Specification for Sucker Rods

API SPECIFICATION 11B
TWENTY-SIXTH EDITION, JANUARY 1, 1998

EFFECTIVE DATE: JULY 1, 1998

American
Petroleum
Institute

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Exploration and Production Department

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Attention users: Portions of this publication have been changed from the previous edition. The locations of substantive changes have been marked with bar notations in the margins, as shown to the left of this paragraph. The bar notations are not used for numerous editorial changes, such as renumbering of sections or paragraphs, which were necessitated by reformatting of this publication (i.e., Section 3 formerly was 2.2, and Sections 4 through 15 formerly were Sections 3 through 14). The bar notations are provided as an aid to users, and API makes no warranty as to their completeness.

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1 Scope

1.1 COVERAGE

This specification covers: 1) steel sucker rods; 2) fiber reinforced plastic (FRP) sucker rods; 3) couplings, subcouplings, and polished rod connections; 4) polished rods; 5) stuffing boxes and pumping tees; 6) polished-rod clamps; and 7) sinker bars.

2 References

This specification includes by reference, either in total or in part, other API, industry, and government standards listed below. The extent of each reference is detailed as it is made.

API	
RP 11BR-89	*With July 1, 1991 Supplement 2, Recommended Practice for Care and Handling of Sucker Rods*
Spec 5B-96	*Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads*
ANSI/ASQC[1]	
Z1.4-93	*Sampling Procedures and Tables for Inspection by Attributes*
ASME[2]	
B1.1-89	*Unified Inch Screw Threads (UN and UNR Thread Form)*
ASNT[3]	
SNT-TC-1A-88	*Recommended Practice*
ASTM[4]	
A370-92	*Standard Test Methods and Definitions for Mechanical Testing of Steel Products*
A395-88	*Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*
A536-84	*Standard Specification for Ductile Iron Castings*
A751-90	*Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products*
D2583-87	*Test Method for Indention Hardness of Rigid Plastics by Means of a Barcol Impressor*
D2584-68	*Test Method for Ignition Loss of Cured Reinforced Resins*
D4475-85	*Test Method for Apparent Horizontal Shear Strength of Pultruded Reinforced Plastic Rods by the Short-Beam Method*
E18-92	*Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials*
E165-91	*Standard Test Method for Liquid Penetrant Examination*
E384-89	*Standard Test Method for Microhardness of Materials*
NACE[5]	
MR0175-92	*Standard Recommended Practice Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment*
TM0170-70	*Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive*
TM0175-75	*Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit and Shot*

[1]American National Standards Institute, Inc./American Society for Quality Control, 1430 Broadway, New York, New York 10018.
[2]American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017.
[3]American Society for Nondestructive Testing, 1711 Arlington Lane, Columbus, Ohio 43228-0518.
[4]American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.

3 Abbreviations

Abbreviations used within this specification are defined below:

AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
ASQC	American Society for Quality Control
ASTM	American Society for Testing and Materials
NACE	National Association of Corrosion Engineers

[5]NACE International, P.O. Box 218340, Houston, Texas 77218-8340.

4 Design Control

4.1 GENERAL

Products designed and manufactured in accordance with this specification shall be constructed of materials in compliance with the appropriate sections of this specification and shall comply with the dimensions given in the appropriate sections of this specification.

4.2 DESIGN DEVELOPMENT

Design development shall be conducted and documented. The design shall conform to the requirements of this specification and any other referenced specifications. Methods, assumptions, formulae, calculations, and testing as required to show design conforms to requirements shall be documented.

4.3 DESIGN DOCUMENTATION

Design documentation shall include drawings, and as required, assumptions, formulae, calculations, design requirements, testing, and acceptance criteria. Design documentation medium shall be clear, legible, reproducible, and retrievable.

4.4 DESIGN VERIFICATION

Manufacturers shall conduct and document verification of design to requirements of this specification.

4.5 DESIGN REVIEW

Design documentation shall be reviewed and verified by qualified individuals other than the individual(s) who developed the original design.

4.6 DESIGN CHANGES

Design changes that affect conformance to this specification's requirements shall be controlled and processed as the original design and documentation.

5 Material

5.1 STEEL SUCKER RODS

5.1.1 Chemical Composition

The chemical composition of steel sucker rods and steel pony rods shall be any composition of AISI recommended series steel listed in Table 1 which can be effectively heat treated to the mechanical property requirements of API Grades K, C, and D rods as shown in Table 2. The exact chemical composition shall be detailed in the material specification of the manufacturer.

Table 1—Chemical Composition of Steel Rods

API Grade	Chemical Composition
K	AISI 46XX Series Steel
C	AISI 10XX Series Steel
	AISI 15XX Series Steel
D Carbon	AISI 10XX Series Steel
	AISI 15XX Series Steel
D Alloy	AISI 41XX Series Steel
D Special	Special*

*Special Alloy shall be any chemical composition that contains a combination of Nickel, Chromium, and Molybdenum that total a minimum of 1.15 percent alloying content.

Table 2—Mechanical Strength Properties of Steel Rods

API Grade	Minimum Yield 0.2% Offset psi (Mpa)	Minimum Tensile psi (Mpa)	Maximum Tensile psi (Mpa)
K	60,000 (414)	90,000 (620)	115,000 (793)
C	60,000 (414)	90,000 (620)	115,000 (793)
D	85,000 (586)	115,000 (793)	140,000 (965)

5.1.1.1 Chemical analysis shall be performed on each heat of steel used in the manufacturer of sucker rods or pony rods. This analysis shall be in accordance with ASTM A751.

5.1.1.2 A Certified Material Test Report for the heat of steel from the original mill manufacturer is an acceptable means to comply with 5.1.1.1.

5.1.2 Mechanical Properties

The mechanical properties of steel sucker rods and steel pony rods shall conform to the strength values listed in Table 2.

5.2 FRP SUCKER RODS

5.2.1 Endfitting Chemical Composition

5.2.1.1 FRP sucker rod and FRP pony rod end fittings shall conform to one of the chemical compositions and grades as listed in Table 1 or the following:

Grade A — This material shall meet the requirements of NACE MR0175 with the exclusion of paragraph 10.3.1 on Sucker Rod Pumps and Sucker Rods.

Grade B — Any chemical composition heat treated to give the specified mechanical properties in Table 3.

5.2.1.2 The exact chemical composition shall be detailed in the material specification of the manufacturer.

5.2.1.3 Chemical analysis shall be performed on each heat of steel used in the manufacture of endfittings. This analysis shall be in accordance with ASTM A751.

5.2.1.4 A Certified Material Test Report for the heat of steel from the original mill manufacturer is an acceptable means to comply with 5.2.1.3.

5.2.2 Mechanical Properties

5.2.2.1 FRP sucker rod endfittings shall conform to the mechanical requirements in Table 3.

5.2.2.2 This maximum operating temperature of FRP sucker rods shall be as shown in Table 4.

Table 3—FRP Sucker Rod Endfitting Grades and Mechanical Properties

API Grade	Minimum Yield 0.2% Offset psi (Mpa)	Minimum Tensile psi (Mpa)	Maximum Tensile psi (Mpa)
A	60,000 (414)	90,000 (620)	115,000 (793)
B	85,000 (586)	115,000 (793)	140,000 (965)
K	60,000 (414)	90,000 (620)	115,000 (793)
C	60,000 (414)	90,000 (620)	115,000 (793)
D	85,000 (586)	115,000 (793)	140,000 (965)

Table 4—Maximum Operating Temperature of FRP Sucker Rods

A Cycles to First Expected Failure	B Allowable Range Modifier	C Operating Temperature °F (°C) of Rod	D Allowable Range Modifier
5 Million	—	RT*	—
7.5 Million	100%	100 (38)	—
10 Million	—	120 (49)	—
15 Million	—	140 (60)	—
30 Million	—	160 (71)	100%
		180 (82)	—
		220 (104)	—
		*	—
		*	—
		Max. Op. Temp.	—
		( )	—

*RT = room temperature.

5.2.2.3 Performance

The manufacturer shall develop a basic stress range diagram (example: Figure 1) that will provide a method to calculate the allowable range at 160°F (71°C) operating temperature and 7.5 million cycles to expected first failure of the rod string. The diagram shall define the applicable nominal rod body diameters. The diagram shall define the scale of the axis, O-C and the curve A-P as indicated on Figure 1.

Notes:
1. Allowable range is the difference between maximum stress and minimum stress for a given minimum stress on the basic stress range diagram.
2. On Figure 1, point A is greater than zero.

5.2.2.4 FRP sucker rod manufacturers shall determine the tensile modulus expressed in pounds per square inch (Mpa) measured from end of endfitting to end of opposite endfitting, and the average weight expressed in pounds per foot (kilograms per meter) for a full length FRP sucker rod assembly for each grade and rod size.

6 General Dimensions

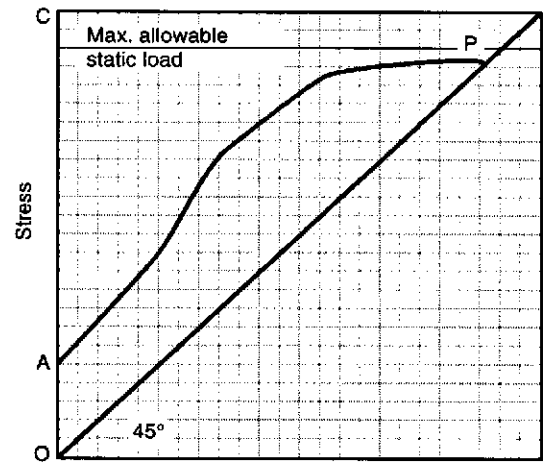
6.1 SIZES AND LENGTHS

6.1.1 Steel sucker rods and steel pony rods shall be furnished in the sizes and lengths shown in Table 5.

6.1.2 FRP sucker rods and FRP pony rods shall be furnished in the sizes and lengths shown in Table 6.

6.2 STEEL ROD BODIES

Final rod body shall conform to the diameter requirements of Table 5 at any point along the rod body.



Note: This diagram rated for 160°F and 7.5 x 10^6 cycles to expected first failure of the rod string.

Figure 1—Example Curve of FRP Sucker Rod "Basic Stress Range Diagram"

6.3 STEEL ROD ENDS

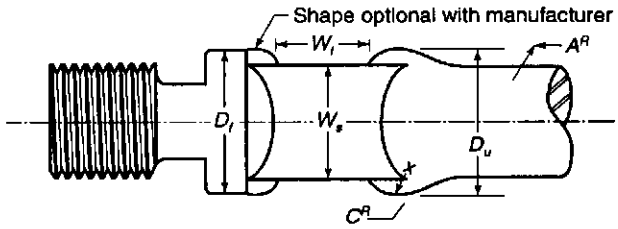
Steel rod ends shall conform to the dimensions given in Figure 2 and Table 5. Steel rod pins shall conform to the requirements of Section 8.

6.4 FRP RODS

FRP rods shall conform to the dimensions given in Table 6. FRP rod pins shall conform to the requirements of Section 8.

6.5 MEASUREMENT AND TESTING

Measurement and testing of all sucker rods shall be performed in accordance with Section 9.



Notes:
See Table 5.
See Section 8 for details of shoulder connection.

Figure 2—General Dimensions for Steel Sucker-Rod Pin Ends

7 Couplings and Subcouplings

7.1 COUPLING AND SUBCOUPLING CLASS

Couplings and subcouplings are furnished in two classes, Class T and Class SM. Mechanical properties shall be per manufacturer's specification with a minimum tensile strength of 95,000 psi (655 Mpa).

7.1.1 Class T—The material shall be per manufacturer's specification and shall have a maximum sulfur content of 0.05 percent.

7.1.1.1 Determination of the metal material hardness as 56 to 62 HRA is an acceptable means to comply with the tensile requirement of 7.1.

7.1.1.2 A Certified Material Test Report for the heat of steel from the original mill manufacturer is an acceptable means to comply with 7.1.

7.1.2 Class SM—The base material shall be per manufacturer's specification and shall have a maximum sulphur content of 0.05 percent. Spray metal coating hardness shall be 595 HV_{200} minimum. The chemical composition of the coating shall be per Table 7.

7.1.2.1 Determination of the base metal material hardness as 56 to 62 HRA is an acceptable means to comply with the tensile requirement of 7.1.

Table 5—General Dimensions and Tolerances for Steel Sucker Rods and Pony Rods

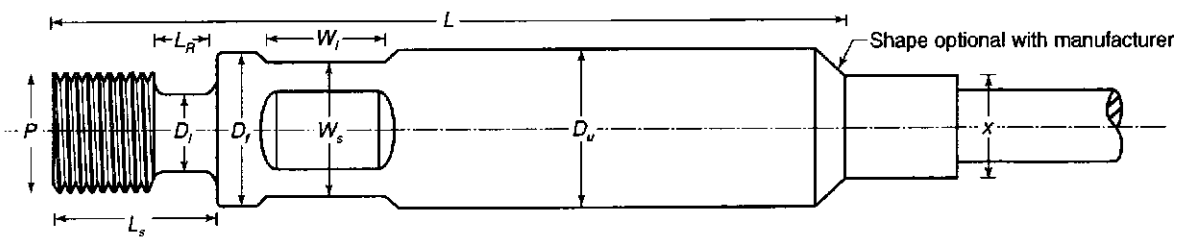
Nominal Length (feet)	25, 30	25, 30	25, 30	25, 30	25, 30
Diameter of Rod Body in. (mm)	5/8, +0.007 –0.014 (15.88, +0.18 –0.36)	3/4, +0.008 –0.016 (19.05, +0.20 –0.41)	7/8, +0.008 –0.016 (22.23, +0.20 –0.41)	1, +0.009 –0.018 (25.40, +0.23 –0.46)	1 1/8, +0.010 –0.020 (28.58, +0.25 –0.51)
Outside Diameter of Pin Shoulder D_f in. (mm)	1.250, +0.005 –0.010 (31.8, +0.13 –0.25)	1.500, +0.005 –0.010 (38.1, +0.13 –0.25)	1.625, +0.005 –0.010 (41.3, +0.13 –0.25)	2.000, +0.005 –0.010 (50.8, +0.13 –0.25)	2.250, ±0.015 (57.2, ±0.38)
Width of Wrench Square W_s in. (mm), ±1/32 (±0.8mm)	7/8 (22.2)	1 (25.4)	1 (25.4)	1 5/16 (33.3)	1 1/2 (38.1)
Length of Wrench Square[1] W_t in. (mm)	1 1/4 (31.8)	1 1/4 (31.8)	1 1/4 (31.8)	1 1/2 (38.1)	1 5/8 (41.3)
Length of Sucker Rod[2] in. (mm), ±2.0 in (±51 mm)	296, 356 (7518, 9042)	296, 356 (7518, 9042)	296, 356 (7518, 9042)	296, 356 (7518, 9042)	296, 356 (7518, 9042)
Length of Pony Rods[2] in. (mm), ±2.0 in. (±51 mm)	20, 44, 68, 92, 116 (508, 1118, 1727, 2337, 2946)	20, 44, 68, 92, 116 (508, 1118, 1727, 2337, 2946)	20, 44, 68, 92, 116 (508, 1118, 1727, 2337, 2946)	20, 44, 68, 92, 116 (508, 1118, 1727, 2337, 2946)	20, 44, 68, 92, 116 (508, 1118, 1727, 2337, 2946)
Diameter of Bead D_u in. (mm)	1 7/32, +0.005 –1/8 (31.1, +0.13 –3.17)	1 13/32, +0.005 –1/8 (35.7, +0.13 –3.17)	1 1/2, +0.005 –1/8 (38.1, +0.13 –3.17)	1 29/32, +0.005 –3/16 (48.4, +0.13 –6.35)	2 3/16, +0.005 –3/16 (55.6, +0.13 –6.35)
A^R in. (mm), ±1/8 (±3.17)	1 7/8 (47.6)	2 1/4 (57.1)	2 5/8 (66.7)	3 (76.2)	3 3/8 (85.7)
C^R in. (mm) +1/16 –1/64 (+1.59 –0.40)	1/8 (3.2)	1/8 (3.2)	3/16 (4.8)	3/16 (4.8)	3/16 (4.8)

[1]Minimum length exclusive of fillet.
[2]The length of sucker and pony rods shall be measured from contact face of pin shoulder to contact face of pin shoulder.

Table 6—General Dimensions and Tolerances for FRP Sucker Rods and Pony Rods

Nominal Size of Rod Body ±0.015 (±0.38)	Rod Pin Size	Nominal Diameter of Pin P	Outside Diameter of Pin Shoulder +0.005 –0.010 (+0.127 –0.254)	Width of Wrench Square W_s	Length of Wrench Square[1] W_l	Maximum Diameter of End Fitting D_c	Maximum Length of End Fitting L	Maximum Diameter of Extension X	Length[3] of Pin-and-Pin Sucker Rod ±2.0 (±51)	Length[3] of Pin-and-Pin Pony Rod ±2.0 (±51)
0.750 (19.05)	5/8 (15.88)	15/16 (23.81)	1.250 (31.75)	1 (25.40)	1 1/4 (31.75)	D_f	[4]	[2]	296, 356, 446 (7518, 9042, 11,328)	32, 68, 104, 212 (813, 1727, 2642, 5385)
0.875 (22.23)	3/4 (19.05)	1 1/16 (26.99)	1.500 (38.10)	1 5/16 (33.34)	1 1/4 (31.75)	D_f	[4]	[2]	296, 356, 446 (7518, 9042, 11,328)	32, 68, 104, 212 (813, 1727, 2642, 5385)
1.000 (25.40)	7/8 (22.23)	1 3/16 (30.16)	1.625 (41.28)	1 5/16 (33.34)	1 1/4 (31.75)	D_f	[4]	[2]	296, 356, 446 (7518, 9042, 11,328)	32, 68, 104, 212 (813, 1727, 2642, 5385)
1.250 (31.75)	1 (25.40)	1 3/8 (34.93)	2.00 (50.80)	1 1/2 (38.10)	1 5/8 (41.28)	D_f	[4]	[2]	296, 356, 446 (7518, 9042, 11,328)	32, 68, 104, 212 (813, 1727, 2642, 5385)

Notes:
All dimensions in inches (mm).
[1]Minimum length exclusive of fillet.
[2]The extension is that portion of the rod body or that portion of the end fitting which is immediately adjacent to the smaller end of the elevator taper. If this section of the end fitting is longer than 0.25 inch (6.3 mm) the maximum outside diameter shall not be more than 0.200 inch (5.08 mm) larger than the diameter of the rod body. If this section of the end fitting is 0.25 inch (6.3 mm) or less in length, the outside diameter shall not be more than 0.25 inch (6.3 mm) larger than the diameter of the rod body.
[3]The length of sucker rods and pony rods shall be measured from contact face of pin shoulder to contact face of pin shoulder.
[4]Not to exceed 10 inches (254 mm) exclusive of extension, if used.



Notes:
See Table 6.
See Section 8 for details of shoulder connection.

Figure 3—General Dimensions for FRP Sucker-Rod Pin Ends

Table 7—Coating Chemical Composition

	Min %	Max %
Carbon	0.50	1.00
Silicon	3.50	5.50
Phosphorus	0.00	0.02
Sulfur	0.00	0.02
Chromium	12.00	18.00
Boron	2.50	4.50
Iron	3.00	5.50
Cobalt	0.00	0.10
Titanium	0.00	0.05
Aluminum	0.00	0.05
Zirconium	0.00	0.05
Nickel	Remainder	

7.1.2.2 Base metal shall be prepared to No. 1 finish per NACE TM0170 or TM0175 prior to spray metal coating in accordance with manufacturer's procedure and specification. Spray metal coating shall not affect the mechanical performance of the Class SM coupling.

7.1.2.3 Spray metal coating thickness shall be 0.010 inch to 0.020 inch (0.254 to 0.508 mm) and shall cover the outside diameter. Spray metal coating shall extend to the outside diameter of the contact face. Finished dimensions shall be per Tables 8 and 11.

7.2 COUPLING AND SUBCOUPLING TYPE (SEE FIGURE 4)

7.2.1 Couplings

Couplings are furnished in two types.

7.2.1.1 Sucker Rod

Sucker rod couplings have the same box thread size in each end and are used for connecting sucker rods. External dimensions shall conform to Table 8. Box thread dimensions shall conform to Table 11. Do not use on polished rods.

7.2.1.2 Polished Rod

Polished rod couplings have the same box thread size in each end and are used for connecting the polished rod to the sucker rod string. External dimensions shall conform to Table 8. Box thread dimensions shall conform to Tables 10 and 11.

7.2.1.3 Subcouplings

Subcouplings have different box threads in each end and are used for connecting two sizes of sucker rods or a polished rod to a sucker rod string. External dimensions shall conform to Table 8. Outside diameter (W) shall conform to the larger box thread. Box thread dimensions shall conform to Tables 10 and 11.

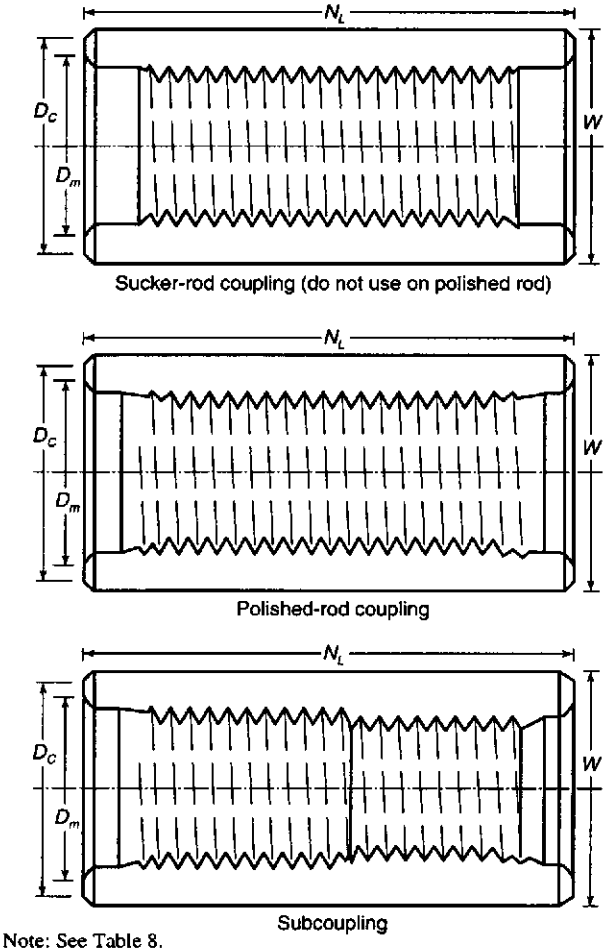
7.3 DIMENSIONS AND TOLERANCES

External dimensions of couplings and subcouplings shall conform to Table 8.

Table 8—Couplings and Subcouplings

Nominal Coupling Size[1]	Outside Diameter (W) +0.005 (+0.13) -0.010 (-0.25)	Length (N_L) +0.062 (+1.57) -0.000 (-0.00)
5/8 (15.9) S.H.[2]	1.250 (31.8)	4.000 (101.6)
5/8 (15.9)	1.500 (38.1)	4.000 (101.6)
3/4 (19.1) S.H.	1.500 (38.1)	4.000 (101.6)
3/4 (19.1)	1.625 (41.3)	4.000 (101.6)
7/8 (22.2) S.H.	1.625 (41.3)	4.000 (101.6)
7/8 (22.2)	1.812 (46.0)	4.000 (101.6)
1 (25.4) S.H.	2.000 (50.8)	4.000 (101.6)
1 (25.4)	2.187 (55.6)	4.000 (101.6)
1 1/8 (28.6)	2.375 (60.3)	4.500 (114.3)
1 (25.4) S.H. Sub Coupling	2.000 (50.8)	4.500 (114.3)
1 (25.4) Sub Coupling	2.187 (55.6)	4.500 (114.3)
1 1/8 (28.6) Sub Coupling	2.375 (60.3)	5.000 (127.0)

Notes:
See Figure 4.
All dimensions in inches (mm).
[1]Size of coupling is same as corresponding sucker rod size.
[2]S.H. is reduced outside diameter coupling known as slim hole.



Note: See Table 8.

Figure 4—Sucker Rod Couplings, Polished Rod Couplings, and Subcouplings

7.4 ANTI-GALLING TREATMENT

This coating shall be per manufacturer's specifications and used on all coupling and subcoupling threads. It shall reduce galling tendency during coupling/sucker rod make-up. Its use shall not affect make-up torque of coupling/sucker rod connection.

7.5 MEASUREMENT AND TESTING

Measurement and testing of all couplings and subcouplings shall be performed in accordance with Section 9.

8 Threaded Connections, Sucker Rod and Pony Rod Pin and Box Connections Sucker Rod and Polished Rod Couplings and Subcouplings

8.1 PIN CONNECTIONS

8.1.1 Sucker rod and pony rod pins shall conform to the applicable dimensions of Table 9 and Figure 5.

8.1.2 Polished rod pins (9 degree cone pin) shall conform to the applicable dimensions of Table 10 and Figure 6.

8.2 BOX CONNECTIONS

8.2.1 Sucker rod and pony rod couplings (deep counterbore) shall conform to the applicable dimensions of Table 11 and Figure 5.

8.2.2 Polished rod couplings, and Box-and-Box subcouplings [$^1/_4$ inch (6.3 mm) deep counterbore and 9 degree taper] shall conform to the applicable dimensions of Tables 10 and 11, and Figure 6.

8.3 THREAD ALIGNMENT

Maximum parallel misalignment of axes of coupling or subcoupling threads shall not exceed 0.020 inch (0.508 mm). Maximum angular misalignment shall not exceed 0.179 degrees [$^{15}/_{32}$ inch (11.9mm) in $12^1/_2$feet (3.81 meters)]. Angular misalignment plus parallel misalignment shall not exceed 0.020 inch (0.508 mm).

8.4 PIN-AND-BOX CONTACT SHOULDERS

Contact shoulders on pin-and-box connections shall conform to the dimensions specified in Table 12.

Table 9—Sucker Rod and Pony Rod Pin Connections

Nominal Size of Rod						
	Steel	$^5/_8$ (15.9)	$^3/_4$ (19.1)	$^7/_8$ (22.2)	1 (25.4)	$1^1/_8$ (28.6)
	FRP	$^3/_4$ (19.1)	$^7/_8$ (22.22)	1 (25.4)	$1^1/_4$ (31.8)	NA*
Nominal Diameter of Thread		$^{15}/_{16}$ (23.8)	$1^1/_{16}$ (27.0)	$1^3/_{16}$ (30.2)	$1^3/_8$ (34.9)	$1^9/_{16}$ (39.7)
Diameter of Stress Relief D_1 ±0.005 (±0.13)		0.790 (20.07)	0.915 (23.24)	1.040 (26.42)	1.227 (31.17)	1.414 (35.92)
Length of Stress Relief L_R +0.031 (+0.79) −0.000 (−0.00)		0.516 (13.11)	0.594 (15.09)	0.672 (17.07)	0.797 (20.24)	0.875 (22.23)
Length of Pin L_3 +0.062 (+1.57) −0.000 (−0.00)		1.250 (31.75)	1.437 (36.50)	1.625 (41.28)	1.875 (47.63)	2.125 (53.98)
Maximum Pin Major Diameter		0.9362 (23.779)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.887)	1.5609 (39.647)
Minimum Pin Major Diameter		0.9233 (23.452)	1.0482 (26.624)	1.1732 (29.799)	1.3606 (34.559)	1.5480 (39.319)
Maximum Pin Pitch Diameter		0.8712 (22.128)	0.9962 (25.303)	1.1211 (28.476)	1.3085 (33.236)	1.4960 (37.998)
Minimum Pin Pitch Diameter		0.8654 (21.981)	0.9900 (25.146)	1.1150 (28.321)	1.3020 (33.071)	1.4892 (37.826)
Maximum Pin Minor Diameter		0.8135 (20.663)	0.9384 (23.835)	1.0634 (27.010)	1.2508 (31.770)	1.4382 (36.530)

Notes:
All dimensions in inches followed by equivalent in mm.
See Figures 5 and 7.
*Pin connections in this size are applicable only to steel rods.

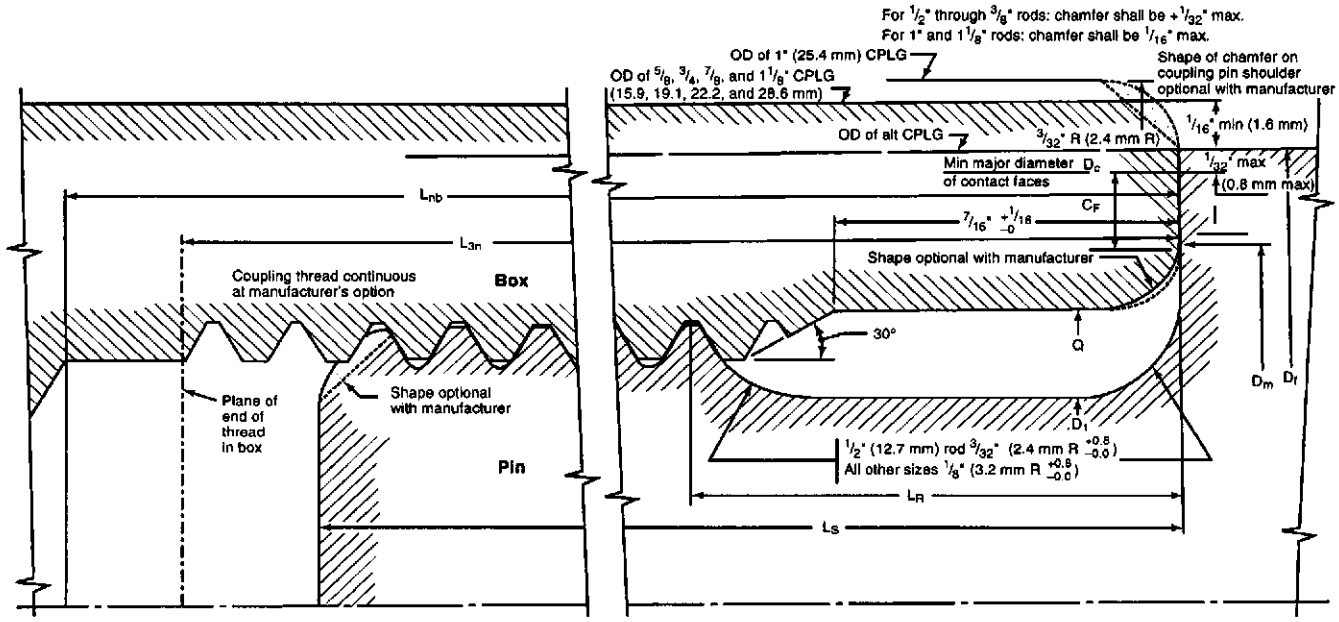


Figure 5—Sucker Rod Connection

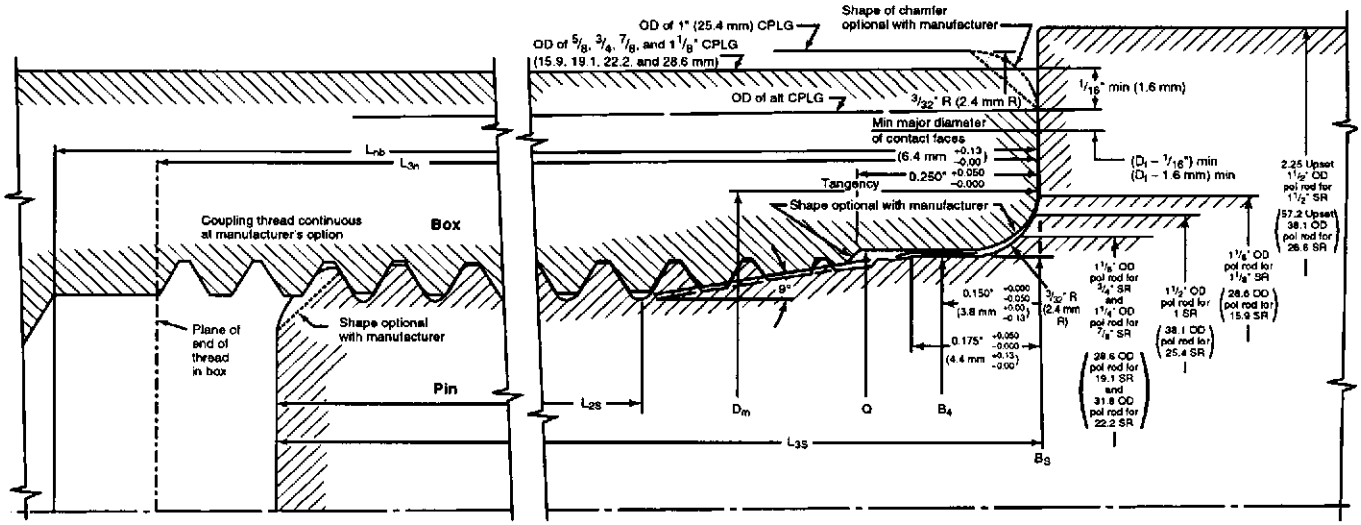


Figure 6—Polished Rod Connection

Table 10—Polished Rod Pin Connections

Nominal Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)
Maximum Pin Major Diameter	0.9362 (23.779)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.887)	1.5609 (39.647)
Minimum Pin Major Diameter	0.9233 (23.452)	1.0482 (26.624)	1.1732 (29.799)	1.3606 (34.559)	1.5480 (39.319)
Maximum Pin Pitch Diameter	0.8712 (22.129)	0.9962 (25.303)	1.1211 (28.476)	1.3085 (33.236)	1.4960 (37.998)
Minimum Pin Pitch Diameter	0.8654 (21.981)	0.9900 (25.146)	1.1150 (28.321)	1.3020 (33.071)	1.4892 (37.826)
Maximum Pin Minor Diameter	0.8135 (20.663)	0.9384 (23.835)	1.0634 (27.010)	1.2508 (31.770)	1.4382 (36.530)
Length of Perfect Polished Rod Threads* L_{2s} +0.111 (+2.82) −0.000 (−0.00)	0.575 (14.61)	0.825 (20.96)	0.825 (20.96)	1.200 (30.48)	1.450 (36.83)
Length Polished Rod Pin L_{3s} +0.061 (+1.55) −0.000 (−0.00)	1.125 (28.58)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)
Diameter of Polished Rod Pin Shank B_s +0.0000 (+0.000) −0.0129 (−0.328)	0.9362 (23.780)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.887)	1.5609 (39.647)
Diameter of Polished Rod Pin-and-Box Cone Base B_4 (Theoretical)	0.9430 (23.952)	1.0680 (27.127)	1.1930 (30.302)	1.3805 (35.065)	1.5680 (39.827)

Notes:
All dimensions in inches followed by equivalent in mm.
See Figures 6 and 7.
*It is not required that dimension L_{2s} be measured separately.

Table 11—Box Connections

Nominal Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)
Nominal Diameter of Thread	15/16 (23.8)	1 1/16 (27.0)	1 3/16 (30.2)	1 3/8 (34.9)	1 9/16 (59.7)
Total Depth of Box Minimum L_{nb}	1 3/4 (44.5)	1 15/16 (49.2)	2 1/8 (53.9)	2 1/2 (63.5)	2 3/4 (69.8)
Total Length of Threads in Box Including Counterbore Min L_{3n}	1.41 (35.8)	1.60 (40.6)	1.79 (45.5)	2.00 (50.8)	2.25 (57.2)
Minimum Box Major Diameter (Basic)	0.9380 (23.825)	1.0630 (27.000)	1.1880 (30.175)	1.3754 (34.935)	1.5630 (39.700)
Maximum Box Pitch Diameter	0.8806 (22.367)	1.0060 (25.552)	1.1310 (28.727)	1.3190 (33.503)	1.5068 (38.273)
Minimum Box Pitch Diameter (Basic)	0.8730 (22.174)	0.9980 (25.349)	1.1230 (28.524)	1.3105 (33.287)	1.4980 (38.049)
Maximum Box Minor Diameter	0.851 (21.62)	0.976 (24.79)	1.101 (27.97)	1.288 (32.72)	1.476 (37.49)
Minimum Box Minor Diameter	0.830 (21.08)	0.955 (24.26)	1.080 (27.43)	1.267 (32.18)	1.455 (36.96)
Diameter of Box Counterbore Q +0.010 (+0.25) −0.000 (−0.00)	0.955 (24.26)	1.080 (27.43)	1.205 (30.61)	1.393 (35.38)	1.580 (40.13)

Notes:
All dimensions in inches followed by equivalent in mm.
See Figures 5 and 7.
The hollow crest of cold-formed threads should not be considered detrimental.
See Table 10 for polished rod box theoretical cone base dimension B_4.

Table 12—Pin-and-Box Contacts

Nominal Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)
Nominal Diameter Of Thread	15/16 (23.8)	1 1/16 (27.0)	1 3/16 (30.2)	1 3/8 (34.9)	1 9/16 (59.7)
Outside Diameter of Pin Shoulder and Box D_f +0.005 (+0.127) –0.010 (–0.254)	1.250 (31.75)	1.500 (38.10)	1.625 (41.28)	2.000 (50.80)	2.250* (57.15)
Minimum Major Diameter of Contact Faces D_c[1]	1.177 (29.90)	1.427 (36.25)	1.552 (39.42)	1.865 (47.37)	2.110 (53.59)
Minor Diameter of Contact Faces, D_m +0.015 (+0.380) –0.000 (–0.000)	1.110 (28.19)	1.253 (31.83)	1.378 (35.00)	1.566 (39.78)	1.753 (44.53)
Minimum Face Width C_f[2]	0.026 (0.66)	0.080 (2.03)	0.080 (2.03)	0.142 (3.61)	0.171 (4.34)

Notes:
All dimensions in inches followed by equivalent in mm.
See Figures 5 and 6.
Limits for pin shank diameter are the same as those for the major pin diameter, see Table 9.
*±0.015 (±0.38)
[1] $D_c = (D_f)$ min. –2 (Chamfer or Rad. On D_f) max.
[2] $C_f = (D_c - (D_m)$ max)/2

8.5 THREADS

The threaded portion of sucker rod shouldered connections and polished rod pins (9 degree cone) shall be 10 threads per inch and conform to the unified thread form with Class 2A-2B tolerances and allowances, as defined in ANSI/ASME B1.1. The design profile of the pin thread is type UNR with rounded root contour as shown in Figure 7. The thread profile of the box thread is type UN having a flat root contour with a permissible round root contour beyond the 0.25 x pitch (0.25p) flat width to allow for crest wear as shown in Figure 7. As indicated herein, sucker rod threads are straight threads (see Figure 5); polished rod threads are straight threads with the imperfect pin threads on the vanish cone (see Figure 6).

Note:
The following relationships are the basis for thread-form dimensions:
1. Height of sharp thread (H) = 0.086603 inch = 0.86603 p.
2. Design form height of pin thread = 0.059539 inch = 11H/16.
3. Basic depth of pin crest truncation = 0.01083 inch = H/8.
4. Basic depth of pin root truncation = 0.01083 inch = H/8.
5. Radius of basic pin root = 0.01083 inch = H/8.
6. Allowance at pin root for worn tool = 0.00361 = H/24.
7. Basic height of box thread = 0.05413 = 5H/8.
8. Basic depth of box crest truncation = 0.02165 inch = H/4.
9. Basic depth of box root truncation = 0.01083 inch = H/8.

9 Measurement, Testing and Gauging

9.1 EQUIPMENT

9.1.1 General

Equipment used to measure, test and inspect products covered by this specification shall be identified, controlled, calibrated and adjusted, if necessary, at specified intervals in accordance with the product manufacturer's specifications to maintain accuracy required by this specification.

9.1.2 Calibration

9.1.2.1 Measurement standards such as thread wires and gauge blocks used to calibrate equipment in 9.1.2.3 shall be checked and approved at least once a year by an outside agency with traceability to the National Institute of Standards and Technology, Gaithersburg, Maryland (NIST). Master gauges shall be checked and approved at least once every two years of use by an outside agency with traceability to NIST.

9.1.2.2 Working gauges (such as thread gauges) shall be calibrated at least once per month of use. A set of working gauges for both box and pin elements shall include the following as a minimum.

9.1.2.2.1 Pin Connections

a. Go pin-thread ring gauges, P8. P8 is used on sucker rods only.

b. Not-go pin-thread ring gauge, P6. P6 is used on sucker rods and polished rods.

c. Pin-cone ring gauge, P4. P4 is used on polished rods only.

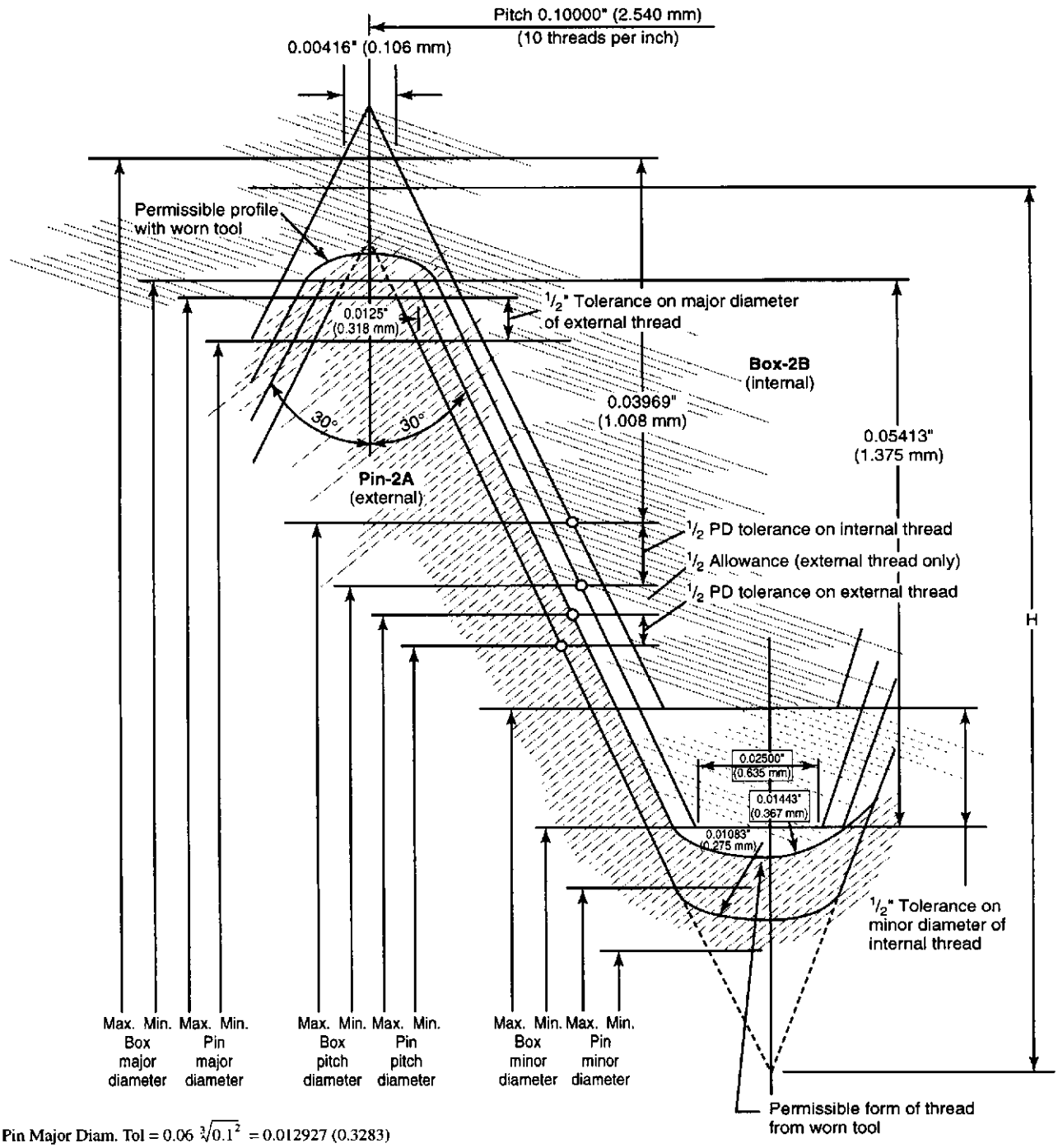
d. Go pin-thread ring gauge, P2. P2 is used on polished rods only and does not check 9 degree cone.

9.1.2.2.2 Box Connections

a. Go box-thread plug gauge, B2. B2 does not check 9 degree cone on polished rod couplings and subcouplings.

b. Box-cone plug gauge, B4. B4 is used on polished rod couplings and subcouplings. Do not use on sucker rod couplings.

c. Not-go box-thread plug gauge, B6. B6 is used on sucker rod couplings, polished rod couplings and subcouplings.



Pin Major Diam. Tol = $0.06\sqrt[3]{0.1^2} = 0.012927$ (0.3283)

Pin Pitch Diam. Tol = $0.0015\sqrt[3]{D} + 0.0015\sqrt[3]{L_e} + 0.0015\sqrt[3]{p^2}$

Box Pitch Diam. Tol = 1.300 Pin Pitch Diam. Tol

Box Minor Diam. Tol = $0.25p - 1.4p^2 = 0.02100$ (0.533)

Pin Allowance = 0.300 Pin Pitch Diam. Tol

2 x Box Thread Height = $1^1/_4 H = 0.10825$ (2.750)

2 x Pin Thread Addendum = $^3/_4 H = 0.06495$ (1.650)

Refer to pages 10, 11, and 12 of ASME B1.1-989 for balance of formulae.

Figure 7—Thread Form

9.1.2.3 Measuring Equipment (such as micrometers)

Measuring equipment shall be calibrated against certified measurement standards traceable to NIST where such standards exist.

9.1.2.4 Testing Equipment (such as hardness tester)

Testing equipment shall be calibrated at least once a year.

9.2 PERSONNEL

Personnel performing visual examination shall have an annual eye examination in accordance with ASNT SNT-TC-1A.

9.3 INSPECTION AND TESTING

9.3.1 Sucker Rods and Pony Rods

9.3.1.1 Dimensional Inspection

9.3.1.1.1 Dimensional inspection shall be performed in accordance with Table 13 for steel rods. For FRP rods, they shall be checked for component length, to assure dimensional compliance. This addresses the rod socket depth dimension, which is to be inspected. Inspection of socket depth and rod body length will assure dimensional compliance with respect to overall length.

9.3.1.1.2 Acceptance of inspection for steel rods shall be per ANSI/ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%*. Acceptance for FRP sucker rods shall be at an AQL of 1.0.

9.3.1.2 Mechanical Testing

9.3.1.2.1 Mechanical properties tests for steel rods shall be performed in accordance with ASTM A370. A minimum of two mechanical tests shall be performed on at least two rod bodies (one near the beginning and one near the end of each furnace lot), per mill heat after final thermal processing. If the manufacturer can document thermal processing control by continuous monitoring and/or statistical process control, an acceptable alternate is a minimum of two mechanical tests performed on at least two rod bodies (one near the beginning to establish process controls and one near the end to verify process controls) per mill heat after final thermal processing. Test samples shall meet the requirements of Table 2.

9.3.1.2.2 For FRP sucker rods, manufacturers shall perform the following tests and verify conformance to the manufacturer's documented specifications:

ASTM D2583
ASTM D2584
ASTM D4475

A minimum of two tests shall be performed on each manufacturing lot: one at the beginning and one at the end of the production run.

9.3.1.2.3 FRP sucker rods shall be proof-loaded to 110 percent of their maximum working stress. This is to ensure seating of the end fitting and detection of defects in assembly. Each rod shall be inspected for visible evidence (visible pull out of the rod from the end fitting) of this pull test.

9.3.1.2.4 Lots failing to meet the test criteria may be reprocessed and considered acceptable if the test criteria are met when the lot is retested.

9.3.2 Couplings and Subcouplings

9.3.2.1 Dimensional Inspection

9.3.2.1.1 Dimensional inspection shall be performed in accordance with Table 14.

9.3.2.1.2 Sucker rod couplings manufactured by boring and threading through from one end are exempt from alignment testing. Alignment tests on subcouplings shall be made by screwing the subcoupling onto a threaded test mandrel which has been accurately centered in a lathe, then screwing onto the other end of the subcoupling a lathe-turned piece which will provide a measured length of about 1 foot (0.3m).

Care should be taken to make certain that the coupling does not shoulder on either mandrel. A taper of $^1/_{16}$ inch per foot (5.2 mm/m) on the mandrel thread is recommended.

The extent of parallel misalignment shall be determined by the use of a micrometer indicator on the turned piece of the outer end as the assembly is rotated.

9.3.2.1.3 Acceptance of inspection shall be per ANSI/ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptance Quality Level = 4.0%*.

Rejected part may be reworked and reinspected in accordance with 9.3.2.1.1.

9.3.2.2 Mechanical Testing

When mechanical testing is elected to verify the tensile properties of couplings and subcouplings, the tests shall be performed in accordance with ASTM A370. A minimum of two mechanical tests shall be performed on at least two couplings or subcouplings per lot after final thermal processing. Test samples shall meet the requirements of Paragraph 7.1.

9.3.2.3 Hardness Testing

9.3.2.3.1 Class T Couplings and Subcouplings

When hardness testing is elected to verify the tensile properties of couplings and subcouplings, the tests shall be per-

formed after final thermal processing using the Rockwell A procedure per ASTM E18 (Figure 8).

9.3.2.3.1.1 Hardness shall conform to Paragraph 7.1.1.1.

9.3.2.3.1.2 Acceptance of testing shall be per ANSI/ ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%.*

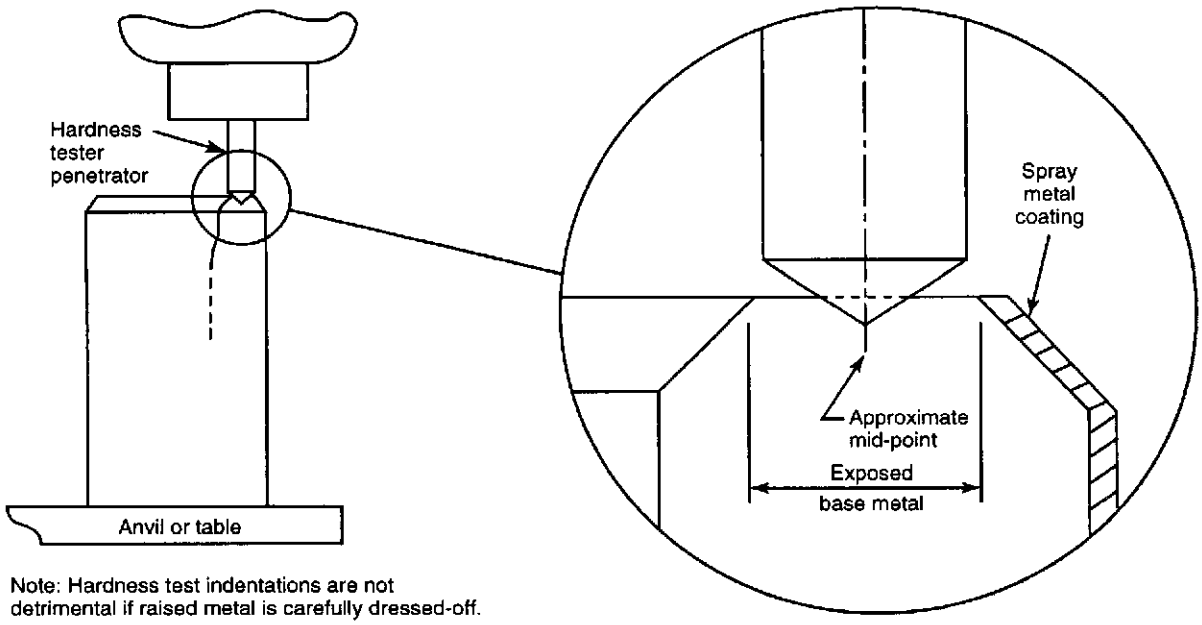
9.3.2.3.2 Class SM Couplings and Subcouplings

Spray metal coating hardness testing shall be by the Vickers Micro Hardness procedure with a 200 kg load per ASTM E384 (Figure 9) or equivalent Knoop hardness. When hardness testing is elected to verify the tensile properties of the base metal of couplings and subcouplings, the tests shall be performed after final thermal processing using the Rockwell A procedure per ASTM E18 (Figure 8).

9.3.2.3.2.1 Hardness shall conform to Section 7.1.2.

9.3.2.3.2.2 Acceptance of testing for spray metal coating shall be based on one coupling or subcoupling per lot of coating, or one coupling or subcoupling per 5000, whichever is more frequent.

9.3.2.3.2.3 Acceptance of testing for base metal shall be per ANSI/ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%.*



Note: Hardness test indentations are not detrimental if raised metal is carefully dressed-off.

Figure 8—Rockwell A Hardness Determination of Base Metal

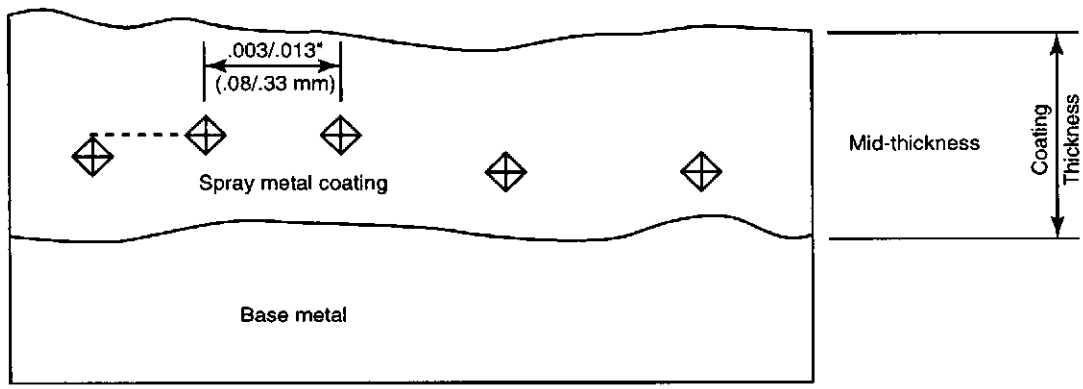


Figure 9—Vickers Microhardness Determination of Spray Metal Coating

9.3.2.4 Surface Finish Inspection

9.3.2.4.1 Surface finish shall conform to Sections 10.3 (subcoupling pin undercut) and 10.4 (outside diameter and face).

9.3.2.4.2 Acceptance of inspection shall be per ANSI/ ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%.*

9.3.3 Polished Rods

9.3.3.1 Dimensional Inspection

9.3.3.1.1 Dimensional inspection shall be performed in accordance with Table 15.

9.3.3.1.2 Acceptance of inspection shall be per ANSI/ ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%.*

Rejected parts may be reworked and inspected in accordance with 9.3.3.1.1.

9.3.3.2 Surface Finish Inspection

9.3.3.2.1 Surface finish shall be checked with a surface finish gauge such as a profilometer or a comparator. Surface shall conform to Section 12.4.

9.3.3.2.2 Acceptance of inspection shall be per ANSI/ ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level I, Acceptable Quality Level = 4.0%.*

9.3.3.3 Hardness Testing

9.3.3.3.1 Metal spray-on polished rods shall be hardness tested using the Vickers Micro Hardness procedure with a 200 kg load per ASTM E384 (Figure 9) or equivalent Knoop hardness.

9.3.3.3.2 Hardness shall conform to Section 12.

9.3.3.3.3 Acceptance of testing shall be based on one test coupon or production metal spray polished rod per lot coating.

9.3.4 Stuffing Boxes and Pumping Tees

9.3.4.1 Alignment Testing

9.3.4.1.1 Alignment shall conform to Section 13.1.2 or 13.2.2 as appropriate.

9.3.4.1.2 Stuffing boxes and pumping tees shall be tested for alignment in accordance with ANSI/ASQC Z1.4 at inspection level S2 and an Acceptable Quality Level of 10%.

9.3.4.1.3 Concentricity and alignment tests may be made by screwing the bottom thread of the box into a threaded test mandrel which has been accurately centered in a lathe. A lathe-turned piece is then fitted into the packing chamber to provide a minimum measurable length of one foot. The extent of radial displacement is determined by the use of a dial indicator on the turned piece close to the top of the box, and the extent of angular misalignment is determined by the use of a dial indicator on the turned piece at its outer end as the assembly is rotated. Any other method giving the same or greater degree of accuracy may be used.

9.3.4.1.4 Concentricity and alignment tests may be made by screwing the bottom end of the tee onto a threaded test mandrel which has been accurately centered in a lathe. A lathe turned piece is then screwed into the other end of the tee to provide a measured length of a least one foot. The extent of radial displacement is determined by the use of a dial indicator on the turned piece close to the face of the tee, and the extent of angular misalignment is determined by the use of a dial indicator on the turned piece on its outer end as the assembly rotated. Any other method giving the same or greater degree of accuracy may be used.

9.3.4.2 Hydrostatic Testing

9.3.4.2.1 Stuffing box bodies (without packing) and pumping tees shall be hydrostatically tested to twice the manufacturer's rated working pressure (NSCWP).

Note: NSCWP = Non-Shock Cold Working Pressure.

9.3.4.2.2 Stuffing boxes and pumping tees shall be hydrostatically tested in accordance with ANSI/ASQC Z1.4 at inspection level S2 and an Acceptable Quality Level of 10%.

9.3.5 Polished Rod Clamps

9.3.5.1 The manufacturer shall perform a production test on a clamp in accordance with ANSI/ASQC Z1.4 at inspection level S2 and at an Acceptable Quality Level of 10%.

9.3.5.2 The test procedure as detailed in paragraphs 14.3.1 through 14.3.6 shall be followed with the exception that paragraph 14.3.5 be modified such that it is not necessary to load to slippage. The applied load shall be the maximum rated load. If the clamp slips before reaching this load it is rejected.

9.3.5.3 The test detailed in paragraph 9.3.5.2 is considered nondestructive and any clamp passing this test is considered usable.

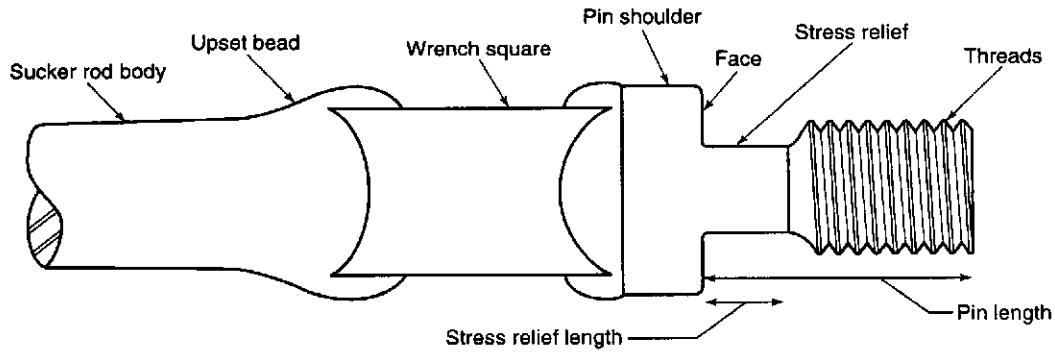
9.3.6 Sinker Bars

9.3.6.1 Dimensional Inspection

9.3.6.1.1 Dimensional inspection shall be performed in accordance with Tables 15 and 19.

9.3.6.1.2 Acceptance of inspection shall be per ANSI/ ASQC Z1.4, *Single Sampling Plan for Normal Inspection, General Inspection Level 1, Acceptance Quality Level = 4.0%.* Rejected parts may be reworked and reinspected in accordance with 9.3.6.1.1.

Table 13—Dimensional Inspection of Sucker Rods and Pony Rods

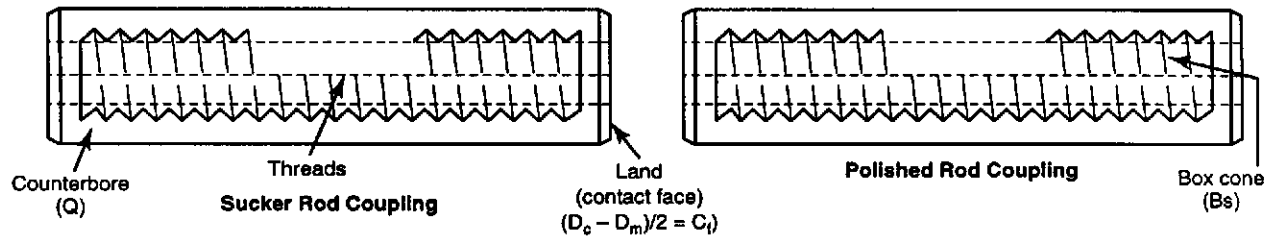


Check for	Gauge or Measuring Instrument	Procedure
Threads minimum (under size)	API P6 Not-go pin-thread ring gauge	The product pin shall not enter the P6 ring gauge more than the third turn of assembly.
Threads maximum (over size)	API P8 Go pin-thread ring gauge	The product pin shall enter the P8 ring gauge to pin-shoulder face contact.
Pin-shoulder face parallelism	API P8 Go pin-thread ring gauge & 0.002 inch (0.051 mm) flat feeler gauge	The product shall enter the P8 ring gauge to pin-shoulder face contact. The feeler gauge shall not enter, at any point, between the face of the gauge and the product pin-shoulder face.
Stress relief D_r maximum and minimum diameter	Micrometer, Vernier caliper, or gap gauge	Maximum diameter: Measure to dimension D_r, Table 9 as appropriate plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the stress relief. Minimum diameter: Measure to dimension D_r, Table 5 as appropriate minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass over the stress relief.
Pin-shoulder D_f & Upset bead D_u maximum and minimum diameter	Micrometer, Vernier caliper, or gap gauge	Maximum diameter: Measure to dimension listed in Table 5 or 6 as appropriate plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the particular area being gauged. Minimum diameter: Measure to dimension listed in Table 5 or 6 as appropriate minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass the particular area being gauged.
Stress relief L_r & Pin length L_s maximum and minimum length	Vernier caliper or gap gauges	Maximum length: Measure to dimension length listed in Table 9 as appropriate plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The product length shall not be longer. Minimum length: Measure to dimension length listed in Table 9 as appropriate or set gap gauge to assure product dimension is within the specified tolerance. The product length shall not be shorter.
Sucker rod and pony rod maximum and minimum diameter	Micrometer, Vernier caliper, or gap gauge *Note: Anvils on measuring instruments shall be $^1/_8$ inch (3mm) wide minimum	Maximum diameter: Measure to dimension listed in Table 5 or 6 as appropriate plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the rod body, the entire length. Minimum diameter: Measure to dimension listed in Table 5 or 6 as appropriate minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass over the rod body, the entire length.

Table 13—Dimensional Inspection of Sucker Rods and Pony Rods (Continued)

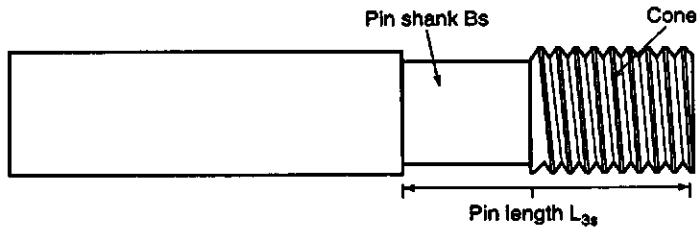
Check for	Gauge or Measuring Instrument	Procedure
Sucker rod and pony rod length maximum and minimum length	Tape Measure	Maximum length: Measure to dimension listed in Table 5 or 6 as appropriate plus the allowable (+) tolerance. The product shall not be longer. Minimum length: Measure to dimension listed in Table 5 or 6 as appropriate minus the allowable (–) tolerance. The product shall not be shorter.
Wrench square width W_t maximum and minimum width	Vernier caliper or gap gauge. *Note: Anvils on measuring instruments shall be $^1/_8$ inch (3mm) wide minimum and their length must be equal to or exceed the wrench square width	Maximum dimension: Measure to dimension listed in Table 5 or 6 as appropriate plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the entire width. Minimum dimension: Measure to dimension listed in Table 5 or 6 as appropriate minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass over the entire width.
Wrench square W_t	Vernier caliper or gap gauge	Measure to dimension listed in Table 5 or 6 as appropriate or set gap gauge to assure the product dimension is within the specified tolerance. The product length shall not be shorter.
Minimum Major Diameter of Contact Face D_c	Micrometer, Vernier caliper or gap gauge	Minimum Diameter (pin contact shoulder) Measure to dimension as listed in Table 12. The diameter shall be equal to or greater than listed dimension.

Table 14—Dimensional Inspection of Couplings and Subcouplings



Check for	Gauge or Measuring Instrument	Procedure
Threads maximum (over size)	API B6 Not-go coupling-thread plug gauge	The B6 plug shall not enter the product box threads more than the third turn of assembly.
Threads minimum (under size)	API B2 Go coupling thread plug gauge	The B2 plug gauge shall enter the product box threads to the contact face.
Coupling face parallelism	API B2 Go coupling thread plug gauge & a 0.002 inch (0.051mm) flat feeler gauge	The B2 plug gauge shall enter the product box threads to the contact face. The feeler gauge shall not enter, at any point, between the face of the gauge and the product contact face.
Box Cones (Polished rod couplings and sub-couplings only	API B4 coupling plug cone gauge & a Vernier caliper or gap gauges	The B4 plug cone gauge shall enter the product box threads to cone contact. When so engaged, the standoff of the gauge from the box face shall be not less than 0.100 inch (2.54mm) and not more than 0.150 inch (3.81mm).
Box counterbore Q & Minor diameter contact face D_m maximum and minimum diameter	Micrometer, Vernier caliper, or gap gauge	Maximum diameter: Measure to applicable dimension Q or D_m, Tables 11 and 12 plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass into the counterbore or if measuring the minor diameter of the coupling land, it shall not pass inside the coupling face. Minimum diameter: Measure to applicable dimension Q or D_m, Tables 11 and 12 minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass into the counterbore or if measuring the minor diameter of the coupling land, it shall pass inside the coupling face.
Coupling outside dimension W maximum and minimum diameter	Micrometer, Vernier caliper, or gap gauges	Maximum diameter (coupling O.D.): Measure to dimension as listed in Table 8, plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the coupling diameter. Minimum diameter (coupling O.D.): Measure to dimension as listed in Table 8, minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass over the coupling diameter.
Coupling land width (contact face) C_f	Vernier caliper or gap gauge	Minimum width (coupling land): Measure to dimension as listed in Table 12. The contact face shall be wider.
Minimum Major Diameter of Contact Face D_c	Micrometer, Vernier caliper or gap gauge	Minimum Diameter (box contact shoulder) Measure to dimension as listed in Table 12. The diameter shall be equal to or greater than listed dimension.
Coupling length N_L	Micrometer, Vernier caliper, or gap gauge	Minimum length: Measure to dimension listed in Table 8 or set gap gauge to same dimension. The product length shall not be shorter.

Table 15—Dimensional Inspection of Polished Rods



Check for	Gauge or Measuring Instrument	Procedure
Threads minimum (under size)	API P6 Not-go pin-thread ring gauge	The product pin shall not enter the P6 ring gauge more than the third turn of assembly.
Threads maximum (over size)	API P2 Go pin-thread ring gauge	The product pin shall enter the P2 ring gauge to pin-shoulder face contact.
Pin-shoulder-Face parallelism	API P2 Go pin-thread ring gauge 0.002 inch (0.051mm) flat feeler	The product pin shall enter the P2 ring gauge to pin-shoulder face contact. The feeler gauge shall not enter, at any point, between the face of the gauge and the product pin-shoulder face. Note: Parallelism cannot be determined on certain sizes due to insufficient shoulder.
Pin cones	API P4 Ring cone gauge, Vernier caliper or gap gauge	The product pin shall enter the P4 ring cone gauge to cone contact. When so engaged, the standoff of the gauge from the pin-shoulder face shall not be less than 0.100 inch (2.54mm) and not greater than 0.150 inch (3.81mm).
Pin Shank B_s maximum and minimum diameter	Micrometer, Vernier caliper or gap gauge	Maximum diameter: Measure to dimension B_s, Table 10 or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the pin shank. Minimum diameter: Measure to dimension B_s, Table 10 minus the allowable (–) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall not pass over the pin shank.
Pin length L_{3s} maximum and minimum length	Vernier caliper or gap gauges	Maximum length: Measure to dimension listed in Table 10 plus the allowable (+) tolerance or set gap gauge to assure product dimension is within the specified tolerance. The pin length shall not be longer. Minimum length: Measure to dimension listed in Table 10 or set gap gauge to assure product dimension is within the specified tolerance. The pin length shall not be shorter.
Outside diameter maximum and minimum	Micrometer, Vernier caliper, or gap gauge	Maximum diameter: Measure to dimension listed in Table 16 or set gap gauge to assure product dimension is within the specified tolerance. The gap gauge shall pass over the polished rod diameter. Minimum diameter: Measure to dimension listed in Table 16 minus the allowable (–) tolerance or set gap gauge to assure the product dimension is within the specified tolerance. The gap gauge shall not pass over the polished rod diameter.

10 Workmanship and Finish

10.1 STEEL SUCKER ROD AND PONY ROD STRAIGHTNESS

10.1.1 General

10.1.1.1 Cold straightening of kinks is not acceptable.

10.1.1.2 A kink is a short, tight bend measured with a 6 inch (152.4 mm) ruler or straight edge with a gap in the middle greater than $^1/_8$ inch (3.175 mm).

10.1.2 Body Straightness

10.1.2.1 The body is the rod length between the upset tapers.

10.1.2.2 Bends can be measured by means of a straight edge held on the concave side of the bend. The amount of bend is the gap measured between the straight edge and the rod surface.

10.1.2.3 Bends can be measured by the total indicator runout (TIR) measured at the rod surface a known distance away from a support. TIR values are twice the amount of the bend over the gauge length.

10.1.2.4 Because of the various types of bends, the measurement should be made at a distance of 1 foot (304.8 mm) from the support.

10.1.2.5 For a gauge length of 12 inches (304.8 mm), the maximum allowable bend for all rod sizes $^1/_2$ to $1^1/_8$ inches (12.7 to 28.6 mm) is 0.065 inches (1.65 mm) or 0.130 inches (3.30 mm) TIR.

10.1.3 End Straightness

10.1.3.1 End straightness will be measured by supporting the rod body at a distance of 1.5 feet [(18 inches) (457.2 mm)] from the rod pin shoulder. The rest of the rod shall be supported at a maximum of 6 feet (1.83 meters) centers in the same plane. The amount of bend is measured via a dial indicator riding on the machined surface of the pin shoulder O.D. The maximum allowable TIR values for all rod sizes $^1/_2$ to $1^1/_8$ inch (12.7 to 28.6 mm) is 0.150 inches (3.81 mm).

10.1.3.2 End straightness for 24 inch (0.61 meter) pony rods will be measured by supporting the rod body at a distance of 1.0 feet [(12 inches (0.30 meter)] from the rod pin shoulder. The amount of bend is measured via a dial indicator riding on the machined surface of the pin shoulder O.D. The maximum allowable TIR values for all rod sizes $^1/_2$ to $1^1/_8$ inch (12.7 to 28.6 mm) is 0.130 inches (3.30 mm).

10.2 STEEL SUCKER ROD AND PONY ROD SURFACE DISCONTINUITY DEFINITIONS

10.2.1 General

10.2.1.1 General Terms:

a. **discontinuity:** Any interruption in the normal physical structure or configuration of a sucker rod such as cracks, laps, seams, pits, and laminations. A discontinuity may or may not affect the usefulness of a sucker rod or exceed critical flaw size. Also called a flaw or imperfection. See Figure 10 for examples of discontinuities.
b. **transverse:** Direction in steel bars at a right angle to the working process.
c. **longitudinal:** The principal direction of material flow in a worked metal.

10.2.1.2 dent: A local change in surface contour caused by mechanical impact, but not accompanied by a loss of metal.

10.2.1.3 nick: A local change in surface contour caused by mechanical impact accompanied by loss of metal.

10.2.1.4 end shear crack: A mill shear discontinuity which shows as a crack across the pin end face. (Not shown in Figure 10).

10.2.1.5 rolling overfill: Raised ridges formed during bar rolling.

10.2.1.6 forging overfill: Excessive metal stocking of the forging die resulting in a forging lap. This shows as crack on the rod bead (C_R in Figure 2) or transition (A_R in Figure 2).

10.2.1.7 underfill: A portion of the upset forging that has a depression, typically insufficient metal, that was formed during forging.

10.2.1.8 scab (sliver): A loose or torn segment of material longitudinally rolled into the surface of the bar.

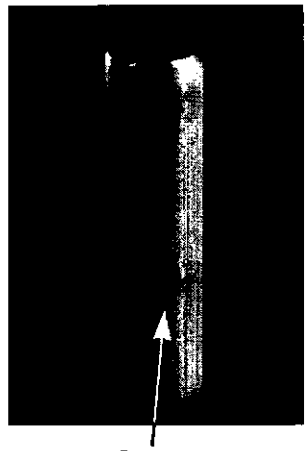
10.2.1.9 rolled-in-scale: A surface discontinuity caused by scale (metal oxide) formed during a previous heating which has not been removed prior to bar rolling or upset forging.

10.2.1.10 rolling lap: A longitudinal surface discontinuity that can have the appearance of a seam, caused during rolling, fins, or sharp corners being folded over and then rolled into the bar surface without metallurgical bonding.

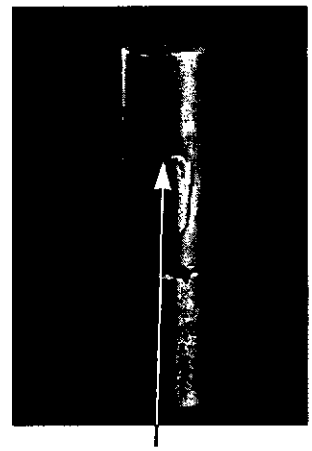
10.2.1.11 forging lap: A discontinuity produced when two surfaces of metal fold against each other without metallurgical bonding. This can occur when flash produced by one forging operation is pressed into the metal surface during a subsequent operation.

10.2.1.12 seam: A longitudinal discontinuity which may be closed or open, but without metallurgical bonding. It can have the appearance of a straight line, scratch, or small longitudinal separation on the bar.

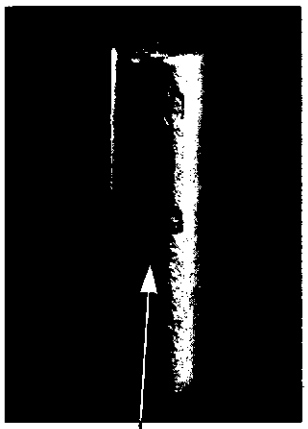
Rolling overfill



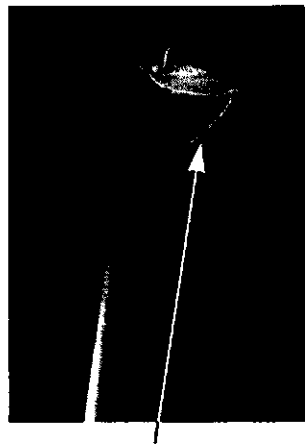
Seam



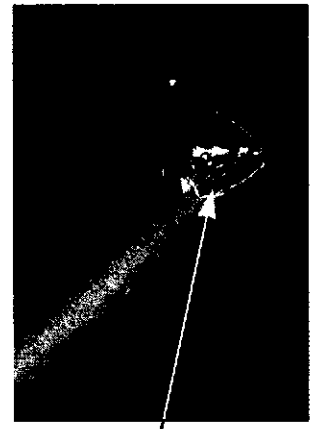
Scab



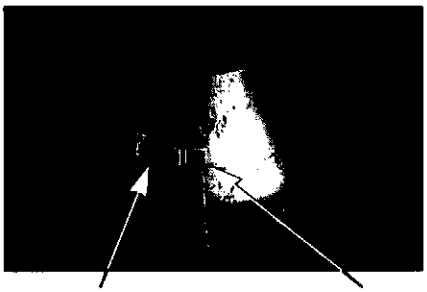
Rolling lap



Nick



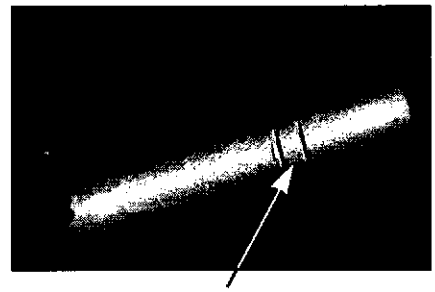
Rolling scale



Forging overfill

Forge lap

Forging underfill



Dent

Figure 10—Representative Examples of Discontinuities

10.2.2 Surface Finish

When the depth of a discontinuity can not be measured, it shall be removed with a smooth transition.

10.2.3 Surface Finish, Rod Body

10.2.3.1 Discontinuities such as rolled-in-scale, slivers, mechanical damage, etc., when removed must be removed with a smooth transition. The rod is unacceptable if the removal of the discontinuity results in a rod tolerance below the minimum specified in Table 5.

10.2.3.2 Longitudinal discontinuities are zero stress concentration points. Longitudinal discontinuities are acceptable as long as the depth or height does not exceed 0.020 inch (0.508 mm) from the actual adjacent surface. Longitudinal discontinuities within 0.020 inch (0.508 mm) need not be removed.

10.2.3.3 Transverse discontinuities which are unaided visually detected, greater than 0.004 inch (0.102 mm) are unacceptable and shall be removed with a smooth transition. Upon removal of the discontinuity, the rod tolerance shall still meet this specification.

10.2.4 Surface Finish, Upset Area

10.2.4.1 Longitudinal discontinuities which occur in the area above the point where the upset diameter equals the width of the wrench square are acceptable. Longitudinal discontinuities which occur in any area of the upset from the rod body up to that point where the upset diameter equals the width of the wrench square are acceptable as long as the height or depth does not exceed $^1/_{32}$ inch (0.794 mm). Longitudinal discontinuities which exceed $^1/_{32}$ inch (0.794 mm) in this area shall be reworked with a smooth transition provided that all tolerances are maintained.

10.2.4.2 Transverse discontinuities which are continuous around the upset, deeper than $^1/_{16}$ inch (1.588 mm), are unacceptable and shall be removed with a smooth transition. Upon removal of the discontinuity, the rod tolerance shall meet this specification. Transverse discontinuities greater than $^1/_8$ inch (3.175 mm) are unacceptable.

10.3 STEEL SUCKER ROD AND PONY ROD AND SUBCOUPLING PIN END SURFACE AND THREADS

10.3.1 The pin undercut ends and adjacent radii shall have a surface finish not to exceed 125 micro-inch R_a.

10.3.2 The presence of end shear cracks past the root of the first thread is reason for rejection.

10.3.3 Raised metal surfaces on the pin shoulder face which result from nicks or dents, shall be carefully removed before feeler gauge inspection per Section 9, Table 13.

10.3.4 Laps originating on either thread flank, below the pitch diameter are reason for rejection.

10.4 COUPLING AND SUBCOUPLING SURFACE FINISH

10.4.1 The surface finish of the outside diameter of Class T couplings shall not exceed 125 micro-inch R_a.

10.4.2 The surface finish of the outside diameter of Class SM couplings shall not exceed 63 micro-inch R_a. This does not apply to the chamfer or radius on the ends between the outside diameter of the contact face and the outside diameter of the coupling.

10.4.3 The surface finish of the coupling face on each end of Class T or Class SM couplings shall not exceed 125 micro-inch R_a.

10.4.4 There shall be no pinholes or pull back in the spray metal coating on the chamfer or radius between the outside diameter of the contact face and the outside diameter of the coupling.

11 Marking, Packaging, and Thread Protectors

11.1 PRODUCT MARKING

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

Sucker rods, pony rods, couplings, and subcouplings, manufactured in conformance with this specification, shall be marked by the manufacturer as specified hereinafter. Such markings shall be die stamped or forged, or both, at the option of the manufacturer.

11.1.1 Sucker Rods and Pony Rods—The following markings shall be applied to the wrench square on one end or both ends but if applied to both ends, the marking on each end shall be complete. Markings shall be applied prior to heat treatment of rods.

a. Manufacturer's name or mark.
b. Size (nominal size of rod).
c. Specification 11B.
d. Temperature Rating (FRP rods only). Mark shall indicate the temperature scale and shall be applied adjacent to Specification 11B.

e. Grade (steel rods only). Grade markings shall be applied adjacent to Specification 11B.

f. Grade of End Fitting (FRP rods only).

g. Identification Code (Steel rods only). The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

h. Julian Date of Assembly (FRP rods only): The date of assembly is the date the endfitting was attached to the rod body.

Examples:

A $^{5}/_{8}$ inch (15.9 mm) grade C sucker rod or pony rod manufactured in February, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	Spec	Grade		Identification Code Month	Year
—	$^{5}/_{8}$	11B	C	—	2	93

A $^{7}/_{8}$ inch (22.2 mm) FRP sucker rod or pony rod with grade A fittings manufactured on April 1, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	Spec	Temp. Rating	Grade of Endfitting	Date of Assembly Day	Year
—	$^{7}/_{8}$	11B	200F	A	091	93

11.1.2 Couplings—The following markings shall be placed on the coupling.

a. Manufacturer's name or mark.

b. Size (nominal size of coupling).

c. Specification 11B.

d. Class. Class markings shall be applied adjacent to Specification 11B.

e. Identification Code. The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

Examples:

A Class T $^{3}/_{4}$ inch (19.1 mm) through hardened sucker rod coupling manufactured in April, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	Spec	Class		Identification Code Month	Year
—	$^{3}/_{4}$	11B	T	—	4	93

A spray metal sucker rod coupling manufacturer in April, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	Spec	Class		Identification Code Month	Year
—	$^{3}/_{4}$	11B	SM	—	4	93

11.1.3 Polished Rod Couplings and Subcouplings—In addition to the marking requirements for sucker rod couplings contained herein, polished rod couplings and subcouplings shall be marked with the letters "PR" in front of the manufacturer's name or mark.

Example:

A $^{7}/_{8}$ inch (22.2 mm) polished rod coupling and a $^{3}/_{4}$ x $^{7}/_{8}$ inch (19.1 x 22.2 mm) subcoupling manufactured in April, 1993 shall be marked as follows:

Polished Rod Coupling	Mfrs. Name or Mark	Size	Spec	Class		Identification Code Month	Year
PR $^{3}/_{4}$ x $^{7}/_{8}$ Inch Sub-Coupling	—	$^{7}/_{8}$	11B	T	—	4	93
PR	—	$^{3}/_{4}$ x $^{7}/_{8}$	Spec 11B	T	—	4	93

11.2 THREAD MARKING

At the manufacturer's option, any sucker rod thread which conforms to the threading and gauging practice requirements given herein may be identified by stamping the product adjacent to such thread with the manufacturer's name or mark, the size, and Specification 11B.

Example:

A pump or other part bearing a $^{3}/_{4}$ inch (19.1 mm) sucker rod pin thread may be marked:

Mfrs. Name or Mark $^{3}/_{4}$ Spec 11B

11.3 SPECIFICATION 11B

The use of Specification 11B as provided in Paragraph 11.2 shall constitute a certification by the manufacturer that the threads so marked comply with the requirements stipulated herein, but should not be construed by the purchaser as a representation that the product so marked is, in its entirety, in accordance with any API specification.

11.4 PACKAGING

When packaged rods are specified on the purchase order, the packages shall conform to the following requirements:

11.4.1 Steel Sucker Rods

11.4.1.1 Overall width shall be 30 inches, ±1 inch (762, ±25 mm).

11.4.1.2 Maximum center-to-center distance of spacers shall be 6 feet (1.83 meters).

11.4.1.3 Maximum distance from edge of spacer to end of rod (coupling, if installed) shall be 20 inches (508 mm).

11.4.2 FRP Sucker Rods

11.4.2.1 Spacers shall be provided such that rows of rod bodies do not touch during shipment.

11.4.2.2 Spacers and supports shall be provided along the bottom of each bundle such that the bundle can be lifted by straps placed at three points along the rod length. The support points shall be located within one foot (0.3 meter) of center and at points at no more than 6 feet (2 meters) from each end.

11.4.2.3 Supports shall be provided along the bottom of each side of the bundle at the support points to prevent lifting straps from coming in contact with the bottom layer of rods.

11.4.2.4 Sufficient clearance shall be provided for passing lifting straps underneath the bundle at the support points without lifting or prying the bundle.

11.5 THREAD PROTECTORS

Thread protectors shall be designed to protect the pin or box thread and contact face from damage.

11.5.1 External thread protectors shall be installed on all external threads.

11.5.2 Internal thread protectors shall be installed in the open ends of all couplings installed on sucker rods and pony rods.

11.6 STEEL ROD AND PONY ROD UNIFORM COLOR CODE:

API Grade C—White
API Grade K—Blue
API Grade D—

Carbon Steel	—AISI 10XX (1) or	
	—AISI 15XX (1)	—Brown
Chrome-Moly	—AISI 41XX (2)	—Yellow
Special Alloy (3)		—Orange

1. Generally manufactured from, but not limited to, AISI 10XX or 15XX which can be effectively heat treated to the minimum ultimate tensile strength per Section 5, Table 2.
2. Generally manufactured from, but not limited to, AISI 41XX which can be effectively heat treated to the minimum ultimate tensile strength per Section 5, Table 2.
3. Any composition other than 15XX or 41XX which can be effectively heat treated to the minimum ultimate tensile strength per Section 5, Table 2.

11.7 RUST PREVENTION

Prior to shipment, exposed metallic surfaces shall be protected with a rust preventative which will not become fluid at a temperature less than 125°F (52°C).

12 Polished Rods

12.1 GENERAL

12.1.1 Polished rods shall be furnished in the sizes shown in Table 16.

12.1.2 Polished rods shall be furnished with polished rod pin threads on each end or a polished rod pin thread on one end and a sucker rod pin thread on the other (upset) end.

12.1.3 Polished-rod couplings shall conform to the requirements in Section 7. The lack of matching tapers on sucker rod couplings and polished-rod pins will prevent proper pin makeup. The use of standard rod couplings on polished rods can result in split couplings.

12.2 GRADES

The chemical composition of polished rods shall be any composition of AISI recommended series steels which meet the chemical and mechanical property requirements listed below. The exact chemical composition shall be detailed in the material specification of the manufacturer.

1. Carbon Steel: 10XX where $35 \leq XX \leq 50$
   Ultimate Tensile Strength: $90{,}000 \leq UTS \leq 120{,}000$ psi
2. Alloy Steel: 41XX where $30 \leq XX \leq 40$
   43XX where $15 \leq XX \leq 25$
   46XX where $15 \leq XX \leq 25$
   86XX where $20 \leq XX \leq 30$
   Ultimate Tensile Strength: $95{,}000 \leq UTS \leq 160{,}000$ psi

12.3 METAL SPRAYED POLISHED RODS

The base material of metal sprayed polished rods shall conform to grades in 12.2. Spray metal coating hardness shall be 480 HV_{200} minimum. The chemical composition of the coating shall be per Table 17. The overall metal sprayed polished rod length shall comply with Table 16 in all designated diameters. The spray metal coating thickness shall be 0.010 inch to 0.020 inch (0.254 mm to 0.508 mm). The finished outside diameter of metal sprayed polished rods shall conform to column 1 of Table 16 except the tolerance on the O.D. between pin end and start of metal spray shall be +0.005 inch –0.040 inch (+0.127 mm –1.016 mm).

12.4 SURFACE FINISH

Polished rods, regular or metal sprayed, shall have a surface finish of 8 to 32 microinch R_a.

12.5 MARKING

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

Table 17—Polished Rod Coating Chemical Composition

	Min %	Max %
Carbon	0.50	1.00
Silicon	3.50	5.50
Phosphorus	0.00	0.02
Sulfur	0.00	0.02
Chromium	12.00	18.00
Boron	2.50	4.50
Iron	3.00	5.50
Cobalt	0.00	0.10
Titanium	0.00	0.05
Aluminum	0.00	0.05
Zirconium	0.00	0.05
Nickel	Remainder	

Polished rods shall be die stamped on one or both ends or the O.D. within 3 inches (76.2 mm) of end face by the manufacturer as follows:

a. Manufacturer's name or mark.
b. Size (outside diameter).
c. Specification 11B.
d. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5

Table 16—General Dimensions and Tolerances for Polished Rods

Polished-Rod Size (OD) +0.005 –0.010 in. (+0.127 –0.254 mm)	Length (L_n) ft., ±2 in. (m, ±50 mm)	Nominal Diameter of Pin Thread in. (mm)	Outside Diameter of Pin Shoulder D_f in. (mm)	Size Sucker Rod with which used in. (mm)
1 1/8 (28.6)	8, 11, 16, 22, 24, 26 (2.438, 3.353, 4.877, 6.707, 7.315, 7.925)	15/16 (23.8) PR 1 1/16 (27.0) PR	— —	5/8 (15,9) 3/4 (19.1)
1 1/8 (28.6) upset	8, 11, 16, 22, 24, 26 (2.438, 3.353, 4.877, 6.707, 7.315, 7.925)	15/16 (23.8) SR	1.250, +0.005 –0.010 (31.8, +0.127 –0.254)	5/8 (15.9)
		1 1/16 (27.0) SR	1.500, +0.005 –0.010 (38.1, +0.127 –0.254)	3/4 (19.1)
1 1/4 (31.8)	11, 16, 22, 24, 26, 30, 36 (3.353, 4.877, 6.707, 7.315, 7.925, 9.144, 10.973)	1 3/16 (30.2) PR	—	7/8 (22.2)
1 1/4 (31.8) upset	11, 16, 22, 24, 26, 30, 36 (3.353, 4.877, 6.707, 7.315, 7.925, 9.144, 10.973)	1 3/16 (30.2) SR	1.625, +0.005 –0.010 (41.3, +0.127 –0.254)	7/8 (22.2)
1 1/2 (38.1)	16, 22, 24, 26, 30, 36 (4.877, 6.707, 7.315, 7.925, 9.144, 10.973)	1 3/8 (34.9) PR	—	1 (25.4)
1 1/2 (38.1) upset	16, 22, 24, 26, 30, 36 (4.877, 6.707, 7.315, 7.925, 9.144, 10.973)	1 9/16 (39.7) SR	2.250, +0.015 –0.015 (57.2, +0.381 –0.381)	1 1/8 (28.6)

Note: See Figure 6 for polished-rod thread details.

years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

13 Stuffing Boxes and Pumping Tees

13.1 STUFFING BOXES

13.1.1 Size

Nominal size of stuffing boxes shall be in accordance with the size and type of bottom connection and for complete boxes the diameter of the polished rod or polished-rod liner with which it is intended to be used. The bottom connection shall be either upset or non-upset external tubing threads conforming to API Specification 5B.

13.1.2 Alignment

The maximum radial displacement of axes of the packing chamber and the bottom thread, measured in a plane perpendicular to the axes, shall not exceed 0.031 inch (0.79 mm). The maximum angular misalignment shall not exceed $^3/_4$ inch (19.1 mm) per 20 feet (6 meters) of projected axis.

13.1.3 Material

The chemical composition of stuffing boxes shall be any composition of AISI recommended series steels which meet the chemical and mechanical property requirements listed below. The exact chemical composition shall be detailed in the material specification of the manufacturer.

a. ASTM A395 Ductile Iron.
b. Carbon Steel: 10XX where $18 \leq XX \leq 45$ or
Alloy Steel: 41XX where $30 \leq XX \leq 40$.

The minimum tensile strength shall be 60 ksi and the minimum yield strength shall be 40 ksi.

13.1.4 Marking

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

Each stuffing box body shall be permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. Specification 11B.
c. Size and type of bottom thread.
d. Maximum working pressure rating (CWP).

Note: CWP = Cold working pressure.

e. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

Example:

A stuffing box body having a $2^3/_8$ inch (60.3 mm) upset tubing thread as a bottom connection and having been hydrostatically tested to 5000 psi (34.4 MPa) manufactured in April, 1993 should be marked as follows:

Mfrs. Name/Mark Spec 11B $2^3/_8$ EUE 2500 CWP — 4 93

13.2 PUMPING TEES

13.2.1 Size

Nominal size of pumping tees shall be in accordance with the size and type of top, bottom and flow line connections. Top and bottom connections shall be either upset or non-upset internal tubing threads conforming to API Specification 5B. Flow line connections shall be line pipe threads conforming to API Specification 5B. Bleeder outlet shall be 1 inch (25.4 mm) line pipe thread conforming to API Specification 5B.

13.2.2 Alignment

The maximum radial displacement of axes of pumping tees threads, measured in the plane of the tee face, shall not exceed 0.013 inch (0.79 mm). The maximum angular misalignment shall not exceed $^3/_4$ inch (19.1 mm) per 20 feet (6 meters) of projected axis.

13.2.3 Material

The chemical composition of pumping tees shall be any composition of AISI recommended series steels which meet the chemical and mechanical property requirements listed below. The exact chemical composition shall be detailed in the material specification of the manufacturer.

a. ASTM A395 Ductile Iron.
b. Carbon Steel: 10XX where $18 \leq XX \leq 45$ or
Alloy Steel: 41XX where $30 \leq XX \leq 40$.

The minimum tensile strength shall be 60 ksi and the minimum yield strength shall be 40 ksi.

13.2.4 Marking

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

Pumping tees shall be permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. Specification 11B.
c. Size and type of top, bottom and flow line threads.
d. Maximum working pressure rating (CWP).

Note: CWP = Cold working pressure.

e. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

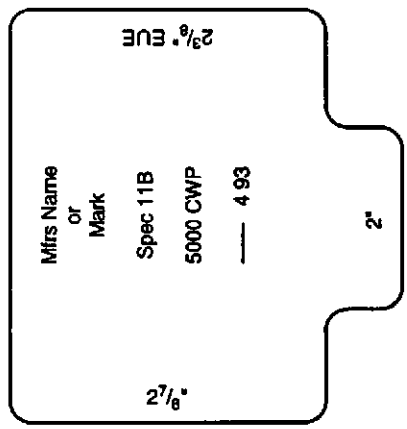
1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

Example:

A pumping tee having a $2^3/_8$ inch (60.3 mm) upset tubing thread on top, a $2^7/_8$ inch (73 mm) non-upset tubing thread on bottom, a 2 inch (50.8 mm) line pipe flow line connection, and having been hydrostatically tested to 10,000 psi (68.8 MPa) manufactured in April, 1993 should be marked as follows:

Mfrs.	Name/Mark	Spec 11	5000 CWP
	$2^3/_8$ EUE x $2^7/_8$ x 2	—	4 93

or



14 Polished Rod Clamps

14.1 MATERIAL

Polished rod clamps shall be manufactured from any AISI recommended cast iron or carbon steel as listed below with a hardness range between 190 and 300 Brinell.

a. ASTM A536 Ductile Cast Iron 65-45-12.
b. Carbon Steel: 10XX where $15 \leq XX \leq 45$ or 15XX where $15 \leq XX \leq 45$.

14.2 MAXIMUM RATED LOAD

The maximum rated load shall be no more than 75 percent of the minimum load to initial slippage when a new polished rod clamp is tested in accordance with this specification.

14.3 DESIGN VERIFICATION

During the design phase the manufacturer shall perform and document a minimum of two tests per size by the method detailed below to ensure that the polished rod clamp for each size will comply with the published rated loads.

14.3.1 Only new polished rod clamps shall be used in this test.

14.3.2 A polished rod whose nominal diameter and surface finish conforms to this specification shall be used.

14.3.3 The polished rod clamp shall be installed in accordance with the manufacturer's instructions on one end of a sample of polished rod of suitable length.

14.3.4 The polished rod sample with the polished rod clamp shall be suspended by the polished rod clamp from the upper crosshead of a tensile testing machine through a hole in a steel plate. The dimension of the hole shall be the nominal diameter of the polished rod plus $^1/_8$ inch (3.17 mm). The tolerances on the hole diameter shall be $+^1/_{64}$ –0 inch (+0.40 –0 mm).

14.3.5 The polished rod shall be gripped in the lower crosshead and a load applied and increased until the first slippage of 0.010 inch (0.30 mm) or more occurs between the polished rod and the polished rod clamp. This load shall be recorded.

14.3.6 The rate of separation of the crossheads under load shall not exceed $^1/_2$ inch (12.7 mm) per minute or be less than $^1/_8$ inch (3.17 mm) per minute.

14.4 TEST RESULTS

The minimum slippage load (see 14.3.5) multiplied by 0.75 shall be equal to or greater than the published maximum rated load of the polished rod clamp.

14.5 SURFACE CONDITION AFTER TEST

Examination of the surface of the polished rod after the test and removal of the polished rod clamp shall not reveal any indentation or deformation in excess of 0.010 inch (0.25 mm). Failure to comply with this requirement shall constitute a test failure.

14.6 POLISHED ROD CLAMP MARKING

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

14.6.1 Each polished rod clamp shall be permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. Specification 11B.
c. Nominal polished rod size.
d. Maximum rated load.

14.6.2 A tag showing the manufacturer's installation instructions shall be securely attached (such as by wiring) to each polished rod clamp. This tag may be paper, plastic, or metal.

15 Sinker Bars

15.1 GENERAL

15.1.1 Sinker bars shall be furnished in the sizes shown in Table 19.

15.1.2 Sinker bars shall be furnished with pin threads on each end.

15.1.3 When using sinker bars with polished rod pin threads, polished rod couplings shall be used. Polished rod couplings shall conform to the requirements in Section 8. The lack of matching tapers on sucker rod couplings and polished rod pins will prevent proper pin makeup. The use of sucker rod couplings on polished rod pins can result in split couplings.

15.2 GRADE

This specification covers two grades of steel sinker bars which shall be designated as follows:

Grade 1—Carbon (AISI 10XX).
Grade 2—Alloy (Optional with manufacturer).

15.3 MECHANICAL PROPERTIES

The mechanical properties of sinker bars shall conform to the strength values listed in Table 18.

15.4 MARKING

Note: Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license the use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix A, herein. No other use of the monogram is permitted.

Sinker bars shall be permanently marked on one or both ends or on the O.D. within 5 inches (127 mm) of end face, or optional reduced diameter(s), by the manufacturer as follows:

a. Manufacturer's name or mark.
b. Grade.
c. Specification 11B.
d. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacture shall be as follows:
   1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
   2. The year of manufacture shall be designated by the last two numerals of the year.

Table 18—Mechanical Strength Properties

	Minimum Tensile	
Grade	psi	(Mpa)
1	65,000	(448)
2	90,000	(620)

Table 19—General Dimensions and Tolerances for Sinker Bars

Sinker Bar Diameter +0.000 (+0.00) –0.030 (–0.76)	Rod Pin Size[1]	Pin Shoulder to Wrench Flat L_{DF}	Width of Wrench Flat[2] (2 Flats Std.) W_s ±1/32 (±0.8)	Length of Wrench Flat[3] W_l	Elevator Neck Diameter[4] D_E +0.009 (+0.23) –0.018 (–0.46)	Length of Elevator Neck[4] L_E minimum	Fishing Neck Diameter D_{FN} minimum	A^R ±1/8 (±3.2)	Length of Sinker Bar[5] feet (meters) ±2 (±50.8)
1 1/4 (31.75)	5/8 (15.9) SR	0.75 (19.05) max.	1.000 (25.4)	1 1/4 (31.8)	0.875 (22.23)	4.0 (101.6)	0.875 (22.23)	2 5/8 (66.7)	25, 30 (7.6, 9.1)
1 1/4 (31.75)	3/4 (19.1) PR	0.75 (19.05) max.	1.000 (25.4)	1 1/4 (31.8)	0.875 (22.23)	4.0 (101.6)	0.875 (22.23)	2 5/8 (66.7)	25, 30 (7.6, 9.1)
1 3/8 (34.93)	5/8 (15.9) SR	0.75 (19.05) max.	1.000 (25.4)	1 1/4 (31.8)	1.000 (25.40)	4.0 (101.6)	1.000 (25.40)	3 (76.2)	25, 30 (7.6, 9.1)
1 3/8 (34.93)	3/4 (19.1) PR	0.75 (19.05) max.	1.000 (25.4)	1 1/4 (31.8)	1.000 (25.40)	4.0 (101.6)	1.000 (25.40)	3 (76.2)	25, 30 (7.6, 9.1)
1 1/2 (38.1)	3/4 (19.1) SR	0.75 (19.05) max.	1.312 (33.3)	1 1/2 (38.1)	1.000 (25.40)	4.0 (101.6)	1.000 (25.40)	3 (76.2)	25, 30 (7.6, 9.1)
1 5/8 (41.28)	7/8 (22.2) SR	0.75 (19.05) max.	1.312 (33.3)	1 1/2 (38.1)	1.000 (25.40)	4.0 (101.6)	1.000 (25.40)	3 (76.2)	25, 30 (7.6, 9.1)
1 3/4 (44.45)	7/8 (22.2) SR	0.75 (19.05) max.	1.500 (38.1)	1 5/8 (41.3)	1.000 (25.40)	4.0 (101.6)	1.000 (25.40)	3 (76.2)	25, 30 (7.6, 9.1)

Notes:
All dimensions in inches followed by equivalent in mm except as noted.
[1]SR = sucker rod pin thread, PR = polished rod pin thread (See Tables 9 and 10).
[2]4 Wrench flats optional with manufacturer.
[3]Minimum length exclusive of fillet.
[4]Elevator neck optional with manufacturer, recess at elevator neck to be within dimension A^R Table 5.
[5]Length of sinker bars shall be measured from outer end of pin to outer end of pin.

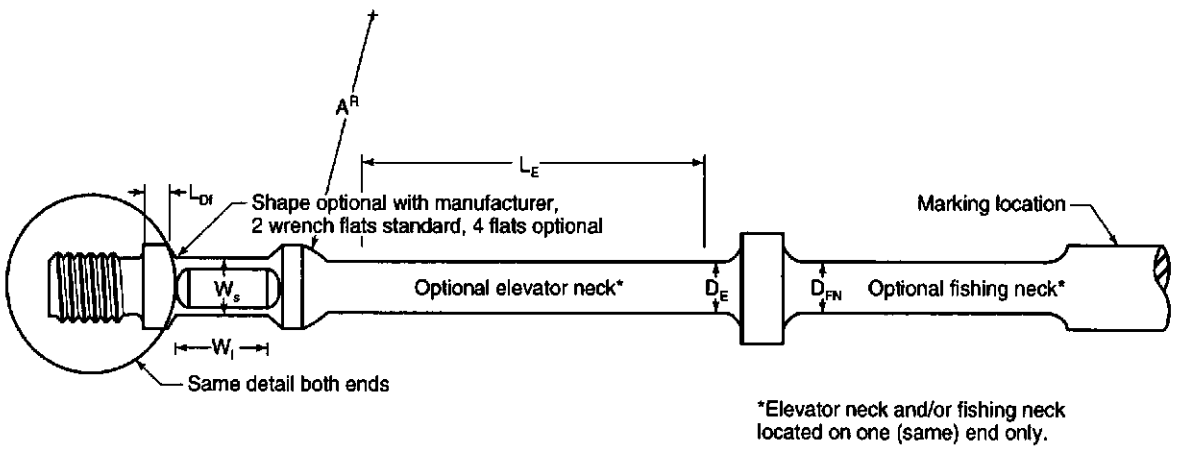


Figure 11—General Dimensions for Sinker Bars

APPENDIX A—MARKING REQUIREMENTS FOR API LICENSED MANUFACTURERS

A.1 Marking

The following marking requirements apply only to manufacturers licensed by the API to use the API monogram on products covered by this specification. Preferably, the complete marking shall be permanently affixed to each product, but the manufacture's license number may be alternatively affixed to each bundle or container, or marked on the documents for each shipment.

A.2 Rods and Couplings

Sucker rods, pony rods, couplings, and subcouplings, manufactured in conformance with this specification, shall be marked by the manufacturer as specified hereinafter. Such markings shall be die stamped or forged, or both, at the option of the manufacturer.

A.2.1 SUCKER RODS AND PONY RODS

The following markings shall be applied to the wrench square on one end or both ends, but if applied to both ends, the marking on each end shall be complete. Markings shall be applied prior to heat treatment of rods.

a. Manufacturer's name or mark.
b. Size (nominal size of rod).
c. API Monogram. The minimum size of the monogram shall be $^1/_8$ inch (3.2 mm).
d. API License Number.
e. Temperature Rating (FRP rods only)—Mark shall indicate the temperature scale and shall be applied adjacent to the API monogram.
f. Grade (Steel rods only)—Grade markings shall be applied adjacent to the API monogram. See 5.1 for applicable grade marks.
g. Grade of End Fitting (FRP rods only).
h. Identification Code (Steel rods only)—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacture shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

i. Julian Date of Assembly (FRP rods only): The date of assembly is the date the endfitting was attached to the rod body.

Example 1:

A $^5/_8$ inch (15.9 mm) grade C sucker rod or pony rod manufactured in February, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	API Monogram	API License Number	Grade	Identification Code		
						Month	Year
—	$^5/_8$		11B-1234	C	—	2	93

Example 2:

A $^7/_8$ inch (22.2 mm) FRP sucker rod or pony rod with grade A end fittings manufactured on April 1, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	API Monogram	API License Number	Temp. Rating	Grade of Endfitting	Date of Assembly	
—	$^7/_8$		11B-1234	200F	A	091	93

A.2.2 COUPLINGS

The following markings shall be placed on the coupling wrench flat or on the outside surface of the coupling.

a. Manufacturer's name or mark.

b. Size (nominal size of rod).

c. API Monogram. The minimum size of the monogram shall be $^1/_8$ inch (3.2 mm).

d. API License Number.

e. Class. Class markings shall be applied adjacent to the API monogram. See 7.1 for class mark.

f. Identification Code—The code mark shall identify the product with respect to a record of the time of the manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacture shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.

2. The year of manufacture shall be designated by the last two numerals of the year.

Example:

A through hardened $^5/_8$ inch (15.9 mm) sucker rod coupling manufactured in April, 1993 by an authorized manufacturer shall be marked as follows:

Mfrs. Name or Mark	Size	API Monogram	API License Number	Class	Identification Code	Month	Year
—	$^5/_8$		11B-1234	T	—	4	93

A spray metal $^5/_8$ inch (15.9 mm) sucker rod coupling manufactured in April, 1993 shall be marked as follows:

Mfrs. Name or Mark	Size	API Monogram	API License Number	Class	Identification Code	Month	Year
—	$^5/_8$		11B-1234	SM	—	4	93

A.2.3 POLISHED ROD COUPLINGS AND SUBCOUPLINGS

In addition to the marking requirements for sucker rod couplings contained herein, polished rod couplings and subcouplings shall be marked with the letters "PR" in front of the manufacturer's name or mark.

Example:

A $^7/_8$ inch (22.2 mm) polished rod coupling and a $^3/_4$ x $^7/_8$ inch (19.1 x 22.2 mm) subcoupling manufactured in April, 1993 shall be marked as follows:

Polished Rod Coupling	Mfrs. Name or Mark	Size	API Monogram	API License Number	Class	Identification Code	Month	Year
PR	—	$^7/_8$		11B-1234	T	—	4	93
$^3/_4$ x $^7/_8$ Inch Sub-Coupling PR	—	$^3/_4$ x $^7/_8$		11B-1234	T	—	4	93

A.3 Polished Rods

Polished rods manufactured in accordance with this specification shall be die stamped on one end or both ends by the manufacturer as follows:

a. Manufacturer's name or mark.
b. Size (outside diameter).
c. API Monogram. The minimum size of the monogram shall be $^1/_4$ inch (6.3 mm).
d. API License Number.
e. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:
   1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
   2. The year of manufacture shall be designated by the last two numerals of the year.

A.4 Stuffing Boxes

Stuffing box bodies shall be prominently and permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. API Monogram. The minimum size of the monogram shall be $^1/_4$ inch (6.4 mm).
c. API License Number.
d. Size and type of bottom thread.
e. Maximum working pressure rating (CWP).

Note: CWP = Cold working pressure.

f. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:
   1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
   2. The year of manufacture shall be designated by the last two numerals of the year.

Example:

A stuffing-box body having a $2^3/_8$ inch (60.3 mm) upset tubing thread as a bottom connection and having been hydrostatically tested to 5000 psi (34.4 kPa) manufactured in April, 1993 should be marked as follows:

Mfrs. Name or mark		11B-1234	$2^3/_8$	EUE	2500	CWP
	—	4 93				

A.5 Pumping Tees

Pumping tees shall be prominently and permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. API Monogram. The minimum size of the monogram shall be $^1/_4$ inch (6.4 mm).
c. API License Number.
d. Size and type of top, bottom, and flow-line threads.

e. Maximum working pressure rating (CWP).

Note: CWP = Cold working pressure.

f. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacturer shall be as follows:

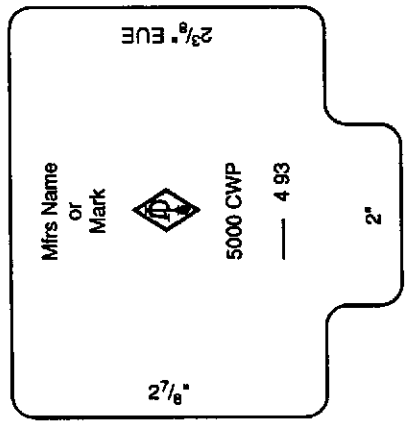
1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

Example:

A pumping tee with a $2^3/_8$ inch (60.3 mm) upset tubing thread on top, a $2^7/_8$ inch (73 mm) non-upset tubing thread on bottom, a 2 inch (50.8 mm) line pipe flow line connection, and having been hydrostatically tested to 10,000 psi (68.8 kPa) manufactured in April, 1993 should be marked as follows:

Mfrs. Name or mark — 11B-1234 — $2^3/_8$ — 5000 CWP — EUE x $2^7/_8$ x 2 — 4 93

or



A.6 Polished Rod Clamps

Polished rod clamps shall be prominently and permanently marked by the manufacturer with the following information:

a. Manufacturer's name or mark.
b. API Monogram. The minimum size of the monogram shall be $^1/_8$ inch (3.2 mm).
c. API License Number.
d. Nominal polished rod size.
e. Maximum rated load.

A.7 Sinker Bars

Sinker bars shall be permanently marked on one or both ends or on the O.D. within 5 inches (127 mm) of end face, or optional reduced diameter(s), by the manufacturer as follows:

a. Manufacturer's name or mark.
b. API Monogram. The minimum size of the monogram shall be $^1/_8$ inch (3.2 mm).
c. API License Number.
d. Grade.
e. Identification Code—The code mark shall identify the product with respect to a record of the time of manufacture, grade of steel, heat number, and metallurgical treatment. This record shall be available to the purchaser on request for 5 years from date of manufacture. The identification with respect to date of manufacture shall be as follows:

1. The month of manufacture shall be designated by the numerals 1 through 12, chronologically, with January represented as number 1.
2. The year of manufacture shall be designated by the last two numerals of the year.

APPENDIX B—SUGGESTIONS FOR ORDERING

B.1 Sucker Rods and Pony Rods

In placing orders for sucker rods and pony rods manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchase orders:

a. Specification API Specification 11B.
b. Quantity.
c. Type: Steel or FRP.
d. Grade: 5.1.1, Table 1 or 5.2.1, Table 1 or 3.
e. Size (Diameter): 6.1.1, Table 5 or 6.1.2, Table 6.
f. Length: 6.1.1, Table 5 or 6.1.2, Table 6.
g. Packaged: 11.4.

B.2 Couplings and Subcouplings

In placing orders for couplings and subcouplings manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchase orders:

a. Specifications: API Specification 11B.
b. Quantity.
c. Class: 7.1.
d. Type: 7.2, Figure 4.
e. Size: 7.3, Table 8.

B.3 Polished Rods

In placing orders for polished rods manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchaser orders:

a. Specification: API Specification 11B.
b. Quantity.
c. Size (outside diameter): 12.1.1, Table 16.
d. Length: 12.1.1 Table 16.
e. End Connections: 12.1.2, Table 16.
f. Grade: 12.2.
g. Spray Metal: 12.3.

B.4 Stuffing Boxes and Pumping Tees

In placing orders for stuffing boxes and pumping tees manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchase orders:

a. Specification: API Specification 11B.
b. Quantity.
c. Size & Type of Connections: 13.1.1, 13.2.1.
d. Working Pressure.

B.5 Polished Rod Clamps

In placing orders for polished rod clamps manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchase orders:

a. Specification: API Specification 11B.
b. Quantity.
c. Polished Rod Size: 12.1.1, Table 16.
d. Load Rating.

B.6 Sinker Bars

In placing orders for sinker bars manufactured in accordance with API Specification 11B, purchasers should specify the following on their purchase orders:

a. Specification: API Specification 11B.
b. Quantity.
c. Size: 15.1.1, Table 19.
d. Grade: 15.2.

APPENDIX C—GAUGE SPECIFICATION

C.1 Reference Master Gauges

Each set of reference master gauges shall consist of the following component gauges for each size of connection listed in Table C-1:

Note: The basis sizes of thread elements of reference master gauges are identical with those of the product. Gauge tolerances encroach on the product tolerance; therefore, it is theoretically possible for one gauge to accept and another to reject a given product thread. For this reason, a product thread passing any certified reference master gauge shall be considered as within the product dimensions, provided such gauge is within the limits specified for used gauges. In case of dispute the owner of gauges in question shall furnish proof regarding compliance.

C.1.1 SUCKER ROD PIN CONNECTIONS

C.1.1.1 Go Pin-Thread Truncated Setting Plug Gauge, P7. This gauge represents the maximum permissible pitch diameter of the pin thread. It is used 1) in setting the mating ring gauge P8 and the corresponding working ring gauge, 2) in checking the shoulder squareness of the working gauge, and 3) for detecting wear, see C.6.

C.1.1.2 Go Pin-Thread Ring Gauge, P8. This gauge mates with the P7 go pin-thread plug gauge. In cases of dispute, this gauge may be used in gauging the product pin threads, but such use should be held to a minimum.

C.1.1.3 Not-Go Pin-Thread truncated Setting Plug Gauge, P5.* This gauge represents the minimum permissible pitch diameter of the pin thread. It is used 1) in setting the mating ring gauge P6 and the corresponding working ring gauge and 2) for detecting wear, see C.6.

C.1.1.4 Not-Go Pin-Thread Ring Gauge, P6*. This gauge mates with the P5 not-go pin-thread plug gauge. In cases of dispute, this gauge may be used in gauging the product pin threads, but such use should be held to a minimum.

C.1.2 BOX CONNECTIONS

C.1.2.1 Go Box-Thread Ring Gauge (Checking Ring), B1. This gauge represents the minimum permissible pitch diameter of the box thread. It is used in checking the B2 go box-thread plug gauge and the corresponding working gauge, also in checking the shoulder squareness of the working gauge.

C.1.2.2 Go Box-Thread Plug Gauge, B2. Go Box-Thread Plug Gauge B2 is used on polished rod couplings and subcouplings but does not check the 9 degree cone.

This gauge mates with the B1 go box-thread ring gauge. In cases of dispute, this gauge may be used in gauging the product box threads, but such use should be held to a minimum.

C.1.2.3 Box-Cone Ring Gauge (Fitting Ring), B3. Go Box-Cone Plug and Ring Gauge B3 and B4 are used on polished rod couplings and subcouplings. Do not use on sucker rod coupling.

This represents the basic box cone. It is used as the master in establishing the standoff of the mating B4 plug gauge and the corresponding working plug gauge.

C.1.2.4 Box-Cone Plug Gauge, B4. Go Box-Cone Plug and Ring Gauge B3 and B4 are used on polished rod couplings and sub-couplings. Do not use on sucker rod coupling.

This gauge mates with the B3 box-cone ring gauge. In cases of dispute, it may be used in gauging the product box cone, but such use should be held to a minimum.

C.1.2.5 Not-Go Box-Thread Ring Gauge (Checking Ring), B5. Not-Go Box-Thread Ring and Plug Gauge B5 and B6 are used on sucker rod coupling, polished rod coupling, and subcoupling.

This gauge represents the maximum permissible pitch diameter of the box thread. It is used in checking the mating plug gauge B6 and the corresponding working plug gauge.

C.1.2.6 Not-Go Box-Thread Plug Gauge, B6. Not-Go Box-Thread Ring and Plug Gauge B5 and B6 are used on sucker rod coupling, polished rod coupling, and subcoupling.

This gauge mates with the B5 not-go box-thread ring gauge. In cases of dispute, this gauge may be used in gauging the product box threads, but such use should be held to a minimum.

C.1.3 POLISHED ROD PIN CONNECTIONS

C.1.3.1 Go Pin-Thread Truncated Setting Plug Gauge, P1. This gauge represents the maximum permissible pitch diameter of the pin thread. It is used 1) in setting the mating ring gauge P2 and the corresponding working ring gauge, 2) in checking the shoulder squareness of the working gauge, and 3) for detecting wear, see C.6.

C.1.3.2 Go Pin-Thread Ring Gauge, P2. P2 does not check 9 degree cone.

This gauge mates with the P1 go pin-thread plug gauge. In cases of dispute, this gauge may be used in gauging the product pin threads, but such use should be held to a minimum.

C.1.3.3 Pin-Cone Plug Gauge (Fitting Plug), P3. This gauge represents the basic pin cone. It is used as the master in

*Not-go pin thread plug and ring gauges, P5 and P6 are used on both sucker rods and polished rods.

establishing the standoff of the mating P4 pin-cone ring gauge and the corresponding working ring gauge.

C.1.3.4 Pin-Cone Ring Gauge, P4. This gauge mates with the P3 pin-cone plug gauge. In cases of dispute, it may be used in gauging the product pin cone, but such use should be held to a minimum.

C.1.3.5 Not-Go Pin-Thread Truncated Setting Plug Gauge, P5.* This gauge represents the minimum permissible pitch diameter of the pin thread. It is used in setting the mating ring gauge P6 and the corresponding working ring gauge.

C.1.3.6 Not-Go Pin-Thread ring Gauge, P6.* This gauge mates with the P5 not-go pin-thread plug gauge. In cases of dispute, this gauge may be used in gauging the product pin threads, but such use should be held to a minimum.

C.2 Hardening

Reference master gauges shall be hardened within the limits of Rockwell C 60-C 63 or equivalent hardness on a superficial scale. They shall be ground and lapped gauges, and shall conform to the dimensions and tolerances given in Table C.1 through C.8 and shall have been certified as required in Appendix D.

C.3 Taper

Pitch diameter taper of setting plug gauges (P1, P5, and P7) and thread plug gauges (B2 and B6) shall not exceed 0.00015 inch (0.0038 mm) over the length L_u. The permissible taper shall be back taper (largest diameter at entering end) and shall be confined within the pitch diameter limits.

C.4 Precision Centers

Go plug gauges (P1, P7 and B2) and cone plug gauges (P3 and B4) shall have precision centers to permit measurement of runout of shoulder face and eccentricity of cone.

C.5 Construction

Cone ring gauges used on polished rods only shall be of the solid type (non-adjustable). Go and not-go ring gauges may be either solid or adjustable.

C.6 Shake Test

Go and not-go ring gauges shall be set at full engagement with their mating plugs. When backed off to 2 turns engagement there shall be no perceptible shake. This test for shake shall be made on the truncated portion of full and truncated setting plugs. An adjustable ring gauge may be set initially on either the full form or the truncated portion of the setting plug. When screwed onto the other portion of the setting plug there shall be only a slight change in fit if any. If there is perceptible shake or play in the looser fit, the ring gauge should be reconditioned to bring the gauge into tolerance.

C.7 Root Form

The minor diameter of thread plug gauges and setting plug gauges shall be cleared beyond a P/8 width of flat, either by an extension of the sides of the thread toward a sharp V or by an undercut to any dimension no wider than the width resulting from P/8 maximum width either side of centerline of the thread space.

The major diameter of go thread ring gauges shall be cleared by a clearance cut of substantially P/8 width and approximately central.

The root form of the go and not-go thread ring gauges shall be of sufficient depth to clear the maximum major diameter of the full form setting plug after the gauge has been properly set.

The major diameter of not-go thread ring gauges shall be cleared by a clearance cut of substantially P/4 width and approximately central.

C.8 Blunt Start

The partial threads of both ends of all gauges and the junction of the full and truncated portions of setting plugs shall be removed to a blunt start except at the entering end of P4 and B3 ring gauges and the counterbored end of P2, P8, and B1 ring gauges where a blunt start would be undesirable or impractical. Figures C-3, C-4, C-6, and C-7 illustrate deviations from the blunt start.

C.9 Helix Angle

The helix angle correction shall be disregarded in all pitch diameter determinations.

C.10 Gauge Marking (by Manufacturer)

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

a. The gauge registration number.
b. The gauge symbol as given in Paragraph C.1.
c. The nominal size of the rod.

*Not-go pin thread plug and ring gauges, P5 and P6 are used on both sucker rods and polished rods.

d. The word 2A-PIN or 2B-BOX, as applicable.

e. The word GO or NOT-GO or CONE as applicable.

f. The gauge manufacturer's name or identifying mark.

g. API Monogram—The API monogram may be used only on certified reference master gauges and shall not be used on working gauges or gauges which do not meet all stipulations given herein. The API monogram shall be applied only as specified. On gauges submitted to the National Institute of Standards and Technology for certification, the monogram shall be applied by the manufacturer. On all other gauges the monogram shall be applied by the certifying agency.

Example:

A master go pin-thread plug gauge, for $^{3}/_{4}$ inch sucker rod should be marked as follows:

Gauge registration number	P7-$^{3}/_{4}$ 2A-PIN-GO	Mfrs. name or identifying mark

C.11 Retest

All new and reconditioned reference master gauges shall be submitted for retest to one of the certifying agencies listed in Appendix D, within a period of two years, if an outside agency indicates on the test certificate that the gauges are approaching the specified limits of permissible wear.

C.12 Reinspection Line

Gauges submitted to a certifying or outside agency for retest shall be certified as satisfactory for continued use if they conform to the following requirements:

a. The pitch diameter of go and not-go plug gauges (P7, P5, B2, B6, and P1) shall be within the tolerance limits as specified in Tables C-1, C-2, C-3, C-5, and C-6.

b. The minor diameter of go and not-go ring gauges (P8, P6, B1, B5, and P2) shall be within the tolerance limits as specified in Tables C-1, C-2, C-3, C-5, and C-6.

c. The axial variation of shoulder face of go thread plug and ring gauges (P1, P2, P7, P8, B1, and B2) shall be within the limits shown in Table C-9.

d. Cone plug and ring gauges (P3, P4, B3, and B4) shall be checked for mating step value, which shall not vary by more than 0.0015 inch (0.038 mm) from the original value.

Note: This is equivalent to a decrease in cone base diameter of 0.00047 inch (0.0019 mm) on plug, or to an increase of 0.00047 inch (0.119 mm) on ring, or to a combined change of 0.00047 inch (0.0119 mm).

e. The fit of go and not-go thread gauges on their mating gauges shall conform to the requirements specified in C-6.

C.13 Maintenance

Maintenance of gauges is the responsibility of the gauge owner, and gauges reported by the certifying or outside agency as in non-conformance with requirements should be promptly reconditioned or replaced, and resubmitted for test.

Table C-1—P7: Go Pin-Thread Truncated Setting Plug Gauge. P8: Go Pin-Thread Ring Gauge (For Gauging Sucker Rod Pin Connections)

Size of Rod	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Truncated Major Diameter B_t +0.0000 (+0.000) −0.0006 (−0.015)	0.7336 (18.633)	0.9216 (23.409)	1.0465 (26.581)	1.1715 (29.756)	1.3589 (34.516)	1.5463 (39.276)	P7
Full Form Major Diameter B_s +0.0006 (+0.015) −0.0000 (−0.000)	0.7482 (19.004)	0.9362 (23.779)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.887)	1.5609 (39.647)	P7
Pitch Diameter E_s +0.0000 (+0.000) −0.0002 (−0.005)	0.6832 (17.353)	0.8712 (22.128)	0.9962 (25.303)	1.1211 (28.476)	1.3085 (33.236)	1.4960 (37.998)*	P7
Length Thd. L_u ±0.015 (±0.38)	1.876 (47.65)	1.968 (49.99)	2.188 (55.58)	2.406 (61.11)	2.656 (67.46)	3.000 (76.20)	P7
Length of Plug L_p ±0.015 (±0.38)	2.113 (53.67)	2.284 (58.01)	2.582 (65.58)	2.878 (73.10)	3.253 (82.63)	3.675 (93.35)	P7
Diameter of Plug or Ring Collar D_f +0.000 (+0.00) −0.010 (−0.25)	1.005 (25.53)	1.255 (31.88)	1.505 (38.23)	1.630 (41.40)	2.005 (50.93)	2.265 (57.53)	
Minor Diameter K_n +0.0000 (+0.000) −0.0006 (−0.0015)	0.6399 (16.253)	0.8279 (21.029)	0.9529 (24.204)	1.0778 (27.376)	1.2652 (32.136)	1.4527 (36.899)	P8
Diameter of C'bore Q +0.005 (+0.13) −0.000 (−0.00)	0.767 (19.48)	0.955 (24.26)	1.080 (27.43)	1.205 (30.61)	1.393 (35.38)	1.580 (40.13)	P8
Length Ring L_R +0.000 (+0.00) −0.020 (−0.51)	1.125 (28.58)	1.250 (31.75)	1.438 (36.53)	1.625 (41.28)	1.875 (47.63)	2.125 (53.98)	P8
Depth of C'bore L_u ±0.015 (±.38)	0.237 (6.02)	0.316 (8.03)	0.394 (10.01)	0.472 (11.99)	0.597 (15.16)	0.675 (17.15)	P8

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C-1.
The P7 and P8 gauges are for undercut pins and were first required in the 14th Edition (1962).
P7: Go Pin-Thread Truncated Setting Plug Gauge.
P8: Go Pin-Thread Ring Gauge.
All sizes, 10 threads per inch. Class 2A-2B.
*Tolerances on E_s for 1 1/8 inch (28.6 mm) plug gauge is +0.0000 (+0.000), −0.00025 (−0.0064).

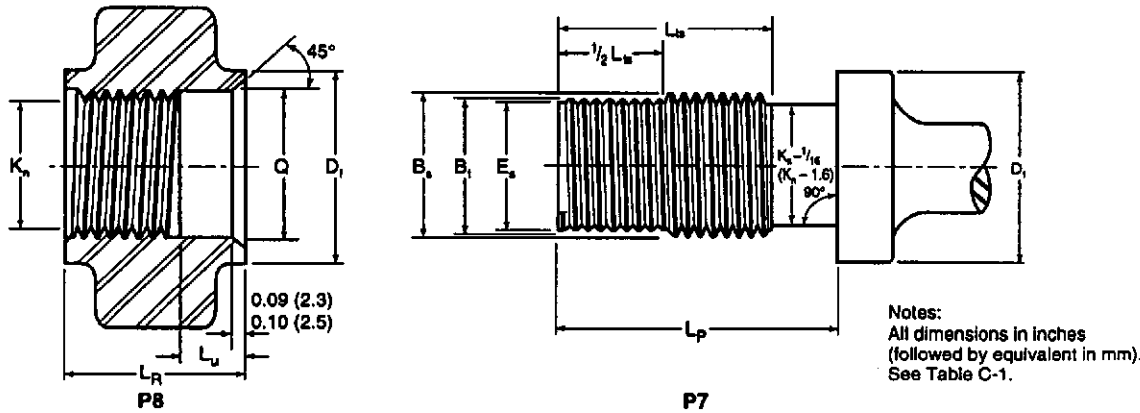


Figure C-1—Go Pin-Thread Gauges (For Gauging Sucker Rod Pin Connections)

Table C-2—P5: Not-Go Pin-Thread Truncated Setting Plug Gauge. P6: Not-Go Pin-Thread Ring Gauge (For Gauging Sucker Rod and Polished Rod Pin Connections)

Size of Rod	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Truncated Major Diameter B_{st} +0.0000 (+0.000) −0.0006 (−0.015)	0.7206 (18.303)	0.9087 (23.081)	1.0333 (26.246)	1.1583 (29.421)	1.3453 (34.171)	1.5325 (38.926)	P5
Full Form Major Diameter B_s +0.0006 (+0.015) −0.0000 (−0.000)	0.7482 (19.004)	0.9362 (23.779)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.889)	1.5609 (39.647)	
Pitch Diameter E_s +0.0002 (+0.005) −0.0000 (−0.000)	0.6773 (17.203)	0.8654 (21.981)	0.9900 (25.146)	1.1150 (28.321)	1.3020 (33.071)	1.4892 (37.826)*	
Length Thd L_{ts} ±0.015 (±0.38)	1.250 (31.75)	1.500 (38.10)	1.500 (38.10)	1.625 (41.28)	1.625 (41.28)	1.875 (47.63)	
Length of Ring L_n ±0.015 (±0.38)	0.562 (14.27)	0.688 (17.48)	0.688 (17.48)	0.750 (19.05)	0.750 (19.05)	0.812 (20.62)	P6
Minor Diameter Ring K_n +0.0006 (+0.015) −0.0000 (−0.000)	0.6557 (16.655)	0.8437 (21.430)	0.9683 (24.595)	1.0933 (27.770)	1.2803 (32.520)	1.4675 (37.275)	

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F (20°C).
See Figure C-2.
P5 and P6 gauges made to 2A and 2B tolerances under Standard 11B, 13th Edition may be used. P5 and P6 gauges made under the 12th and prior editions of Standard 11B (not conforming to 2A and 2B tolerances) may not be used.
P5: Not-Go Pin-Thread Truncated Setting Plug Gauge.
P6: Not-Go Pin-Thread Ring Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
*Tolerance on E_s for 1 1/8 inch. (28.6 mm) plug gauge is +0.00025 (+0.0064), −0.00000 (−0.0000).

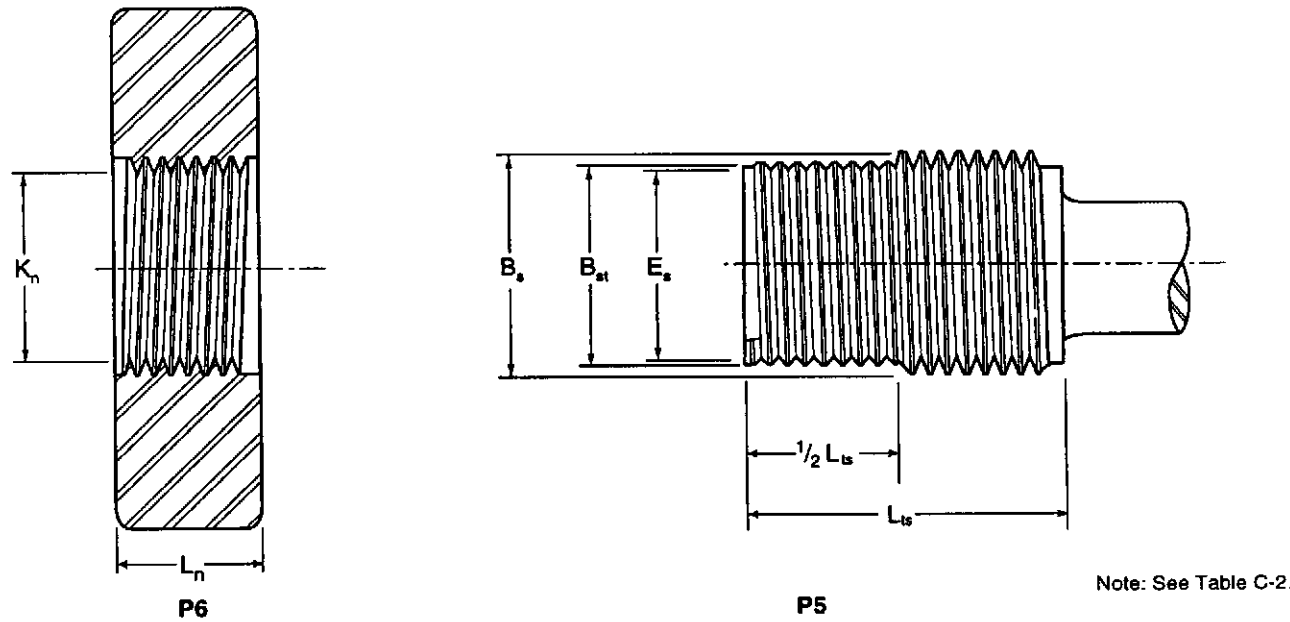


Figure C-2—Not-Go Pin-Thread Gauges (For Gauging Sucker Rod and Polished Rod Pin Connections)

Table C-3—B1: Go Box-Thread Ring Gauge (Checking Ring). B2: Go Box-Thread Plug Gauge (For Gauging Sucker Rod, Polished Rod, and Subcoupling Box Connections)

Size of Rod	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Major Diameter B_s +0.0006 (+0.015) −0.0000 (−0.000)	0.7500 (19.050)	0.9380 (23.825)	1.0630 (27.000)	1.1880 (30.175)	1.3754 (34.935)	1.5630 (39.700)	B2
Pitch Diameter E_s +0.0002 (+0.005) −0.0000 (−0.000)	0.6850 (17.399)	0.8730 (22.174)	0.9980 (25.349)	1.1230 (28.524)	1.3105 (33.287)	1.4980 (38.049)*	B2
Length Thd. L_{ts} ±0.015 (±0.38)	0.888 (22.56)	1.011 (25.68)	1.200 (30.48)	1.386 (35.20)	1.636 (41.55)	1.886 (47.90)	B2
Diameter of Plug of Ring Collar D_f +0.000 (+0.000) −0.010 (−0.25)	1.005 (25.53)	1.255 (31.86)	1.505 (38.23)	1.630 (41.40)	2.005 (50.93)	2.265 (57.53)	
Length of Plug or Ring L ±0.015 (±0.38)	1.188 (30.18)	1.311 (33.30)	1.500 (38.10)	1.686 (42.82)	1.936 (49.17)	2.186 (55.52)	
Minor Diameter K_n +0.001 (+0.03) −0.000 (−0.00)	0.652 (16.56)	0.840 (21.34)	0.965 (24.51)	1.090 (27.69)	1.278 (32.46)	1.465 (37.21)	B1
Diameter of C'bore D_M +0.005 (+0.13) −0.000 (−0.00)	0.861 (21.87)	1.128 (28.65)	1.253 (31.83)	1.378 (35.00)	1.566 (39.78)	1.753 (44.53)	B1

Notes:
B2 does not check 9 degree cone.
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C.3.
B1 and B2 gauges are for box connections used with undercut pins.
B1 and B2 gauges made under the 13th and prior editions of Standard 11B may not be used, except on polished rod connections.
B2: Go Box-Thread Plug Gauge.
B1: Go Box-Thread Ring Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
*Tolerance on E_s for 1 1/8 inch (28.6 mm) plug gauge is +0.00025 (+0.0064), −0.00000 (−0.0000).

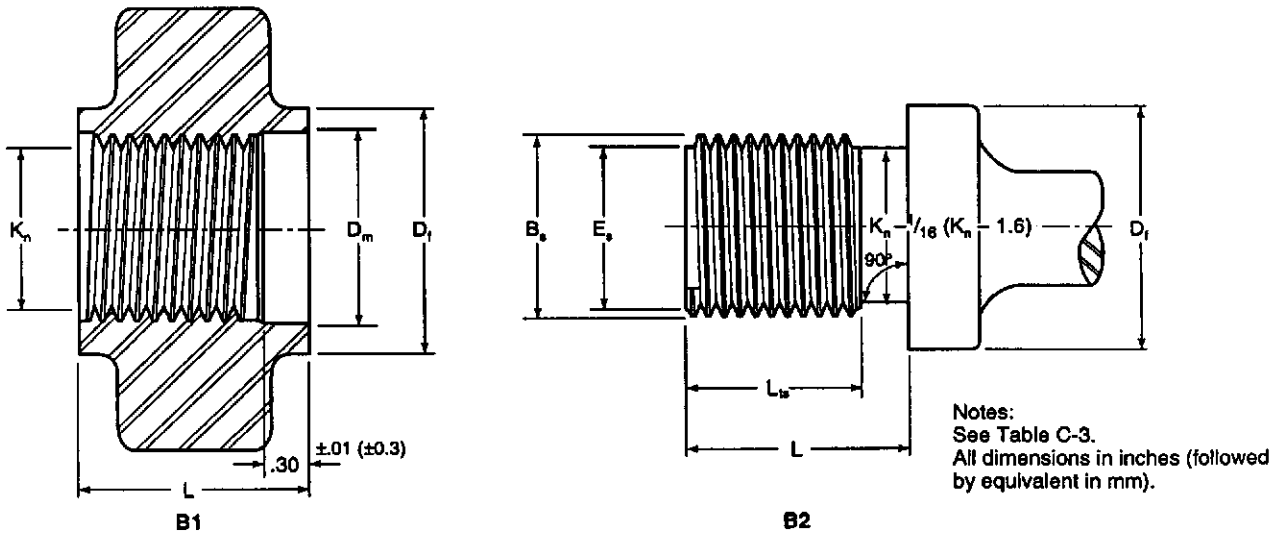


Figure C-3—Go Box-Thread Gauges (For Gauging Box Connections)

Table C-4—B3: Box-Cone Ring Gauge (Fitting Ring). B4: Box-Cone Plug Gauge (For Gauging Polished Rod and Subcoupling Box Connections)

Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Major Diameter B_4 +0.0006 (+0.015) −0.0000 (−0.000)	0.9233 (23.452)	1.0482 (26.624)	1.1732 (29.799)	1.3606 (34.559)	1.5480 (39.319)	B4
Pitch Diameter E_s +0.0005 (+0.013) −0.0000 (−0.000)	0.8654 (21.981)	0.9900 (25.146)	1.1150 (28.321)	1.3020 (33.071)	1.4892 (37.826)	B4
Length Thd. L_{ts} ±0.015 (±0.32)	0.63 (16.00)	0.88 (22.35)	0.88 (22.35)	1.26 (32.00)	1.51 (38.35)	B4
Diameter Plug Cone B_4 +0.0000 (+0.000) −0.0002 (−0.005)	0.9430 (23.952)	1.0680 (27.127)	1.1930 (30.302)	1.3805 (35.065)	1.5680 (39.827)	B4
Length of Plug or Ring L ±0.015 (±0.38)	1.03 (26.2)	1.28 (32.5)	1.28 (32.5)	1.66 (42.2)	1.91 (48.5)	
Diameter of Plug or Ring Collar D_f +0.000 (+0.00) −0.010 (−0.25)	1.255 (31.88)	1.505 (38.23)	1.630 (41.40)	2.005 (50.93)	2.265 (57.53)	
Minor Diameter Ring K_n +0.000 (+0.00) −0.001 (−0.03)	0.822 (20.88)	0.947 (24.05)	1.072 (27.23)	1.259 (31.98)	1.446 (36.73)	

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C-4.
B3 and B4 gauges made under any edition of Standard 11B may be used.
B4: Box Cone Plug Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
Diameter of ring cone (B_5) must be such as to provide a standoff of 0.325, ±0.0015 inch. (8.26, ±0.038 mm).

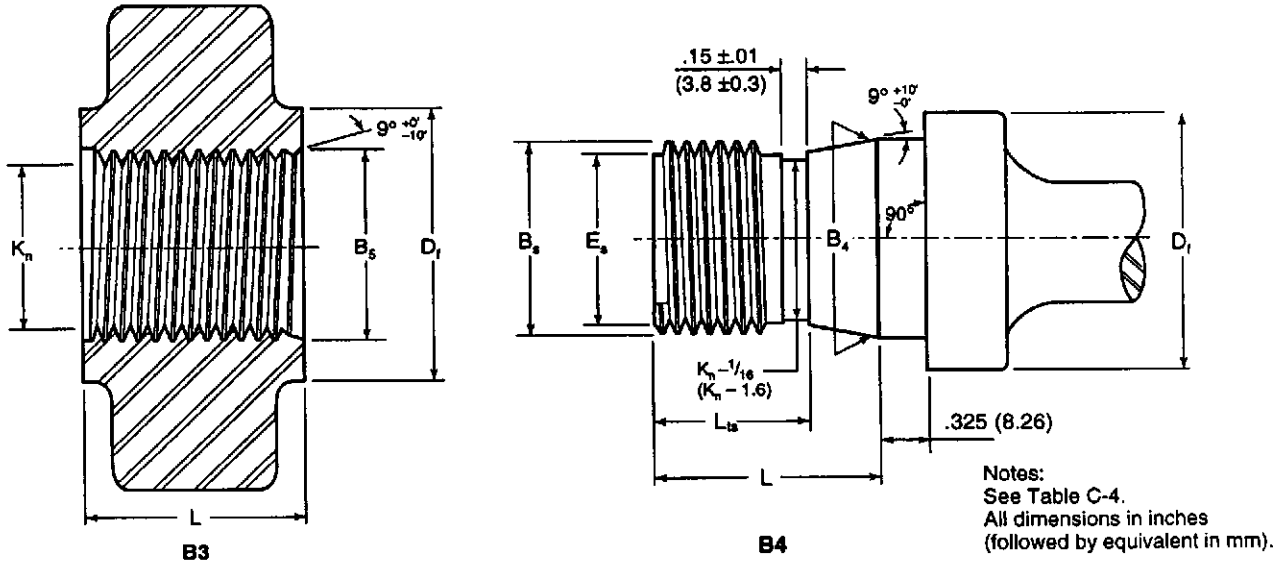


Figure C-4—Box-Cone Gauges (For Gauging Box Connections)

Table C-5—B5: Not-Go Box-Thread Ring Gauge (Checking Ring). B6: Not-Go Box-Thread Plug Gauge (For Gauging Sucker Rod, Polished Rod and Subcoupling Box Connections)

Size of Rod	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Major Diameter B_s +0.0000 (+0.000) −0.0006 (−0.015)	0.7360 (18.694)	0.9239 (23.467)	1.0493 (26.652)	1.1743 (29.827)	1.3623 (34.602)	1.5501 (39.373)	B6
Pitch Diameter E_s +0.0000 (+0.000) −0.0002 (−0.005)	0.6927 (17.595)	0.8806 (22.367)	1.0060 (25.552)	1.1310 (28.727)	1.3190 (33.503)	1.5068 (38.272)*	
Length Thd. L_u ±0.015 (±0.38)	0.500 (12.70)	0.625 (15.88)	0.625 (15.88)	0.750 (19.05)	0.750 (19.05)	0.875 (22.23)	
Length of Ring L_n ±0.015 (±0.38)	0.562 (14.27)	0.688 (17.48)	0.688 (17.48)	0.750 (19.05)	0.750 (19.05)	0.812 (20.62)	B5
Minor Diameter K_n +0.001 (+0.03) −0.000 (−0.00)	0.652 (16.56)	0.840 (21.34)	0.965 (24.51)	1.090 (27.69)	1.278 (32.46)	1.465 (37.21)	

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C-5.
B5 and B6 gauges made to 2A and 2B tolerances under Standard 11B, 13th Edition may be used. B5 and B6 gauges made under the 12th and prior editions of Standard 11B (not conforming to 2A and 2B tolerances) may not be used.
B6: Not Go Box-Thread Plug Gauge.
B5: Not Go Box-Thread Ring Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
*Tolerance on E_s for 1 1/8 inch (28.6 mm) plug gauge is +0.00000 (+0.0000), −0.00025 (−0.0064).

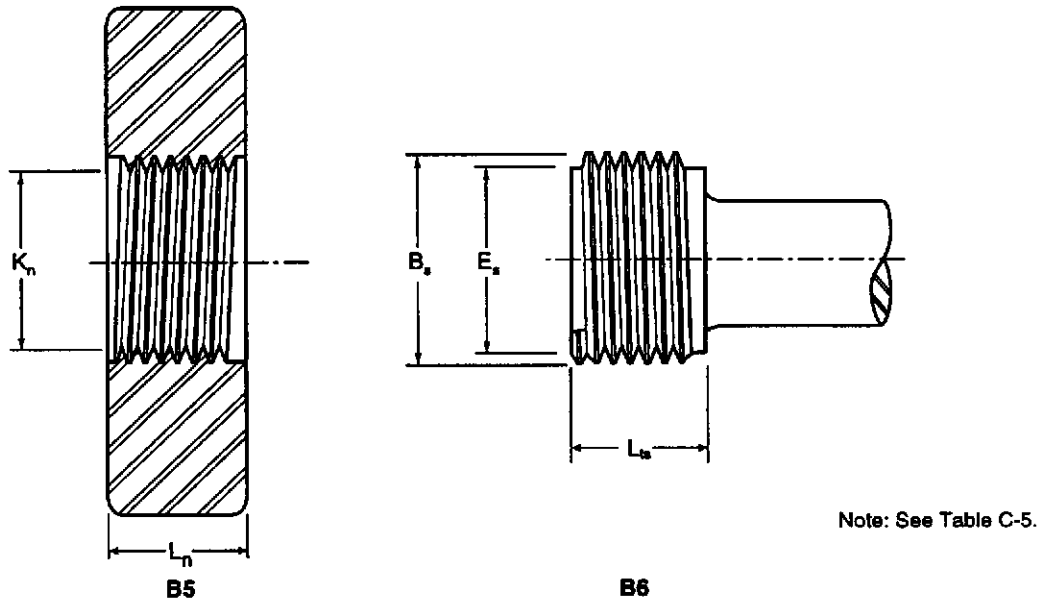


Figure C-5—Not-Go Box-Thread Gauges (For Gauging Box Connections)

Table C-6—P1: Go Pin-Thread Truncated Setting Plug Gauge. P2: Go Pin-Thread Ring Gauge (For Gauging Polished Rod Pin Connections)

Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Truncated Major Diameter B_t +0.0000 (+0.000) −0.0006 (−0.015)	0.9216 (23.409)	1.0465 (26.581)	1.1715 (29.756)	1.3589 (34.516)	1.5463 (39.276)	P1
Full Form Major Diameter B_s +0.0006 (+0.015) −0.0000 (−0.000)	0.9362 (23.779)	1.0611 (26.952)	1.1861 (30.127)	1.3735 (34.887)	1.5609 (39.647)	
Pitch Diameter E_s +0.0000 (+0.000) −0.0002 (−0.005)	0.8712 (22.128)	0.9962 (25.303)	1.1211 (28.476)	1.3085 (33.236)	1.4960 (37.998)*	
Length Thd. L_{ts} ±0.015 (±0.38)	1.25 (31.8)	1.75 (44.5)	1.75 (44.5)	2.50 (63.5)	3.00 (76.2)	
Length of Plug L_p ±0.015 (±0.38)	1.80 (45.7)	2.30 (58.4)	2.30 (58.4)	3.05 (77.5)	3.55 (90.2)	
Diameter of Plug or Ring Collar D_f +0.0000 (+0.00) −0.0010 (−0.25)	1.255 (31.88)	1.505 (38.23)	1.630 (41.40)	2.005 (50.93)	2.265 (57.53)	
Minor Diameter K_n +0.0000 (+0.000) −0.0006 (−0.015)	0.8279 (21.029)	0.9529 (24.204)	1.0778 (27.376)	1.2652 (32.136)	1.4527 (36.899)	P2
Diameter of C'bore Q +0.005 (+0.13) −0.000 (−0.00)	0.955 (24.26)	1.080 (27.43)	1.205 (30.61)	1.393 (35.38)	1.580 (40.13)	
Length Ring L_R +0.000 (+0.00) −0.020 (−0.51)	1.125 (28.58)	1.375 (34.93)	1.375 (34.93)	1.750 (44.45)	2.000 (50.80)	

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C-6.
P1 and P2 gauges made to 2A and 2B tolerances under Standard 11B, 13th Edition may be used. P1 and P2 gauges made under the 12th and prior editions of Standard 11B (not conforming to 2A and 2B tolerances) may not be used.
P1: Go Pin-thread Truncated Setting Plug Gauge.
P2: Go Pin-Thread Ring Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
*Tolerance on E_s for 1 1/8 inch. (28.6 mm) plug gauge is +0.00000 (+0000), -0.00025 (-0.0064).

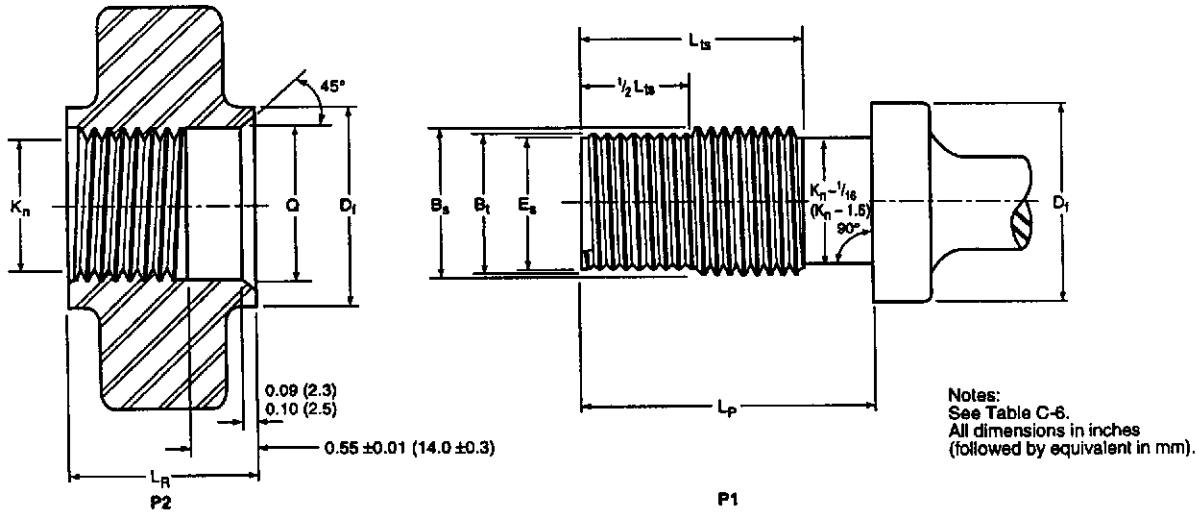


Figure C-6—Go Pin-Thread Gauges (For Gauging Polished Rod Pin Connections)

Table C-7—P3: Go Pin-Cone Plug Gauge (Fitting Plug). P4: Pin-Cone Ring Gauge (For Gauging Polished Rod Pin Connections)

Size of Rod	5/8 (15.9)	3/4 (19.1)	7/8 (22.2)	1 (25.4)	1 1/8 (28.6)	
Major Diameter B_s +0.0006 (+0.015) −0.0000 (−0.000)	0.9456 (24.018)	1.0710 (27.203)	1.1960 (30.378)	1.3840 (35.154)	1.5718 (39.924)	P3
Pitch Diameter E_s +0.0000 (+0.000) −0.0005 (−0.013)	0.8806 (22.367)	1.0060 (25.552)	1.1310 (28.727)	1.3190 (33.503)	1.5068 (38.273)	P3
Length Thd. L_{te} ±0.015 (±0.38)	0.63 (16.0)	0.88 (22.4)	0.88 (22.4)	1.26 (32.0)	1.51 (38.4)	P3
Diameter Plug Cone B_4 +0.0000 (+0.000) −0.0002 (−0.005)	0.9430 (23.952)	1.0680 (27.127)	1.1930 (30.302)	1.3805 (35.065)	1.5680 (39.827)	P3
Length Plug and Ring L ±0.015 (±0.38)	1.03 (26.2)	1.28 (32.5)	1.28 (32.5)	1.66 (42.2)	1.91 (48.5)	
Diameter of Plug or Ring Collar D_f +0.000 (+0.00) −0.010 (−0.25)	1.255 (31.88)	1.505 (38.23)	1.630 (41.40)	2.005 (50.93)	2.265 (57.53)	P4
Minor Diameter K_n +0.000 (+0.00) −0.001 (−0.03)	0.851 (21.62)	0.976 (24.79)	1.101 (27.97)	1.288 (32.72)	1.476 (37.49)	P4

Notes:
All dimensions in inches (followed by equivalent in mm) at 68°F(20°C).
See Figure C-7.
P3 and P4 gauges made under any edition of Standard 11B may be used.
P3: Pin-Cone Plug Gauge.
P4: Pin-Cone Ring Gauge.
All sizes, 10 threads per inch. Class 2A and 2B.
Diameter of ring cone B_5 must be such as to provide a standoff of 0.325, ±0.0015 inch (8.26, ±0.038 mm).

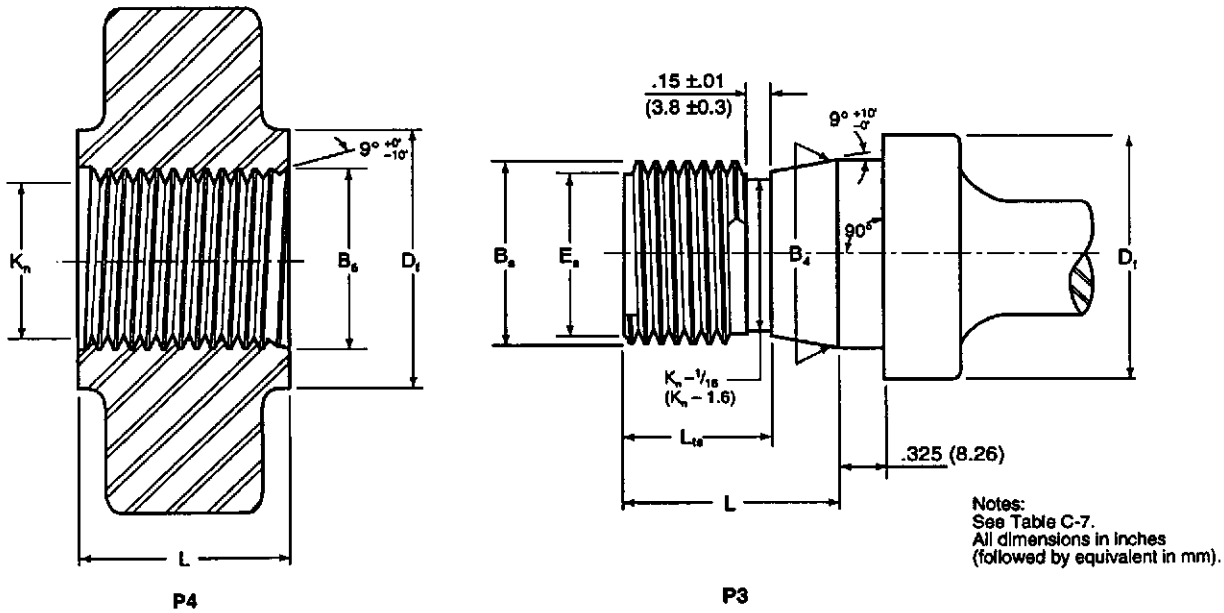


Figure C-7—Pin-Cone Gauges (For Gauging Polished Rod Pin Connections)

Table C-8—Tolerances for Reference Master Gauges

Element	Tolerance
Plug Gauges	
Half angle of thread	±6 minutes
Lead[1]	±0.00025 (±0.0064)
Runout of shoulder face[2] (P1, P7, and B2)	0.0002 (0.005)
Eccentricity of cone with respect to thread (P3 and B4)	0.0002 (0.005)
total indicator reading	0.0004 (0.010)
Ring Gauges	
Half angle of thread	±6 minutes
Lead[1]	±0.00025 (±0.0064)
Runout of face[2] (P2, P8, and B1)	0.0002 (0.005)
Eccentricity of cone with respect to thread	0.0003 (0.008)
total indicator reading	0.0006 (0.015)
Standoff from plug[3] (P4 and B3)	0.325 ±0.0015 (8.26 ±0.038)

Notes:
All dimensions in inches at 68°F (followed by mm at 20°C), except as otherwise indicated.
[1]The tolerance shown is the maximum deviation in lead between any two threads, whether adjacent or separated by an amount not exceeding the full length less one full turn at each end. In the case of setting plugs, the tolerance applies to a length of thread equal to that of the thread in the mating ring gauge. On truncated setting plugs, the sign of any lead deviation present shall be the same on the full-form portion of the truncated portion and such deviation shall be uniform within 0.0001 inch (0.003 mm) over any portion equivalent to the length of the ring gauge.
[2]Runout shall be measured at distance $D_f/2$ minus $^1/_8$ inch (3.2 mm) from the axis of the gauge.
[3]Ring shall be assembled with mating plug to cone contact by hand without spinning.

Table C-9—Allowable Axial Variation of Shoulder Face

Gauge	Allowable Axial Variation of Shoulder Face*
P1	0.0003 (0.008)
P2	0.0004 (0.010)
P7	0.0003 (0.008)
P8	0.0004 (0.010)
B1	0.0004 (0.010)
B2	0.0003 (0.008)

Notes:
All dimensions in inches at 68°F (followed by mm at 20°C).
*If the axial centers of plug gauges P7, B2, and P1 have been damaged so that a reliable determination of the variation in shoulder faces cannot be obtained, the combined variation of mating gauges shall be determined by the use of a gauge block, or a combination of gauge blocks, as feeler gauges. The combined variation shall not exceed 0.0007 inch (0.018 mm).

APPENDIX D—GAUGE CERTIFICATION

D.1 Certification Agencies

All new and reconditioned reference master plug and mating ring gauges, prior to use, shall have been certified to be in conformance with the stipulations given in Appendix C, by one of the following agencies:

Note: A schedule of fees for tests be obtained upon application to the testing agency.

a. Instituto Nacional De Technologia Industrial, Buenos Aires, Argentina.

b. National Institute of Metrology, Beijing, People's Republic of China.

c. National Institute of Standards and Technology, Gaithersburg, Maryland.

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

e. Oil Country Tubular Goods Inspection Laboratory.

f. China National Oil & Gas.

g. Exploration and Development Corporation BAOJI, SHAANXI People's Republic of China.

h. Physikalisch-Technische Bundesanstalt, Braunschweig, Germany.

D.2 Certification

The gauge certifying agency shall inspect new and reconditioned reference master gauges for conformance to the requirements of Appendix C. For each gauge which complies with all requirements, the certifying agency shall issue a certificate to the gauge owner, with copy to the API Dallas office, stating that the gauge complies with API Specification 11B. For each gauge which does not comply with all requirements, the certifying agency shall issue a report to the gauge manufacturer, with copy to the API Dallas office, stating the reason for rejection and showing the measured value for those dimensions which are outside the permissible limits. Reference master gauges must be certified in complete sets, i.e., a reference master plug and a reference master ring gauge. A single reference master plug or a single reference master ring gauge may not be certified unless accompanied by a previously certified mating reference master gauge.

D.3 Marking (by Certifying Agency)

The certifying agency shall verify the markings required under C.10, and shall mark all acceptable reference master gauges (both plug and ring unless otherwise stated below) with the following markings.

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

In recertifying reconditioned gauges, the markings as applied by the certifying agency making the previous test shall be replaced as necessary, so that only one set of markings appears on the recertified gauge.

a. Date of Certification—The date of certification shall be marked on all gauges. In recertifying reconditioned gauges, the previous certification date shall be replaced with the date of recertification. Dates of retest, as required by C.11, shall not be marked on reference master gauges.

b. Name or Mark of Certifying Agency—The identification mark of the certifying agency shall be placed on all gauges.

c. Mating Standoff—The initial mating standoff of cone gauges shall be marked on the ring gauge only for pin gauges, and on the plug gauge only for box gauges.

d. API Monogram—All certified gauges shall be marked with the monogram by the certifying agency, if not applied by the gauge maker. If any gauge marked with the monogram is determined by the certifying agency to be in nonconformance to requirements, that agency shall remove the monogram, unless the gauge is to be reconditioned and returned to the agency for rechecking.

D.4 Retest

On gauges submitted to the certifying agency for retest (see C.11 for test period), the agency shall give the owner a report, with copy to API, stating whether or not the gauge is suitable for further use, and if not, giving the measurements of the elements which are outside the permissible limits. If the gauge is approaching the permissible limit of wear and, in the opinion of the certifying agency, should be retested within a two-year period, the report shall so state, giving the measurement for the element or elements on which the statement is based.

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