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Revision Key	Current/unchanged content in BLACK; Track Changes as: 1) Additions in underlined BLUE 2) Deletions in stricken RED NOTE The "******" indicates there is un-altered content above/below.

Work Item Charge: The work scope includes the collection of items included in the last collection of recirculation comments (April 2017) from the 16th edition, in addition to new topics that were proposed and approved raised and voted for during committee meetings since then.

Ballot Rationale: These updates will provide necessary clarity and guidance and remove ambiguity of unresolved items during development of previous editions, as well as allowing for easier implementation of improved methods for threading and inspection.

NOTE See the ballot email notification for additional information regarding this ballot.

Threading, Gauging, and Inspection of Casing, Tubing, and Line Pipe Threads

API SPECIFICATION 5B
~~SIXTEENTH~~SEVENTENTH EDITION, ~~DECEMBER 2017~~TBD

API MONOGRAM PROGRAM EFFECTIVE DATE: TBD

THE *CONTENTS*, *SPECIAL NOTES*, AND REMAINING *FOREWORD* WILL BE INSERTED BY API DURING THE PAGE-PROOFING PROCESS.

The following additional paragraphs to be added to the Foreword:

******

See Annex A of API Specification Q1 or the API website for information pertaining to the API Monogram Program and use of the API Monogram on applicable products or for information about the Monogram licensing program, please contact certification@api.org.

For API Monogram Program licensees and APIQR program registrants, this standard/addendum shall become effective on the program date printed on the cover but may be used voluntarily from the date of publication. Also concerning the API Monogram Program, for references listed in Section 2 that are undated, new editions may be used upon publication but become mandatory on the effective date specified by the publisher or 12 months from the publication date if an effective date is not specified.

Threading, Gauging, and Inspection of Casing, Tubing, and Line Pipe Threads

1 Scope

1.1 Coverage—Threading and Gauging

This specification covers dimensions, tolerances, and marking requirements for API threads and the gauges that control the acceptance criteria for the threads. Thread element gauges, instruments, and requirements for the inspection of threads for line pipe, round thread casing, round thread tubing, and buttress casing connections are included. Thread dimensions shown without specifications (or shown as NA) are not subject to inspection of diameter, ovality, and addendum. Thread dimensions shown without tolerances are related to the basis for connection design and are not subject to measurement to determine acceptance of product.

1.2 Coverage—Inspection

Thread inspection applies at the point of manufacture prior to shipment, to inspection at some 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~~their option, use other instruments or methods to control manufacturing operations; but acceptance and rejection of the product is determined by the results of inspection made in accordance with the requirements of Section 4, Section 5, and Section 6 of this specification.

Alternative instruments or methods may include (but are not limited to) threads that are measured with a laser measurement or optical measurement system with demonstrated accuracy. Alternative instruments or methods are validated as described in 4.15. In case of dispute, traditional gauging as described in Sections 5 and 6 govern. Records for validation and verification of such alternative methods or instruments are maintained in accordance with 4.15.

Thread inspection is performed using instruments designed to measure either the functional relationship of multiple thread elements or measure an individual thread element. The inspection requirements include measurements of standoff, diameter, ovality, addendum, taper, lead, height, and angle of thread that are applicable to threads having $11^{1}/_{2}$ or less turns per inch (0.45 or less turns per mm). Ring and plug gauges are designed to measure the functional size of an internal or external thread. Individual thread elements listed are measured with one or more specific instruments.

See API 5B1 for additional inspection procedures.

~~1.3 Application of the API Monogram~~

~~If product (master gauges only) is manufactured at a facility licensed by API and it is intended to be supplied bearing the API Monogram, the requirements of Annex A apply.~~

~~1.4 Other Applications~~

~~By agreement between the purchaser and manufacturer, the supplemental requirements for *Enhanced Leak Resistance LTC* in API 5TRSR22 and Annex B apply.~~

Information on the shipping of Master Gauges can be found in Annex ~~C~~A.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda or errata) applies.

API Recommended Practice 5A3, *Thread Compounds for Casing, Tubing, Line Pipe, and Drill Stem Elements*

API Specification 5L, *Line Pipe Specifications*, 6th Edition

API Specification Q1, *Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ASME B1.3M, *Screw Thread Gaging Systems for Acceptability: Inch and Metric Screw Threads (UN, UNR, UNJ, M, and MJ)*

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this specification, the following terms and definitions apply.

3.1.1
addendum
The distance from the crest cone to the pitch cone.

NOTE The opposite of addendum is dedendum (see 3.1.12).

3.1.2
angular misalignment
The measured angular deviation of one or both coupling-thread cones to the centerline thread cone axis.

3.1.3
basic size
The theoretical size from which variations are measured.

3.1.4
black-crested threads
Threads that are not fully crested because the original mill surface has not been removed.

NOTE 1 They have historically been and continue to be referred to as “black-crested threads”.

NOTE 2 There can be non-full-crested threads that are not black-crested.

3.1.5
burr
A localized point of roughness or a thin ridge or protrusion produced by mechanical damage or machining.

3.1.6
chamfer
The beveled surface, beginning at the end of the pipe or coupling, where the thread form starts.

3.1.7
concentricity
The measured concentric deviation from the centerline thread cone axis by one or both coupling-thread cones.

3.1.8
continuity of thread
A thread that meets the thread form and angle requirements throughout the perfect thread length.

3.1.9
crest
The top of the thread.

3.1.10
crest diameter
The major diameter of an external thread or the minor diameter of an internal thread.

3.1.11
crest truncation
The distance between the theoretical sharp crest (crest apex) and the finished crest.

3.1.12
dedendum
The distance between the pitch cone and root cone.

NOTE The opposite of dedendum is addendum (see 3.1.1).

3.1.13
defect
Imperfection of sufficient magnitude to warrant rejection of the thread based on specification requirements.

3.1.14
effective thread length
The dimension designated as L_2 for line pipe and round thread tubing and casing.

NOTE This is the theoretical point at which the vanish cone angle begins.

3.1.15
external thread
A thread on the external surface of a pipe.

3.1.16
first perfect thread
The first completely machined thread.

3.1.17
flank
(side)
The surface of the thread which connects the crest with the root.

3.1.18
flank angle
The angle between the individual flanks and a line perpendicular to the axis of the thread measured in an axial plane.

NOTE A flank angle of a symmetrical thread is commonly termed the half-angle of the thread.

3.1.19
hand-tight
Threaded connection that has been made up by hand without the aid of tongs or other mechanical devices.

3.1.20
hand-tight mating standoff
The length at hand-tight engagement from the face of the coupling to the vanish point of the threads for casing and tubing round threads and line pipe threads; and to the base of the triangle for buttress threads.

3.1.21
height
The distance between the crest and root, normal to the axis of the thread.

3.1.22
imperfect thread length
The buttress threads located beyond the L_7 plane (away from the pipe ends).

3.1.23
imperfection
Discontinuity or irregularity in the product.

3.1.24
included angle
The angle between the flanks of the threads measured in an axial plane.

3.1.25
internal thread
Thread on the internal surface of a coupling or pipe.

3.1.26
last scratch
(vanish point)
The last visible evidence of the continuous machined root as it stops or runs out.

3.1.27
lead
The distance parallel to the thread axis from a point on a thread turn and the corresponding point on the next turn (i.e. the axial displacement of a point following a helix, one turn around the thread axis).

3.1.28
leading flank
(front or stab flank)
The flank of the pipe thread facing the nearest open end of pipe.

NOTE The flank of the coupling thread facing the open end of the coupling.

3.1.29
length of full-crest thread length
The length measured parallel to the thread axis from the end of the pipe to the first non-full-crested thread.

NOTE The partial threads in the chamfer are considered to be within the full-crest thread length.

3.1.30
load flank
(pressure flank)
The flank of the pipe thread facing away from the open end of the pipe.

NOTE The flank of the coupling or box thread facing away from the open end of the coupling; the 3-degree flank on buttress thread.

3.1.31
major cone
An imaginary cone which would bound the crest of an external taper thread or the roots of an internal taper thread.

3.1.32
major diameter
The crest diameter of the external thread and the root diameter of the internal thread.

3.1.33
mill end
The end of the pipe to which the coupling is applied at the mill.

NOTE Referred to as the box end of the integral joint pipe.

3.1.34
minor cone
An imaginary cone which passes over the root of the external thread and crest of internal thread.

3.1.35
minor diameter
The root diameter of the external thread and the crest diameter of the internal thread.

3.1.36
ovality
The difference between the maximum and minimum thread diameter measurements.

3.1.37
qualified gauge surface
A surface on a gauge defined by qualified surface requirements used to simulate product dimensions.

3.1.38
perfect
Within the specification limits.

3.1.39
perfect thread length
The last perfect thread location on external threads shall be $L_4 - \mathrm{g}$ for tubing and line pipe, L_7 for buttress, and last scratch (last thread groove) – 0.625 in. for casing round threads; the last perfect thread location on internal threads is $J + 1\mathrm{p}$ measured from the physical center of the coupling or from the small end of the box for integral joint tubing.

3.1.40
pin
(pin end)
The externally threaded end of pipe without a coupling applied.

3.1.41
pitch
Axial distance between corresponding points on successive threads which in a single start thread is equivalent to lead.

3.1.42
pitch cone
(pitch line)
An imaginary cone of such apex angle and location of its vertex and axis that its surface would pass through a taper thread in such a manner as to make the axially measured widths of the thread ridge and thread groove are equal.

NOTE It is located equidistant between the sharp major and minor cones of a given thread; on a theoretically perfect taper thread, these widths are equal to half of the basic pitch.

3.1.43
pitch diameter
On a taper thread, the pitch diameter at a given position on the thread axis is the diameter of the pitch cone at that position; on buttress threads, the pitch diameter is midway between the major and minor diameter.

3.1.44
power-tight
A threaded connection that has been fully made up by mechanical means using power tongs or a screw-on machine.

3.1.45
recess
The counter-bored section at the end of line pipe, casing, and tubing round thread coupling that facilitates stabbing the threads.

3.1.46
right-hand thread
A thread that advances in a clockwise receding direction when viewed axially.

3.1.47
root
The bottom of the thread.

3.1.48
root truncation
The distance between the theoretical sharp root (root apex) and the finished root.

3.1.49
run-out
(buttress threads)
Intersection of the thread root and the pipe outside surface.

3.1.50
standoff
Distance between faces of gauges or gauges and product reference planes when mated.

3.1.51
taper
For round threads and line pipe threads, taper is defined as the increase in the pitch diameter of the thread, in "inch per inch of thread" ("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.

3.2 Abbreviations

BC buttress casing thread

LC long threaded casing connection

LP line pipe

Rd thread form on round threaded connections

SC short threaded casing connection

TECL thread element control length

MOW mic over wire

4 Thread Dimensions and Tolerances—Line Pipe, Round Thread Casing and Tubing, and Buttress Thread Casing

4.1 Thread Measurement

4.1.1 Thread length shall be measured parallel to the thread axis; thread crest diameter, ovality, addendum (round threads), height and taper diameter shall be measured approximately normal to the thread axis.

4.1.2 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.

4.1.3 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 procedures, see Sections 5 and 6, and API 5B1.

4.2 Visual Inspection

Threads shall be free from visible tears, cuts, grinds, shoulders or 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 $J + 1$ 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. Due to 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 length, L_c, and 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, and so forth. Minor pitting and thread discoloration may also be encountered in any part of the threaded area and may not necessarily be detrimental. Due to the difficulty to define minor 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 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 shall 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 4.2, item c.

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; refer to API 5CT for prove-up and evaluation.

4.3 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 API 5A3. 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. Subsequent use of tubing is reviewed in API 5C1 (i.e. content 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 in. (406.4 mm), $18^{5}/_{8}$ in. (474.34 mm), and 20 in. (505 mm) 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 1 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 when a properly made up power-tight using a high-grade thread compound, shows no leaks at ambient temperature at pressures up to and including the specified hydrostatic test pressure.

4.4 Thread Design

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

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 0.090 in. (2.29 mm) or the following formula, whichever is greater:

$$t_o = 0.009D + 0.040 \text{ in. } (0.009D + 1.02 \text{ mm}) \quad (1)$$

where

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

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

The theoretical wall thickness t_o 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).

4.5 Chamfer

The angle (60 degrees) of the outside chamfer at the end of the pipe shall be as shown in Figure 1, Figure 4, Figure 5, and Figure 8, and shall extend 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.

4.6 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 $J + 1$ 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.

4.7 Thread Finish

The threads in steel coupling for line pipe nominal sizes 2 in. (50.8 mm) and larger, and in each size of casing and tubing, shall be zinc, tin, or copper electroplated or phosphated, or another appropriate coating or process method 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, copper or other ductile coating in excess of 0.001 in. (0.03 mm) are used, the thread tolerance, standoff, and thread diameter 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, thread diameter (accomplished by measurement of the thread crest diameter and addendum), 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.

4.8 Thread Control

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

4.9 Thread Elements

Thread elements for all threads, except line pipe threads finer than $11^{1}/_{2}$ threads per inch ($11^{1}/_{2}$ threads per 25.4 mm), shall be subject to inspection in accordance with Sections 5 and 6.

NOTE With respect to thread elements, line pipe threads finer than $11^{1}/_{2}$ threads per inch ($11^{1}/_{2}$ threads per 25.4 mm), nominal pipe sizes smaller than 1 in., only the requirements on thread length and stand-off are subject to inspection.

4.10 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 in. and larger and in each size 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 other method giving an equal degree of accuracy may be used.

4.11 Misalignment Tests (Options)

If requested by 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 a coupling fails, two additional couplings from the same lot may be tested, both of which shall conform to 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.

4.12 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 affect the performance of the pipe. The criteria for rejection shall demonstrate 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.

4.13 Full Crested Thread Length

The required minimum length of full crest threads is defined by L_c in Table 1 and Tables 3–~~9~~8.

Black-crested threads within the L_c shall not be made to appear full crested either mechanically or by hand.

4.14 Rounded Nose

In lieu of the conventional corner breaks on the ends of threaded tubing, the "Round" or "Bullet-nose" profile specified in Table ~~10~~9 (and depicted in Figure 9) 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 ~~10~~9 are recommended values but are not subject to measurement to determine acceptance or rejection of the product.

4.15 Alternative Thread Dimensional Measurement System Capability Validation

a) The manufacturer shall maintain equipment system records verifying the system(s) accuracy in accordance with the requirements of Section 4, Section 5 and Section 6.

b) The validation shall cover, as a minimum, the following criteria:

   1) measurement equipment description and capability and limitations

   2) set-up parameters

c) The following capabilities shall also be validated and documented:

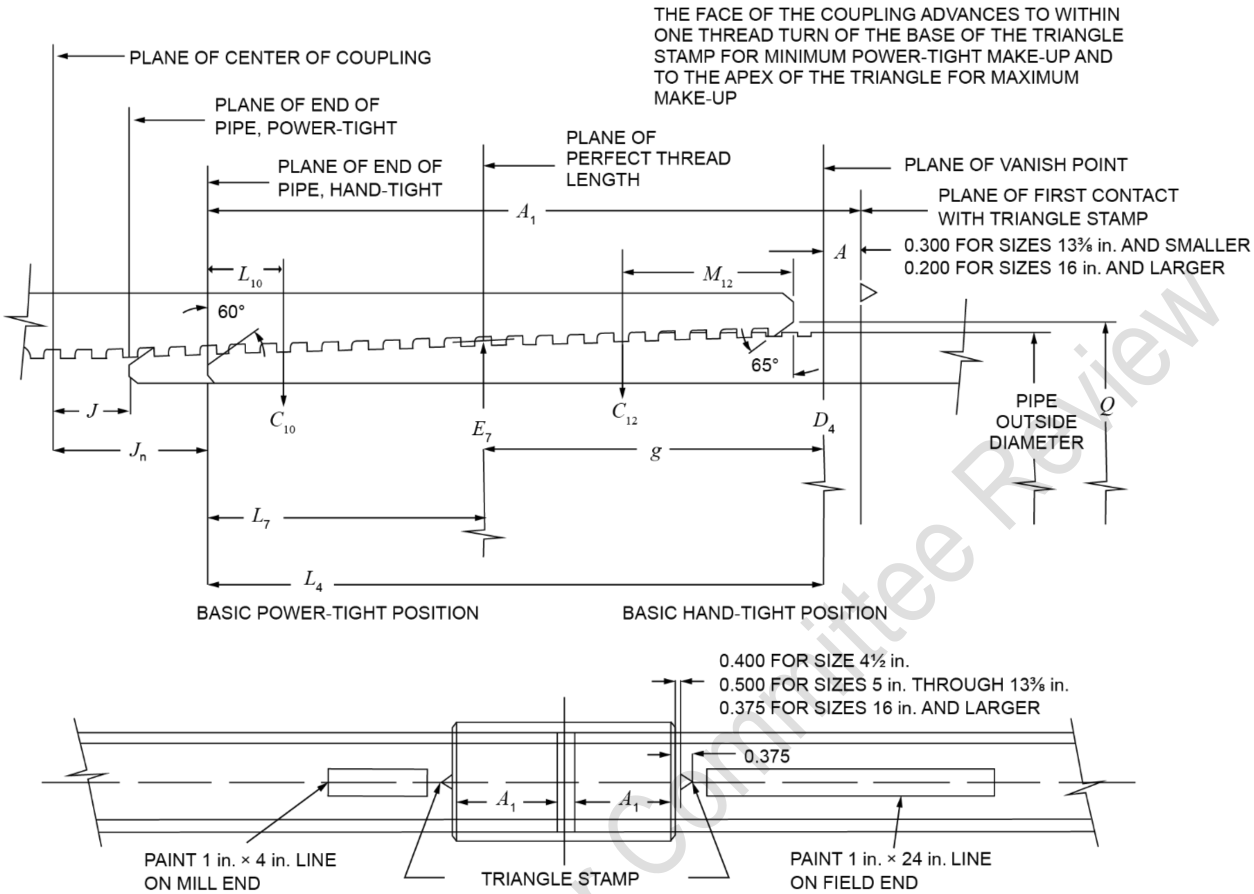
   1) size range,

   2) type of thread,

   3) accuracy of measurement,

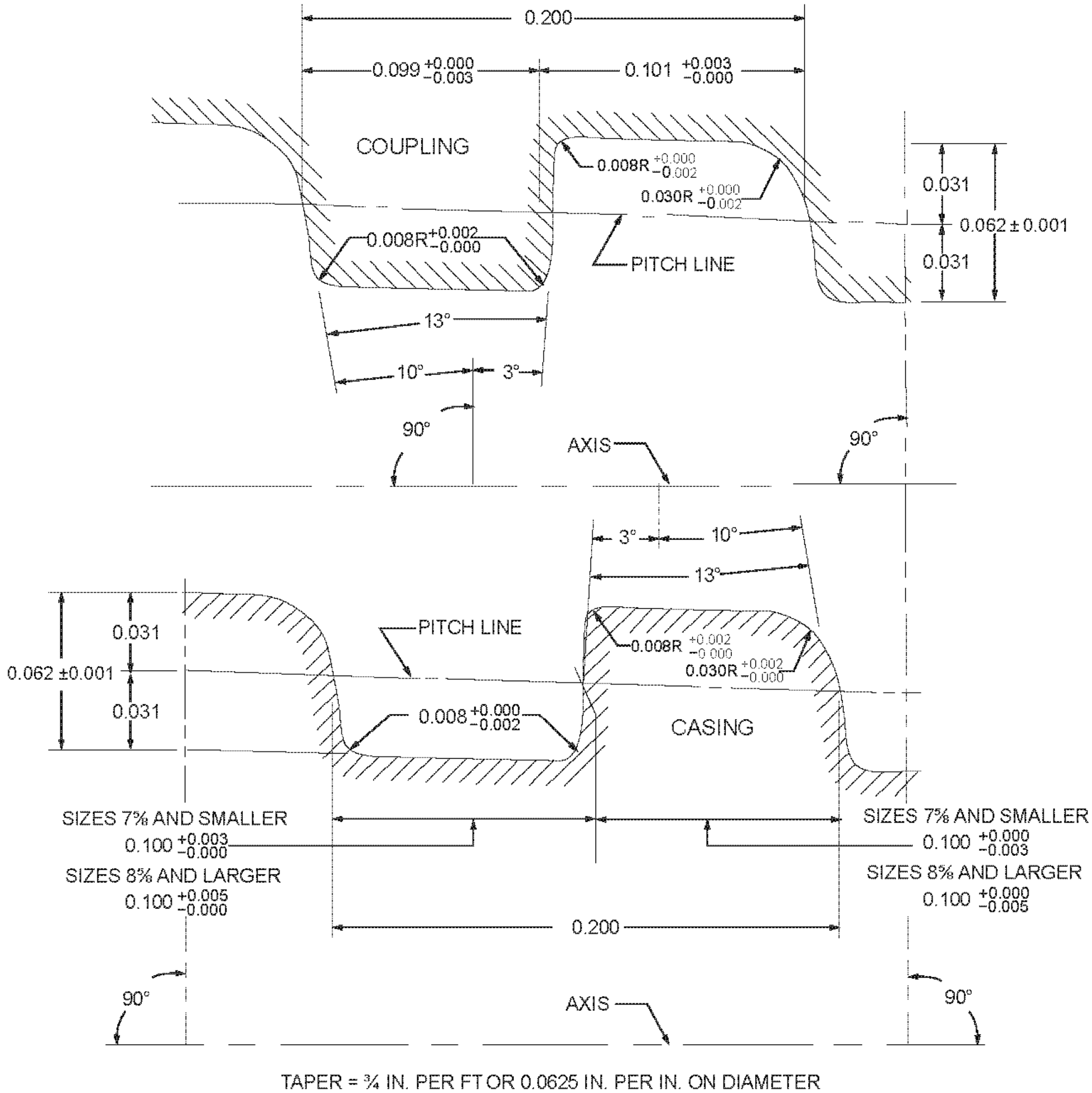
   4) repeatability,

   5) the reject threshold for dimensional measurement shall be established using reference standards within the specified tolerances for the dimension to be inspected, and demonstration that thread dimensions out-of-tolerance are detected.



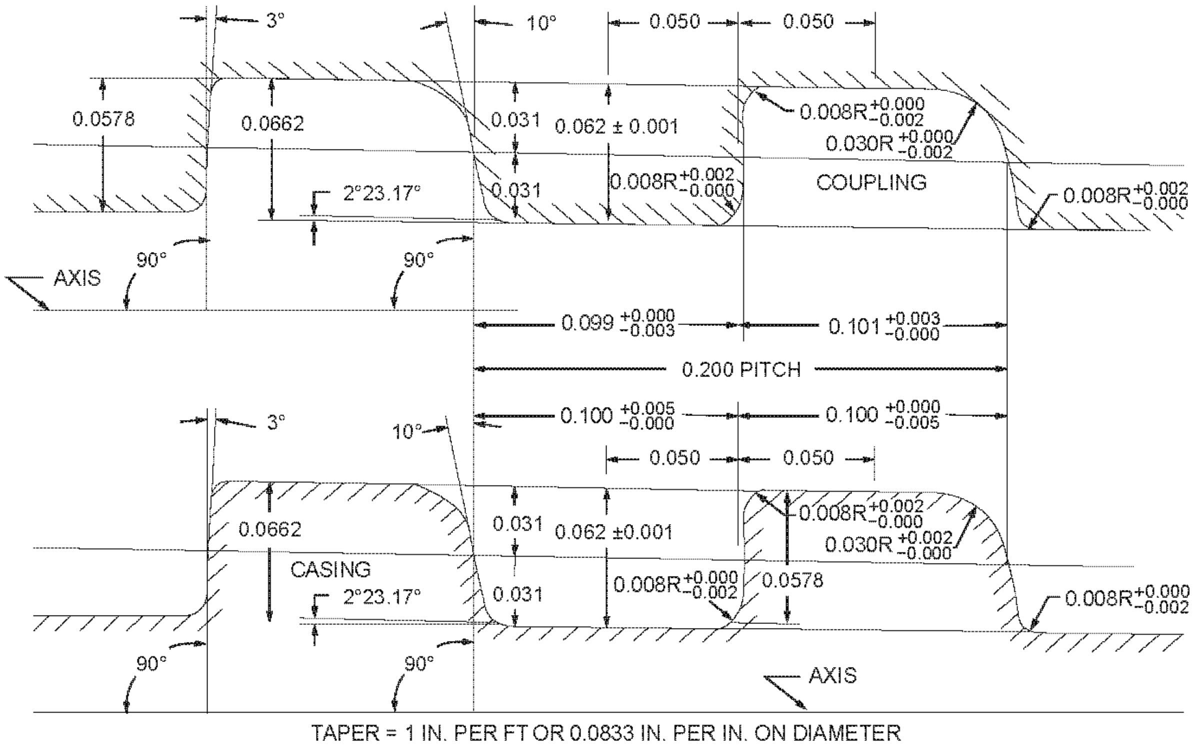
NOTE See Figure 2 and Figure 3 for detail of thread form and dimensions.

Figure 1—Basic Dimensions of Buttress Threads Hand-tight Make-up



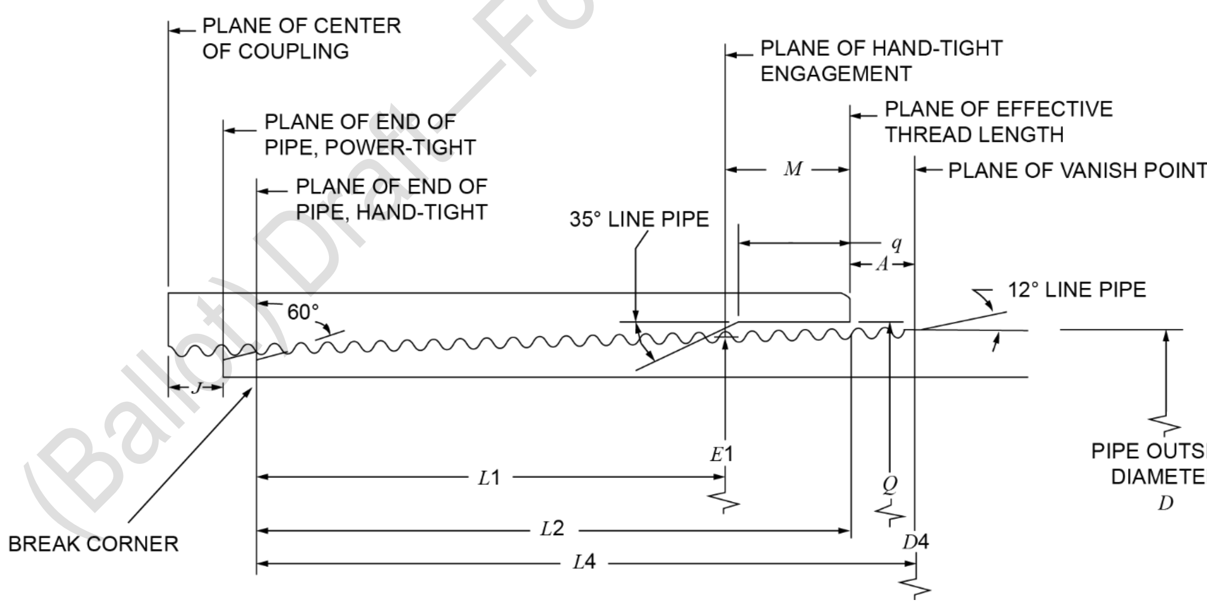
NOTE Thread crests and roots are parallel to cone.

Figure 2—Buttress Casing Thread Form and Dimensions (Casing sizes 4 1/2 through 13 3/8 in.)



NOTE Thread crests and roots are parallel to thread axis.

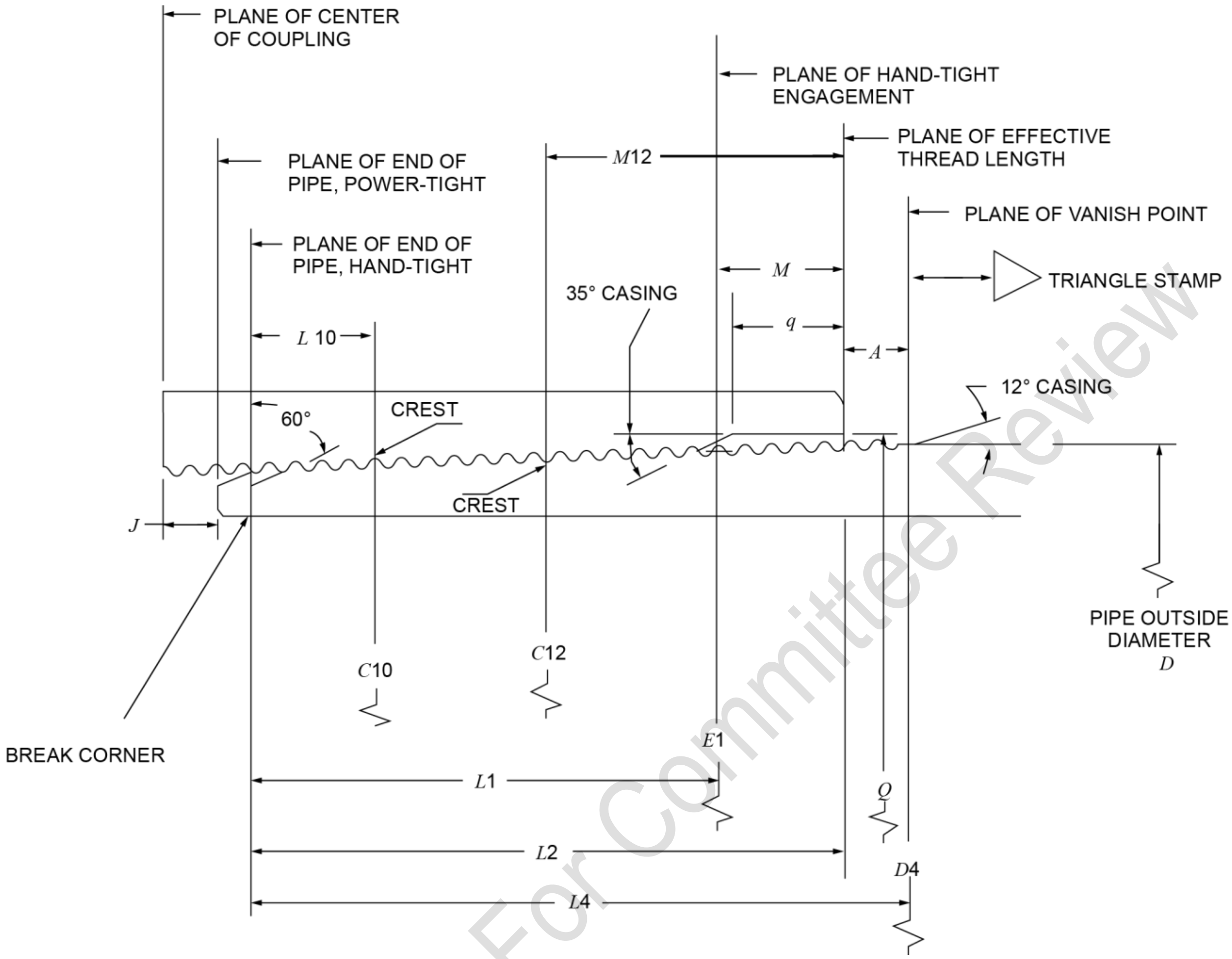
Figure 3—Buttress Casing Thread Form and Dimensions (Casing sizes 16 in. and larger)



NOTE 1 For basic power tight make-up, the face of the coupling or box advances to plane of vanish point.

NOTE 2 The vanishing cone angle applies to the roots of the incomplete threads produced by either multiple points or single point tools.

Figure 4—Basic Dimensions of Line Pipe Hand-tight Make-up



NOTE 1 See Figure 6 and Figure 7 for detail of thread form and dimensions. NOTE 2 The vanish cone angle is optional for round threads on downhole tools.

NOTE 3 For basic power-tight make-up, the face of coupling or box advances to plane of vanish point.

NOTE 4 The vanish cone angle applies to the roots of the incomplete threads produced by either multiple point or single point tools.

NOTE 5 TECL (thread element control length) is a measured dimension (actual total thread length—~~0.500~~0.625 in.), therefore, not a basic design measurement.

Figure 5—Basic Dimensions of Casing Round Threads Hand-tight Make-up

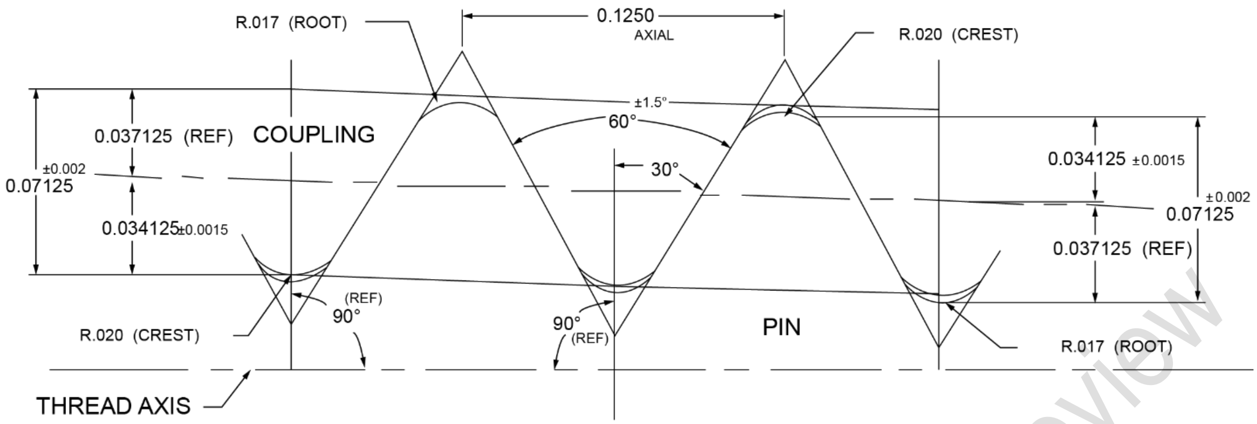
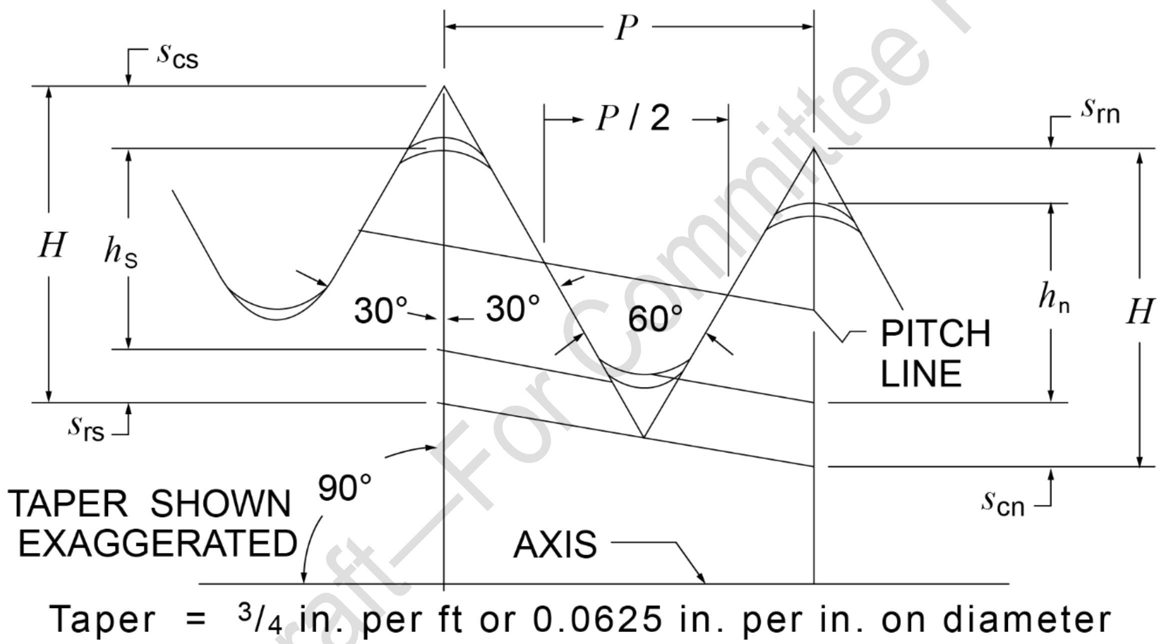
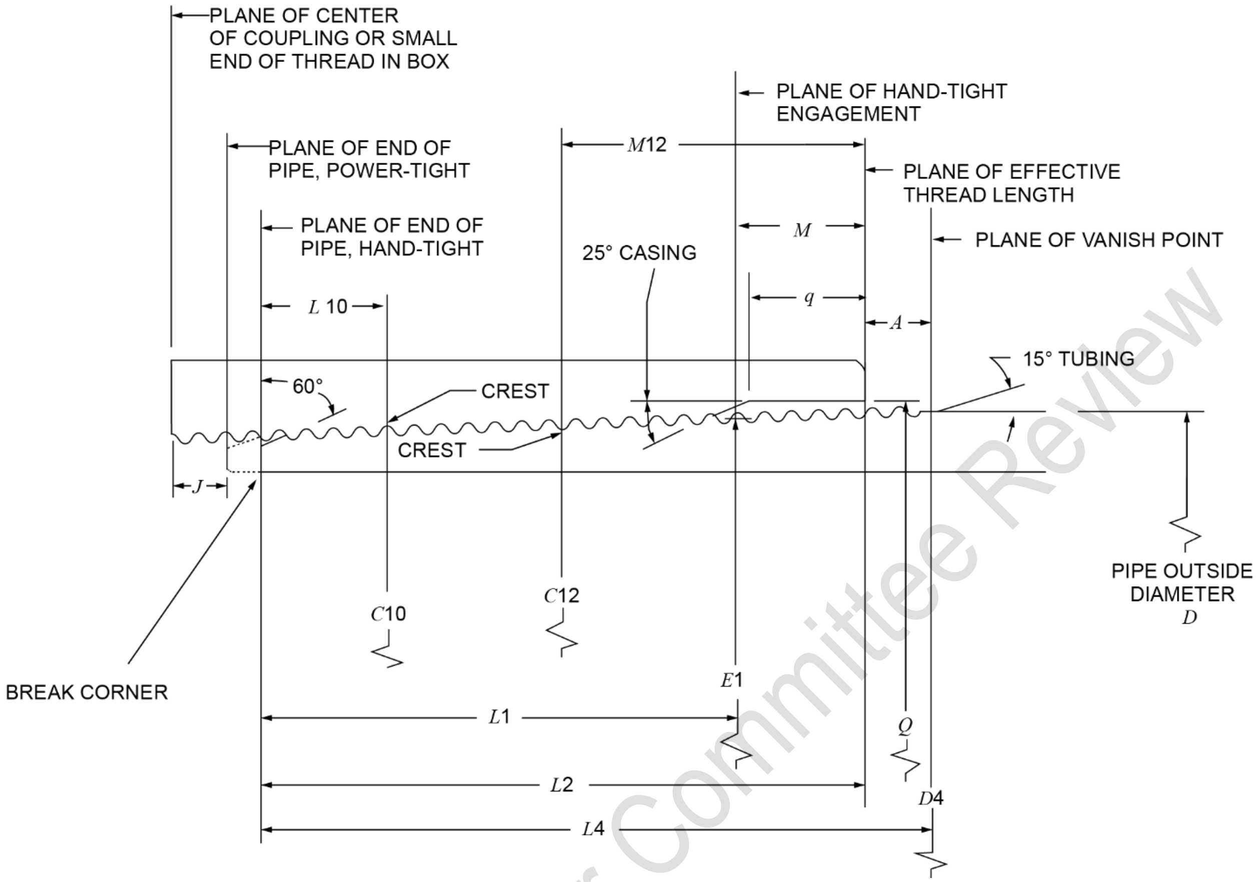


Figure 6—Casing Round Thread Dimensions



NOTE See Table ~~11~~10 and Table ~~12~~11 for dimensions and tolerances.

Figure 7—Casing Round Thread Form



NOTE 1 The vanish cone angle is optional for round threads on downhole tools.

NOTE 2 The vanish cone angle applies to the roots of the incomplete threads produced by either multiple point or single point tools.

NOTE 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

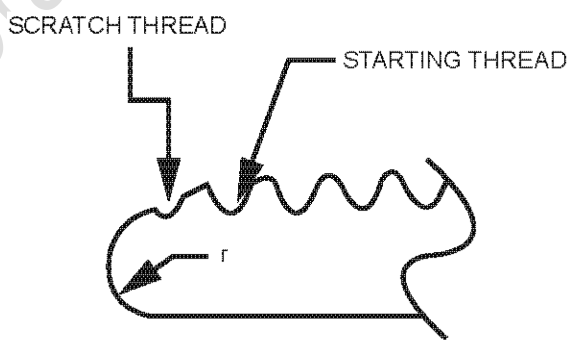
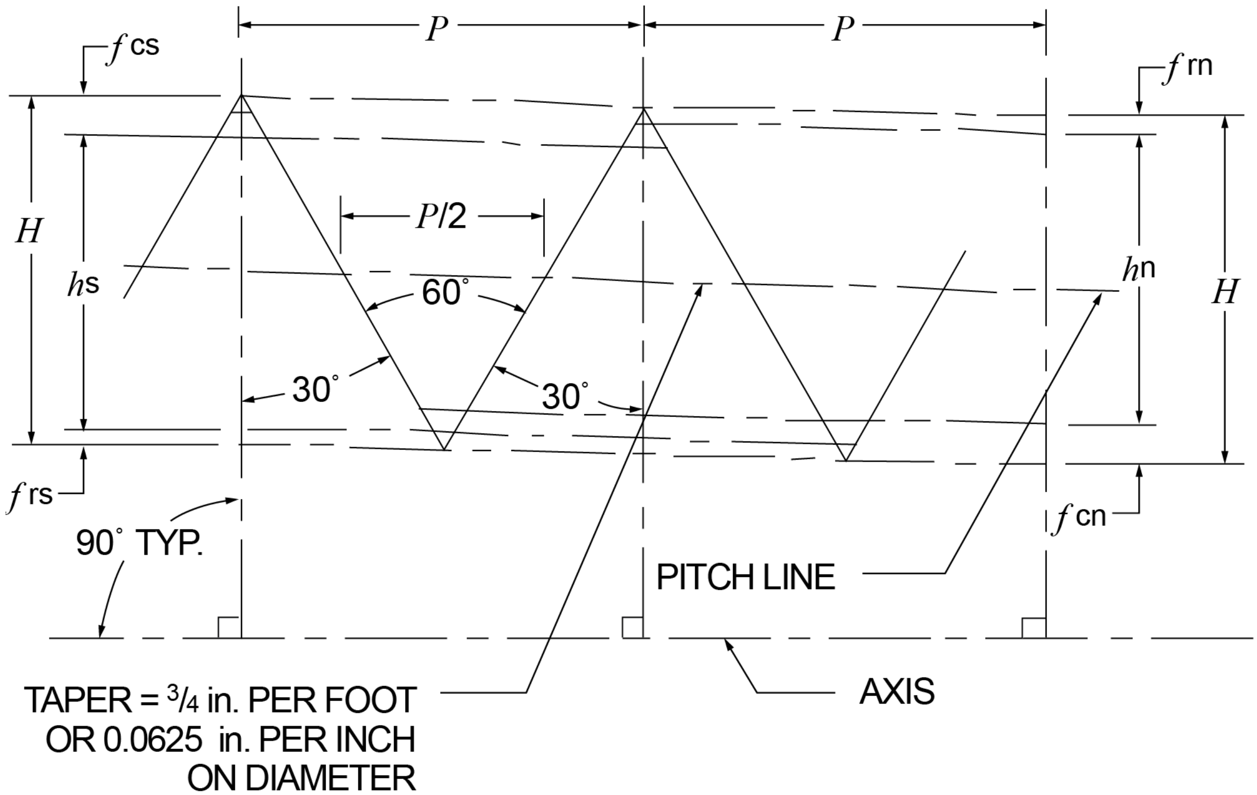


Figure 9—Round Nose Ends



NOTE See Table ~~13~~12 and ~~14~~13 for dimensions and tolerances.

Figure 10—Line Pipe Thread Form

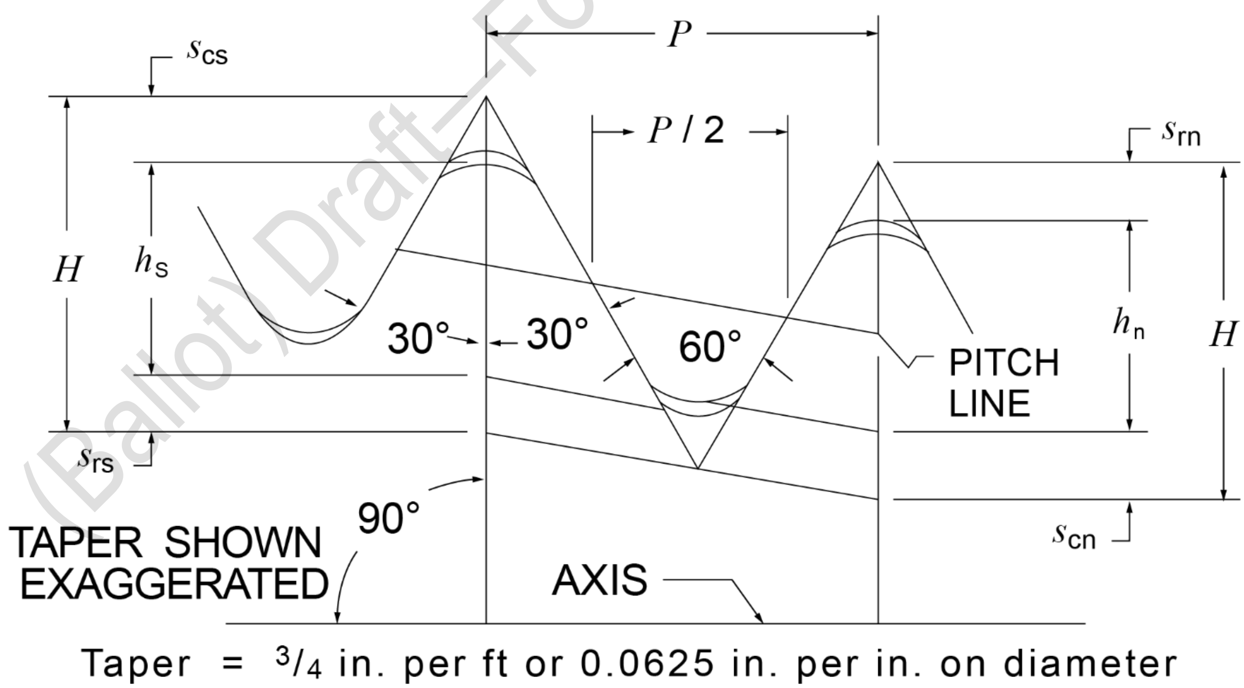


Figure 11—Tubing Round Thread Form

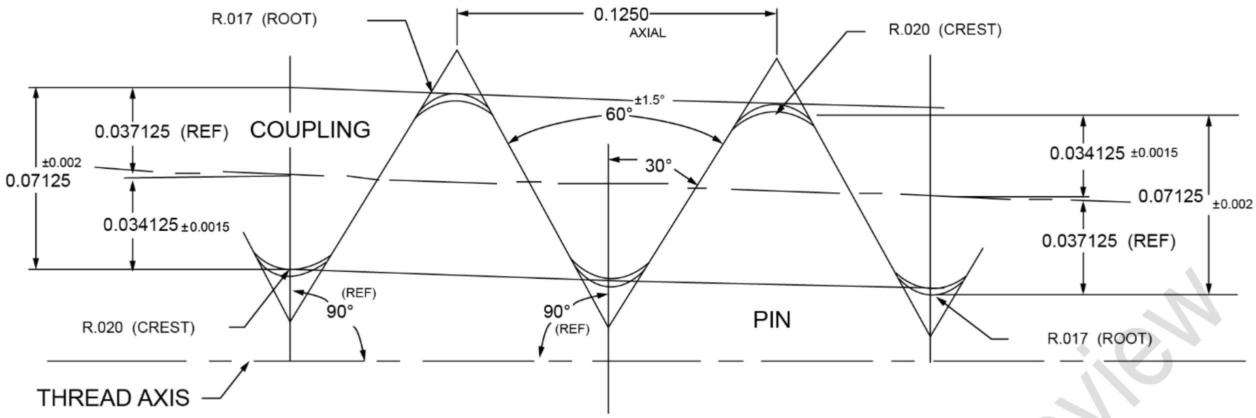


Figure 12—8 Round Tubing Thread Dimensions

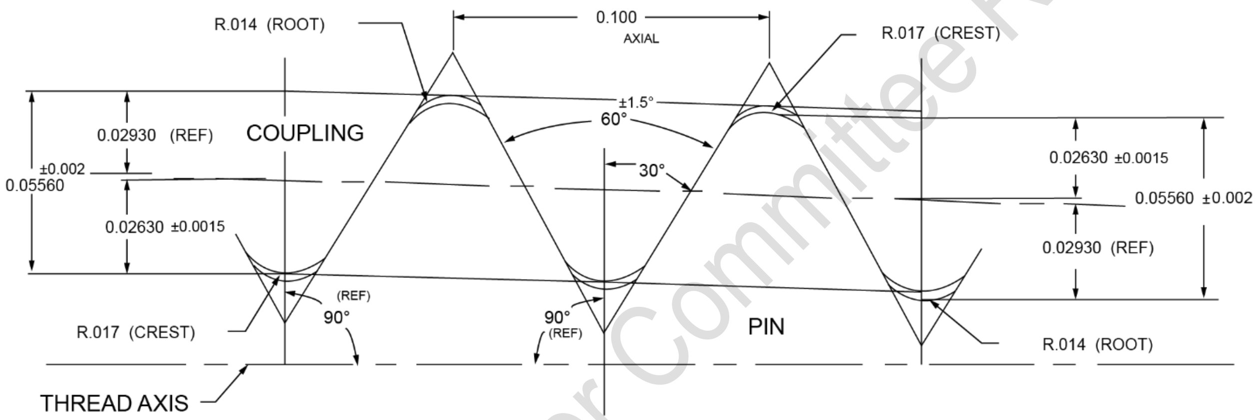


Figure 13—10 Round Tubing Thread Dimensions

Table 1—Casing Short-thread Dimensions

Size Designation	Major Diameter	Nominal Weight Thread and Coupling lb per ft	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 / Counter bore	Depth of Coupling Recess	Hand-tight Standoff, Thread Turns	Minimum Length, Full Crest Threads from End of Pipe	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	Length End of Pipe to Gauge Plane	Pin Thread Crest Diameter at L_{10}	Length: Face of Coupling to Gauge Plane	Box Thread Crest Diameter at M_{12}
D	D_4			L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c[a]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
4 1/2	4.500	9.50	8	0.921	1.715	2.000	4.40337	1.125	0.704	4 19/32	0.500	3	0.875	4.3791	4.4141	0.5625	4.4492	1.2045	4.3038
4 1/2	4.500	Others	8	1.546	2.340	2.625	4.40337	0.500	0.704	4 19/32	0.500	3	1.500	4.3791	4.3750	1.1875	4.4492	1.2045	4.3038
5	5.000	11.50	8	1.421	2.215	2.500	4.90337	0.750	0.704	5 3/32	0.500	3	1.375	4.8791	4.8828	1.0625	4.9492	1.2045	4.8038
5	5.000	Others	8	1.671	2.465	2.750	4.90337	0.500	0.704	5 3/32	0.500	3	1.625	4.8791	4.8672	1.3125	4.9492	1.2045	4.8038
5 1/2	5.500	All	8	1.796	2.590	2.875	5.40337	0.500	0.704	5 ~~3~~19/32	0.500	3	1.750	5.3791	5.3594	1.4375	5.4492	1.2045	5.3038
6 5/8	6.625	All	8	2.046	2.840	3.125	6.52837	0.500	0.704	6 23/32	0.500	3	2.000	6.5041	6.4687	1.6875	6.5742	1.2045	6.4288
7	7.000	17.00	8	1.296	2.090	2.375	6.90337	1.250	0.704	7 3/32	0.500	3	1.250	6.8791	6.8906	0.9375	6.9492	1.2045	6.8038
7	7.000	Others	8	2.046	2.840	3.125	6.90337	0.500	0.704	7 3/32	0.500	3	2.000	6.8791	6.8437	1.6875	6.9492	1.2045	6.8038
7 5/8	7.625	All	8	2.104	2.965	3.250	7.52418	0.500	0.709	7 25/32	0.433	3 1/2	2.125	7.5002	7.4609	1.8125	7.5742	1.2095	7.4246
8 5/8	8.625	24.00	8	1.854	2.715	3.000	8.52418	0.875	0.709	8 25/32	0.433	3 1/2	1.875	8.5002	8.4766	1.5625	8.5742	1.2095	8.4246
8 5/8	8.625	Others	8	2.229	3.090	3.375	8.52418	0.500	0.709	8 25/32	0.433	3 1/2	2.250	8.5002	8.4531	1.9375	8.5742	1.2095	8.4246
9 5/8 [b]	9.625	All	8	2.229	3.090	3.375	9.52418	0.500	0.709	9 25/32	0.433	3 1/2	2.250	9.5002	9.4531	1.9375	9.5742	1.2095	9.4246
9 5/8 [c]	9.625	All	8	2.162	3.090	3.375	9.51999	0.500	0.713	9 25/32	0.433	4	2.250	9.4963	9.4531	1.9375	9.5742	1.2095	9.4207
10 3/4 [b]	10.750	32.75	8	1.604	2.465	2.750	10.64918	1.250	0.709	10 29/32	0.433	3 1/2	1.625	10.6252	10.6172	1.3125	10.6992	1.2095	10.5496
10 3/4 [b]	10.750	Others	8	2.354	3.215	3.500	10.64918	0.500	0.709	10 29/32	0.433	3 1/2	2.375	10.6252	10.5703	2.0625	10.6992	1.2095	10.5496
10 3/4 [c]	10.750	Others	8	2.287	3.215	3.500	10.64499	0.500	0.713	10 29/32	0.433	4	2.375	10.6213	10.5703	2.0625	10.6992	1.2095	10.5457

Table 1—Casing Short-thread Dimensions (Continued)

Size Designation	Major Diameter	Nominal Weight Thread and Coupling lb per ft	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 / Counter bore	Depth of Coupling Recess	Hand-tight Standoff, Thread Turns	Minimum Length, Full Crest Threads from End of Pipe	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	Length End of Pipe to Gauge Plane	Pin Thread Crest Diameter at L_{10}	Length: Face of Coupling to Gauge Plane	Box Thread Crest Diameter at M_{12}
D	D_4			L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c[a]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
11 3/4[b]	11.750	All	8	2.354	3.215	3.500	11.64918	0.500	0.709	11 29/32	0.433	3 1/2	2.375	11.6252	11.5703	2.0625	11.6992	1.2095	11.5496
11 3/4[c]	11.750	All	8	2.287	3.215	3.500	11.64499	0.500	0.713	11 29/32	0.433	4	2.375	11.6213	11.5703	2.0625	11.6992	1.2095	11.5457
13 3/8[b]	13.375	All	8	2.354	3.215	3.500	13.27418	0.500	0.709	13 17/32	0.433	3 1/2	2.375	13.2502	13.1953	2.0625	13.3242	1.2095	13.1746
13 3/8[c]	13.375	All	8	2.287	3.215	3.500	13.26999	0.500	0.713	13 17/32	0.433	4	2.375	13.2463	13.1953	2.0625	13.3242	1.2095	13.1707
16	16.000	All	8	2.854	3.715	4.000	15.89918	0.500	0.709	16 7/32	0.366	3 1/2	2.875	15.8752	15.7891	2.5625	15.9492	1.2095	15.7996
18 5/8	18.625	87.50	8	2.854	3.715	4.000	18.52418	0.500	0.709	18 27/32	0.366	3 1/2	2.875	18.5002	18.4141	2.5625	18.5742	1.2095	18.4246
20[d]	20.000	All	8	2.854	3.715	4.000	19.89918	0.500	0.709	20 7/32	0.366	3 1/2	2.875	19.8752	19.7891	2.5625	19.9492	1.2095	19.7996
20[e]	20.000	All	8	2.787	3.715	4.000	19.89499	0.500	0.713	20 7/32	0.366	4	2.875	19.8713	19.7891	2.5625	19.9492	1.2095	19.7957

NOTE 1 All dimensions in inches, except as indicated. See Figure 5. For thread crest details, see Figures 6 and 7.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

NOTE 3 Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 5.

NOTE 4 See 6.1.3 for additional information on crest diameter locations; these locations may be different from traditional diameters and locations, and new standards may be required.

[a] L_c = L4 – 1.125 in. for 8 round thread casing.

[b] Applicable to coupling grades lower than P110.

[c] Applicable to coupling grades P110 and higher.

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

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

Table 2—Tolerances on Buttress Casing Thread Dimensions

Element			Tolerances
Taper			
	coupling	0.750 or 1.000 in. per ft on diameter	+0.054 in. –0.030 in.
		0.0625 or 0.0833 in. per in. on diameter	+0.0045 in. –0.0025 in.
	pipe (perfect thread length)	0.750 or 1.000 in. per ft on diameter	+0.042 in. –0.018 in.
		0.0625 or 0.0833 in. per in. on diameter	+0.0035 in. –0.0015 in.
	pipe (imperfect thread length)[a]	0.750 or 1.000 in. per ft on diameter	+0.054 in. –0.018 in.
		0.0625 or 0.0833 in. per ft 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.
Thread height			+0.062 ±0.001 in.
Angle, included			± 1 degree
Length, L_4 (external thread)			
tolerance not specified because of type of thread			
Length, A_1			± $^{1}/_{32}$ in.
Chamfer			
	60 deg on outside end of threaded pipe		±5 deg
	65 deg on inside end of threaded coupling		+5 deg, –0 deg
Average thread crest diameter [d]	4 $^{1}/_{2}$ through 13 $^{3}/_{8}$ in. (external)		+0.0060 in. –0.0020 in.
	4 $^{1}/_{2}$ through 13 $^{3}/_{8}$ in. (internal)		+0.0080 in. –0.0000 in.
	16 in. and larger (external)		+0.0085 in. –0.0020 in.
	16 in. and larger (internal)		+0.0100 in. –0.0000 in.

Table 2—Tolerances on Buttress Casing Thread Dimensions (Continued)

Element	Tolerances
~~Single Dial Buttress Thread Form~~Buttress Tooth Thickness Gauge Tolerance[e,h]	
external threads	
< 8 5/8 in. OD	+0 in. (0.0 mm) –0.003 in. (0.08 mm)
≥ 8 5/8 in. OD	+0 in. (0.0 mm) –0.005 in. (0.13 mm)
internal threads	
all sizes	–~~0.001~~0 in. (~~0.03~~0 mm) –~~0.004~~0.003 in. (~~0.10~~0.08 mm)
Ovality[d]	
thread crest diameter, D/t < 20	0.003D[g,f]
thread crest diameter, D/t ≥ 20	0.004D[g,f]
Standoff, A[g]	see 6.1.10

[a] Taper of the thread root (or "minor") cone should not increase over the max tolerance at the point of intersection with the pipe OD.

[b] The lead tolerance per in. is the maximum allowable error in any inch 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 5.2.1.

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

[d] Ovality shall be measured while part is ~~outside of machine~~in the free state (un-chucked); See 6.1.6 for details.

[e] See 5.7.2 for details.

[f] D = nominal pipe body OD.

[g] The presence of ovality may require adjustments to standoff requirements; For standoff adjustments due to ovality; see 6.1.8.

[h] These tolerances apply to the basic 0.100 thread tooth ~~width as measured with the single dial buttress thread form gauge and do not correspond to the tolerances shown in Figure 2 and Figure 3~~for a pin and 0.99 in. basic thread tooth thickness for a box as measured with the buttress tooth thickness gauge and correspond to the tolerances shown in Figure 2 and Figure 3..

Table 3—Line Pipe Thread Dimensions

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[a]		L1	L2	L4	E1	J	M	Q	q	A	Lc[b]
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	0.2400	0.4078	0.6006	0.62701	0.2119	0.1938	0.738	0.1147	3	—
1/2	0.840	14	0.3200	0.5337	0.7815	0.77843	0.2810	0.2473	0.903	0.1582	3	—
3/4	1.050	14	0.3390	0.5457	0.7935	0.98887	0.2690	0.2403	1.113	0.1516	3	—
1	1.315	11 1/2	0.4000	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	0.4200	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	0.4200	0.7235	1.0252	1.82234	0.3498	0.3442	1.963	0.2439	3	0.3732
2	2.375	11 1/2	0.4360	0.7565	1.0582	2.29627	0.3793	0.3611	2.469	0.2379	3	0.4062
2 1/2	2.875	8	0.6820	1.1375	1.5712	2.76216	0.4913	0.6392	2.969	0.4915	2	0.6342
3	3.500	8	0.7660	1.2000	1.6337	3.38850	0.4913	0.6177	3.594	0.4710	2	0.6967
3 1/2	4.000	8	0.8210	1.2500	1.6837	3.88881	0.5038	0.6127	4.094	0.4662	2	0.7467
4	4.500	8	0.8440	1.3000	1.7337	4.38712	0.5163	0.6397	4.594	0.4920	2	0.7967
5	5.563	8	0.9370	1.4063	1.8400	5.44929	0.4725	0.6530	5.657	0.5047	2	0.9030
6	6.625	8	0.9580	1.5125	1.9462	6.50597	0.4913	0.7382	6.719	0.5861	2	1.0092
8	8.625	8	1.0630	1.7125	2.1462	8.50003	0.4788	0.8332	8.719	0.6768	2	1.2092
10	10.750	8	1.2100	1.9250	2.3587	10.62094	0.5163	0.8987	10.844	0.7394	2	1.4217
12	12.750	8	1.3600	2.1250	2.5587	12.61781	0.5038	0.9487	12.844	0.7872	2	1.6217
14D	14.000	8	1.5620	2.2500	2.6837	13.87263	0.5038	0.8717	14.094	0.7136	2	1.7467
16D	16.000	8	1.8120	2.4500	2.8837	15.87575	0.4913	0.8217	16.094	0.6658	2	1.9467
18D	18.000	8	2.0000	2.6500	3.0837	17.87500	0.4788	0.8337	18.094	0.6773	2	2.1467
20D	20.000	8	2.1250	2.8500	3.2837	19.87031	0.5288	0.9087	20.094	0.7490	2	2.3467

NOTE 1 All dimensions in inches, except as indicated. See Figure 4.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

NOTE 3 Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 4.

a D4 = D

b Lc = L4 – 0.652 in. for 11 1/2 thread line pipe and L4 – 0.937 in. for 8 thread line pipe.

Table 4—Casing Long-thread Dimensions

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	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	End Length of Pipe to Gauge Plane	Thread Crest Diameter at L_{10}	Length Face of Coupling to Gauge Plane	Thread Crest Diameter at M_{12}
D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	Lc[a]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
4 1/2	4.500	8	1.921	2.715	3.000	4.40337	0.500	0.704	4-19/32	0.500	3	1.875	4.3791	4.3516	1.5625	4.4492	1.2045	4.3038
5	5.000	8	2.296	3.090	3.375	4.90337	0.500	0.704	5-3/32	0.500	3	2.250	4.8791	4.8281	1.9375	4.9492	1.2045	4.8038
5 1/2	5.500	8	2.421	3.215	3.500	5.40337	0.500	0.704	5-19/32	0.500	3	2.375	5.3791	5.3203	2.0625	5.4492	1.2045	5.3038
6 5/8	6.625	8	2.796	3.590	3.875	6.52837	0.500	0.704	6-23/32	0.500	3	2.750	6.5041	6.4219	2.4375	6.5742	1.2045	6.4288
7	7.000	8	2.921	3.715	4.000	6.90337	0.500	0.704	7-3/32	0.500	3	2.875	6.8791	6.7891	2.5625	6.9492	1.2045	6.8038
7 5/8	7.625	8	2.979	3.840	4.125	7.52418	0.500	0.709	7-25/32	0.433	3 1/2	3.000	7.5002	7.4062	2.6875	7.5742	1.2095	7.4246
8 5/8	8.625	8	3.354	4.215	4.500	8.52418	0.500	0.709	8-25/32	0.433	3 1/2	3.375	8.5002	8.3828	3.0625	8.5742	1.2095	8.4246
9 5/8[b]	9.625	8	3.604	4.465	4.750	9.52418	0.500	0.709	9-25/32	0.433	3 1/2	3.625	9.5002	9.3672	3.3125	9.5742	1.2095	9.4246
9 5/8[c]	9.625	8	3.537	4.465	4.750	9.51999	0.500	0.713	9-25/32	0.433	4	3.625	9.4963	9.3672	3.3125	9.5742	1.2095	9.4207
20[d]	20.000	8	4.104	4.965	5.250	19.89918	0.500	0.709	20-7/32	0.366	3 1/2	4.125	19.8752	19.7109	3.8125	19.9492	1.2095	19.7996
20[e]	20.000	8	4.037	4.965	5.250	19.89499	0.500	0.713	20-7/32	0.366	4	4.125	19.8713	19.7109	3.8125	19.9492	1.2095	19.7957

NOTE 1 All dimensions in inches, except as indicated. See Figure 5.

NOTE 2 For thread crest details, see Figure 6 and Figure 7.

NOTE 3 Included taper on diameter, all sizes, 0.0625 in. per inch.

NOTE 4 Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 5.

NOTE 5 See 6.1.3 for additional information on crest diameter locations; these locations may be different from traditional diameters and locations, and new standards may be required.

[a] $L_c = L_4 - 1.125$ in. for 8 round thread casing.

[b] Applicable to coupling grades lower than P110.

[c] Applicable to coupling grades P110 and higher.

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

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

Table 5—Buttress Casing Thread Dimensions

Size Designation	Major Diameter	No. of Threads Per in.	Length: Imperfect Threads	Length: Perfect Threads	Total Length: End of Pipe to Vanish Point	Pitch Diameter[a]	End of Pipe to Center of Coupling, Power-tight Make-up	End of Pipe to Center of Coupling, Hand-tight Make-up	Length: Face of Coupling to Plane E_7	Length: End of Pipe to Triangle Stamp	Hand-Tight Standoff Thread Turns	Diameter of Counterbore in Coupling	Minimum Length, Full Crest Threads from End of Pipe	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	Length: End of Pipe to Gauge Plane	Thread Crest Diameter at L_{10}	Length: Face of Coupling to Gauge Plane	Thread Crest Diameter at M_{12}
D	D_4		g	L_7	L_4	E_7	J	J_n	M	A_1	A	Q	Lc[b]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
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	4.5098	4.4127	0.9410	4.4715	1.8845	4.3920
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	5.0035	4.9048	1.0660	4.9715	1.7845	4.8920
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	5.5035	5.4009	1.1285	5.4715	1.7845	5.3920
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	6.6285	6.5142	1.3160	6.5965	1.7845	6.5170
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	7.0035	6.8775	1.5035	6.9715	1.7845	6.8920
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	7.6285	7.4908	1.6910	7.5965	1.7845	7.5170
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	8.6285	8.4830	1.8160	8.5965	1.7845	8.5170
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	9.6285	9.4830	1.8160	9.5965	1.7845	9.5170
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	10.7535	10.6080	1.8160	10.7215	1.7845	10.6420
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	11.7535	11.6080	1.8160	11.7215	1.7845	11.6420
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	13.3785	13.2330	1.8160	13.3465	1.7845	13.2670
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	15.9822	15.7412	2.4120	15.9422	1.3425	15.8703
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	18.6072	18.3662	2.4120	18.5672	1.3425	18.4953
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	19.9822	19.7412	2.4120	19.9422	1.3425	19.8703

NOTE 1 All dimensions in inches, except as indicated; see Figure 1. For thread details, see Figure 2 and Figure 3.

NOTE 2 Included taper on diameter: sizes 13 3/8 and smaller –0.0625 in. per inch; sizes 16 and larger –0.0833 in. per inch.

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

NOTE 4 Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 1; the 3/8 in. 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".

NOTE 5 See 6.1.3 for additional information on crest diameter locations; these locations may be different from traditional diameters and locations, and new standards may be required.

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

[b] $L_c = L_7 – 0.400$ in. for buttress thread casing; within the L_c length, as many as two 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 6—Non-upset Tubing Thread Dimensions

Size Designation	Major Diameter	No. of Threads Per in.	Length: End of Pipe to Hand-tight Plan	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 / Counterbore	Depth of Coupling Recess	Hand-Tight Standoff Thread Turns	Minimum Length, Full Crest Threads from End of Pipe	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	Length End of Pipe to Gauge Plane	Thread Crest Diameter at L10	Length: Face of Coupling to Gauge Plane	Thread Crest Diameter at M12
D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c[a]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
1.050	1.050	10	0.448	0.925	1.094	0.98826	0.500	0.446	1.113	5/16	2	0.300	NA	NA	NA	NA	NA	NA
1.315	1.315	10	0.479	0.956	1.125	1.25328	0.500	0.446	1.378	5/16	2	0.300	NA	NA	NA	NA	NA	NA
1.660	1.660	10	0.604	1.081	1.250	1.59826	0.500	0.446	1.723	5/16	2	0.350	NA	NA	NA	NA	NA	NA
1.900	1.900	10	0.729	1.206	1.375	1.83826	0.500	0.446	1.963	5/16	2	0.475	NA	NA	NA	NA	NA	NA
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	NA	NA	NA	NA	NA	NA
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	NA	NA	NA	NA	NA	NA
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	NA	NA	NA	NA	NA	NA
4	4.000	8	1.591	2.140	2.375	3.91395	0.500	0.534	4.063	3/8	2	1.375	3.8791	3.8828	1.0625	3.9492	1.0345	3.8144
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	4.3791	4.3710	1.2505	4.4492	1.0345	4.3144

NOTE 1 All dimensions in inches, except as indicated. See Figure 8 and Figure 11–13.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inches.

NOTE 3 Hand-tight standoff “A” is the basic allowance for basic power make-up of the joint as shown in Figure 8.

NOTE 4 See 6.1.3 for additional information on crest diameter locations; these locations may be different from traditional diameters and locations, and new standards may be required.

[a] $L_c = L_4 - 0.900$ in. for 10-thread tubing, but not less than 0.300, and $L_4 - 1.000$ for 8-thread tubing.

Table 7—External-upset Tubing Thread Dimensions

Size Designation	Major Diameter	No. of Threads Per in.	Length: End of Pipe to Hand-tight Plan	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	Thread Crest Diameter at Face of Coupling	Thread Crest Diameter at End of Pin	Length End of Pipe to Gauge Plane	Thread Crest Diameter at L10	Length: Face of Coupling to Gauge Plane	Thread Crest Diameter at M12
D	D_4		L_1	L_2	L_4	E_1	J	M	Q	q	A	L_c[a]	C_{11}	C_9	L_{10}	C_{10}	M_{12}	C_{12}
1.050	1.315	10	0.479	0.956	1.125	1.25328	0.500	0.446	1.378	5/16	2	0.300	NA	NA	NA	NA	NA	NA
1.315	1.469	10	0.604	1.081	1.250	1.40706	0.500	0.446	1.531	5/16	2	0.350	NA	NA	NA	NA	NA	NA
1.660	1.812	10	0.729	1.206	1.375	1.75079	0.500	0.446	1.875	5/16	2	0.475	NA	NA	NA	NA	NA	NA
1.900	2.094	10	0.792	1.269	1.438	2.03206	0.500	0.446	2.156	5/16	2	0.538	NA	NA	NA	NA	NA	NA
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	2.4729	2.5039	0.6255	2.5430	1.0345	2.4082
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	2.9729	2.9922	0.8125	3.0430	1.0345	2.9082
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	3.6291	3.6328	1.0625	3.6992	1.0345	3.5644
4	4.250	8	1.716	2.265	2.500	4.16395	0.500	0.534	4.313	3/8	2	1.500	4.1291	4.1250	1.1875	4.1992	1.0345	4.0644
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	4.6291	4.6171	1.3125	4.6992	1.0345	4.5644

NOTE 1 All dimensions in inches, except as indicated. See Figure 8 and Figures 11 through 13.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inches.

NOTE 3 Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.

NOTE 4 See 6.1.3 for additional information on crest diameter locations; these locations may be different from traditional diameters and locations, and new standards may be required.

[a] $L_c = L_4$ – 0.900 in. for 10-thread tubing, but not less than 0.300, and L_4 – 1.000 for 8-thread tubing.

~~Table 8—External-upset Long Round Thread Dimensions for Fiberglass Pipe~~

~~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[a]~~
~~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~~

~~NOTE 1 All dimensions in inches, except as indicated. See Figure 8 and Figures 11–13.~~

~~NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.~~

~~NOTE 3 Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.~~

~~[a] $L_c = L_4 - 0.900$ in. for 10 thread tubing and $L_c = L_4 - 1.000$ in. for 8 thread tubing.~~

Table ~~9~~8—Integral-joint Tubing Thread Dimensions

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[a]
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

NOTE 1 All dimensions in inches, except as indicated. See Figure 8.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

NOTE 3 Hand-tight standoff "A" is the basic allowance for basic power make-up of the joint as shown in Figure 8.

[a] $L_c = L_4 - 0.900$ in. for 10 thread tubing.

Table ~~10~~9—Round Nosed Ends

Size (in.)	Radius, r (in.)[a]
2 3/8	3/32
2 7/8	3/32
3 1/2	1/8
4	1/8
4 1/2	1/8

[a] Radius transition shall be smooth with no sharp corners, burrs or slivers on ID or OD chamfer surfaces.

Table ~~11~~10—Casing Round Thread Height Dimensions

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 1 All dimensions in inches. See Figure 6 and Figure 7.

NOTE 2 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 ~~12~~11—Tolerances on Casing Round Thread Dimensions [c]

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 inch	±0.003 in.
	cumulative	±0.006 in.
Height	h_s and h_n	±0.002 in.
Addendum[j]	pitch cone-to-crest	±0.0015 in.
Angle, included		±1$^1/_2$ deg
Length, L_4 (external thread) [b]		±1p
Chamfer		±5 deg
Standoff, A [g,i]		see 6.1.10
Average thread crest diameter [e,~~j~~]		±0.008 in.
Ovality [f]	thread crest diameter D/t < 20	0.003D [h]
	thread crest diameter D/t ≥ 20	0.004D [h]
Casing coupling Counterbore diameter (Q) and depth (q)		+0.031 in./–0
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 inch within the length $L_4 - g$; See Table 32 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 $J + 1$ thread turn from the center of the coupling.

[b] Thread Length (L_4) is measured from the pipe face to the farthest point where the machined thread root runs out on the pipe surface.

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

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

[e] Tolerance for standoff is ±1p (±0.125); A corresponding crest diameter tolerance has been calculated by multiplying the standoff tolerance by the taper per inch (0.0625) and rounding to the nearest 0.0005 in.; Crest diameter tolerance is ±0.008 and shall be measured while part is ~~outside of machine~~in the free state (un-chucked).

[f] Ovality shall be measured while part is ~~outside of machine~~in the free state (un-chucked); See 6.1.6 for details.

[g] Dimension "A" shown applies to threads manufactured to API 5B and are not applicable to API 6A.

[h] D = nominal pipe body OD.

[i] The presence of ovality may require adjustments to standoff requirements; For standoff adjustments due to ovality, see 6.1.8.

~~[j] Refer to thread form (Addendum) crest diameter adjustment in 5.5.5.~~

Table ~~13~~12—Line Pipe Thread Height Dimensions

Thread Element	27 Threads per in.	18 Threads per in.	14 Threads per in.	$11^1/_2$ Threads per in.	8 Threads per in.
	p = 0.0370	p = 0.0556	p = 0.0714	p = 0.0870	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.~~0029~~0063	0.0091

NOTE 1 All dimensions in inches. See Figure 10.

NOTE 2 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 ~~14~~13—Tolerances on Line Pipe Dimensions [c]

Element		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.
Angle, included[d]		±1.5 deg
Length, L_4 (external thread)[b]		±1p
Chamfer[d]		±5 deg
Standoff, A[e]		see 6.1.10

[a] For pipe (external threads) the lead tolerance per in. is the maximum allowable error in any inches within the length $L_4 - g$; See Table 31 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 + 1 thread turn from the center of the coupling.

[b] Thread length (L_4) is measured from the pipe face to the farthest point where the machined thread root runs out on the pipe surface.

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

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

[e] "A" shown in this table only apply to threads manufactured to API 5B and are not applicable to API 6A.

Table ~~15~~14—Tubing Round Thread Height Dimensions

Thread Element	Threads per in. p = 0.1000	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 1 (All dimensions in inches. See Figures 11–13.)

NOTE 2 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 ~~16~~15—Tolerances on Tubing Round Thread Dimensions [c]

Element			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.
Thread addendum [~~e~~d]		
	non-upset tubing, regular thread external-upset tubing, and integral joint tubing………………..............	±0.0015 in.
Angle, included		±1.5 deg
Length, L_4 (external thread)[b]		
	8 thread per in.	±1p
	10 thread per in.	
	external-upset..........................	+1-$^1/_2$ p –$^3/_4$p
	non-upset................................	±1-$^1/_2$ p
Chamfer (on outside end of threaded pipe).................................		±5 deg
Tubing coupling recess diameter (Q) and depth (q)....................		+0.031/–0.000 in.
Average thread crest diameter [~~e~~d,~~f~~e]		
	8 thread per inch………………………………	±0.008 in. [~~f~~e]
	~~10 thread per inch………………………………~~	~~±0.0095 in. f~~
Ovality [~~g~~f]		
	thread crest diameter, D/t < 20	0.003D
	thread crest diameter, D/t ≥ 20	0.004D
Standoff, A [~~h~~g,~~i~~h]...		see 6.1.10
25° angle of counterbore of bottom of coupling recess[j]		±5 deg ~~d~~

[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 34, 35, and 36 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+1 thread turn from the center of the coupling or from the small end of the thread in the box of integral joint tubing.

[b] Thread length (L_4) is a measured distance from the pipe face to the farthest point where the machined thread root runs out on the pipe surface.

[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] Refer to thread form (Addendum) crest diameter adjustment in 5.5.5.~~

[f] Tolerance for standoff is dependent on the number of threads per inch; 8TPI standoff tolerance is ±1p (±0.125) and 10TPI is ±1-$^1/_2$p (±0.150); A corresponding crest diameter tolerance has been calculated by multiplying the standoff tolerance by the taper per inch (0.0625) and rounding to the nearest 0.0005 inch; Crest diameter tolerance for 8TPI is ±0.008~~ and 10TPI is ±0.0095~~; Crest diameter shall be measured while part is ~~outside of machine~~in the free state (un-chucked).

[g] Ovality shall be measured while part is ~~outside of machine~~in the free state (un-chucked); See 6.1.6 for details.

[h] Standoff tolerance dimensions shown only apply to threads manufactured to API 5B and are not applicable to API 6A.

[i] The presence of ovality may require adjustments to standoff requirements; For standoff adjustments due to ovality; See 6.1.8.

[j] Criteria for rejection of the 25° angle at the bottom of the coupling recess shall demonstrate the angle exceeds the ±5° tolerance.

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 an instrument is dropped or shocked, it shall not be used for inspection purposes until its accuracy has been re-established (see API 5B1 for more details).

5.1.3 Cleaning the Threads

All threads shall be cleaned thoroughly before inspection. The imperfect starting thread should be de-burred before inspection

5.2 Location of Measurements

5.2.1 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) –0.625 in. (–15.875 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 (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.

5.2.2 Measuring Intervals

Figures 14–17 illustrate the thread intervals for measuring.

a) Thread Height and addendum—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 $^1/_2$ in. (12.7 mm) to 1 in. (25.4 mm), and intervals consisting of four 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 four 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 (see API 5B1 for more details). 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 31–36. For rounded thread “g” was chosen as 0.625 in. (15.88 mm) for casing and 0.500 in. (12.7 mm) for tubing.

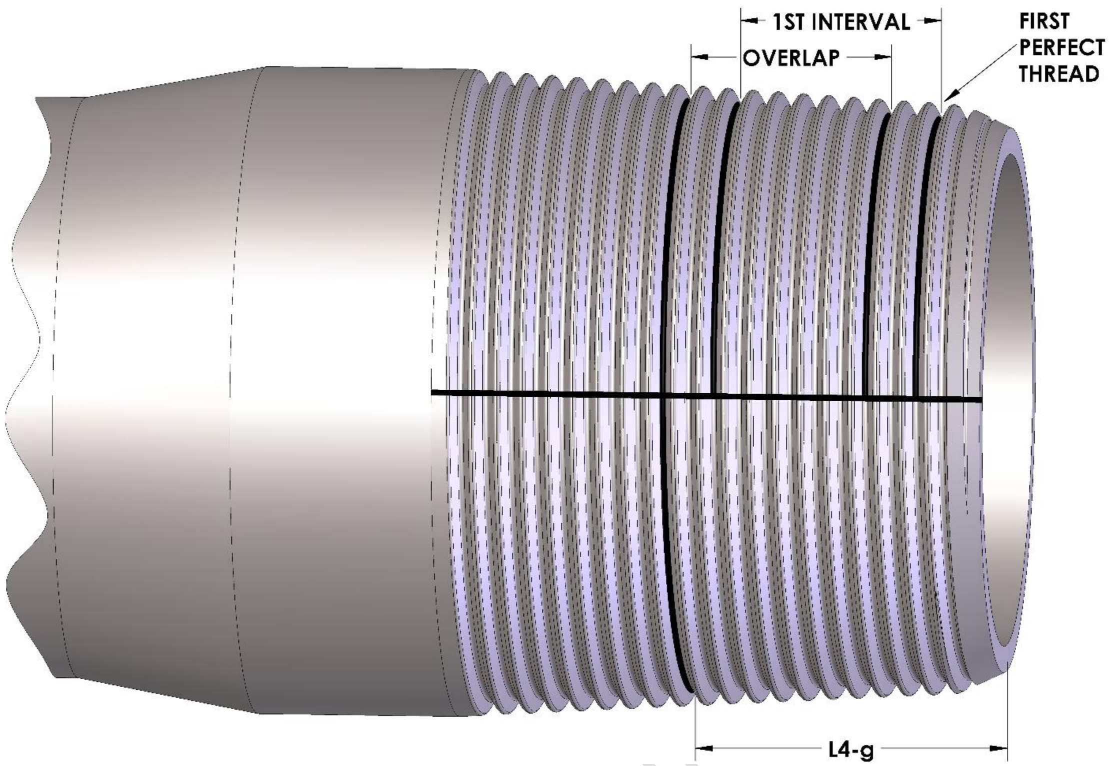


Figure 14—Measuring Interval (8-round Tubing Pin)

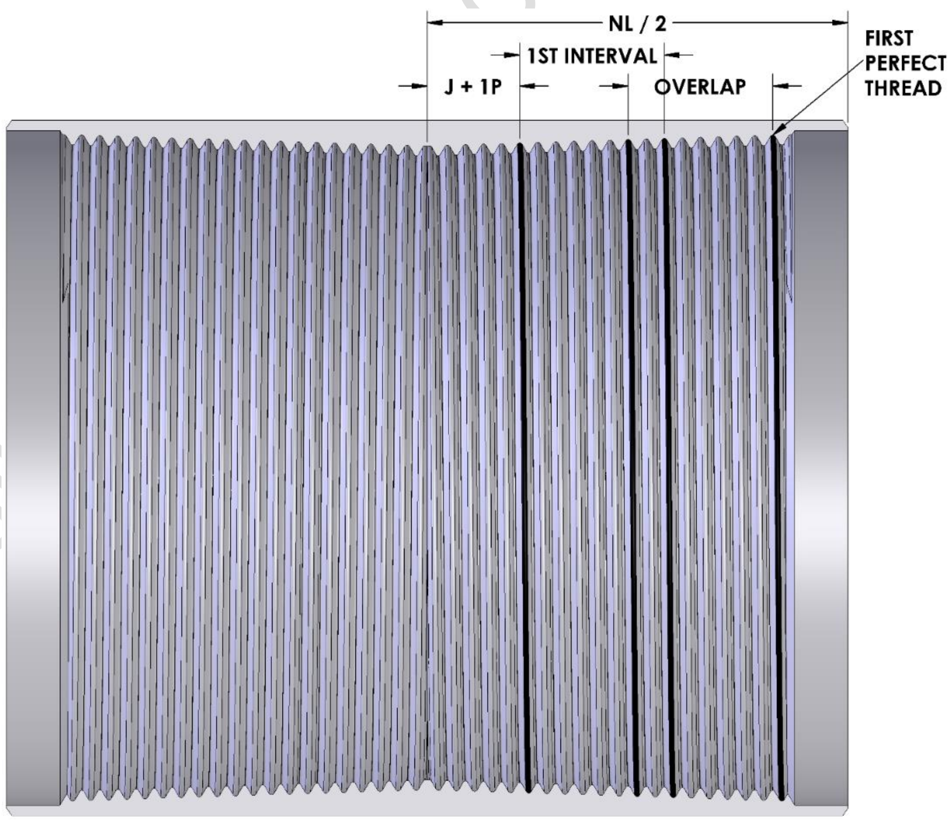


Figure 15—Measuring Interval (8-round Coupling)

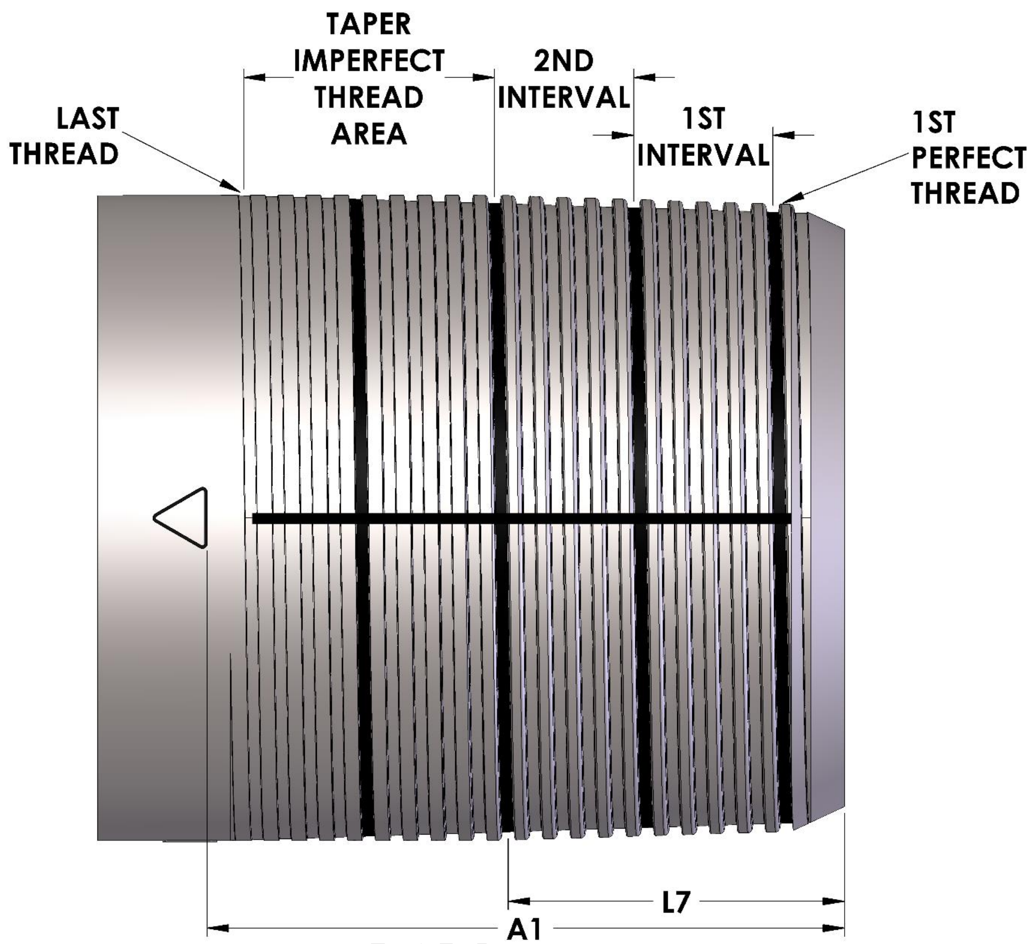


Figure 16—Measuring Interval (Buttress Pin)

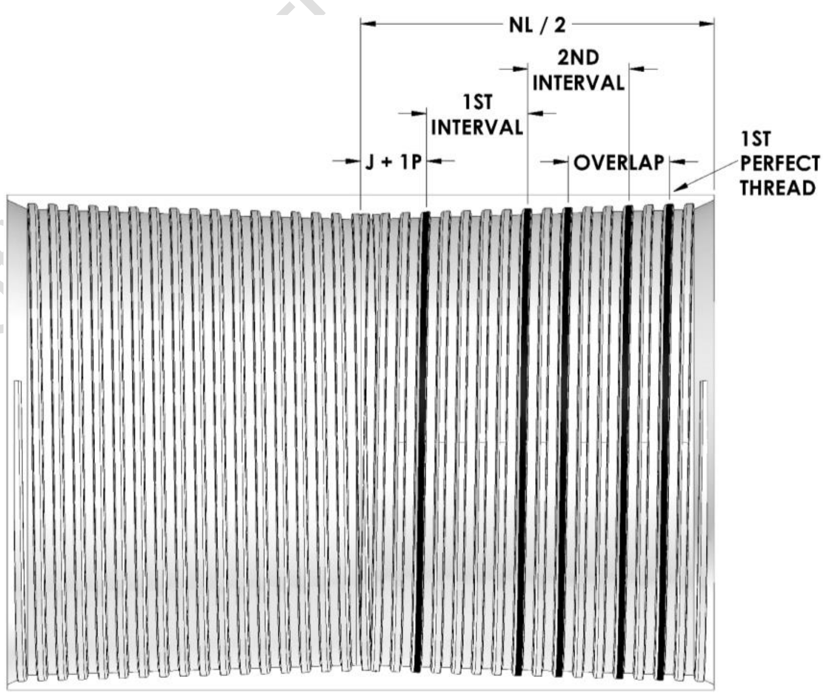


Figure 17—Measuring Interval (Buttress Coupling)

5.3 Taper Measurement

5.3.1 General

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 "inch-per-inch of thread" ("millimeter-per-millimeter of thread") basis (see 3.1.51)

5.3.2 Gauge Contact Points

The contact points of taper gauges shall be of the ballpoint type with diameters in accordance with Table ~~17~~16. 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~~the contact points shall contact the minor cone of the external thread or the major cone of the internal thread.

Table ~~17~~16—Contact Point Dimensions for Taper and Run-out Gauges

Type Gauge	Threads per in.	Type Thread	Ball-point Diameter[a] in.	Ball-point Diameter[a] mm
Taper	8	Rd	0.072	1.83
Taper	8	LP	0.072	1.83
Taper	10	Rd	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	BC	0.090	2.29
Run-out	5	BC	0.057	1.45

[a] Tolerance is ±0.002 in. (0.05 mm).

A barrel style or truncated ball contact may be used for buttress threads, given the point of contact does not interfere with the corner radii of the groove, as depicted in Figure 18. Barrel-type contacts more easily facilitate measurements beyond L_7.

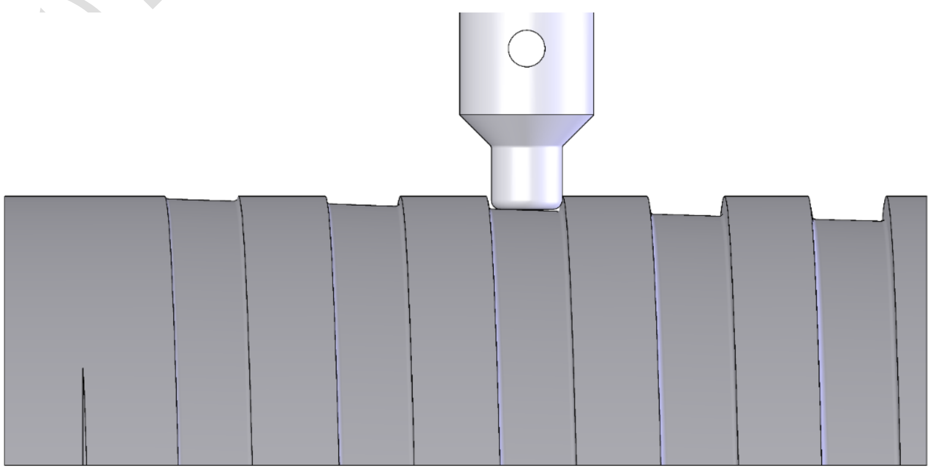


Figure 18—Barrel Contact on Buttress Pin (Example)

5.3.3 External Threads

5.3.3.1 Taper Gauge

The taper of external threads shall be measured with a taper gauge (see Figure ~~18~~19 and Figure ~~19~~20).

5.3.3.2 Procedure

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.

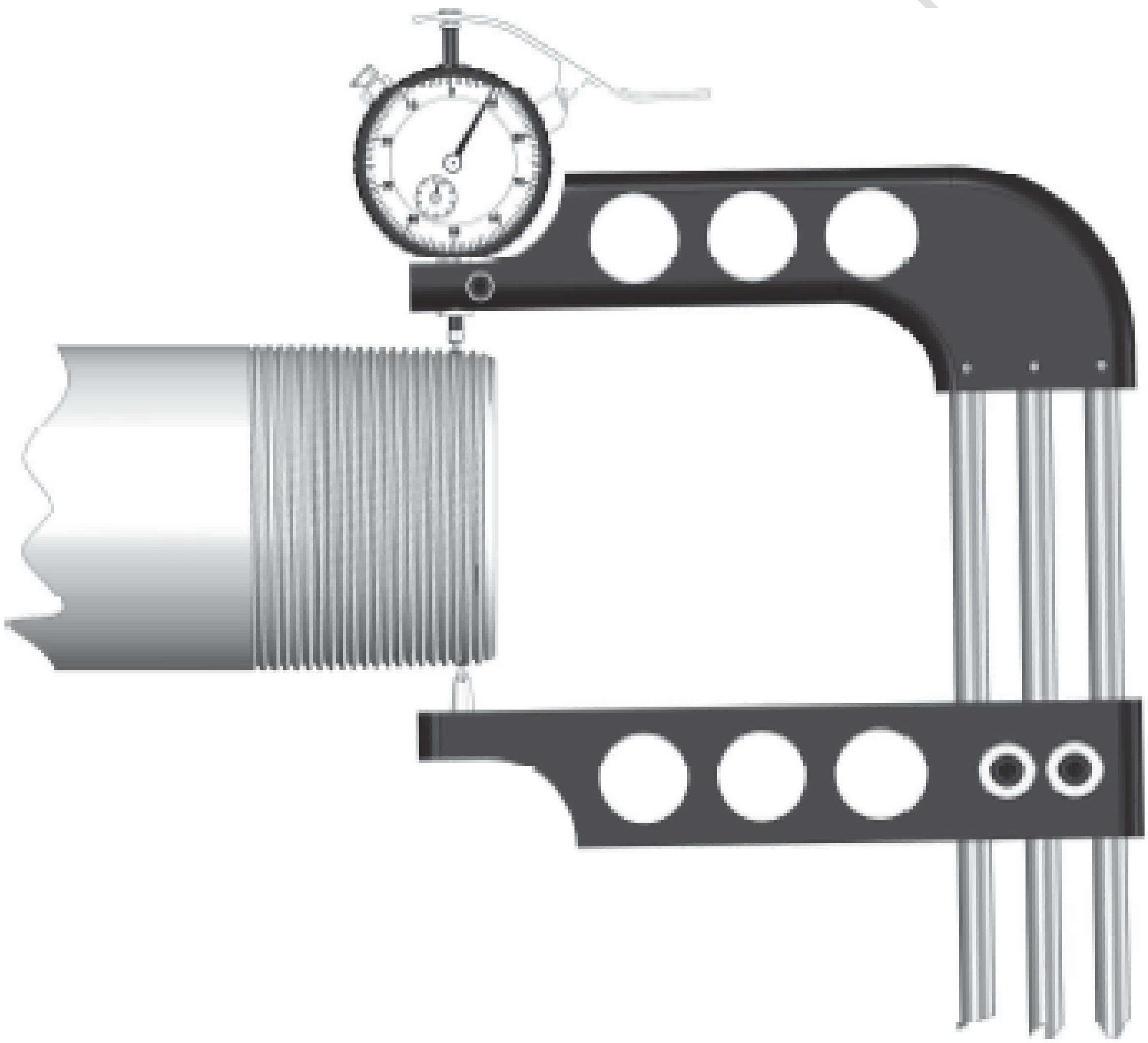


Figure ~~18~~19—External Thread Taper Measurements (Gauge Set near First Perfect Thread)

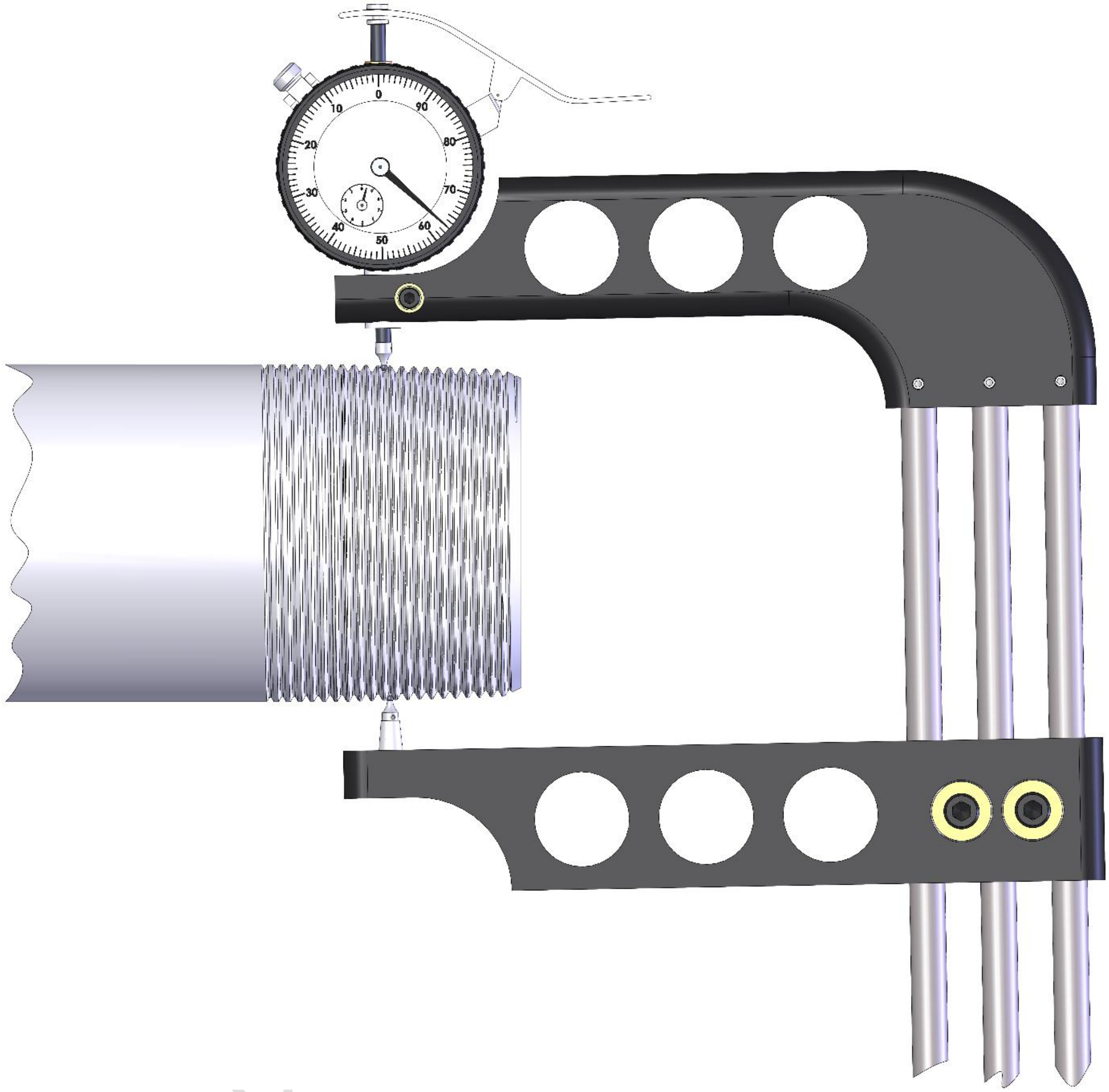


Figure ~~19~~20—External Thread Taper Measurements (Measurement at Last Perfect Thread)

5.3.3.3 Run-out (buttress only)

The run-out gauge (see Figure ~~20~~21) shall be used to check the run-out thread root and insure that the external thread is sufficiently long and is a true run-out thread. The run-out gauge indicator shall be set to zero using a flat surface as a setting standard for sizes 13$^3/_8$ in. (339.72 mm) and smaller. For sizes 16 in. (406.4 mm) 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.

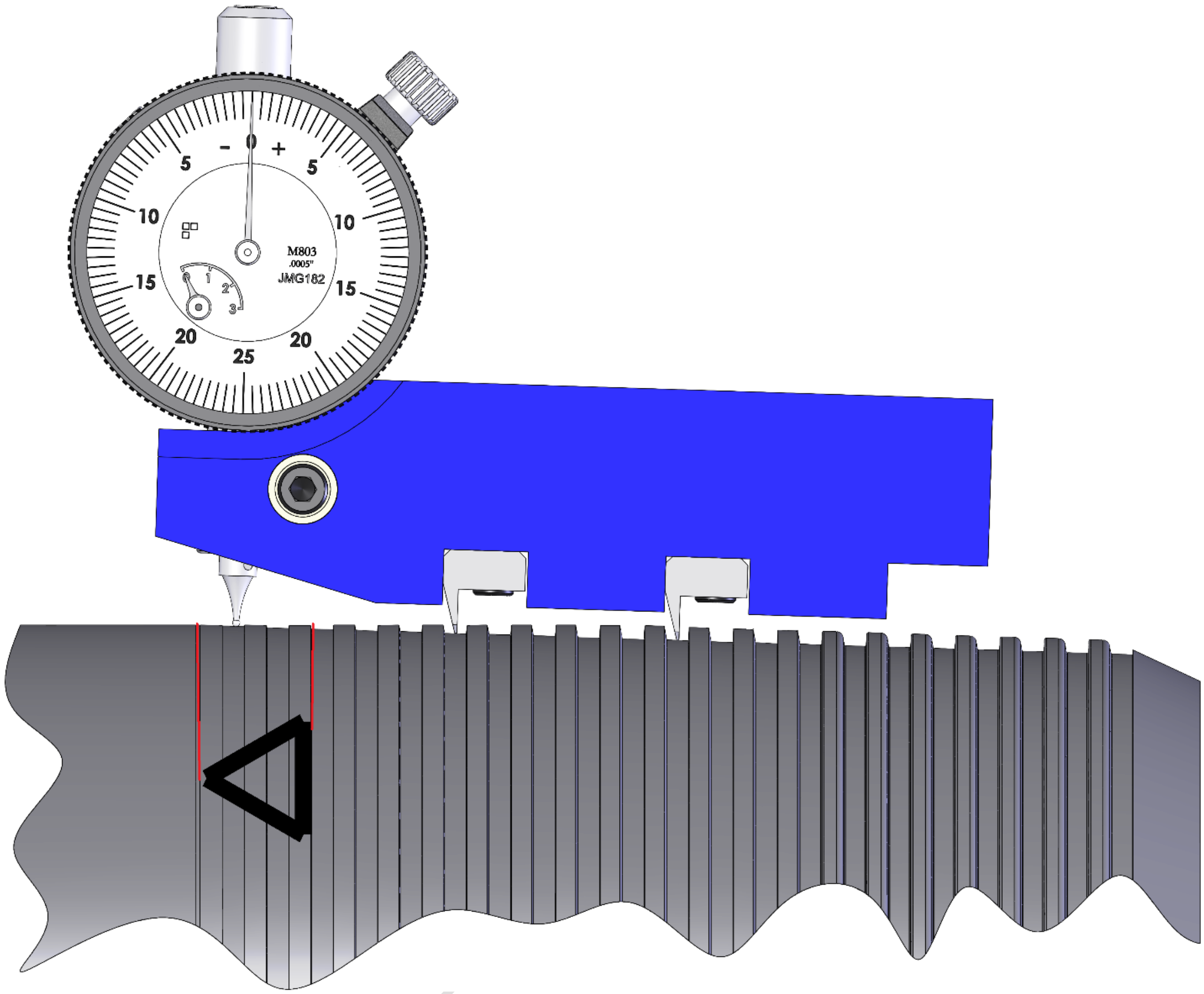


Figure ~~20~~21—Buttress Thread Run-out Measurements

5.3.3.4 Procedure (run-out)

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 shall 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.

5.3.4 Internal Thread (4 $^{1}/_{2}$ in. and larger)

5.3.4.1 Taper Gauge

The taper of internal threads in sizes $4^{1}/_{2}$ in. (114.3 mm) and larger ~~shall~~should be measured with an internal-taper gauge as illustrated in Figure ~~21~~22. The taper of internal threads may be measured with an internal-taper gauge as illustrated in Figure 22 for threads in sizes $4^{1}/_{2}$ in. (114.3 mm) up to 7 in. (177.8 mm).

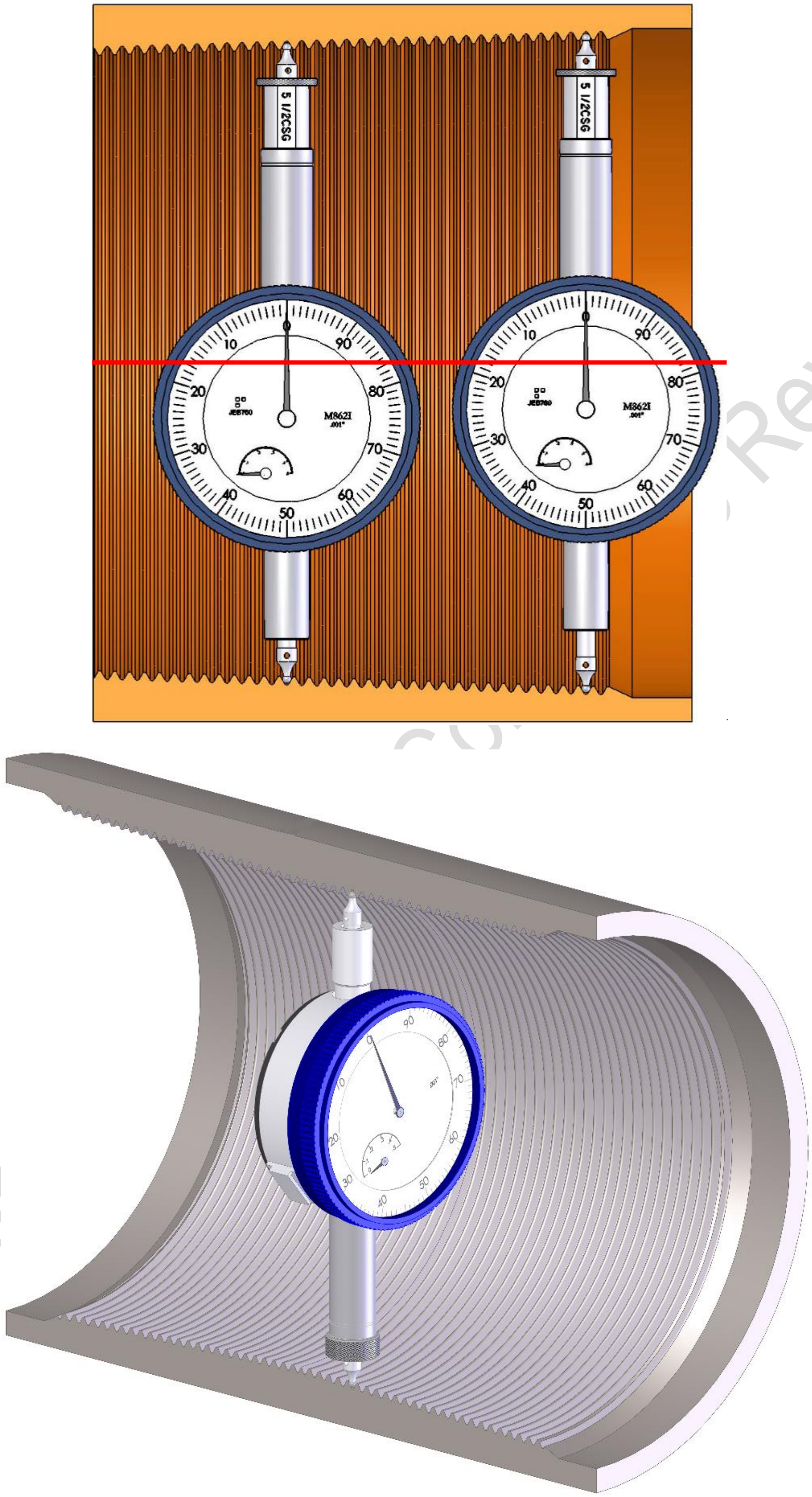


Figure ~~21~~22—Internal Thread Taper Measurements

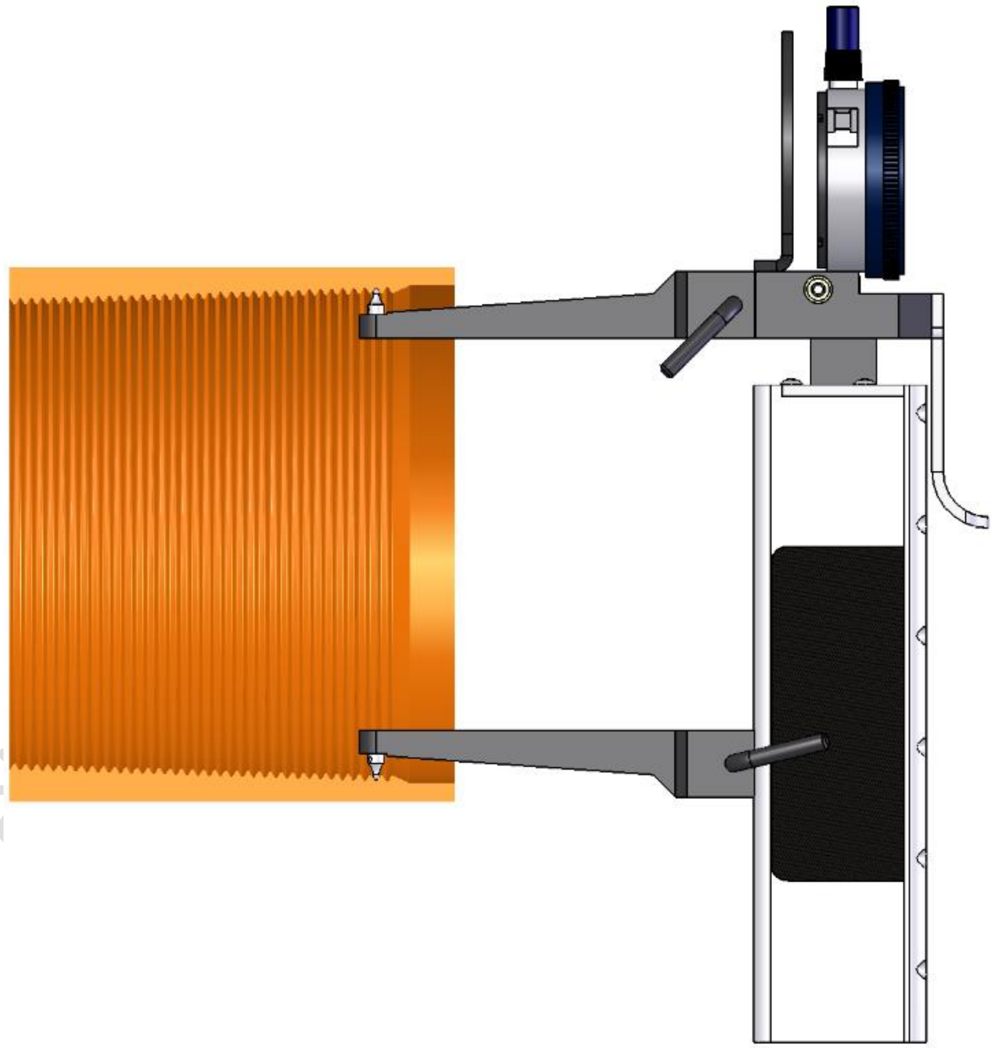
5.3.4.2 Procedure

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.

5.3.5 Internal Thread (Smaller than $4^1/_2$ in.)

5.3.5.1 Taper Gauge

The taper of internal threads in sizes smaller than $4^1/_2$ in. (114.3 mm) shall be measured with an internal-taper gauge as illustrated in Figure ~~22~~23. For connections between $4^1/_2$ in. (114.3 mm) and 7 in. (177.8mm), an internal-taper gauge as illustrated in Figure 23 may be used.



NOTE See Figure ~~18~~19 and Figure ~~19~~20 for first and last perfect threads.

Figure ~~22~~23—~~Internal Taper Measurements ($4^1/_2$ in. and smaller)~~Internal Taper Measurements Using Plunger-style Gauge (Example)

5.3.5.2 Procedure

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 thread.

5.4 Lead Measurement

5.4.1 General

Lead tolerances are expressed in terms of "per inch" ("per millimeter") of threads and "cumulative," and lead errors shall be determined accordingly. For interval measurements over lengths other than 1 in. (25.4 mm) the observed deviation should be calculated to the per inch (per mm) basis. For cumulative measurements, observed deviations represent the cumulative deviation.

5.4.2 Gauge Contact Points

The contact points of lead gauges shall be of the ball point type with diameters in accordance with Table ~~18~~17. For line pipe and round threads, the diameter of the contact points are such that they ~~contact~~touch 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.

Table ~~18~~17—Contact Point Dimensions for Lead Gauge

Threads per in. (25.4 mm)	Type Thread	Ball-Point Diameter[a] in. (mm)
8	Rd	0.072 (1.83)
8	LP	0.072 (1.83)
10	Rd	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	BC	0.062 (1.57)

[a] Tolerance is ±0.002 in. (±0.05 mm).

5.4.3 Lead Gauge

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 ~~23~~24). 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 ~~19~~18. 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). Any other master value between notches not specifically listed in Table ~~19~~18, may be validated by calculating a combination of values that are listed. The lead of the external threads or internal threads in sizes $4^{1}/_{2}$ in. (114.3 mm) and larger, may be measured with either style lead gauge of the type illustrated in Figure ~~24~~25 or Figure ~~25~~26. The lead of the internal threads in sizes smaller than $4^{1}/_{2}$ in. shall be measured with a lead gauge of the type illustrated in Figure ~~25~~26.

5.4.4 Adjustment of Gauges

Prior to using, the fixed ball point shall be set to provide a distance between points equal to the interval of threads to be inspected (see 5.2.2.b), 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 shall be taken to ~~insure~~ensure the contact points engage the root and the 3-degree flank.

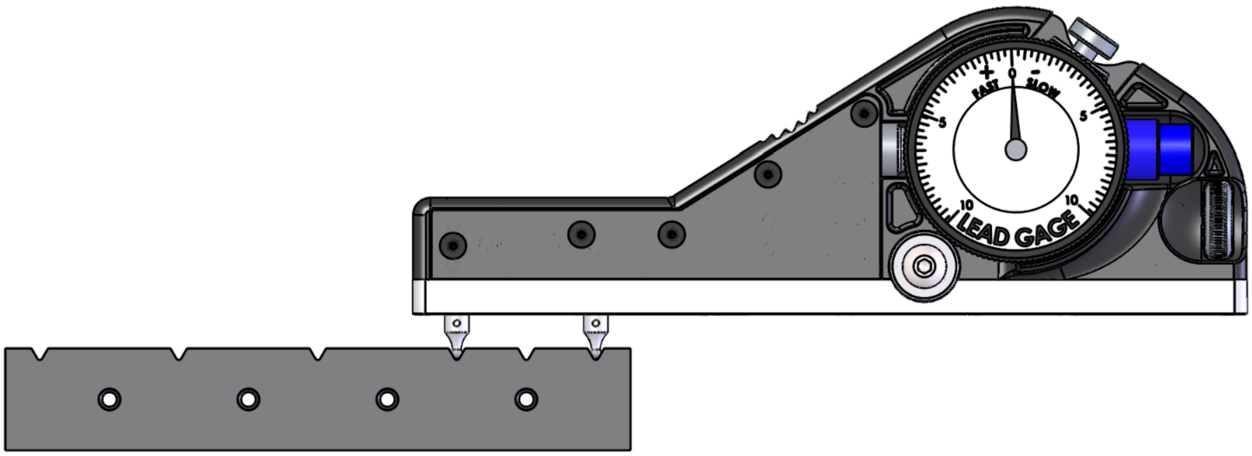


Figure ~~23~~24—Internal Lead Gauge on Standard Template

Table ~~19~~18—Compensated Thread Lengths for Measurements Parallel to the Taper Cone

Length of Thread Inch (Parallel to Thread Axis) ~~in.~~	Compensated Length Inch (Parallel to Taper Cone) for Threads Having a Taper of: 3/4 in. per ft	1 in. per ft
0.34783[a]	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

[a] Equivalent to 4p for 11 1/2 threads per in.

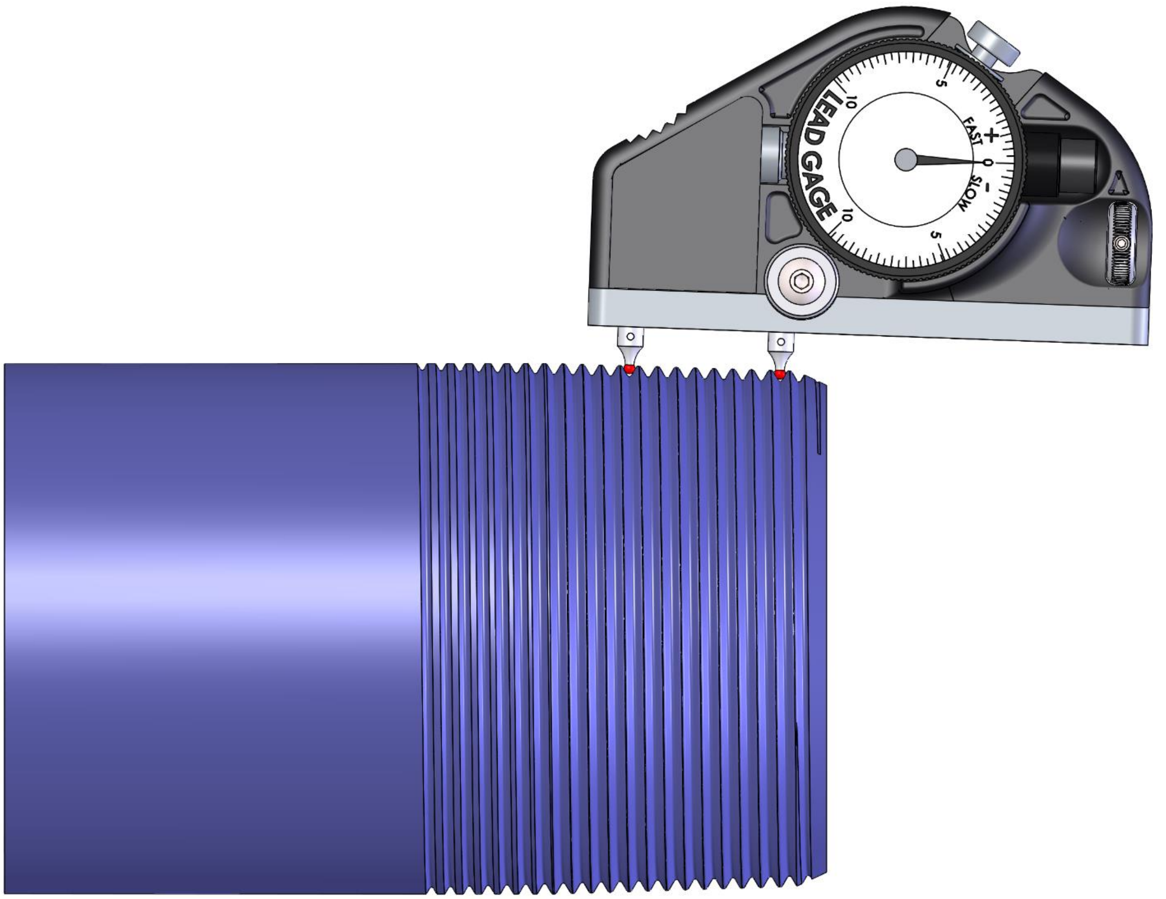


Figure ~~24~~25—Lead Gauge on Pin Thread

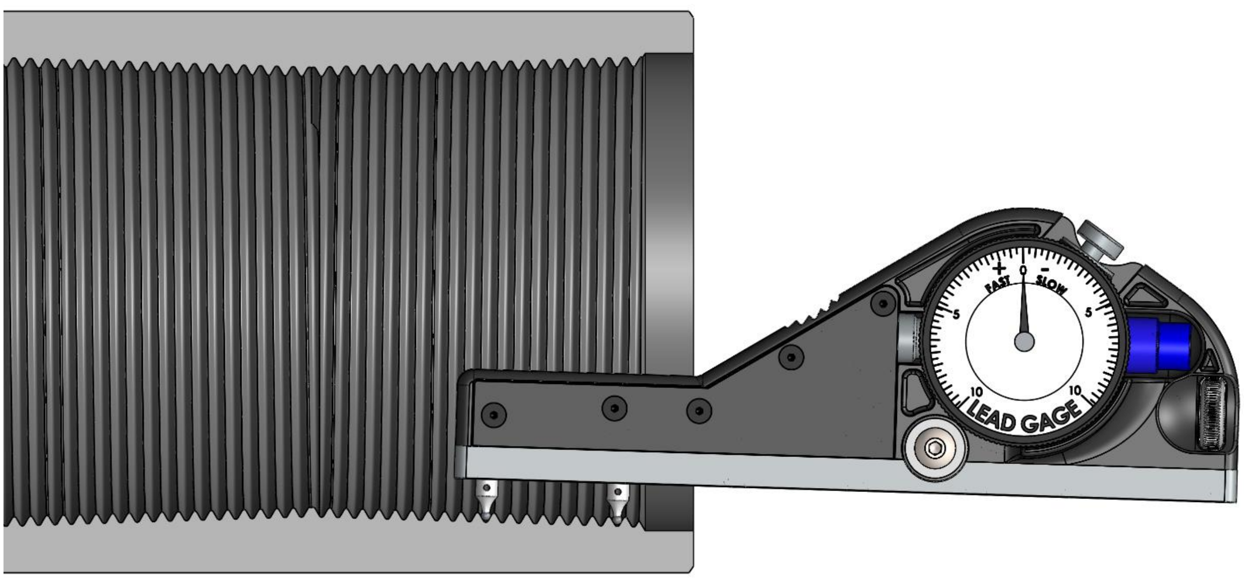


Figure ~~25~~26—Lead Gauge on Coupling Thread

5.4.5 Procedure

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 (BC), sufficient 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. The fixed ball contact shall be placed on the first full form thread groove behind the point where the threading insert first made contact on the ~~lead in~~lead-in chamfer.

5.5 Height and Addendum Measurement

5.5.1 General

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 and addendum measurement should be shifted to the last thread root having a full crest on each side.

5.5.2 Addendum Gauge Procedure

The addendum shall be measured on round thread.

Place the contact point of the thread addendum gauge in the thread groove and anvil of the gauge resting on top of full-crested threads. The anvil shall be held in firm contact with the thread crests. The gauge shall be aligned with the axis of threads by rocking the gauge about the longitudinal axis of the anvil (see Figure 56). The thread addendum is indicated correctly when the dial indicator stops moving near the center of the rocking motion, the null point. The dial indicator reads the error in the thread addendum at the null point (see API 5B1 for more details).

5.5.3 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. Figures ~~26~~27–~~28~~29 illustrate the gauge contact points. Reference Table ~~20~~19 for addendum contact point dimensions.

5.5.4 Height, Addendum Gauges, and Check Blocks

Thread height ~~and addendum~~ shall be measured with gauges of the types illustrated in Figures 26–~~28~~27. Such gauges for line pipe and round threads may have continuous-style indicators graduated to register the actual thread height or balanced-style indicators graduated to register the deviation in thread height as illustrated in Figures ~~29~~31–~~34~~32 and 34–35. Check blocks as shown in Figures ~~35~~38–~~38~~40 and Tables ~~21~~20–~~23~~21, shall be provided for checking the height gauge~~ and addendum respectively~~. Buttress threads shall be measured with gauges of the type illustrated in Figures ~~29~~31–~~34~~36, registering error in thread height in 0.0005 in. (0.013 mm) increments.

Addendum shall be measured with gauges of the types illustrated in Figure 33 and Figure 36. Such gauges shall have balanced style indicators graduated to register error in addendum in 0.0005 in. (0.013 mm) increments. Check blocks as shown in Figure 37 and Table ~~23~~22 shall be provided for standardizing the addendum gauge.

Gauges for sizes 16 in. and larger, buttress threads shall be provided with a step-type anvil. Check blocks of the step type as shown in Figure ~~37~~39 and Table ~~22~~21, shall be provided for checking the height gauge.

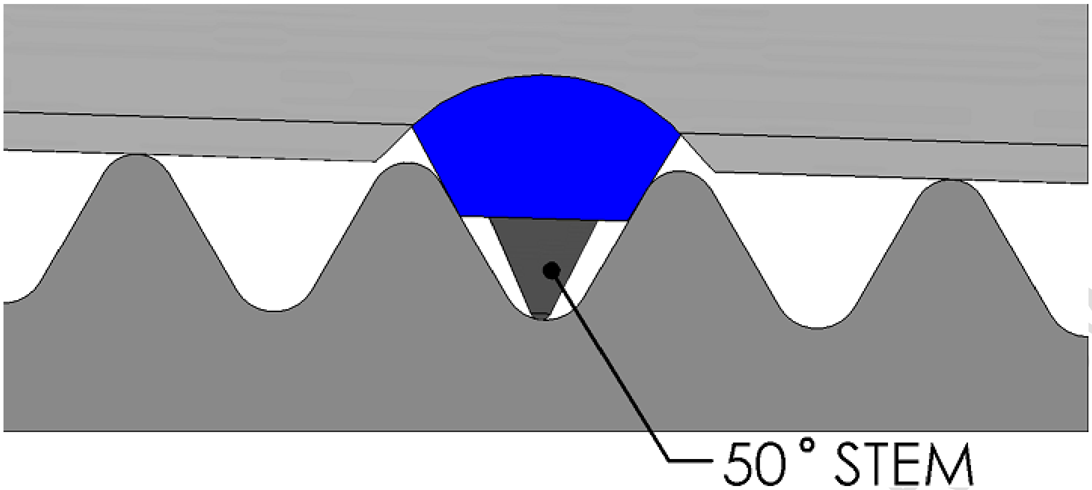


Figure ~~26~~27—Thread Height Contact Point (Round Thread Height Gauge)

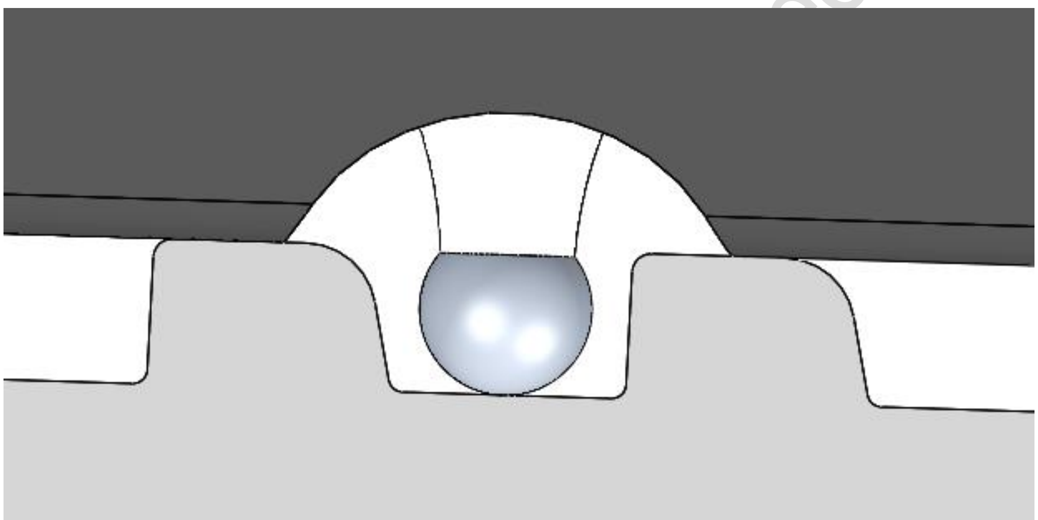


Figure ~~27~~28—Thread Height Contact Point (Buttress Thread Height)

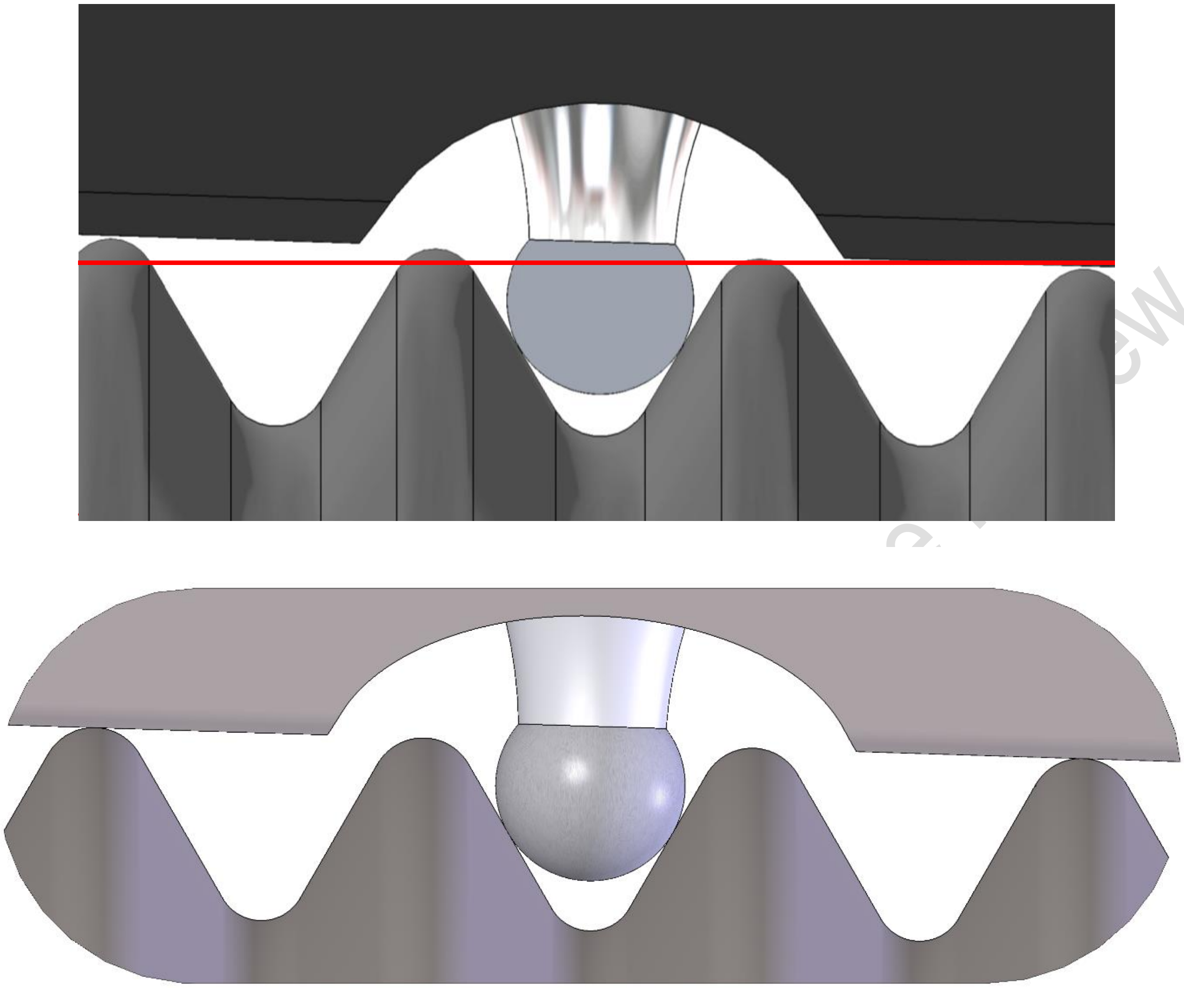


Figure ~~28~~29—External Addendum Contact Point (Round Thread Addendum Gauge)

Table ~~20~~19—Contact Point Dimensions for Addendum Gauge

Thread per in. (25.4 mm)	Type Thread	in. (mm)
8	Rd	0.072 (1.83)
10	Rd	0.057 (1.45)
NOTE Tolerance is ~~±0.002 in. (±0.05 mm)~~defined by the standardization practice described in 5.5.5.5.		

Table ~~21~~20—Thread Height Groove Check Blocks

60° Thread Forms	U-Groove Depth $4^{1}/_{2}$ to 13 $^{3}/_{8}$ in. in. (mm)	60° V-Groove Depth in. (mm)	V-Groove Root Radius/Flat in. (mm)	V-Groove Mic Over Wires in. (mm)	ANSI Thread Wire Size in. (mm)
~~Depth/MOW~~ Tolerance	±0.0002 (±0.005)	±0.0002 (±0.005)	±0.~~0002~~005 (±0.~~005~~127)	±0.0002 (±0.005)	±0.0002 (±0.005)
8-V Groove (line pipe)	0.095 (2.413)	0.095 (2.413)	0.0041 (0.104)	0.009915 (0.252)	0.072169 (1.8331)
$11^{1}/_{2}$ V Groove (line pipe)	0.0661 (1.679)	0.0661 (1.679)	0.0021 (0.053)	0.00666 (0.169)	0.050204 (1.2752)
8 Round Groove (casing and tubing)	0.0712 (1.808)	0.0712 (1.808)	0.0170 (0.432)	0.02004 (0.509)	0.072169 (1.8331)
10 Round Groove (tubing)	0.0556 (1.412)	0.0556 (1.412)	0.0140 (0.356)	0.01702 (0.432)	0.057735 (1.4665)

NOTE 8-V, 8 Round, 10 Round, $11^{1}/_{2}$ V. See Figure ~~36~~38.

Table ~~22~~21—Buttress Thread Height Groove Check Blocks

Buttress Casing	U-Groove Depth $4^{1}/_{2}$ in. to $13^{3}/_{8}$ in. (mm)	U-Groove Depth 16 in. to 20 in. (mm) [for 1st and 2nd plateaus]	
Buttress Thread Groove ($4^{1}/_{2}$ in. to $13^{3}/_{8}$ in.)	0.0620 (1.575)	—	—
Buttress Thread Groove (16 in. to 20 in.)	—	0.0578 (1.468) [for 1st plateau]	0.0662 (1.681) [for 2nd plateau]

NOTE 1 Size ranges: $4^{1}/_{2}$ in. to $13^{3}/_{8}$ in. and 16 in. to 20 in. See Figure ~~37~~39 and Figure ~~38~~40, respectively.

NOTE 2 Depth/MOW Tolerance: ±0.0002 (±0.005).

Table ~~23~~22—Thread Addendum Groove Check Blocks

60° Thread Forms	U-Groove Depth in. (mm)	60° V-Groove Depth in. (mm)	V-Groove Root Radius/Flat in. (mm)	V-Groove Mic Over Wires in. (mm)	ANSI Thread Wire Size in. (mm)
~~Depth/MOW~~ Tolerance	±0.0002 (±0.005)	±0.~~0002~~001 (±0.~~005~~025)	±0.~~0002~~005 (±0.~~005~~127)	±0.0002 (±0.005)	±0.0002 (±0.005)
8 Round Groove (casing and tubing)	0.05222 (1.326)	0.07120 (1.808)	0.0170 (0.432)	0.02004 (0.509)	0.072169 (1.8331)
10 Round Groove (tubing)	0.04108 (1.043)	0.05560 (1.412)	0.0140 (0.356)	0.01702 (0.432)	0.057735 (1.4665)

NOTE 8 Round and 10 Round. See Figure ~~35~~37.

Table 23—Tooth Width Standard

Label	S_f	L_f	T_d	T_a	T_h	T_w	S_{cr}	S_{rr}	L_{cr}	L_{rr}
	Stab Flank	**Load Flank**	**Tooth Dedendum**	**Tooth Addendum**	**Tooth Height**	**Tooth Width**	**Stab Crest Radius**	**Stab Root Radius**	**Load Crest Radius**	**Load Root Radius**
	deg	deg	in.	in.	in.	in.	in.	in.	in.	in.
	+/- deg	+/- deg	basic	(Ref)	+/- 0.0002	-0.0004	+/- 0.0025	+/- 0.0025	+/- 0.0025	+/- 0.0025
BC External, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0620	0.1000	0.0300	0.0080	0.0080	0.0080
BC Internal, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0620	0.0990	0.0080	0.0300	0.0080	0.0080
BC External, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0620	0.1000	0.0300	0.0080	0.0080	0.0080
BC Internal, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0620	0.0990	0.0080	0.0300	0.0080	0.0080

NOTE Refer to Figure 29 for an illustration of the symbols.

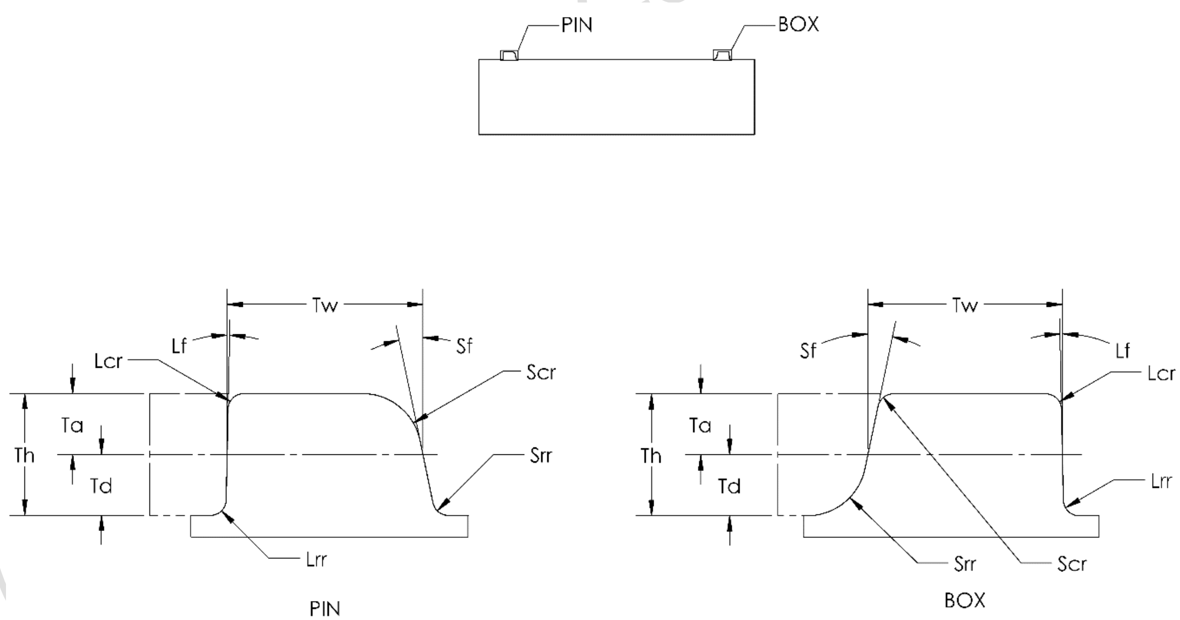


Figure 29—Tooth Width Standard Symbols

Table 24—GO/NO-GO Groove Width

Label	**S_f**	**L_f**	**T_d**	**T_a**	**T_h**	**T_w**	**S_{cr}**	**S_{rr}**	**L_{cr}**	**L_{rr}**
	Stab Flank	**Load Flank**	**Tooth Dedendum**	**Tooth Addendum**	**Tooth Height**	**Tooth Width**	**Stab Crest Radius**	**Stab Root Radius**	**Load Crest Radius**	**Load Root Radius**
	deg	deg	in.	in.	in.	in.	in.	in.	in.	in.
	+/- deg	+/- deg	basic	(Ref)	min / max	+/- 0.0002	+0.005	+0.005	-0.005	-0.005
Groove Width, GO										
BC External < 8-5/8, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0610	0.1002	0.0080	0.0080	0.0300	0.0080
BC External ≥ 8-5/8, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0610	0.1002	0.0080	0.0080	0.0300	0.0080
BC Internal, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0610	0.1012	0.0300	0.0080	0.0080	0.0080
BC External, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0610	0.1002	0.0080	0.0080	0.0300	0.0080
BC Internal, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0610	0.1012	0.0300	0.0080	0.0080	0.0080
Groove Width, NO-GO										
BC External, < 8-5/8, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0615	0.1028	0.0080	0.0080	0.0300	0.0080
BC External ≥ 8-5/8, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0615	0.1048	0.0080	0.0080	0.0300	0.0080
BC Internal, 0.750 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0615	0.1038	0.0300	0.0080	0.0080	0.0080
BC External, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0615	0.1048	0.0080	0.0080	0.0300	0.0080
BC Internal, 1.000 TPF	10.0000	3.0000	0.0310	0.0300	0.0400 / 0.0615	0.1038	0.0300	0.0080	0.0080	0.0080
NOTE Refer to Figure 30 for an illustration of the symbols.										

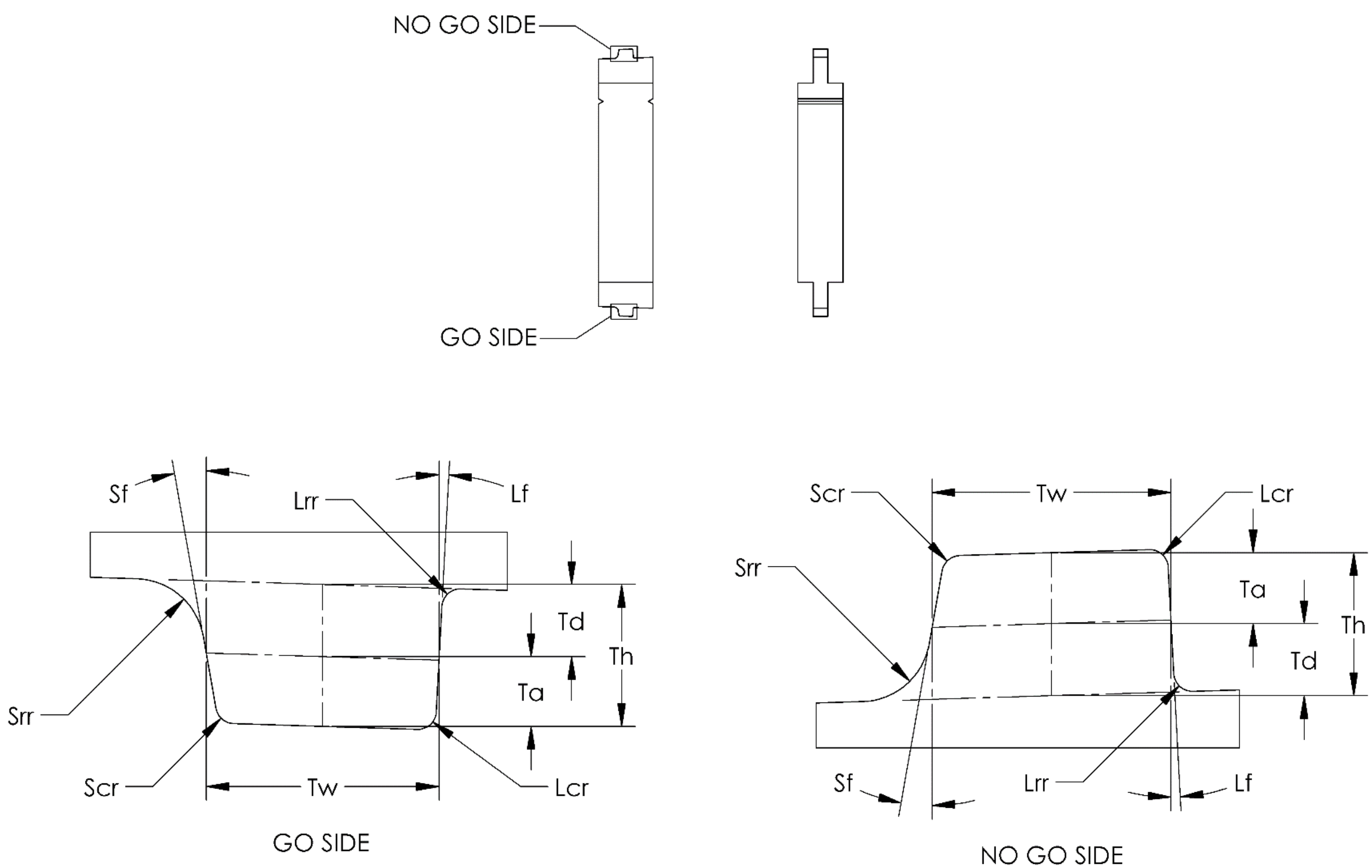


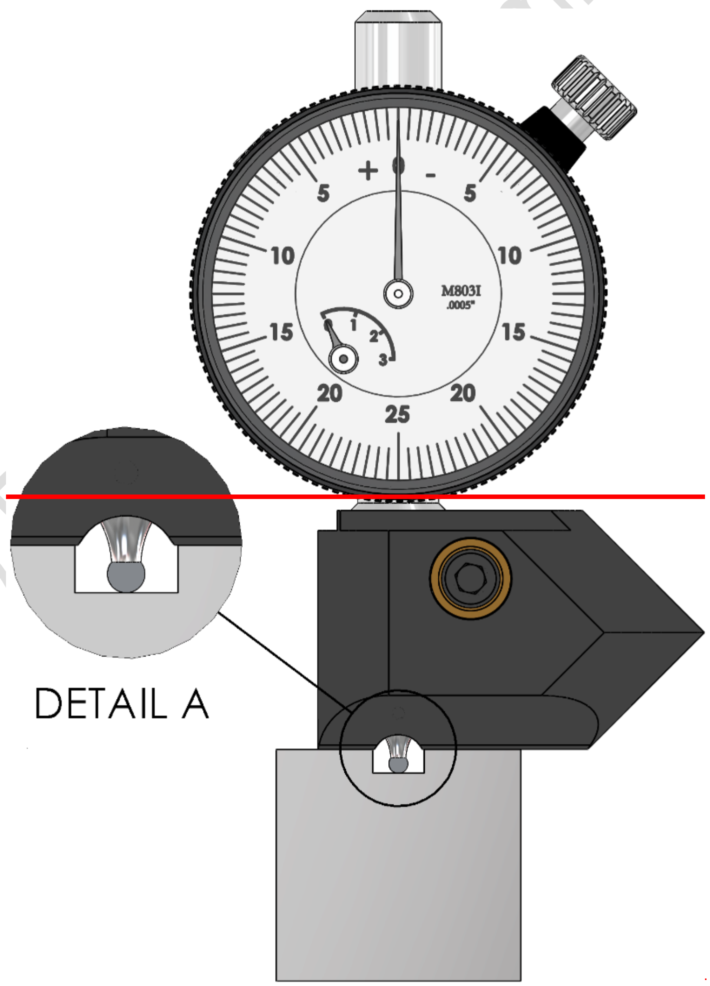
Figure 30—GO/NO-GO Groove Width Symbols

5.5.5 Adjustments

Gauges shall be adjusted when applied to the U-groove (see 5.5.4) 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 register, the contact point has probably become worn or damaged and shall be replaced. For thread height gauges of the type illustrated in Figure ~~30~~32 and Figure ~~31~~33, 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.

5.5.6 External Threads and Internal Threads Procedure

The thread height gauges of the type illustrated in Figures ~~29~~31–~~34~~36, and Figures ~~39~~41–~~44~~46 shall be used for the external and 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.



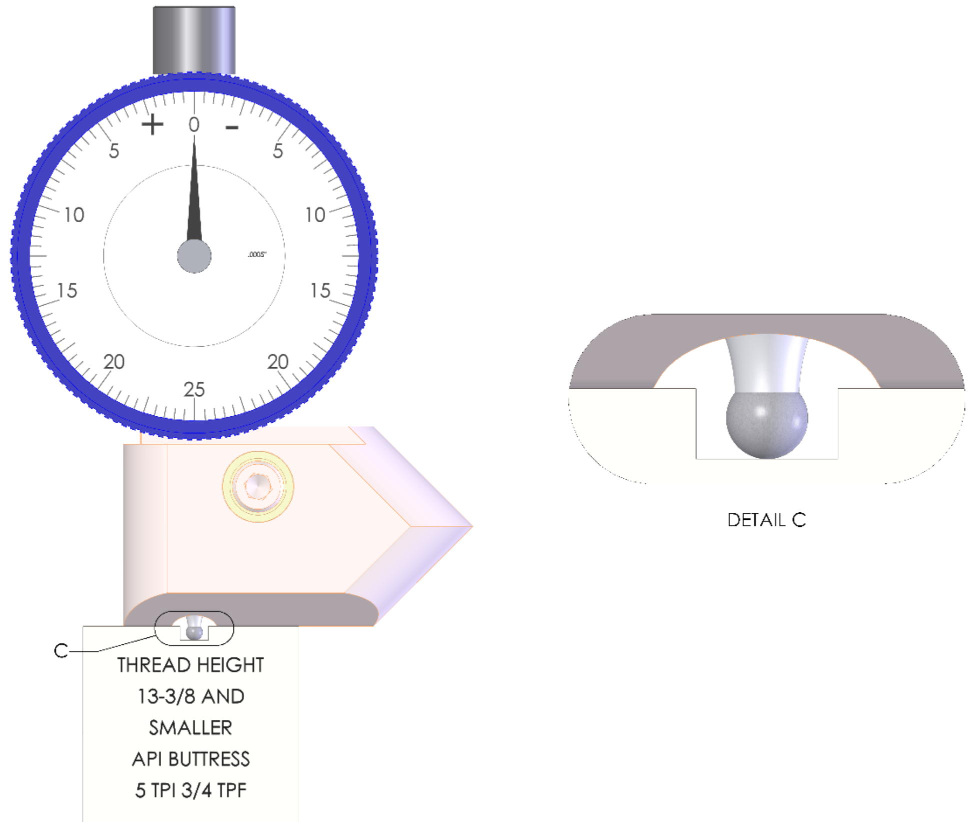


Figure ~~29~~31—~~Internal~~External Thread Height Gauge on Setting Standards (Buttress Thread Height Gauge on Block)

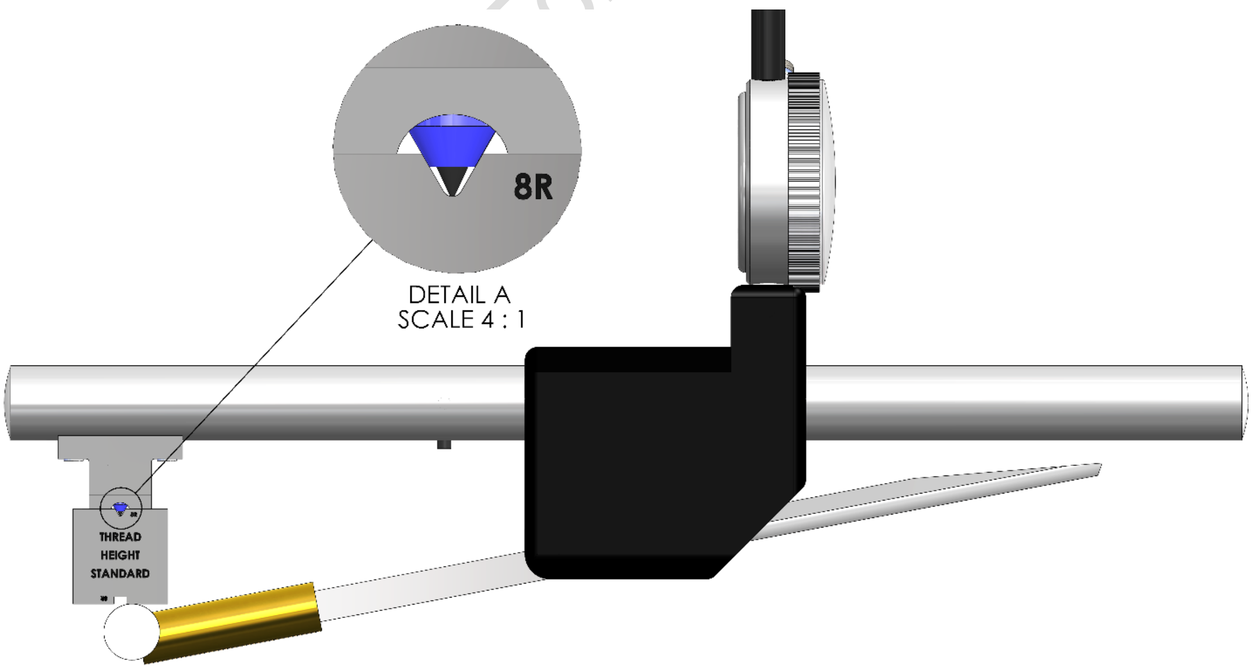


Figure ~~30~~32—Internal Thread Height Gauge on Setting Standards (8R and 10R Thread Height Gauge on Block)

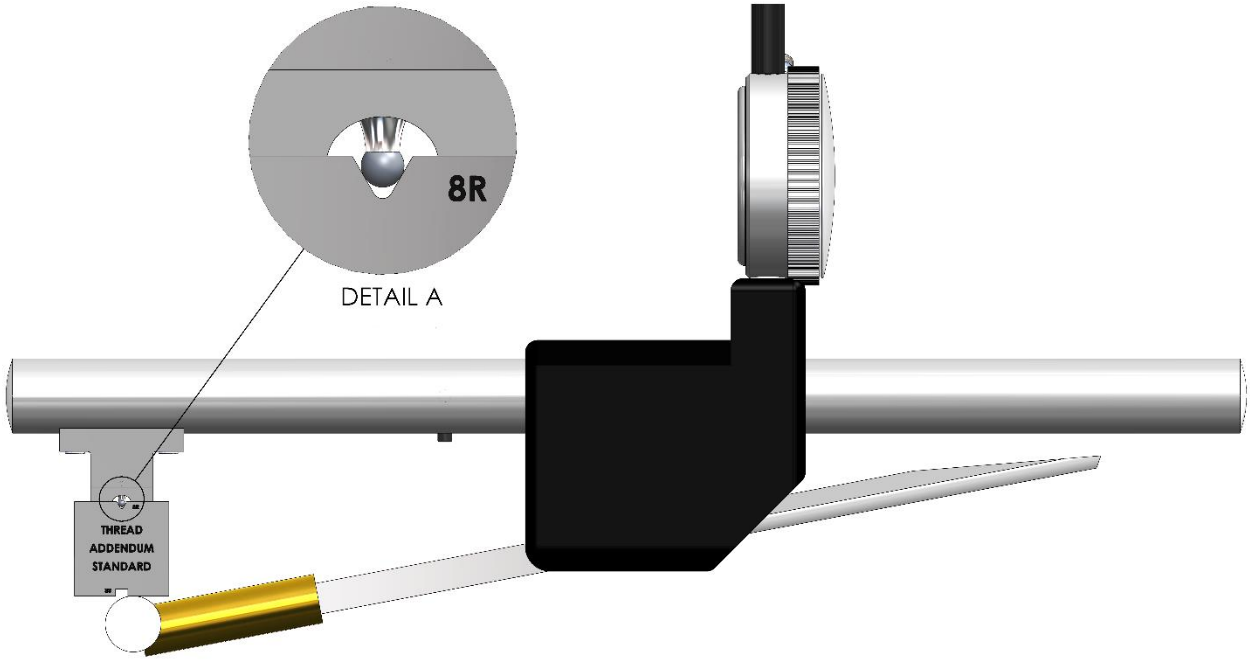


Figure ~~31~~33—Internal Addendum Gauge on Setting Standards (8R and 10R Addendum Gauge on Block)

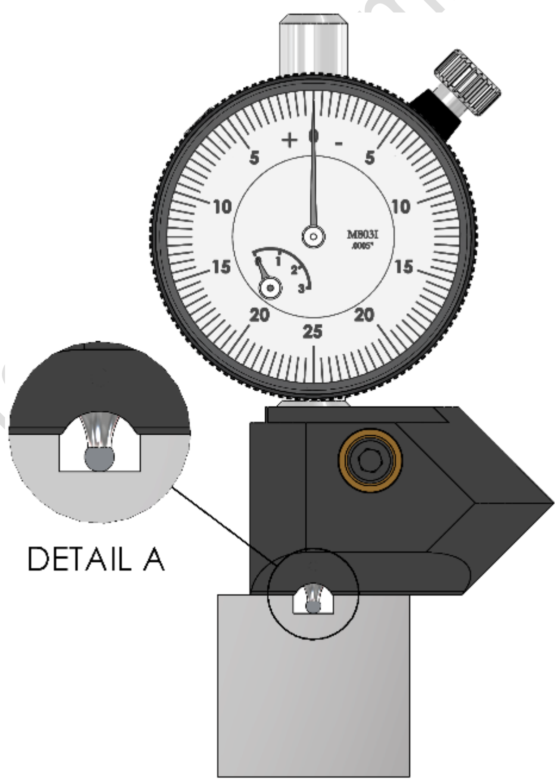


Figure ~~32~~34—External Thread Height Gauge on Setting Standards (Buttress Thread Height Gauge on Block)

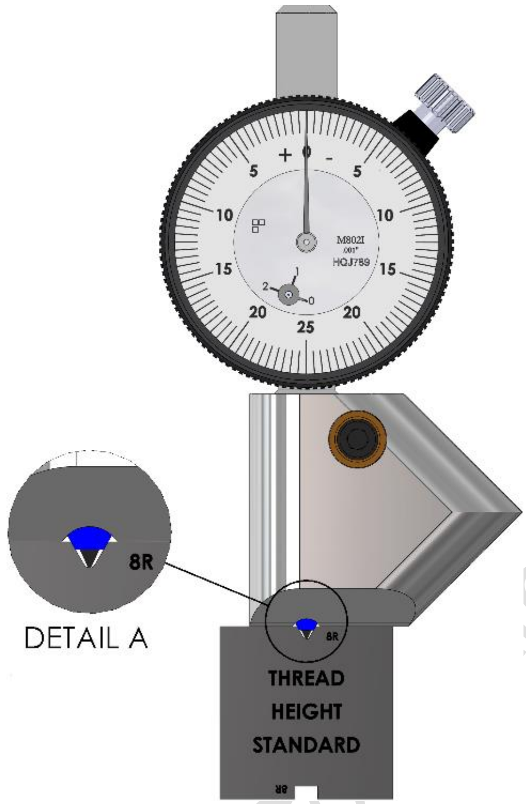


Figure ~~33~~35—External Thread Height Gauge on Setting Standards (8R and10R Thread Height Gauge on Block)

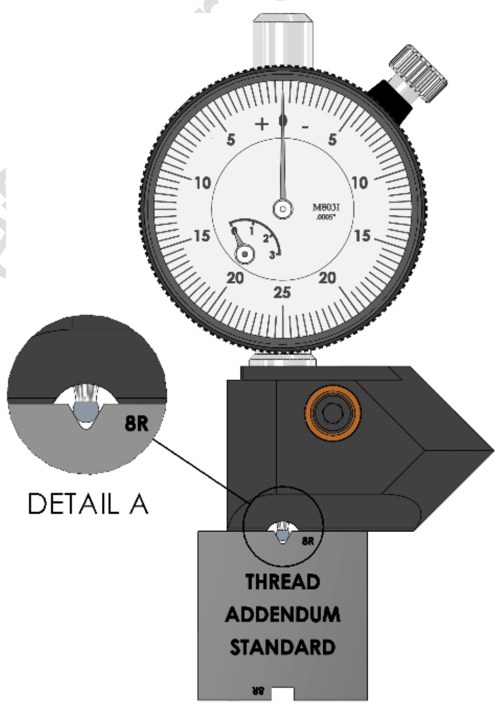


Figure ~~34~~36—External Addendum Gauge on Setting Standards (8R and 10R Addendum Gauge on Block)

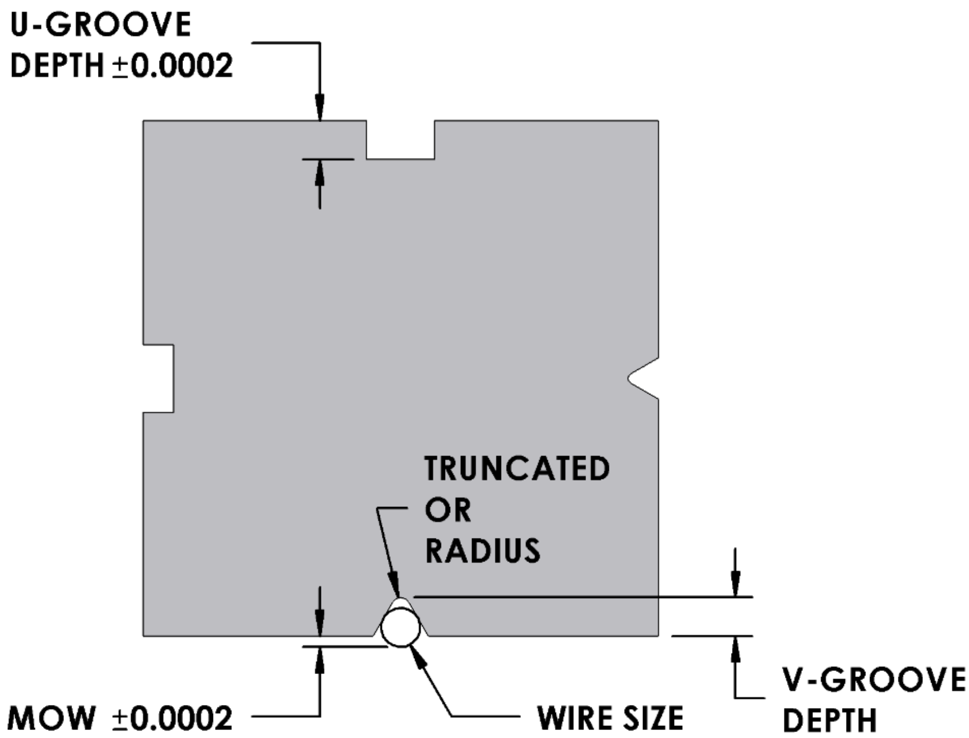


Figure ~~35~~37—~~Round Thread Height Gauge Setting Standard (~~Thread Addendum Gauge Setting Standard~~)~~

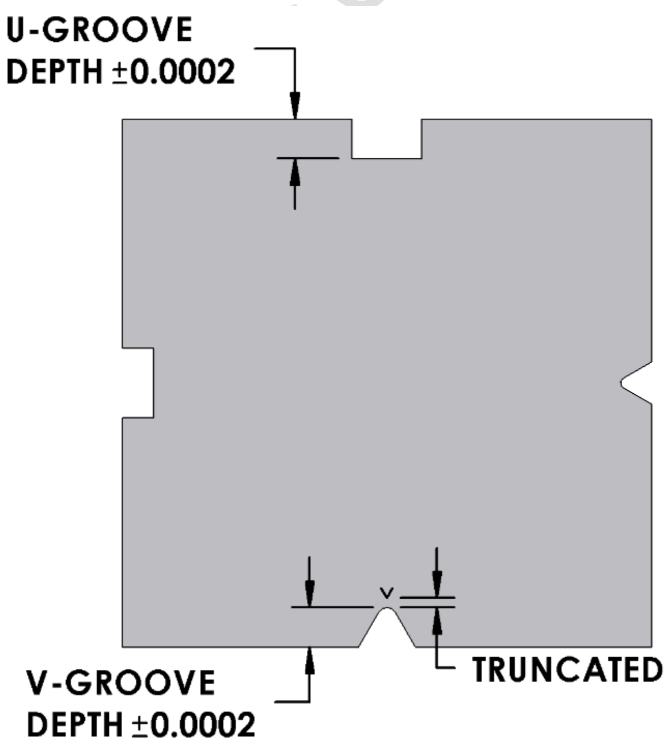


Figure ~~36~~38—Round Thread Height Gauge Setting Standard (Thread Height Standard)

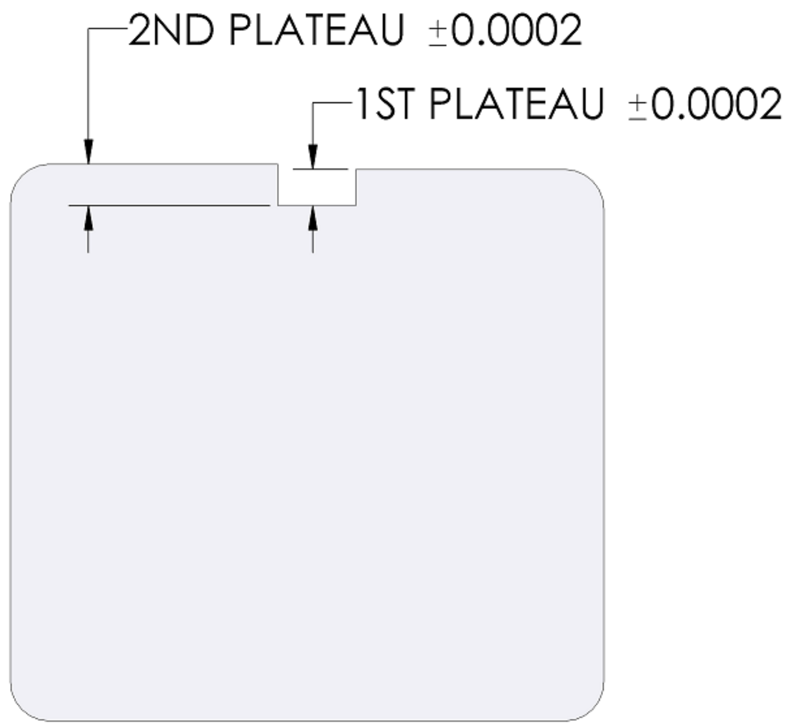


Figure ~~37~~39—Buttress Height Gauge Setting Standard (1 in. TPF Buttress Thread Height Standard)

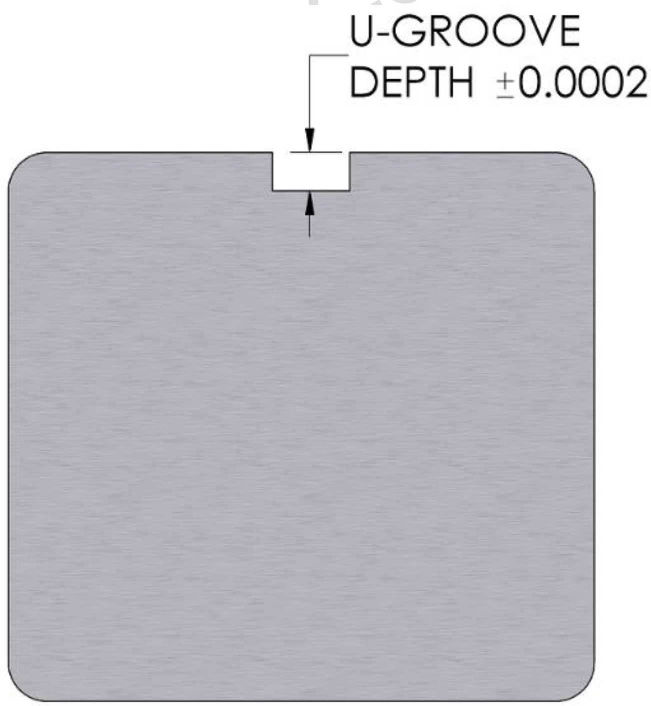


Figure ~~38~~40—Round Thread Height Gauge Setting Standard ($^3/_4$ in. TPF Buttress Thread Height Standard)

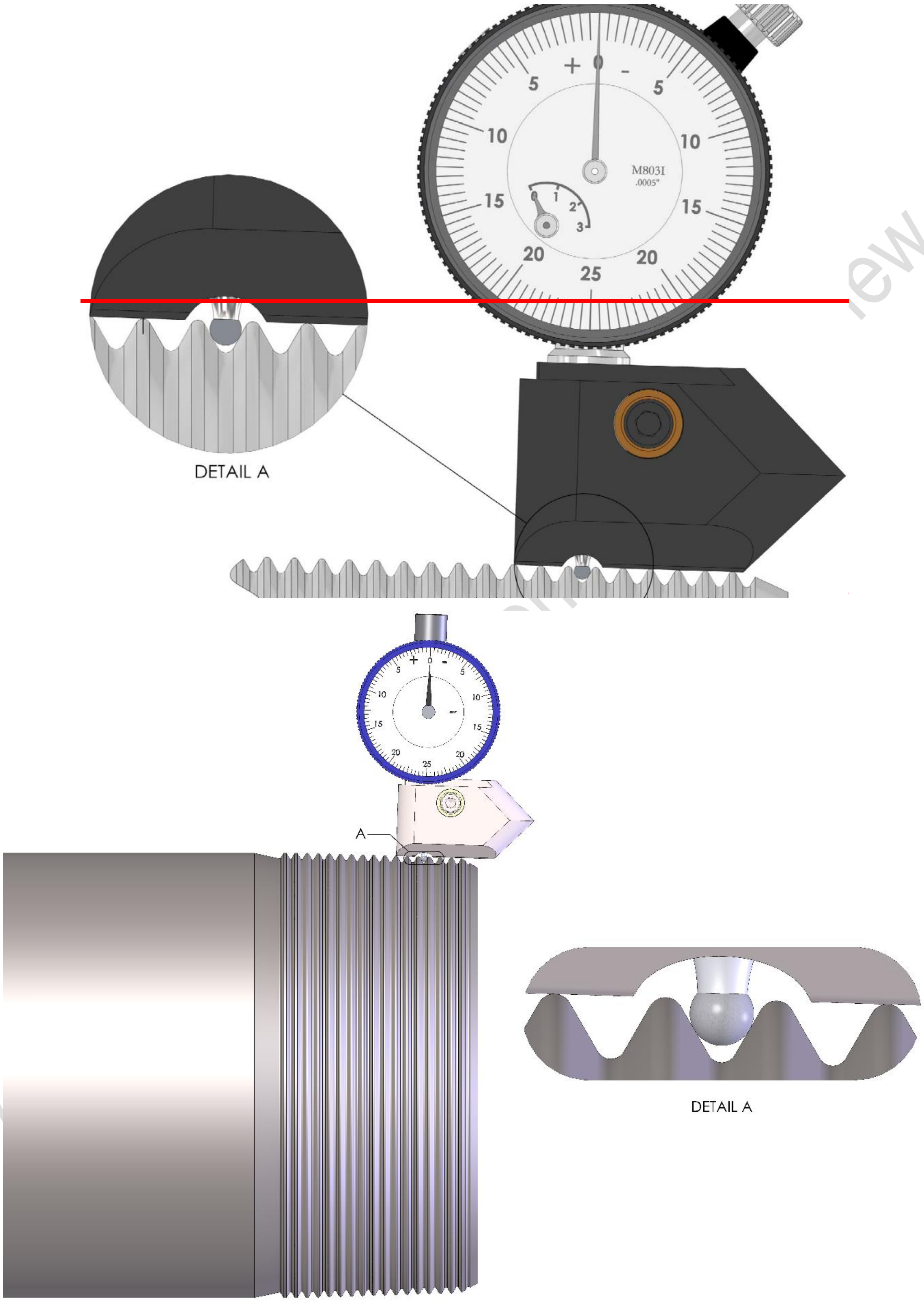


Figure ~~39~~41—External Addendum Gauge on Pin Threads (Round Thread Addendum Gauge)

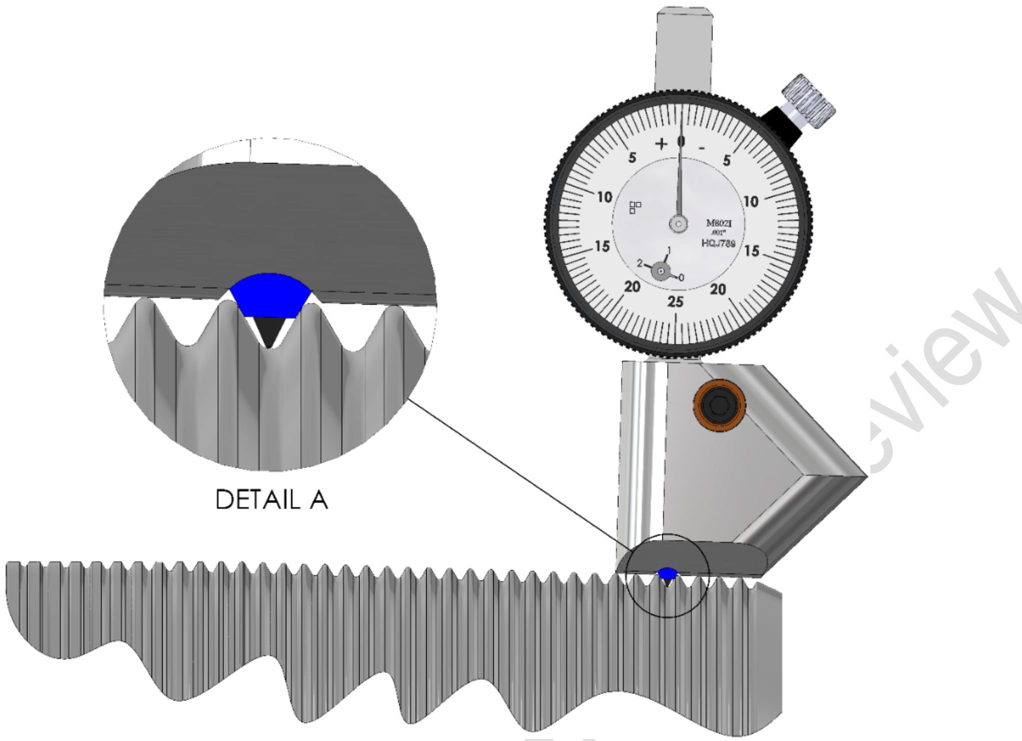


Figure ~~40~~42—External Thread Height Gauge on Pin Threads (Round Thread Height Gauge)

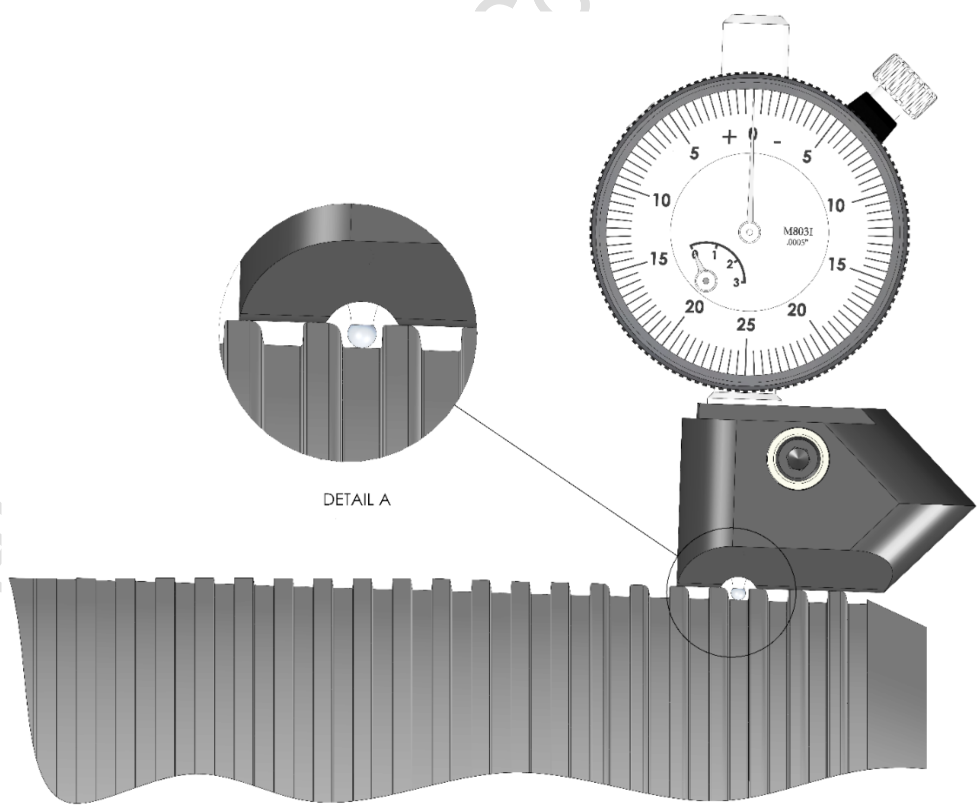


Figure ~~41~~43—External Thread Height Gauge on Pin Threads (Buttress Thread Height Gauge)

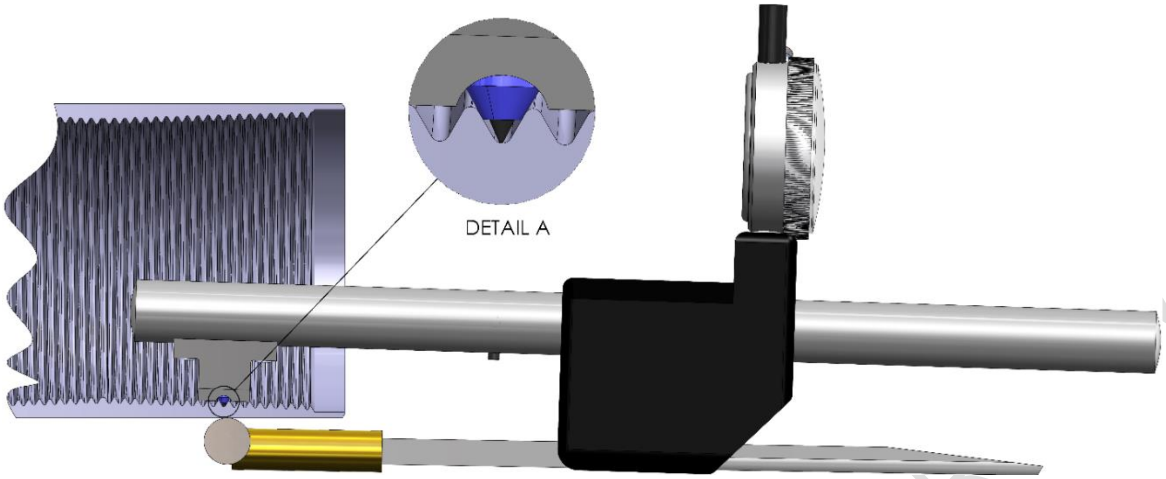


Figure ~~42~~44—Internal Thread Height Gauge on Coupling Threads (Round Thread Height Gauge)

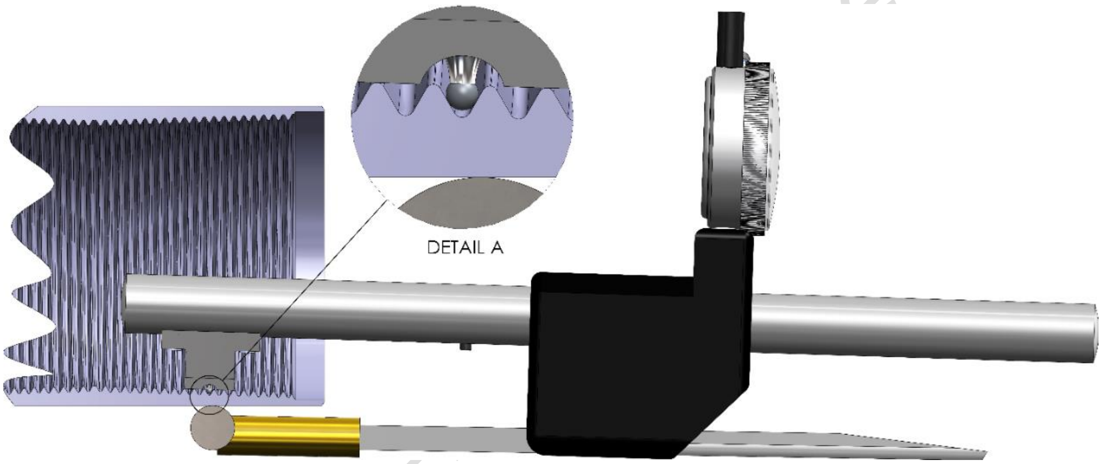


Figure ~~43~~45—Internal Addendum Gauge on Coupling Threads (Round Thread Addendum Gauge)

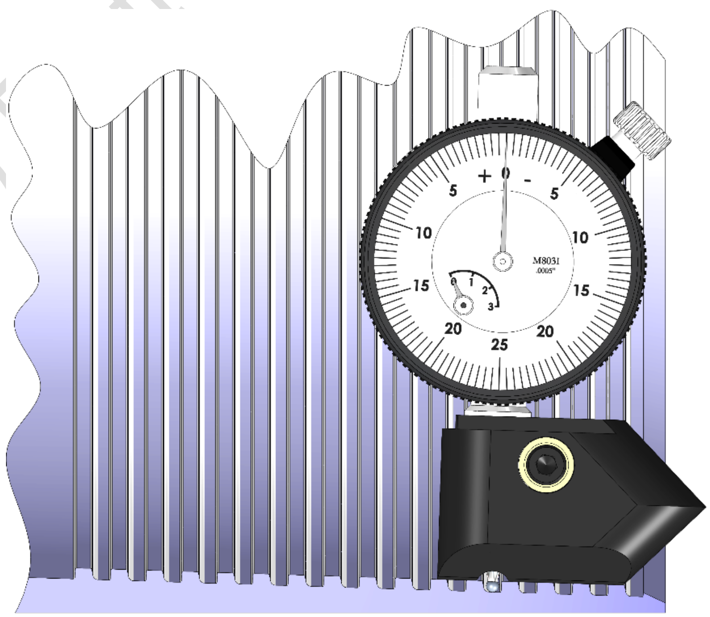


Figure ~~44~~46—Internal Thread Height Gauge on Coupling Threads (Buttress Thread Height Gauge)

5.6 Angle and Thread Form Measurement

5.6.1 General

The following criteria are applicable to thread angle and form.

— 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.

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

5.6.2 Angle and Form Measurement (Profile Projector or Equivalent)

Thread form shall be assessed with an Optical Comparator/Profile Projector or equivalent form assessment device. A thread form master overlay, physical or digital, of known accuracy is required. Thread angles shall be measured with an Optical Comparator/Profile Projector or equivalent precision angle measuring device. Equivalent methods may include (but are not limited to) threads that are measured with a laser measurement system with demonstrated accuracy, optical measurement system with demonstrated accuracy or a properly calibrated precision thread contour measuring machine.

5.6.3 Procedure

The angles of the uncoated thread shall be verified and assured that the complete thread form is within tolerance.

5.6.4 Requirements

For 60-degree threads, thread form requirements include the limitations imposed by the requirements on height of thread, thread addendum, and included angle or individual flank angles. For buttress threads, the thread form shall conform to the basic dimensions within the tolerances of Figure 2 and Figure 3 including the requirements of thread height, included flank angles, tooth thickness, or groove width. The following are examples of acceptable methods of measuring tooth thickness: ~~Single dial~~buttress tooth thickness gauge, Go/No-Go groove width, optical comparator~~,~~ or contour measuring machine~~,~~ directly or in conjunction with cast molds. The quality of workmanship required for acceptance under these specifications automatically prohibits the presence of such defects in thread form as torn threads, shaved threads, broken threads, and distorted threads that fall outside thread form requirements. Such imperfections may be detected, while at the same time measuring flank angles. Angular, as well as linear, assessments of the defects shall be determined by comparing the thread profile image with that of a toleranced thread overlay (Figure ~~45~~47 and Figure ~~46~~48) or by direct measurement.

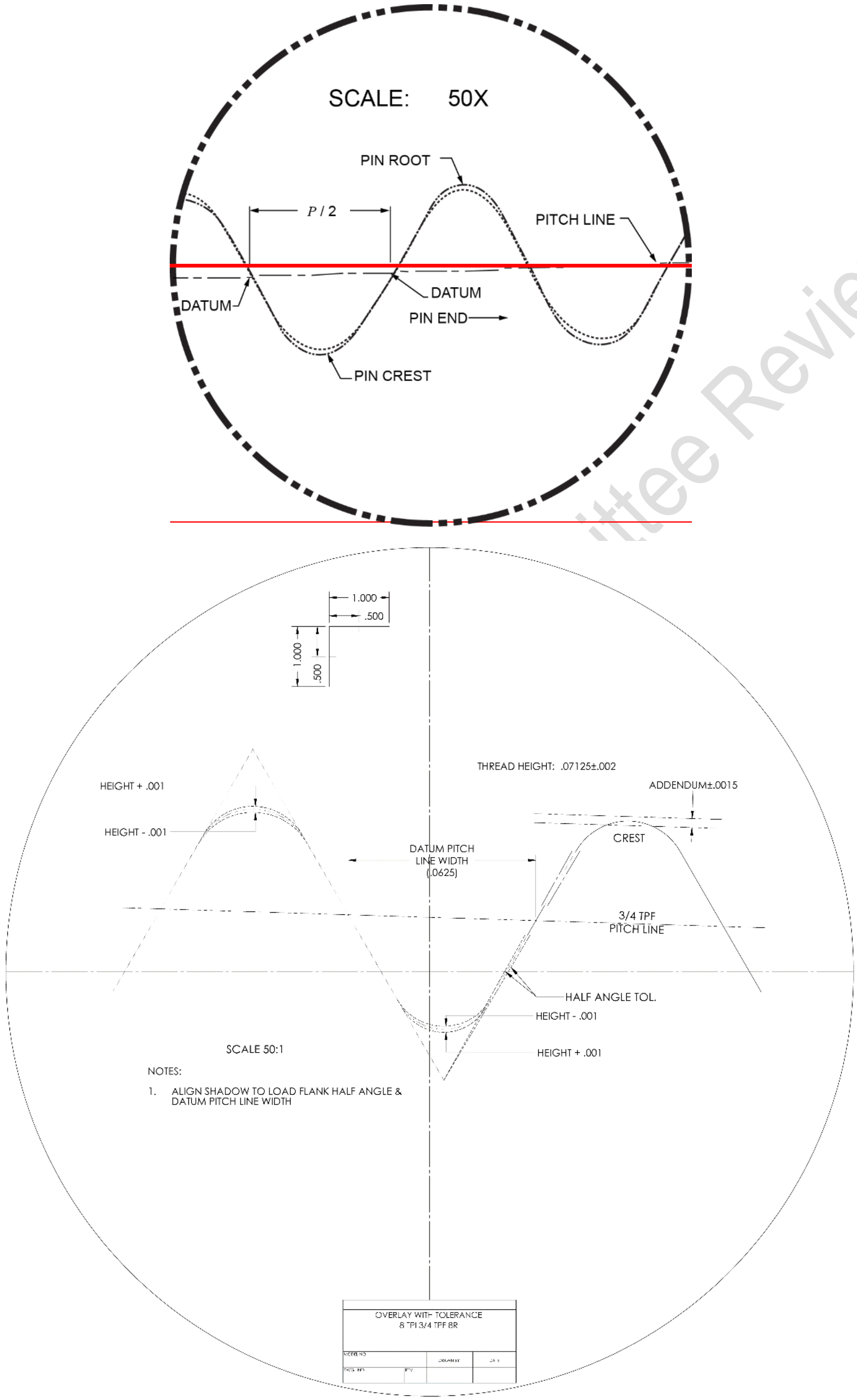


Figure ~~45~~47—External Thread Form Overlays for 8 Round Threads

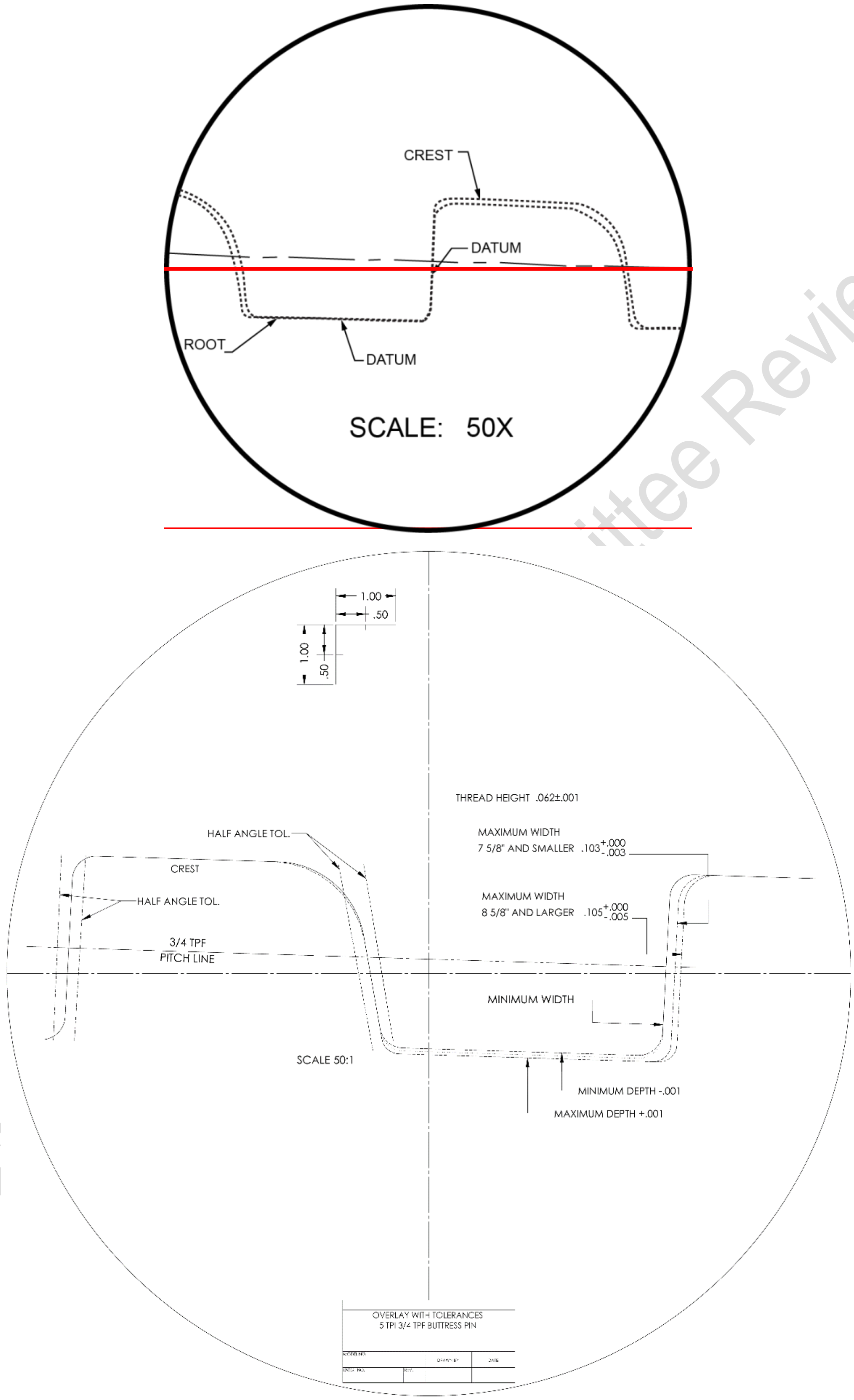


Figure ~~46~~48—External Thread Form Overlays for Buttress Threads

5.7 ~~Single Dial Buttress Thread Form Gauge~~Buttress Tooth Thickness Gauge

5.7.1 General

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 gauge shall be ball pointers of 0.087 in. (22.1 mm) diameter truncated 0.023 in. (0.58 mm)~~Contact points of diameter 0.087 in. (2.21 mm) and truncated 0.023 in. (0.58 mm) shall be used for datum off crest style instruments as seen in figure. The contact points for the tooth thickness gauge shall be ball type, all of equal diameter, in the range of available nominal sizes 0.062 in. (1.57 mm) to 0.072 in. (1.83 mm) as listed in Table ~~18~~17 for datum off root style. Before use, the dial indicator shall be adjusted to zero using a setting standard.

5.7.2 Procedure

After the gauge is properly verified against the setting standard, place the point of the gauge in the thread groove starting at the small diameter. With the anvil of the gauge contacting the thread root or crests (always over full crested threads), pivot the gauge 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 maximum indication (which may be 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~~tooth thickness gauge tolerances from zero setting are illustrated in Figure ~~47~~49 and Figure ~~48~~50, and a Go-no/Go- fixed limit gauge as shown in Figure ~~49~~51. In case of dispute, actual measurement shall govern.

With the anvil contacting shown in Figure ~~48~~50, contacting the thread crests or the contacts shown in Figure ~~47~~49, contacting the root.

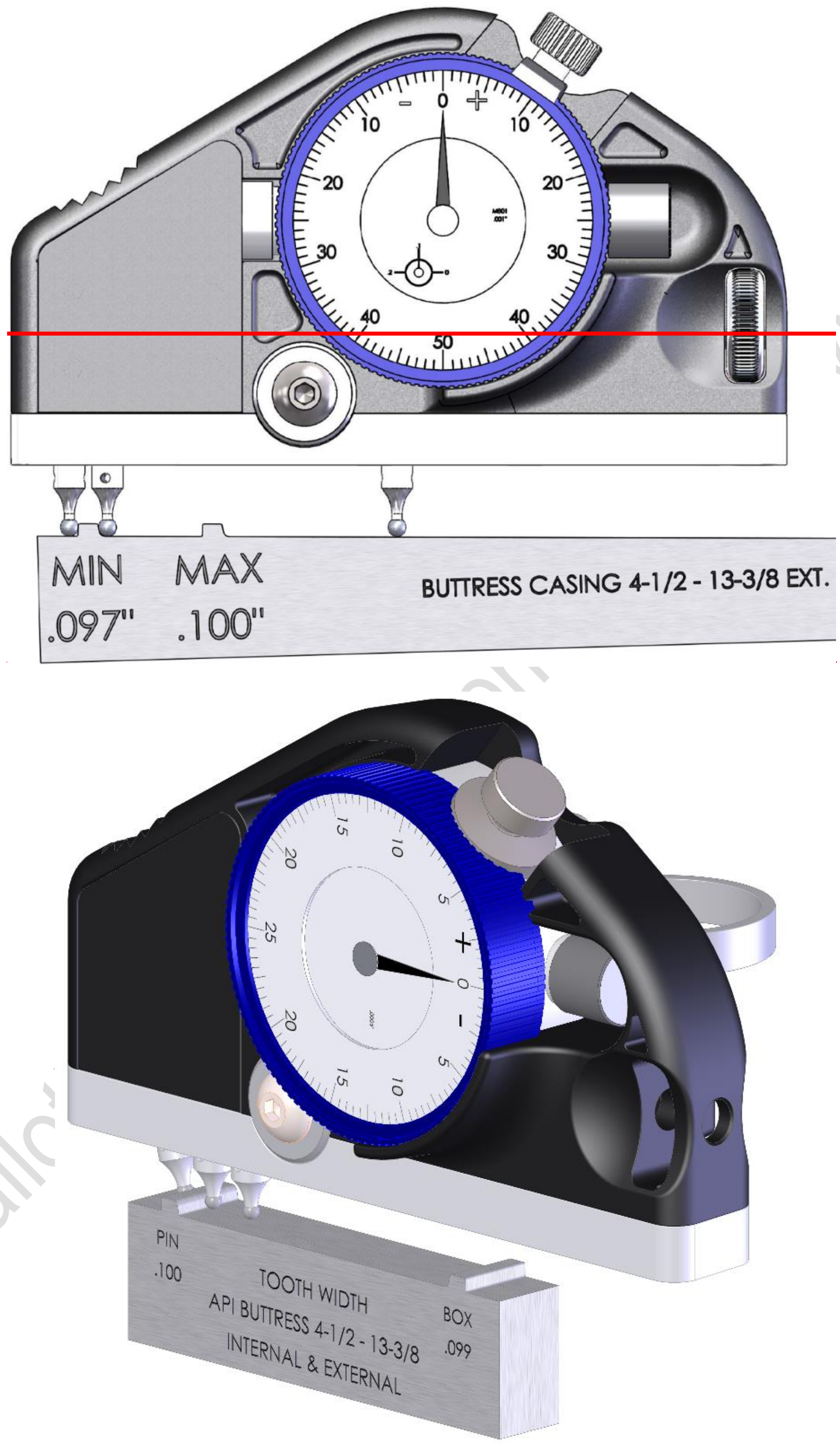


Figure ~~47~~49—Buttress Tooth Width Gauge (Measured from Thread Root)

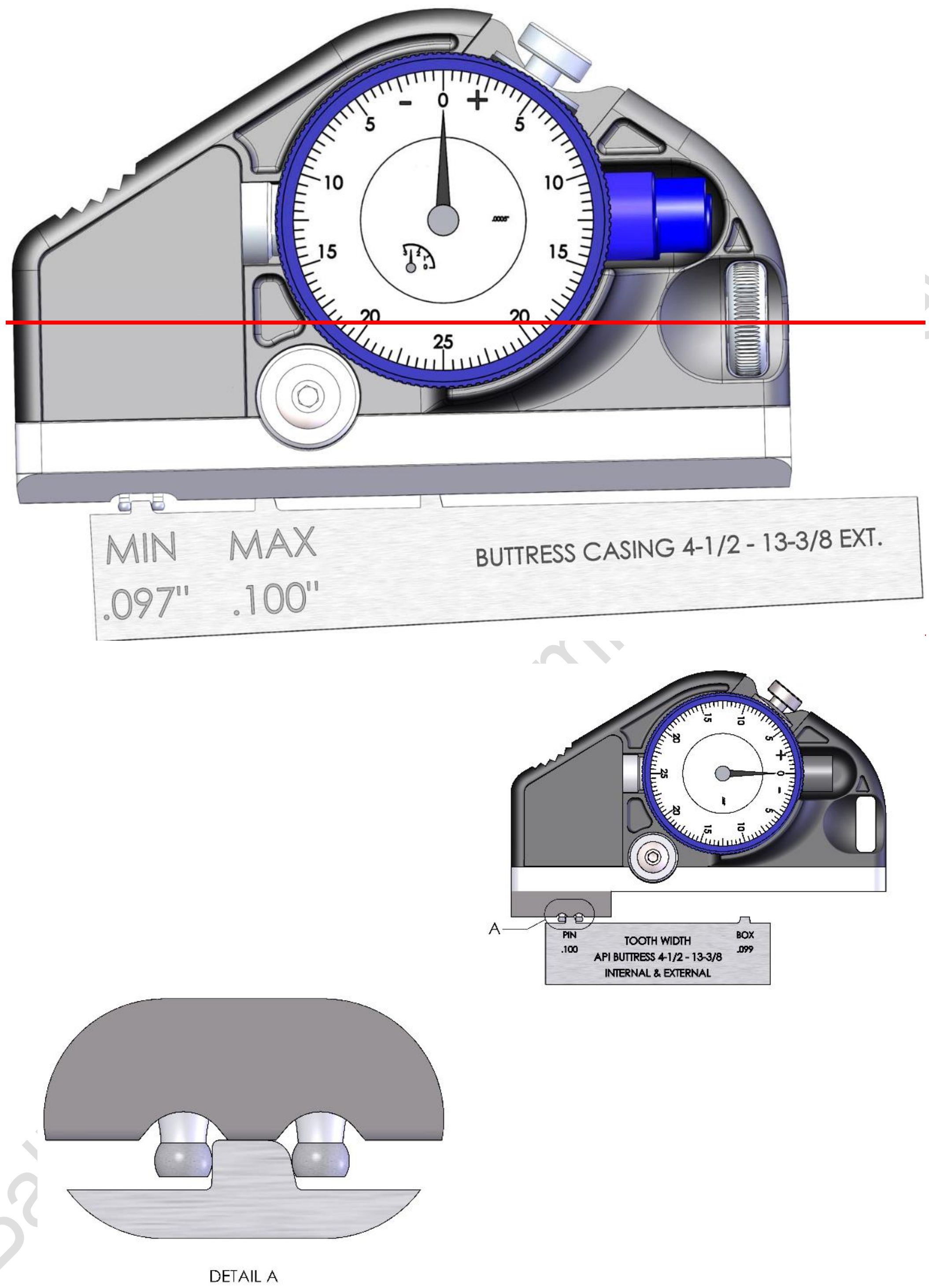


Figure 4850—Buttress Tooth Width Gauge (Measured from Thread Crest)

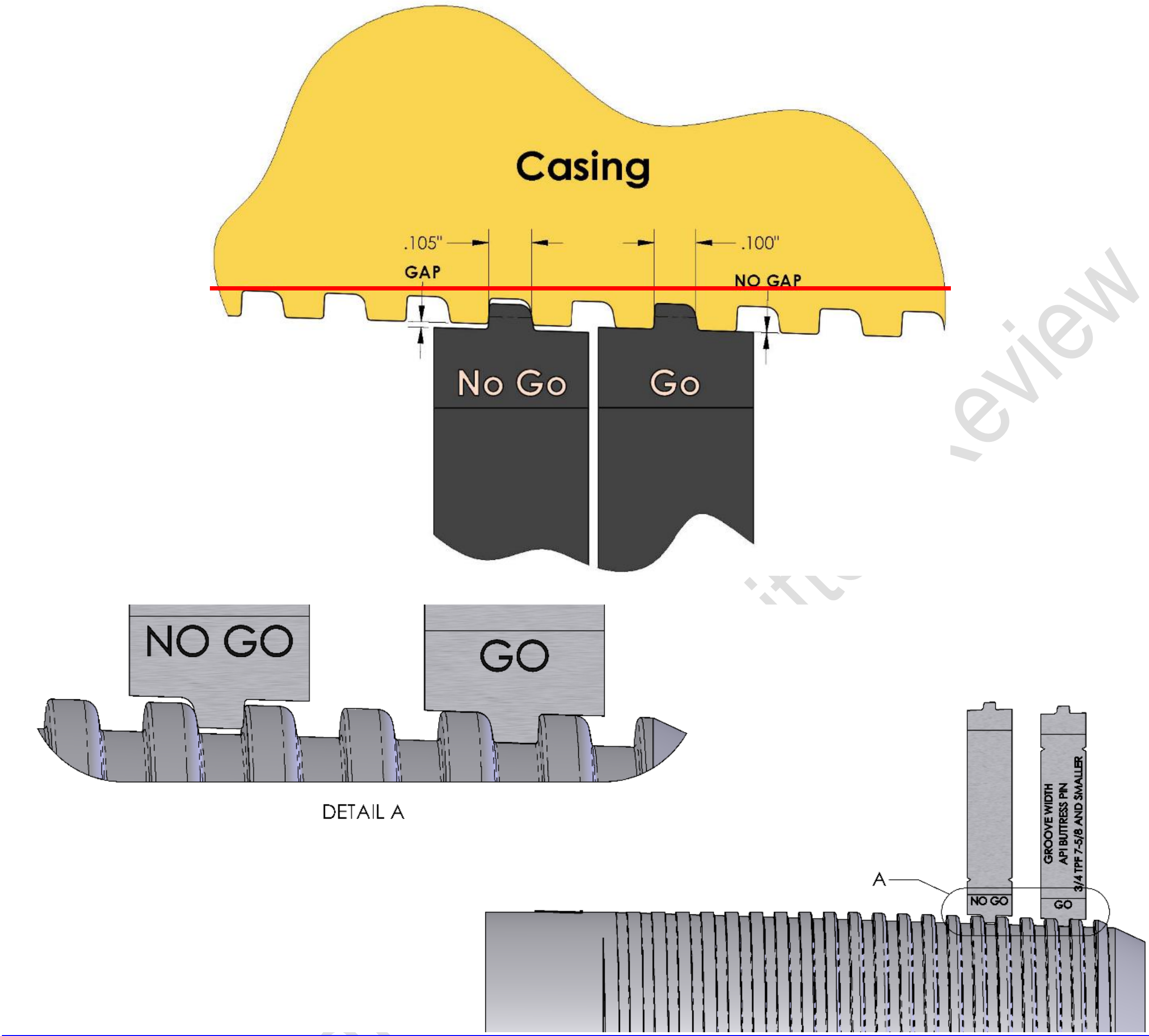


Figure ~~49~~51—Buttress Groove Width Gauge

5.8 Coupling Thread Alignment

5.8.1 General

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

5.8.2 Equipment

~~Concentricity and a~~Alignment of coupling threads may be measured ~~with~~according to the following~~ types of equipment~~:

~~a) Figure 50 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)~~a) Figure 51 is an example of a coupling-thread alignment gauge. The contact points utilized on thread alignment gauges of this type shall be as follows:

1) Line pipe, round thread casing and tubing shall be the same as those as shown in 5.4.2 for the lead gauge.

2) Ball point diameter of 0.100 in. (2.54 mm) truncated 0.030 in. (0.76 mm) shall be used for buttress casing threads.

   i) The ball points shall be inserted in the thread grooves an equal distance on either side of the J area but not less than $2J + 2$ thread turns apart parallel along the centerline axis of the coupling as shown in Figure 52 and Figure 53.

   ii) The ball points shall then be rotated one turn while positioned in the thread grooves.

b) The maximum sweep of the dial gauge indicator (space between the maximum and minimum indications) shall not exceed the amount determined by the equation below (also see API 5B1 for an informative annex which contains a chart to correlate maximum sweep values to the permissible angular misalignment):

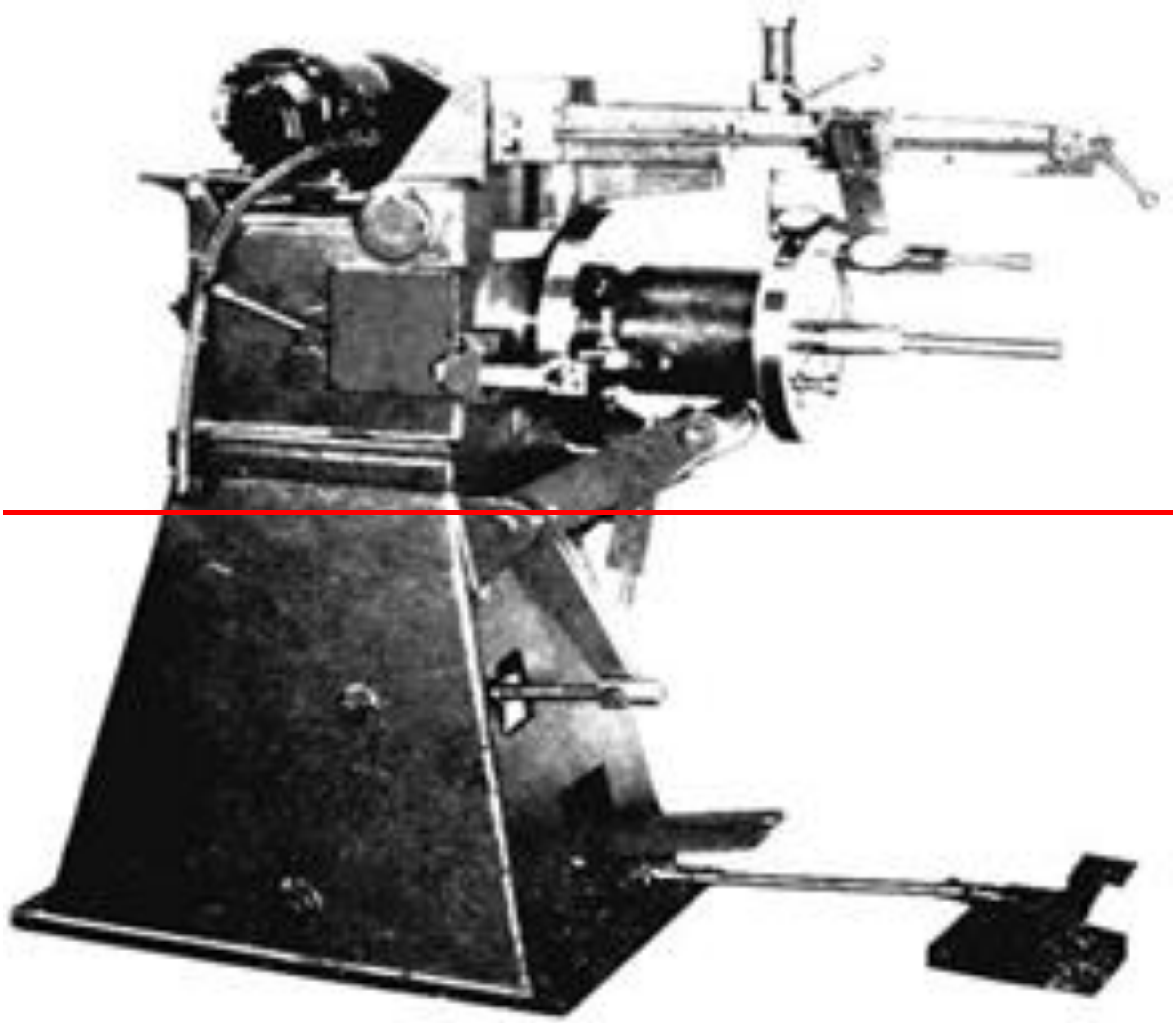
$$R = EA/240 \qquad (2)$$

where

A is the maximum allowable misalignment in 20 ft (6.1 m) (see 4.10);

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

R is the maximum permissible sweep of the dial gauge indicator.



~~**Figure 50—Equipment for Measuring Coupling Alignment and Concentricity**~~

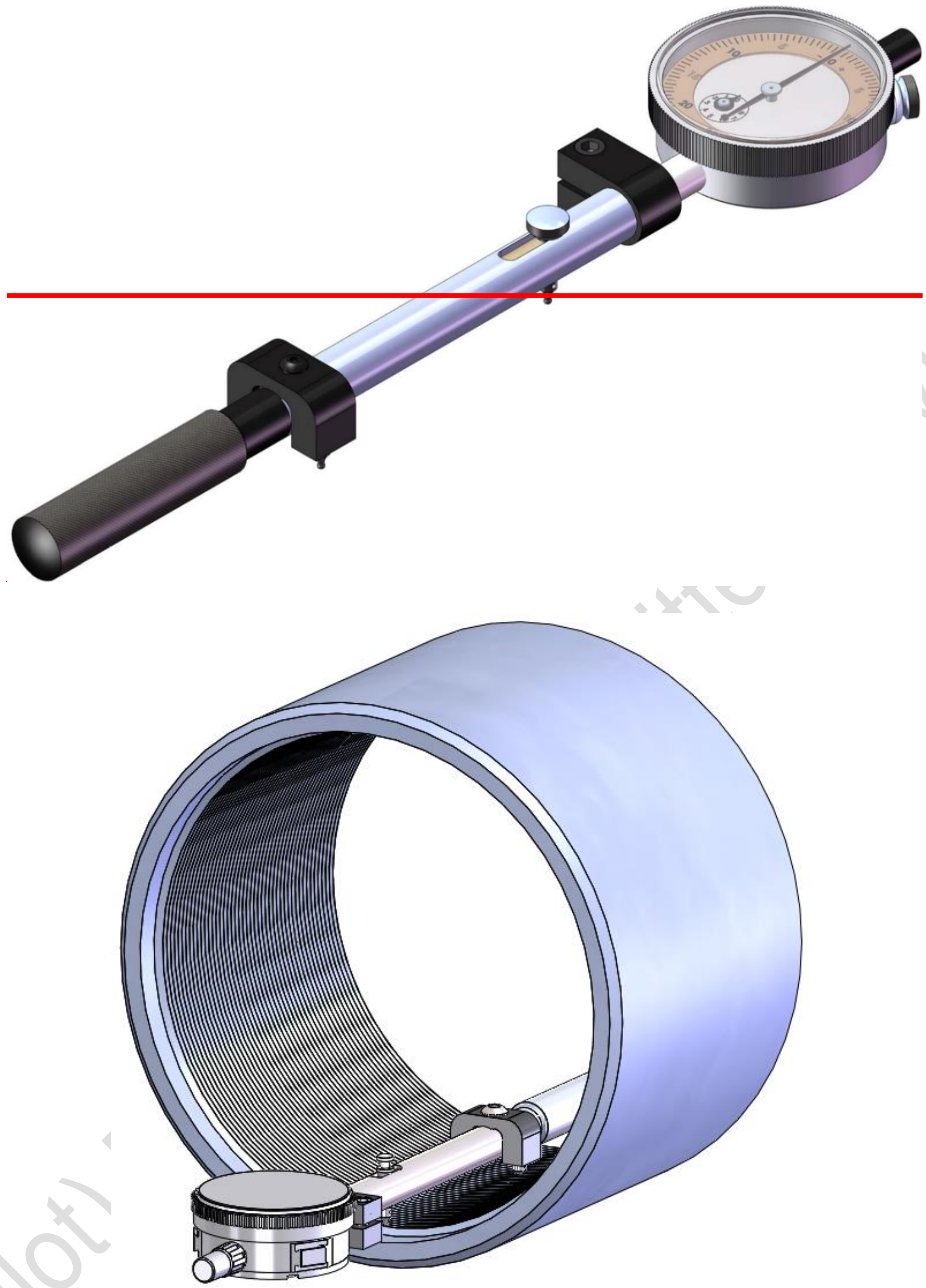


Figure 51—Coupling Alignment Gauge

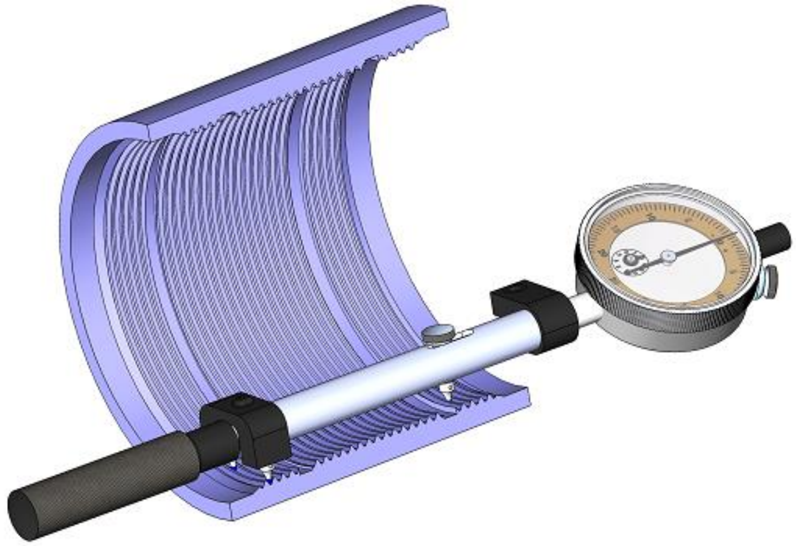


Figure 52—Coupling Alignment Inspection

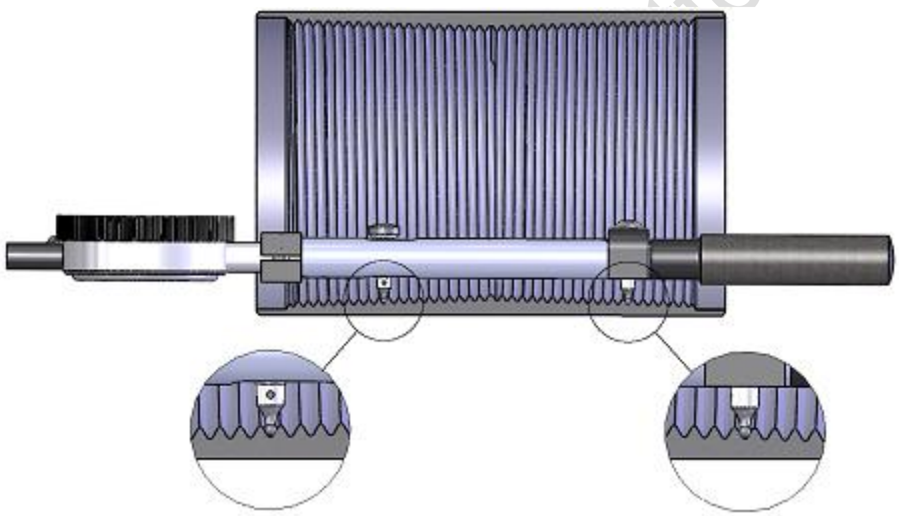


Figure 53—Coupling Alignment Inspection (Detail)

5.9 Calibration of Instruments and Dial Gauges

5.9.1 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.

5.9.2 The accuracy of lead gauge standard templates, height gauge check blocks and crest cone standards should be verified in an approximately 68 °F (20°C) environment by ~~a means~~an instrument that assures a measurement precision no greater than 25 % of the allowable tolerance for the dimension being measured or an instrument with a resolution equal to 0.00005 in. (0.00127 mm) or better. 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 ~~19~~18 and 5.4.3. The groove dimensions for height check blocks are given in Table ~~21~~20 and Table ~~22~~21, and 5.5.4.

5.9.3 Calibrate dial gauges by a method with a resolution of 0.0001 in. (0.003 mm). Following are some examples of acceptable calibration instruments:

— toolmaker's microscope

— universal measuring microscope

— precision screw micrometer reading in increments of 0.0001 in. (0.003 mm)

— precision gauge blocks

— precision linear-measuring machine

5.9.4 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 as shown in Table ~~24~~25:

Table ~~24~~25—Dial Gauge Error Check

Dial Range in. (mm)	Max Error 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)

5.9.5 Frequency of Calibration

Verify calibration of dial gauges at frequent intervals throughout the entire range of plunger travel when received, and after they have been dropped, subjected to unusual shocks, or other conditions which might affect the accuracy of precision measuring instruments. Intervals shall be no less than once per year or more often as required by internal quality management systems. The calibration interval shall start when the gauge is placed into service after calibration~~However, if the dial gauge is not used in the 1-year period, calibration is not required until subsequent future usage~~.

6 Diameter, Ovality, and Size 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 requirements specified herein. Accordingly, a manufacturer who produces products using the threads covered by this Specification shall have access to setting standards for thread diameter gauges and shall have access to master size gauges for each size and type of thread produced. Setting standards for thread crest diameter gauges conform to the requirements of Section 7. Master size gauges consists of a plug and mating ring conforming to the requirements of Section 7 and certified as required in Section 8.

Gauges made under API 5A, 5AX, or 5L prior to 1962 may be used provided proper allowance is made for deviations from the requirements of Section 5. ~~See 6.1.15 regarding line pipe gauges made prior to 1940.~~

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 size gauge is assembled on a product thread.

6.1.2 Gauge Requirements

The manufacturer of product threads shall also provide working gauges for the measurement of crest diameter, addendum, ovality, and size, conforming to the requirements of 7.1.2 for use in gauging the product threads, and shall maintain each working gauge 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 on each gauge and setting standard(s) used in the production of API threads. Included in this program shall be detailed procedures for the measurement of wear, and the criteria of rejection that will result in the complete decommissioning of gauges, or setting standards from future use, or a combination thereof. The results of each required measurement shall be documented. The records of procedures used and measurements made, shall be maintained for not less than ~~three~~five 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 the controls of the specific manufacturing process.

6.1.3 Crest Diameter Locations

For product threads in this specification that require measurement of crest diameter, the location of the crest diameter on pins (the major cone) is defined as the diameter of the crest cone C_{10} at the L_{10} length and on couplings (the minor cone) is defined as the diameter of the crest cone C_{12} at the M_{12} length. On buttress casing pipe, as many as two threads within the L_c length may be showing the original outside surface of the pipe on their crests for a circumferential distance not exceeding 25 % of the pipe circumference. Because these black-crested threads may extend into the L_{10} gauging length, measurements shall be made with a minimum of 50 % of the measuring shoe located on full-crested threads. For crest diameter measurements made at locations other than L_{10} length and M_{12} length, corresponding setting values shall be appropriately adjusted.

Gauge systems in existence prior to the 16th Edition of API 5B may be utilized. Crest diameter measurements may be made at locations other than L_{10} length and M_{12} length if the corresponding setting values are appropriately adjusted using nominal taper; setting standards shall also comply with the marking and tolerancing requirements in 7.1.11. In case of dispute, acceptance or rejection shall be made with measurements at L_{10} and M_{12} lengths, provided the gauge shoes ride on full-crested threads.

6.1.4 Thread Diameter Gauge Requirements

Thread diameter gauges, conforming to the requirements of Section 7 and certified as required in Section 8, may be of a particular type (mechanical, dial indicator, optical, laser or equivalent) capable of thread crest diameter measurements, or thread pitch diameter measurements at the L_{10} or M_{12} planes, or both, with a demonstrated measurement precision of 0.001 in. (0.0254 mm) or better. See Figures 54 ~~and Figure 55~~to 57 for ~~an~~ illustrations of the gauge's location.

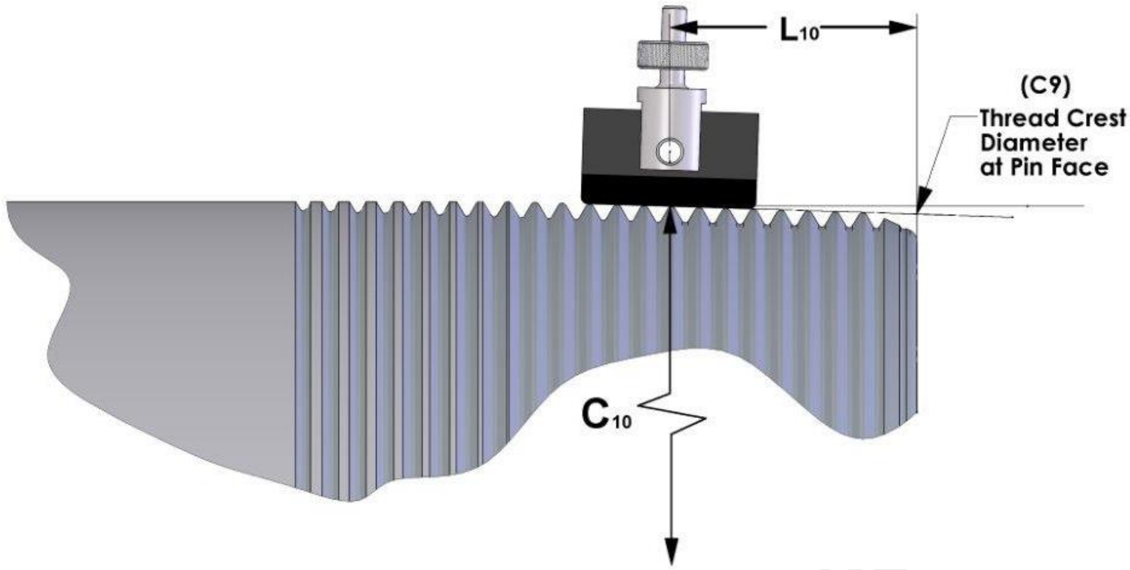


Figure 54—External Thread Crest Diameter Gauge Location

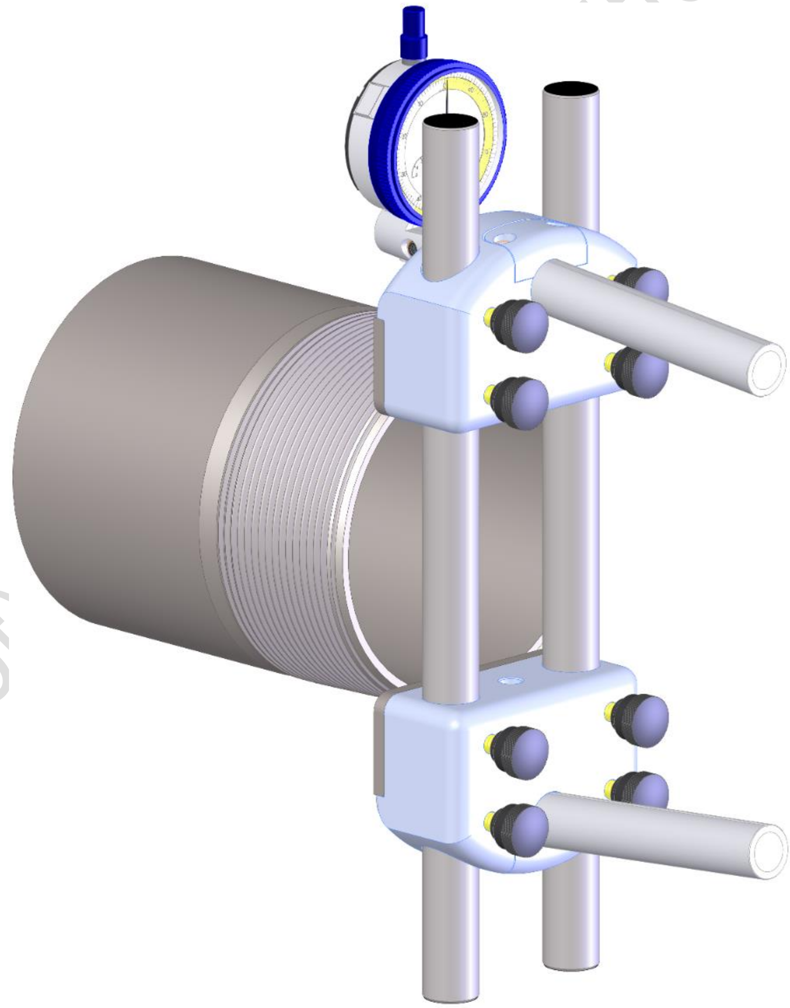


Figure 55—Crest Diameter Gauge on Pin

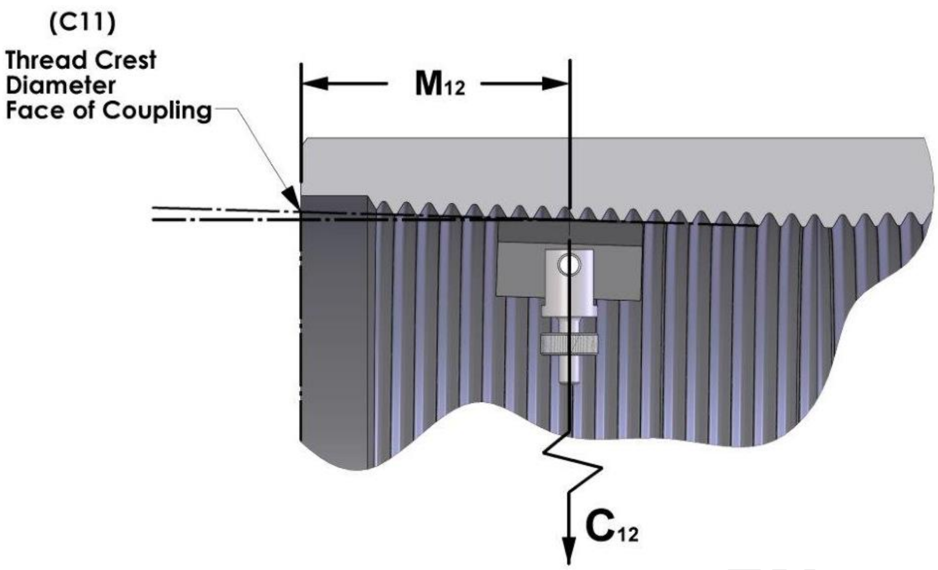


Figure ~~55~~56—Internal Thread Crest Diameter Gauge Location

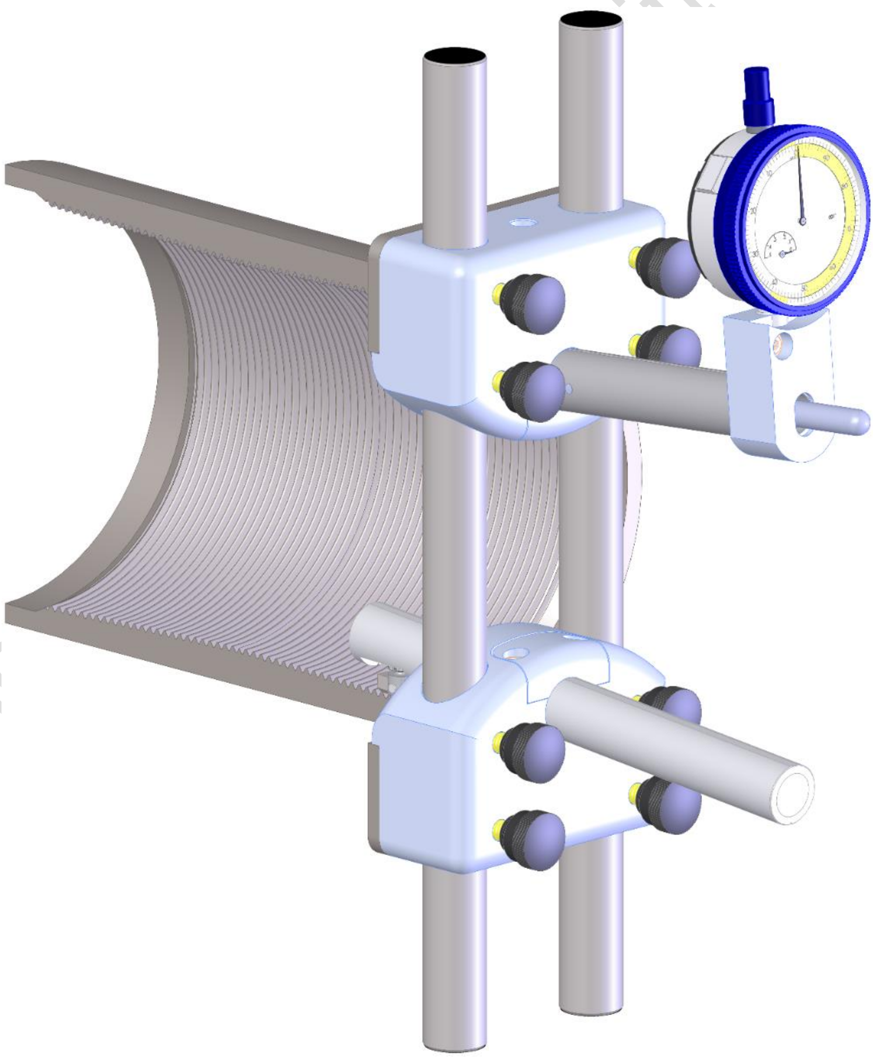


Figure 57—Crest Diameter Gauge on Box

6.1.5 Average Crest Diameter

Average Crest Diameter is the mean of maximum and minimum measurements taken at the specified gauge plane. See Figure ~~56~~58 for illustration.

~~NOTE~~ Average crest diameter measurements ~~are to~~shall be taken while part is ~~outside of the machine~~in the free state (un-chucked).

LARGEST DIAMETER	SMALLEST DIAMETER	AVERAGED DIAMETER
+0.007	-0.015	-0.004

LARGEST DIAMETER	SMALLEST DIAMETER	AVERAGED DIAMETER
+0.005	-0.005	-0.000

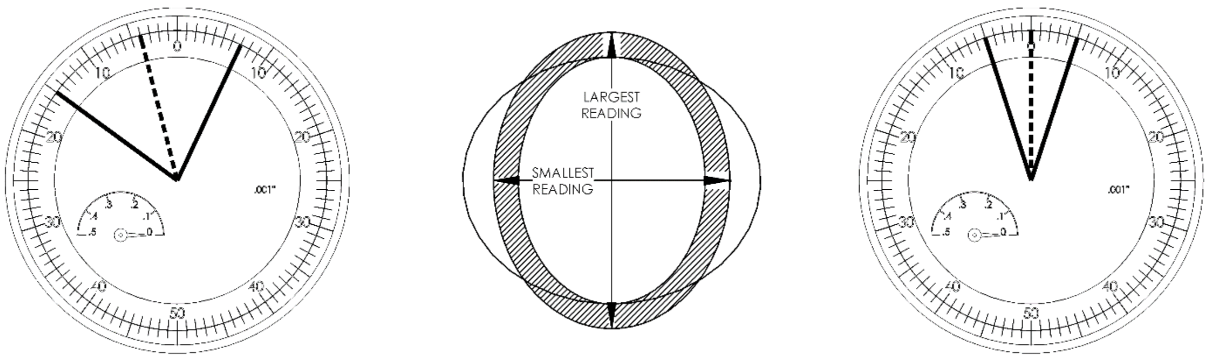


Figure ~~56~~58—Average Crest Diameter

6.1.6 Ovality

Determining ovality requires locating the largest and the smallest diameter readings on the part. Ovality is the difference between the largest and smallest diameters on the part. See Figure 57 for illustration.59

~~NOTE~~ Ovality ~~measurements are to be taken~~shall be measured while part is ~~outside of the machine~~in the free state (un-chucked).

LARGEST DIAMETER	SMALLEST DIAMETER	TOTAL OVALITY
+0.007	-0.015	0.022

LARGEST DIAMETER	SMALLEST DIAMETER	TOTAL OVALITY
+0.005	-0.005	0.010

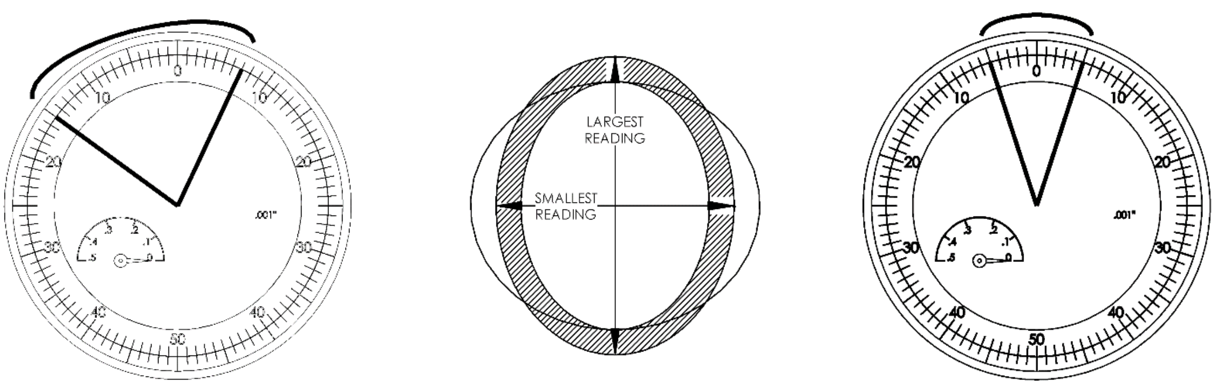


Figure ~~57~~59—Ovality

6.1.7 Effects of Thread Ovality

Thread Ovality results in additional standoff of the ring and plug gauge. Determining the ovality requires locating the maximum and minimum diameter of the part (see 6.1.6). Ovality is computed as the difference between the maximum and minimum diameters. The maximum ovality limits for pipe and coupling threads are listed below:

a) Thread Diameter (internal thread)……………………...D*0.003 in.

b) Thread Diameter (external thread)……………………..D*OM

NOTE 1 *OM* = Ovality Multiplier as specified in Table ~~25~~26; *D* = Specified Pipe body OD in inches.

NOTE 2 Using the limits, the Thread Ovality Maximums are calculated for each (Nominal Pipe Body) OD in Table ~~25~~26.

NOTE 3 *t* = specified wall thickness in inches.

6.1.8 Standoff Adjustments Due to Thread Ovality

Equation 3 is for expected maximum total Standoff using standoff tolerances and thread ovality as measured in accordance with 6.1.7.

$$Maximum\ SO = Standoff\ Tolerance + [OV / (Taper \times 2)] \quad (2)$$

where

OV thread ovality as measured out of the machine in inches;

SO maximum allowable standoff as measured ~~out of the machine~~in the free state (un-chucked) and includes standoff tolerance plus standoff due to the effect of thread ovality (in.);

Standoff Tolerance from Table ~~28~~29; and

Taper specified thread taper (in./in.).

The Thread Standoff is increased due to the Thread Ovality. This is shown in Table ~~26~~27 for 3/4 in. taper per foot threads and Table ~~27~~28 for threads with 1 in. taper per foot.

NOTE Minimum standoff values are unaffected.

Table ~~25~~26—Thread Ovality Maximum for Standoff

Pipe OD (D in.)	Specified Wall (*t*) (in.)	Ovality Multiplier (OM)	Max Thread Ovality (in.)
2.875	> 0.144 ≤ 0.144	0.003 0.004	0.009 0.012
3.500	> 0.175 ≤ 0.175	0.003 0.004	0.011 0.014
4.500	> 0.225 ≤ 0.225	0.003 0.004	0.014 0.018
5.000	> 0.250 ≤ 0.250	0.003 0.004	0.015 0.020
5.500	> 0.275 ≤ 0.275	0.003 0.004	0.017 0.022
6.625	> 0.331 ≤ 0.331	0.003 0.004	0.020 0.027
7.000	> 0.350 ≤ 0.350	0.003 0.004	0.021 0.028
7.625	> 0.381 ≤ 0.381	0.003 0.004	0.023 0.031
8.625	> 0.431 ≤ 0.431	0.003 0.004	0.026 0.035
9.625	> 0.481 ≤ 0.481	0.003 0.004	0.029 0.039
10.750	> 0.538 ≤ 0.538	0.003 0.004	0.032 0.043
11.750	> 0.588 ≤ 0.588	0.003 0.004	0.035 0.047
13.375	> 0.669 ≤ 0.669	0.003 0.004	0.040 0.054
16.000	> 0.800 ≤ 0.800	0.003 0.004	0.048 0.064
18.625	> 0.931 ≤ 0.931	0.003 0.004	0.056 0.075
20.000	> 1.000 ≤ 1.000	0.003 0.004	0.060 0.080

Table ~~26~~27—Max Allowable Standoff for Given Values of Thread Ovality ($^3/_4$ in. TPF)

1	2	3	4	5	6	7	8	9
Thread Ovality	Buttress Pins: Connections plus Standoff Tolerance + Ovality Standoff		Buttress Couplings: Connections plus Standoff A + Ovality Standoff					
	8-Round Pins	Buttress Pins	A = 2 turns	A = 3 turns	A = $3^1/_2$ turns	A = 4 turns	$4^1/_2$ in. A = $^1/_2$ turn	5 to $13^3/_8$ in. A = 4 turn
in.	in.	in.	in.	in.	in.	in.	in.	in.
0.002	0.141	0.116	0.391	0.516	0.579	0.641	0.116	0.216
0.004	0.157	0.132	0.407	0.532	0.595	0.657	0.132	0.232
0.006	0.173	0.148	0.423	0.548	0.611	0.673	0.148	0.248
0.008	0.189	0.164	0.439	0.564	0.627	0.689	0.164	0.264
0.010	0.205	0.180	0.455	0.580	0.643	0.705	0.180	0.280
0.012	0.221	0.196	0.471	0.596	0.659	0.721	0.196	0.296
0.014	0.237	0.212	0.487	0.612	0.675	0.737	0.212	0.312
0.016	0.253	0.228	—	0.628	0.691	0.753	0.228	0.328
0.018	0.269	0.244	—	0.644	0.707	0.769	0.244	0.344
0.020	0.285	0.260	—	0.660	0.723	0.785	—	0.360
0.022	0.301	0.276	—	0.676	0.739	0.801	—	0.376
0.024	0.317	0.292	—	0.692	0.755	0.817	—	0.392
0.026	0.333	0.308	—	0.708	0.771	0.833	—	0.408
0.028	0.349	0.324	—	0.724	0.787	0.849	—	0.424
0.030	0.365	0.340	—	—	0.803	0.865	—	0.440
0.032	0.381	0.356	—	—	0.819	0.881	—	0.456
0.034	0.397	0.372	—	—	0.835	0.897	—	0.472
0.036	0.413	0.388	—	—	0.851	0.913	—	0.488
0.038	0.429	0.404	—	—	0.867	0.929	—	0.504
0.040	0.445	0.420	—	—	0.883	0.945	—	0.520
0.042	0.461	0.436	—	—	0.899	0.961	—	0.536
0.044	0.477	0.452	—	—	0.915	0.977	—	0.552
0.046	0.493	0.468	—	—	0.931	0.993	—	0.568
0.048	0.509	0.484	—	—	0.947	1.009	—	0.584
0.050	0.525	0.500	—	—	0.963	1.025	—	0.600
0.052	0.541	0.516	—	—	0.979	1.041	—	0.616
0.054	0.557	0.532	—	—	0.995	1.057	—	0.632
0.056	0.573	refer to 1 in. taper	—	—	1.011	1.073	—	refer to 1 in. taper
0.058	0.589	refer to 1	—	—	1.027	1.089	—	refer to 1 in.

1	2	3	4	5	6	7	8	9
Thread Ovality	**Buttress Pins: Connections plus Standoff Tolerance + Ovality Standoff**		**Buttress Couplings: Connections plus Standoff A + Ovality Standoff**					
	8-Round Pins	**Buttress Pins**	**A = 2 turns**	**A = 3 turns**	**A = 3 1/2 turns**	**A = 4 turns**	**4 1/2 in.** **A = 1/2 turn**	**5 to 13 3/8 in.** **A = 4 turn**
in.	**in.**	**in.**	**in.**	**in.**	**in.**	**in.**	**in.**	**in.**
		in. taper						taper
0.060	0.605	refer to 1 in. taper	—	—	1.043	1.105	—	refer to 1 in. taper
0.062	0.621	refer to 1 in. taper	—	—	1.059	1.121	—	refer to 1 in. taper
0.064	0.637	refer to 1 in. taper	—	—	1.075	1.137	—	refer to 1 in. taper
0.066	0.653	refer to 1 in. taper	—	—	1.091	1.153	—	refer to 1 in. taper
0.068	0.669	refer to 1 in. taper	—	—	1.107	1.169	—	refer to 1 in. taper
0.070	0.685	refer to 1 in. taper	—	—	1.123	1.185	—	refer to 1 in. taper
0.072	0.701	refer to 1 in. taper	—	—	1.139	1.201	—	refer to 1 in. taper
0.074	0.717	refer to 1 in. taper	—	—	1.155	1.217	—	refer to 1 in. taper
0.076	0.733	refer to 1 in. taper	—	—	1.171	1.233	—	refer to 1 in. taper
0.078	0.749	refer to 1 in. taper	—	—	1.187	1.249	—	refer to 1 in. taper
0.080	0.765	refer to 1 in. taper	—	—	1.203	1.265	—	refer to 1 in. taper

NOTE 1 For round and buttress threads with 3/4 in. taper per foot, 10 Round is not applicable.

NOTE 2 The standoff tolerances listed in Table ~~28~~29 are included in this table.

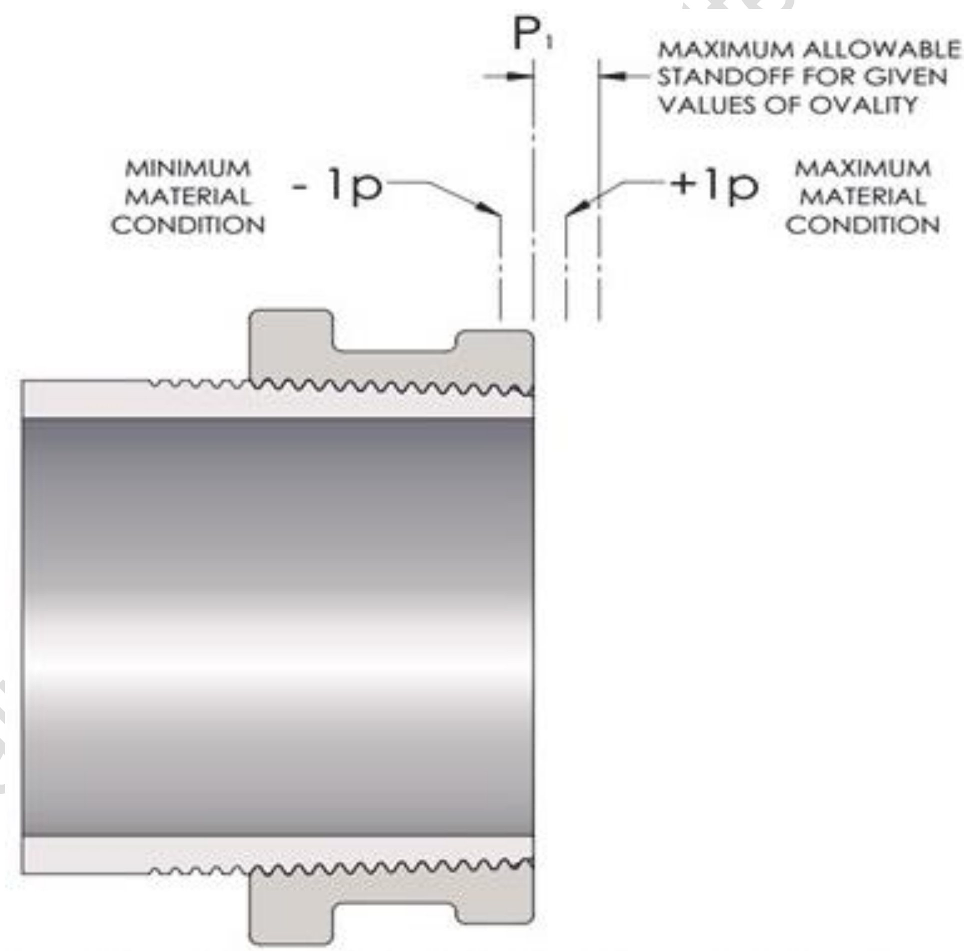
NOTE 3 This is the maximum standoff deviation from “P_1” on the ring gauges and “A” on the plug gauges; see Figure ~~58~~60 and Figure ~~59~~61 (round thread only); for buttress, see Figure ~~61~~63 details D (coupling) and F (pipe).

Table ~~27~~28—Max Allowable Standoff for Given Values of Thread Ovality (1 in. TPF)

1	2	3
Thread Ovality	Buttress Pins: Connections plus Standoff Tolerance + Ovality Standoff	Buttress Couplings: Connections plus Standoff A + Ovality Standoff
		A = 7/8 turns
in.	in.	in.
0.002	0.112	0.187
0.004	0.124	0.199
0.006	0.136	0.211
0.008	0.148	0.223
0.010	0.160	0.235
0.012	0.172	0.247
0.014	0.184	0.259
0.016	0.196	0.271
0.018	0.208	0.283
0.020	0.220	0.295
0.022	0.232	0.307
0.024	0.244	0.319
0.026	0.256	0.331
0.028	0.268	0.343
0.030	0.280	0.355
0.032	0.292	0.367
0.034	0.304	0.379
0.036	0.316	0.391
0.038	0.328	0.403
0.040	0.340	0.415
0.042	0.352	0.427
0.044	0.364	0.439
0.046	0.376	0.451
0.048	0.388	0.463
0.050	0.400	0.475
0.052	0.412	0.487
0.054	0.424	0.499
0.056	0.436	0.511
0.058	0.448	0.523
0.060	0.460	0.535
0.062	0.472	0.547
0.064	0.484	0.559
0.066	0.496	0.571
0.068	0.508	0.583
0.070	0.520	0.595
0.072	0.532	0.607

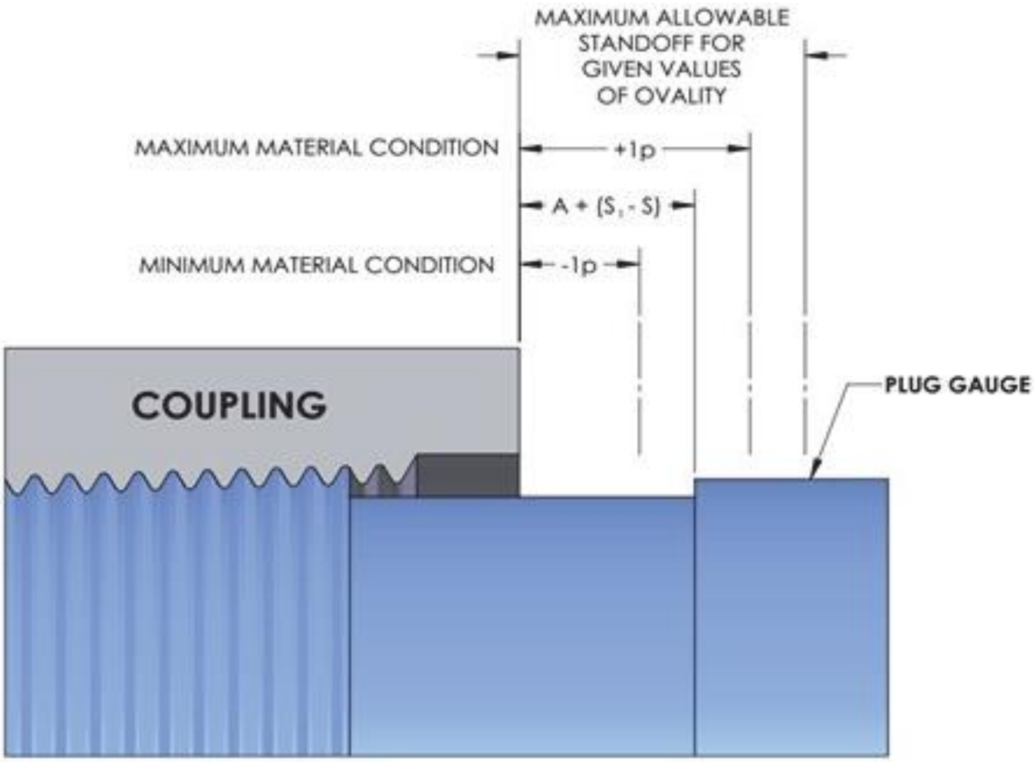
1	2	3
Thread Ovality	Buttress Pins: Connections plus Standoff Tolerance + Ovality Standoff	Buttress Couplings: Connections plus Standoff A + Ovality Standoff A = $^7/_8$ turns
in.	in.	in.
0.074	0.544	0.619
0.076	0.556	0.631
0.078	0.568	0.643
0.080	0.580	0.655

NOTE 1 For 16 in., 18 5/8 in., and 20 in. buttress thread with 1 in. taper per foot.
NOTE 2 The standoff tolerances listed int Table ~~28~~29 are included in this table.
NOTE 3 This is the maximum standoff deviation from “P_1” on the ring gauges and “A” on the plug gauges; for buttress, see Figure ~~61~~63 details D (coupling) and F (pipe).



NOTE See 6.1.8 and 6.1.9 for additional stand-off adjustments due for ovality.

Figure ~~58~~60—8 Round Casing Thread Ring Standoff



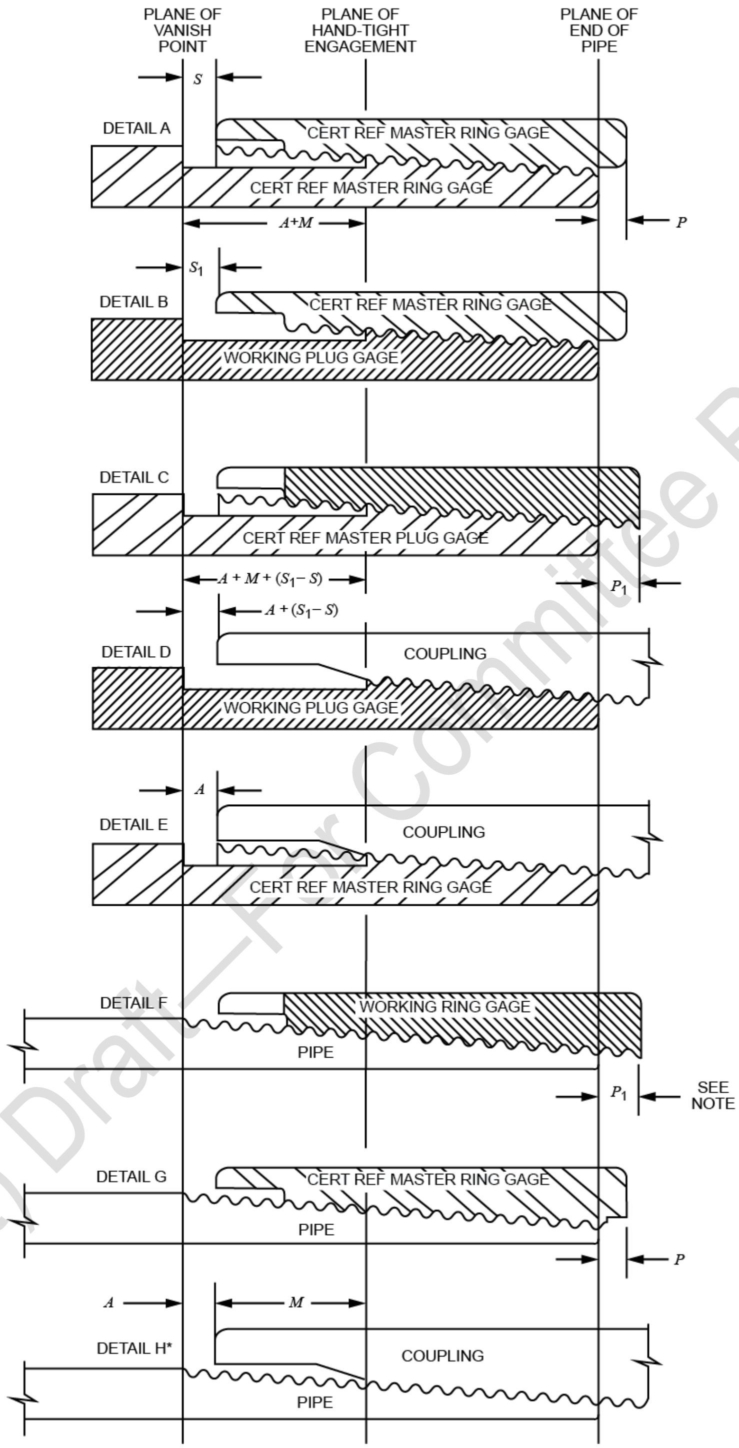
NOTE See 6.1.8 and 6.1.9 for additional stand-off adjustments due for ovality.

Figure ~~59~~61—8 Round Casing Thread Plug Standoff

6.1.9 Size Gauge Requirements

6.1.9.1 The relationship between master gauges, working gauges, and product threads shall be as shown in Figure ~~60~~62 and Figure ~~61~~63 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.

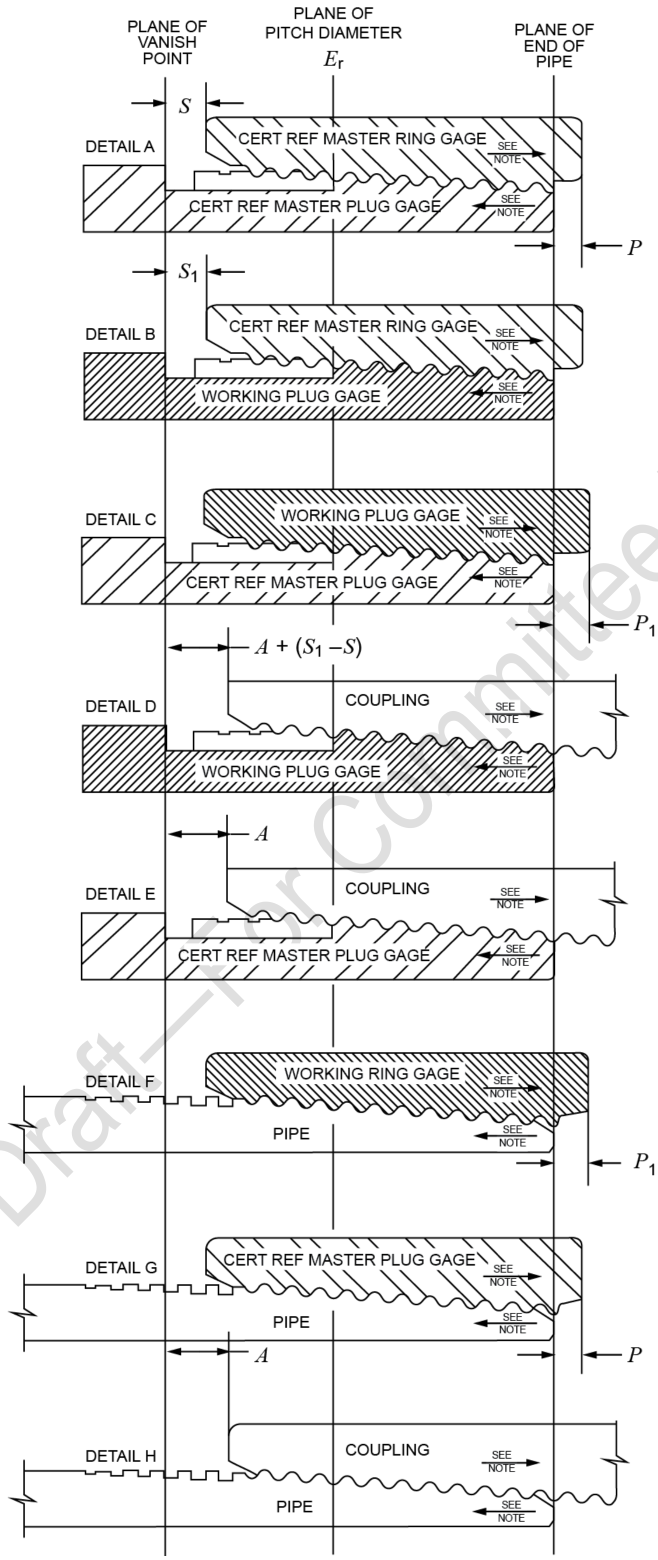
6.1.9.2 The mating standoff of the master ring gauge against the master plug gauge, as marked on the ring gauge, is intended primarily as the basis for establishing the limits of wear or secular change in the gauges. Deviation from this initial S value should be taken into account in establishing working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



NOTE 1 Detail H is a nominal design illustration and the tolerances given in Table ~~28~~29 are not applicable to the standoff of coupling on pipe.

NOTE 2 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 (L_1 long – L_1 short) – P_1.

Figure ~~60~~62—Gauging Practice for Line Pipe Threads, Casing, and Tubing Round Thread Hand-tight Assembly



[a] In order to obtain correct standoff on sizes 16 in. (406.4 mm) 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 ~~61~~63—Gauging Practice for Buttress Casing Threads Hand-tight Assembly

6.1.10 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 shown in Table ~~28~~29.

Table ~~28~~29—Standoff Tolerances

	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 1 The requirements given herein for line pipe and round thread gauges do not include mandatory provisions for a gauging notch. Therefore, the length $A + M + (S_1 - S)$ cannot be measured readily with these gauges (see Figure ~~60~~62, 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 ~~63~~64).

NOTE 2 "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).

6.1.11 Gauge Calibration Maintenance

The maintenance of master gauges within the standoff limits specified in 6.1.12 shall be the responsibility of the gauge user. Gauges shall be periodically tested for mating standoff by the procedure stipulated in 8.1.4, 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 stand-off of working gauges to master gauges shall indicate a traceable identification of the master utilized.

6.1.12 Master Size 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 and in Table ~~29~~30. Master gauges manufactured to and conforming to the requirements of previous editions are acceptable for continued use given any of the miscellaneous elements including: D_4, D_u, U, Q, q, length of plug collar, and depth of ring counterbore do not interfere with proper function of the gauge.

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 each pitch and size, 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 in. (203.2 mm) and smaller, and 1/5 thread turn for 8-thread gauges for line pipe in nominal sizes 8 in. (203.2 mm) 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 each pitch and size and shall not decrease from this original value for 8-thread gauges by more than 5/32 thread turn for sizes 85/8 in. (220.34 mm) and smaller, 1/5 thread turn for sizes 95/8 in. (245.74 mm) and larger, and 1/5 thread turn for each 10 thread gauge.

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 each size and shall not decrease from this original value by more than 1/10 thread turn for sizes 85/8 in. (220.34 mm) and smaller, and 1/8 thread turn for sizes 95/8 in. (245.74 mm) 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 in Table 28 in turns are equivalent to the axial tolerances shown in Table ~~29~~30.

Table ~~29~~30—Gauge Standoff Tolerance for Acceptance

Number of Threads per Inch	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 in. and smaller)	+0.0125 –0.0195
8 (nominal pipe sizes 10 in. and larger)	+0.0125 –0.0250
Round thread casing and tubing gauges:	
10	+0.0100 –0.0200
8 (pipe sizes 8 5/8 in. and smaller)	+0.0125 –0.0195
8 (pipe sizes 9 5/8 in. and larger)	+0.0125 –0.0250
Buttress thread casing gauges:	
5 (pipe sizes 8 5/8 in. and smaller)	+0.0125 –0.0200
5 (pipe sizes 9 5/8 in. and larger)	+0.0125 –0.0250

6.1.13 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 6.1.12 shall be reconditioned or replaced.

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 6.1.12, the gauges shall be reconditioned or replaced.

6.1.14 Recertification

Before reuse, each reconditioned gauge shall be recertified by an official testing agency.

6.1.15 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 62). 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 presented in Table 30.

Table 30—Gauge Standoff Correction Factor

Number of Threads per in.	Correction Difference in Values of g
27	0.017
18	0.026
14	0.034
11½	0.041
8	0.059

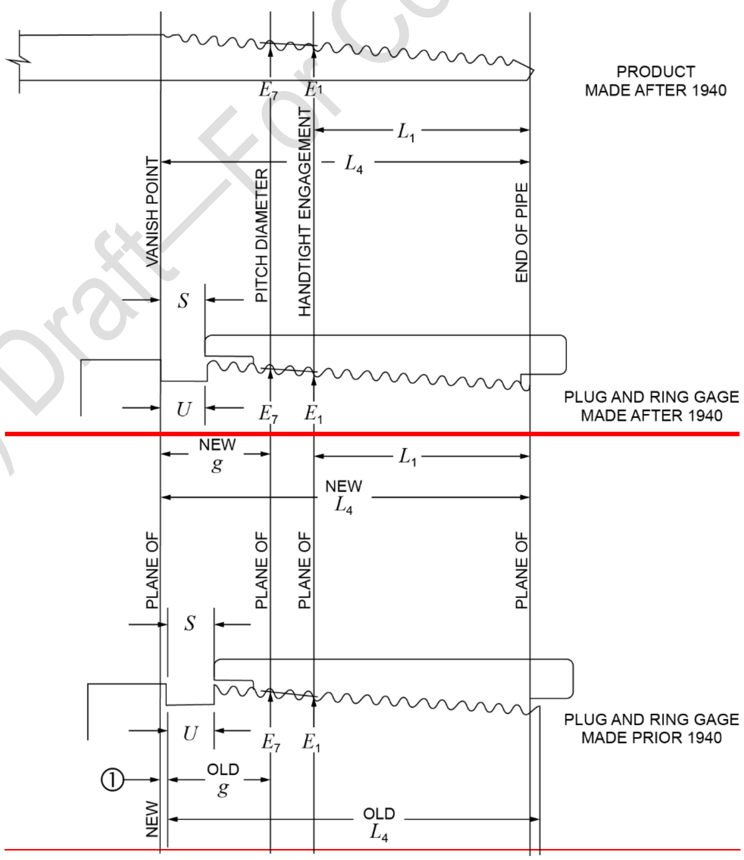


Figure 62—Comparison of Line Pipe Gauges Made Subsequent to 1940 and Gauges Made Prior to 1940

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~~through-hardened and ground. Hardness shall be a minimum of Rockwell C55, or equivalent hardness on a superficial scale. They shall be ground gauges and shall conform to the dimensions and tolerances specified in Tables 31–41, and Figures ~~63~~64–~~67~~69. Imperfect threads 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 $L_4 – U$.

The following relationships described in 7.1.1.1 and 7.1.1.2 are the basis of gauge dimensions.

7.1.1.1 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. (1.52 mm) smaller than the minor cone diameter of the product thread at the E_7 plane.

7.1.1.2 For round thread casing and tubing gauges:

a) The E_7 pitch diameter is equal to $D_4 – (h – 0.003\text{ in.})$.

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:

   1) 5p—for casing and 10 thread tubing

   2) 4p—for 8 thread tubing

d) The length of vanish threads is:

   1) 2.28p for casing

   2) 1.69p for 10 thread tubing

   3) 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. (1.52 mm) smaller than the minor-cone diameter of the product thread at the plane of E_7.

7.1.1.3 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 in. (339.72 mm) and smaller; for 16 in. (406.4 mm) 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 the pipe D for sizes 13 3/8 in. (339.72 mm) and smaller, and is equal to the specified pipe diameter for sizes 16 in. (406.4 mm) and larger.

c) The pitch diameter E_7 is equal to $D_4 - 0.062$ in.

NOTE 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. (50.394 mm) for sizes 13 3/8 in. (339.72 mm) and smaller; for 16 in. (406.4 mm) and larger, g is 1.488 in. (37.395 mm).

f) The plug-groove width U is equal to 3/16 in. (4.762 mm) for each size.

g) The diameter of the plug collar, D_4, is equal to the tabulated outside diameter of the pipe plus 0.016 in. (0.406 mm) for sizes 13 3/8 in. (339.72 mm) and smaller; for 16 in. (406.4 mm) 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. (4.762 mm) smaller than the plug collar.

j) Thread crests and roots are parallel to cone for sizes 13 3/8 in. (339.72 mm) and smaller; crests and roots are parallel to the pipe axis for sizes 16 in. (406.4 mm) and larger.

7.1.2 Working Size Gauges

Working size 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 31–41. The length of thread for working plug gauges shall be the basic L_1 dimension on line pipe 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 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~~shall be through-hardened and ground. Hardness shall be a minimum of Rockwell C55, or equivalent hardness on a superficial scale.

Working gauges manufactured to and conforming to the requirements of previous editions are acceptable for continued use given any of the miscellaneous elements including: D_4, D_u, U, Q, q, length of plug collar, and depth of ring counterbore do not interfere with proper function of the gauge.

Table 31—Line Pipe Thread Gauge Dimensions

Nominal Size[a]	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	Depth of Counterbore	No. of Threads per in.	Pitch Diameter at Hand-tight Plane	Pitch Diameter at Length g from Vanish Point	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to Hand-tight Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
	D_4	D_u	Q	q		E_1	E_7	g	L_1	L_4	U	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
14D	14.000	13.740	14.094	0.309	8	13.87263	13.90000	0.6837	1.562	2.6837	0.375	0.375
16D	16.000	15.740	16.094	0.309	8	15.87575	15.90000	0.6837	1.812	2.8837	0.375	0.375
18D	18.000	17.740	18.094	0.309	8	17.87500	17.90000	0.6837	2.000	3.0837	0.375	0.375
20D	20.000	19.740	20.094	0.309	8	19.87031	19.90000	0.6837	2.125	3.2837	0.375	0.375

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

[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 in.

Table 32—Short and Long Round Casing Thread Gauge Dimensions

Outside Diameter of Pipe Size	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	Depth of Counterbore	No. of Threads per in.	Pitch Diameter at Hand-tight Plane	Pitch Diameter at Length g from Vanish Point	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to Hand-tight Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
Designation	D_4	D_u	Q	q		E_1	E_7	g	L_1	L_4	U	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

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

Table 33—Buttress Casing Thread Gauge Dimensions

Outside Diameter of Pipe Size	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	No. of Threads per in.	Pitch Diameter[a]	Major Diameter at End of Plug Gauge	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to E_7 Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
Designation	D_4	D_u	Q		E_7	D_o	g	L_7	L_4	U	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

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~64~~65.

NOTE 2 Included taper on diameter: sizes 13 3/8 in. and smaller—0.0625 in. per in.; sizes 16 in. and larger—0.0833 in. per inch.

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

Table 34—Non-upset Tubing Thread Gauge Dimensions

Outside Diameter of Pipe Size	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	Depth of Counterbore	No. of Threads per in.	Pitch Diameter at Hand-tight Plane	Pitch Diameter at Length g from Vanish Point	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to Hand-tight Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
Designation	**D_4**	**D_u**	**Q**	**q**		**E_1**	**E_7**	**g**	**L_1**	**L_4**	**U**	**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

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

NOTE 3 See NOTE 3 in Table 36 for interchangeability of gauges.

Table 35—External-upset Tubing Thread Gauge Dimensions

Outside Diameter of Pipe Size	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	Depth of Counterbore	No. of Threads per in.	Pitch Diameter at Hand-tight Plane	Pitch Diameter at Length g from Vanish Point	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to Hand-tight Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
Designation	D_4	D_u	Q	q		E_1	E_7	g	L_1	L_4	U	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

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64.

NOTE 2 Included taper on diameter (all sizes) 0.0625 in. per inch.

NOTE 3 See NOTE 3 in Table 36 for interchangeability of gauges.

Table 36—Integral-joint Tubing Thread Gauge Dimensions

Outside Diameter of Pipe Size	Outside Diameter of Plug Collar	Diameter of Groove	Diameter of Counterbore	Depth of Counterbore	No. of Threads per in.	Pitch Diameter at Hand-tight Plane	Pitch Diameter at Length g from Vanish Point	Length: Plane of E_7 to Vanish Point	Length: End of Plug Gauge to Hand-tight Plane	Length: End of Plug Gauge to Vanish Point	Width of Groove	Standoff
Designation	D_4	D_u	Q	q		E_1	E_7	g	L_1	L_4	U	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

NOTE 1 All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64.

NOTE 2 Included taper on diameter (all sizes) of 0.0625 in. per inch.

NOTE 3 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.

NOTE 4 The 2.063 integral-joint tubing gauges are identical to 1.900 external-upset tubing gauges and may be used interchangeably.

NOTE 5 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 37—Gauge Thread Height Dimensions for Line Pipe

Thread Element	27 Threads per in.	18 Threads per in.	14 Threads per in.	$11^1/_2$ Threads per in.	8 Threads per in.
	p = 0.0370	p = 0.0556	p = 0.0714	p = 0.0870	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
$f_{cs} = f_{cn}$ = 0.100p	0.00370	0.00556	0.00714	0.00870	0.01250

NOTE All dimensions in inches at 68 °F. See Figure ~~65~~66. See Table 39 for tolerances on crest truncation.

Table 38—Gauge Thread Height Dimensions for Round Thread Casing and Tubing

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

NOTE All dimensions in inches at 68 °F. See Figure ~~65~~66. See Table 40 for tolerances on crest truncation.

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 39–41.

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, the major cone of buttress working plug and master ring gauges, and the minor cone of buttress working ring and master plug gauges, at a minimum of two positions covering the length of full thread height less the end threads. The difference between the diameter at the large end of a gauge and the diameter at any position nearer to 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 39–41. 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 Figure ~~66~~67, Figure ~~67~~68, and Table 41.

Table 39—Tolerances on Gauge Dimensions for Line Pipe

Element	Tolerances				
	Number of Threads per in.				
	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	±15 min	±15 min	±10 min	±10 min	±10 min
Width of groove, U	±0.074	±0.111	±0.143	±0.174	±0.250
Diameter of groove, D_u	max	max	max	max	max
Diameter of collar, D_4	max	max	max	max	max
Length, L_4[d]	±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	±15 min	±15 min	±15 min
Length of ring, $L_4 - S$[d]	±0.002	±0.002	±0.002	±0.002	±0.002
Diameter of counterbore, Q	min	min	min	min	min
Mating standoff, S	±0.037	±0.056	±0.071	±0.087	±0.100

NOTE All dimensions in inches at 68 °F, except as otherwise indicated. See Figure ~~63~~64 and Figure ~~65~~66.

[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 7.1.4; 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] This requirement does not apply to gauges made prior to March 1979.

Table 40—Tolerances on Gauge Dimensions for Round Thread Casing and Tubing

Element	Tolerances
For 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	±10 min
Width of groove, U	
for casing and 8-thread non-upset tubing	±0.250
for 10-thread non-upset tubing and 8-thread; and 10-thread upset tubing	±0.200
Diameter of groove, D_u	maximum
Diameter of collar, D_4	maximum
Length, L_4	±0.001
Length of gauging notch	+0.002 –0.000
For 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	minimum
Length of ring, $L_4 - S$	±0.002
Mating standoff, S[e]	±0.025

NOTE All dimensions in inches at 68 °F, except as otherwise indicated. See Figure 6364 and Figure 6566.

[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 7.1.4; 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] 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.

[e] This requirement does not apply to gauges made prior to March 1979.

Table 41—Tolerances on Gauge Dimensions for Buttress Casing

Element	Tolerances
For Plug Gauge:	
Major diameter, D_o, per specified size (in.)	
$4^1/_2$ 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	
$13^3/_8$ and smaller	±0.001
16 and larger	±0.002
Length, L_4	±0.001
For 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	minimum
Length of ring, $L_4 - S$[c]	±0.002
Mating Standoff, S	±0.015

NOTE All dimensions in inches at 68 °F. See Figure 6465, Figure 6667, and Figure 6768.

[a] The tolerance shown is the maximum allowable error in taper in the length $L_4 - S$; See 7.1.4.

[b] See 7.1.3 for measurement of lead.

[c] This requirement does not apply to gauges made prior to March 1979.

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 $L_4 - g - 1^1/_2p$ for line pipe and round thread gauges, and not less than $L_4 - 1$ in. for buttress thread casing gauges. If 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. (4.762 mm) 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 Figure ~~62~~63 and Figure ~~64~~65).

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 up to and including $8^5/_8$ in. (220.345 mm), shall have centers, arbors or handles with centers suitable for inspecting the gauge between centers. On gauges larger than $8^5/_8$ in. (220.345 mm), bolt circles and back-up plates in accordance with Figure ~~68~~69 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 31–36. The initial mating standoff of the gauges shall conform to the specified value within the tolerance given in Tables 39–41.

7.1.10 Marking—Gauges

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. Other markings which are considered necessary by the gauge maker may be added. Unless otherwise stated, both plug and ring shall also 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 the stipulations given herein, including determination of mating standoff.

b) Date of Manufacture.

c) Size of Gauge—for line pipe gauges the nominal sizes, as given in Table 31 and for casing and tubing gauges, the outside diameter of the pipe as given in Tables 31–36 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.. LP
   — Long and Short Round thread casing…………………........... CSG
   — Buttress thread casing……………………….......................... BC~~SG~~
   — Non-upset tubing and integral joint tubing…........................ TBG
   — External-upset tubing…………………….............................. ~~UPTBG~~EU

e) Name or Identifying Mark of Gauge Maker—the name or identifying mark of the gauge maker shall be placed on the 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 6.1.15 for correction factors.~~

7.1.11 ~~Marking~~ Crest Diameter Setting Standards Requirements

Crest diameter setting standards of dedicated and non-adjustable style shall be permanently marked by the gauge manufacturer with the marking given below:

a) Size, thread type, and applicable grade(s).

b) The actual diameters and length to the qualified surface(s).

c) Qualified reference standard surfaces used to simulate Thread Crest diameter dimensions (C_{10} and C_{12}) as specified in Table 1 and Tables 4–7 shall be kept within an accuracy of ±0.0003 in. (±0.00762 mm).

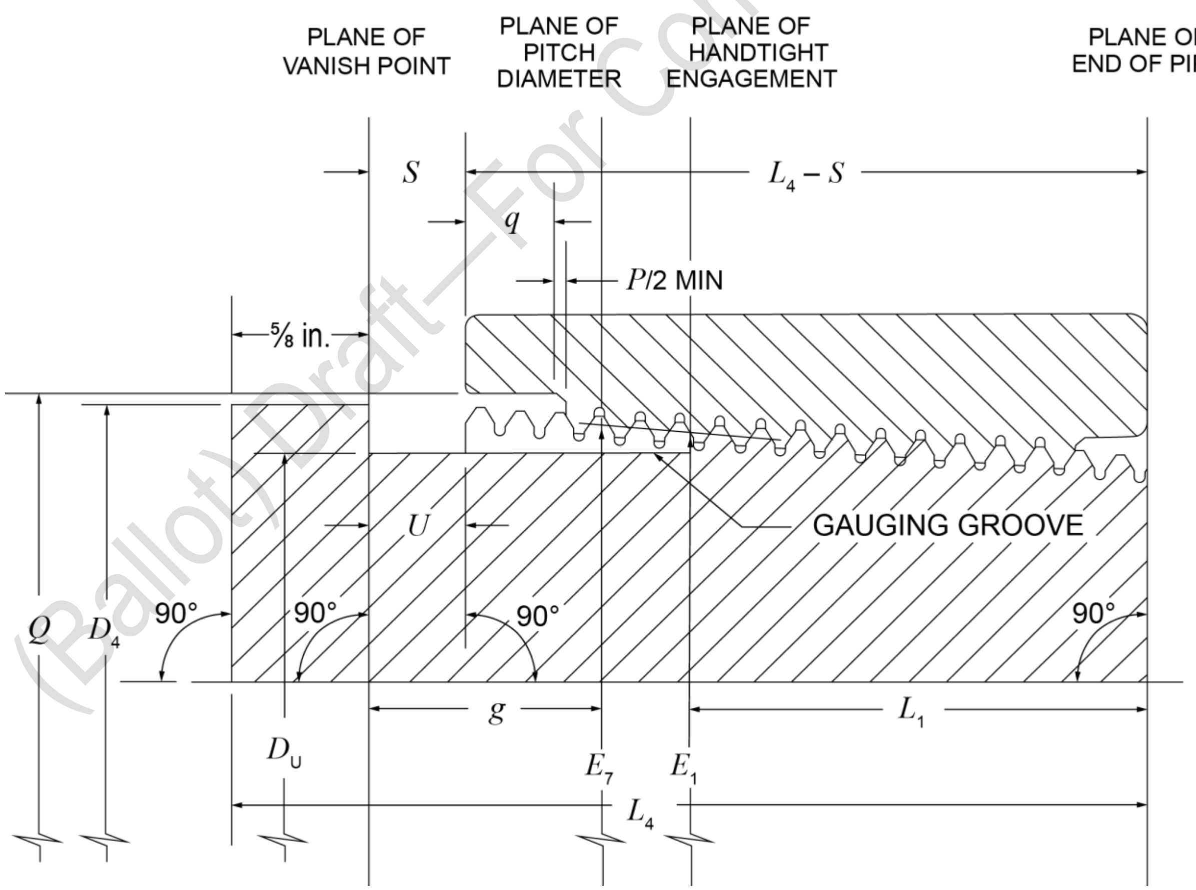
1) Qualified reference standard surfaces used to simulate the location (Reference L_{10} and M_{12}) specified in Table 1 and Tables 4–7 shall be kept within an accuracy ±0.0005 in. (±0.0127 mm).

2) Qualified reference standard surfaces used to simulate the taper cone of the qualified surface shall be as specified for the product, within an accuracy ±0.0003 in. (±0.00762 mm).

3) Qualified reference standard surfaces used to simulate the roundness of product shall be within an accuracy 0.0001 in. (0.00254 mm).

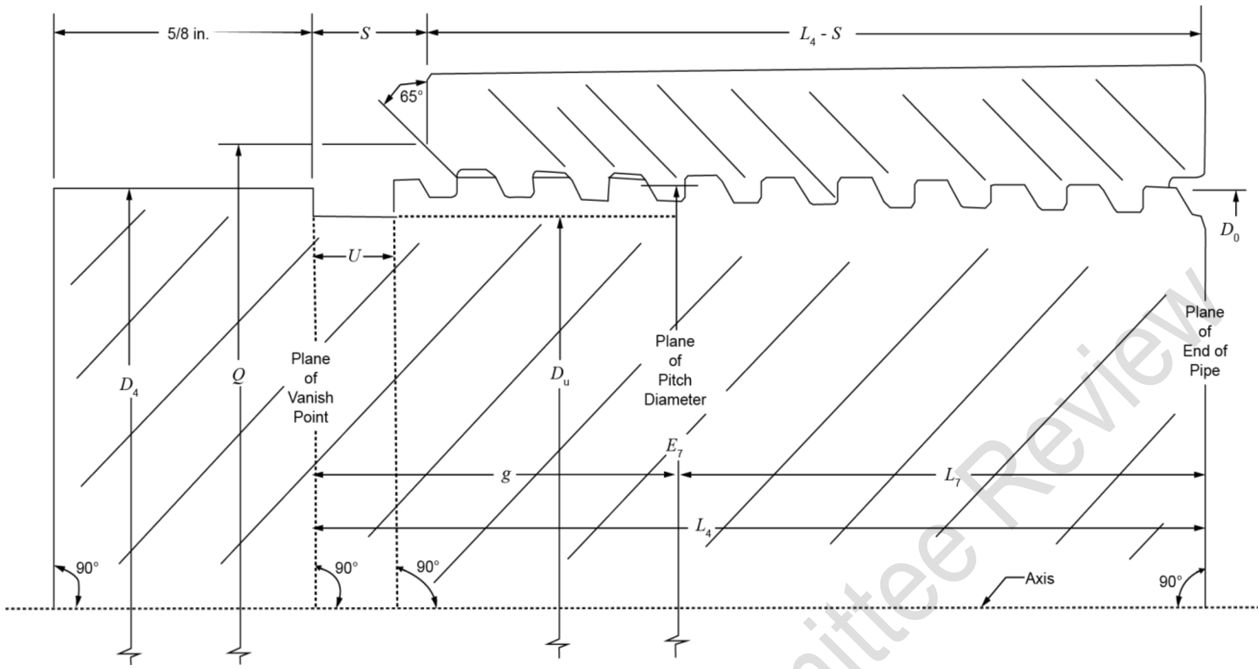
d) The name or identifying mark of the gauge maker.

e) Other markings which are considered necessary by the gauge maker may be added.



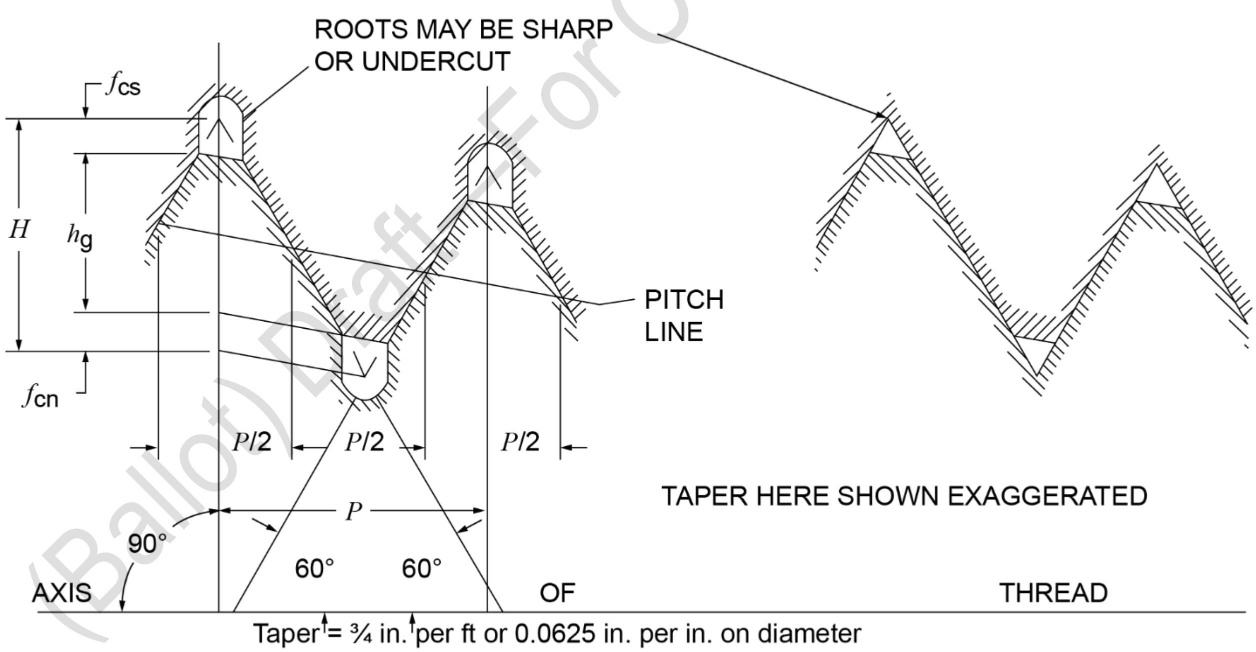
NOTE See Figure 66 for detail of thread form; see Table 31-36 for dimensions; see 6.1.12 and 7.1.7, and Table 39 and Table 40 for tolerances.

Figure ~~63~~64—Thread Gauge for Line Pipe and Round Thread Casing and Tubing



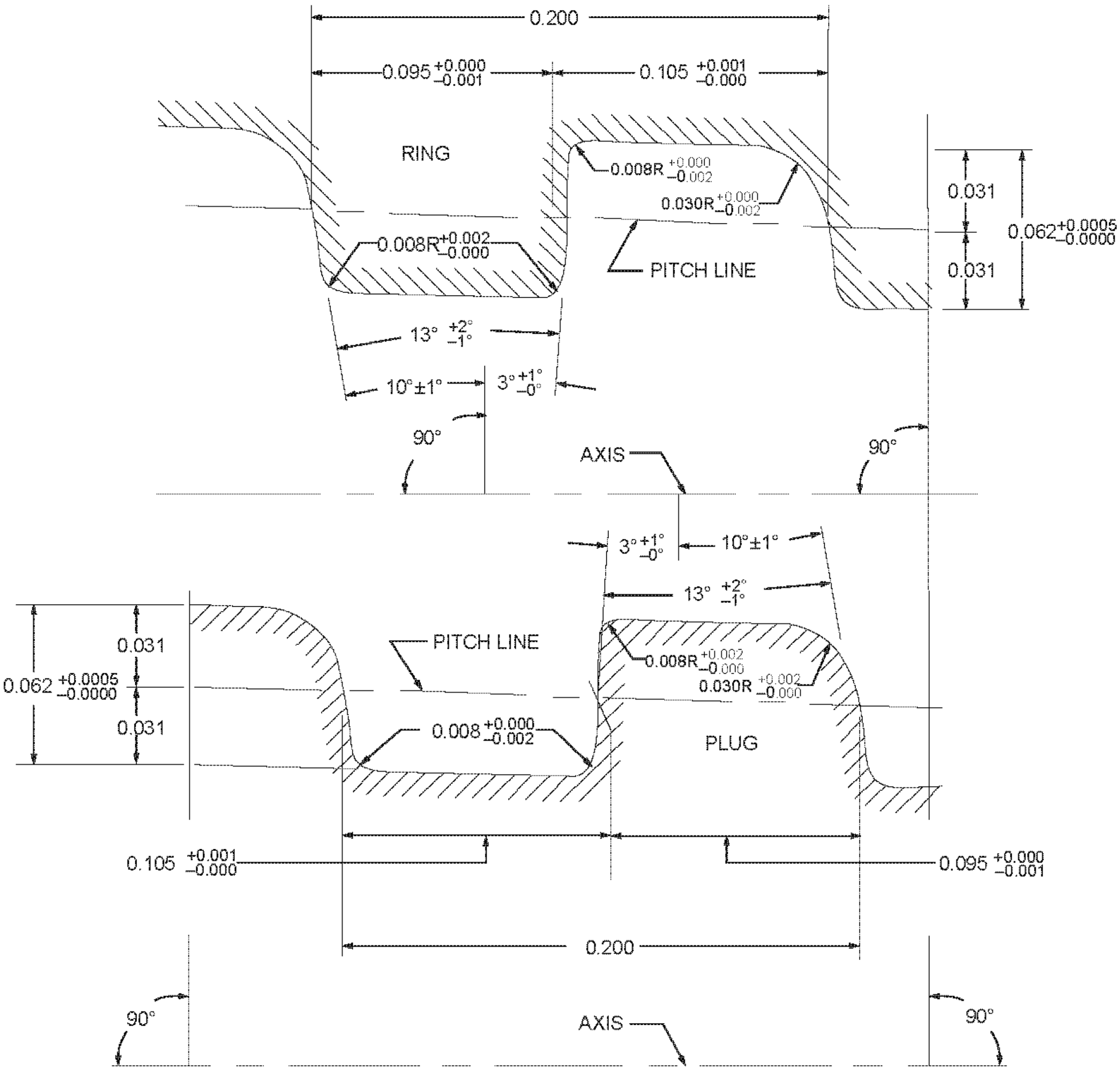
NOTE See Figure ~~66~~67 and Figure ~~67~~68 for detail of thread form; see Table 33 for dimensions; see 6.1.12 and 7.1.7, and Table 41 for tolerances.

Figure ~~64~~65—Thread Gauge for Buttress Casing



NOTE See Tables 37–40 for dimensions.

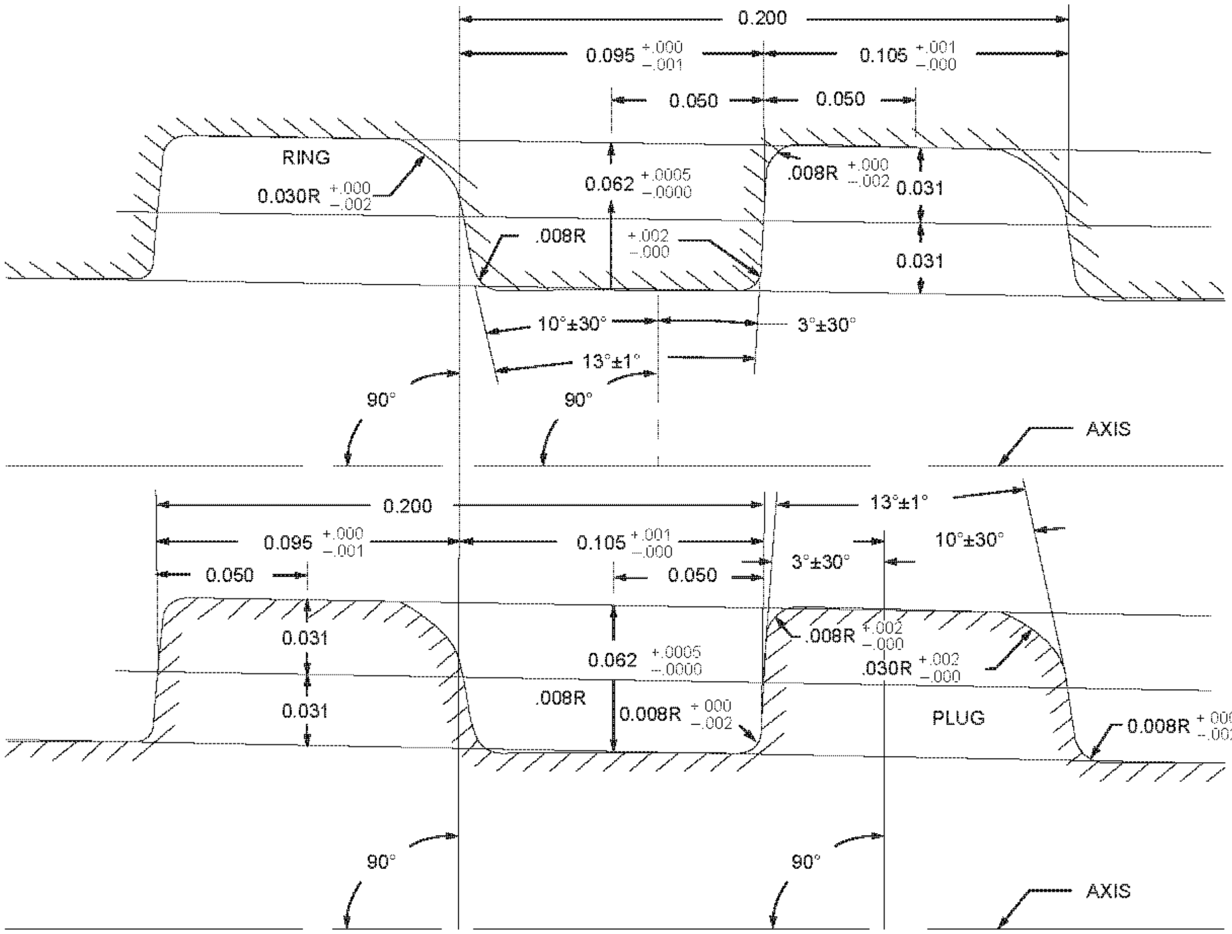
Figure ~~65~~66—Gauge Thread Form for Line Pipe and Round Thread Casing and Tubing



TAPER = ³/₄ IN. PER FT OR 0.0625 IN. ON DIAMETER

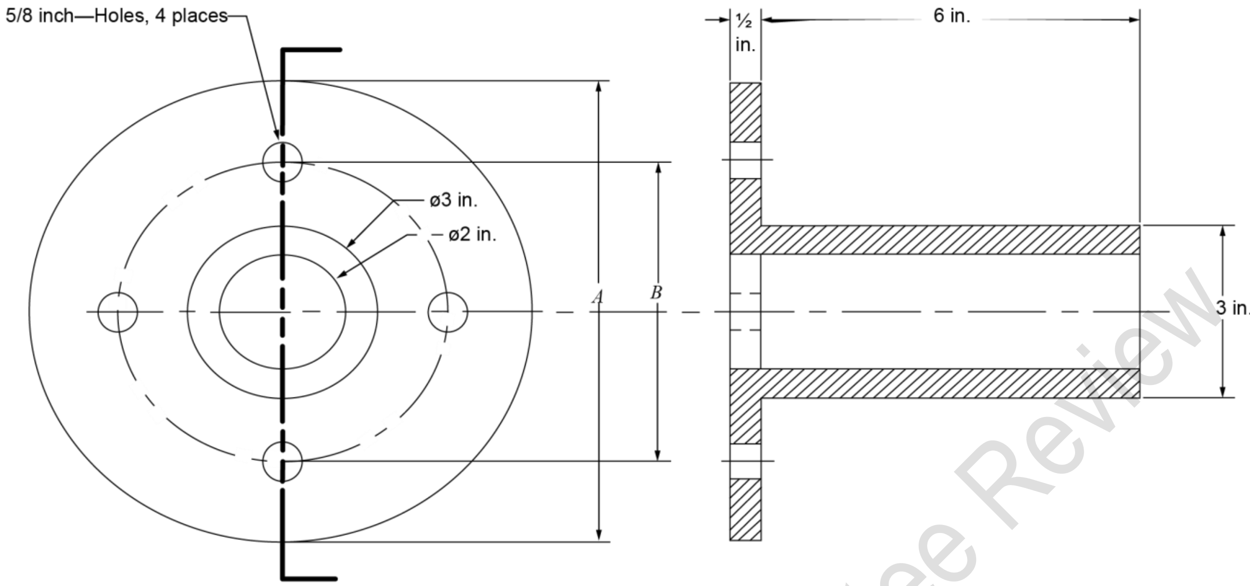
NOTE Thread crests and roots are parallel to cone.

Figure ~~66~~67—Gauge Thread Form and Dimensions for Buttress Casing (Taper sizes $4^1/_2$ in. through $13^3/_8$ in.)



NOTE Thread crests and roots are parallel to thread axis.

Figure ~~67~~68—Gauge Thread Form and Dimensions for Buttress Casing (Taper sizes 16 in. and larger)



Size (in.)	9⅝–10	10¾ / 11¾ / 12	13⅜ / 14	16	18 / 18⅝	20
A	9⅝	10¾	13⅜	16	18	20
B	7¼	9⅜	10¾	12⅜	16	17⅜

Figure ~~68~~69—Bolt Circles and Back-up Plate Dimensions for Line Pipe, Buttress Casing and Short or Long Round Casing Master Plug Gauges

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 be certified in accordance with the stipulations given in Section 7. These metrology laboratories and accreditation bodies shall operate in accordance with ISO/IEC 17025 or equivalent standards.

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 shall 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 the 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 the 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 the gauge certifying agency.

~~8.1.3 Conformance of Reconditioned Pipe Gauges~~

~~Used line pipe gauges made prior to January 1, 1940, with *g* dimensions equal to 5*p*, when reconditioned, shall be checked for conformance to the dimensions given in API 5L, 6th Edition (August 1935) and recertified as provided herein.~~

~~8.1.4~~8.1.3 Standoff

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 advancement (very slight) 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~~8.1.4 Marking Verification

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

a) Date of Certification—the date of certification shall be marked on each gauge. In recertifying reconditioned gauges, the previous certification date shall be replaced with the date of recertification. Dates of retest, as required by 6.1.11, 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 6.1.12 shall not be marked on master gauges.

~~d) API Monogram—if a gauge marked with the Monogram is determined by the certifying agency to be in non- conformance to requirements, the Monogram shall be removed.~~

NOTE The certifying agency may mark the gauges with other additional markings considered necessary for proper identification.

~~8.1.6~~8.1.5 Setting Standards

The accuracy of crest check and addendum setting standards should be verified in an approximately 68 °F (20 °C) environment by a means that assures a measurement uncertainty no greater than 25 % of the allowable tolerance for the setting standard dimension being measured.

9 Thread Marking

9.1 Unless specified differently by the applicable product specification, products having pipe threads which conform to the threading and gauging stipulation given in API 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~~API 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 $2^{1}/_{2}$ in. (63.5 mm), line pipe threads may be marked:

AB CO $2^{1}/_{2}$ ~~Spec~~API 5B LP

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

— Casing (short round thread)................................... ~~CSG~~SC

— Casing (long round thread)................................... LC~~SG~~

— Casing (buttress thread)....................................... BC~~SG~~

— Line Pipe.. LP

— Tubing (non-upset)... ~~TBG~~NU

— Tubing (external-upset).. ~~UPTBG~~EU

— Tubing (integral joint).. IJ

NOTE For gauge marking requirements, see 7.1.10.

9.2 The use of the letters "~~Spec~~API 5B" as provided in 9.1 constitutes a certification by the manufacturer that the threads so marked comply with the requirements stipulated in API 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 other API specification. Manufacturers who use the letters "~~Spec~~API 5B" for thread identification shall 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.

~~Annex A~~

~~(informative)~~

~~API Monogram Program~~
~~Use of the API Monogram by Licensees~~

~~Annex B~~
~~(informative)~~

~~Supplementary Requirements~~

Annex ~~C~~A
(informative)

Instructions for Shipment of Master Gauges

~~C~~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.

~~C~~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.

~~C~~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.

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

~~C~~A.5 Carriage charges should be prepaid. Shipment should preferably be by a fast system of transit. When returning gauges, custodians may ship collect. Owners should prescribe to the custodian the preferable method of transit for return of gauges.

~~C~~A.6 If cleaning is required, other than that required to remove the protective coating, the testing agency may charge for the extra work. If the gauge is rusted or scored to such extent as to require reconditioning, the gauge owner shall be so notified. Failure to recondition such gauges will be considered justification for cancellation of their status as authorized master gauges.

~~C~~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 should 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.

~~C~~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 (IAD), Washington, DC. 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 may be returned collect with transportation charges payable at destination.

~~C~~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 decrease in the time the gauges are away from the owner's factory.

Bibliography

[1] API Recommended Practice 5B1, *Gauging and Inspection of Casing, Tubing, and Line Pipe Threads*

[2] API Recommended Practice 5C1, *Care and Use of Casing and Tubing*

[3] API Specification 5CT, *Casing and Tubing*

[4] API Specification 5L, *Line Pipe*

[5] API Specification 6A, *Specification of Wellhead and Christmas Tree Equipment*

[6] ~~API Technical Report 5TRSR22, *SR 22 Supplementary Requirements for Enhanced Leak Resistance LTC*~~