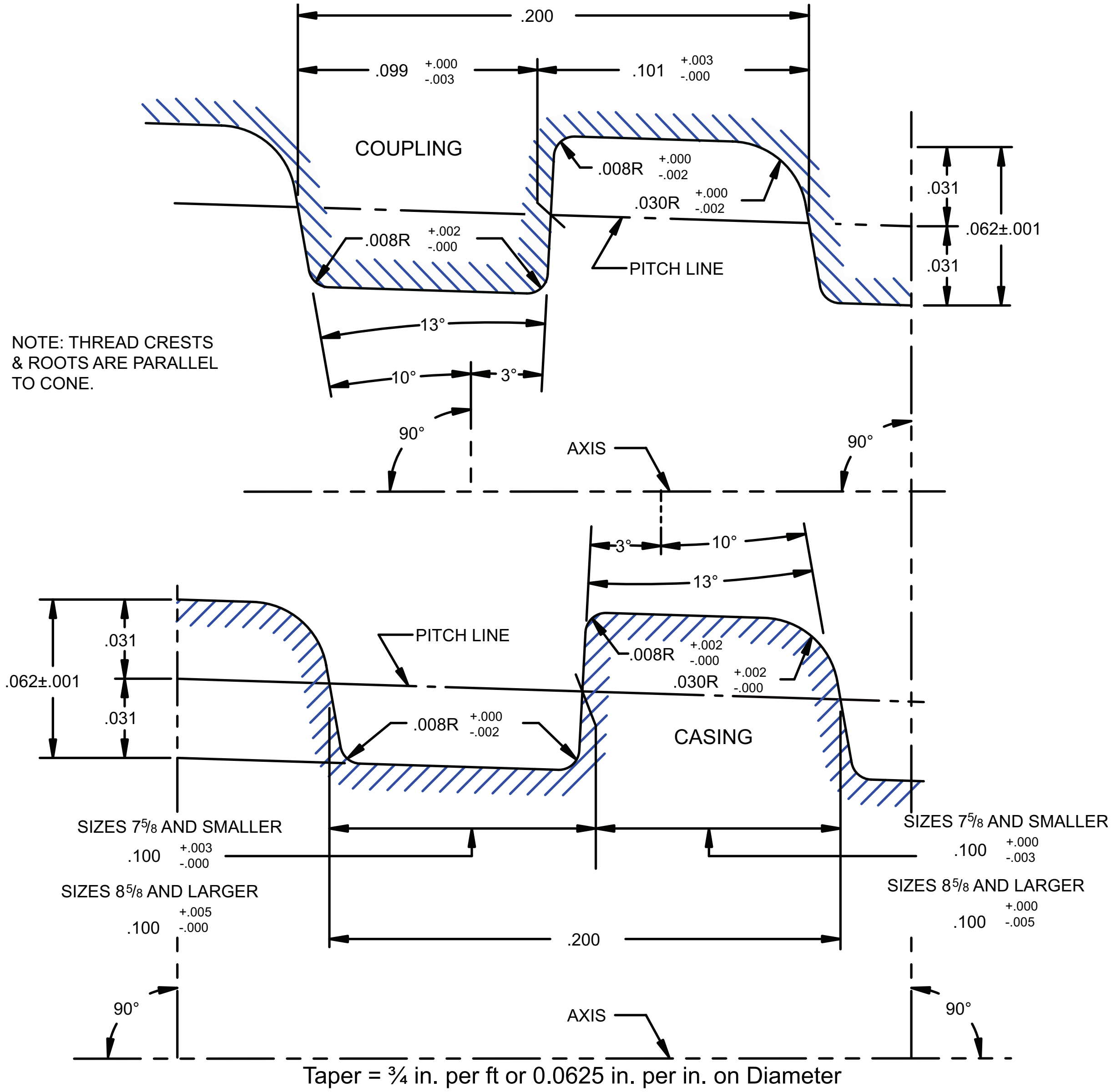
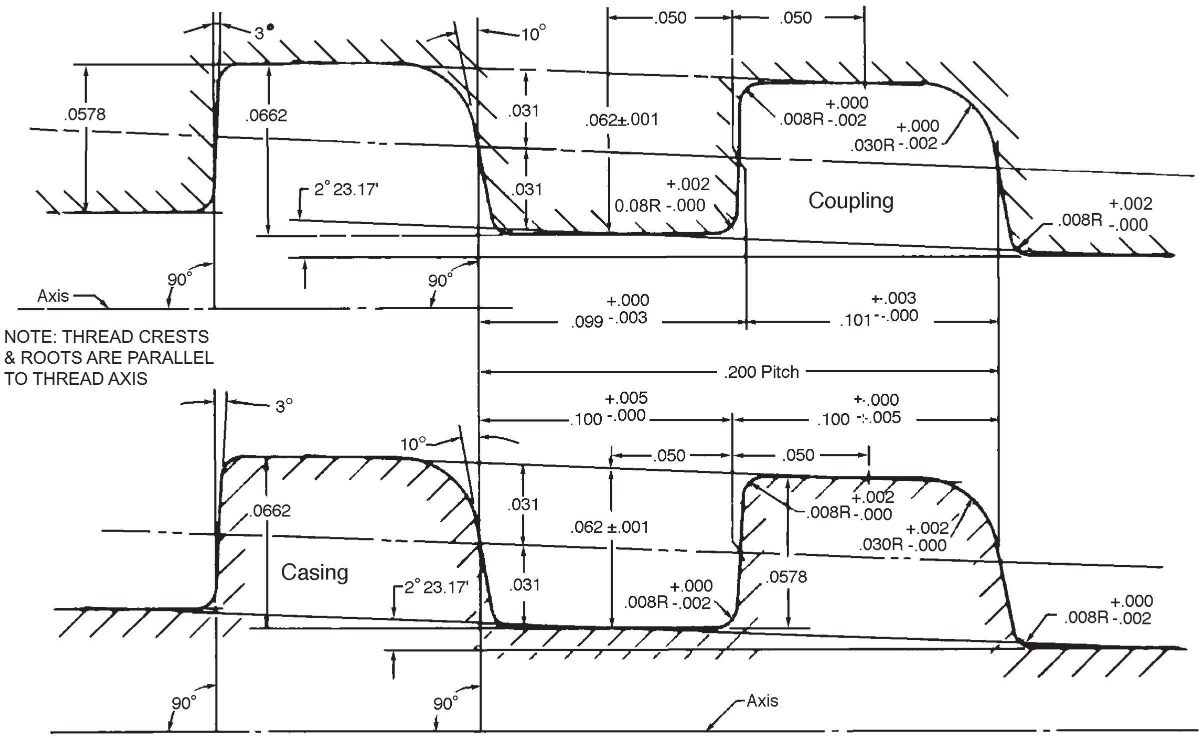


Figure 6—Buttress Casing Thread Form and Dimensions—for Casing Sizes 4½ through 13⅜

(See Figure 6M for metric units.)



Taper = 1 in. per ft or 0.0833 in. per in. on Diameter

Figure 7—Buttress Casing Thread Form and Dimensions—for Casing Sizes 16 and Larger

Table 8—Tolerances on Buttress Casing Thread Dimensions[c]

(1) Element	(2) Tolerances
Taper:	
Coupling:	
0.750 in. or 1.000 in. per ft on Diameter	+0.054 in. –0.030 in.
0.0625 in. or 0.0833 in. per in. on Diameter	+0.0045 in. –0.0025 in.
Pipe (In perfect thread length):	
0.750 in. or 1.000 in. per ft on Diameter	+0.042 in. –0.018 in.
0.0625 in. or 0.0833 in. per in. on Diameter	+0.0035 in. –0.0015 in.
Pipe (In imperfect thread length):[a]	
0.750 in. or 1.000 in. per ft on Diameter	+0.054 in. –0.018 in.
0.0625 in. or 0.0833 in. per in. on Diameter	+0.0045 in. –0.0015 in.
Lead:[b]	
Per in.	
$13^3/_8$ and smaller	±0.002 in.
16 and larger	±0.003 in.
Cumulative	±0.004 in.
Thread Height:	0.062 ±0.001
Angle, included:	±1 deg.
Length, L_4 (external thread):	
Tolerance not specified because of type of thread	
Length, A_1:	$\pm^1/_{32}$ in.
Chamfer:	
60 deg. on outside end of threaded pipe	±5 deg.
65 deg. on outside end of threaded coupling	+5 deg., –0 deg.
Standoff, A:	See 6.1.4

[a]Taper of the thread root (or “minor”) cone should not increase over the maximum tolerance at the point of intersection with the pipe outside diameter.
[b]The lead tolerance per in. is the maximum allowable error in any in. within the perfect thread length. The cumulative tolerance is the maximum allowable error over the full perfect thread length. The perfect thread length for (external and internal) threads is defined by 5.1.4.
[c]Tolerances apply to both external and internal threads except where otherwise indicated.

Table 9—Buttress Casing Thread Dimensions

All dimensions in inches, except as indicated. See Figure 5.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: Imperfect Threads g	Length: Perfect Threads L_7	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter[a] E_7	End of Pipe to Center of Coupling, Power-Tight Make-Up J	End of Pipe to Center of Coupling, Hand-Tight Make-Up Jn	Length: Face of Coupling to Plane E_7	Length: End of Pipe to Triangle Stamp A_1	Hand-Tight Standoff Thread Turns A	Diameter of Counterbore in Coupling Q	Minimum Length, Full Crest Threads from End of Pipe L_c*
4 1/2	4.516	5	1.984	1.6535	3.6375	4.454	0.500	0.900	1.884	3 15/16	1/2	4.640	1.2535
5	5.016	5	1.984	1.7785	3.7625	4.954	0.500	1.000	1.784	4 1/16	1	5.140	1.3785
5 1/2	5.516	5	1.984	1.8410	3.8250	5.454	0.500	1.000	1.784	4 1/8	1	5.640	1.4410
6 5/8	6.641	5	1.984	2.0285	4.0125	6.579	0.500	1.000	1.784	4 5/16	1	6.765	1.6285
7	7.016	5	1.984	2.2160	4.2000	6.954	0.500	1.000	1.784	4 1/2	1	7.140	1.8160
7 5/8	7.641	5	1.984	2.4035	4.3875	7.579	0.500	1.000	1.784	4 11/16	1	7.765	2.0035
8 5/8	8.641	5	1.984	2.5285	4.5125	8.579	0.500	1.000	1.784	4 13/16	1	8.765	2.1285
9 5/8	9.641	5	1.984	2.5285	4.5125	9.579	0.500	1.000	1.784	4 13/16	1	9.765	2.1285
10 3/4	10.766	5	1.984	2.5285	4.5125	10.704	0.500	1.000	1.784	4 13/16	1	10.890	2.1285
11 3/4	11.766	5	1.984	2.5285	4.5125	11.704	0.500	1.000	1.784	4 13/16	1	11.890	2.1285
13 3/8	13.391	5	1.984	2.5285	4.5125	13.329	0.500	1.000	1.784	4 13/16	1	13.515	2.1285
16	16.000	5	1.488	3.1245	4.6125	15.938	0.500	0.875	1.313	4 13/16	7/8	16.154	2.7245
18 5/8	18.625	5	1.488	3.1245	4.6125	18.563	0.500	0.875	1.313	4 13/16	7/8	18.779	2.7245
20	20.000	5	1.488	3.1245	4.6125	19.938	0.500	0.875	1.313	4 13/16	7/8	20.154	2.7245

Included taper on diameter: Sizes 13 3/8 and smaller—0.0625 in. per in.
Sizes 16 and larger—0.0833 in. per in.

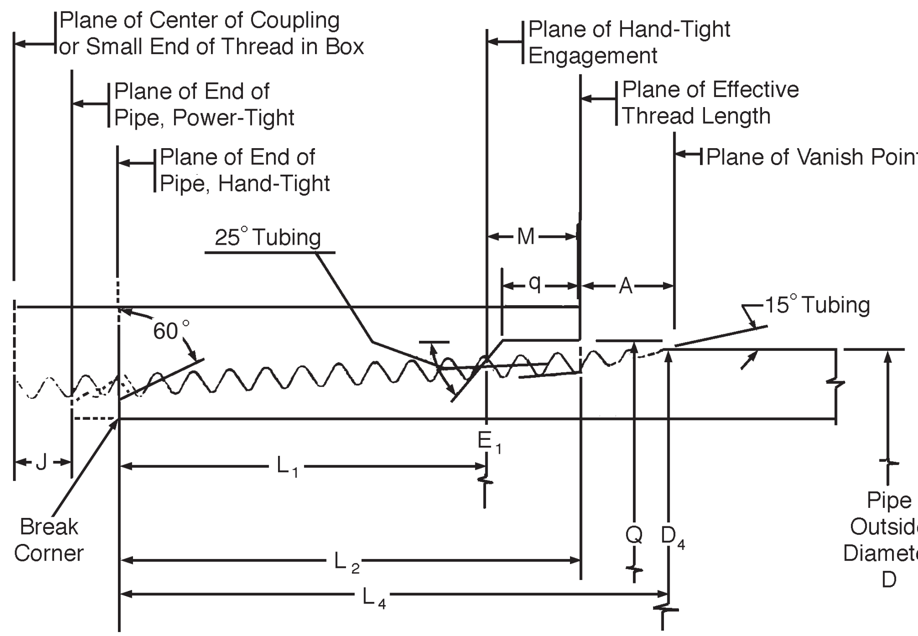
Notes:

1. At plane of perfect thread length L_7, the basic major diameter of the pipe thread and plug gage thread is 0.016 in. greater than specified pipe diameter D for sizes 13 3/8 and smaller and is equal to the specified pipe diameter for sizes 16 and larger.

2. Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 5. The 3/8 in. equilateral triangle stamp located on the pipe at the length A1 from the end of the pipe facilitates obtaining the power make-up provided for by the hand-tight standoff “A.”

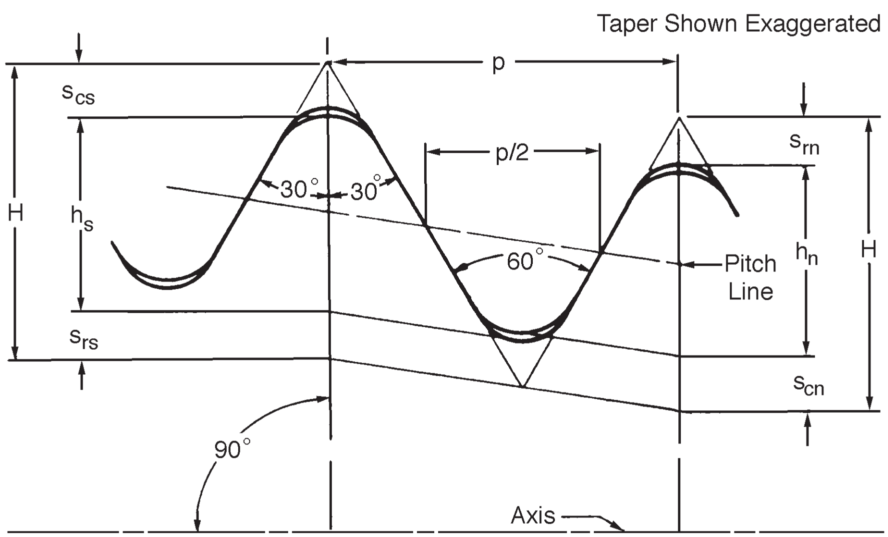
[a]Pitch diameter on buttress casing thread is defined as being midway between the major and minor diameters.

*$L_c = L_7 - 0.400$ in. for buttress thread casing. Within the L_c length, as many as 2 threads showing the original outside surface of the pipe on their crests for a circumferential distance not exceeding 25% of the pipe circumference is permissible. The remaining threads in the L_c thread length shall be full crested threads.



Notes:
1. The vanish cone angle is optional for round threads on downhole tools.
2. The vanish cone angle applies to the roots of the incomplete threads produced by either multiple point or single point tools.
3. For basic power-tight make-up, the face of coupling or box advances to plane of vanish point.

Figure 8—Basic Dimensions of Tubing Round Threads Hand-Tight Make-Up



Taper 3/4 in. per ft or 0.0625 in. per in. on Diameter
(19,05 mm per 304,8 mm or 1,588 mm per 25,4 mm on Diameter)

Figure 9—Tubing Round Thread Form
(See Table 10 or Table 10M for dimensions.)

Table 10—Tubing Round Thread Height Dimensions

All dimensions in inches. See Figure 9.

Thread Element	10 Threads per in. p = 0.1000	8 Threads per in. p = 0. 1250
$H = 0.866p$	0.08660	0.10825
$h_s = h_n = 0.626p - 0.007$	0.05560	0.07125
$s_{rs} = s_{rn} = 0.120p + 0.002$	0.01400	0.01700
$s_{cs} = s_{cn} = 0.120p + 0.005$	0.01700	0.02000

Note: Calculations for H, h_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with 0.125 in. pitch and 3/4 in. per ft taper or less.

Table 11—Tolerances on Tubing Round Thread Dimensions[c]

(1) Element	(2) Tolerances
Taper:	
Per ft on Diameter:	
Non-upset tubing, regular thread external upset, and integral joint tubing	+0.0625 in. –0.0312 in.
Per in. on Diameter:	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	+0.0052 in. –0.0026 in.
Lead:[a]	
Per in.:	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	±0.003 in.
Cumulative	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	±0.006 in.
Height, h_s and h_n:	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	+0.002 in. –0.004 in.
Angle, included	$\pm 1\frac{1}{2}$ deg.
Length, L_4 (external thread):[b]	
8-thread per in	±1p
10-thread per in.	
External-upset	$+1\frac{1}{2}$p $-\frac{3}{4}$p
Non-upset	$\pm 1\frac{1}{2}$p
Chamfer: (on outside end of threaded pipe)	±5 deg.
Tubing coupling recess Diameter Q, and Depth q	+0.031 in./–0.000 in.
Standoff, A:	See 6.1.4
25° angle of counterbore of bottom of coupling recess[d, e]	±5 deg.

[a]For pipe (external threads) the lead tolerance per in. is the maximum allowable error in any in. within the length L_4 – g. See Tables 21, 22 and 23 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 – g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling or from the small end of the thread in the box of integral joint tubing.
[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.
[c]Tolerances apply to both external and internal threads except where otherwise indicated.
[d]For tolerance on fiberglass long round pipe threads, see applicable fiberglass pipe standards.
[e]The criteria for rejection of the 25 degree angle at the bottom of the coupling recess shall be a demonstration that the angle exceeds the ±5 degree tolerance.

Table 12—Non-Upset Tubing Thread Dimensions

All dimensions in inches, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1.050	1.050	10	0.448	0.925	1.094	0.98826	0.500	0.446	1.113	$^5/_{16}$	2	0.300
1.315	1.315	10	0.479	0.956	1.125	1.25328	0.500	0.446	1.378	$^5/_{16}$	2	0.300
1.660	1.660	10	0.604	1.081	1.250	1.59826	0.500	0.446	1.723	$^5/_{16}$	2	0.350
1.900	1.900	10	0.729	1.206	1.375	1.83826	0.500	0.446	1.963	$^5/_{16}$	2	0.475
$2^3/_8$	2.375	10	0.979	1.456	1.625	2.31326	0.500	0.446	2.438	$^5/_{16}$	2	0.725
$2^7/_8$	2.875	10	1.417	1.894	2.063	2.81326	0.500	0.446	2.938	$^5/_{16}$	2	1.163
$3^1/_2$	3.500	10	1.667	2.144	2.313	3.43826	0.500	0.446	3.563	$^5/_{16}$	2	1.413
4	4.000	8	1.591	2.140	2.375	3.91395	0.500	0.534	4.063	$^3/_8$	2	1.375
$4^1/_2$	4.500	8	1.779	2.328	2.563	4.41395	0.500	0.534	4.563	$^3/_8$	2	1.563

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 0.900$ in. for 10 thread tubing, but not less than 0.300.
$L_c = L_4 - 1.000$ for 8 thread tubing.

Table 13—External-Upset Tubing Thread Dimensions

All dimensions in inches, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1.050	1.315	10	0.479	0.956	1.125	1.25328	0.500	0.446	1.378	$^5/_{16}$	2	0.300
1.315	1.469	10	0.604	1.081	1.250	1.40706	0.500	0.446	1.531	$^5/_{16}$	2	0.350
1.660	1.812	10	0.729	1.206	1.375	1.75079	0.500	0.446	1.875	$^5/_{16}$	2	0.475
1.900	2.094	10	0.792	1.269	1.438	2.03206	0.500	0.446	2.156	$^5/_{16}$	2	0.538
$2^3/_8$	2.594	8	1.154	1.703	1.938	2.50775	0.500	0.534	2.656	$^3/_8$	2	0.938
$2^7/_8$	3.094	8	1.341	1.890	2.125	3.00775	0.500	0.534	3.156	$^3/_8$	2	1.125
$3^1/_2$	3.750	8	1.591	2.140	2.375	3.66395	0.500	0.534	3.813	$^3/_8$	2	1.375
4	4.250	8	1.716	2.265	2.500	4.16395	0.500	0.534	4.313	$^3/_8$	2	1.500
$4^1/_2$	4.750	8	1.841	2.390	2.625	4.66395	0.500	0.534	4.813	$^3/_8$	2	1.625

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 0.900$ in. for 10 thread tubing, but not less than 0.300.
$L_c = L_4 - 1.000$ for 8 thread tubing.

Table 14—External-Upset Long Round Thread Dimensions for Fiberglass Pipe

All dimensions in inches, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1.050	1.315	10	0.979	1.456	1.625	1.25328	0.500	0.446	1.378	$^5/_{16}$	2	0.725
1.315	1.469	10	1.104	1.581	1.750	1.40706	0.500	0.446	1.531	$^5/_{16}$	2	0.850
1.660	1.812	10	1.229	1.706	1.875	1.75079	0.500	0.446	1.875	$^5/_{16}$	2	0.975
1.900	2.094	10	1.417	1.894	2.063	2.03206	0.500	0.446	2.156	$^5/_{16}$	2	1.163
$2^3/_8$	2.594	8	1.779	2.328	2.563	2.50775	0.500	0.534	2.656	$^3/_8$	2	1.563
$2^7/_8$	3.094	8	2.091	2.640	2.875	3.00775	0.500	0.534	3.156	$^3/_8$	2	1.875
$3^1/_2$	3.750	8	2.341	2.890	3.125	3.66395	0.500	0.534	3.813	$^3/_8$	2	2.125
4	4.250	8	2.591	3.140	3.375	4.16395	0.500	0.534	4.313	$^3/_8$	2	2.375
$4^1/_2$	4.750	8	2.716	3.265	3.500	4.66395	0.500	0.534	4.813	$^3/_8$	2	2.500

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 0.900$ in. for 10 thread tubing.
$L_c = L_4 - 1.000$ for 8 thread tubing.

Table 15—Integral-Joint Tubing Thread Dimensions

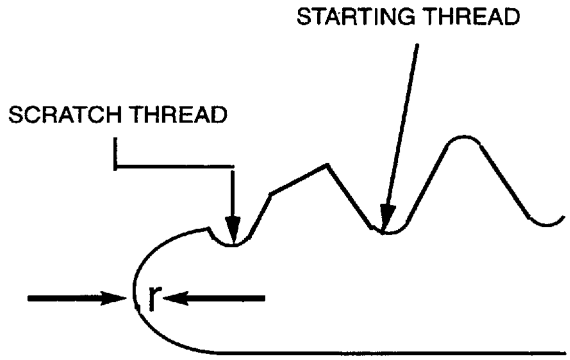
All dimensions in inches, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Size Designation D	Major Diameter D_4	No. of Threads per in.	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1.315	1.315	10	0.479	0.956	1.125	1.25328	0.500	0.446	1.378	$^5/_{32}$	2	0.225
1.660	1.660	10	0.604	1.081	1.250	1.59826	0.500	0.446	1.723	$^5/_{16}$	2	0.350
1.900	1.900	10	0.729	1.206	1.375	1.83826	0.500	0.446	1.963	$^5/_{16}$	2	0.475
2.063	2.094	10	0.792	1.269	1.438	2.03206	0.500	0.446	2.156	$^5/_{16}$	2	0.538

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 0.900$ in. for 10 thread tubing.

Table 16—Round Nosed Ends



(1)	(2)
Size	Radius, r (in.)
$2^{3}/_{8}$	$^{3}/_{32}$
$2^{7}/_{8}$	$^{3}/_{32}$
$3^{1}/_{2}$	$^{1}/_{8}$
4	$^{1}/_{8}$
$4^{1}/_{2}$	$^{1}/_{8}$

Note: Radius transition shall be smooth with no sharp corners, burrs or slivers on ID or OD chamfer surfaces.

5 Thread Inspection

5.1 LINE PIPE, ROUND THREAD CASING AND TUBING, AND BUTTRESS THREAD CASING

PRECAUTIONS

5.1.1 Temperature

All instruments shall be exposed to the same temperature conditions as the product to be inspected, for a time sufficient to eliminate temperature difference.

5.1.2 Care of Instruments

The instruments described herein are precision instruments and should be handled in a careful and intelligent manner, commensurate with the maintenance of the high accuracy and precision required for inspection under this Specification. If any instrument is dropped or shocked, it shall not be used for inspection purposes until its accuracy has been re-established.

5.1.3 Cleaning the Threads

All threads shall be cleaned thoroughly before inspection.

LOCATION OF MEASUREMENTS

5.1.4 Locations of First and Last Perfect Threads

a. The first perfect thread location is the thread nearest the chamfer on the pin or face of the coupling with a root having a full crest on both sides.

b. The last perfect thread location on external threads shall be $L_4 - g$ for tubing and line pipe, L_7 for buttress, and last scratch (last thread groove) –0.500 in. (–12,7 mm) for casing round threads. For casing, the distance from the end of the pipe to the last perfect thread is called the thread element control length or TECL. The last perfect thread location on internal threads is J + 1p measured from the physical center of the coupling or from the small end of the box for integral joint tubing.

5.1.5 Measuring Intervals

a. Thread Height. For the gauging of external or internal threads, measurements shall be made at the first and last perfect threads where full crested threads exist and continued from either in 1 in. (25,4 mm) intervals for products having a distance between the first and last perfect threads of more than 1 in. (25,4 mm); 1/2 in. (12,7 mm) intervals for products having a distance between the first and last perfect threads of 1 in. (25,4 mm) to 1/2 in. (12,7 mm), and intervals consisting of 4 threads for products having 11 1/2 threads per in. (11 1/2 threads per 25,4 mm).

b. Lead/Taper

1. Common Intervals. For the gauging of external or internal threads, lead and taper measurements shall be made starting at the first or last perfect thread and continued from either in 1 in. (25,4 mm) intervals for products having a distance between the first and last perfect threads of more than 1 in. (25,4 mm), 1/2 in. (12,7 mm) intervals for products having a distance between the first and last perfect threads of 1/2 in to 1 in. (12,7 mm to 25,4 mm), and intervals consisting of 4 threads for products having 11 1/2 threads per in. (11 1/2 threads per 25,4 mm). Measurement of full perfect thread length may require an overlap of the thread measuring interval. At no time shall taper, height or lead measurements be taken with a contact point beyond the last perfect thread location except on buttress threads. Buttress thread taper shall also be checked in the imperfect thread area.

2. Cumulative Lead Interval. The gauging of cumulative lead on external or internal threads shall be measured over an interval (between the first and last perfect threads) which has a length equal to the largest multiple of 1/2 in. (12,7 mm) for an even number of threads per in. or 1 in. (25,4 mm) for an odd number of threads per 1 in. (25,4 mm).

Note: The g values are given in Tables 18, 19, 20, 21, 22, and 23. For rounded thread "g" was chosen as 0.625 in. (15,88 mm) for casing and 0.500 in. (12,7 mm) for tubing.

TAPER MEASUREMENT

5.1.6 Definition

For round threads and line pipe threads, taper shall be defined as the increase in the pitch diameter of the thread, in inches per inch (millimeter per millimeter) of thread. For buttress threads, taper is defined as the change in diameter along the minor cone of the external threads and the major cone of the internal threads. On all threads, taper tolerances are expressed in terms of "inch per inch of thread" ("millimeter per millimeter of thread") and taper deviation shall be determined accordingly. The measurements are made for the specific interval lengths and the observed deviation shall be calculated to the inches per inch (millimeters per millimeter) basis.

5.1.7 Gauge Contact Points

The contact points of taper gauges shall be of the ballpoint type with diameters in accordance with the following table. For line pipe and round threads, the diameter of the contact points are such that they contact the thread flanks at the pitch cone, approximately, rather than the minor cone. For buttress threads, the dimensions of the contact points are such that they contact the minor cone of external thread and the major cone of the internal thread.

Contact Point Dimensions for Taper and Runout Gauges

			Ball-Point Diameter[a]	
Type Gauge	Threads per in.	Type Thread	in.	mm
Taper	8	Rd	0.072	1,83
Taper	8	LP	0.072	1,83
Taper	10	Rd	0.057	1,45
Taper	10	LP	0.057	1,45
Taper	11 1/2	LP	0.050	1,27
Taper	14	LP	0.041	1,04
Taper	18	LP	0.032	0,81
Taper	27	LP	0.021	0,53
Taper	5	Buttress	0.090	2,29
Runout	5	Buttress	0.057	1,45

[a]Tolerance is ±0.002 in. (0,05 mm).

EXTERNAL THREADS

5.1.8 Taper Gauge

The taper of external threads shall be measured with a taper gauge (see Figure 10).

5.1.9 Procedure (Taper Gauge)

The ball point on the fixed end of the gauge shall be placed in the groove at the first perfect thread position and the ball point on the plunger in the groove diametrically opposite. The fixed point shall be held firmly in position, the plunger point oscillated through a small arc, and the dial indicator set so that the zero position coincides with the maximum indication. Similarly, successive measurements at the same radial position relative to the axis of the thread, shall then be taken at the required intervals for the full length of threads for buttress threads or the full length of perfect threads for tubing and line pipe threads and the TECL for round thread casing. The difference between successive measurements shall be the taper in that interval of threads. The taper in the last interval of perfect threads shall be measured.

5.1.10 Run-Out (Buttress Only)

The run-out gauge (see Figure 13) shall be used to check the run-out thread root and insure that the external thread is sufficiently long and is a true runout thread. The run-out gauge indicator shall be set to zero using a flat surface as a setting standard for size $13^3/8$ and smaller. For size 16 and larger casing, the run-out gauge indicator shall be set to zero using the perfect thread roots as a setting standard. These perfect thread roots shall be checked for acceptable taper prior to setting the run-out gauge.

5.1.11 Procedure (Runout)

If the last thread groove is less than or equal to the distance from the end of the pipe to the apex of the make up triangle (A1 + 0.375 in. [9,52 mm]), the thread must be a true run-out thread. The thread run-out shall be measured where it terminates or at the apex of the make up triangle, whichever is the shortest length, by placing the run-out gauge contact point at 90 degrees prior to the thread termination or the apex of the triangle, and rotating the run-out gauge clockwise until the contact point is out of the thread groove or beyond the triangle apex. If the dial indicator reads +0.005 in. (+0,13 mm) or less, the run-out is acceptable.

INTERNAL THREADS IN SIZES $4^1/2$ AND LARGER

5.1.12 Taper Gauge

The taper of internal threads in sizes $4^1/2$ and larger shall be measured with an internal-taper gauge as illustrated in Figure 11.

5.1.13 Procedure (Taper Gauge)

The ball point in the fixed end of the gauge shall be placed in the groove at the last perfect thread position and the ball point on the plunger in the groove diametrically opposite. The fixed point shall be held firmly in position, the plunger point oscillated through a small arc, and the dial indicator set so that the zero position coincides with the maximum indication. Similarly, successive measurements, at the same radial position relative to the axis of the thread, shall then be taken at the required intervals toward the large end of the internal thread for the full length of perfect threads. The taper in the first interval of perfect threads shall be measured. The difference between successive measurements shall be the taper in that interval of threads.

INTERNAL THREADS IN SIZES SMALLER THAN $4^1/2$

5.1.14 Taper Gauge

The taper of internal threads in sizes smaller than $4^1/2$ shall be measured with an internal-taper gauge as illustrated in Figure 12.

5.1.15 Procedure (Taper Gauge)

The ball point on the adjustable arm of the gauge shall be placed in the groove at the last perfect thread position and the ball point on the pivoted arm of the gauge in the groove diametrically opposite. The fixed point shall be held firmly in position, the pivoted point oscillated through a small arc, and the dial indicator set so that the zero position coincides with the maximum indication. Similarly, successive measurements, at the same radial position relative to the axis of the thread, shall then be taken at the required intervals toward the large end of the internal thread for the length of perfect threads. The taper in the first interval of perfect threads shall be measured. The difference between successive measurements shall be the taper in that interval of threads.

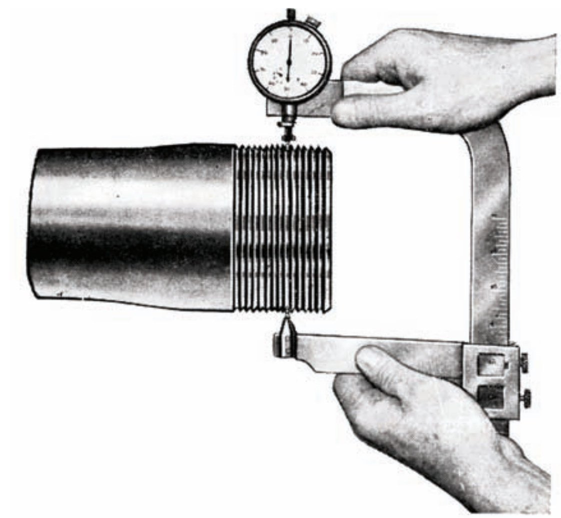


Figure 10—Typical External-Thread Taper Gauge

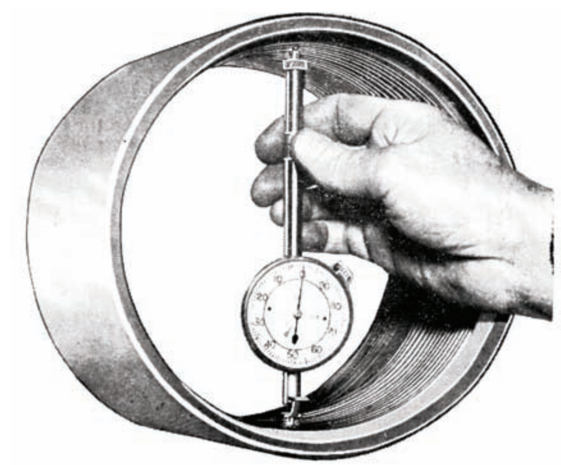


Figure 11—Typical Internal-Thread Taper Gauge for Threads in Sizes $4^1/2$ and Larger

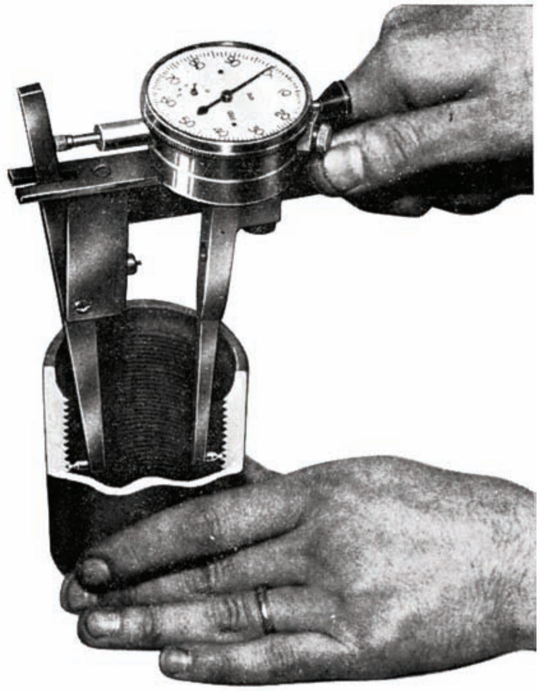


Figure 12—Typical Internal-Thread Taper Gauge for Threads in Sizes Smaller than $4^1/_2$

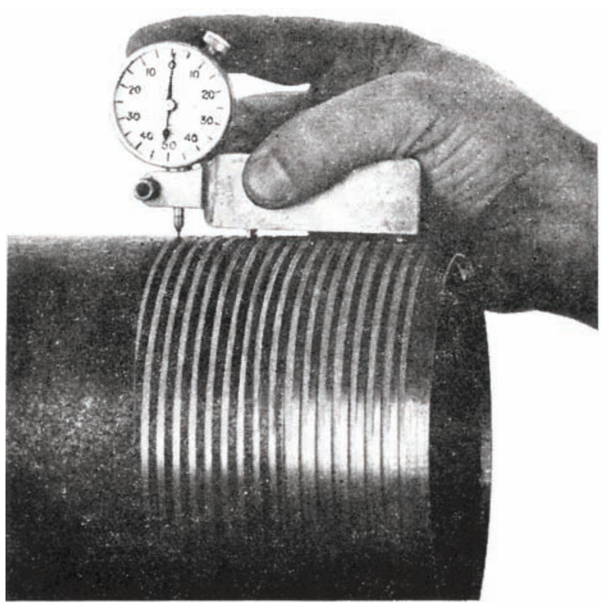


Figure 13—Typical Run-Out Gauge for Buttress Thread Casing

LEAD MEASUREMENT

5.1.16 Definition

Lead shall be defined as the distance from a point on a thread to a corresponding point on the next thread turn, measured parallel to the thread axis. Lead tolerances are expressed in terms of "per inch" ("per millimeter") of threads and "cumulative," and lead errors must be determined accordingly. For interval measurements over lengths other than 1 in. (25,4 mm) the observed deviation should be calculated to the per in. (per mm) basis. For cumulative measurements, observed deviations represent the cumulative deviation.

5.1.17 Gauge Contact Points

The contact points of lead gauges shall be of the ball point type with diameters in accordance with the following table. For line pipe and round threads, the diameter of the contact points are such that they contact the thread flanks at the pitch cone, approximately, rather than the minor cone. For buttress threads, the dimensions of the contact points are such that they simultaneously touch the root and the 3 degree flank of the thread.

Contact Point Dimensions for Lead Gauge

Threads per in. (25,4 mm)	Type Thread	Ball-Point Diameter[a] in.	Ball-Point Diameter[a] mm
8	Rd	0.072	1,83
8	LP	0.072	1,83
10	Rd	0.057	1,45
10	LP	0.057	1,45
$11^1/_2$	LP	0.050	1,27
14	LP	0.041	1,04
18	LP	0.032	0,81
27	LP	0.021	0,53
5	Buttress	0.062	1,57

[a]Tolerance is ±0.002 in. (±0,05 mm)

5.1.18 Lead Gauge

The lead of all external or internal threads in sizes $4^1/_2$ and larger shall be measured with a lead gauge of the type illustrated in Figure 14, Detail A. The lead of all internal threads in sizes smaller than 4 shall be measured with a lead gauge of the type illustrated in Figure 14, Detail B. Lead gauges shall be so constructed that the measuring mechanism is under strain when the indicator is set to zero by means of the standard template (see Figure 14, Detail C). The standard template shall be so constructed as to compensate for the error in measuring lead parallel to the taper cone instead of parallel to the thread axis, according to the values shown in Table 17. The distance between any two adjacent notches of the template shall be accurate within a tolerance of ±0.0001 in. (±0,003 mm), and between any two non-adjacent notches within a tolerance of ±0.0002 in. (0,005 mm).

5.1.19 Adjustment of Gauges

Before use, the fixed ball point shall be set to provide a distance between points equal to the interval of threads to be inspected (see 5.1.5b), and the indicator set to the zero position when the gauge is applied to the standard template. When applying the lead gauge to Buttress templates, care must be taken to insure the contact points engage the root and the 3 degree flank.

5.1.20 Procedure (Lead Gauge)

The ball points of the gauge shall be placed in the proper thread grooves and the gauge shall be pivoted upon the fixed ball point through a small arc on either side of the correct line of measurement. The minimum fast (+) or maximum slow (–) reading is the deviation in lead. On buttress casing threads, slight pressure shall be exerted on the gauge so that the fixed ball point remains simultaneously in contact with the 3-degree flank and root of the thread during the measurement. The pressure is applied toward the small end on external threads and toward the large end on couplings.

Table 17—Compensated Thread Lengths for Measurements Parallel to the Taper Cone

Length of Thread (Parallel to Thread Axis) in.	Compensated Length (Parallel to Taper Cone) for Threads Having a Taper of: $^3/_4$ in. per ft	1 in. per ft
0.34783*	0.34800	—
$^1/_2$	0.50024	—
1	1.00049	1.00087
$1^1/_2$	1.50073	1.50130
2	2.00098	2.00174
$2^1/_2$	2.50122	2.50217
3	3.00146	3.00260
$3^1/_2$	3.50171	3.50304
4	4.00195	4.00347

*Equivalent to 4p for $11^1/_2$ threads per in.

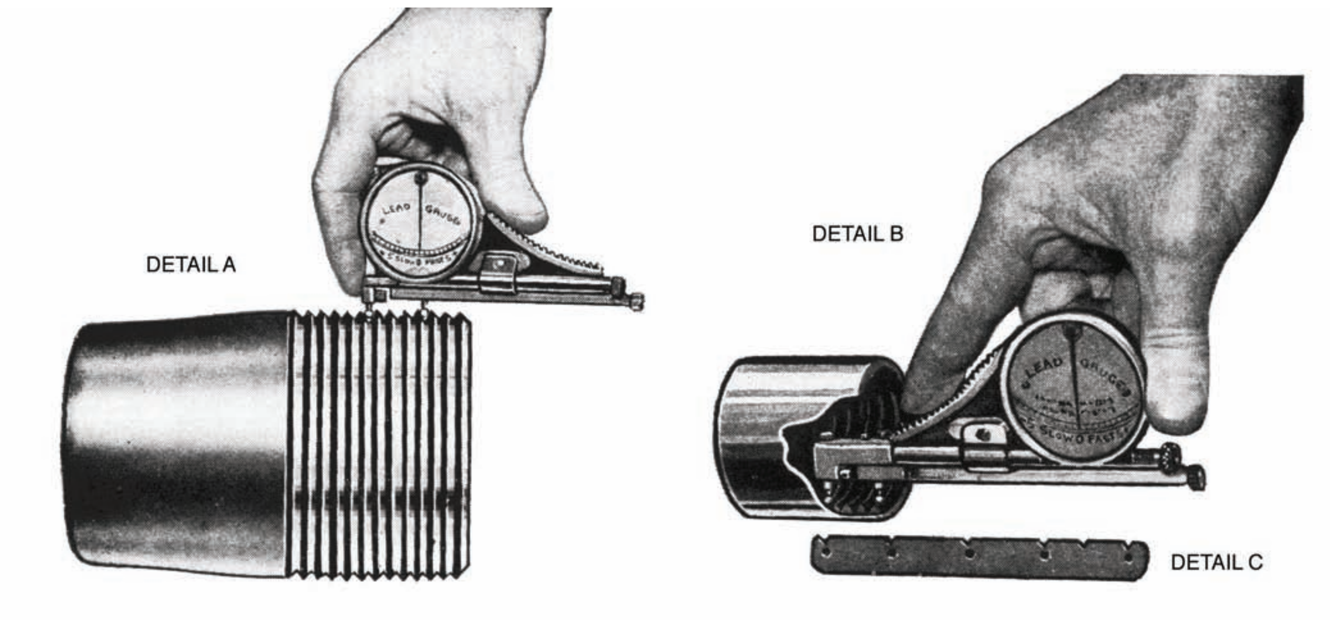


Figure 14—Typical Lead Gauges

HEIGHT MEASUREMENT

5.1.21 Definition

Height of thread shall be defined as the distance between the crest and root, normal to the axis of the thread.

Note: A certain number of threads with imperfect crests are permissible on pipe under the requirements of Section 4. When threads with imperfect crests occur within the perfect thread length on pipe, the last point of height measurement should be shifted to the last thread root having a full crest on each side.

5.1.22 Gauge Contact Points

The contact points for thread height gauges for line pipe and round threads shall be conical in shape with a maximum included angle of 50 degrees and shall not contact the thread flank. Height gauges for buttress threads can use a cone point or a ball type point provided the contact point does not contact the thread flanks and does not exceed 0.092 in. (2,34 mm) diameter.

5.1.23 Height Gauges

Thread height shall be measured with gauges of the types illustrated in Figures 15 and 16. Such gauges for line pipe and round threads may have indicators graduated to register the actual thread height or the deviation in thread height, as illustrated in Figure 15. Check blocks as shown in Figure 15, Detail A shall be provided for checking the height gauge. Buttress threads shall be measured with gauges of the type illustrated in Figure 15 registering error in thread height in 0.0005 in. (0,013 mm) increments. Gauges for size 16 and larger buttress threads shall be provided with a step-type anvil. Check blocks of the step type as shown in Figure 15, Detail B, shall be provided for checking the height gauge.

For the U-groove check block, the depths of the grooves shall conform to the following dimensions, within a tolerance of ±0.0002 in. (±0,005 mm).

8-V (fine pipe) groove	0.0950 in.	2,413 mm
$11^{1}/_{2}$-V (line pipe) groove	0.0661 in.	1,6789 mm
8-round (casing and tubing) groove	0.0712 in.	1,808 mm
10-round (tubing) groove	0.0556 in.	1,412 mm
Buttress thread groove, size $13^{3}/_{8}$ and smaller:	0.0620 in.	1,575 mm

For the V-groove check block, the grooves shall have a maximum 60 degrees included angle and shall be truncated the following amounts, within a tolerance of ±0.0002 in. (±0,005 mm).

8-V (fine pipe) groove	0.0031 in.	0,079 mm
$11^{1}/_{2}$ -V (line pipe) groove	0.0022 in.	0,056 mm
8-round (casing and tubing) groove	0.0130 in.	0,330 mm
10-round (tubing) groove	0.0100 in.	0,254 mm

Buttress thread check blocks size 16 and larger:

Depth of groove to first plateau	0.0578 in.	1,468 mm
Depth of groove to second plateau	0.0662 in.	1,681 mm

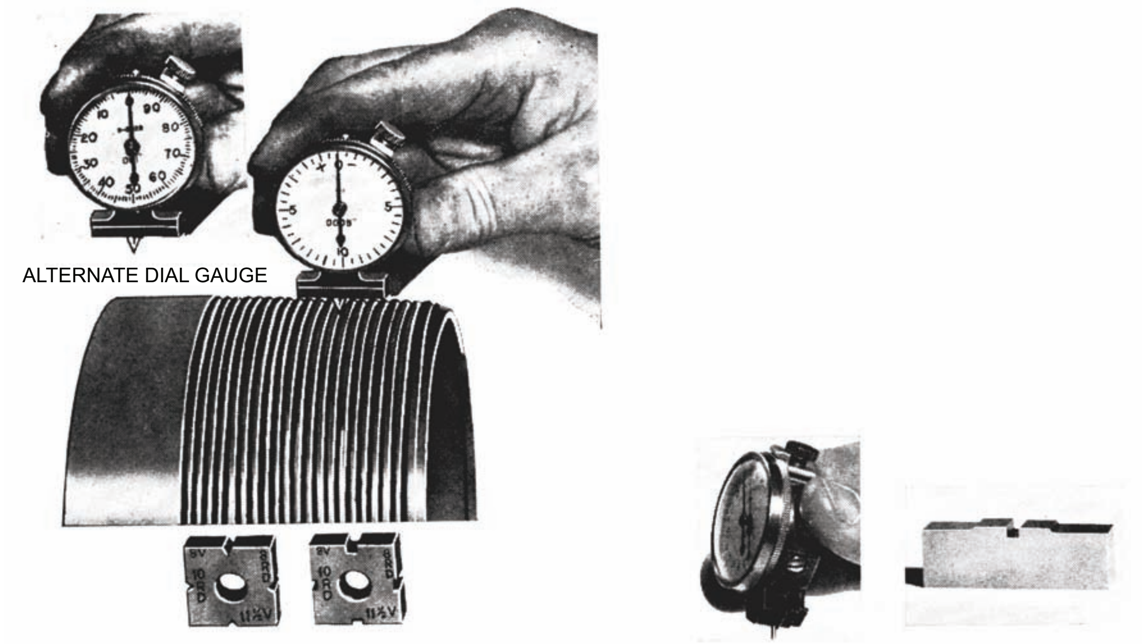
5.1.24 Adjustments

Gauges shall be adjusted when applied to the U-groove (defined by 5.1.23) for the type of thread to be measured. Gauges having indicators for determining the deviation in thread height shall be adjusted to register zero when applied to the applicable groove. Gauges having indicators for determining the actual thread height shall be adjusted to register the proper thread height when applied to the applicable groove. For V-threads and round threads, the gauge shall also be applied to the applicable V-groove for the threads to be measured. The gauge reading on the V-groove check block shall not vary more than 0.0005 in. (0,013 mm) from its reading on the U-groove check block. If it does not so register, the contact point has probably become worn or damaged and shall be replaced. For thread height gauges of the type illustrated in Figure 16, if the check block cannot be positioned flat on the anvil with the pressure arm applied, the arm shall be shifted out of the way to prevent contact with the check block during adjustments or checks.

PROCEDURE

5.1.25 External Threads and Internal Threads

The thread height gauges of the type illustrated in Figures 15 and 16 shall be used for all external and all internal threads. The tip of the penetrator shall be placed in the proper thread groove with the anvil in a line parallel to the axis of the thread and resting on the crests of the adjacent threads, and the gauge oscillated through a small arc on each side of the position normal to the taper cone. For gauges graduated to measure the actual thread height, the minimum reading on the indicator shall be taken as the actual thread height.



Detail A
Thread-height gauge for external threads and for internal threads in norminal size 3 and larger

Detail B
Thread-height gauge and check block for size 16 and larger buttress thread casing

Figure 15—Typical Thread Height Gauges

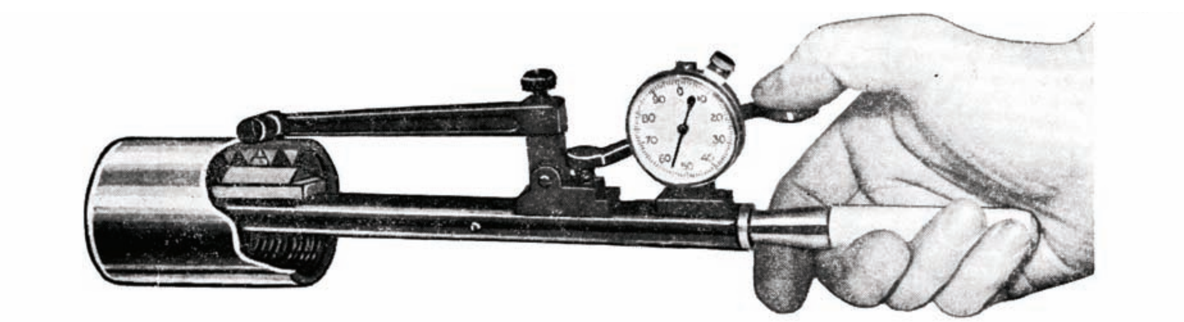


Figure 16—Typical Thread Height Gauge for Internal Threads in Nominal Sizes Smaller than 3

ANGLE MEASUREMENT

5.1.26 Definition

The angle of thread shall be defined as the included angle between the thread flanks. The flank angles of thread shall be defined as the angles between the flanks and are perpendicular to the thread axis. For 60 degree threads, the flank angles are half angles of the thread and therefore equal. For buttress threads, the leading flanks are 10 degrees and the following flanks are 3 degrees.

5.1.27 Angle Measurement Optical Comparator or Other Type

Thread angles shall be measured with an Optical Comparator or other type of precision angle measuring device, one type of which is illustrated in Figure 17. The recommended contact points for various thread types, except buttress, are the same as those shown in 5.1.17 for the lead gauge. For buttress casing threads, a ball point of 0.100 in. (2,54 mm) truncated 0.030 in. (0,76 mm) is recommended. This is to insure that the instrument seats properly into the thread flanks and to prevent rotational movement. When measuring the angle of coated threads, the measurement shall be taken prior to the application or after the coating has been chemically removed. As an alternative method, threads may be measured with a properly calibrated precision thread contour measuring machine equipped with master overlays of known accuracy and recording strip charts.

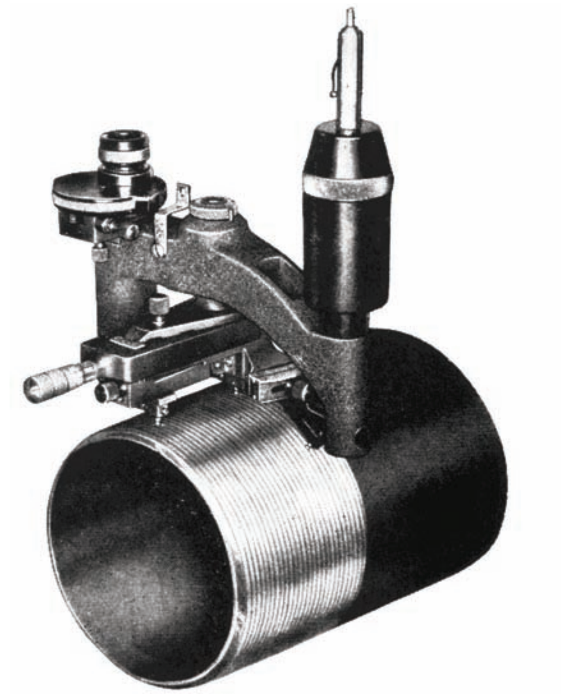


Figure 17—Typical Thread-Contour Microscope for Measuring Thread Angle and Checking Thread Form

EXTERNAL THREADS

5.1.28 Procedure

Clean pipe threads to be inspected so that they are free from any particles that may impair viewing of the threads. Install the contact points, as described in 5.1.27, into all four locations. Lock the stabilizer legs at the proper index mark, as shown in the manufacturer's instructions.

Note: This setting is a function of the thread helix angle and thus varies with pitch, taper and diameter.

a. Set the taper on the moveable contact arm to match that of the thread being inspected, e.g., 8 round would be set to the $^{3}/_{4}$ in. (19,05 mm) mark. Set the comparator on the pipe by first setting the moveable contact point into the thread flanks near the small end and then locating the central contact and the stabilizer leg contacts into the flanks near the last thread. The stabilizer legs should now be securely locked.

Rotate the diopter adjustment until the point of the arrow on the reticle is at its sharpest. This is an individual adjustment for each operator. The eye cup may be pushed down for eyeglass wearers. If you choose not to wear your glasses, return the cup to the extended position and readjust the diopter.

Rotate the reticle by using upper or lower knob until arrow points to the 0 line of the form you are inspecting. The upper reticle is for API and H90 rotary shouldered connections and the lower reticle is for API casing and tubing. Only one reticle at a time may be adjusted.

Note: To shift from one reticle to another, you must line up the two illustrated gauges over one another and turn reticle selection knob.

Rotate vertical micrometer clockwise until threads appear in the lower half of the green image field. Focus the unit so that both flanks of the actual thread are sharp.

The comparator is now adjusted for the particular diameter and thread form to be inspected. To inspect further connections, simply set it onto another pipe end. No more adjustments are necessary.

b. Using the rapid traverse knob along with the vertical micrometer, position a particular thread profile in close alignment with the reticle hairline form. Lock traverse movement by pushing lever downward and outward. Final alignment of the hairline and profile can now be made by using the horizontal and vertical micrometers.

Variation in dimensions of the actual thread can now be measured using the two micrometers.

c. Measurement of flank angle is done by rotating the reticle so that the flank angle of the reticle hairline matches that of the actual thread. Readjust image using both micrometers until a slight amount of green is seen between hairline and actual flank angle. The error in flank angle can now be read on the degree scale.

Note: Be sure to properly correlate the flank with the pipe-end as shown by upper arrow in reticle.

As an alternative method, threads may be measured with a properly calibrated precision thread contour measuring machine equipped with master overlays of known accuracy and recording strip charts to provide for a permanent documented record of the thread contour inspection.

INTERNAL THREADS

5.1.29 Procedure

Note: In order to measure the flank angle of internal threads, it is first necessary to make a cast of the threads and then measure the flank angle of the threads on the cast. Therefore, a thread tooth on the cast represents a thread groove in the product and vice versa.

The following procedure shall be followed in the measurement of flank angle of internal threads.

a. When thread coatings are present, remove electroplated or hot-dipped zinc coating from the threads by immersion in dilute hydrochloric acid (one volume of commercial hydrochloric acid to one volume of water) until violent evolution of gas ceases. Thoroughly rinse and dry the threads.

Note: Inhibited hydrochloric acid is to be preferred when available.

b. The casting of the internal thread must be made from a material which is stable and non-shrinking. It must be large enough to accommodate the portable optical comparator or other type precision angle measuring device used in the same manner as described in 5.1.27. Determine the angle of the threads on the cast in the same manner as specified for the measurement of the angle of external threads.

THREAD FORM

5.1.30 Definition

The form of thread is its profile in an axial plane for a length of one pitch.

5.1.31 Requirements

For 60 degree threads, there are no specific requirements on thread form except the limitations imposed by the requirements on height of thread and included flank angle. For buttress threads, the thread form must conform to the basic dimensions within the tolerances of Figures 6 and 7 including the requirements of thread height, included flank angles, and tooth thickness. The following are examples of acceptable methods of measuring tooth thickness: Single dial gauge as shown in Figure 18, optical comparator, contour measuring machine, or cast molds. The quality of workmanship required for acceptance under these specifications automatically prohibits the presence, to an objectionable degree, of such defects in thread form as torn threads, shaved threads, broken threads and distorted threads. Such imperfections may be detected, while at the same time measuring flank angles. Angular as well as linear measurements of the defects can be determined by comparing the thread-contour image with that of a toleranced thread outline. Rejection shall be made when such imperfections are present to an extent that there is a probability of galling or leakage when the connections are made up.

SINGLE DIAL BUTTRESS THREAD FORM GAGE

5.1.32 Definition

This gauge is used for checking the actual tooth thickness (amount of shave) of both external and internal buttress casing threads near the pitch line. The contact points for the form gage shall be ball pointers of 0.087 in. (22,1 mm) diameter truncated 0.023 in. (0,58 mm). Before use, the dial indicator shall be adjusted to zero using a setting standard.

5.1.33 Procedure

After the gage is properly verified against the setting standard, place the point of the gage in the thread groove starting at the small diameter. With the anvil of the gage contacting the thread crests (always over full crested threads), pivot the gage on the rounded anvil edge through a small arc. Ensure that base is in a line parallel to the thread axis. Take the reading at the point where the indicator hand reaches the highest position. Check the remaining threads in the required intervals in the same axis line clock position (last perfect thread). If the threads have imperfect crests, shift to the last threads having a full crest.

Buttress Thread Form Gage Tolerances from Zero Setting

External Threads	Plus	Minus
Less than $8^5/_8$ in. OD	0 in. (0 mm)	–0.003 in. (0,08 mm)
Greater than or Equal to $8^5/_8$ in.	0 in. (0 mm)	–0.005 in. (0,13 mm)
Internal Threads—All Sizes	–0.001 in. (0,03 mm)	–0.004 in. (0,10 mm)

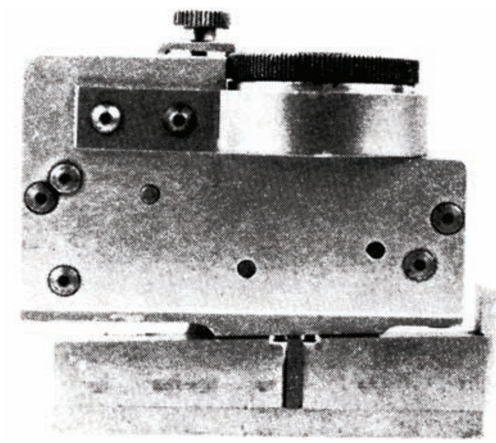


Figure 18—Typical Single Dial Gauge for Buttress Threads

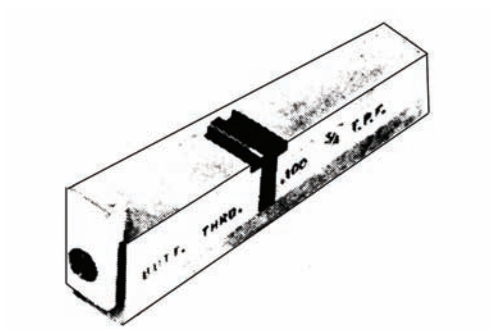


Figure 19—Typical Check Pieces for Setting Dial Gauges

COUPLING THREAD ALIGNMENT

5.1.34 Definition

The opposing coupling-thread cones are aligned through the bore.

a. Angular Misalignment. The measured angular deviation of one or both coupling-thread cones to the centerline thread cone axis.
b. Concentric Misalignment. The measured concentric deviation from the centerline thread cone axis by one or both coupling-thread cones.

5.1.35 Equipment

Concentricity and alignment of coupling threads may be measured with the following types of equipment:

a. Figure 20 is an example of equipment capable of measuring for concentricity and alignment of coupling threads. Concentricity and alignment tests for coupling threads (see Section 4) are made by screwing the coupling onto the threaded test mandrel which has been centered on the lathe type spindle, then screwing into the other end of the coupling a threaded plug provided with an axial extension of 1 ft (304,8 mm) and a disc attached as shown. While the assembly is rotated, concentricity of the coupling threads can be determined by means of a dial gauge bearing radially against the OD of the disc next to the coupling face (as shown). Angular misalignment can be determined by means of a dial gauge bearing radially against the plug extension, or axially against the side of the disc which is parallel to the coupling face.

b. Figure 21 is an example of a coupling-thread alignment gauge. The contact points utilized on thread alignment gauges of this type shall be as follows: Line pipe, round thread casing and tubing shall be the same as those as shown in 5.1.17 for the lead gauge. Ball point diameter of 0.100 in. (2,54 mm) truncated 0.030 in. (0,76 mm) shall be used for buttress casing threads. The ball points shall be inserted in the thread grooves, an equal distance on either side of the J area but not less than 2J plus two thread turns apart parallel along the centerline axis of the coupling as shown in Figure 21, and rotated one turn while positioned in the thread grooves. The maximum sweep of the dial gauge indicator (space between the maximum and minimum indications) shall not exceed the amount determined by the following formula:

$$R = EA/240$$

where

R = maximum permissible sweep of the dial gauge indicator;

E = pitch diameter of the coupling where the contact points on the gauge are located. This must be calculated for the coupling being inspected,

A = maximum allowable misalignment in 20 ft (6,1 m) (see 4.4.1.10).

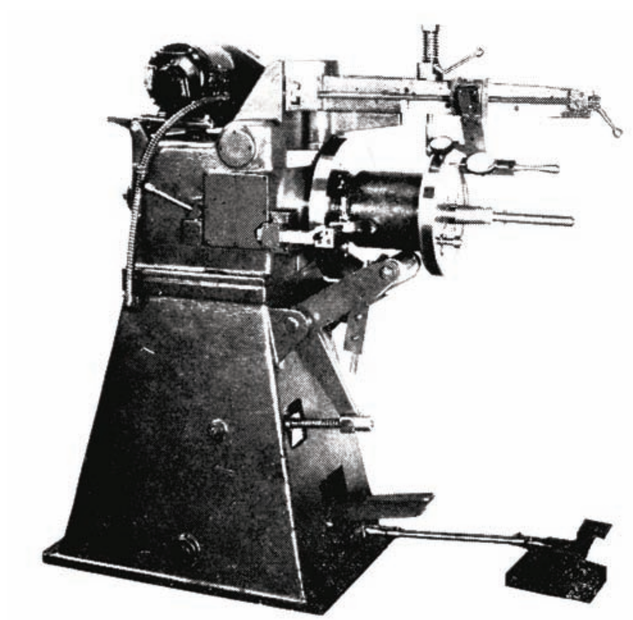


Figure 20—Typical Machine for Checking Coupling-Thread Alignment

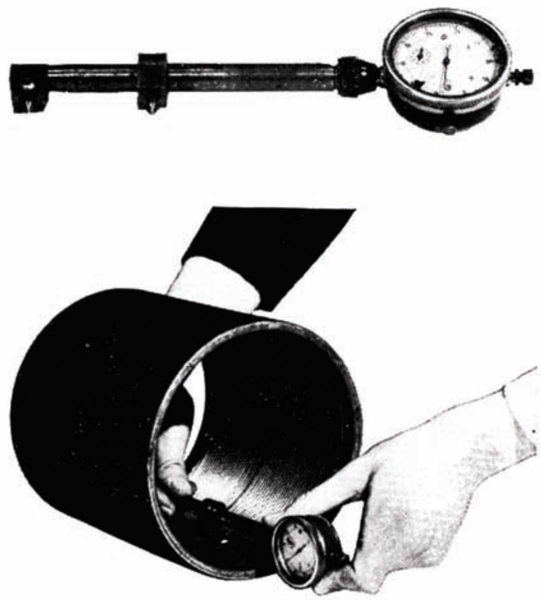


Figure 21—Typical Application of Coupling-Thread Alignment Gauge

CALIBRATION OF INSTRUMENTS AND DIAL GAUGES

5.1.36 Use a lead-gauge calibrator to verify calibration of lead gauges through the entire range of scale for total lengths of threads up to 4 in. (101,60 mm). It is essential that calibrators of this type utilize a precision screw micrometer reading in increments of 0.0001 in. (0,003 mm). Determine the amount of movement of the micrometer screw (reading the micrometer to 0.0001 in. [0,003 mm]), necessary to indicate an error of 0.001 in. (0,03 mm) by the lead gauge for each 0.001 in. (0,03 mm) of the lead-gauge scale. From these determinations prepare a table of accumulative error for the entire scale range of the lead gauge.

5.1.37 The accuracy of lead gauge standard templates and height gauge check blocks should be verified in an approximately 20°C (68°F) environment by a means that assures a measurement uncertainty no greater than 25% of the allowable tolerance for the dimension being measured. The required distances between notches on the lead gauge standard template are compensated for measurement parallel to the taper cone and are given in Table 17 and 5.1.l 8. The groove dimensions for height check blocks are given in 5.1.23.

5.1.38 Calibrate dial gauges by a method with a resolution of 0.0001 in. (0,003 mm). Following are some examples of acceptable calibration instruments:

a. Toolmaker’s microscope.
b. Universal measuring microscope.
c. A precision screw micrometer reading in increments of 0.0001 in. (0,003 mm).
d. Precision gauge blocks.
e. Precision linear-measuring machine.

5.1.39 Dial gauges shall be tested for accuracy on repeated readings and also of measuring intervals, over the full dial scale. The accuracy of repeated readings shall be within 0.0002 in. (0,005 mm). The accuracy of interval measurements shall be within the following values:

Range of Dial		Maximum Error	
in.	mm	in.	mm
1.0000	25,400	0.0010	0,025
0.5000	12,700	0.0010	0,025
0.1000	2,540	0.0005	0,013
0.0200	0,508	0.0002	0,005

5.1.40 Frequency of Calibration

Verify calibration of dial gauges throughout the entire range of plunger travel when received, at frequent intervals (no less than once per year, however, if the dial gauge is not used in the 1 year period, calibration is not required until subsequent future usage.), and after they have been dropped, subjected to unusual shocks, or any other conditions which might affect the accuracy of precision measuring instruments.

6 Gauging Practice

6.1 LINE PIPE, ROUND THREAD CASING AND TUBING, AND BUTTRESS THREAD CASING

6.1.1 Coverage

All threads covered by this section shall comply with the gauging practice requirements specified herein. Accordingly, any manufacturer who produces products using any of the threads covered by this Specification shall have access to master gauges for each size and type of thread produced.

Master gauges consist of a plug and mating ring conforming to the requirements of Section 7 and certified as required in Section 8.

Note:

1. Gauges made under API Std 5A, 5AX or 5L prior to 1962 may be used provided proper allowance is made for deviations from the requirements of Section 5. See 6.1.9 regarding line pipe gauges made prior to 1940.

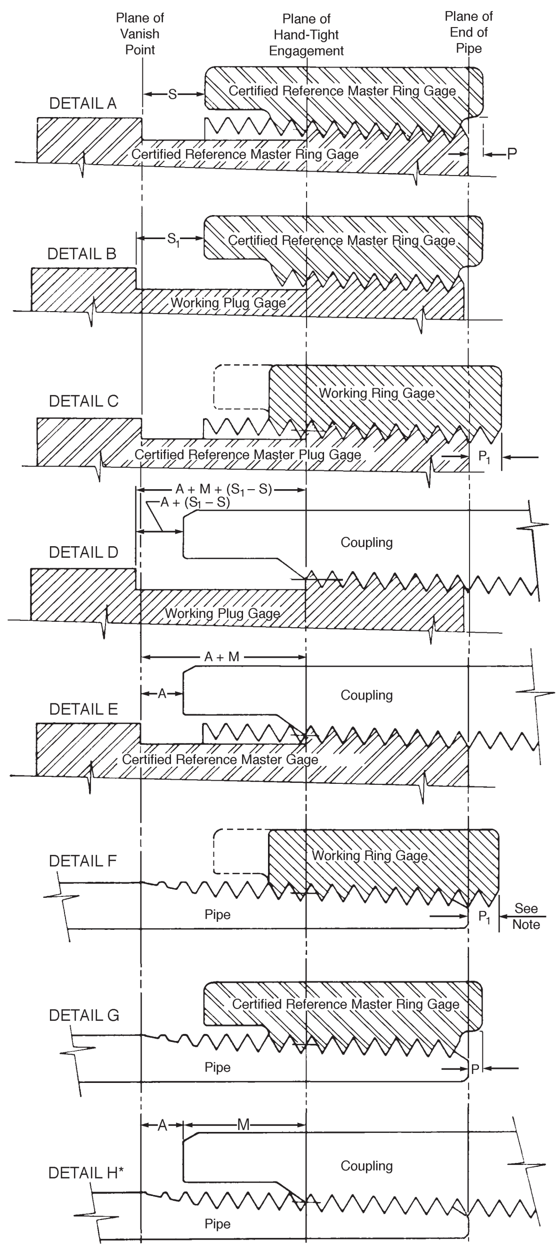
2. The use of master gauges in checking product threads should be minimized. Such use should be confined to cases of dispute which cannot be settled by rechecking the working gauge against the master. Good care should be exercised when the master gauge is assembled on a product thread.

6.1.2 Gauge Requirements

The manufacturer of product threads shall also provide working gauges conforming to the requirements of 7.1.2 for use in gauging the product threads, and shall maintain all working gauges in such condition as to ensure that product threads, gauged as required herein, are acceptable under this Specification. The manufacturer shall establish and document a program of measuring the wear (interchange standoff of working gauges with master gauges) on each working ring and plug gauge that is used in the production of API threads. Included in this program shall be detailed procedures, frequency of measuring wear, and criteria of rejection that completely decommission a working ring or plug gauge from any further use. The results of each required measurement for each working ring or plug gauge shall be documented. The records of procedures and measurements shall be maintained for not less than 3 years following the last usage of each gauge. The manufacturer shall also establish and document a frequency for inspecting product threads with working gauges based on his control of the manufacturing process.

6.1.3 The relationship between master gauges, working gauges, and product threads shall be as shown in Figures 22 and 23, wherein the master plug gauge is shown as the standard and the master ring gauge as the transfer standard. The standoff value S of master gauges is the distance from the plane of vanish point on the master plug gauge to the face of the master ring gauge. The standoff value "P" of master gauges is the difference between the tabulated L_4 dimension and the distance from the plane of vanish point on the master plug gauge to the small end of the master ring gauge. The master ring gauge is used to establish the standoff value S_1 of the working plug gauge. The master plug gauge is used to establish the standoff value P_1 of the working ring gauge. When calculating P_1 values, differences in ring gauge length (L_4 – S) between master and working ring gauges should be calculated, as this will affect P_1 calculations.

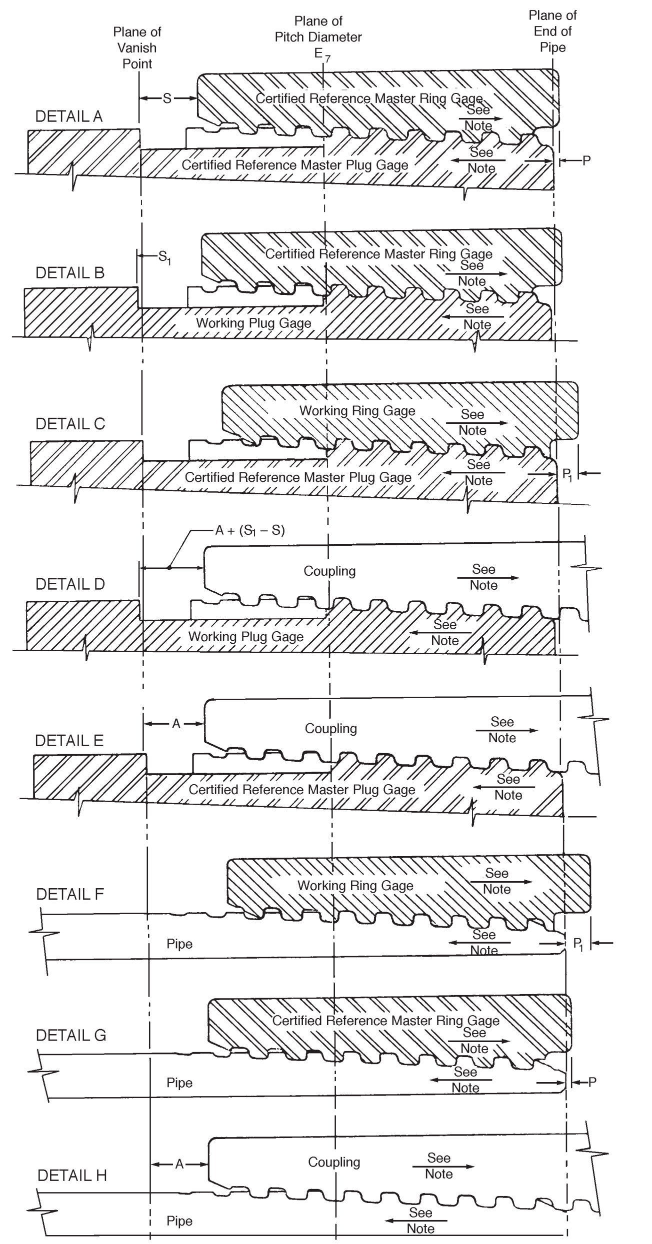
Note: The mating standoff of the master ring gauge against the master plug gauge as marked on the ring gauge, is intended primarily as the basis for establishing the limits of wear or secular change in the gauges. Deviation from this initial S value should be taken into account in establishing working gauge standoff values.



*Detail H is a nominal design illustration and the tolerances given in 6.1.4 are not applicable to the standoff of coupling on pipe.

Note: When checking long thread casing with short thread ring gauges, the end of the pipe will extend beyond the small end of the ring gauge by an amount equal to (L1 long − L1 short) − P1.

Figure 22—Gauging Practice for Line Pipe Threads and Casing and Tubing Round Thread Hand-Tight Assembly



Note: To obtain correct standoff on sizes 16 and larger buttress casing thread gauges, the gauges should be advanced axially with back pressure in direction of arrows so that all clearance is removed between the make-up flanks of threads.

Figure 23—Gauging Practice for Buttress Casing Threads Hand-Tight Assembly

6.1.4 Tolerances

Tolerance on standoff P and P_1 of the ring gauge against the end of the pipe, and on standoff A and A + (S_1 – S) of the plug gauge against the face of the coupling or box, shall be as follows:

	Tolerance	
	P and P_1	A and A + (S_1 – S)
Line pipe		
All sizes	±1p	±1p
8 threads per in.		
Round thread casing and tubing	±1p	±1p
10 threads per in.		
Round thread tubing	±1 1/2p	±1 1/2p
Buttress casing	+1/2p	+0
	–0	–1/2p

Note: The requirements given herein for line pipe and round thread gauges do not include mandatory provisions for a gaging notch. Therefore, the length A + M + (S_1 – S) cannot be measured readily with these gauges (see Figure 10, Detail D). This length may be measured by providing a suitable notch on the working plug gauge located at the Distance L_1 from the end-of-pipe plane (see Figure 25).

"p" is defined as the distance from a point on a nominal thread form to a corresponding point on the next thread, measured parallel to the axis. This value can be calculated by dividing 1 in. by the number of threads per in. (1 mm by the number of threads per mm).

6.1.5 Gauge Calibration Maintenance

The maintenance of master gauges within the standoff limits specified in 6.1.6 shall be the responsibility of the gauge user. Gauges shall be periodically tested for mating standoff by the procedure stipulated in 6.1.4, the interval between tests being dependent on the frequency of their use. The API Monogram shall not be applied on products controlled by gauges which have not been so tested.

All records of mating standoff of working gauges to master gauges shall indicate a traceable identification of the master utilized.

6.1.6 Gauge Acceptance

A pair of gauges (master plug and mating master ring) which have been tested as prescribed in 8.1.4 may be considered acceptable for continued use provided the mating standoff remains equal to the original certified standoff "S" (as stamped on the ring gauge), or does not change from this original value more than that shown below.

a. For line pipe gauges the mating standoff shall not increase from the original S value by more than the equivalent of 1/10 thread turn for all pitches and sizes, and shall not decrease from this original value by more than 1/8 thread turn for 27-thread and 18-thread (per in.) gauges, 5/32 thread turn for 14-thread and 11 1/2-thread gauges, or 5/32 thread turn for 8-thread gauges for line pipe in nominal sizes 8 and smaller, and 1/5 thread turn for 8-thread gauges for line pipe in nominal sizes 8 and larger.
b. For round thread casing and tubing gauges, the mating standoff shall not increase from the original S value by more than the equivalent of 1/10 thread turn for all pitches and sizes and shall not decrease from this original value for 8-thread gauges by more than 5/32 thread turn for sizes 8 5/8 and smaller, 1/5 thread turn for sizes 9 5/8 and larger, and 1/5 thread turn for all 10-thread gauges.
c. For buttress thread casing gauges the mating standoff shall not increase from the original S value by more than the equivalent of 1/16 thread turn for all sizes and shall not decrease from this original value by more than 1/10 thread turn for sizes 8 5/8 and smaller, and 1/8 thread turn for sizes 9 5/8 and larger.

The standoff in thread turns is converted to axial standoff by dividing the fractional turn by the number of threads per in., or by multiplying the fractional turn by the pitch. The tolerances on standoff as given above in turns are equivalent to the following axial tolerances:

Number of Threads per in.	Axial Tolerance in.
Line pipe gauges	
27	+0.0037 –0.0046
18	+0.0056 –0.0070
14	+0.0071 –0.0112
$11^1/_2$	+0.0087 –0.0136
8 (Nominal pipe sizes 8 and smaller)	+0.0125 –0.0195
8 (Nominal pipe sizes 10 and larger)	+0.0125 –0.0250
Round thread casing and tubing gauges	
10	+0.0100 –0.0200
8 (Pipe sizes $8^5/_8$ and smaller)	+0.0125 –0.0195
8 (Pipe sizes $9^5/_8$ and larger)	+0.0125 –0.0250
Buttress thread casing gauges	
5 (Pipe sizes $8^5/_8$ and smaller)	+0.0125 –0.0200
5 (Pipe sizes $9\ ^5/_8$ and larger)	+0.0125 –0.0250

6.1.7 Change in S Value

A pair of master gauges showing at any time an increase or decrease in S value greater or less than given in 6.1.6 shall be reconditioned or replaced.

Note: An increase in standoff usually indicates the presence of burrs, rough threads, some foreign substance, or possibly a secular change in dimensions. When an increase is observed, the gauges should be cleaned of burrs or foreign substances and rechecked. If the increase is still greater than that specified in 6.1.6, the gauges shall be reconditioned or replaced.

6.1.8 Recertification

Before reuse, all reconditioned gauges shall be recertified by an official testing agency.

6.1.9 Line Pipe Gauges Prior to 1940

Master line pipe gauges made prior to January 1, 1940, can be used in establishing working gauge standoff values, if proper corrections are applied. On line pipe gauges made prior to 1940, gauge dimensions were referenced to a plane 5 thread turns from the E_7 plane. Under current gauge requirements, measurements are referred to the plane of vanish point, which is 5.47 thread turns from the E_7 plane (see Figure 24). Other gauge dimensions which affect how the gauges may be used were not changed; therefore, gauges made prior to 1940 may be used in current gauging practice, provided proper adjustment in standoff values is made for the shift in reference plane. These correction values, which are either negative or positive depending upon the standoff under consideration, are as follows:

7 Gauge Specification

7.1 LINE PIPE, ROUND THREAD CASING AND TUBING, AND BUTTRESS THREAD CASING

7.1.1 Master Gauges

Master plug and ring gauges, including fitting plates, shall be hardened within the limits of C60 to C63 Rockwell. They shall be ground gauges and shall conform to the dimensions and tolerances specified in Tables 18 – 28 and Figures 25 – 29. Imperfect threads

Number of Threads per in.	Correction Difference in Values of g
	in
27	0.017
18	0.026
14	0.034
11 1/2	0.041
8	0.059

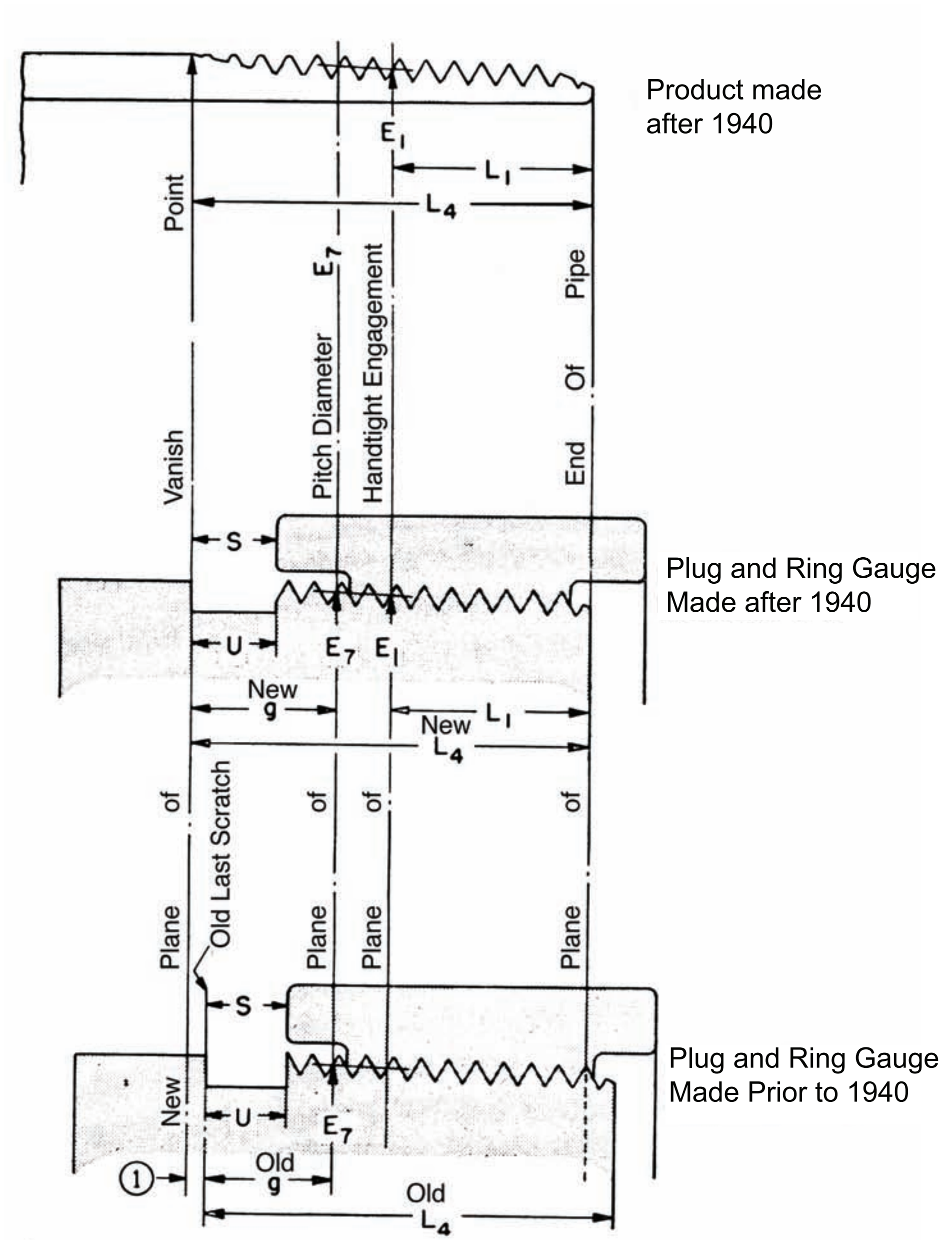


Figure 24—Comparison of Line Pipe Gauges Made Subsequent to 1940 and Gauges Made Prior to 1940

at both ends of master gauges for line pipe, round thread casing, and tubing, and on the small end of master gauges for buttress casing, shall be convoluted to a full thread form. The lengths of thread for master plug gauges shall be $L_4 - U$.

Note: The following relationships are the basis of gauge dimensions:

For line pipe thread gauges:

a. The E_7 pitch diameter is equal to the basic outside diameter of the pipe, minus 0.8p.
b. The inside edge of the plug collar represents the basic plane of vanish point on the pipe.
c. The length g is equal to 5.47p.
d. The length of vanish threads is 3.47p.
e. The plug groove width U is equal to 3p.
f. The diameter of the plug collar D_4 is equal to the basic outside diameter of the pipe.
g. The basic diameter of the counterbore Q in the ring gauge is the same as the diameter of the recess in the coupling.
h. The basic diameter of the plug groove D_u is 0.060 in. smaller than the minor cone diameter of the product thread at the E_7 plane.

For round thread casing and tubing gauges:

a. The E_7 pitch diameter is equal to D_4 – (h – 0.003 in.).
b. The inside edge of the plug collar represents the basic plane of vanish point on the pipe.
c. The length g is equal to:
   5p—for casing and 10-thread tubing.
   4p—for 8-thread tubing.
d. The length of vanish threads is:
   2.28p for casing.
   1.69p for 10-thread tubing.
   1.88p for 8-thread tubing.
e. The plug-groove width U is equal to 2p.
f. The diameter of the plug collar, D_4, is equal to the outside diameter of that portion of the pipe adjacent to the threads.
g. The basic diameter of the counterbore in the ring gauge is the same as the basic diameter of the recess in the coupling.
h. The basic diameter D_u of the plug groove is 0.060 in. smaller than the minor-cone diameter of the product thread at the plane of E_7.

For buttress thread casing gauges:

a. The major diameter at the end of the plug gauge D_o is equal to $E_7 - 0.0625\ L_7 + 0.062$ in. for sizes 13 $^3/_8$ and smaller; for 16 and larger, D_o is equal to $E_7 - 0.0833\ L_7 + 0.062$ in.
b. At plane of perfect thread length L_7, the basic major diameter of pipe thread and plug gauge thread is 0.016 in. greater than specified outside diameter of thc pipe D for sizes 13 $^3/_8$ and smaller, and is equal to the specified pipe diameter for sizes 16 and larger.
c. The pitch diameter E_7 is equal to D_4 – 0.062 in. The pitch diameter E_7 is for design purposes only and does not require certification.
d. The inside edge of the plug collar represents the basic plane of vanish point on the pipe.
e. The length of imperfect threads, g, of the plug gauge is 1.984 in. for sizes 13 $^3/_8$ and smaller; for 16 and larger, g is 1.488 in.
f. The plug-groove width U is equal to $^3/_{16}$ in. for all sizes.
g. The diameter of the plug collar, D_4, is equal to the tabulated outside diameter of the pipe plus 0.016 in. for sizes 13 $^3/_8$ and smaller; for 16 and larger, D_4 is equal to the tabulated outside diameter of the pipe.
h. The basic diameter of the counterbore in the ring gauge is the same as the basic diameter of the counterbore in the coupling.
i. The basic diameter D_u of the plug gauge is $^3/_{16}$ in. smaller than the plug collar.
j. Thread crests and roots are parallel to cone for sizes 13 $^3/_8$ and smaller; crests and roots are parallel to the pipe axis for sizes 16 and larger.

7.1.2 Working Gauges

Working gauges shall conform to stipulations given herein with respect to lead, taper, and angle of thread. Working gauges shall conform to the dimensions and tolerances specified in Tables 18 – 28, but shall not be rejected for the non-compliance thereto of the miscellaneous elements D_4, D_u, U, Q, q, length of plug collar, and depth of ring counterbore unless interfering with the proper use of the gauge. The length of thread for working plug gauges shall be the basic L_1 dimension on linepipe and round thread gauges, and the basic $L_4 - U$ dimension on buttress thread gauges. On buttress thread casing gauges, the plug gauges may be furnished with a gauging notch at the E_7 plane. The length from the plane of vanish point at to the end of the notch shall be equal to g, within the specified tolerances. It is permissible to provide a fitting plate on the small end face of the ring gauges. Working gauges should be hardened within the limits C60 to C63 Rockwell.

7.1.3 Lead

The lead of line pipe and round thread plug and ring gauges shall be measured parallel to the thread axis along the pitch cone, over the full threaded length, less the end threads. The lead of buttress thread ring gauges shall be measured parallel to the thread axis, approximately along the pitch cone, over the full threaded length, less the end threads.

The lead of buttress thread plug gauges shall be measured parallel to the thread axis, approximately along the pitch cone, in the perfect thread length, less the end thread at the small end. The lead error between any two threads shall not exceed the tolerance specified in Tables 26, 27 and 28.

7.1.4 Taper

The taper of both plug and ring gauges shall be determined from measurements of the diameter of the pitch cone for line pipe and round thread gauges and of the major or the minor cones of buttress thread gauges, at a minimum of two positions covering the full threaded length less the end threads. The difference between the diameter at the large end of a gauge and the diameter at any position nearer the small end, less the end threads, shall not differ from the specified taper by more than the appropriate fraction of the total tolerance specified in Tables 26, 27, and 28. The applicable fraction of the tolerance shall be determined from the ratio of the axial distance between the positions where the diameter measurements are made to the L_4 – g length for line pipe and round thread gauges and the L_4 – S length for buttress thread gauges. In determining compliance with the specified tolerance, allowance should be made for the uncertainty of the diameter measurements, particularly in the case of small axial intervals where the taper tolerance is necessarily small.

7.1.5 Thread Height

For line pipe gauges and round thread gauges, the thread height, h_g, is the distance from the crest of the thread on the plug to the crest of the thread on the ring at any given diameter assuming perfect thread form. It is a reference dimension used in determining the diameter of the ring gauge. It cannot be measured directly. Thread height, h_g, does not apply to buttress thread gauges. For buttress thread gauges, the thread height is measured directly and shall comply with the dimensions and tolerances given in Figures 28 and 29, and Table 28.

7.1.6 Root Form

The roots of line pipe and round thread gauges shall be sharp or undercut to a width approximately the width of the product crest. The undercut shall be substantially symmetrical with respect to the adjoining thread flanks, and of such depth as to clear the basic sharp thread; otherwise, the shape of the undercut is optional with the gauge manufacturer.

7.1.7 Gauge Length

The length of thread in master and working ring gauges shall not be less than L_4 – g – $1^1/_2$p for linepipe and round thread gauges, and not less than L_4 – 1 in. for buttress thread casing gauges. If so specified or agreed to by the purchaser, the small end of the plug gauge shall be finished with a projection having a length approximately $1^1/_2$p on line pipe and round thread gauges, and approximately $^3/_{16}$ in. on buttress thread casing gauges, and a gauging notch. The diameter at the end of the projection shall be such that the projection will not interfere with proper gauging (see Figures 25 and 26).

Note: Ring gauges made prior to 1979 having an extension on the small end to provide sockets for make-up may be used if the P_1 is determined and recorded so that the compensated values are known.

7.1.8 Master Plug Gauges—Centering Provisions

All API Master plug gauges (see note) up to and including $8^5/_8$ must have centers, arbors or handles with centers suitable for inspecting the gauge between centers. On gauges larger than $8^5/_8$, bolt circles and back-up plates per Figure 30 are required for line pipe, buttress casing and short or long round casing gauges. The certifying agency can reject a plug gauge with inadequate centers or bolt circle.

Note: Applies only to Master Casing and Line Pipe Plug Gauges made after May 31, 1988.

7.1.9 Mating Standoff

The mating standoff "S" of the master ring gauge from the plane of vanish point on the master plug gauge shall conform to the values given in Tables 18 – 23. The initial mating standoff of the gauges shall conform to the specified value within the tolerance given in Tables 26, 27 and 28.

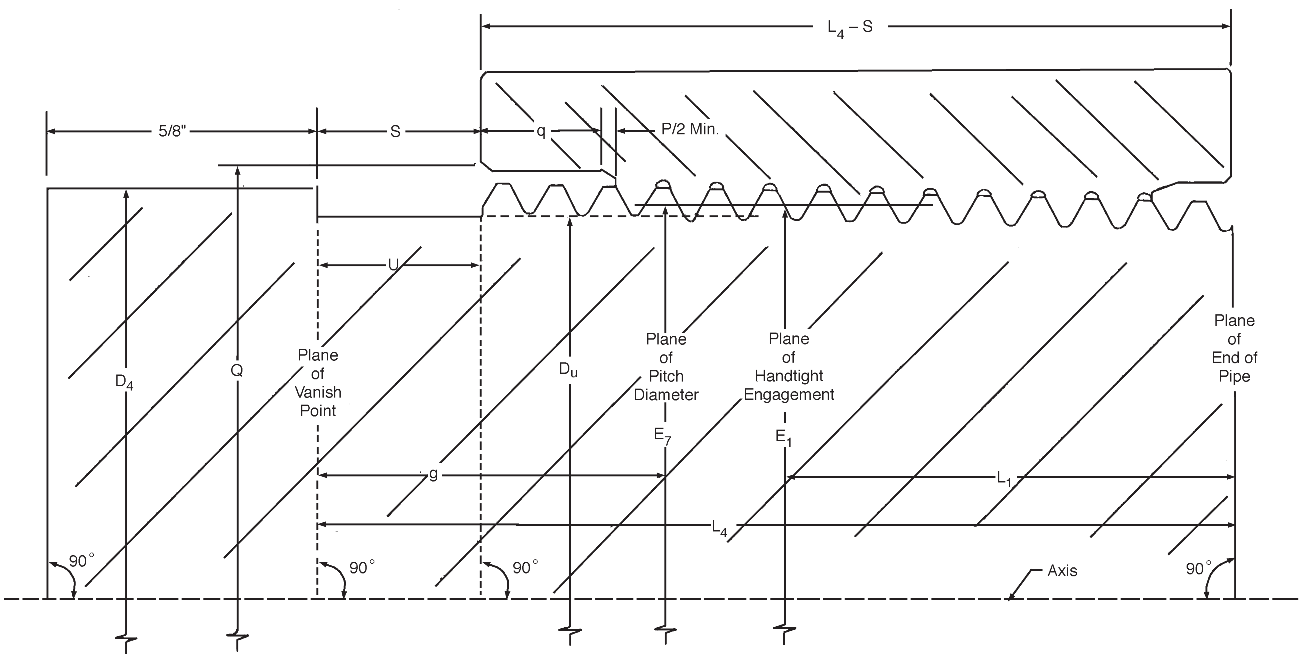
7.1.10 Marking

Master gauges shall be permanently marked by the gauge manufacturer with the marking given below. Plug gauges should preferably be marked on the body, although marking on the handle is acceptable on gauges in small sizes or when the handle is integral with the body. Any markings which are considered necessary by the gauge maker may be added. Both plug and ring shall be marked as follows:

a. Specification 5B (see note). "Spec 5B" may be used on master gauges produced by non-licensees and shall not be used on working gauges or gauges which do not meet all stipulations given herein, including determination of mating standoff. The API Monogram shall be applied by authorized manufacturers in accordance with the regulations governing the use of the Monogram described in Appendix B.
b. Date of Manufacture.
c. Size of Gauge. For line pipe gauges the nominal sizes, as given in Table 18, and for casing and tubing gauges the outside diameter of the pipe as given in Tables 19 – 23, shall be marked on each new plug and ring gauge.
d. Type of thread. Both plug and ring gauges shall be marked with the proper identifying terms or their abbreviations as follows:

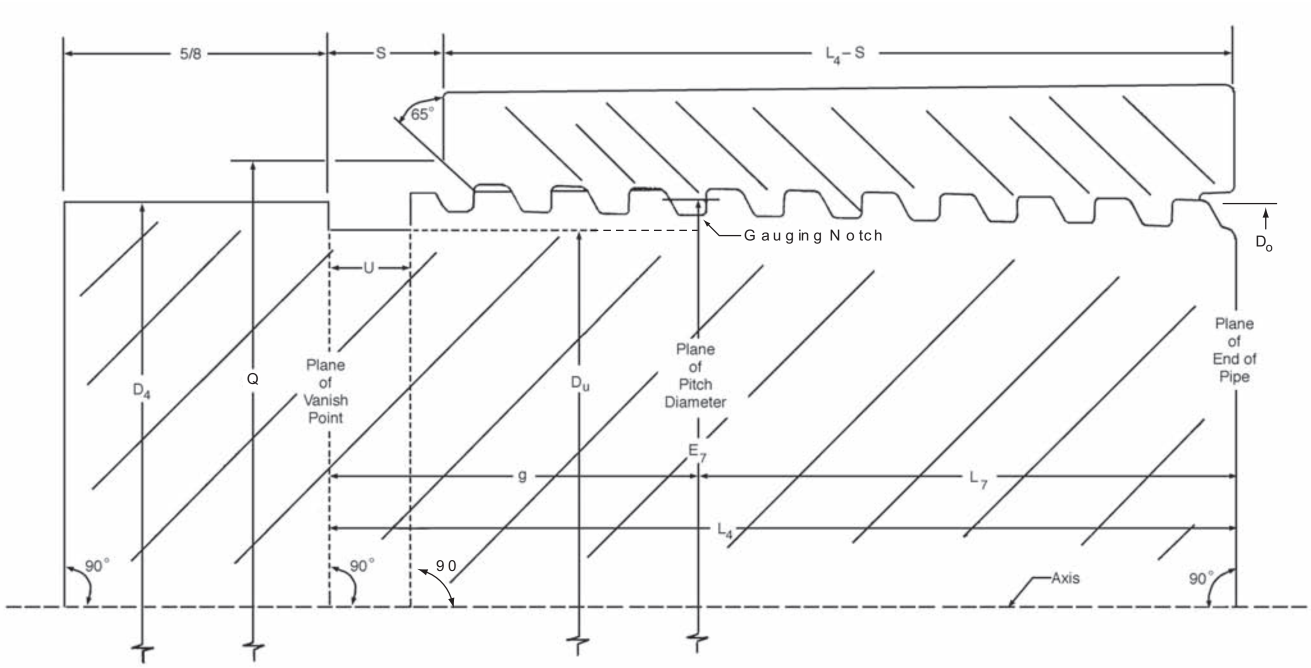
Line pipe	LINE PIPE or LP
Round thread casing	CSG
Buttress thread casing	BUTTRESS CSG
Non-upset tubing and integral joint tubing	TBG
External-upset tubing	UP TBG

e. Name or Identifying Mark of Gauge Maker. The name or identifying mark of the gauge maker shall be placed on both plug and ring gauge.
f. Year of Adoption (Line Pipe Gauges Only). Gauge dimensions stipulated herein for new gauges were adopted in 1940. Plug gauges made prior to January 1, 1940 may have g values at variance with such values as given herein. See 6.1.9 for correction factors.



Note: See Figure 27 for detail of thread form; see Tables 18, 19, and 21 – 25 for dimensions; see 7.1.8 and Tables 26 and 27 for tolerances.

Figure 25—Thread Gauge for Line Pipe and Round Thread Casing and Tubing



Note: See Figure 28 for detail of thread form; see Table 20 for dimensions; see Table 28 for tolerances.

Figure 26—Thread Gauge for Buttress Casing

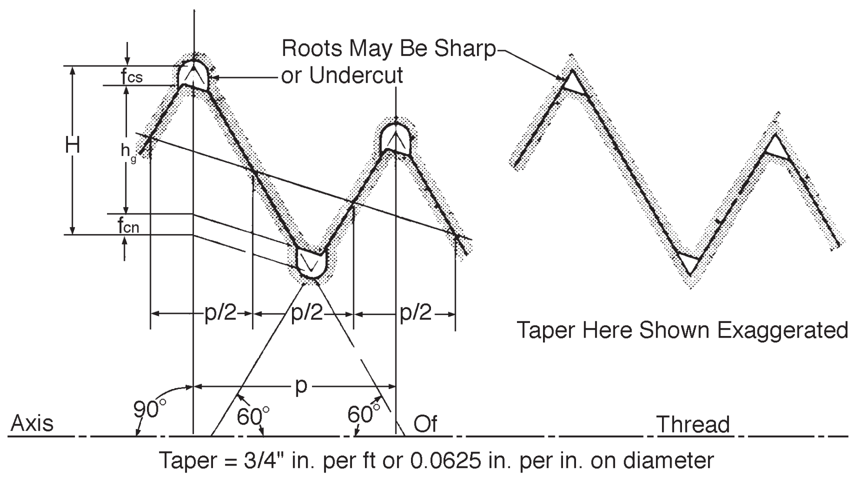


Figure 27—Gauge Thread Form for Line Pipe and Round Thread Casing and Tubing

(See Tables 24 and 25 for dimensions.)

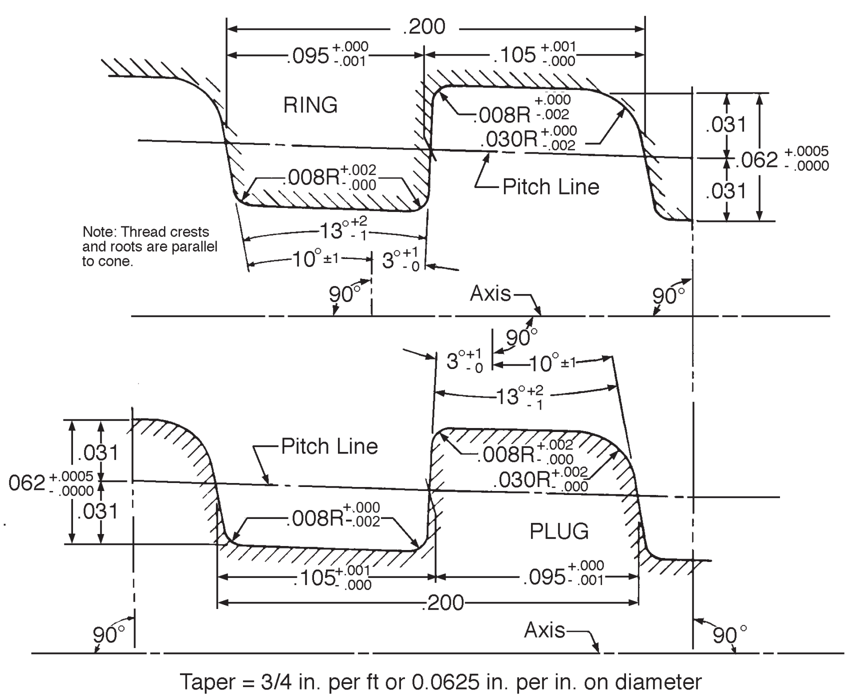


Figure 28—Gauge Thread Form and Dimensions for Buttress Casing

(Size designations $4^1/_2$ through $13^3/_8$.)

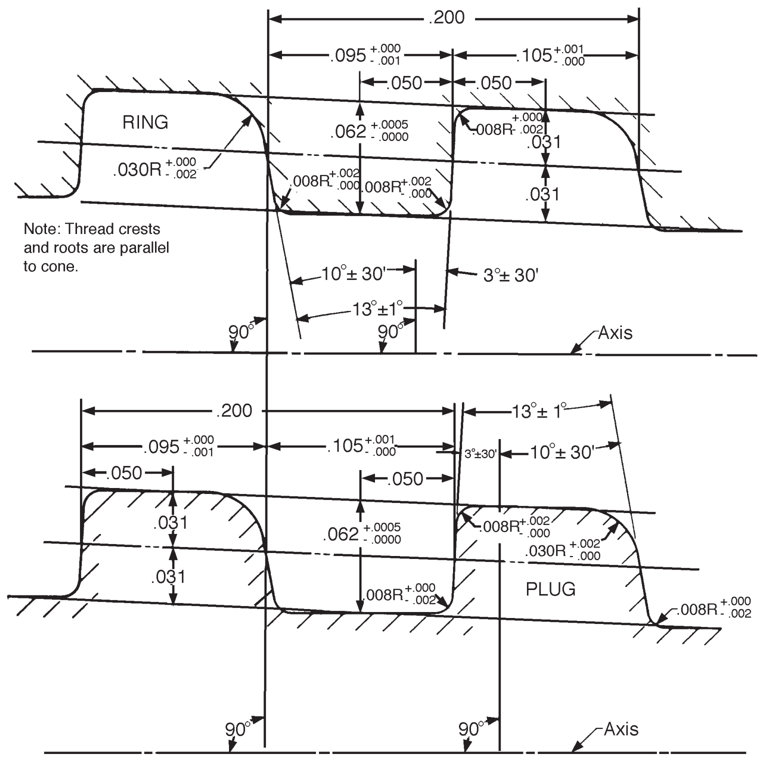
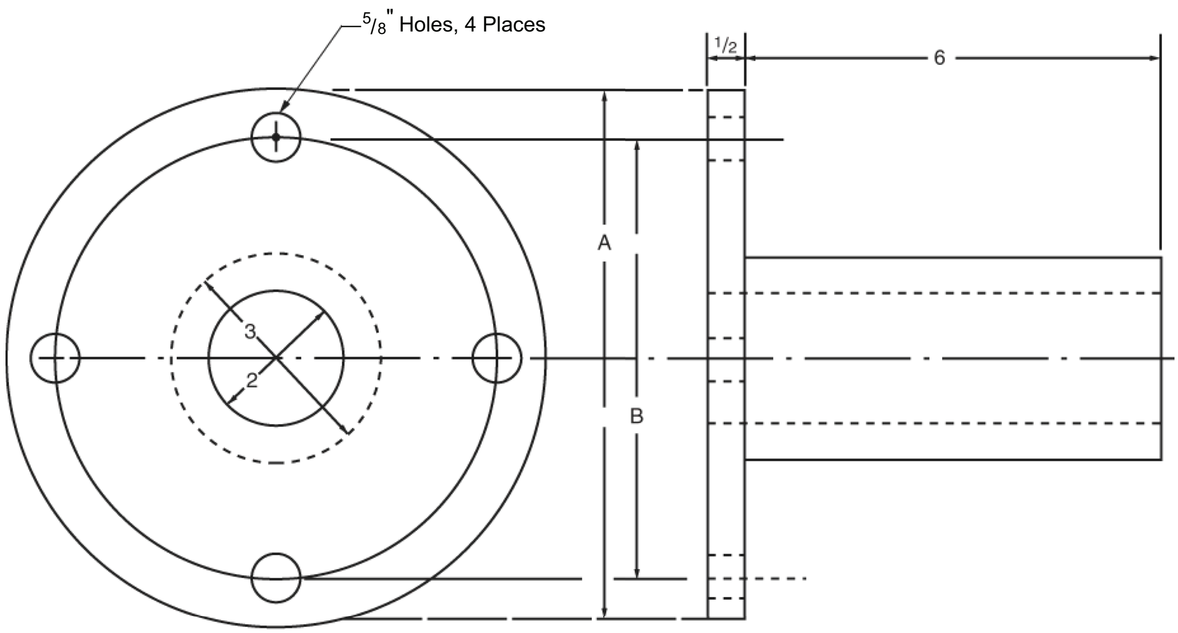


Figure 29—Gauge Thread Form and Dimensions for Buttress Casing
(Size designations 16 and larger.)



Size, in.	9 5/8/10	10 3/4/11 3/4/12	13 3/8/14	16	18/18 5/8	20
A	9 5/8	10 3/4	13 3/8	16	18	20
B	7 1/4	9 3/8	10 3/4	12 3/8	16	17 3/8

Figure 30—Bolt Circles and Back-Up Plate Dimensions for Line Pipe, Buttress Casing and Short or Long Round Casing Master Plug Gauges

Table 18—Line Pipe Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 25.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Nominal Size[a]	Outside Diameter of Plug Collar D_4	Diameter of Groove D_u	Diameter of Counter-bore Q	Depth of Counter-bore q	No. of Threads per in.	Pitch Diameter at Hand-Tight Plane E_1	Pitch Diameter at Length g from Vanish Point E_7	Length: Plane of E_7 to Vanish Point g	Length: End of Plug Gauge to Hand-Tight Plane L_1	Length: End of Plug Gauge to Vanish Point L_4	Width of Groove U	Standoff S
1/8	0.405	0.286	0.468	0.092	27	0.37360	0.37537	0.2026	0.1615	0.3924	0.111	0.111
1/4	0.540	0.391	0.603	0.137	18	0.49163	0.49556	0.3039	0.2278	0.5946	0.167	0.167
3/8	0.675	0.526	0.738	0.137	18	0.62701	0.63056	0.3039	0.240	0.6006	0.167	0.167
1/2	0.840	0.666	0.903	0.177	14	0.77843	0.78286	0.3906	0.320	0.7815	0.214	0.214
3/4	1.050	0.876	1.113	0.177	14	0.98887	0.99286	0.3906	0.339	0.7935	0.214	0.214
1	1.315	1.116	1.378	0.215	11 1/2	1.23863	1.24543	0.4756	0.400	0.9845	0.261	0.261
1 1/4	1.660	1.461	1.723	0.215	11 1/2	1.58338	1.59043	0.4756	0.420	1.0085	0.261	0.261
1 1/2	1.900	1.701	1.963	0.215	11 1/2	1.82234	1.83043	0.4756	0.420	1.0252	0.261	0.261
2	2.375	2.176	2.469	0.215	11 1/2	2.29627	2.30543	0.4756	0.436	1.0582	0.261	0.261
2 1/2	2.875	2.615	2.969	0.309	8	2.76216	2.77500	0.6837	0.682	1.5712	0.375	0.375
3	3.500	3.240	3.594	0.309	8	3.38850	3.40000	0.6837	0.766	1.6337	0.375	0.375
3 1/2	4.000	3.740	4.094	0.309	8	3.88881	3.90000	0.6837	0.821	1.6837	0.375	0.375
4	4.500	4.240	4.594	0.309	8	4.38712	4.40000	0.6837	0.844	1.7337	0.375	0.375
5	5.563	5.303	5.657	0.309	8	5.44929	5.46300	0.6837	0.937	1.8400	0.375	0.375
6	6.625	6.365	6.719	0.309	8	6.50597	6.52500	0.6837	0.958	1.9462	0.375	0.375
8	8.625	8.365	8.719	0.309	8	8.50003	8.52500	0.6837	1.063	2.1462	0.375	0.375
10	10.750	10.490	10.844	0.309	8	10.62094	10.65000	0.6837	1.210	2.3587	0.375	0.375
12	12.750	12.490	12.844	0.309	8	12.61781	12.65000	0.6837	1.360	2.5587	0.375	0.375
14 D	14.000	13.740	14.094	0.309	8	13.87263	13.90000	0.6837	1.562	2.6837	0.375	0.375
16 D	16.000	15.740	16.094	0.309	8	15.87575	15.90000	0.6837	1.812	2.8837	0.375	0.375
18 D	18.000	17.740	18.094	0.309	8	17.87500	17.90000	0.6837	2.000	3.0837	0.375	0.375
20 D	20.000	19.740	20.094	0.309	8	19.87031	19.90000	0.6837	2.125	3.2837	0.375	0.375

Included taper on diameter, all sizes, 0.0625 in. per in.

[a]The gauge size is the same as nominal size of the pipe, and is not the outside diameter except for sizes 14 through 20.

Table 19—Short and Long Round Casing Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 25.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Outside Diameter of Pipe Size Designation	Outside Diameter of Plug Collar D_4	Diameter of Groove D_u	Diameter of Counter-bore Q	Depth of Counter-bore q	No. of Threads per in.	Pitch Diameter at Hand-Tight Plane E_1	Pitch Diameter at Length g from Vanish Point E_7	Length: Plane of E_7 to Vanish Point g	Length: End of Plug Gauge to Hand-Tight Plane L_1	Length: End of Plug Gauge to Vanish Point L_4	Width of Groove U	Standoff S
4 1/2	4.500	4.2975	4.594	0.250	8	4.40337	4.43175	0.625	0.921	2.000	0.250	0.375
5	5.000	4.7975	5.094	0.250	8	4.90337	4.93175	0.625	1.671	2.750	0.250	0.375
5 1/2	5.500	5.2975	5.594	0.250	8	5.40337	5.43175	0.625	1.796	2.875	0.250	0.375
6 5/8	6.625	6.4225	6.719	0.250	8	6.52837	6.55675	0.625	2.046	3.125	0.250	0.375
7	7.000	6.7975	7.094	0.250	8	6.90337	6.93175	0.625	2.046	3.125	0.250	0.375
7 5/8	7.625	7.4225	7.719	0.250	8	7.52418	7.55675	0.625	2.104	3.250	0.250	0.375
8 5/8	8.625	8.4225	8.719	0.250	8	8.52418	8.55675	0.625	2.229	3.375	0.250	0.375
9 5/8	9.625	9.4225	9.719	0.250	8	9.52418	9.55675	0.625	2.229	3.375	0.250	0.375
10 3/4	10.750	10.5475	10.844	0.250	8	10.64918	10.68175	0.625	2.354	3.500	0.250	0.375
11 3/4	11.750	11.5475	11.844	0.250	8	11.64918	11.68175	0.625	2.354	3.500	0.250	0.375
13 3/8	13.375	13.1725	13.469	0.250	8	13.27418	13.30675	0.625	2.354	3.500	0.250	0.375
16	16.000	15.7975	16.094	0.250	8	15.89918	15.93175	0.625	2.854	4.000	0.250	0.375
18 5/8	18.625	18.4225	18.719	0.250	8	18.52418	18.55675	0.625	2.854	4.000	0.250	0.375
20	20.000	19.7975	20.094	0.250	8	19.89918	19.93175	0.625	2.854	4.000	0.250	0.375

Included taper on diameter, all sizes, 0.0625 in. per in.

Table 20—Buttress Casing Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 26.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Outside Diameter of Pipe Size Designation	Outside Diameter of Plug Collar D_4	Diameter of Groove D_u	Diameter of Counter-bore Q	No. of Threads per in.	Pitch Diameter[a] E_7	Major Diameter at End of Plug Gauge D_o	Length: Plane of E_7 to Vanish Point g	Length: End of Plug Gauge to E_7 Plane L_7	Length: End of Plug Gauge to Vanish Point L_4	Width of Groove U	Standoff S
4 1/2	4.516	4.328	4.640	5	4.454	4.4127	1.984	1.6535	3.6375	3/16	0.100
5	5.016	4.828	5.140	5	4.954	4.9048	1.984	1.7785	3.7625	3/16	0.200
5 1/2	5.516	5.328	5.640	5	5.454	5.4009	1.984	1.8410	3.8250	3/16	0.200
6 5/8	6.641	6.453	6.765	5	6.579	6.5142	1.984	2.0285	4.0125	3/16	0.200
7	7.016	6.828	7.140	5	6.954	6.8775	1.984	2.2160	4.2000	3/16	0.200
7 5/8	7.641	7.453	7.765	5	7.579	7.4908	1.984	2.4035	4.3875	3/16	0.200
8 5/8	8.641	8.453	8.765	5	8.579	8.4830	1.984	2.5285	4.5125	3/16	0.200
9 5/8	9.641	9.453	9.765	5	9.579	9.4830	1.984	2.5285	4.5125	3/16	0.200
10 3/4	10.766	10.578	10.890	5	10.704	10.6080	1.984	2.5285	4.5125	3/16	0.200
11 3/4	11.766	11.578	11.890	5	11.704	11.6080	1.984	2.5285	4.5125	3/16	0.200
13 3/8	13.391	13.203	13.515	5	13.329	13.2330	1.984	2.5285	4.5125	3/16	0.200
16	16.000	15.812	16.154	5	15.938	15.7397	1.488	3.1245	4.6125	3/16	0.175
18 5/8	18.625	18.437	18.779	5	18.563	18.3647	1.488	3.1245	4.6125	3/16	0.175
20	20.000	19.812	20.154	5	19.938	19.7397	1.488	3.1245	4.6125	3/16	0.175

Included taper on diameter: Sizes 13 3/8 and smaller—0.0625 in. per in.
Sizes 16 and larger—0.0833 in. per in.

[a]Pitch diameter on buttress casing thread is defined as being midway between the major and minor diameters. The pitch diameter is for design purposes only and does not require certification.

Table 21—Non-Upset Tubing Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 25.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Outside Diameter of Pipe Size Designation	Outside Diameter of Plug Collar D_4	Diameter of Groove D_u	Diameter of Counter-bore Q	Depth of Counter-bore q	No. of Threads per in.	Pitch Diameter at Hand-Tight Plane E_1	Pitch Diameter at Length g from Vanish Point E_7	Length: Plane of E_7 to Vanish Point g	Length: End of Plug Gauge to Hand-Tight Plane L_1	Length: End of Plug Gauge to Vanish Point L_4	Width of Groove U	Standoff S
1.050	1.050	0.8788	1.113	0.200	10	0.98826	0.99740	0.500	0.448	1.0938	0.200	0.300
1.315	1.315	1.1438	1.378	0.200	10	1.25328	1.26240	0.500	0.479	1.1250	0.200	0.300
1.660	1.660	1.4888	1.723	0.200	10	1.59826	1.60740	0.500	0.604	1.2500	0.200	0.300
1.900	1.900	1.7288	1.963	0.200	10	1.83826	1.84740	0.500	0.729	1.3750	0.200	0.300
$2^3/_8$	2.375	2.2038	2.438	0.200	10	2.31326	2.32240	0.500	0.979	1.6250	0.200	0.300
$2^7/_8$	2.875	2.7038	2.938	0.200	10	2.81326	2.82240	0.500	1.417	2.0625	0.200	0.300
$3^1/_2$	3.500	3.3288	3.563	0.200	10	3.43826	3.44740	0.500	1.667	2.3125	0.200	0.300
4	4.000	3.7975	4.063	0.125	8	3.91395	3.93175	0.500	1.591	2.3750	0.250	0.375
$4^1/_2$	4.500	4.2975	4.563	0.125	8	4.41395	4.43175	0.500	1.779	2.5625	0.250	0.375

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: See footnote Table 23 for interchangeability of gauges.

Table 22—External-Upset Tubing Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 25.

(1) Outside Diameter of Pipe Size Designation	(2) Outside Diameter of Plug Collar D_4	(3) Diameter of Groove D_u	(4) Diameter of Counter-bore Q	(5) Depth of Counter-bore q	(6) No. of Threads per in.	(7) Pitch Diameter at Hand-Tight Plane E_1	(8) Pitch Diameter at Length g from Vanish Point E_7	(9) Length: Plane of E_7 to Vanish Point g	(10) Length: End of Plug Gauge to Hand-Tight Plane L_1	(11) Length: End of Plug Gauge to Vanish Point L_4	(12) Width of Groove U	(13) Standoff S
1.050	1.315	1.1438	1.378	0.200	10	1.25328	1.26240	0.500	0.479	1.1250	0.200	0.300
1.315	1.469	1.2976	1.531	0.200	10	1.40706	1.41615	0.500	0.604	1.2500	0.200	0.300
1.660	1.812	1.6413	1.875	0.200	10	1.75079	1.75990	0.500	0.729	1.3750	0.200	0.300
1.900	2.094	1.9226	2.156	0.200	10	2.03206	2.04115	0.500	0.792	1.4375	0.200	0.300
2 3/8	2.594	2.3912	2.656	0.125	8	2.50775	2.52550	0.500	1.154	1.9375	0.250	0.375
2 7/8	3.094	2.8912	3.156	0.125	8	3.00775	3.02550	0.500	1.341	2.1250	0.250	0.375
3 1/2	3.750	3.5475	3.813	0.125	8	3.66395	3.68175	0.500	1.591	2.3750	0.250	0.375
4	4.250	4.0475	4.313	0.125	8	4.16395	4.18175	0.500	1.716	2.5000	0.250	0.375
4 1/2	4.750	4.5475	4.813	0.125	8	4.66395	4.68175	0.500	1.841	2.6250	0.250	0.375

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: See footnote Table 23 for interchangeability of gauges.

Table 23—Integral-Joint Tubing Thread Gauge Dimensions

All dimensions in inches at 68°F, except as otherwise indicated. See Figure 25.

(1) Outside Diameter of Pipe Size Designation	(2) Outside Diameter of Plug Collar D_4	(3) Diameter of Groove D_u	(4) Diameter of Counter-bore Q	(5) Depth of Counter-bore q	(6) No. of Threads per in.	(7) Pitch Diameter at Hand-Tight Plane E_1	(8) Pitch Diameter at Length g from Vanish Point E_7	(9) Length: Plane of E_7 to Vanish Point g	(10) Length: End of Plug Gauge to Hand-Tight Plane L_1	(11) Length: End of Plug Gauge to Vanish Point L_4	(12) Width of Groove U	(13) Standoff S
1.315	1.315	1.1438	1.378	0.200	10	1.25328	1.26240	0.500	0.479	1.1250	0.200	0.300
1.660	1.660	1.4888	1.723	0.200	10	1.59826	1.60740	0.500	0.604	1.2500	0.200	0.300
1.900	1.900	1.7288	1.963	0.200	10	1.83826	1.84740	0.500	0.729	1.3750	0.200	0.300
2.063	2.094	1.9226	2.156	0.200	10	2.03206	2.04115	0.500	0.792	1.4375	0.200	0.300

Included taper on diameter, all sizes, 0.0625 in. per in.

Note: The 1.315, 1.660, and 1.900 integral-joint tubing gauges are identical to non-upset tubing gauges of the same size and may be used interchangeably.
The 2.063 integral-joint tubing gauges are identical to 1.900 external-upset tubing gauges and may be used interchangeably.
The 1.050 external-upset tubing gauges, the 1.315 non-upset tubing gauges, and the 1.315 integral-joint tubing gauges are identical and may be used interchangeably.

Table 24—Gauge Thread Height Dimensions for Line Pipe

All dimensions in inches at 68°F. See Figure 27.
See Table 26 for tolerances on crest truncation.

(1)	(2)	(3)	(4)	(5)	(6)
Thread Element	27 Threads per in. p = 0.0370	18 Threads per in. p = 0.0556	14 Threads per in. p = 0.0714	$11^1/2$ Threads per in. p = 0.0870	8 Threads per in. p = 0.1250
H = 0.866p	0.03204	0.04815	0.06183	0.07534	0.10825
h_g = 0.666p	0.02464	0.03703	0.04755	0.05794	0.08325
f_{cs} = f_{cn} = 0.l00p	0.00370	0.00556	0.00714	0.00870	0.01250

Table 25—Gauge Thread Height Dimensions for Round Thread Casing and Tubing

All dimensions in inches at 68°F. See Figure 27. See Table 27 for tolerances on crest truncation.

(1)	(2)	(3)
Thread Element	10 Threads per in. p = 0.1000	8 Threads per in. p = 0.1250
H = 0.866p	0.08660	0.10825
h_g = 0.356p	0.03560	—
h_g = 0.386p	—	0.04825
f_{cs} = f_{cn} = 0.255p	0.02550	—
f_{cs} = f_{cn} = 0.240p	—	0.03000

Table 26—Tolerances on Gauge Dimensions for Line Pipe

All dimensions in inches at 68°F, except as otherwise indicated. See Figures 25 and 27.

	Tolerances				
	Number of Threads per in.				
Element	27	18	14	11 1/2	8
Plug Gauge					
Pitch Diameter[a]	±0.0002	±0.0004	±0.0006	±0.0007	±0.0010
Taper[b]	+0.0003	+0.0004	+0.0006	+0.0008	+0.0010
	–0.0000	–0.0000	–0.0000	–0.0000	–0.0000
Lead[c]	±0.0002	±0.0002	±0.0003	±0.0004	±0.0005
Crest truncation	+0.0015	+0.0015	+0.0015	+0.0025	+0.0025
	–0.0010	–0.0010	–0.0010	–0.0015	–0.0015
Half-angle of thread	±l5 min.	±l5 min.	±l0 min.	±l0 min.	±l0 min.
Width of groove, U[d]	±0.037	±0.056	±0.071	±0.087	±0.125
Diameter of groove, D_u[d]	±0.020	±0.020	±0.020	±0.020	±0.020
Diameter of collar, D_4[d]	±0.010	±0.010	±0.010	±0.010	±0.010
Length, L_4[e]	±0.0010	±0.0010	±0.0010	±0.0010	±0.0010
Ring Gauge					
Taper[b]	+0.0000	+0.0000	+0.0000	+0.0000	–0.0002
	–0.0006	–0.0007	–0.0009	–0.0012	–0.0014
Lead[c]	±0.0004	±0.0004	±0.0006	±0.0008	±0.0010
Crest truncation	+0.0015	+0.0015	+0.0015	+0.0025	+0.0025
	–0.0010	–0.0010	–0.0010	–0.0015	–0.0015
Half-angle of thread	±20 min.	±20 min.	±l5min.	±l5min.	±l5min.
Length of ring, $L_4 – S$[e]	±0.002	±0.002	±0.002	±0.002	±0.002
Diameter of counterbore, Q[d]	+ 1/16	+ 1/16	+ 1/16	+ 1/16	+ 1/16
	–0.000	–0.000	–0.000	–0.000	–0.000
Mating standoff, S	±0.037	±0.056	±0.071	±0.087	±0.100

[a]Helix angle correction shall be disregarded in pitch diameter determinations.
[b]The tolerance shown is the maximum allowable error in taper in the length of thread $L_4 – g$. See 7.14. The pitch cone of the 8 threads per in. ring gauge is provided with a minus taper in order to minimize variations in interchange standoff due to lead errors.
[c]The tolerance shown is the maximum allowable error in lead between any two threads whether adjacent or separated by any amount not exceeding the full length of thread less one full thread at each end.
[d]See 7.12 for permissible non-conformance.
[e]This requirement does not apply to gauges made prior to March, 1979.

Table 27—Tolerances on Gauge Dimensions for Round Thread Casing and Tubing

All dimensions in inches at 68°F, except as otherwise indicated. See Figures 25 and 27.

Element	Tolerances
Plug Gauge	
Pitch Diameter[a]	±0.0010
Taper[b]	+0.0010 –0.0000
Lead[c]	±0.0005
Crest truncation	+0.0040 –0.0000
Half-angle of thread	±l0 min.
Width of groove, U[d]:	
For casing and 8-thread non-upset tubing	±0.125
For 10-thread non-upset tubing and 8-thread and 10-thread upset tubing	±0.100
Diameter of groove, D_u[d]	±0.020
Diameter of collar, D_4[d]	±0.010
Length, L_4	±0.001
Length of gauging notch	+0.002 –0.000
Ring Gauge	
Taper[b]	–0.0002 –0.0012
Lead[c]	±0.0008
Crest truncation	+0.0040 –0.0000
Half-angle of thread	±15 min.
Diameter of counterbore, Q[d]	+0.062 –0.000
Length of ring, $L_4 – S$[f]	±0.002
Mating standoff, S[e]	±0.025

[a]Helix angle correction shall be disregarded in pitch diameter determinations.
[b]The tolerance shown is the maximum allowable error in taper in the length of thread L_4 – g. See 7.14. The pitch cone of the ring gauge is provided with a minus taper in order to minimize variation in interchange standoff due to lead error.
[c]The tolerance shown is the maximum allowable error in lead between any two threads whether adjacent or separated by any amount not exceeding the full length of thread less one full thread at each end.
[d]See 7.12 for permissible nonconformance.
[e]Master gauges made prior to March 1979 need not comply with the ±0.025 in. standoff tolerance. For gauges made prior to March 1979 a standoff tolerance of ±0.100 in. is acceptable.
[f]This requirement does not apply to gauges made prior to March, 1979.

Table 28—Tolerances on Gauge Dimensions for Buttress Casing

All dimensions in inches at 68°F. See Figures 26, 28, and 29.

Element		Tolerances
Plug Gauge		
Major Diameter, D_o, per specified size:		
	4 1/2 through 7	±0.0005
	7 5/8 through 13 3/8	±0.0007
	16 and larger	±0.0010
Taper[a]	13 3/8 and smaller	+0.0010
		–0.0000
	16 and larger	+0.0015
		–0.0000
Lead[b]		±0.0005
Thread height		+0.0005
		–0.0000
Diameter of collar, D_4[c]:		
	13 3/8 and smaller	±0.001
	16 and larger	±0.002
Length, L_4		±0.001
Ring Gauge		
Taper[a]	13 3/8 and smaller	+0.0002
		–0.0012
	16 and larger	+0.0002
		–0.0017
Lead[b]		±0.0008
Thread height		+0.0005
		–0.0000
Diameter of counterbore, Q[c]		+1/64
		–0.000
Length of ring, $L_4 - S$[d]		±0.002
Mating standoff, S		±0.015

[a]The tolerance shown is the maximum allowable error in taper in the length $L_4 - S$. See 7.14.
[b]See 7.1.3 for measurement of lead.
[c]See 7.1.2 for permissible non-conformance.
[d]This requirement does not apply to gauges made prior to March, 1979.

8 API Gauge Certification

8.1 LINE PIPE, ROUND THREAD CASING AND TUBING, AND BUTTRESS THREAD CASING

8.1.1 Certification Agencies

All master plug and mating ring gauges, prior to use, shall have been certified to be in accordance with the stipulations given in Section 7, by one of the following nationally recognized independent agencies (see note):

Note: Schedule of fees for tests may be obtained upon application to the testing agencies.

a. Instituto National de Technologia Industrial, Buenos Aires, Republic of Argentina.

b. Stabilimento Militare Materiali Elettronici e di Precisione, Rome, Italy.

c. National Institute of Metrology, Beijing, Peoples' Republic of China.

d. National Institute of Standards and Technology, Gaithersburg, Maryland, USA.

e. National Physical Laboratory, Teddington, Middlesex, England.

f. National Research Laboratory of Metrology, Ibaraki, Japan.

g. National Standards Laboratory, Chippendale, New South Wales, Australia (limited to gauges for sizes $8^5/8$ and smaller).

Note: Application to become an API Gauge Certification Agency is open to any nationally recognized independent metrology laboratory capable of demonstrating compliance to API policy and specified requirements. Interested parties shall notify the API Standards Department. Appendix C of this Specification outlines certification agency requirements.

8.1.2 Certification

The gauge-certifying agency shall inspect new and reconditioned master gauges for conformance to the requirements of Section 7. Master gauges must be certified in complete sets, i.e., a master plug and a master ring gauge. A single master plug or a single master ring gauge may not be certified unless accompanied by a previously certified mating master gauge. For each gauge which complies with all requirements, the certifying agency shall issue a certificate to the gauge owner, showing the mating standoff measurement and stating that the gauge complies with this Specification. For each gauge which does not comply with all requirements, the certifying agency shall issue a report to the gauge owner, stating the reason for rejection and showing the measured value for those dimensions which are outside the permissible limits. The certifying agency shall also report obvious defects and poor workmanship which, in the opinion of the certifying agency, may affect the future use of the gauge.

Master Gauges and Certificates of compliance may be transferred. If a Certificate is not available, the gauges shall be recertified and a new Certificate issued by an agency listed in 8.1.1.

8.1.3 Conformance of Reconditioned Pipe Gauges

All used line pipe gauges made prior to January 1, 1940, with g dimensions equal to 5p, when reconditioned, shall be checked for conformance to the dimensions given in the sixth edition of API Standard 5L (August, 1935) and recertified as provided herein.

8.1.4 The standoff "S" of ring gauges against the mating plug gauge shall be determined as follows:

a. The threads should be cleaned thoroughly and lubricated thoroughly with light high-grade mineral oil.

b. The temperature of the plug and of the ring should be identical.

c. The plug gauge should be rigidly held so as to prevent movement.

d. The mating gauge should be made up using a suitable lever arrangement which provides two hand holds equidistant on diametrically opposite sides of the gauge.

e. The mating plug and ring should be screwed up and unscrewed several times to permit uniform distribution of oil.

f. When checking gauges, it is permissible to strike lightly with a rubber hammer while screwing up. The hammer should not be used until the gauges become tight on the threads.

g. In the final tightening, the gauges should be screwed up snug by one person with a slow steady pull, care being exercised not to jerk them. The hammer is not used. With this procedure, the gauges should pull up freely to a full tight position with an abrupt stop, although further very slight advancement may be obtained by the application of a considerable additional force. It is believed that the actual force used to tighten in determining the S value is of secondary importance as compared with using the same force in screwing the master ring on to the working plug gauge, and in screwing the working gauges on the product.

8.1.5 Marking Verification

The certifying agency shall verify the markings required under Section 6, and shall mark all acceptable gauges (both plug and ring unless otherwise indicated herein) with the following markings (see note):

Note: The certifying agency may mark the gauges with any additional markings considered necessary for proper identification.

a. Date of Certification. The date of certification shall be marked on all gauges. In recertifying reconditioned gauges, the previous certification date shall be replaced with the date of recertification. Dates of retest, as required by 6.1.5, shall not be marked on master gauges.
b. Name or Mark of Certifying Agency. The identification mark of the testing agency shall be marked on the plug gauge only.
c. Mating Standoff. The initial mating standoff shall be marked on the ring gauge only. Mating standoff values determined as specified in 6.1.5 shall not be marked on master gauges.
d. API Monogram. If any gauge marked with the Monogram is determined by the certifying agency to be in non-conformance to requirements, the Monogram shall be removed.

9 Thread Marking

Note: See 7.1.10 and G.4.11 for gauge marking requirements.

9.1 Products having pipe threads which conform to the threading and gauging stipulation given in API Spec 5B may be identified by stamping or stenciling the product adjacent to such thread with the manufacturer's name or mark, the size, the letters Spec 5B, and the thread symbol. The thread marking may be applied to products which do or do not bear the API Monogram. For example, a product having size $2^1/_2$ line pipe threads may be marked:

AB CO $2^1/_2$ Spec 5B LP

If the product is clearly marked elsewhere with the manufacturer's identification, his name or mark may be omitted. Thread type marking symbols shall be as follows:

Casing (short round thread)	CSG
Casing (long round thread)	LCSG
Casing (buttress thread)	BCSG
Casing (extreme-line)	XCSG
Line pipe	LP
Tubing (non-upset)	TBG
Tubing (external-upset)	UPTBG

9.2 The use of the letters Spec 5B as provided in 9.1 shall constitute a certification by the manufacturer that the threads so marked comply with the requirements stipulated in API Spec 5B, but should not be construed by the purchaser as a representation that the product so marked is in its entirety in accordance with any API specification. Manufacturers who use the letters Spec 5B for thread identification must have access to properly certified Reference Master pipe gauges and have in their possession working gauges with established values derived from API monogrammed master gauges.

APPENDIX A—INSTRUCTIONS FOR SHIPMENT OF MASTER GAUGES

A.1 Master gauges should ordinarily remain in good condition for years if properly cared for and used only for the purpose intended, namely, the checking of working gauges with smooth, clean threads. If the gauges become dirty they should be cleaned by the gauge owner before shipment to the custodian for standoff determination.

A.2 Burrs or small scored places on the threads may be stoned with a fine grade of stone. The stoning of scored places extending all the way around the gauge is not approved as the accuracy of the gauges may be seriously affected by extensive stoning. For severe cases of pitting or scoring, regrinding by the gauge manufacturer is advisable.

A.3 Shipping boxes should be securely made, and the material should be heavy enough to prevent damage of the gauges during shipment. The use of green lumber is to be avoided. Each mating pair of gauges should be boxed separately or separated by adequate separators, if contained in the same box. The use of waste or similar packaging to occupy voids and the wrapping of the gauge in a waterproof material is recommended. It is further recommended that the two-element master ring or plug gauges (extreme-line) should be locked and secured within itself to prevent in-transit damage.

A.4 The return address should be affixed securely on the box to aid the custodian for return shipment to the licensee.

A.5 All carriage charges must be prepaid. Shipment should preferably be by a fast system of transit. When returning gauges, custodians will ship collect. Owners should prescribe to the custodian the preferable method of transit for return of gauges.

A.6 Custodians are not permitted to assemble Grand Master gauges with Reference Master gauges which have dirty or damaged threads. If cleaning is required, other than that required to remove the protective coating, the testing agency will charge for the extra work. If the gauge is rusted or scored to such extent as to require reconditioning, the gauge owner will be so notified. Failure to recondition such gauges will be considered justification for cancellation of their status as authorized master gauges.

A.7 Owners of gauges which are to be transported by ship from outside the United States to the National Institute of Standards and Technology (NIST) for test must make prior arrangements with a customs broker either in the country of origin or in the United States for entry of the gauges into the United States, with or without bond as may be necessary, and prepaid transportation to and from the ports of entry and exit. Entry in bond is required for gauges made outside the United States; whereas gauges made in the United States may be entered without bond. If arrangements are made with a broker in the country of origin, that broker should, in turn, have a customs broker in or near the port of entry arrange for entry of the gauges and prepaid transportation to the NIST, Gaithersburg, Maryland.

A.8 An alternative method of shipment which eliminates the need for the services of a customs broker is by air freight to NIST, via Dulles International Airport, Washington, D.C. When shipments are made by this method the NIST will pick up the gauges at the airport, arrange for entry in bond when necessary, and after test obtain release from bond if required and deliver the gauges to the airport for return shipment. The gauges will be returned collect with transportation charges payable at destination.

A.9 Transportation by air is much more expensive than by ship but the difference is largely offset by customs broker's charges. An added advantage of air transportation is the very great decrease in the time the gauges are away from the owner’s factory.

A.10 NIST’s charges for tests will be billed separately from those of a customs broker. Prepayment of all charges for tests is required.

APPENDIX B—MARKING INSTRUCTIONS FOR API LICENSEES

B.1 Introduction

The API Monogram Program allows an API Licensee to apply the API Monogram to products. The use of the Monogram on products constitutes a representation and warranty by the Licensee to purchasers of the products that, on the date indicated, the products were produced in accordance with a verified quality management system and in accordance with an API product specification. The API Monogram Program delivers significant value to the international oil and gas industry by linking the verification of an organization's quality management system with the demonstrated ability to meet specific product specification requirements.

When used in conjunction with the requirements of the API License Agreement, API Spec Q1, including Annex Insert Proper Annex Designation, defines the requirements for those organizations who wish to voluntarily obtain an API License to provide API monogrammed products in accordance with an API product specification.

API Monogram Program Licenses are issued only after an on-site audit has verified that the Licensee conforms to the requirements described in API Spec Q1 in total.

For information on becoming an API Monogram Licensee, please contact API, Certification Programs, 1220 L Street, N. W., Washington, D.C. 20005 or call 202-682-8000 or by email at quality@api.org.

B.2 Marking

Master gauges shall be permanently marked by the gauge manufacturer with the markings given below. Plug gauges should preferably be marked on the body, although marking on the handle is acceptable on gauges in small sizes or when the handle is integral with the body. Any markings which are considered necessary by the gauge maker may be added. Unless otherwise stated, both plug and ring shall be marked as follows:

a. API Monogram. The API Monogram may be used only on master gauges and shall not be used on working gauges or gauges which do not meet all stipulations given herein, including determination of mating standoff. The API Monogram shall be applied only as specified herein only by authorized manufacturers. The product shall be marked with the date of manufacture defined as the moth and year when the Monogram is applied. This marking shall be applied in a location adjacent to the Monogram.

b. Size of Gauge. For line pipe gauges the nominal sizes, as given in Table 18, and for casing and tubing gauges the size designation (outside diameter of the pipe), as given in Tables 19 – 23, shall be marked on each new plug and ring gauge.

Note: Existing tubing gauges marked with the nominal tubing size should be restamped to show the outside diameter size.

c. Type of Thread. Both plug and ring gauges shall be marked with the proper identifying terms or their abbreviations as follows:

Line Pipe	LINE PIPE or LP
Round Thread Casing	CSG
Buttress Thread Casing	BUTTRESS CSG
Non-Upset Tubing and Integral Joint Tubing	TBG
External-Upset Tubing	UP TBG

d. Name or Identifying Mark of Gauge Maker. The name or identifying mark of the gauge maker shall be placed on both plug and ring gauge.

e. Year of Adoption. (Line Pipe Gauges Only.) All new gauges, and all used gauges which have been reconditioned to the dimensions given herein for new gauges, shall be marked with the numerals 1940. (Gauge dimensions stipulated herein for new gauges were adopted in 1940. Plug gauges made prior to Jan. 1, 1940 may have g values at variance with such values as given herein. See 6.1.9 for correction factors.)

APPENDIX C—API GAUGE CERTIFICATION AGENCY REQUIREMENTS

All API Gauge Certification Agency applicants shall be required to demonstrate measurement capability in the following areas.

1. Facility environment.
2. Inspection equipment.
3. Standards and calibration.
4. Personnel qualifications.
5. Organizational structure.
6. Documentation.
7. Storage and handling.

APPENDIX D—SUPPLEMENTARY REQUIREMENTS (NORMATIVE)

By agreement between the purchaser and the manufacturer and when specified on the purchase order, the following supplementary requirements shall apply:

SR22 Enhanced Leak Resistance LTC Connection

SR22.1 Casing and couplings shall be furnished in accordance with the requirements for dimensions, inspection, and coupling thread coatings specified herein. The threads shall comply with all of the applicable requirements specified in Sections 1 through 5 unless otherwise specified in SR22. Basic thread dimensions are shown in Figure D1.

SR22.2 THREAD CONTROL

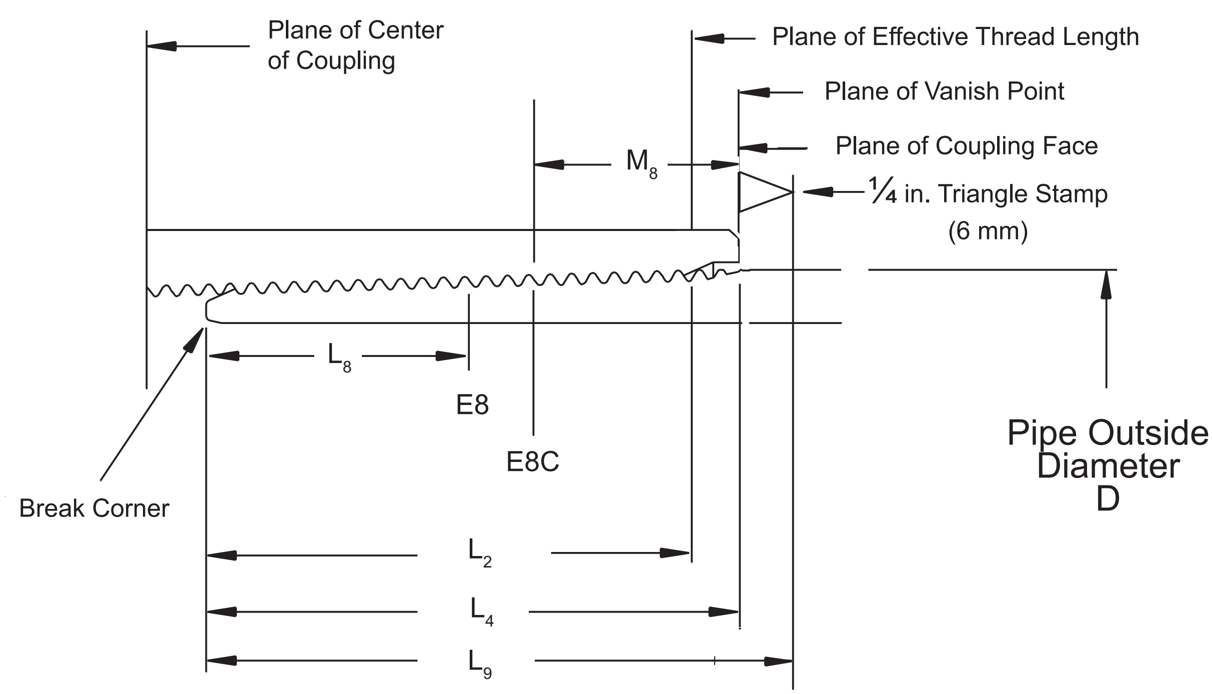
SR22.2.1 Thread elements, including lead, taper, thread height, included flank angle, total thread length, chamfer, pitch diameter and ovality shall comply with the requirements specified in Tables D1 and D2.

SR22.2.2 Thread form shall comply with the requirements of Figure D2.

SR22.2.3 The thread diameter of Enhanced Leak Resistance LTC Connection shall be controlled by measurement of the pitch diameter. The method used to determined the pitch diameter of pipe and coupling threads shall be in accordance with ANSI/ASME B1.3M *Screw Thread Gaging Systems for Dimensional Acceptability—Inch and Metric Screw Threads*. Acceptability shall be determined based on System 23, ASME B1.3. An example of a method to measure the pitch diameter is given in SR22 of API RP 5B1. Ring and plug gages shall not be the basis for acceptance or rejection.

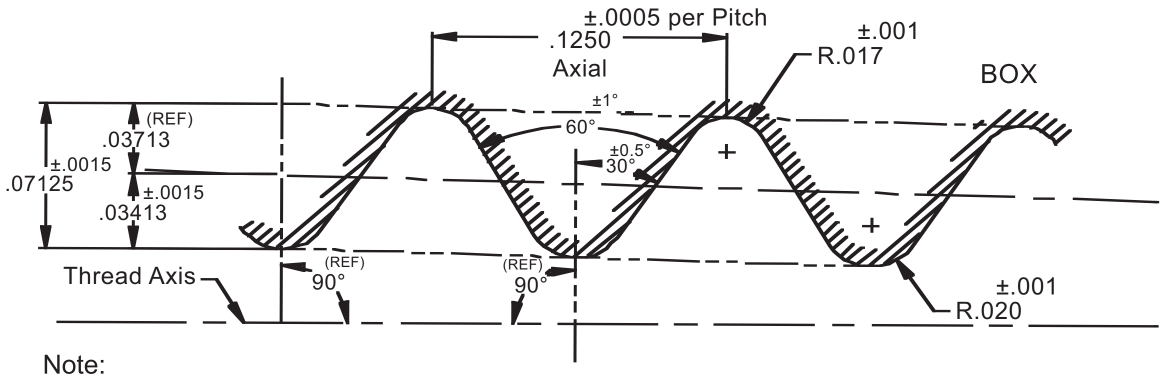
SR22.3 COUPLING THREAD COATINGS

The threads in Grade J55, K55, L80 and N80 couplings shall be phosphated to a minimum coating weight of 1000 mg/ft^2 or tin electroplated at the manufacturer's option. The threads in Grade C90, C95, T95 and P110 couplings shall be tin electroplated. The tin electroplate shall be 0.0025 in. – 0.0045 in. thick.



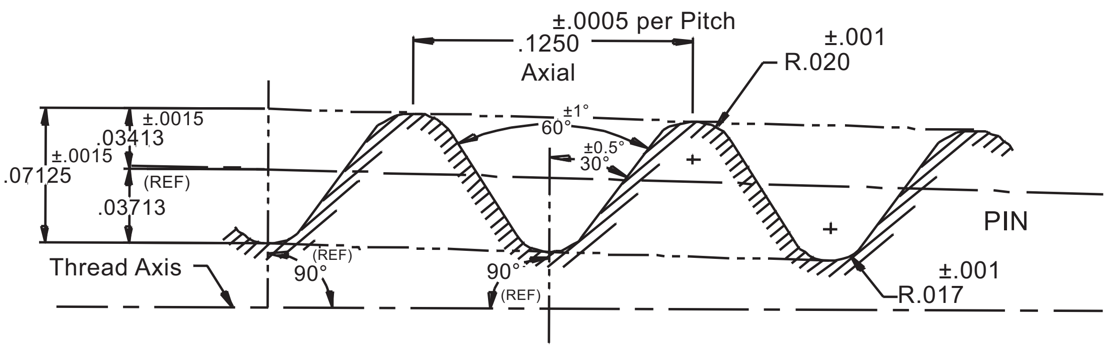
Note: The standard LTC length M (length: face of coupling to hand tight plane) may be different for SR22.

Figure D1—Basic Dimension of Power Tight Make-Up



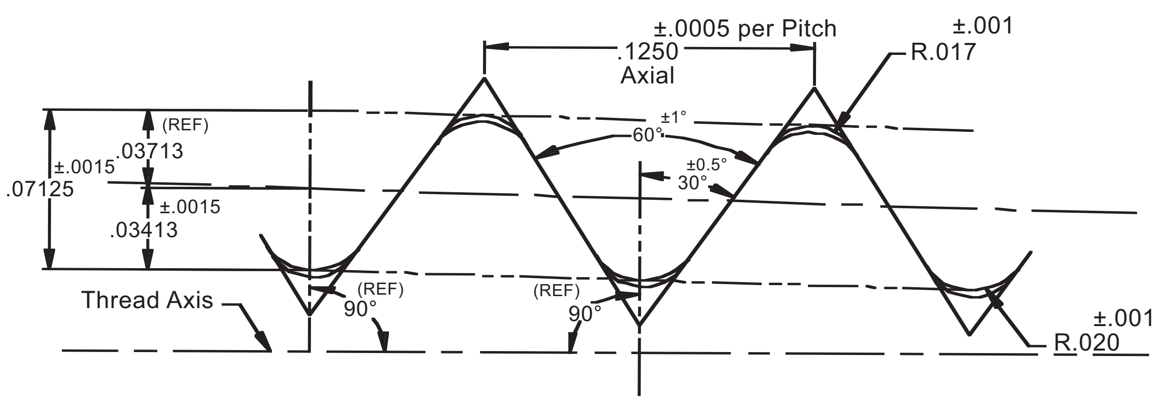
Note:
1. Taper: 0.0625 in./in. on Diameter.

API 8-ROUND INTERNAL THREADFORM



Note:
1. Taper: 0.0625 in./in. on Diameter.

API 8-ROUND EXTERNAL THREADFORM



API 8-ROUND MATED THREADFORM

Figure D2—SR22 Casing Round Thread Form

Table D1—Enhanced Leak Resistance LTC Thread Dimensions

All dimensions in inches, except as indicated. See Figure D1.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Designation			Pin (Pipe Thread)					Coupling (Internal Thread)				Makeup	
Label 1	Grade	No. of threads per in.	Length: Effective Threads L_2	Total Length End of Pipe to Vanish Point L_4	Length: End of Pipe To Pitch Diameter Plane L_8	Pin Pitch Diameter at L_8 E_8	Min. Length Full Crest Threads from End of Pipe L_c*	Length Face of Coupling to Pitch Diameter Plane M_8	Coupling Pitch Diameter E_8C	Diameter of Coupling Recess Q	Depth of Coupling Recess q	End of Pipe to Apex of Traingle Stamp L_9	Makeup Power Turns A
$4^{1}/_{2}$	J/K 55	8	2.715	3.000	0.9210	4.3409	1.875	1.7040	4.3393	$4^{19}/_{32}$	0.500	3.25	3
$4^{1}/_{2}$	L/N 80	8	2.715	3.000	0.9210	4.3409	1.875	1.7040	4.3354	$4^{19}/_{32}$	0.500	3.25	3
$4^{1}/_{2}$	C 90/T 95/P110	8	2.715	3.000	0.9210	4.3409	1.875	1.7040	4.3409	$4^{19}/_{32}$	0.500	3.250	3
5	J/K 55	8	3.090	3.375	1.2960	4.8409	2.250	1.7040	4.8370	$5^{3}/_{32}$	0.500	3.625	3
5	L/N 80	8	3.090	3.375	1.2960	4.8409	2.250	1.7040	4.8292	$5^{3}/_{32}$	0.500	3.625	$3^{1}/_{2}$
5	C 90	8	3.090	3.375	1.2960	4.8409	2.250	1.7040	4.8409	$5^{3}/_{32}$	0.500	3.625	3
5	C/T 95, P110	8	3.090	3.375	1.2960	4.8409	2.250	1.7040	4.8370	$5^{3}/_{32}$	0.500	3.625	$3^{1}/_{2}$
$5^{1}/_{2}$	J/K 55	8	3.215	3.500	1.4210	5.3409	2.375	1.7040	5.3354	$5^{19}/_{32}$	0.500	3.75	3
$5^{1}/_{2}$	L/N 80	8	3.215	3.500	1.4210	5.3409	2.375	1.7040	5.3276	$5^{19}/_{32}$	0.500	3.75	$3^{1}/_{2}$
$5^{1}/_{2}$	C 90	8	3.215	3.500	1.4210	5.3409	2.375	1.7040	5.3401	$5^{19}/_{32}$	0.500	3.75	3
$5^{1}/_{2}$	C/T 95	8	3.215	3.500	1.4210	5.3409	2.375	1.7040	5.3401	$5^{19}/_{32}$	0.500	3.75	$3^{1}/_{2}$
$5^{1}/_{2}$	P110	8	3.215	3.500	1.4210	5.3409	2.375	1.7040	5.3354	$5^{19}/_{32}$	0.500	3.75	4
$6^{5}/_{8}$	J/K 55	8	3.590	3.875	1.7960	6.4659	2.750	1.7040	6.4597	$6^{23}/_{32}$	0.500	4.125	3
$6^{5}/_{8}$	L/N 80, C 90	8	3.590	3.875	1.7960	6.4659	2.750	1.7040	6.4519	$6^{23}/_{32}$	0.500	4.125	4
$6^{5}/_{8}$	C/T 95	8	3.590	3.875	1.7960	6.4659	2.750	1.7040	6.4519	$6^{23}/_{32}$	0.500	4.125	4
$6^{5}/_{8}$	P 110	8	3.590	3.875	1.7960	6.4659	2.750	1.7040	6.4557	$6^{23}/_{32}$	0.500	4.125	$4^{1}/_{2}$
7	J/K 55	8	3.715	4.000	1.9210	6.8409	2.875	1.7040	6.8284	$7^{3}/_{32}$	0.500	4.25	4
7	L/N 80	8	3.715	4.000	1.9210	6.8409	2.875	1.7040	6.8166	$7^{3}/_{32}$	0.500	4.25	$5^{1}/_{2}$
7	C 90, C/T 95	8	3.715	4.000	1.9210	6.8409	2.875	1.7040	6.8307	$7^{3}/_{32}$	0.500	4.25	4
7	P 110	8	3.715	4.000	1.9210	6.8409	2.875	1.7040	6.8284	$7^{3}/_{32}$	0.500	4.25	5
$7^{5}/_{8}$	J/K 55	8	3.840	4.125	1.9790	7.4617	3.000	1.7090	7.4539	$7^{25}/_{32}$	0.433	4.375	$3^{1}/_{2}$
$7^{5}/_{8}$	L/N 80	8	3.840	4.125	1.9790	7.4617	3.000	1.7090	7.4422	$7^{25}/_{32}$	0.433	4.375	5
$7^{5}/_{8}$	C 90, C/T 95	8	3.840	4.125	1.9790	7.4617	3.000	1.7090	7.4539	$7^{25}/_{32}$	0.433	4.375	$4^{1}/_{2}$
$7^{5}/_{8}$	P 110	8	3.840	4.125	1.9790	7.4617	3.000	1.7090	7.4515	$7^{25}/_{32}$	0.433	4.375	5
$8^{5}/_{8}$	J/K 55	8	4.215	4.500	2.3540	8.4617	3.375	1.7090	8.4539	$8^{25}/_{32}$	0.433	4.750	$3^{1}/_{2}$
$8^{5}/_{8}$	L/N 80	8	4.215	4.500	2.3540	8.4617	3.375	1.7090	8.4398	$8^{25}/_{32}$	0.433	4.750	$5^{1}/_{2}$
$8^{5}/_{8}$	C 90	8	4.215	4.500	2.3540	8.4617	3.375	1.7090	8.4539	$8^{25}/_{32}$	0.433	4.750	$4^{1}/_{2}$
$8^{5}/_{8}$	C/T 95	8	4.215	4.500	2.3540	8.4617	3.375	1.7090	8.4515	$8^{25}/_{32}$	0.433	4.750	5
$8^{5}/_{8}$	P110	8	4.215	4.500	2.3540	8.4617	3.375	1.7090	8.4500	$8^{25}/_{32}$	0.433	4.750	$5^{1}/_{2}$
$9^{5}/_{8}$	J/K 55	8	4.465	4.750	2.6040	9.4617	3.625	1.7090	9.4539	$9^{25}/_{32}$	0.433	5.000	$3^{1}/_{2}$
$9^{5}/_{8}$	L/N 80	8	4.465	4.750	2.6040	9.4617	3.625	1.7090	9.4398	$9^{25}/_{32}$	0.433	5.000	$5^{1}/_{2}$
$9^{5}/_{8}$	C 90	8	4.465	4.750	2.6040	9.4617	3.625	1.7090	9.4515	$9^{25}/_{32}$	0.433	5.000	5
$9^{5}/_{8}$	C/T 95	8	4.465	4.750	2.6040	9.4617	3.625	1.7090	9.4484	$9^{25}/_{32}$	0.433	5.000	$5^{1}/_{2}$
$9^{5}/_{8}$	P110	8	4.465	4.750	2.5370	9.4575	3.625	1.7130	9.4472	$9^{25}/_{32}$	0.433	5.000	6

Included taper on diameter, all sizes .0625 per in.

Note: Hand-tight Standoff "A" is the basic allowance for basic power makeup of the joint shown in Figure D1.

*$L_c = L_4$ - 1.125 in. for 8-Round Thread Round Thread Casing.

Table D2—Dimensional Tolerances on SR22 Casing 8-Round Thread Dimensions

(1) Element		(2) Tolerances Grades J55, K55, N80 and L80	(3) Tolerances Grades C90, C/T95 and P110
Taper, External Thread:			
	Per ft on Diameter (0.750 in.)	+0.042, -0.0312 in.	+0.018, -0.0312 in.
	Per in. on Diameter (0.0625 in.)	+0.0035, -0.0025 in.	+0.0015, -0.0025 in.
Taper, Internal Thread:			
	Per ft on Diameter (0.750 in.)	+0.030, -0.018 in.	+0.006 through +0.042 in.
	Per in. on Diameter (0.0625 in.)	+0.0025, -0.0015 in.	+0.0005 through +0.0035 in.
Lead:			
	Per in.	±0.002 in.	±0.0015 in.
	Cumulative	±0.003 in.	±0.002 in.
Thread Height:			
	h_s and h_n	±0.0015 in.	±0.0015 in.
Thread Addendum:			
	Pitch Line to Crest	±0.0015 in.	±0.0015 in.
Included Flank Angle		±1 deg.	±1 deg.
Length L_4 (External Thread)		+0.125, -0 in.	+0.125, -0 in.
Chamfer		±5 deg.	±5 deg.
Average Thread Pitch Diameter (External Thread)		+0.008, -0.003 in.	+0.007, -0.003 in.
Average Thread Pitch Diameter (Internal Thread)		±0.004 in.	+0.002, -0.006 in.
Ovality, Thread Pitch Diameter (Internal Thread)		0.003D	0.003D
Ovality, Thread Pitch Diameter, D/t < 20 (External Thread)		0.003D	0.003D
Ovality, Thread Pitch Diameter, D/t ≥ 20 (External Thread)		0.004D	0.004D
Minimum Tin Plating Thickness (Internal Thread)		(See SR22.3)	0.0025 in.
Maximum Tin Plating Thickness (Internal Thread)		(See SR22.3)	0.0045 in.
Casing Coupling Diameter Q and Depth q		+0.031, -0 in.	+0.031, -0 in.

The above tolerances shall be verified and documented on first article. For pipe (external threads) the lead tolerance per inch is the maximum allowable error in any inch within the length L_4 - g. See Section 5 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 - g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance five (5) thread turns from the center of the coupling.

L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance. Tolerances apply to both external and internal threads except where otherwise indicated.

APPENDIX E—TABLES IN INTERNATIONAL STANDARD UNITS

Table 1M—Line Pipe Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 1.

(1)	(2)	(3)	(4)	(5)	(6)
Thread Element	27 Threads per 25,4 mm p = 0,941	18 Threads per 25,4 mm p = 1,411	14 Threads per 25,4 mm p = 1,814	$11^{1}/_{2}$ Threads per 25,4 mm p = 2,209	18 Threads per 25,4 mm p = 3,175
$H = 25{,}4 \times 0{,}866/n$	0,815	1,222	1,572	1,913	2,748
$h_s = h_n = 25{,}4 \times 0{,}760/n$	0,715	1,072	1,379	1,679	2,413
$f_{rs} = f_{rn} = 25{,}4 \times 0{,}033/n$	0,031	0,046	0,061	0,074	0,104
$f_{cs} = f_{cn} = 25{,}4 \times 0{,}073/n$	0,069	0,104	0,132	0,160	0,231

Note: Calculations for H, h_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with a pitch of 18 threads per 25,4 mm or less.

Table 2M—Tolerances on Line Pipe Thread Dimensions[c]

(1)	(2)
Element	Tolerances
Taper:[d]	
Per 304,8 mm on Diameter (19,05 mm)	+1,588 mm –0,792 mm
Per 25,4 mm on Diameter (1,587 mm)	+0,132 mm –0,066 mm
Lead:[a,d]	
Per 25,4 mm	±0,08 mm
Cumulative	±0,15 mm
Height:[d]	
h_s and h_n	+0,05 mm –0,15 mm
Angle, included	$\pm 1^{1}/_{2}$ deg.
Length, L_4 (external thread):[b]	±1p
Chamfer:[d]	±5 deg.
Standoff, A:	See 6.1.4

[a]For pipe (external threads) the lead tolerance per 25,4 mm is the maximum allowable error in any 25,4 mm within the length $L_4 - g$. See Table 18 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length $L_4 - g$. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling.

[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.

[c]Tolerances apply to both external and internal threads except where otherwise indicated.

[d]Not applicable to line pipe smaller than nominal size 1.

Table 3M—Line Pipe Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 2.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Label 1	Major Diameter D_4	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length: Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1/8	10,29	27	4,102	6,703	9,967	9,4894	3,528	3,043	11,89	1,331	3	—
1/4	13,72	18	5,786	10,206	15,103	12,4874	5,535	5,083	15,32	3,063	3	—
3/8	17,14	18	6,096	10,358	15,255	15,9261	5,382	4,923	18,75	2,913	3	—
1/2	21,34	14	8,128	13,556	19,850	19,7721	7,137	6,281	22,94	4,018	3	—
3/4	26,67	14	8,611	13,861	20,155	25,1173	6,833	6,104	28,27	3,851	3	—
1	33,40	11 1/2	10,160	17,343	25,006	31,4612	8,331	8,217	35,00	5,692	3	8,446
1 1/4	42,16	11 1/2	10,668	17,953	25,616	40,2179	9,309	8,318	43,76	5,789	3	9,055
1 1/2	48,26	11 1/2	10,668	18,377	26,040	46,2874	8,885	8,743	49,86	6,195	3	9,479
2	60,32	11 1/2	11,074	19,215	26,878	58,3253	9,634	9,172	62,71	6,043	3	10,317
2 1/2	73,02	8	17,323	28,892	39,908	70,1589	12,479	16,236	75,41	12,484	2	16,109
3	88,90	8	19,456	30,480	41,496	86,0679	12,479	15,690	91,29	11,963	2	17,696
3 1/2	101,60	8	20,853	31,750	42,766	98,7758	12,797	15,563	103,99	11,841	2	18,966
4	114,30	8	21,438	33,020	44,036	111,4328	13,114	16,248	116,69	12,497	2	20,236
5	141,30	8	23,800	35,720	46,736	138,4120	12,002	16,586	143,69	12,819	2	22,936
6	168,28	8	24,333	38,418	49,433	165,2516	12,479	18,750	170,66	14,887	2	25,634
8	219,08	8	27,000	43,498	54,513	215,9008	12,162	21,163	221,46	17,191	2	30,714
10	273,05	8	30,734	48,895	59,911	269,7719	13,114	22,827	275,44	18,781	2	36,111
12	323,85	8	34,544	53,975	64,991	320,4924	12,797	24,097	326,24	19,995	2	41,191
14D	355,60	8	39,675	57,150	68,166	352,3648	12,797	22,141	357,99	18,125	2	44,366
16D	406,40	8	46,025	62,230	73,246	403,2440	12,479	20,871	408,79	16,911	2	49,446
18D	457,20	8	50,800	67,310	78,326	454,0250	12,162	21,176	459,59	17,203	2	54,526
20D	508,00	8	53,975	72,390	83,406	504,7059	13,432	23,081	510,39	19,025	2	59,606

Included taper on diameter, all sizes, 1,588 mm per 25,4 mm

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 2.

*$L_c = L_4 - 16{,}56$ mm for 11 1/2 thread line pipe.

$L_c = L_4 - 23{,}80$ mm for 8 thread line pipe.

Table 4M—Casing Round Thread Height Dimensions

All dimensions in millimeters, unless indicated. See Figure 4.

Thread Element	8 Threads per 25,4 mm p = 3,175 mm
$H = 0.866p$	2,7496
$h_s = h_n = 0.626p – 0.1778$	1,8098
$s_{rs} = s_{rn} = 0.120p + 0.0508$	0,4318
$s_{cs} = s_{cn} = 0.120p + 0.1270$	0,5080

Note: Calculations for H, h_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with a pitch of 8 threads per 25,4 mm and 1 mm taper per 16 mm or less.

Table 5M—Tolerances on Casing Round Dimensions[c]

(1) Element		(2) Tolerances
Taper:		
	Per 304,8 mm on Diameter (19,05 mm)	+1,588 mm –0,792 mm
	1,587 mm per 25,4 mm on Diameter	+0,132 mm –0,066 mm
Lead:[a]		
	Per 25,4 mm	±0,08 mm
	Cumulative	±0,15 mm
Height:		
	h_s and h_n	+0,05 mm –0,10 mm
Angle, included		±1 1/2 deg.
Length, L_4 (external thread):[b]		±1p
Chamfer:		± 5 deg.
Standoff, A:		See 6.1.4
Casing coupling counterbore Diameter Q, and Depth q		+0,79 mm/ –0,00 mm
25° angle of counterbore of bottom of coupling recess[d]		±5 deg.

[a]For pipe (external threads) the lead tolerance per 25,4 mm is the maximum allowable error in any 25,4 mm within the length L_4 – g. See Table 19 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 – g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling.

[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.

[c]Tolerances apply to both external and internal threads except where otherwise indicated.

[d]The criteria for rejection of the 25 degree angle at the bottom of the coupling recess shall be a demonstration that the angle exceeds the ±5 degree tolerance.

Table 6M—Casing Short-Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 3.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Label 1	Label 2	Major Diameter	Number of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane	Length: Effective Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter at Hand-Tight Plane	End of Pipe to Center of Coupling, Power-Tight Make-Up	Length: Face of Coupling to Hand-Tight Plane	Diameter of Coupling Recess	Depth of Coupling Recess	Hand-Tight Standoff, Thread Tums	Minimum Length, Full Crest Threads from End of Pipe
		D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c*
4 1/2	9,50	114,30	8	23,39	43,56	50,80	111,8456	28,58	17,88	116,68	12,70	3	22,22
4 1/2	Others	114,30	8	39,27	59,44	66,68	111,8456	12,70	17,88	116,68	12,70	3	38,10
5	11,50	127,00	8	36,09	56,26	63,50	124,5456	19,05	17,88	129,38	12,70	3	34,92
5	Others	127,00	8	42,44	62,61	69,85	124,5456	12,70	17,88	129,38	12,70	3	41,28
5 1/2	All	139,70	8	45,62	65,79	73,02	137,2456	12,70	17,88	142,08	12,70	3	44,45
6 5/8	All	168,28	8	51,97	72,14	79,38	165,8206	12,70	17,88	170,66	12,70	3	50,80
7	17,00	177,80	8	32,92	53,09	60,32	175,3456	31,75	17,88	180,18	12,70	3	31,75
7	Others	177,80	8	51,97	72,14	79,38	175,3456	12,70	17,88	180,18	12,70	3	50,80
7 5/8	All	193,68	8	53,44	75,31	82,55	191,1142	12,70	18,01	197,64	11,00	3 1/2	53,98
8 5/8	24,00	219,08	8	47,09	68,96	76,20	216,5142	22,22	18,01	223,04	11,00	3 1/2	47,62
8 5/8	Others	219,08	8	56,62	78,49	85,72	216,5142	12,70	18,01	223,04	11,00	3 1/2	57,15
9 5/8	All	244,48	8	56,62	78,49	85,72	241,9142	12,70	18,01	248,44	11,00	3 1/2	57,15[a]
9 5/8	All	244,48	8	54,91	78,49	85,72	241,8077	12,70	18,11	248,44	11,00	4	57,15[b]
10 3/4	32,75	273,05	8	40,74	62,61	69,85	270,4892	31,75	18,01	277,02	11,00	3 1/2	41,28[a]
10 3/4	Others	273,05	8	59,79	81,66	88,90	270,4892	12,70	18,01	277,02	11,00	3 1/2	60,32[a]
10 3/4	Others	273,05	8	58,09	81,66	88,90	270,3827	12,70	18,11	277,02	11,00	4	60,32[b]
11 3/4	All	298,45	8	59,79	81,66	88,90	295,8892	12,70	18,01	302,42	11,00	3 1/2	60,32[a]
11 3/4	All	298,45	8	58,09	81,66	88,90	295,7827	12,70	18,11	302,42	11,00	4	60,32[b]
13 3/8	Al1	339,72	8	59,79	81,66	88,90	337,1642	12,70	18,01	343,69	11,00	3 1/2	60,32[a]
13 3/8	All	339,72	8	58,09	81,66	88,90	337,0577	12,70	18,11	343,69	11,00	4	60,32[b]
16	All	406,40	8	72,49	94,36	101,60	403,8392	12,70	18,01	411,96	9,30	3 1/2	73,02
18 5/8	87,50	473,08	8	72,49	94,36	101,60	470,5142	12,70	18,01	478,63	9,30	3 1/2	73,02
20	All	508,00	8	72,49	94,36	101,60	505,4392	12,70	18,01	513,56	9,30	3 1/2	73,02[c]
20	All	508,00	8	70,79	94,36	101,60	505,3327	12,70	18,11	513,56	9,30	4	73,02[d]

Included taper on diameter, all sizes, 1,588 mm per 25,4 mm

Note: Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 3.

*$L_c = L_4 - 28{,}58$ mm for 8 round thread casing.

[a]Applicable to coupling grades lower than P110.

[b]Applicable to coupling grades P110 and higher.

[c]Applicable to coupling grades lower than J55 and K55.

[d]Applicable to coupling grades J55 and K55 and higher

Table 7M—Casing Long-Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 3.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Label 1	Major Diameter	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane	Length: Effective Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter at Hand-Tight Plane	End of Pipe to Center of Coupling, Power-Tight Make-Up	Length: Face of Coupling, to Hand-Tight Plane	Diameter of Coupling Recess	Depth of Coupling Recess	Hand-Tight Standoff Thread Turns	Minimum Length, Full Crest Threads from End of Pipe
	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c*
4 1/2	114,30	8	48,79	68,96	76,20	111,846	12,70	17,88	116,68	12,70	3	47,62
5	127,00	8	58,32	78,49	85,72	124,546	12,70	17,88	129,38	12,70	3	57,15
5 1/2	139,70	8	61,49	81,66	88,90	137,246	12,70	17,88	142,08	12,70	3	60,32
6 5/8	168,28	8	71,02	91,19	98,42	165,821	12,70	17,88	170,66	12,70	3	69,85
7	177,80	8	74,19	94,36	101,60	175,346	12,70	17,88	180,18	12,70	3	73,02
7 5/8	193,68	8	75,67	97,54	104,78	191,114	12,70	18,01	197,64	11,00	3 1/2	76,20
8 5/8	219,08	8	85,19	107,06	114,30	216,514	12,70	18,01	223,04	11,00	3 1/2	85,72
9 5/8	244,48	8	91,54	113,41	120,65	241,914	12,70	18,01	248,44	11,00	3 1/2	92,08[a]
9 5/8	244,48	8	89,84	113,41	120,65	241,808	12,70	18,11	248,44	11,00	4	92,08[b]
20	508,00	8	104,24	126,11	133,35	505,439	12,70	18,01	513,56	9,30	3 1/2	104,78[c]
20	508,00	8	102,54	126,11	133,35	505,333	12,70	18,11	513,56	9,30	4	104,78[d]

Included taper on diameter, all sizes, 1,587 mm per 25,4 mm

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 3.

*$L_c = L_4 - 28{,}58$ mm for 8 round thread casing.

[a]Applicable to coupling grades lower than P110.

[b]Applicable to coupling grades P110 and higher.

[c]Applicable to coupling grades lower than J55 and K55.

[d]Applicable to coupling grades J55 and K55 and higher

Table 8M—Tolerances on Buttress Casing Thread Dimensions[c]

(1) Element	(2) Tolerances
Taper:	
Coupling:	
19,05 mm or 25,4 mm per 304,8 mm on Diameter	+1,37 mm –0,76 mm
1,588 mm or 2,117 mm per 25,4 mm on Diameter	+0,11 mm –0,06 mm
Pipe (In perfect thread length):	
19,05 mm or 25,4 mm per 304,8 mm on Diameter	+1,07 mm –0,46 mm
1,588 mm or 2,117 mm per 25,4 mm on Diameter	+0,09 mm –0,04 mm
Pipe (In imperfect thread length):[a]	
19,05 mm or 25,4 mm per 304,8 mm on Diameter	+1,37 mm –0,46 mm
1,588 mm or 2,117 mm per 25,4 mm on Diameter	+0,11 mm –0,04 mm
Lead:[b]	
Per 25,4 mm	
Label 1—13 3/8 and smaller	±0,05 mm
Label 1—16 and larger	±0,08 mm
Cumulative	±0,10 mm
Thread height:	1,57 ± 0,03 mm
Angle, included:	±1 deg.
Length, L_4 (external thread): Tolerance not specified because of type of thread	
Length, A_1:	±0,79 mm
Chamfer:	
60 deg. on outside end of threaded pipe	±5 deg.
65 deg. on outside end of threaded coupling	+5 deg./0 deg.
Standoff, A:	See 6.1.4

[a]Taper of the thread root (or “minor”) cone should not increase over the maximum tolerance at the point of intersection with the pipe outside diameter.
[b]The lead tolerance per 25,4 mm is the maximum allowable error in any 25,4 mm within the perfect thread length. The cumulative tolerance is the maximum allowable error over the full perfect thread length. The perfect thread length for (external and internal) threads is defined by 5.1.4.
[c]Tolerances apply to both external and internal threads except where otherwise indicated.

Table 9M—Buttress Casing Thread Dimensions

All dimensions in SI units, except as indicated. See Figure 5M.

(1) Label 1	(2) Major Diameter D_4	(3) No. of Threads per 25,4 mm	(4) Length: Imperfect Threads g	(5) Length: Perfect Threads L_7	(6) Total Length: End of Pipe to Vanish Point L_4	(7) Pitch Diameter[a] E_7	(8) End of Pipe to Center of Coupling, Power-Tight Make-Up J	(9) End of Pipe to Center of Coupling, Hand-Tight Make-Up J_n	(10) Length: Face of Coupling to Plane E_7	(11) Length: End of Pipe to Triangle Stamp A_1	(12) Hand-Tight Standoff Thread Turns A	(13) Diameter of Counter-bore in Coupling Q	(14) Minimum Length, Full Crest Threads from End of Pipe L_c*
4 1/2	114,71	5	50,394	41,999	92,392	113,132	12,7	22,86	47,85	100,01	1/2	117,86	31,839
5	127,41	5	50,394	45,174	95,568	125,832	12,7	25,40	45,31	103,19	1	130,56	35,014
5 1/2	140,11	5	50,394	46,761	97,155	138,532	12,7	25,40	45,31	104,78	1	143,26	36,601
6 5/8	168,68	5	50,394	51,524	101,918	167,107	12,7	25,40	45,31	109,54	1	171,83	41,364
7	178,21	5	50,394	56,286	106,680	176,632	12,7	25,40	45,31	114,30	1	181,36	46,126
7 5/8	194,08	5	50,394	61,049	111,442	192,507	12,7	25,40	45,31	119,06	1	197,23	50,889
8 5/8	219,48	5	50,394	64,224	114,618	217,907	12,7	25,40	45,31	122,24	1	222,63	54,064
9 5/8	244,88	5	50,394	64,224	114,618	243,307	12,7	25,40	45,31	122,24	1	248,03	54,064
10 3/4	273,46	5	50,394	64,224	114,618	271,882	12,7	25,40	45,31	122,24	1	276,61	54,064
11 3/4	298,86	5	50,394	64,224	114,618	297,282	12,7	25,40	45,31	122,24	1	302,01	54,064
13 3/8	340,13	5	50,394	64,224	114,618	338,557	12,7	25,40	45,31	122,24	1	343,28	54,064
16	406,40	5	37,795	79,362	117,158	404,825	12,7	22,22	33,35	122,24	7/8	410,31	69,202
18 5/8	473,08	5	37,795	79,362	117,158	471,500	12,7	22,22	33,35	122,24	7/8	476,99	69,202
20	508,00	5	37,795	79,362	117,158	506,425	12,7	22,22	33,35	122,24	7/8	511,91	69,202

Included taper on diameter: Label 1—13 3/8 and smaller—1 mm per 16 mm
Label 1—16 and larger—1 mm per 12 mm

Notes:

1. At plane of perfect thread length L_7, the basic major diameter of the pipe thread and plug gage thread is 0,41 mm greater than specified pipe diameter D for Label 1—13 3/8 and smaller and is equal to the specified pipe diameter for Label 1—16 and larger.

2. Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 5. The 9.52 mm equilateral triangle stamp located on the pipe at the length A_1 from the end of the pipe facilitates obtaining the power make-up provided for by the hand-tight standoff "A."

[a]Pitch diameter on buttress casing thread is defined as being midway between the major and minor diameters.

*$L_c = L_7 - 10{,}16$ mm for buttress thread casing. Within the L_c length, as many as 2 threads showing the original outside surface of the pipe on their crests for a circumferential distance not exceeding 25% of the pipe circumference is permissible. The remaining threads in the L_c thread length shall be full crested threads.

Table 10M—Tubing Round Thread Height Dimensions

See Figure 9.

Thread Element	10 Threads per 25,4 mm p = 2,540 (mm)	8 Threads per 25,4 mm p = 3,175 (mm)
$H = 0.866p$	2,1996	2,7496
$h_s = h_n = 0.626p - 0.1778$	1,4122	1,8098
$s_{rs} = s_{rn} = 0.120p + 0.0508$	0,3556	0,4318
$s_{cs} = s_{cn} = 0.120p + 0.1270$	0,4318	0,5080

Note: Calculations for H, h_s, and h_n are based on formulas for a symmetrical straight screw thread rather than a symmetrical tapered thread. The resulting differences are deemed to be insignificant for threads with 3,18 mm pitch and 62,5 mm per meter taper or less.

Table 11M—Tolerances on Tubing Round Thread Dimensions[c]

(1) Element	(2) Tolerances
Taper:	
Per 304,8 mm on Diameter:	
Non-upset tubing, regular thread external-upset, and integral joint tubing	+1,588 mm –0,792 mm
Per 25,4 mm on Diameter:	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	+0,132 mm –0,066 mm
Lead:[a]	
Per 25,4 mm:	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	±0,08 mm
Cumulative	
Non-upset tubing, regular thread external-upset tubing, and integral joint tubing	±0,15 mm
Height, h_s and h_n:	
Non-upset tubing and regular thread external-upset tubing, and integral joint tubing	+0,05 mm –0,10 mm
Angle, included	± 1 1/2 deg.
Length, L_4 (extemal thread):[b]	
8-thread per in.	±1p
10-thread per in. External-upset	+ 1 1/2p –3/4p
Non-upset	±1 1/2p
Chamfer: (on outside end of threaded pipe)	±5 deg
Tubing coupling recess Diameter Q, and Depth Q	+0,79 mm, –0,00 mm
Standoff, A:	See 6.1.4
25° angle of counterbore of bottom of coupling recess[d, e]	±5 deg

[a]For pipe (external threads) the lead tolerance per 25,4 mm is the maximum allowable error in any 25,4 mm within the length L_4 – g. See Tables 21M, 22M and 23M for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 – g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance J + one thread turn from the center of the coupling or from the small end of the thread in the box of integral joint tubing.

[b]L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance.

[c]Tolerances apply to both external and internal threads except where otherwise indicated.

[d]For tolerance on fiberglass long round pipe threads, see applicable fiberglass pipe standards.

[e]The criteria for rejection of the 25 degree angle at the bottom of the coupling recess shall be a demonstration that the angle exceeds the ±5 degree tolerance.

Table 12M—Non-Upset Tubing Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Label 1	Major Diameter D_4	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length: Face of Coupling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1,050	26,67	10	11,38	23,50	27,79	25,1018	12,7	11,33	28,27	7,94	2	7,62
1,315	33,40	10	12,17	24,28	28,58	31,8333	12,7	11,33	35,00	7,94	2	7,62
1,660	42,16	10	15,34	27,46	31,75	40,5958	12,7	11,33	43,76	7,94	2	8,89
1,900	48,26	10	18,52	30,63	34,92	46,6918	12,7	11,33	49,86	7,94	2	12,06
2 3/8	60,32	10	24,87	36,98	41,28	58,7568	12,7	11,33	61,92	7,94	2	18,42
2 7/8	73,02	10	35,99	48,11	52,40	71,4568	12,7	11,33	74,62	7,94	2	29,54
3 1/2	88,90	10	42,34	54,46	58,75	87,3318	12,7	11,33	90,50	7,94	2	35,89
4	101,60	8	40,41	54,36	60,32	99,4143	12,7	13,56	103,20	9,52	2	34,92
4 1/2	114,30	8	45,19	59,13	65,10	112,1143	12,7	13,56	115,90	9,52	2	39,70

Included taper on diameter, all sizes, 1,588 mm per 25,4 mm

Note: Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 22,86$ mm for 10 thread tubing, but not less than 7,62 mm.
$L_c = L_4 - 25,4$ mm for 8 thread tubing.

Table 13M—External-Upset Tubing Thread Dimensions

All dimensions in millimeters, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Label 1	Outside Diameter D	Major Diameter D_4	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane L_1	Length: Effective Threads L_2	Total Length: End of Pipe to Vanish Point L_4	Pitch Diameter at Hand-Tight Plane E_1	End of Pipe to Center of Coupling, Power-Tight Make-Up J	Length: Face of Cou-pling, to Hand-Tight Plane M	Diameter of Coupling Recess Q	Depth of Coupling Recess q	Hand-Tight Standoff Thread Turns A	Minimum Length, Full Crest Threads from End of Pipe L_c*
1,050	26,67	33,40	10	12,17	24,28	28,58	31,8333	12,7	11,33	35,00	7,94	2	7,62
1,315	33,40	37,31	10	15,34	27,46	31,75	35,7393	12,7	11,33	38,89	7,94	2	8,89
1,660	42,16	46,02	10	18,52	30,63	34,92	44,4701	12,7	11,33	47,62	7,94	2	12,06
1,900	48,26	53,19	10	20,12	32,23	36,52	51,6143	12,7	11,33	54,76	7,94	2	13,67
2 3/8	60,32	65,89	8	29,31	43,26	49,23	63,6968	12,7	13,56	67,46	9,52	2	23,83
2 7/8	73,02	78,59	8	34,06	48,01	53,98	76,3968	12,7	13,56	80,16	9,52	2	28,58
3 1/2	88,90	95,25	8	40,41	54,36	60,32	93,0643	12,7	13,56	96,85	9,52	2	34,92
4	101,60	107,95	8	43,59	57,53	63,50	105,7643	12,7	13,56	109,55	9,52	2	38,10
4 1/2	114,30	120,65	8	46,76	60,71	66,68	118,4643	12,7	13,56	122,25	9,52	2	41,28

Included taper on diameter, all sizes, 1,587 mm per 25,4 mm

Note: Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 22,86$ mm for 10 thread tubing, but not less than 7,62 mm.
$L_c = L_4 - 25,4$ mm for 8 thread tubing.

Table 14M—External-Upset Long Round Thread Dimensions for Fiberglass Pipe

All dimensions in millimeters, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Label 1	Outside Diameter	Major Diameter	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane	Length: Effective Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter at Hand-Tight Plane	End of Pipe to Center of Coupling, Power-Tight Make-Up	Length: Face of Coupling, to Hand-Tight Plane	Diameter of Coupling Recess	Depth of Coupling Recess	Hand-Tight Standoff Thread Turns	Minimum Length, Full Crest Threads from End of Pipe
	D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c*
1,050	26,67	33,40	10	24,87	36,98	41,28	31,8333	12,7	11,33	35,00	7,94	2	18,42
1,315	33,40	37,31	10	28,04	40,16	44,45	35,7393	12,7	11,33	38,89	7,94	2	21,59
1,660	42,16	46,02	10	31,22	43,33	47,62	44,4701	12,7	11,33	47,62	7,94	2	24,76
1,900	48,26	53,19	10	35,99	48,11	52,40	51,6143	12,7	11,33	54,76	7,94	2	29,54
$2^3/_8$	60,32	65,89	8	45,19	59,13	65,10	63,6968	12,7	13,56	67,46	9,52	2	39,70
$2^7/_8$	73,02	78,59	8	53,11	67,06	73,02	76,3968	12,7	13,56	80,16	9,52	2	47,62
$3^1/_2$	88,90	95,25	8	59,46	73,41	79,38	93,0643	12,7	13,56	96,85	9,52	2	53,98
4	101,60	107,95	8	65,81	79,76	85,72	105,7643	12,7	13,56	109,55	9,52	2	60,32
$4^1/_2$	114,30	120,65	8	68,99	82,93	88,90	118,4643	12,7	13,56	122,25	9,52	2	63,50

Included taper on diameter, all sizes, 1,588 mm per 25,4mm

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 22{,}86$ mm for 10 thread tubing.
$L_c = L_4 - 25{,}4$ mm for 8 thread tubing.

Table 15M—Integral-Joint Tubing Thread Dimensions

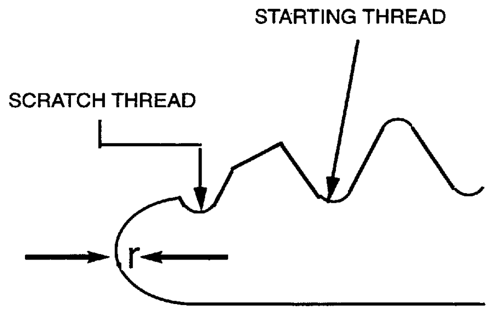
All dimensions in millimeters, except as indicated. See Figure 8.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Label 1	Outside Diameter	Major Diameter	No. of Threads per 25,4 mm	Length: End of Pipe to Hand-Tight Plane	Length: Effective Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter at Hand-Tight Plane	End of Pipe to Center of Coupling, Power-Tight Make-Up	Length: Face of Coupling, to Hand-Tight Plane	Diameter of Coupling Recess	Depth of Coupling Recess	Hand-Tight Standoff Thread Turns	Minimum Length, Full Crest Threads from End of Pipe
	D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c*
1,315	33,40	33,40	10	12,17	24,28	28,58	31,8333	12,7	11,33	35,00	3,97	2	5,72
1,660	42,16	42,16	10	15,34	27,46	31,75	40,5958	12,7	11,33	43,76	7,94	2	8,89
1,900	48,26	48,26	10	18,52	30,63	34,92	46,6918	12,7	11,33	49,86	7,94	2	12,06
2,063	52,40	53,19	10	20,12	32,23	36,53	51,6143	12,7	11,33	54,76	7,94	2	13,67

Included taper on diameter, all sizes, 1,588 mm per 25,4 mm

Note: Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.
*$L_c = L_4 - 22{,}86$ mm for 10 thread tubing.

Table 16M—Round Nosed Ends



(1)	(2)
Label 1	Radius, r (mm)
$2^3/8$	2,4
$2^7/8$	2,4
$3^1/2$	3,2
4	3,2
$4^1/2$	3,2

Note: Radius transition shall be smooth with no sharp corners, burrs or slivers on ID or OD chamfer surfaces.

Table 17M—Compensated Thread Lengths for Measurements Parallel to the Taper Cone

Length of Thread (Parallel to Thread Axis) (mm)	Compensated Length (Parallel to Taper Cone) for Threads Having a Taper of: 19,05 mm per 304,8 mm (mm)	25,4 mm per 304,8 mm (mm)
8,8349*	8,8392	—
12,70	12,7062	—
25,40	25,4124	25,4220
38,10	38,1186	38,1331
50,80	50,8248	50,8441
63,50	63,5310	63,5551
76,20	76,2372	76,2661
88,90	88,9434	88,9771
101,60	101,6496	101,6882

*Equivalent to 4p for 38.10 threads per mm.

Table D1M—Enhanced Leak Resistance LTC Thread Dimensions

All dimensions in millimeters except where indicated.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Designation			Pin (Pipe Thread)					Coupling (Internal Thread)				Makeup	
Label 1	Grade	No. of Threads per 25,4 mm	Length: Effective Threads L_2	Total Length End of Pipe to Vanish Point L_4	Length: End of Pipe To Pitch Diameter Plane L_8	Pin Pitch Diameter at L_8 E_8	Min. Length Full Crest Threads from End of Pipe L_c*	Length Face of Coupling to Pitch Diameter Plane M_8	Coupling Pitch Diameter E_8C	Diameter of Coupling Recess Q	Depth of Coupling Recess q	End of Pipe to Apex of Traingle Stamp L_9	Makeup Power Turns A
4 1/2	J/K 55	3.175	68.96	76.20	23.393	110.259	47.62	43.282	110.218	116.68	12.70	82.55	3
4 1/2	L/N 80	3.175	68.96	76.20	23.393	110.259	47.62	43.282	110.119	116.68	12.70	82.55	3
4 1/2	C 90 / T 95 / P110	3.175	68.96	76.20	23.393	110.259	47.62	43.282	110.259	116.68	12.70	82.55	3
5	J/K 55	3.175	78.49	85.72	32.918	122.959	57.15	43.282	122.860	129.38	12.70	92.08	3
5	L/N 80	3.175	78.49	85.72	32.918	122.959	57.15	43.282	122.662	129.38	12.70	92.08	3 1/2
5	C 90	3.175	78.49	85.72	32.918	122.959	57.15	43.282	122.959	129.38	12.70	92.08	3
5	C/T 95, P110	3.175	78.49	85.72	32.918	122.959	57.15	43.282	122.860	129.38	12.70	92.08	3 1/2
5 1/2	J/K 55	3.175	81.66	88.90	36.093	135.659	60.32	43.282	135.519	142.08	12.70	95.25	3
5 1/2	L/N 80	3.175	81.66	88.90	36.093	135.659	60.32	43.282	135.321	142.08	12.70	95.25	3 1/2
5 1/2	C 90	3.175	81.66	88.90	36.093	135.659	60.32	43.282	135.638	142.08	12.70	95.25	3
5 1/2	C/T 95	3.175	81.66	88.90	36.093	135.659	60.32	43.282	135.638	142.08	12.70	95.25	3 1/2
5 1/2	P110	3.175	81.66	88.90	36.093	135.659	60.32	43.282	135.519	142.08	12.70	95.25	4
6 5/8	J/K 55	3.175	91.19	98.42	45.618	164.234	69.85	43.282	164.076	170.66	12.70	104.78	3
6 5/8	L/N 80, C 90	3.175	91.19	98.42	45.618	164.234	69.85	43.282	163.878	170.66	12.70	104.78	4
6 5/8	C/T 95	3.175	91.19	98.42	45.618	164.234	69.85	43.282	163.878	170.66	12.70	104.78	4
6 5/8	P 110	3.175	91.19	98.42	45.618	164.234	69.85	43.282	163.975	170.66	12.70	104.78	4 1/2
7	J/K 55	3.175	94.36	101.60	48.793	173.759	73.02	43.282	173.441	180.18	12.70	107.95	4
7	L/N 80	3.175	94.36	101.60	48.793	173.759	73.02	43.282	173.142	180.18	12.70	107.95	5 1/2
7	C 90, C/T 95	3.175	94.36	101.60	48.793	173.759	73.02	43.282	173.500	180.18	12.70	107.95	4
7	P 110	3.175	94.36	101.60	48.793	173.759	73.02	43.282	173.441	180.18	12.70	107.95	5
7 5/8	J/K 55	3.175	97.54	104.78	50.267	189.527	76.20	43.409	189.329	197.64	11.00	111.12	3 1/2
7 5/8	L/N 80	3.175	97.54	104.78	50.267	189.527	76.20	43.409	189.032	197.64	11.00	111.12	5
7 5/8	C 90, C/T 95	3.175	97.54	104.78	50.267	189.527	76.20	43.409	189.329	197.64	11.00	111.12	4 1/2
7 5/8	P 110	3.175	97.54	104.78	50.267	189.527	76.20	43.409	189.268	197.64	11.00	111.12	5
8 5/8	J/K 55	3.175	107.06	114.30	59.792	214.927	85.72	43.409	214.729	223.04	11.00	120.65	3 1/2
8 5/8	L/N 80	3.175	107.06	114.30	59.792	214.927	85.72	43.409	214.371	223.04	11.00	120.65	5 1/2
8 5/8	C 90	3.175	107.06	114.30	59.792	214.927	85.72	43.409	214.729	223.04	11.00	120.65	4 1/2
8 5/8	C/T 95	3.175	107.06	114.30	59.792	214.927	85.72	43.409	214.668	223.04	11.00	120.65	5
8 5/8	P110	3.175	107.06	114.30	59.792	214.927	85.72	43.409	214.630	223.04	11.00	120.65	5 1/2
9 5/8	J/K 55	3.175	113.41	120.65	66.142	240.327	92.08	43.409	240.129	248.44	11.00	127.00	3 1/2
9 5/8	L/N 80	3.175	113.41	120.65	66.142	240.327	92.08	43.409	239.771	248.44	11.00	127.00	5 1/2
9 5/8	C 90	3.175	113.41	120.65	66.142	240.327	92.08	43.409	240.068	248.44	11.00	127.00	5
9 5/8	C/T 95	3.175	113.41	120.65	66.142	240.327	92.08	43.409	239.989	248.44	11.00	127.00	5 1/2
9 5/8	P110	3.175	113.41	120.65	64.440	240.220	92.08	43.510	239.959	248.44	11.00	127.00	6

Table D2M—Dimensional Tolerances on SR22 Casing 8-Round Thread Dimensions

(1) Element		(2) Tolerances Grades J55, K55, N80 and L80	(3) Tolerances Grades C90, C/T95 and P110
Taper, External Thread:			
	62.5 mm per Meter on Diameter	+3,50, -2,60 mm	+1,50, -2,60 mm
	1,588 mm per 25,4 mm on Diameter	+0,089, -0,064 mm	+0,038, -0,064 mm
Taper, Internal Thread:			
	62,5 mm per Meter on Diameter	+2.50, -1.50 mm	+0,500 through +3,500 mm
	1,588 mm per 25,4 mm on Diameter	+0,064, -0,038 mm	+0,013 through +0,089 mm
Lead:			
	Per 25,4 mm	±0,051 mm	±0,038 mm
	Cumulative	±0,076 mm	±0,051 mm
Thread Height:			
	h_s and h_n	±0,038 mm	±0,038 mm
Thread Addendum:			
	Pitch Line to Crest	±0,038 mm	±0,038 mm
Included Flank Angle		±1 deg.	±1 deg.
Length L_4 (External Thread)		+3,18, - 0,00 mm	+3,18, -0,00 mm
Chamfer		±5 deg.	±5 deg.
Average Thread Pitch Diameter (External Thread)		+0.20, -0,08 mm	+0,18, -0,08 mm
Average Thread Pitch Diameter (Internal Thread)		±0,10 mm	+0,05, -0,15 mm
Ovality, Thread Pitch Diameter (Internal Thread)		0,003D	0,003D
Ovality, Thread Pitch Diameter, D/t < 20 (External Thread)		0,003D	0,003D
Ovality, Thread Pitch Diameter, D/t ≥ 20 (External Thread)		0,004D	0,004D
Minimum Tin Plating Thickness (Internal Thread)		(See SR22.3)	0,064 mm
Maximum Tin Plating Thickness (Internal Thread)		(See SR22.3)	0,114 mm
Casing Coupling Diameter Q and Depth q		+0,79, -0 mm	+0,79, -0 mm

The above tolerances shall be verified and documented on first article. For pipe (external threads) the lead tolerance per inch is the maximum allowable error in any inch within the length L_4 - g. See Section 5 for g dimensions. The cumulative lead tolerance is the maximum allowable error over the entire length L_4 - g. For internal threads, lead measurements shall be made within the length from the recess to a plane located at a distance five (5) thread turns from the center of the coupling.

L_4 is acceptable: a, if the distance from the end of the pipe to the vanish plane (at the point where the outside diameter of the pipe is a maximum) is within the above minus tolerance; or b, if the distance from the end of the pipe to the vanish plane (where the outside diameter of the pipe is a minimum) is within the above plus tolerance. Tolerances apply to both external and internal threads except where otherwise indicated.

Table G1M—Extreme-Line Casing—Label 1—5 through 7$^5/_8$ Threading and Machining Dimensions

(See Figure G1 for illustration.)
(See Table G3 for thread and seal tolerances)
(See G.3 for gauging practice)
(See Figure G2 and Table G2 for sizes over Label 1—7$^5/8$ in.)
All dimensions in millimeters, except as indicated.

(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)		(12)		(13)
		Threading and Machining Dimensions													
		Made-Up Joint ID	Drift Dia. for Bored	A							H		I		
Label 1	Label 2	(Nom.)	Upset	Max.	Min.	B	C	D	E	G	Min.	Max.	Min.	Max.	J
	15,0	106,63	106,25	114,40	114,45	106,88	115,44	107,57	116,20	125,43	122,61	122,66	122,40	122,45	126,36
5	18,0	106,63	106,25	114,40	114,45	106,88	115,44	107,57	116,20	125,43	122,61	122,66	122,40	122,45	126,36
	15,5	120,29	119,91	127,20	127,25	120,55	128,22	121,23	129,01	138,23	135,41	135,46	135,20	135,26	139,17
	17,0	119,41	119,02	127,20	127,25	119,66	128,22	120,35	129,01	138,23	135,41	135,46	135,20	135,26	139,17
5$^1/_2$	20,0	119,41	119,02	127,20	127,25	119,66	128,22	120,35	129,01	138,23	135,41	135,46	135,20	135,26	139,17
	23,0	117,09	116,71	127,18	127,23	117,32	128,22	118,03	129,01	138,20	135,38	135,43	135,20	135,26	139,17
	24,0	146,84	146,46	154,66	154,71	147,12	155,70	147,78	156,46	165,68	162,86	162,92	162,64	162,69	166,60
6$^5/_8$	28,0	145,57	145,19	154,64	154,69	145,82	155,68	146,51	156,46	165,66	162,84	162,89	162,64	162,69	166,60
	32,0	142,62	142,24	154,64	154,69	142,85	155,68	143,56	156,44	165,66	162,84	162,89	162,66	162,71	166,62
	23,0	156,74	156,36	164,52	164,57	157,02	165,56	157,68	166,34	175,56	172,75	172,80	172,52	172,57	176,48
	26,0	156,74	156,36	164,52	164,57	157,02	165,56	157,68	166,34	175,56	172,75	172,80	172,52	172,57	176,48
	29,0	155,52	155,14	164,52	164,57	155,80	165,56	156,46	166,34	175,56	172,75	172,80	172,52	172,57	176,48
7	32,0	153,21	152,83	164,52	164,57	153,47	165,56	154,15	166,32	175,54	172,72	172,77	172,52	172,57	176,48
	35,0	150,88	150,50	164,49	164,54	151,10	165,53	151,82	166,32	175,54	172,72	172,77	172,54	172,59	176,50
	38,0	148,84	148,46	164,49	164,54	149,07	165,53	149,78	166,32	175,54	172,72	172,77	172,54	172,59	176,50
	26,4	171,96	171,58	179,63	179,68	172,26	180,67	172,90	181,56	190,78	187,96	188,01	187,71	187,76	191,67
	29,7	171,96	171,58	179,63	179,68	172,26	180,67	172,90	181,56	190,78	187,96	188,01	187,71	187,76	191,67
7$^5/_8$	33,7	170,31	169,93	179,63	179,68	170,59	180,64	171,25	181,53	190,75	187,93	187,99	187,71	187,76	191,72
	39,0	166,75	166,37	179,60	179,65	167,00	180,64	167,69	181,53	190,75	187,93	187,99	187,73	187,78	191,74

Table G1M—Extreme-Line Casing—Label 1—5 through $7^5/8$ Threading and Machining Dimensions (Continued)

(See Figure G1 for illustration.)
(See Table G3 for thread and seal tolerances)
(See G.3 for gauging practice)
(See Figure G2 and Table G2 for sizes over Label 1—$7^5/8$ in.)
All dimensions in millimeters, except as indicated.

(1)	(2)	(14)	(15)		(16)	(17)		(18)	(19)	(20)	(21)		(22)		(23)		(24)	
		Threading and Machining Dimensions									Gauge to Product Standoff							
											Ring to Pin				Plug to Box			
			M								Seal		Thread		Seal		Thread	
			Std.	Opt.		O			X	Y	j	i	h	g	b	a	d	c
Label 1	Label 2	K	Jt.	Jt.	N	Min.	Max.	P	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	15,0	117,14	136,14	—	115,16	114,20	114,25	113,31	3,84	3,56	3,66	3,96	8,28	8,69	26,47	26,77	1,83	2,24
5	18,0	117,14	136,14	—	115,16	114,20	114,25	113,31	3,84	3,56	3,66	3,96	8,28	8,69	26,47	26,77	1,83	2,24
	15,5	129,95	148,84	146,81	127,94	127,00	127,05	126,09	3,40	3,10	3,53	3,84	7,87	8,28	26,39	26,70	1,52	1,93
	17,0	129,95	148,84	146,81	127,94	127,00	127,05	126,09	3,84	3,56	3,53	3,84	7,87	8,28	26,39	26,70	1,52	1,93
$5^1/2$	20,0	129,95	148,84	146,81	127,94	127,00	127,05	126,09	3,84	3,56	3,53	3,84	7,87	8,28	26,39	26,70	1,52	1,93
	23,0	129,95	148,84	146,81	127,97	127,00	127,05	126,09	5,00	4,72	3,45	3,75	7,77	8,18	26,31	26,62	1,42	1,83
	24,0	157,38	177,80	176,02	155,37	154,43	154,48	153,52	3,84	3,56	3,76	4,06	9,09	9,50	26,62	26,92	2,74	3,15
$6^5/8$	28,0	157,38	177,80	176,02	155,40	154,43	154,48	153,54	4,50	4,19	3,68	3,99	8,99	9,40	26,54	26,85	2,64	3,05
	32,0	157,40	177,80	176,02	155,40	154,46	154,51	153,54	5,97	5,66	3,61	3,91	8,89	9,30	26,47	26,77	2,54	2,95
	23,0	167,26	187,71	185,67	165,25	164,29	164,34	163,40	3,84	3,53	3,84	4,14	9,25	9,65	26,70	27,00	2,84	3,25
	26,0	167,26	187,71	185,67	165,25	164,29	164,34	163,40	3,84	3,53	3,84	4,14	9,25	9,65	26,70	27,00	2,84	3,25
	29,0	167,26	187,71	185,67	165,25	164,29	164,34	163,40	4,44	4,14	3,84	4,14	9,25	9,65	26,70	27,00	2,84	3,25
7	32,0	167,26	187,71	185,67	165,25	164,31	164,36	163,40	5,59	5,31	3,76	4,06	9,14	9,55	26,62	26,92	2,74	3,15
	35,0	167,28	191,26	187,71	165,28	164,31	164,36	163,42	6,78	6,48	3,68	3,99	9,04	9,45	26,54	26,85	2,64	3,05
	38,0	167,28	191,26	187,71	165,28	164,31	164,36	163,42	7,80	7,49	3,68	3,99	9,04	9,45	26,54	26,85	2,64	3,05
	26,4	182,45	203,45	201,17	180,34	179,37	179,43	178,46	3,76	3,48	3,99	4,29	8,89	9,30	26,85	27,15	2,64	3,05
$7^5/8$	29,7	182,45	203,45	201,17	180,34	179,37	179,43	178,46	3,76	3,48	3,99	4,29	8,89	9,30	26,85	27,15	2,64	3,05
	33,7	182,45	203,45	201,17	180,34	179,37	179,43	178,49	4,60	4,29	3,91	4,22	8,79	9,19	26,77	27,08	2,54	2,95
	39,0	182,47	203,45	201,17	180,34	179,40	179,45	178,51	6,38	6,10	3,84	4,14	8,69	9,09	26,70	27,00	2,44	2,84

Table G2M—Extreme-Line Casing—Label 1—$8^5/8$ through $10^3/4$ Threading and Machining Dimensions

(See Figure G2 for illustration)
(See Table G1 for thread and seal tolerances)
(See Figure G1 and Table G1 for Label 1—$8^5/8$ through $10^3/4$)
(See G.3 for gauging practice)
All dimensions in millimeters, except as indicated.

(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)		(12)		(13)
		Threading and Machining Dimensions													
		Made-Up Joint ID	Drift Dia. for Bored	A							H		I		
Label 1	Label 2	(Nom.)	Upset	Max.	Min.	B	C	D	E	G	Min.	Max.	Min.	Max.	J
	32,0	196,22	195,83	205,74	205,79	196,52	206,96	197,15	208,08	217,65	213,82	213,87	213,56	213,61	218,47
	36,0	196,22	195,83	205,74	205,79	196,52	206,96	197,15	208,08	217,65	213,82	213,87	213,56	213,61	218,47
$8^5/8$	40,0	194,64	194,26	205,74	205,79	194,92	206,96	195,58	208,08	217,65	213,82	213,87	213,59	213,61	218,49
	44,0	192,15	191,77	205,74	205,79	192,40	206,93	193,09	208,05	217,63	213,79	213,84	213,59	213,64	218,49
	49,0	189,26	188,87	205,71	205,77	189,48	206,93	190,20	208,05	217,63	213,79	213,84	213,61	213,66	218,52
	40,0	220,09	219,71	229,64	229,69	220,40	230,86	221,03	232,00	241,60	237,77	237,82	237,52	237,57	242,42
	43,5	220,09	219,71	229,64	229,69	220,40	230,86	221,03	232,00	241,60	237,77	237,82	237,52	237,57	242,42
$9^5/8$	47,0	218,97	218,59	229,64	229,69	219,28	230,86	219,91	232,00	241,60	237,77	237,82	237,52	237,57	242,42
	53,5	215,26	214,88	229,62	229,67	215,52	230,84	216,20	231,98	241,58	237,74	237,79	237,54	237,59	242,44
	45,5	249,40	249,02	261,26	261,32	249,66	262,48	250,29	263,60	273,20	269,37	269,42	269,16	269,21	274,07
	51,0	246,86	246,48	261,26	261,32	247,12	262,48	247,75	263,60	273,20	269,37	269,42	269,16	269,21	274,07
$10^3/4$	55,5	244,58	244,20	261,26	261,32	244,83	262,48	245,47	263,60	273,20	269,37	269,42	269,16	269,21	274,07
	60,7	242,04	241,66	261,26	261,32	242,29	262,48	242,93	263,60	273,20	269,37	269,42	269,16	269,21	274,07

Table G2M—Extreme-Line Casing—Label 1—8⁵/₈ through 10³/₄ Threading and Machining Dimensions (Continued)

(See Figure G2 for illustration)

(See Table G1 for thread and seal tolerances)

(See Figure G1 and Table G1 for Label 1—8⁵/₈ through 10³/₄)

(See G.3 for gauging practice)

All dimensions in millimeters, except as indicated.

(1)	(2)	(14)	(15)		(16)	(17)		(18)	(19)	(20)	(21)		(22)		(23)		(24)	
		Threading and Machining Dimensions									Gauge to Product Standoff							
											Ring to Pin				Plug to Box			
			M								Seal		Thread		Seal		Thread	
			Std	Opt.		O			X	Y	j	i	h	g	b	a	d	c
Label 1	Label 2	K	Jt.	It.	N	Min.	Max.	P	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.
	32,0	208,89	231,65	229,36	206,58	205,49	205,54	204,47	4,78	4,39	4,06	4,37	9,02	9,50	26,92	27,23	2,69	3,18
$8^5/_8$	36,0	208,89	231,65	229,36	206,58	205,49	205,54	204,47	4,78	4,39	4,06	4,37	9,02	9,50	26,92	27,23	2,69	3,18
	40,0	208,89	231,65	229,36	206,60	205,51	205,56	204,47	5,56	5,21	3,99	4,29	8,89	9,40	26,85	27,15	2,57	3,05
	44,0	208,91	231,65	229,36	206,60	205,54	205,59	204,50	6,83	6,43	3,91	4,22	8,79	9,27	26,77	27,08	2,44	2,92
	49,0	208,91	231,65	229,36	206,63	205,54	205,59	204,50	8,28	7,90	3,84	4,14	8,66	9,14	26,70	27,00	2,31	2,79
	40,0	232,84	256,54	254,51	230,48	229,39	229,44	228,37	4,80	4,42	4,06	4,37	9,02	9,50	26,92	27,23	2,69	3,18
	43,5	232,84	256,54	254,51	230,48	229,39	229,44	228,37	4,80	4,42	4,06	4,37	9,02	9,50	26,92	27,23	2,69	3,18
$9^5/_8$	47,0	232,84	256,54	254,51	230,48	229,39	229,44	228,37	5,36	4,98	4,06	4,37	9,02	9,50	26,92	27,23	2,69	3,18
	53,5	232,87	256,54	254,51	230,51	229,41	229,46	228,40	7,21	6,83	3,91	4,22	8,79	9,27	26,77	27,08	2,44	2,92
	45,5	264,49	291,08	—	262,15	261,06	261,11	260,02	5,99	5,59	3,91	4,22	8,79	9,27	26,77	27,08	2,44	2,92
$10^3/_4$	51,0	264,49	291,08	—	262,15	261,06	261,11	260,02	7,26	6,86	3,91	4,22	8,79	9,27	26,77	27,08	2,44	2,92
	55,5	264,49	291,08	—	262,15	261,06	261,11	260,02	8,41	8,00	3,91	4,22	8,76	9,27	26,77	27,08	2,44	2,92
	60,7	264,49	291,08	—	262,15	261,06	261,11	260,02	9,68	9,27	3,91	4,22	8,79	9,27	26,77	27,08	2,44	2,92

Table G3M—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances

THREAD TAPER

Taper shall be defined as the change in the cone diameter along the minor thread taper cone. The pin taper shall be measured in the thread roots; the box taper shall be measured on the thread crests. The box and pin tapers shall be measured through positions shown as taper A and taper B in Figure G1 and Figure G2. The taper elements shall be as follows:

THREAD TAPER

Position		Taper Limit on Diameter Minimum mm per 25,4 mm	Taper Limit on Diameter Maximum mm per 25,4 mm
Sizes 5 through 7 5/8:			
	Pin End Taper A & B	3,12	3,23
	Box End Taper A	3,12	3,25
	Box End Taper B	3,12	3,23
Sizes 8 5/8 through 10 3/4:			
	Pin End Taper A & B	2,59	2,69
	Box End Taper A	2,59	2,72
	Box End Taper B	2,59	2,69

The thread of the pin member has two tapers as shown in detail F, Figure G3 and Figure G5. The taper of the imperfect entrance thread adjacent to the seal is greater than that through positions shown as tapers A and B in Figure G1 and Figure G2. The imperfect pin and box starting thread crests are normal while the roots of these threads are not due to truncation—see details E and F, Figure G3 and Figure G5 (see Note 1). The reverse condition occurs in the box mating threads adjacent to the box seal and on the male runout threads adjacent to the shoulder cylinder. These imperfect threads have normal roots on the same taper as the perfect threads while the crests are not normal due to truncation (see Figure G1 and Figure G2).

Note 1: Strict conformance to profile details indicated for entrance threads is not mandatory. Modifications to facilitate generation of these threads in keeping with the various methods of manufacture, or to ease or simplify inspection, are permissible, provided such changes do not in any way impair the functioning of the joint with respect to handling, stabbing, make-up, interchangeability, performance properties, and service. Figure G3 and Figure G5 show details of two entrance thread designs for both box and pin, representative of the two commonly used methods of machining.

Internal-thread taper measurements shall be made on the thread crests. Three readings are required to cover tapers A and B. For measurements in taper area A, and internal taper gauge (see Note 2) fitted with the proper extension arm for the size of the thread to be inspected is required. The square contact point in the fixed end of the gauge shall be placed on the thread crest previously specified and the square contact point of the plunger is placed on the crest diametrically opposite.

Note 2: An internal micrometer fitted with flat contacts is also acceptable.

For pipe sizes 5 through 7 5/8, the inspection area shall start at a distance 12,7 mm (1/2 in.) from the face of the box, which coincides with the fourth thread crest.

For pipe sizes 8 5/8 through 10 3/4, the inspection area shall start at a distance 25,4 mm (1 in.) from the face of the box, which coincides with the fifth thread crest.

The fixed point shall be held firmly in position, the plunger point oscillated through a small arc and the dial gauge set so that the zero position coincides with the maximum indication.

In a similar manner, the second reading of taper area A is made at the same radial position relative to the axis of the thread but at an additional 25,4 mm interval. This resulting reading is the actual taper for area A.

Measurement of taper area B commences with the last area A reading and concludes with the final reading taken at an additional 25,4 mm interval. The difference between these successive measurements shall be the taper of that interval of threads.

Table G3M—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances (Continued)

CONTACT POINTS FOR TAPER GAUGES

For all taper gauge points, all sizes, the point dimension shall be 1,52 mm in diameter. The recommended contact points for pin threads shall be of the ball type. The contact points for the box threads shall be flat bottomed square block type.

THREAD LEAD

Lead shall be measured through positions shown as follows:

Taper A and B (Figures G1 and G2)	Tolerance (mm)
Per 25,4 mm	±0,08
Cumulative	±0,15

CONTACT POINTS FOR LEAD GAUGES

Lead gauge contact points shall be of the truncated ball type (truncated 0,58 mm from the crest of the diameter).

Size	Ball-Point Diameter (mm)
Label 1—5 through $7^5/8$	2,21
Label 1—$8^5/8$ through $10^3/4$	2,67

The standard templates shall be constructed so as to compensate for the error in measuring lead parallel to the taper cone instead of parallel to the thread axis, according to the following values:

Length of Thread (Parallel to Thread Axis)	Compensated Length (mm) (Parallel to Taper Cone) for Threads having a Taper of: 104,17 mm per Meter	125,00 mm per Meter
25,4 mm	25,4344	25,4496
50,8 mm	50,8689	50,8991

The distance between any two adjacent notches of the template shall be accurate within a tolerance of ±0,003 mm, and between any two non-adjacent notches within a tolerance of ±0,0005 mm.

THREAD HEIGHT AND WIDTH

Height and width of threads shall be as shown in Figures G3 – G6. The height, width, and angle deviations appearing, as viewed and/or measured on an optical comparator relative to an imposed perfect thread profile template, constitute the applicable combined tolerances for these elements.

Note 3: Provided all other thread element dimensions are within the tolerances stipulated herein, an additional tolerance of +0,03 mm on thread height is acceptable.

Table G3M—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances (Continued)

CONTACT POINTS FOR THREAD HEIGHT GAUGES AND CHECK BLOCKS

Thread height gauges shall be fitted with a conical point 3,2 mm long. For 5 through $7^5/_8$, the point shall be tapered from 1,57 mm diameter to a 1,27 mm diameter at the tip. For $8^5/_8$ through $10^3/_4$, the point shall be tapered from 2,01 mm diameter to a 1,27 mm diameter at the tip.

THREAD HEIGHT GAUGE AND CHECK BLOCK FOR ALL SIZES OF EXTREME-LINE CASING

Extreme-line check blocks shall conform to the following dimensions within a tolerance of ±0,005 mm:

	Pin (mm)	Box (mm)
Label 1—5 through $7^5/_8$		
Width of groove at base of 152,4 mm flanks	2,032	2,032
Depth of groove from 1st plateau	1,240	1,417
Depth of groove from 2nd plateau	1,504	1,681
Label 1—$8^5/_8$ through $10^3/_4$		
Width of groove at base of 152,4 mm flanks	2,540	2,540
Depth of groove from 1st plateau	1,748	1,925
Depth of groove from 2nd plateau	2,012	2,189

Extreme-line thread height gauges having dials for determining the error in height of a thread shall be adjusted to register zero when applied to the proper 6 degree flank groove of the step-type check block.

Thread lengths shall be shown in Figure G1 and Figure G2.

The box member seal surface shall be conical at a taper of 2 in. per ft on diameter, $\pm^1/_{16}$ in. per ft. The pin member seal surface shall be curved to a radius of $11^1/_2$ in. $\pm\ ^1/_4$ in. centered as shown in Figure G3 and Figure G5.

Thread and seal gauge standoff values shall be as shown in Table G1 and Table G2.

APPENDIX F—FIGURES IN INTERNATIONAL STANDARD UNITS

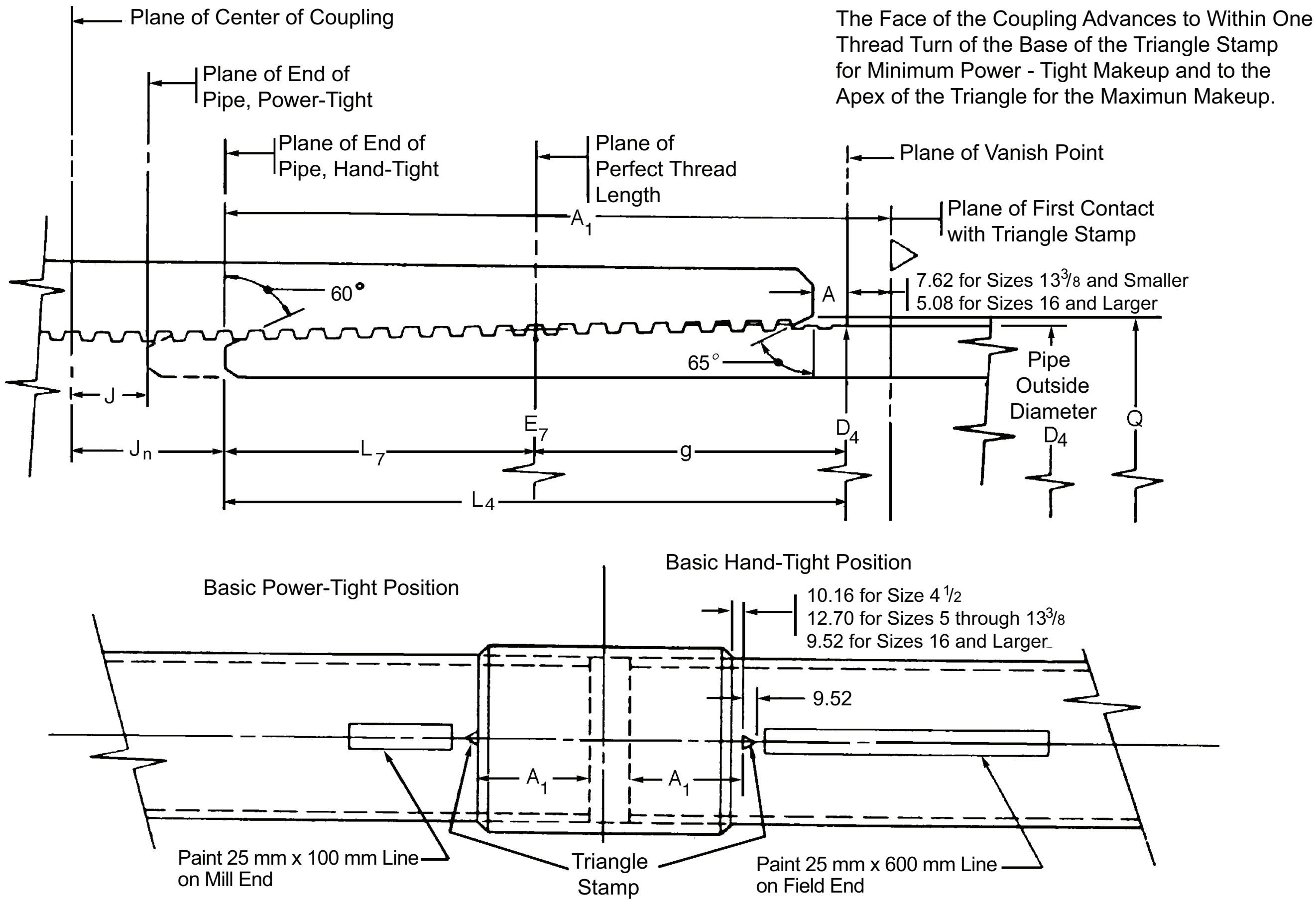


Figure 5M—Basic Dimensions of Buttress Casing Threads Hand-Tight Make-Up
(See Figures 6M and 7M for detail of thread form and dimensions.)

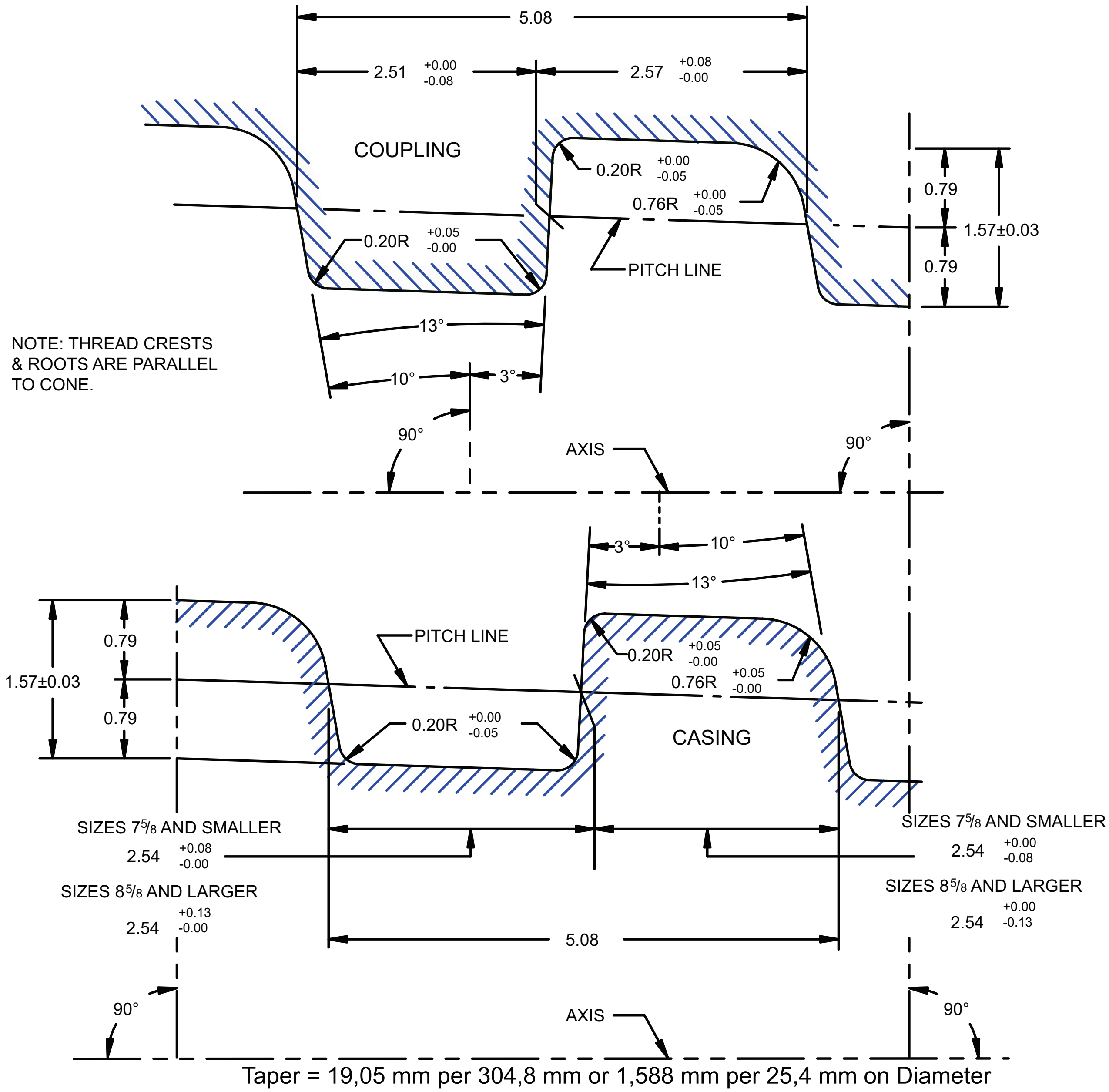
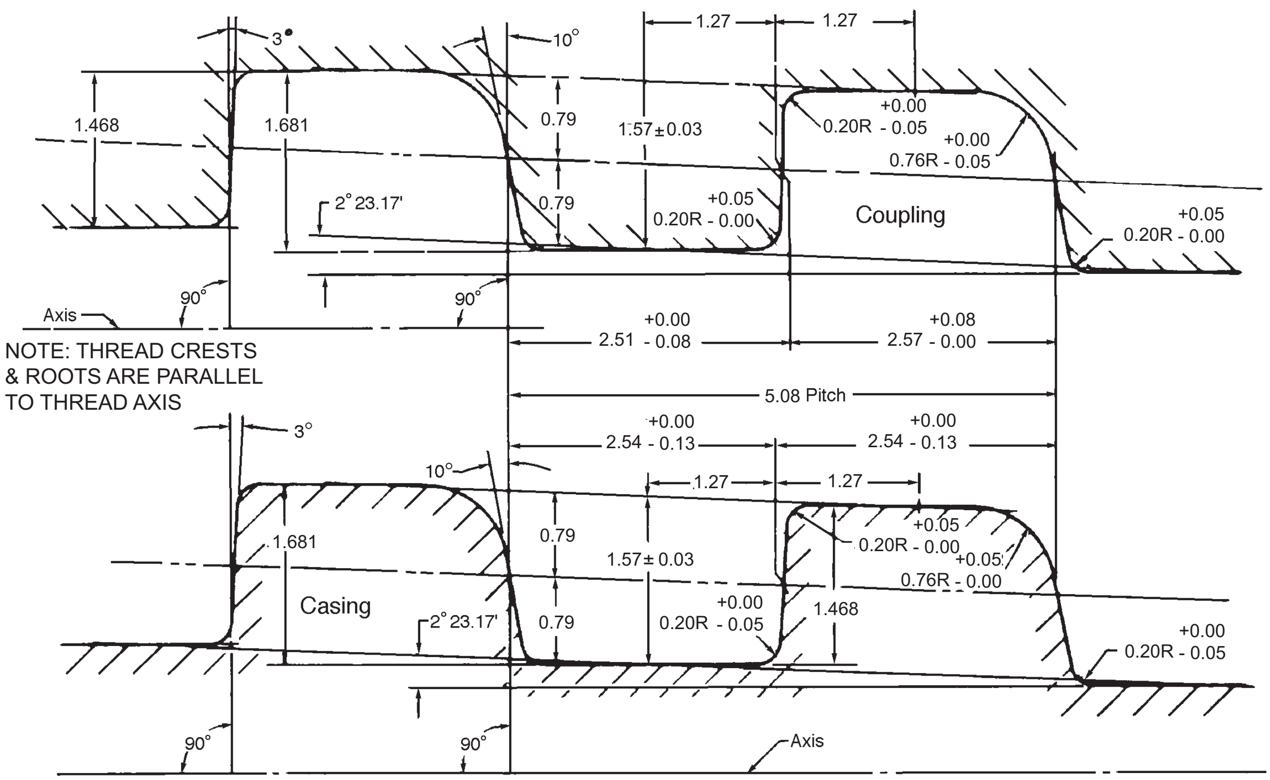
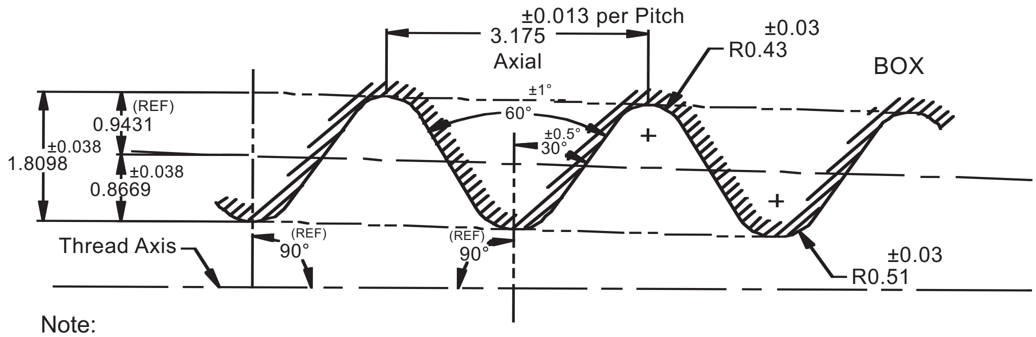


Figure 6M—Buttress Casing Thread Form and Dimensions—for Casing Sizes 4½ through 13⅜



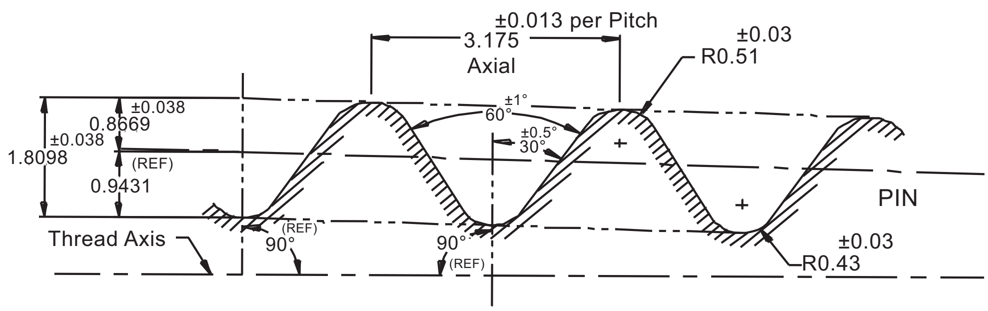
Taper = 25,4 mm per 304,8 mm or 2,117 mm per 25,4 mm on Diameter

Figure 7M—Buttress Casing Thread Form and Dimensions—for Casing Sizes 16 and Larger



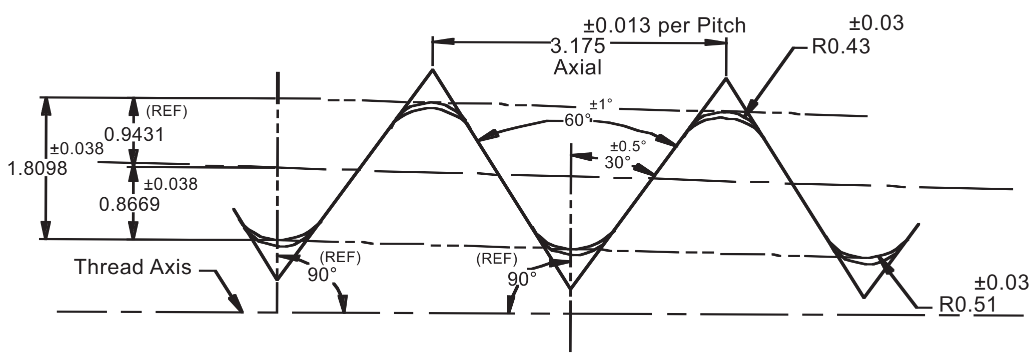
Note:
1. Taper: 1,588 mm per 25,4 mm on Diameter.

API 8-ROUND INTERNAL THREADFORM



Note:
1. Taper: 1,588 mm per 25,4 mm on Diameter.

API 8-ROUND EXTERNAL THREADFORM



API 8-ROUND MATED THREADFORM

Figure D2M—SR22 Casing Round Thread Form

APPENDIX G—EXTREME-LINE CASING

G.1 Thread Dimensions and Tolerances

G.1.1 CONNECTION

Extreme-line casing shall be furnished with threaded external upset pin and box ends. The made-up casing joint shall be shoulder-tight. The shoulder provides the stop that provides the engaging members in their proper interference fit. The thread and seal elements shall conform to the specifications herein. The seal interference is that occurring in the fit of pin seal to box seal at the tangent point (see Figures G1 and G2, dimensions A and O).

G.1.2 SEALS

The seals shall be finished in a manner to assure a pressure-tight connection when properly made up power-tight. The seals shall have a surface finish free of any defects which could cause surface galling of the mating members when connection is made up properly.

Note: A tight joint is one which, when properly made up power-tight using a suitable thread compound shows no leaks at ambient temperature at any pressure up to and including the specified hydrostatic test pressure.

G.1.3 THREAD DIMENSIONS

Extreme-line casing threads shall conform to the dimensions specified in Figures G3 – G6 and the tolerances given in Table G3 and shown in Figures G3 – G6. The thread lengths and length tolerances shall be as specified in Figures G1 and G2. All thread lengths shall be measured parallel to the thread axis; all thread heights and diameters shall be measured normal to the thread axis; the lead shall be measured parallel to the thread axis along the reference dimension line in the perfect thread portion. The pin member entrance threads shall be as shown in Figures G3 and G5.

G.1.4 THREAD FINISH

The threads shall be free of any defects which break their continuity. The box and pin threads shall be of such form and finish and shall be machined uniformly within the specified limits to assure interchangeability and the ability to withstand power make-up and break out without injury to the thread or seal elements of either member when using a thread compound meeting or exceeding the performance requirements of the latest edition of API RP 5A3. The threads and seal in the box or on the pipe male end of extreme-line casing shall be electroplated, heat treated, or processed by some other acceptable method which will minimize galling and develop the maximum leak resistance characteristics of the connection.

G.1.5 OTHER MACHINED ELEMENTS

The pin shoulders and box faces shall be free of any defects which would cause a false standoff of the connection in the made-up position.

G.1.6 GAUGING

The pin and box threads and seals shall be controlled by API certified Reference Master gauges in accordance with gauging practices in G.3. All thread and seal elements shall be subject to inspection in accordance with Table G3 and Section 8.

G.2 Thread Inspection

Inspection procedures for extreme-line casing threads and seals are included in Table G3.

G.3 Gauging Practice

G.3.1 REFERENCE MASTER GAUGES

(See Notes 1, 2, 3 and 6). All threads shall comply with the gauging practice requirements specified herein. Accordingly, any manufacturer who desires to produce API extreme-line casing shall have access to Reference Master gauges for each size and type of threads produced on products marked with the Monogram. Reference Master gauges consist of a plug and mating ring conforming to the requirements of G.4 and certified as specified in G.5.

G.3.2 WORKING GAUGES

(See Notes 1, 3 and 5). The manufacturer shall also have in their possession working gauges for use in gauging the product threads and seals. The working gauges shall consist of a two-part seal and thread plug and a two-part seal and thread ring as illustrated in Figures G9 and G10 each conforming to the requirements of G.4, or modifications thereof.

G.3.3 STANDOFF LIMITS

Tolerance limits for standoff of working plug gauge in product are shown as b and a (seal) and d and c (thread) in Tables G1 and G2. Tolerance limits for standoff of the working ring gauge on product are shown as j and i (seal) and h and g (thread) in Tables G1 and G2. New working gauges shall be made to standoff within ±0.0015 in. tolerance on the thread element and ±0.002 in. tolerance on the seal element, to the compensated Reference Master gauge standoff (see example in G.4.5). A record of the deviation from the compensated standoff must accompany each working gauge when submitted to the user by the gauge maker.

The maintenance of working gauges shall be the responsibility of the gauge user. Working gauges shall be tested for mating standoff with Reference Master gauges by the procedure stipulated in G.5.3, the interval between tests being dependent upon the frequency of their use. A change of 0.002 in. in the recorded standoff is permissible before it is necessary to regrind and readjust the working gauge wear pads of the plug or ring element. A record of the adjustments shall be maintained, and regrinds totaling 0.032 in. deviation from the original standoff are allowable before the working gauge must be reconditioned or replaced. The API Monogram shall not be applied on products controlled by gauges which have not been so tested, nor shall the letters API be used for identification of any pipe joints unless these requirements have been met.

G.3.4 GAUGE VARIATIONS

(See Notes 4 and 5.) A pair of gauges (Reference Master plug and mating Reference Master ring) which have been tested according to the requirements of the applicable parts of Section 8 may be considered safe for continued use as long as the mating standoff does not vary from the original certified value marked on the master gauge by more than minus 0.012 in. on 5 pitch and minus 0.010 in. on 6 pitch thread, provided compensation is made for the amount of deviation from the original certified relationship. The mathematical adjustment for deviations is explained in G.4.5. A pair of Reference Master gauges shall be reconditioned if at any time there is a change in relationship exceeding the limits given in the preceding statement.

Note 1: The function of Reference Master gauges is to check working gauges. The product box cannot be checked by the Reference Master plug, which has a fixed thread to seal relationship, with respect to allowable limits between the seal element and the thread element of the product. It is therefore necessary to control the amount of wear allowed in the working gauges before they must be reconditioned to comply with the prescribed working gauge to master gauge standoff value. The gauge user shall maintain all working gauges in such condition as to insure that product threads and seals, gauged as required herein, are acceptable under this Specification. Cleanliness of product and gauge is imperative for satisfactory gauging of product. See Appendix A.

Note 2: It is not necessary that authority to use the API Monogram on pipe be obtained in order to purchase certified Reference Master gauges, but the purchaser of such gauges must comply with all the stipulations on certification and retesting of such gauges as given in this Specification.

Note 3: The relationships between the Reference Master gauges, working gauges and product threads and seals shall be as indicated in Figure G7 wherein the certified Reference Master plug gauge is shown as the standard and the certified master ring gauge is the transfer standard. The thread standoff “e” of Reference Master plug gauge to the Reference Master ring gauge is the distance from the plug shoulder to the face of the ring thread member. The seal standoff for all sizes (1.500 in.) of the Reference Master plug gauge from the Reference Master ring gauge is the distance from the plug shoulder to the face of the ring seal member. To obtain correct standoff, the gauges should be advanced axially with back pressure in the direction indicated by the arrows (see Figure G7) so that all clearance is removed between the make-up flanks of the threads. The certified Reference Master ring gauge is used to establish the thread standoff “e” and seal standoff for all sizes (2.500 in.) of the working plug gauge. The certified Reference Master plug gauge is used to establish the thread standoff “e” and seal standoff “f” of the working ring gauge. See Table G4 for standoff values.

Note 4: An increase in standoff usually indicates the presence of burrs, rough threads, some foreign substances or possible physical distortion of dimensions. When an increase is observed, the gauges should be cleaned of burrs or foreign substances and rechecked. If the standoff exceeds the permissible limits, the gauge shall be reconditioned. Before reuse, all reconditioned gauges shall be recertified by an authorized certification agency or testing agency as given in G.5.1.

Note 5: The manufacturer is not limited to the exact design of working gauges as prescribed herein. Modifications of his own choice, which would duplicate the functions and control the same limits in standoff, but not necessarily the same standoff values indicated for the working gauges shown in G.4 are permissible.

Note 6: Reference Master extreme-line casing gauges made prior to 1962 are acceptable without certification provided the standoff has not changed more than the permissible amount shown in G.3.4. Ring gauges shall be submitted to the National Institute of Standards and Technology for determination of interchange standoff with the Grand Master gauges.

G.4 Gauge Specification

G.4.1 GRAND MASTER GAUGES

The Grand Master gauges comply with the same limitations and tolerances as prescribed herein for the Reference Master plug gauges. Any deviation from nominal size shall be determined by the National Institute of Standards and Technology. Grand master gauges may not be used for checking working gauges, nor for checking Reference Master gauges not marked with the API Monogram. Grand master gauges for all sizes of extreme-line casing are deposited with the National Institute of Standards and Technology, Gaithersburg, Maryland 20899, USA.

G.4.2 REFERENCE MASTER PLUG AND RING

The Reference Master plug and ring gauges as required in G.3 shall be hardened within the limits of C60 to C63 Rockwell or equivalent hardness on a superficial scale. They shall be ground gauges and shall conform to the dimensions and tolerances specified herein. The master ring assembly shall consist of two sliding members, a threaded member and a seal member.

Note: The following relationships are the basis of gauge dimensions: (see Figure G7). The relationship, as defined herein, is to the product in the minimum metal condition.

a. (See Detail A.) The root diameter T (as shown in Table G4) at R distance from the plane of the pin shoulder shall be the reference point for all thread dimensions.

b. (See Detail A.) The tangent point U (as shown in Table G4) at S distance from the plane of the pin shoulder shall be the reference point for all seal dimensions.

c. (See Detail E.) The crest diameter I max. at R distance from the box face shall be the reference point on the box thread member.

d. (See Detail E.) The tangent point O max. at S distance from the box face shall be the reference point for the box seal member.

e. (See Detail D.) The root diameter H min. at R distance from the pin shoulder shall be the reference point for the pin thread member.

f. (See Detail D.) The tangent point A min. at S distance from the pin shoulder shall be the reference point for the pin seal member.

g. (See Detail D.) The distance r between the reference point T and H min. equals the difference between the thread standoff "e" of the gauge to gauge and the thread standoff "h" of the gauge to product pin: $r = e - h$.

h. (See Detail D.) The distance s between reference point U and A min. equals the difference between the seal standoff "f" of the master plug gauge to the working ring gauge and the seal standoff "j" of the working ring gauge to the product pin: $s = f - j$.

i. (See Detail E.) The distance d between reference point T and I max. equals the standoff "d" of the working thread plug gauge to the product box.

j. (See Details B and E.) The distance m between reference point U and O max. (see Detail E) equals the difference between the seal standoff "b" of the working plug gauge to the product box and the working seal plug shoulder to the shoulder base line distance of 1,000 in. (see Detail B): $m = b - 1.000$ in.

Note: m, r and s are not listed in the tables.

G.4.3 RECONDITIONING

The maintenance of Reference Master gauges within the standoff limits specified in G.3.4 shall be the responsibility of the gauge user. Reference Master gauges in noncompliance with the standoff requirements of G.3.4 or otherwise unsuitable for further use, shall be promptly reconditioned (or replaced) and recertified in accordance with G.5.1.

G.4.4 WORKING GAUGES

Working gauges shall conform to stipulations given herein. The length of thread for working plug gauges shall be as shown on Figures G9 and G10.

G.4.5 STANDOFF

Reference Master and working gauges made to dimensions and tolerances, as prescribed in G.1, will not be perfect. They will contain slight deviations (within allowable tolerances) from the nominal standoffs. Mathematical compensation in the form of adding or subtracting the amount of deviation from the nominal standoffs shall be carried through and accounted for in the gauge mating sequence of Reference Master plug to Reference Master ring to working plug and Reference Master plug to working ring, and thus the product can be maintained within the seal and thread diametral tolerances of +0.001 in. without accumulating gauge discrepancies. To further clarify, an example of the mathematical adjustment is as follows:

EXAMPLE:
Subject: The size 5$^1/_2$ gauge sequence: Reference Master plug gauge through working gauges on (a) the threaded element and on (b) the seal element.

Terms Used:
Nominal means the basic design or theoretical figure.
Actual means the actual physical measured dimensions.
Compensated means the mathematically adjusted figure.
Reference: Figure G7 and Table G4.

a. Thread Element. For the thread element on the Reference Master plug, the nominal distance from the plane of the pin shoulder to the gauge point T is R or 1.2400 in.; however, upon making the actual measurement, R of the plug was 1.2397 in. or a deviation of –0.0003 in. from the nominal. This value is marked on the gauge by the authorized certifying agency, COMP R = 1.2397 in. When making a Reference Master thread ring element using the Reference Master plug as a measuring device, the nominal standoff "e" should be 0.3220 in., therefore, with this Reference Master plug the standoff to be produced will be 0.3217 in. (accounting for the –0.0003 in.). When actually measured, the standoff was 0.3206 in. or a deviation from the compensated Reference Master plug to the Reference Master ring element of –0.0011 in. The actual standoff is marked on the threaded ring element by the certifying agency, ACT e = 0.3206 in. When making the working plug thread element gauge using the Reference Master ring as a measuring device, the nominal standoff "e" should be 0.3220 in.; however with this master ring the compensated "e" to be actually produced must be 0.3209 ±0.0015 in. The Reference Master ring is marked with the compensated standoff by the certifying agency, COMP e = 0.3209 in. When making a working ring thread element using a Reference Master plug as a measuring device, the nominal standoff "e" should be 0.3220 in.; however with this Reference Master plug the compensated "e" to be actually produced must be 0.3217 ±0.0015 in. This value is not marked on the plug.

b. Seal Element. For the seal element on the master plug, the nominal distance from the plane of the pin shoulder to the gauge point U is S or 4.1840 in.; however, upon making the actual measurement, S of the plug was 4.1858 in. or a deviation of +0.0018 in. from the nominal. This value is marked on the gauge by the certifying agency, COMP S = 4.1858 in. When making the Reference Master seal ring element using the Reference Master plug as a measuring device, the nominal standoff should be the 1.5000 REF; therefore, with this Reference Master plug the standoff to be produced will be 1,5018 in. (accounting for the +0.0018 in.). When actually measured, the standoff was 1.5024 in. or a deviation from the compensated Reference Master plug to the Reference Master ring element of +0.0006 in. The actual and compensated standoff is marked on the ring by the certifying agency, ACT = 1.5024 in. and COMP = 1.5006 in. When making the working plug seal element gauge using the Reference Master ring as a measuring device, the nominal standoff should be 2.5000 in.; however, with this master ring, the standoff to be produced must be 2.5006 ±0.002 in. When making the working ring seal element using a Reference Master plug as a measuring device, the nominal standoff "f" should be 0.1420 in.; however, with this Reference Master plug the compensated "f" to be actually produced must be 0.1438 ±0,002 in.

G.4.6 LEAD

The lead of plug and ring gauges shall be measured parallel to the thread axis along the dimensional reference line over the full thread length, omitting one full thread at each end. The lead error between any two threads shall not exceed the tolerances specified in Table G5.

G.4.7 TAPER

On both thread plug and thread ring gauge, the basic reference diameter shall be on the minor cone. On both plug and ring gauge, the major cone may vary by the amount of thread depth tolerance. The taper of both plug and ring gauges shall be determined from measurements of the minor cone at a suitable number of positions covering the full thread length less one full thread at each end. The difference between the diameter at the large end of a gauge and the diameter at any position nearer the small end, neglecting end threads in all cases, shall not differ from the nominal taper by more than the appropriate fraction of the total tolerance specified in Table G5. The applicable fraction of the tolerance shall be determined from the ratio of the axial distance between the positions where diameter measurements are made to the gauge thread element length. In determining compliance with the specified tolerance, allowance should be made for the uncertainty of the diameter measurements, particularly in the case of small axial intervals where the taper tolerance is necessarily small.

On both seal plug and seal ring gauge member seal surface, the included taper over the full length of the seal cone surface elements of these gauge members shall be within the tolerances specified in Table G5.

G.4.8 THREAD HEIGHT

The thread height on gauges shall conform to the thread height and tolerances as shown on the gauge thread dimensions of Figures G11 and G12.

G.4.9 ROOT AND CREST FORM

The roots and crests shall be parallel to the axis. The minor cone taper line shall bisect the root of the plug and the crest of the ring threads at a distance of $^1/_4$ pitch from the intersection of the bearing flank and the dimensional reference cone line.

G.4.10 MISCELLANEOUS ELEMENTS

The dimensions as shown on Figures G9 and G10, Detail C and Detail D, defining the outside diameters, pin lengths, etc., should conform to the dimensions given; but gauges shall not be rejected for non-compliance thereto unless such non-compliance interferes with the proper use of the gauge. See Figure G8 for dimensions of API removable back-up plates for Extreme-Line Casing Gauges. The certifying agency can reject a plug gauge with inadequate bolt circle.

G.4.11 MARKING

The gauge manufacturer shall permanently mark the thread and seal gauge members with the markings given below. Any additional markings that are considered necessary by the gauge manufacturer may also be added.

a. API Monogram. The API Monogram may be used only on certified Reference Master gauges and shall not be used on working gauges or gauges which do not meet all stipulations given herein, including determination of mating standoff. The API Monogram shall be applied only as specified and only by authorized manufacturers.

b. Size of Gauge. The size as given in Tables G1 and G2 shall be marked on each plug and ring gauge.

Note: The size of the gauge is the same as the outside diameter of the pipe.

c. Type of Thread. Both plug and ring gauges shall be marked with the proper identification terms or their abbreviations as follows:

Extreme-line casing	Ex. Li. Csg.

d. Gauge Set Identification. The gauge maker shall mark all gauge members for proper identification of matched ring and plug gauge sets.

e. Name or Identification Mark of Gauge Maker. The name or identification mark of the gauge maker shall be placed on both plug and ring gauges.

f. Dimensions and Standoffs. Dimensions and standoff determinations as indicated below shall be marked on master gauges by the certifying agency.

Plug gauge dimensions

Nom. R __________

Comp. R __________

Nom. S __________

Comp. S __________

Ring gauge standoffs

Thread member

Nom. e __________

Act. e __________

Comp. e __________

Seal member

Nom. 1.5000 (for all sizes)

Act. ______________

Comp. ______________

G.5 Gauge Certification

G.5.1 CERTIFICATION AGENCIES

New and reconditioned Reference Master gauges shall be certified for accuracy of essential elements as specified in G.4, including determination of mating standoff, by any of the agencies listed in 8.1.1 possessing the appropriate Grand Master gauges.

G.5.2 CERTIFICATION

The gauge certifying agency shall inspect all new and reconditioned Reference Master gauges for compliance with the requirements of G.4. Reference Master gauges must be certified in complete sets, i.e., a Reference Master plug and a Reference Master ring gauge. A single Reference Master plug or a single Reference Master ring gauge may not be certified unless accompanied by a previously certified mating Reference Master gauge. For each pair of approved gauges the certifying agency shall issue a certificate to the gauge owner stating that the gauges meet all requirements of API Spec 5B and list the nominal and compensated values of the R and S dimensions of the Reference Master plug gauge and the nominal, actual, and compensated standoff values for both the thread and seal members of the reference ring gauge.

If any dimension of the gauges is outside the permissible limits the certifying agency shall issue a report to the gauge owner showing the reason for rejection and the magnitude of the deviation.

In the case of a new or reconditioned Reference Master gauge submitted to the National Institute of Standards and Technology for measurement of standoff from the Grand Master gauges, the agency shall issue a certificate to the owner of the gauges listing the actual standoff values for the thread and seal members of the reference ring gauge.

G.5.3 STANDOFF DETERMINATION PROCEDURE

The thread and seal standoff of ring gauges against the mating plug gauge shall be determined as follows:

a. Cleaning. The thread and seal surfaces should be cleaned thoroughly and lubricated thoroughly with light high-grade mineral oil.
b. Temperature. The temperature of the plug and of the ring gauges should be identical.
c. Holding. The plug gauge should be rigidly held so as to prevent movement.
d. Make-Up. The mating gauge should be made up using a suitable lever arrangement which provides two hand holds equidistant on diametrically opposite sides of the gauge.
e. Tightening. In the final tightening, to obtain correct standoff, the gauges should be advanced axially with back pressure in the direction indicated by the arrows shown in Figure G7 so that all clearance is removed between the make-up flanks of the threads.

f. Seating Seal. After thread members of gauges are properly made-up, push forward on ring gauge seal member and turn clockwise one turn to seat on the mating seal plug gauge.
g. Checking. Check thread and seal member standoff values.

G.5.4 MARKING

New and reconditioned Reference Master plug gauges shall be marked with the nominal and compensated values of the R and S dimensions (actual and compensated values of the R and S dimensions are identical). New and reconditioned Reference Master ring gauges shall be marked with the nominal, actual, and compensated standoffs of both thread and seal members from the mating Reference Master plug gauge. The nominal values shall be marked by the gauge manufacturer. The actual and compensated values shall be marked by the certifying agency. See G.4.11.

Thread standoffs shall be marked on the threaded part of the ring gauge and seal standoff on the seal part of the ring gauge.

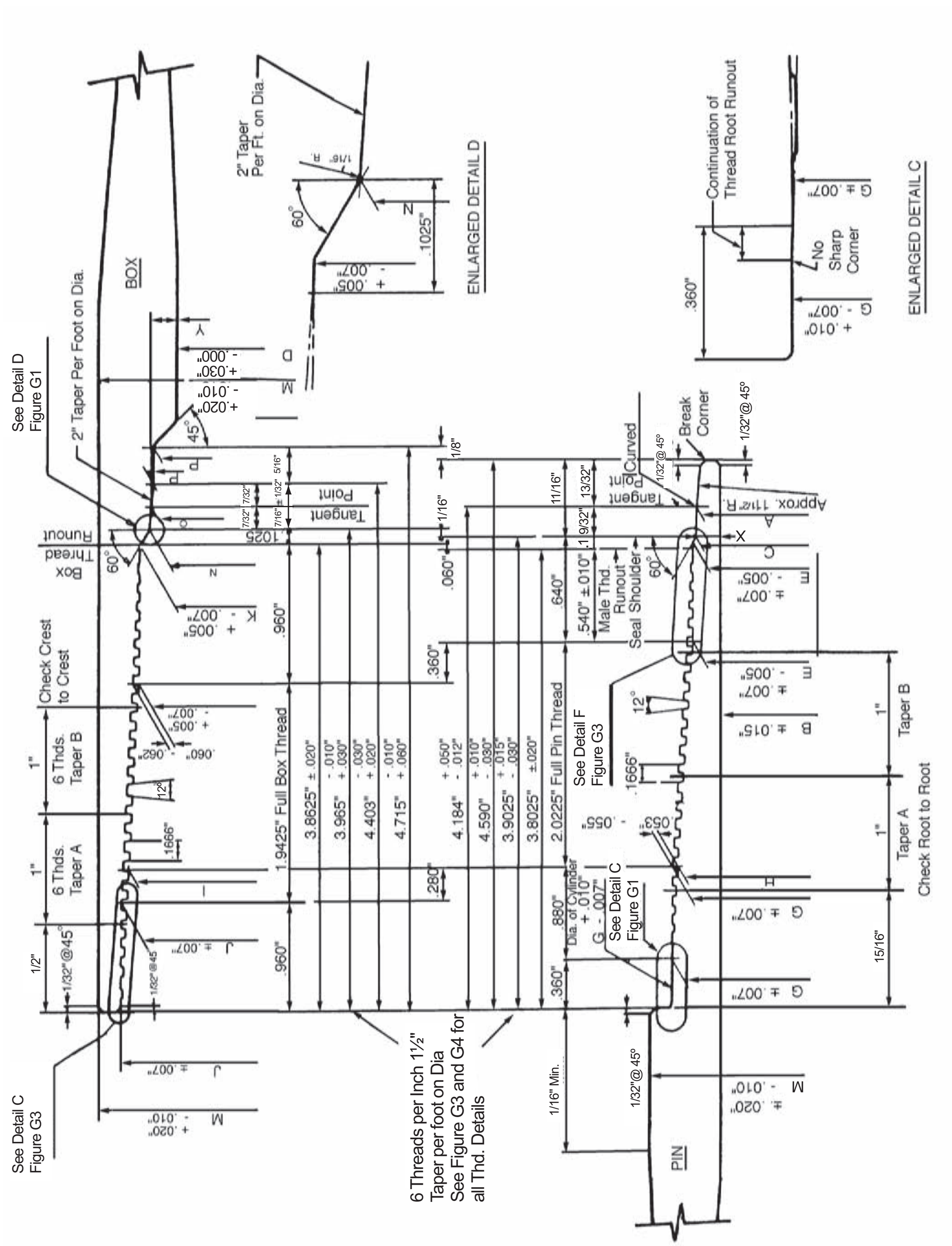
The original actual standoff which shall be shown with the year of measurement shall never be removed from the Reference Master ring gauge unless the gauge is reconditioned. Subsequent values of actual standoff shall be marked separately with appropriate date. Only the latest value shall be retained.

Using the abbreviations suggested below the original actual standoff would be listed as AS-62 .xxx inch and a subsequent value as AS-65 .xxx inch. This requirement applies to both the thread and seal members.

When only limited space is available on a gauge for marking, the following abbreviations may be used:

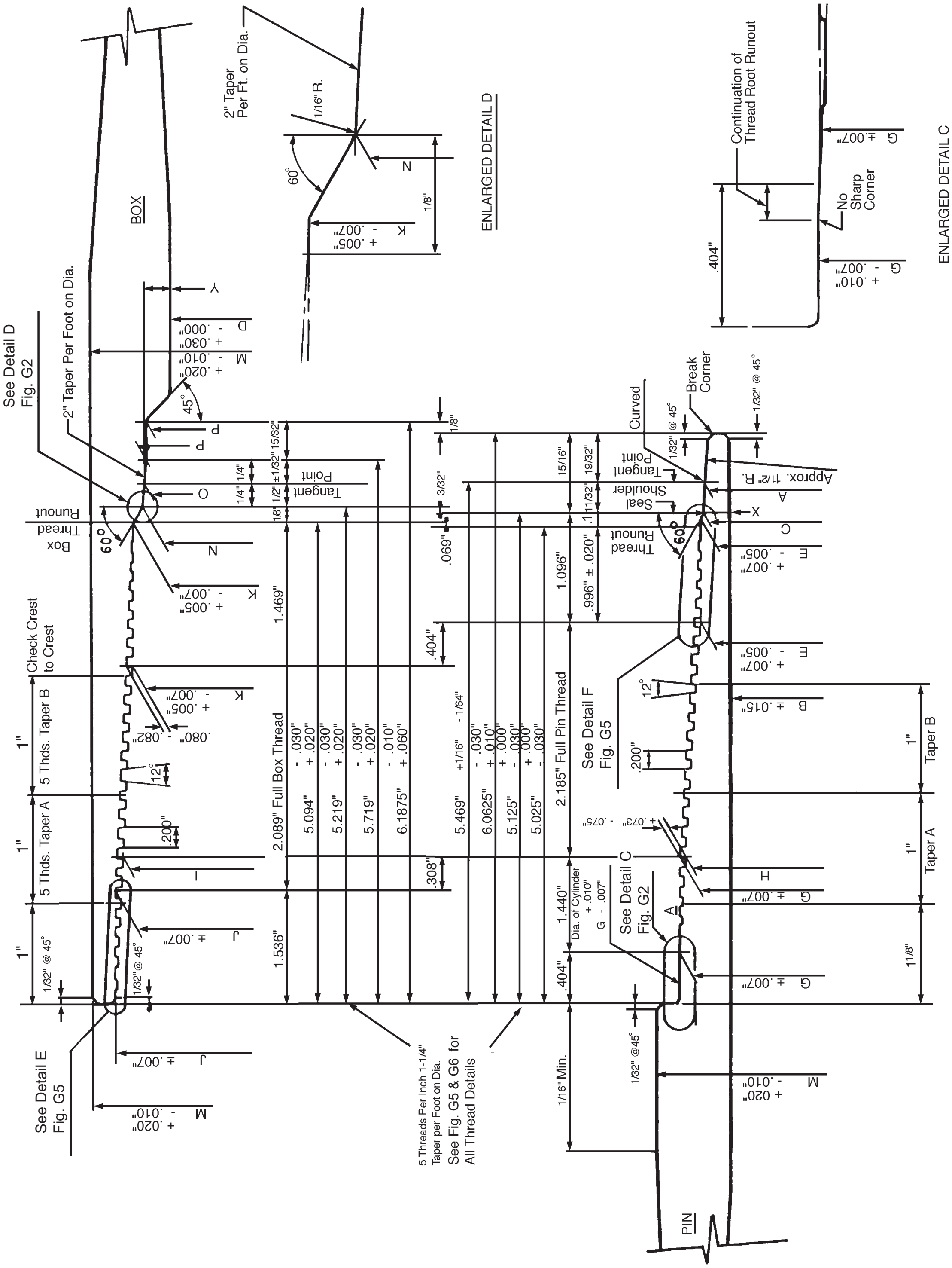
Nominal . . . . . N
Actual. . . . . . . A
Compensated . C
Standoff . . . . . S

Using these abbreviations, nominal R, for example, will be NR and compensated standoff, CS.



(See Table G1 for dimensions and standoff values.)
(See Figures G3 and G4 for thread details.)
(See Table G3 for thread and seal tolerances.)
(See G.3 for gauging practice.)
(See Figure G2 and Table G2 for sizes over 7⅝.)

Figure G1—Machining Details—Sizes 5 through 7⅝



(See Table G2 for dimensions and standoff values.)
(See Figures G5 and G6 for thread details.)
(See Table G3 for thread and seal tolerances.)
(See G.3 for gauging practice.)
(See Figure G1 and Table G1 for sizes under $8^{5}/_{8}$.)

Figure G2—Machining Details—Sizes $8^{5}/_{8}$ through $10^{3}/_{4}$

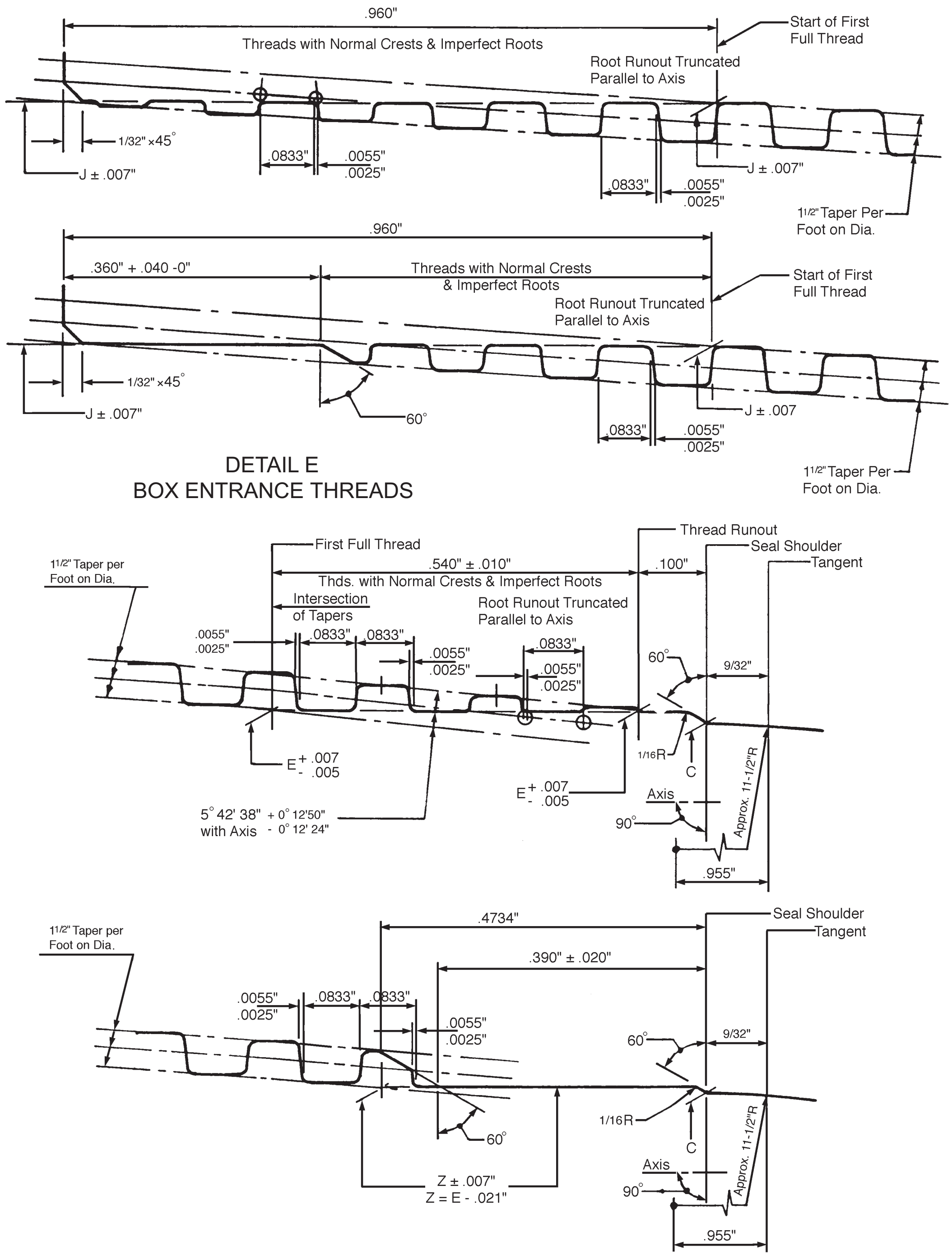


Figure G3—Box and Pin Entrance Threads—Sizes 5 through 7 5/8
(See Figure G1 and Table G1 for illustrations and other dimensions.)
(See Figure G4 for thread form and details.)
(See Figure G5 for sizes over 7 5/8.)

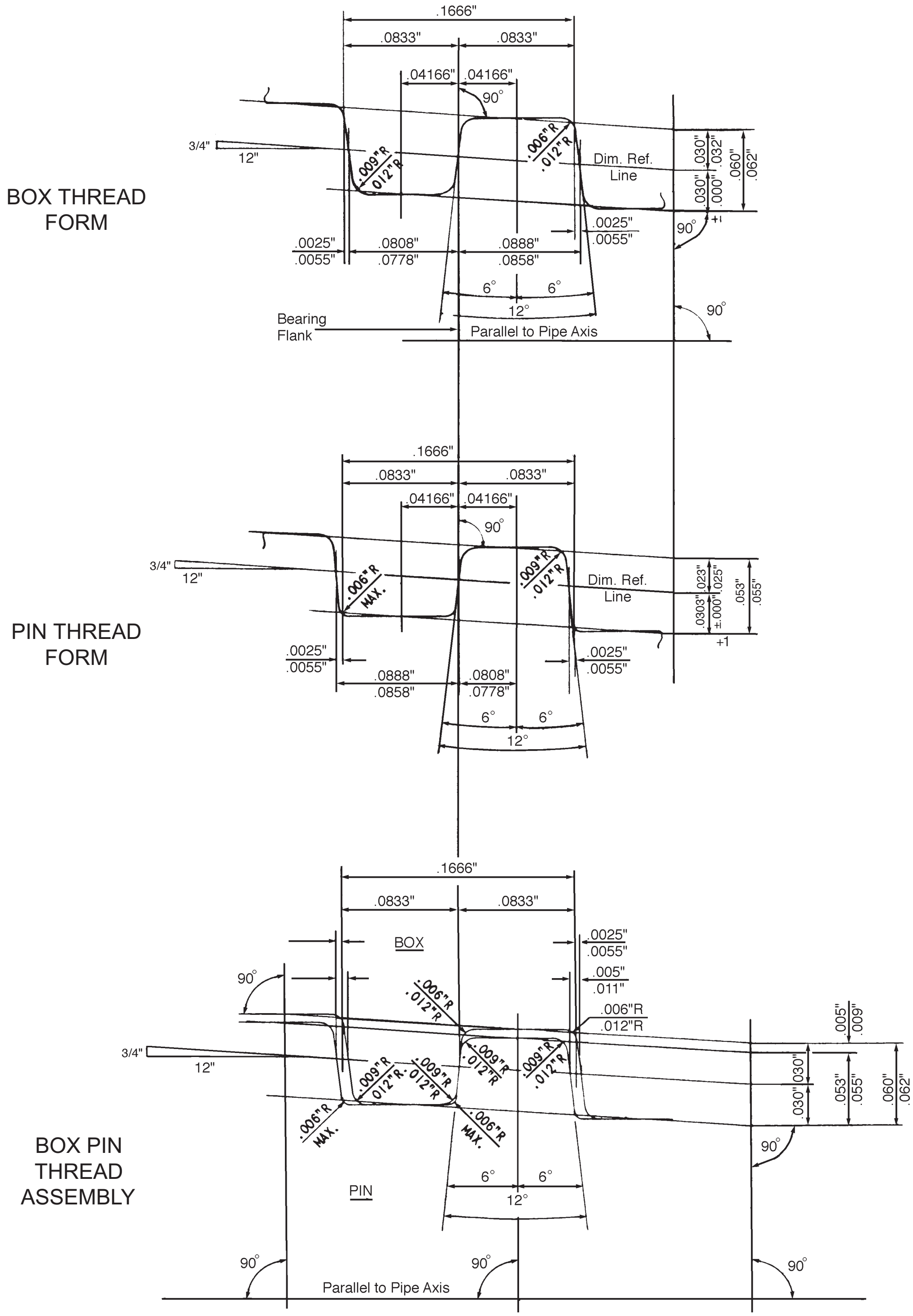


Figure G4—Product Thread Form—Sizes 5 through 7$^5/_8$
6 Threads per in.—1$^1/_2$ in. Taper per ft on Dia.
(See Figure G1 for other threading details.)
(See Figure G6 for thread form, sizes over 7$^5/_8$.)

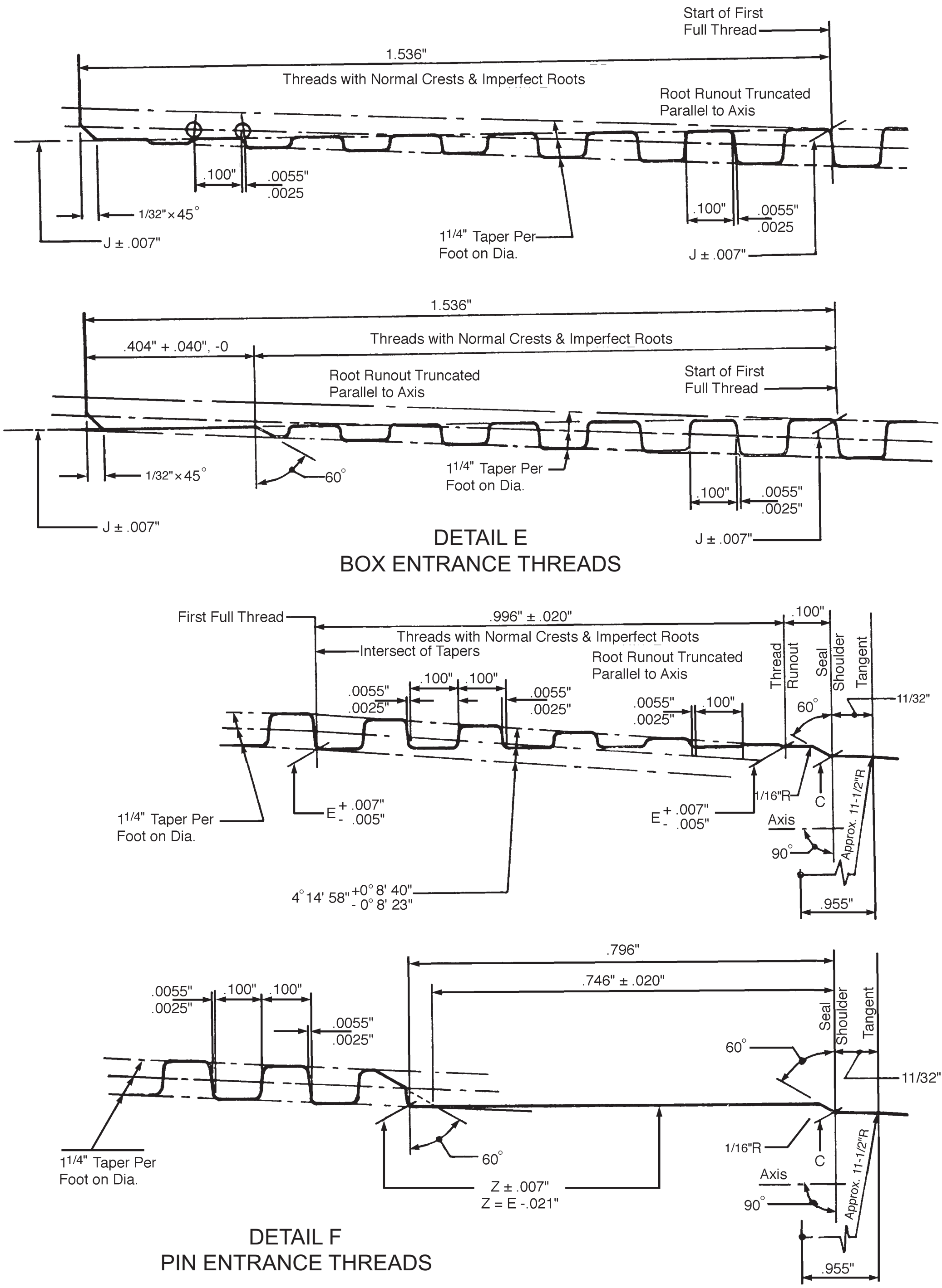


Figure G5—Box and Pin Entrance Threads—Sizes 8 5/8 through 10 3/4

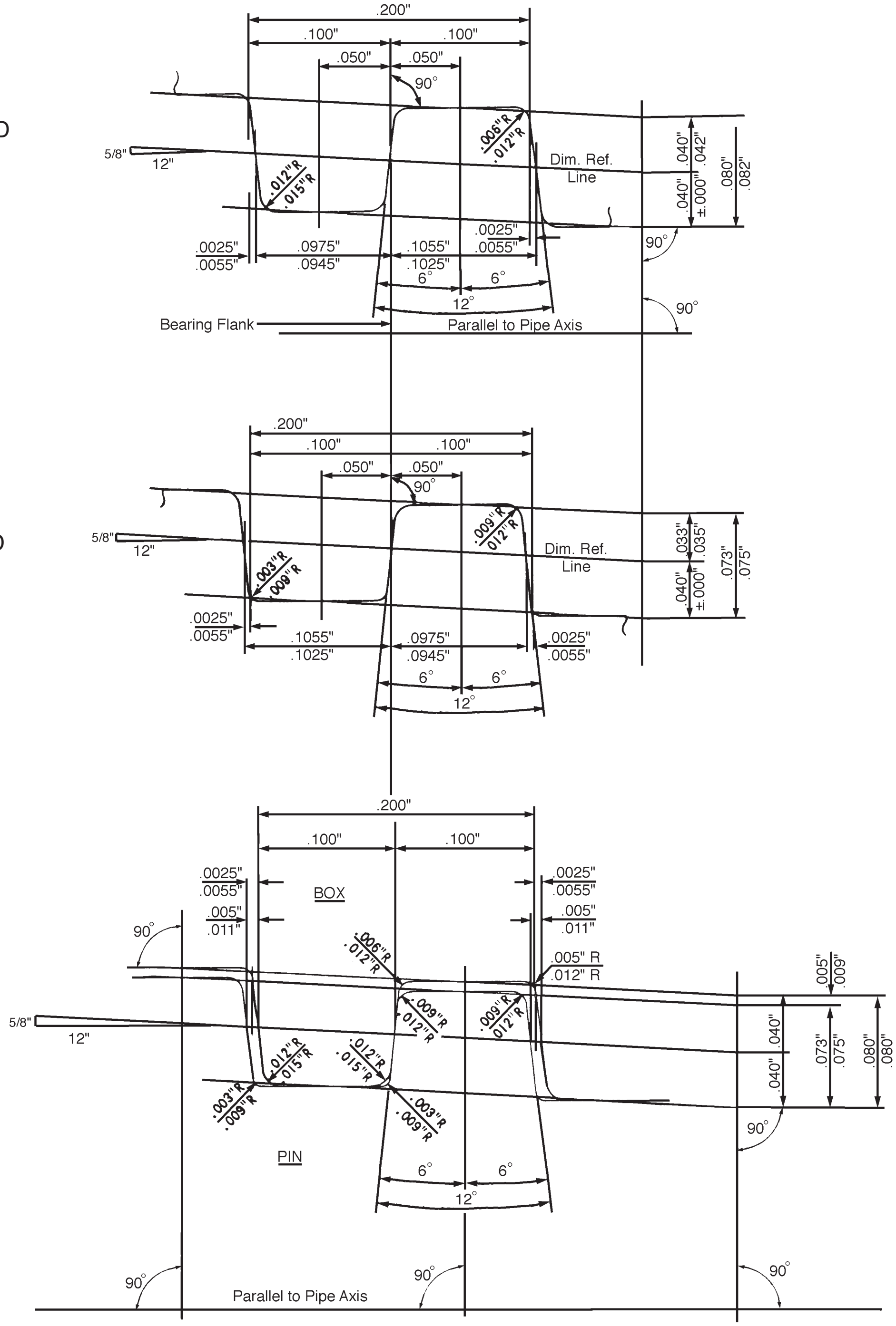
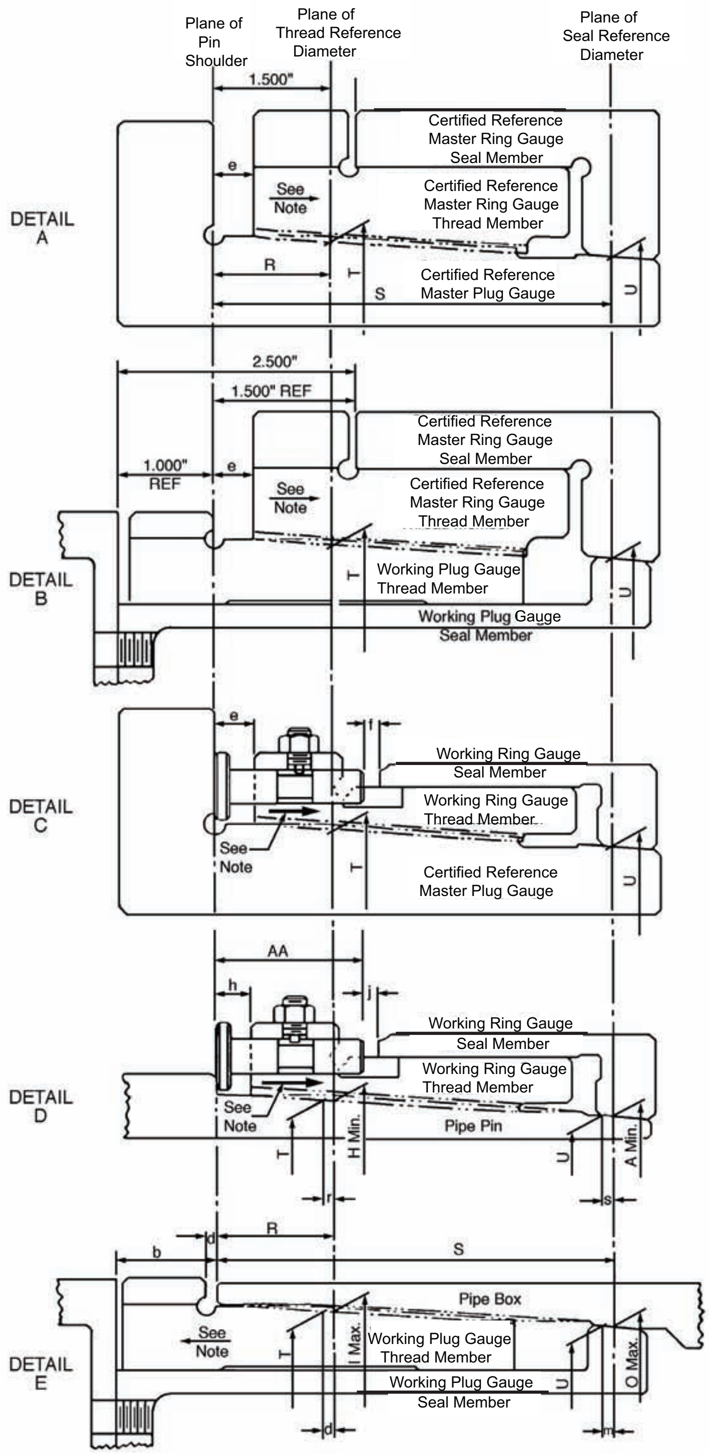


Figure G6—Product Thread Form—Sizes 8$^5/_8$ through 10$^3/_4$
5 Threads per in.—1$^1/_4$ in. Taper per ft on Dia.



1. See Figures G1 and G2 and Tables G1 and G2 for dimensions; see Figures G9 and G10 for gauge details; see Figures G11 and G12 for gauge thread form.
2. The letters j, h, d, and b constitute the minimum standoffs wherein the product is in the minimum metal condition. The corresponding standoffs for maximum metal conditions are identified in like sequence by letters i, g, c, and d as listed in Tables G1 and G2. For all other gauge dimensions, see Table G4.
3. To obtain correct standoff, gauges should be advanced axially with back pressure in direction of arrows so that all clearance is removed between the make-up flanks of threads.

Figure G7—Gauging Practice for Extreme-Line Casing

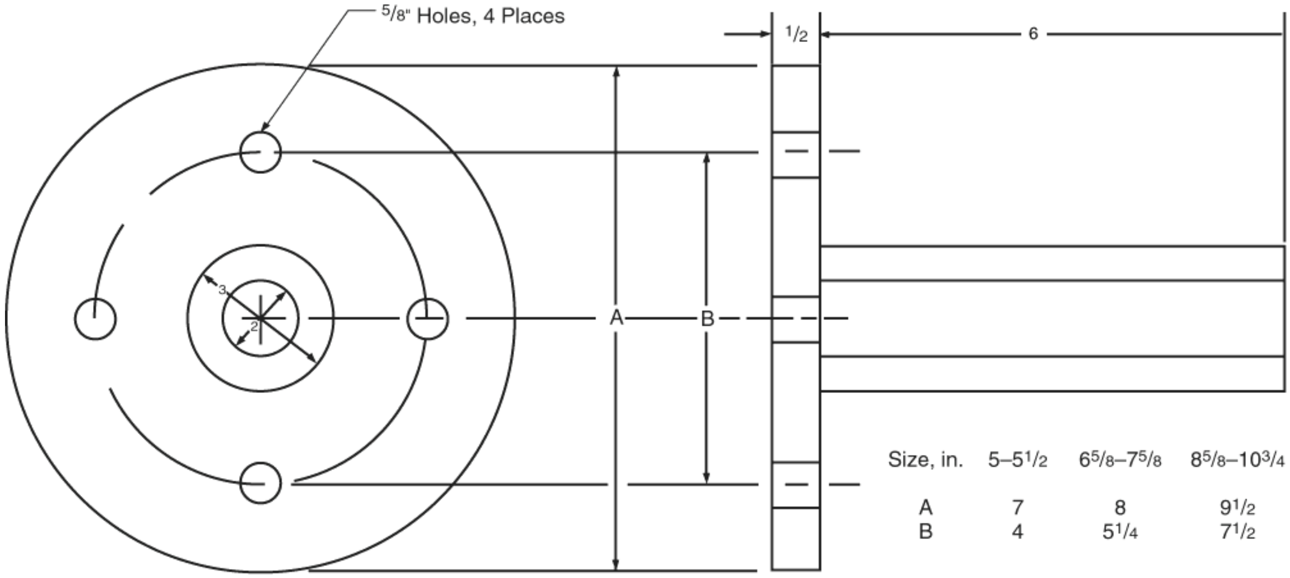
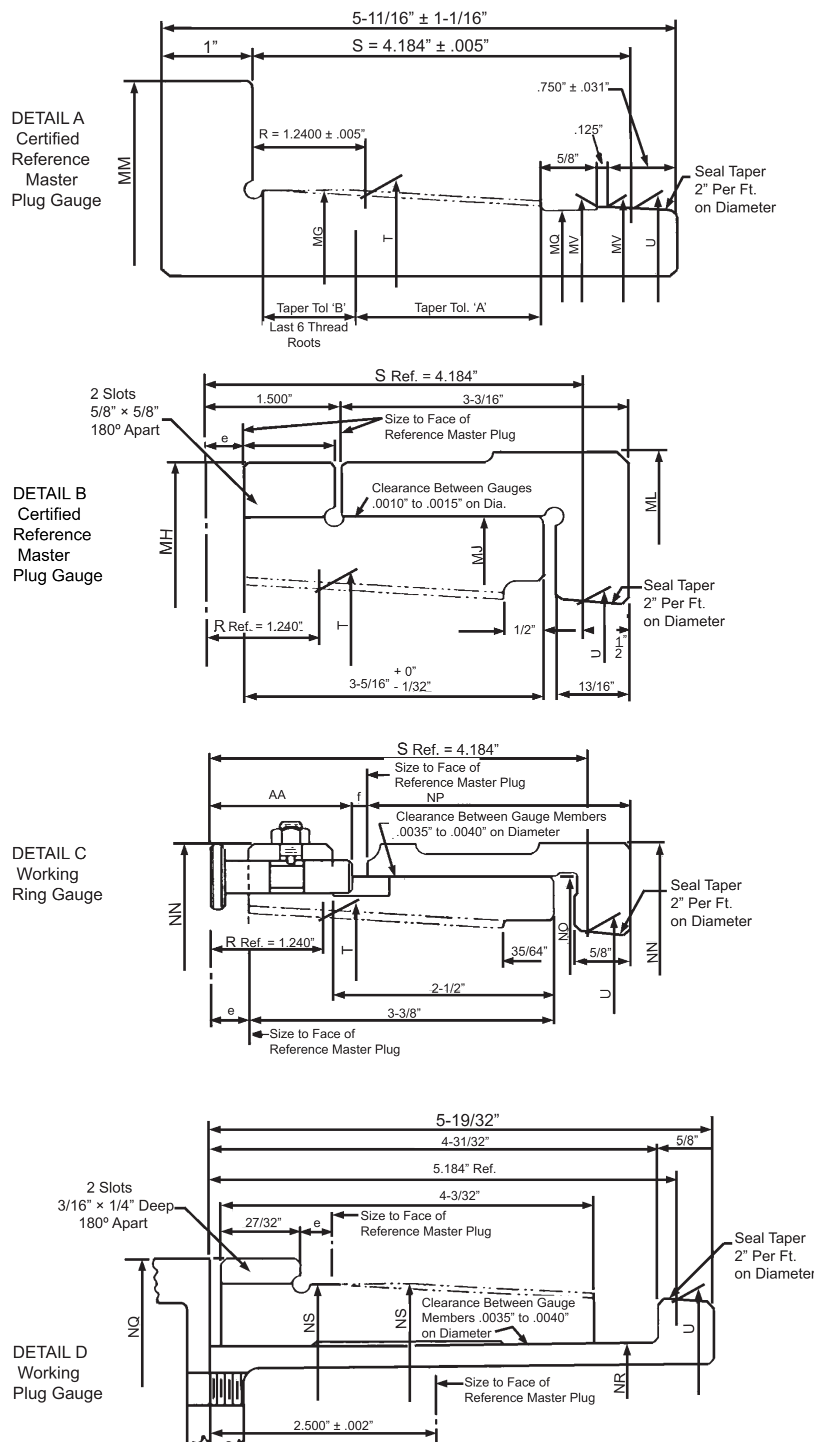


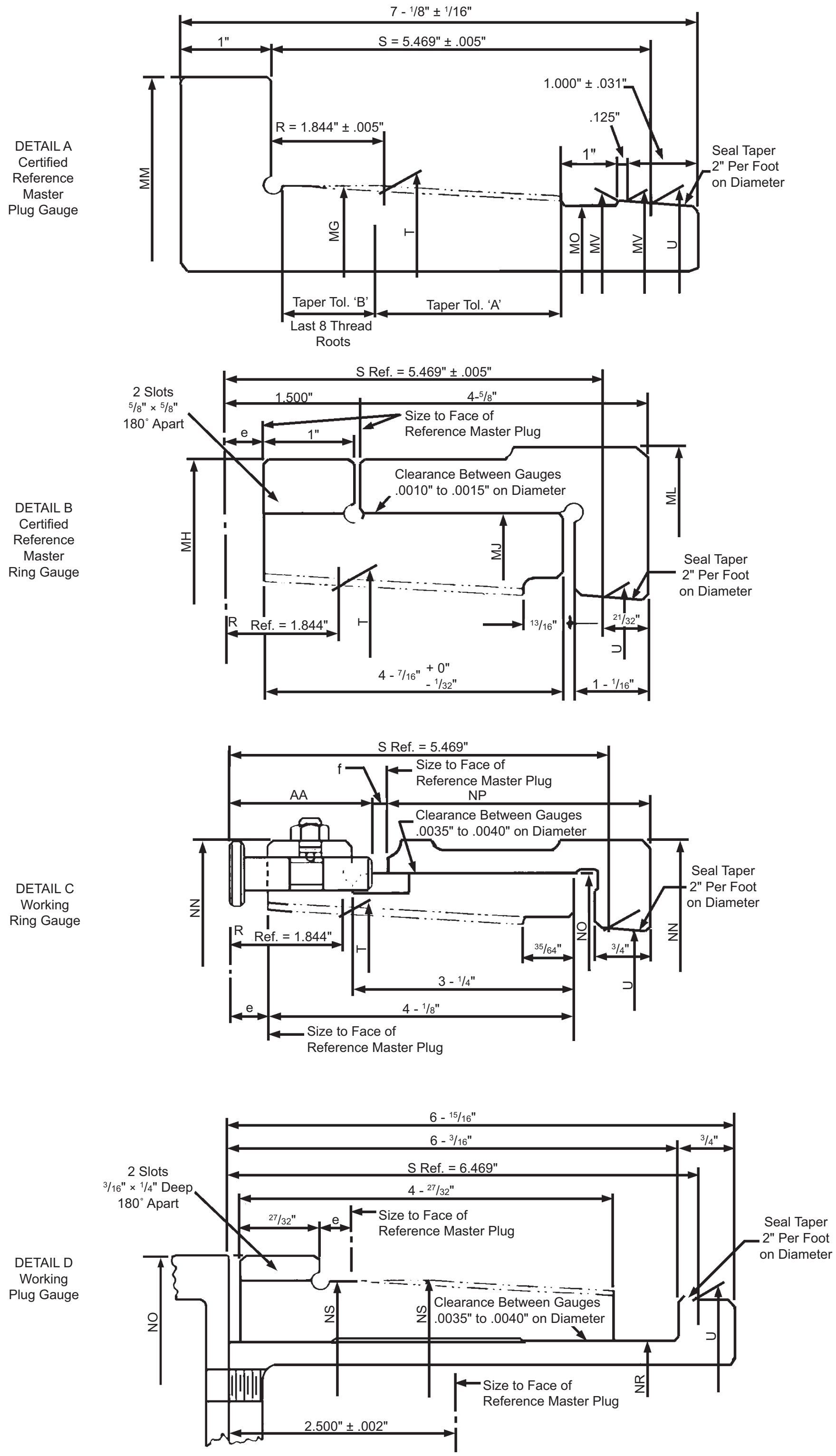
Figure G8—Bolt Circles and Back-Up Plate Dimensions for Extreme-Line Casing Master Plug Gauges



Notes:

1. End surfaces shall be ground normal to axis of the gauge within 0.0005 in T.I.R.
2. See Table G4 for other dimensions; see Table G5 for thread and seal tolerances; see Figure G11 for thread form details; see Figure G7 for gauging practice; see Figure G10 for size designations over $7^5/_8$ in.

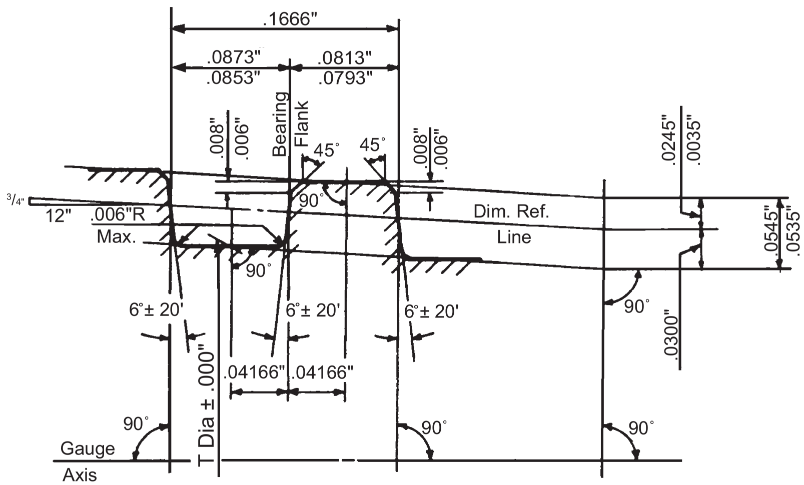
Figure G9—Gauge Details—Size Designations 5 through $7^5/_8$



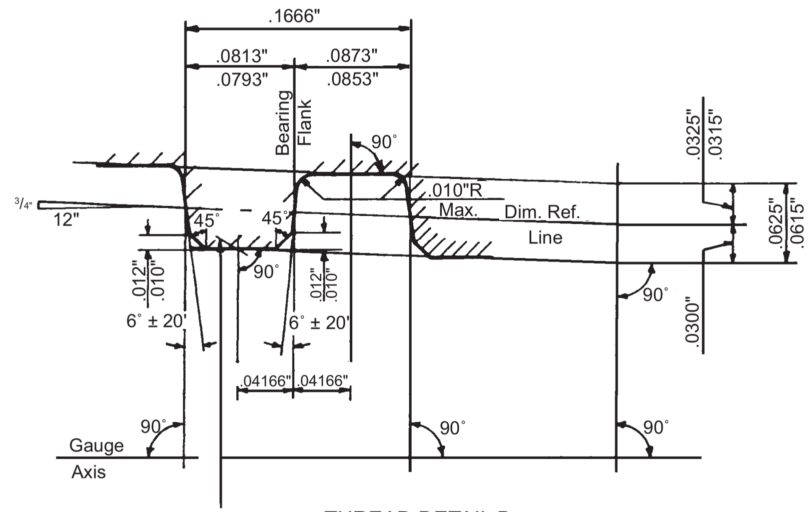
Notes:

1. End surfaces shall be ground normal to axis of the gauge within 0.0005 in T.I.R.
2. See Table G4 for other dimensions; see Table G5 for thread and seal tolerances; see Figure G12 for thread form details; see Figure G7 for gauging practice; see Figure G9 for size designations over 7⁵/₈.

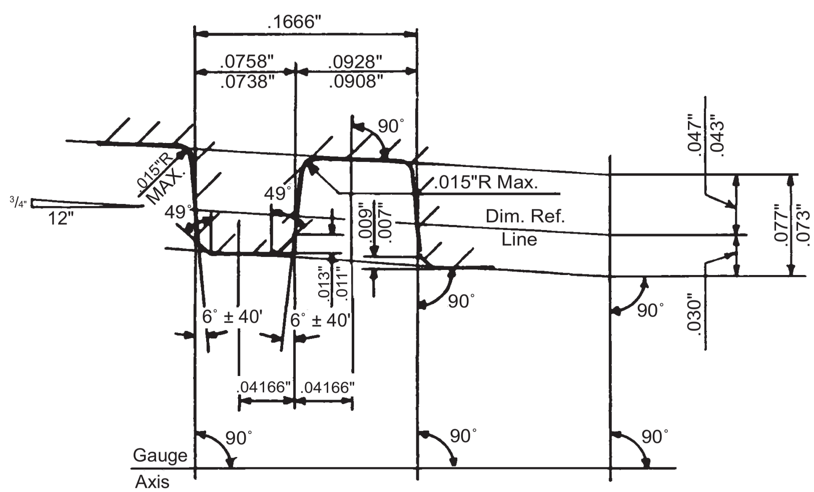
Figure G10—Gauge Details—Size Designations 8⁵/₈ through 10³/₄



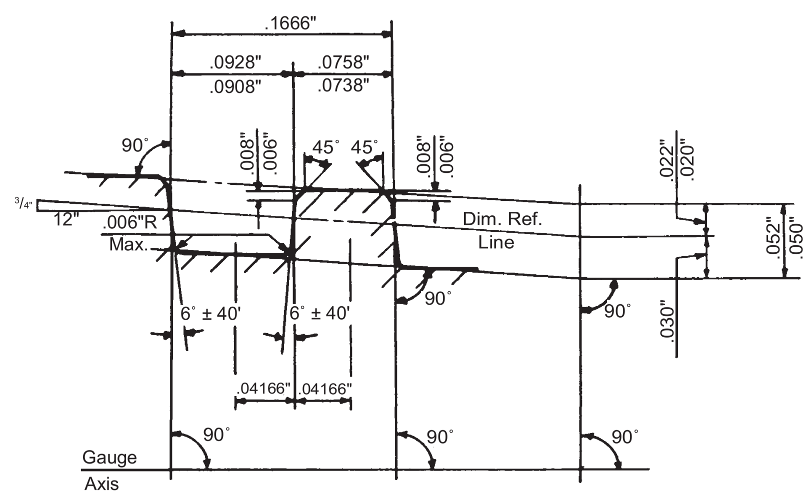
THREAD DETAIL A
Master Plug Gauge Thread, 6 Threads Per Inch, 1 - 1/2" Taper Per Ft. on Dia.



THREAD DETAIL B
Master Ring Gauge Thread, 6 Threads Per Inch, 1 - 1/2" Taper Per Ft. on Dia.



THREAD DETAIL C
Working Ring Gauge Thread, 6 Threads Per Inch, 1 - 1/2" Taper Per Ft. on Dia.



THREAD DETAIL D
Working Plug Gauge Thread, 6 Threads Per Inch, 1 - 1/2" Taper Per Ft. on Dia.

Note: See Figure G9 for other details; see Table G5 for other tolerances.

Figure G11—Gauge Thread Form—Size Designations 5 through 7 5/8

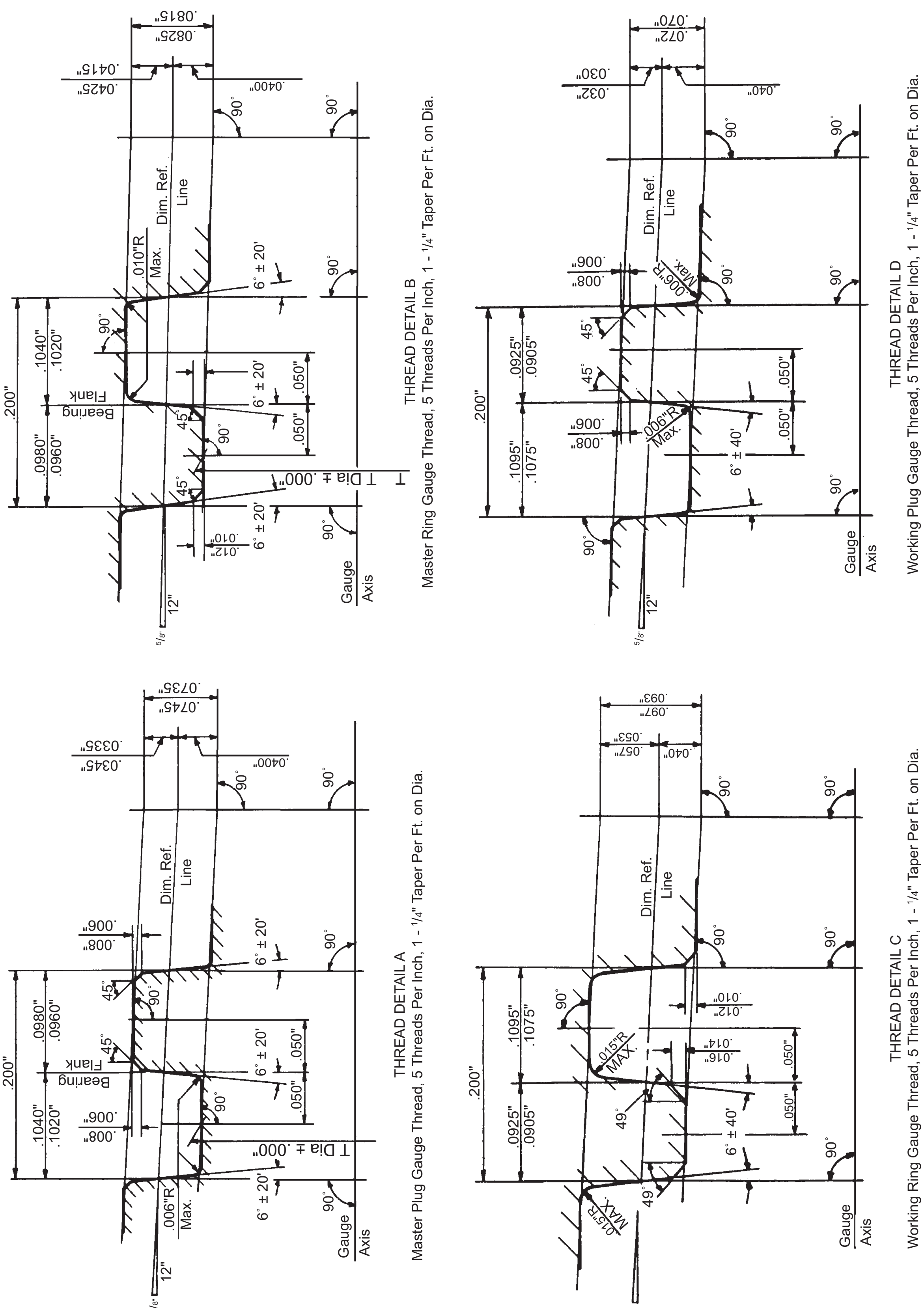


Figure G12—Gauge Thread Form—Size Designations $8^5/_8$ through $10^3/_4$

Note: See Figure G10 for other details; see Table G5 for other tolerances.

Table G1—Extreme-Line Casing—Sizes 5 through $7^5/_8$
Threading and Machining Dimensions

(See Figure G1 for illustration.)
(See Table G3 for thread and seal tolerances.)
(See G.3 for gauging practice.)
(See Figure G2 and Table G2 for sizes over $7^5/_8$.)
All dimensions in inches, except as indicated.

(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)		(12)		(13)
		Threading and Machining Dimensions													
Size OD	Nom. Weight lb per ft	Made-Up Joint ID (Nom.)	Drift Dia. for Bored Upset	A Max.	A Min.	B	C	D	E	G	H Min.	H Max.	I Min.	I Max.	J
	15.0	4.198	4.183	4.504	4.506	4.208	4.545	4.235	4.575	4.938	4.827	4.829	4.819	4.821	4.975
5	18.0	4.198	4.183	4.504	4.506	4.208	4.545	4.235	4.575	4.938	4.827	4.829	4.819	4.821	4.975
	15.5	4.736	4.721	5.008	5.010	4.746	5.048	4.773	5.079	5.442	5.331	5.333	5.323	5.325	5.479
	17.0	4.701	4.686	5.008	5.010	4.711	5.048	4.738	5.079	5.442	5.331	5.333	5.323	5.325	5.479
$5^1/_2$	20.0	4.701	4.686	5.008	5.010	4.711	5.048	4.738	5.079	5.442	5.331	5.333	5.323	5.325	5.479
	23.0	4.610	4.595	5.007	5.009	4.619	5.048	4.647	5.079	5.441	5.330	5.332	5.323	5.325	5.479
	24.0	5.781	5.766	6.089	6.091	5.792	6.130	5.818	6.160	6.523	6.412	6.414	6.403	6.405	6.559
$6^5/_8$	28.0	5.731	5.716	6.088	6.090	5.741	6.129	5.768	6.160	6.522	6.411	6.413	6.403	6.405	6.559
	32.0	5.615	5.600	6.088	6.090	5.624	6.129	5.652	6.159	6.522	6.411	6.413	6.404	6.406	6.560
	23.0	6.171	6.156	6.477	6.479	6.182	6.518	6.208	6.549	6.912	6.801	6.803	6.792	6.794	6.948
	26.0	6.171	6.156	6.477	6.479	6.182	6.518	6.208	6.549	6.912	6.801	6.803	6.792	6.794	6.948
	29.0	6.123	6.108	6.477	6.479	6.134	6.518	6.160	6.549	6.912	6.801	6.803	6.792	6.794	6.948
7	32.0	6.032	6.017	6.477	6.479	6.042	6.518	6.069	6.548	6.911	6.800	6.802	6.792	6.794	6.948
	35.0	5.940	5.925	6.476	6.478	5.949	6.517	5.977	6.548	6.911	6.800	6.802	6.793	6.795	6.949
	38.0	5.860	5.845	6.476	6.478	5.869	6.517	5.897	6.548	6.911	6.800	6.802	6.793	6.795	6.949
	26.4	6.770	6.755	7.072	7.074	6.782	7.113	6.807	7.148	7.511	7.400	7.402	7.390	7.392	7.546
	29.7	6.770	6.755	7.072	7.074	6.782	7.113	6.807	7.148	7.511	7.400	7.402	7.390	7.392	7.546
$7^5/_8$	33.7	6.705	6.690	7.072	7.074	6.716	7.112	6.742	7.147	7.510	7.399	7.401	7.390	7.392	7.548
	39.0	6.565	6.550	7.071	7.073	6.575	7.112	6.602	7.147	7.510	7.399	7.401	7.391	7.393	7.549

Table G1—Extreme-Line Casing—Sizes 5 through 7⁵⁄₈ Threading and Machining Dimensions (Continued)

(See Figure G1 for illustration.)
(See Table G3 for thread and seal tolerances.)
(See G.3 for gauging practice.)
(See Figure G2 and Table G2 for sizes over 7⁵⁄₈.)
All dimensions in inches, except as indicated.

(1)	(2)	(14)	(15)		(16)	(17)		(18)	(19)	(20)	(21)		(22)		(23)		(24)	
		Threading and Machining Dimensions									Gauge to Product Standoff							
											Ring to Pin				Plug to Box			
	Nom.		M								Seal		Thread		Seal		Thread	
Size	Weight		Std.	Opt.		O			X	Y	j	i	h	g	b	a	d	c
OD	lb per ft	K	Jt.	Jt.	N	Min.	Max.	P	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
	15.0	4.612	5.360	—	4.534	4.496	4.498	4.461	.151	.140	.144	.156	.326	.342	1.042	1.054	.072	.088
5	18.0	4.612	5.360	—	4.534	4.496	4.498	4.461	.151	.140	.144	.156	.326	.342	1.042	1.054	.072	.088
	15.5	5.116	5.860	5.780	5.037	5.000	5.002	4.964	.134	.122	.139	.151	.310	.326	1.039	1.051	.060	.076
	17.0	5.116	5.860	5.780	5.037	5.000	5.002	4.964	.151	.140	.139	.151	.310	.326	1.039	1.051	.060	.076
5¹⁄₂	20.0	5.116	5.860	5.780	5.037	5.000	5.002	4.964	.151	.140	.139	.151	.310	.326	1.039	1.051	.060	.076
	23.0	5.116	5.860	5.780	5.038	5.000	5.002	4.964	.197	.186	.136	.148	.306	.322	1.036	1.048	.056	.072
	24.0	6.196	7.000	6.930	6.117	6.080	6.082	6.044	.151	.140	.148	.160	.358	.374	1.048	1.060	.108	.124
6⁵⁄₈	28.0	6.196	7.000	6.930	6.118	6.080	6.082	6.045	.177	.165	.145	.157	.354	.370	1.045	1.057	.104	.120
	32.0	6.197	7.000	6.930	6.118	6.081	6.083	6.045	.235	.223	.142	.154	.350	.366	1.042	1.054	.100	.116
	23.0	6.585	7.390	7.310	6.506	6.468	6.470	6.433	.151	.139	.151	.163	.364	.380	1.051	1.063	.112	.128
	26.0	6.585	7.390	7.310	6.506	6.468	6.470	6.433	.151	.139	.151	.163	.364	.380	1.051	1.063	.112	.128
	29.0	6.585	7.390	7.310	6.506	6.468	6.470	6.433	.175	.163	.151	.163	.364	.380	1.051	1.063	.112	.128
7	32.0	6.585	7.390	7.310	6.506	6.469	6.471	6.433	.220	.209	.148	.160	.360	.376	1.048	1.060	.108	.124
	35.0	6.586	7.530	7.390	6.507	6.469	6.471	6.434	.267	.255	.145	.157	.356	.372	1.045	1.057	.104	.120
	38.0	6.586	7.530	7.390	6.507	6.469	6.471	6.434	.307	.295	.145	.157	.356	.372	1.045	1.057	.104	.120
	26.4	7.183	8.010	7.920	7.100	7.062	7.064	7.026	.148	.137	.157	.169	.350	.366	1.057	1.069	.104	.120
	29.7	7.183	8.010	7.920	7.100	7.062	7.064	7.026	.148	.137	.157	.169	.350	.366	1.057	1.069	.104	.120
7⁵⁄₈	33.7	7.183	8.010	7.920	7.100	7.062	7.064	7.027	.181	.169	.154	.166	.346	.362	1.054	1.066	.100	.116
	39.0	7.184	8.010	7.920	7.100	7.063	7.065	7.028	.251	.240	.151	.163	.342	.358	1.051	1.063	.096	.112

Table G2—Extreme-Line Casing—Sizes $8^5/_8$ through $10^3/_4$ Threading and Machining Dimensions

(See Figure G2 for illustration.)
(See Table G1 for thread and seal tolerances.)
(See G.3 for gauging practices.)
(See Figure G1 and Table G1 for sizes under $8^5/_8$.)
All dimensions in inches, except as indicated.

(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)		(12)		(13)
		Threading and Machining Dimensions													
Size OD	Nom. Weight lb per ft	Made-Up Joint ID (Nom.)	Drift Dia. for Bored Upset	A Max.	A Min.	B	C	D	E	G	H Min.	H Max.	I Min.	I Max.	J
	32.0	7.725	7.710	8.100	8.102	7.737	8.148	7.762	8.192	8.569	8.418	8.420	8.408	8.410	8.601
	36.0	7.725	7.710	8.100	8.102	7.737	8.148	7.762	8.192	8.569	8.418	8.420	8.408	8.410	8.601
$8^5/_8$	40.0	7.663	7.648	8.100	8.102	7.674	8.148	7.700	8.192	8.569	8.418	8.420	8.409	8.411	8.602
	44.0	7.565	7.550	8.100	8.102	7.575	8.147	7.602	8.191	8.568	8.417	8.419	8.409	8.411	8.602
	49.0	7.451	7.436	8.099	8.101	7.460	8.147	7.488	8.191	8.568	8.417	8.419	8.410	8.412	8.603
	40.0	8.665	8.650	9.041	9.043	8.677	9.089	8.702	9.134	9.512	9.361	9.363	9.351	9.353	9.544
	43.5	8.665	8.650	9.041	9.043	8.677	9.089	8.702	9.134	9.512	9.361	9.363	9.351	9.353	9.544
$9^5/_8$	47 0	8.621	8.606	9.041	9.043	8.633	9.089	8.658	9.134	9.512	9.361	9.363	9.351	9.353	9.544
	53.5	8.475	8.460	9.040	9.042	8.485	9.088	8.512	9.133	9.511	9.360	9.362	9.352	9.354	9.545
	45 5	9.819	9.804	10.286	10.288	9.829	10.334	9.854	10.378	10.756	10.605	10.607	10.597	10.599	10.790
	51.0	9.719	9.704	10.286	10.288	9.729	10.334	9.754	10.378	10.756	10.605	10.607	10.597	10.599	10.790
$10^3/_4$	55 5	9.629	9.614	10.286	10.288	9.639	10.334	9.664	10.378	10.756	10.605	10.607	10.597	10.599	10.790
	60.7	9.529	9.514	10.286	10.288	9.539	10.334	9.564	10.378	10.756	10.605	10.607	10.597	10.599	10.790

Table G2—Extreme-Line Casing—Sizes 8 5/8 through 10 3/4 Threading and Machining Dimensions (Continued)

(See Figure G2 for illustration.)
(See Table G1 for thread and seal tolerances.)
(See G.3 for gauging practices.)
(See Figure G1 and Table G1 for sizes under 8 5/8.)
All dimensions in inches, except as indicated.

(1)	(2)	(14)	(15)		(16)	(17)		(18)	(19)	(20)	(21)		(22)		(23)		(24)	
		Threading and Machining Dimensions									Gauge to Product Standoff							
											Ring to Pin				Plug to Box			
	Nom.		M								Seal		Thread		Seal		Thread	
Size	Weight,		Std	Opt.		O			X	Y	j	i	h	g	b	a	d	c
OD	lb per ft	K	Jt.	It.	N	Min.	Max.	P	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.
	32.0	8.224	9.120	9.030	8.133	8.090	8.092	8.050	0.188	0.173	0.160	0.172	0.355	0.374	1.060	1.072	0.106	0.125
8 5/8	36.0	8.224	9.120	9.030	8.133	8.090	8.092	8.050	0.188	0.173	0.160	0.172	0.355	0.374	1.060	1.072	0.106	0.125
	40.0	8.224	9.120	9.030	8.134	8.091	8.093	8.050	0.219	0.205	0.157	0.169	0.350	0.370	1.057	1.069	0.101	0.120
	44.0	8.225	9.120	9.030	8.134	8.092	8.094	8.051	0.269	0.253	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115
	49.0	8.225	9.120	9.030	8.135	8.092	8.094	8.051	0.326	0.311	0.151	0.163	0.341	0.360	1.051	1.063	0.091	0.110
	40.0	9.167	10.100	10.020	9.074	9.031	9.033	8.991	0.189	0.174	0.160	0.172	0.355	0.374	1.060	1.072	0.106	0.125
	43.5	9.167	10.100	10.020	9.074	9.031	9.033	8.991	0.189	0.174	0.160	0.172	0.355	0.374	1.060	1.072	0.106	0.125
9 5/8	47.0	9.167	10.100	10.020	9.074	9.031	9.033	8.991	0.211	0.196	0.160	0.172	0.355	0.374	1.060	1.072	0.106	0.125
	53.5	9.168	10.100	10.020	9.075	9.032	9.034	8.992	0.284	0.269	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115
	45.5	10.413	11.460	—	10.321	10.278	10.280	10.237	0.236	0.220	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115
10 3/4	51.0	10.413	11.460	—	10.321	10.278	10.280	10.237	0.286	0.270	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115
	55.5	10.413	11.460	—	10.321	10.278	10.280	10.237	0.331	0.315	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115
	60.7	10.413	11.460	—	10.321	10.278	10.280	10.237	0.381	0.365	0.154	0.166	0.346	0.365	1.054	1.066	0.096	0.115

Table G3—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances

THREAD TAPER

Taper shall be defined as the change in the cone diameter along the minor thread taper cone. The pin taper shall be measured in the thread roots; the box taper shall be measured on the thread crests. The box and pin tapers shall be measured through positions shown as taper A and taper B in Figures G1 and G2. The taper elements shall be as follows:

	Taper Limit on Diameter	
Position	Minimum in. per in.	Maximum in. per in.
Sizes 5 through 7⁵/8:		
Pin end taper A & B	0.123	0.127
Box end taper A	0.123	0.128
Box end taper B	0.123	0.127
Sizes 8⁵/8 through 10³/4:		
Pin end taper A&B	0.102	0.106
Box end taper A	0.102	0.107
Box end taper B	0.102	0.106

The thread of the pin member has two tapers as shown in detail F, Figures G3 and G5. The taper of the imperfect entrance thread adjacent to the seal is greater than that through positions shown as tapers A and B in Figures G1 and G2. The imperfect pin and box starting thread crests are normal while the roots of these threads are not due to truncation—see details E and F, Figures G3 and G5 (see Note 1). The reverse condition occurs in the box mating threads adjacent to the box seal and on the male runout threads adjacent to the shoulder cylinder. These imperfect threads have normal roots on the same taper as the perfect threads while the crests are not normal due to truncation (see Figures G1 and G2).

Note 1: Strict conformance to profile details indicated for entrance threads is not mandatory. Modifications to facilitate generation of these threads in keeping with the various methods of manufacture, or to ease or simplify inspection, are permissible, provided such changes do not in any way impair the functioning of the joint with respect to handling, stabbing, make-up, interchangeability, performance properties, and service. Figures G3 and G5 show details of two entrance thread designs for both box and pin, representative of the two commonly used methods of machining.

Internal-thread taper measurements shall be made on the thread crests. Three readings are required to cover tapers A and B. For measurements in taper area A, and internal taper gauge (see Note 2) fitted with the proper extension arm for the size of the thread to be inspected is required. The square contact point in the fixed end of the gauge shall be placed on the thread crest previously specified and the square contact point of the plunger is placed on the crest diametrically opposite.

Note 2: An internal micrometer fitted with flat contacts is also acceptable.

For pipe sizes 5 through 7⁵/8, the inspection area shall start at a distance ¹/2 in. from the face of the box, which coincides with the fourth thread crest.

For pipe sizes 8⁵/8 through 10³/4, the inspection area shall start at a distance 1 in. from the face of the box, which coincides with the fifth thread crest.

The fixed point shall be held firmly in position, the plunger point oscillated through a small arc and the dial gauge set so that the zero position coincides with the maximum indication.

In a similar manner, the second reading of taper area A is made at the same radial position relative to the axis of the thread but at an additional 1 in. interval. This resulting reading is the actual taper for area A.

Measurement of taper area B commences with the last area A reading and concludes with the final reading taken at an additional 1 in. interval. The difference between these successive measurements shall be the taper of that interval of threads.

Table G3—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances (Continued)

CONTACT POINTS FOR TAPER GAUGES

For all taper gauge points, all sizes, the point dimension shall be 0.060 in. in diameter. The recommended contact points for pin threads shall be of the ball type. The contact points for the box threads shall be flat bottomed square block type.

THREAD LEAD

Lead shall be measured through positions shown as follows:

Taper A and B (Figures G1 and G2)	Tolerance (in.)
Per in.	±0.003
Cumulative	±0.006

CONTACT POINTS FOR LEAD GAUGES

Lead gauge contact points shall be of the truncated ball type (truncated 0.023 in. from the crest of the diameter).

Size	Ball-Point Diameter (in.)
5 through $7^5/8$	0.087
$8^5/8$ through $10^3/4$	0.105

The standard templates shall be constructed so as to compensate for the error in measuring lead parallel to the taper cone instead of parallel to the thread axis, according to the following values:

Length of Thread (in.) (Parallel to Thread Axis)	Compensated Length (in.) (Parallel to Taper Cone) for Threads having a Taper of:	
	$1^1/4$ in. per ft	$1^1/2$ in. per ft
1	1.00136	1.00195
2	2.00271	2.00390

The distance between any two adjacent notches of the template shall be accurate within a tolerance of ±0.0001in., and between any two non-adjacent notches within a tolerance of ±0.0002 in.

THREAD HEIGHT AND WIDTH

Height and width of threads shall be as shown in Figures G3 – G6. The height, width, and angle deviations appearing, as viewed and/or measured on an optical comparator relative to an imposed perfect thread profile template, constitute the applicable combined tolerances for these elements.

Note 3: Provided all other thread element dimensions are within the tolerances stipulated herein, an additional tolerance of +0.001 in. on thread height is acceptable.

CONTACT POINTS FOR THREAD HEIGHT GAUGES AND CHECK BLOCKS

Thread height gauges shall be fitted with a conical point $^1/8$ in. long. For 5 through $7^5/8$, the point shall be tapered from 0.062 in. diameter to a 0.050 in. diameter at the tip. For $8^5/8$ through $10^3/4$, the point shall be tapered from 0.079 in. diameter to a 0.050 in. diameter at the tip.

Table G3—Inspection of Extreme-Line Threads and Seals with Dimensions and Tolerances (Continued)

THREAD HEIGHT GAUGE AND CHECK BLOCK FOR ALL SIZES OF EXTREME-LINE CASING

Extreme-line check blocks shall conform to the following dimensions within a tolerance of ±0.0002 in.:

	Pin (in)	Box (in.)
Sizes 5 through 7$^{5}/_{8}$		
Width of groove at base of 6 in. flanks	0.080	0.080
Depth of groove from 1st plateau	0.0488	0.0558
Depth of groove from 2nd plateau	0.0592	0.0662
Sizes 8$^{5}/_{8}$ through 10$^{3}/_{4}$		
Width of groove at base of 6 in. flanks	0.100	0.100
Depth of groove from 1st plateau	0.0688	0.0758
Depth of groove from 2nd plateau	0.0792	0.0862

Extreme-line thread height gauges having dials for determining the error in height of a thread shall be adjusted to register zero when applied to the proper 6 degree flank groove of the step-type check block.

Thread lengths shall be shown in Figures G1 and G2.

The box member seal surface shall be conical at a taper of 2 in. per ft on diameter, ±$^{1}/_{16}$ in. per ft. The pin member seal surface shall be curved to a radius of 11$^{1}/_{2}$ in. ±$^{1}/_{4}$ in. centered as shown in Figures G3 and G5.

Thread and seal gauge standoff values shall be as shown in Tables G1 and G2.

Table G4—Gauge Dimensions for Extreme-Line Casing[a]

Note: See Figures G7, G9, and G10 for all illustrations and other dimensions; see Table G5 for other tolerances; all dimensions in inches at 68°F.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Size	MM	MG Tol. +.0020 –.0000	MQ	MV Tol. ±.0010	MH	ML	AA Tol. ±.0001	MJ	NN	NO
5	7 1/2	4.9501	4 7/16	4.5464	7 3/4	8	1.4060	6 1/2	6 5/8	5 7/8
5 1/2	8	5.4523	4 15/16	5.0491	8 1/4	8 1/2	1.4060	7	7 1/8	6 3/8
6 5/8	9	6.5383	6 1/32	6.1308	9 1/4	9 1/2	1.4375	8	8 1/8	7 3/8
7	9 7/16	6.9275	6 13/32	6.5200	9 11/16	9 15/16	1.4375	8 7/16	8 1/2	7 3/4
7 5/8	10	7.5248	7	7.1146	10 1/4	10 1/2	1.5000	9	9 1/8	8 1/4
8 5/8	11 3/16	8.5759	8 1/32	8.1598	11 7/16	11 11/16	1.5000	10 1/16	10 3/8	9 1/2
9 5/8	12 1/8	9.5181	8 31/32	9.1007	12 3/8	12 5/8	1.5000	11	11 1/4	10 3/8
10 3/4	13 3/8	10.7636	10 7/32	10.3463	13 5/8	13 7/8	1.5000	12 1/4	12 5/8	11 7/8

(1)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Size	NP Reference	NQ	NR	NS Tol. +.002 –.000	T	U	e Nominal, Reference	f	R Tol. ±.005	S Tol. ±.005
5	3	5 17/32	3 7/8	4.932	4.8301	4.5053	0.350	0.150	1.240	4.184
5 1/2	3	6	4 1/4	5.434	5.3323	5.0080	0.322	0.142	1.240	4.184
6 5/8	2 31/32	7 1/8	5 3/8	6.520	6.4183	6.0897	0.410	0.154	1.240	4.184
7	2 31/32	7 1/2	5 1/2	6.909	6.8075	6.4789	0.420	0.160	1.240	4.184
7 5/8	2 57/64	8 3/32	5 3/4	7.507	7.4048	7.0735	0.390	0.166	1.240	4.184
8 5/8	4 1/4	9 7/32	6 3/4	8.563	8.4213	8.1025	0.384	0.172	1.844	5.469
9 5/8	4 1/4	10 7/32	7 5/8	9.505	9.3635	9.0434	0.384	0.172	1.844	5.469
10 3/4	4 1/4	11 21/32	9	10.751	10.6090	10.2890	0.384	0.172	1.844	5.469

[a]For product dimensions O max., A min., H min., I max. and product standoff values see Tables G1 and G2.

Table G5—Tolerances on Gauge Dimensions for Extreme-Line Casing

See Figures G7, G9, and G10 for gauging practice and gauge details.
See Table G4 for other dimensions and tolerances.
See Figures G11 and G12 for thread form details.
All dimensions in inches at 68°F, except as otherwise indicated.

	(1) Element	(2) Tolerance
	Reference Master Plug Gauge	
Thread Element:		
	R distance to nominal T	±0.005
	Lead error between any two threads	0.0005
	Taper of minor diameter, per in.	+0.0002 –0.0000
	Half angle of thread	±20 minutes
	Squareness—face of thread member to thread axis	0.0005 T.I.R.
Seal Element:		
	S distance to nominal U	±0.005
	Taper, per in.	±0.00012
	Concentricity—seal element to thread element	0.0004 T.I.R.
	Reference Master Ring Gauge	
Thread Element:		
	Taper of minor diameter, per in.	+0.0000 –0.00025
	Lead error between any two threads	0.0005
	Half angle of thread	±20 minutes
	Squareness—face of thread member to thread axis	0.0005 T.I.R.
	Concentricity—thread element to thread member shaft	0.0004 T.I.R.
	Standoff of thread member from master plug	±0.003*
Seal Element:		
	Taper over full seal length	±0.00012
	Concentricity—seal element to seal member hub	0.0004 T.I.R.
	Standoff of seal member from master plug (1.500)	±0.003*
	Diametral clearance between seal ring hub and thread ring shaft	0.0010 to 0.0015
	Working Plug Gauge	
Thread Element:		
	Lead error between any two threads	0.0005
	Taper of minor diameter, per in.	+0.0003 –0.0000
	Half angle of thread	±40 minutes
	Squareness—face of gauge to thread axis	0.0005 T.I.R.
	Concentricity—thread element to thread member hub	0.0004 T.I.R.
	Standoff of thread member from master ring	±0.0015*
Seal Element:		
	Taper, per in.	±0.00015
	Concentricity—seal element to seal shaft	0.0004 T.I.R.
	Standoff of seal member from master ring (2.500)	±0.002*
	Diametral clearance between seal plug hub and thread plug shaft	0.0035 to 0.0040

Table G5—Tolerances on Gauge Dimensions for Extreme-Line Casing (Continued)

See Figures G7, G9, and G10 for gauging practice and gauge details.
See Table G4 for other dimensions and tolerances.
See Figures G11 and G12 for thread form details.
All dimensions in inches at 68°F, except as otherwise indicated.

	(1) Element	(2) Tolerance
	Working Ring Gauge	
Thread Element:		
	Taper of minor diameter, per in.	+0.0000 –0.0003
	Lead error between any two threads	0.0005
	Half angle of thread	±40 minutes
	Squareness—face of gauge to thread axis	0.0005 T.I.R.
	Concentricity thread element to thread member shaft	0.0004 T.I.R.
	Standoff of thread member master plug	±0.0015*
Seal Element:		
	Taper over full seal length	±0.00015
	Concentricity—seal element to seal member hub	0.0004 T.I.R.
	Standoff of seal member from master plug (AA + f)	±0.002*
	Diametral clearance between seal ring hub and thread ring shaft	0.0035 to 0.0040
Pin Element:		
	Pin length AA	±0.0001

*Tolerances apply to compensated standoff.

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