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ISO 10428

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Petroleum and natural gas industries — Sucker rods (pony rods, polished rods, couplings and sub-couplings) — Specification

*Industries du pétrole et du gaz naturel — Tiges de pompage —
Spécifications*



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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10428 was prepared by the American Petroleum Institute (API) (as Spec 11B, 24th edition) and was adopted, under a special "fast-track procedure", by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum and natural gas industries*, in parallel with its approval by the ISO member bodies.

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International Organization for Standardization

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Introduction

International Standard ISO 10428:1993 reproduces the content of API Spec 11B, 24th edition, 1990, and its Supplement 1 (April 1, 1991). ISO, in endorsing these API documents, recognizes that in certain respects they do not comply with all current ISO rules on the presentation and content of an International Standard. Therefore, the relevant technical body, within ISO/TC 67, will review ISO 10428:1993 and reissue it, when practicable, in a form complying with these rules.

This standard is not intended to obviate the need for sound engineering judgement as to when and where this standard should be utilized and users of this standard should be aware that additional or differing requirements may be needed to meet the needs for the particular service intended.

Standards referenced herein may be replaced by other international or national standards that can be shown to meet or exceed the requirements of the referenced standards.

Appendix A to the API document shall not be regarded as being part of the requirements of this standard.

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Petroleum and natural gas industries — Sucker rods (pony rods, polished rods, couplings and sub-couplings) — Specification

1 Scope

This International Standard specifies the requirements for the dimensional characteristics, chemical and mechanical properties and gauging practice of sucker rods (pony rods, polished rods, couplings and sub-couplings) used in the petroleum and natural gas industries.

2 Requirements

Requirements are specified in:

“API Specification 11B (Spec 11B), Twenty-fourth Edition, October 1, 1990 — *Specification for Sucker Rods (Pony Rods, Polished Rods, Couplings and Subcouplings)*”,

which is adopted as ISO 10428.

For the purposes of international standardization, however, modifications shall apply to specific clauses and paragraphs of publication API Spec 11B. These modifications are outlined below.

Throughout publication API Spec 11B, the conversion of English units shall be made in accordance with ISO 31.

LENGTH	1 inch (in)	= 25,4 mm (exactly)
	1 foot (ft)	= 304,8 mm or 0,3048 m (exactly)
TORQUE	1 foot-pound force (ft·lbf)	= 1,355 818 N·m
TEMPERATURE	The following formula was used to convert degrees Fahrenheit (°F) to degrees Celsius (°C)	

$$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$$

Page 12

Suggestion for ordering sucker rods

The option to place an order in accordance with ISO 10428 shall be added.

Page 13

Information given in the POLICY is relevant to the API publication only.

Page 14

Scope

Information given in subclauses 1.3 through 1.6 is relevant to the API publication only.

Page 18

Subclause 4.3.2.2

The reference to MIL-STD-105D shall be replaced by a reference to ISO 2859-1.

Page 19

Subclause 4.3.7

The reference to MIL-STD-105D shall be replaced by a reference to ISO 2859-1.

Table 4.4 and Table 4.5

The reference to MIL-STD-105D shall be replaced by a reference to ISO 2859-1.

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Subclause 6.2

Reference to class X tolerance according to National Bureau of Standards¹⁾ Handbook H28 should be supplemented by reference to the equivalent ISO tolerance class, if available.

Page 41

Section 8, Gauge certification

The gauge certification system specified in this section is not considered as an integral part of this International Standard. This system shall be subject of a further study by ISO/TC 67 with a view to establishing an ISO or ISO/API certification scheme. The registration of certification agencies and reference master gauges should then be carried out in accordance with Annex N of Part 1 of the ISO/IEC Directives.

Page 45

Section 10 — “Marking, packaging and thread protection”

Subclauses 1c., 2c.

The option to mark the product with “ISO 10428” shall be added. Moreover, the “identification code marks” described in the examples to subclauses 1e., 2e., 3 and 10.2 respectively, may be used on a provisional basis. In the future edition of this International Standard marking should comply with the provisions of annex E of the ISO/IEC Directives, part 2.

Page 48

Subclause 12.9

The reference to MIL-STD-105D shall be replaced by a reference to ISO 2859-1.

Page 49

Subclause 12.10, Footnote*

This information is relevant to the API document only.

1) Replace “National Bureau of Standards” by “National Institute of Standards and Technology”.

Subclause 12.10c.

The option to mark the product with “ISO 10428” shall be added.

Table 12.3

The reference to MIL-STD-105D shall be replaced by a reference to ISO 2859-1.

Page 56

Appendix A, Use of API monogram

Appendix A, as well as any other clauses that refer to the use of the API monogram, shall not be considered as an integral part of this International Standard.

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Specification for Sucker Rods (Pony Rods, Polished Rods, Couplings and Subcouplings)

API SPECIFICATION 11B (SPEC 11B)
TWENTY-FOURTH EDITION, OCTOBER 1, 1990

American Petroleum Institute
1220 L Street, Northwest
Washington, DC 20005



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Supplement 1
(April 1, 1991)

Specification for Sucker Rods (Pony Rods, Polished Rods, Couplings and Subcouplings)

API SPECIFICATION 11B (SPEC 11B)
TWENTY-FOURTH EDITION, OCTOBER 1, 1990

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Foreword

This supplement covers changes in API Spec 11B (Twenty-Fourth Edition, October 1, 1990): *Specification for Sucker Rods (Pony Rods, Polished Rods, Couplings and Subcouplings)*, adopted at the 1990 Standardization Conference as reported in Circ PS-1920 and approved by letter ballot.

Page 13, Table 5.3: *Revise the following D_c and C_f dimensions.*

Size of Rod	D_c
1 (25.4)	1.865 (47.37)
1½ (28.6)	2.110 (53.54)
Size of Rod	C_f
½ (12.7)	.026 (.66)
¾ (15.9)	.026 (.66)
¾ (19.1)	.08 (2.03)
¾ (22.2)	.08 (2.03)
1 (25.4)	.142 (3.61)
1½ (28.6)	.171 (4.34)

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SUGGESTIONS FOR ORDERING SUCKER RODS

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

- 1. Specification API Spec 11B
- 2. Quantity
- 3. Grade Par. 2.1, Table 2.1
- 4. Size Par. 3.1, Table 3.1
- 5. Length Par. 3.1, Table 3.1
- 6. Type of Ends Par. 3.2, 3.3
- 7. Couplings:
 - Size Par. 4.1
 - Class Par. 4.3
 - Style Par. 4.4
 - Subcouplings Par. 4.2

Foreword

a. This specification is under the jurisdiction of the Committee on Standardization of Production Equipment of the American Petroleum Institute.

b. **Attention Users of this Publication:** Portions of this publication have been changed from the previous edition. The location of changes has been marked with a bar in the margin. In some cases the changes are sig-

nificant, while in other cases the changes reflect minor editorial adjustments. The bar notations in the margins are provided as an aid to users to identify those parts of this publication that have been changed from the previous edition, but API makes no warranty as to the accuracy of such bar notations.

c. *This Standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution.*

Note

This edition supersedes the 23rd edition dated October, 1, 1989. It includes changes adopted at the 1989 Standardization Conference and subsequently approved by letter ballot.

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SECTION 1
SCOPE

1.1 Definition. “One-piece” sucker rod is understood to mean a rod whose body and pin or box ends are an integral unit. The ends may be formed by forging the ends of a one-piece body stock or by welding or fusing end pieces on the body. “Three-piece” sucker rod is understood to mean a rod whose body and pin or box ends are joined by threaded connections. Except where specified “one-piece” or “three-piece,” this specification shall apply to both types of sucker rods.

1.2 Coverage. This specification covers (1) three grades of sucker rods; (2) dimensional requirements for sucker rods, couplings, subcouplings and polished rod connections; (3) stipulations on thread gages, gaging practice, and gage certification; (4) polished rods and polished rod liners; (5) stuffing boxes and pumping tees; (6) requirements on packaging; and (7) conditions under which the API monogram may be used.

1.3 American Petroleum Institute (API) Specifications are published as aids to the procurement of standardized equipment and materials, as well as instructions to manufacturers of equipment or materials covered by an API Specification. These Specifications are not intended to obviate the need for sound engineering, nor to inhibit in any way anyone from purchasing or producing products to other specifications.

1.4 The formulation and publication of API Specifications and the API monogram program is not intended in any way to inhibit the purchase of products from companies not licensed to use the API monogram.

1.5 API Specifications may be used by anyone desiring to do so, and diligent effort has been made by the Institute to assure the accuracy and reliability of the data contained therein. However, the Institute makes no representation, warranty, or guarantee in connection with the publication of any API Specification and hereby expressly disclaims any liability or responsibility for loss or damage resulting from their use, for any violation of any federal, state, or municipal regulation with which an API Specification may conflict, or for the infringement of any patent resulting from the use of an API Specification.

1.6 Any manufacturer producing equipment or materials represented as conforming with an API Specification is responsible for complying with all the provisions of that Specification. The American Petroleum Institute does not represent, warrant or guarantee that such products do in fact conform to the applicable API standard or specification.

SECTION 2
MATERIAL*

2.1 Chemical and Mechanical Properties. Grade K, C, and D sucker rods and pony rods furnished to this specification shall conform to the chemical and mechanical properties shown in Table 2.1. The chemical composition and mechanical properties of other grades of sucker rods and pony rods shall be as agreed upon between the user and the manufacturer.

NOTE: Although minimum impact requirements are not specified, sucker rod impact properties shall be determined from round Type 2 (cantilever-beam) Izod test specimens detailed in the latest revision of ASTM E23, Notched Bar Impact Testing of Metallic Materials.

*The requirements of Section 2 do not apply to couplings, subcouplings, polished rods, polished rod liners, stuffing boxes or pumping tees.

TABLE 2.1
CHEMICAL AND MECHANICAL PROPERTIES

Grade	Chemical Composition	Tensile Strength, psi	
		Min.	Max.
		(PSI)	(PSI)
		(MPa)	(MPa)
K	AISI 46XX	85,000 (586)	115,000 (793)
C	AISI 1536 ⁽¹⁾	90,000 (620)	115,000 (793)
D	Carbon or Alloy ⁽²⁾	115,000 (793)	140,000 (965)

⁽¹⁾Generally manufactured from, but not restricted to, AISI 1536.

⁽²⁾Any composition which can be effectively heat treated to the minimum ultimate tensile strength.

SECTION 3 GENERAL DIMENSIONS

3.1 Sizes and Lengths. Sucker rods and pony rods shall be furnished in the sizes and lengths shown in Table 3.1, as specified on the purchase order.

3.2 Dimensional Tolerances for Rod Bodies. Final rod body should be manufactured to the following tolerances, Table 3.1, column 12. The diameter must be met at any point along the rod body.

3.3 Pin-and-Pin Rods. Unless box-and-pin rods are ordered, sucker rods shall be furnished with pins on both ends. Rod ends shall conform to the dimensions given in Table 3.1. Rod pins shall conform to the requirements of Sect. 5.

3.4 Box-and-Pin Rods. Box-and-pin rods (and box-and-pin pony rods) are available in $\frac{1}{8}$ and $\frac{3}{4}$ in. sizes only, and shall be furnished with one box end and one pin end. Rod ends shall conform to the dimensions given

in Table 3.1. Rod pins and boxes shall conform to the requirements of Sect. 5.

3.5 Couplings. Unless otherwise ordered, all pin-and-pin sucker and pony rods shall be furnished with a coupling assembled on one end. All couplings and subcouplings shall conform to the requirements of Sect. 4 and Sect. 5.

3.6 Polished Rod Pins. Polished rods shall be furnished with pins on both ends as specified in Sect. 12. Polished rod pins shall conform to Fig. 5.2, and Tables 5.1 and 5.3.

3.7 Thread Protection. All exposed threads shall be provided with thread protectors conforming to the requirements of Sect. 10.

NOTE: This requirement does not apply to unassembled couplings or subcouplings.

TABLE 3.1
GENERAL DIMENSIONS AND TOLERANCES FOR SUCKER RODS AND PONY RODS

1	2	3	4	5	6	7	8	9	10	11	12
Size of Rod	Nominal Diameter of Pin	Outside Diameter of Pin Shoulder and Box D_f	Width of Wrench Square W_s	Length of Wrench Square ¹ W_l	Total Length of Rod Box, min. L_b	Length of Sucker Rod ² ± 2.0 in. (± 50.8 mm)	Length of Pony Rods 1, 2, 3 ± 2.0 in. (± 50.8 mm)	Diameter of Bead ⁶ D_u	AR $\pm \frac{1}{16}$ (± 3.17)	CR $\pm \frac{1}{16}$ (± 3.17)	Tolerances Diameter in. (mm)
in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	in. (mm)	ft. (m)	ft. (m)	in. (mm)	in. (mm)	in. (mm)	in. (mm)
$\frac{1}{2}$ (12.7)	$\frac{3}{4}$ (19.1)	1.000 $^{+0.005}_{-0.010}$ (25.4 $^{+0.13}_{-0.25}$)	$\frac{7}{8}$ (22.2)	$\frac{1}{4}$ (19.1)	—	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{7}{8}$ $^{+0.005}_{-0.010}$ (22.2 $^{+0.13}_{-0.25}$)	$\frac{1}{2}$ (38.1)	$\frac{1}{8}$ (3.17)	$^{+0.007}_{-0.014}$ ($^{+0.178}_{-0.356}$)
$\frac{5}{8}$ (15.9)	$\frac{1}{2}$ (23.8)	1.250 $^{+0.005}_{-0.010}$ (31.8 $^{+0.13}_{-0.25}$)	$\frac{7}{8}$ (22.2)	$\frac{1}{4}$ (19.1)	2 $\frac{1}{2}$ (54.0)	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{17}{32}$ $^{+0.005}_{-0.010}$ (31.0 $^{+0.13}_{-0.25}$)	$\frac{1}{8}$ (47.6)	$\frac{1}{8}$ (3.17)	$^{+0.007}_{-0.014}$ ($^{+0.178}_{-0.356}$)
$\frac{3}{4}$ (19.1)	$\frac{1}{2}$ (27.0)	1.500 $^{+0.005}_{-0.010}$ (38.1 $^{+0.13}_{-0.25}$)	1 (25.4)	$\frac{1}{4}$ (19.1)	2 $\frac{3}{4}$ (60.3)	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{11}{32}$ $^{+0.005}_{-0.010}$ (35.7 $^{+0.13}_{-0.25}$)	2 $\frac{1}{4}$ (57.1)	$\frac{1}{8}$ (3.17)	$^{+0.008}_{-0.016}$ ($^{+0.203}_{-0.406}$)
$\frac{7}{8}$ (22.2)	$\frac{1}{2}$ (30.2)	1.625 $^{+0.005}_{-0.010}$ (41.3 $^{+0.13}_{-0.25}$)	1 (25.4)	$\frac{1}{4}$ (19.1)	2 $\frac{3}{4}$ (60.3)	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{11}{32}$ $^{+0.005}_{-0.010}$ (38.1 $^{+0.13}_{-0.25}$)	2 $\frac{3}{4}$ (66.7)	$\frac{3}{16}$ (4.76)	$^{+0.008}_{-0.016}$ ($^{+0.203}_{-0.406}$)
1 (25.4)	$\frac{1}{2}$ (34.9)	2.000 $^{+0.005}_{-0.010}$ (50.8 $^{+0.13}_{-0.25}$)	$\frac{1}{2}$ (33.3)	$\frac{1}{2}$ (38.1)	3 (76.2)	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{129}{32}$ $^{+0.005}_{-0.010}$ (48.4 $^{+0.13}_{-0.25}$)	3 (76.2)	$\frac{3}{16}$ (4.76)	$^{+0.009}_{-0.018}$ ($^{+0.229}_{-0.457}$)
$\frac{1}{2}$ (28.6)	$\frac{1}{2}$ (39.7)	2.250 $^{+0.005}_{-0.010}$ (57.2 $^{+0.13}_{-0.25}$)	$\frac{1}{2}$ (38.1)	$\frac{1}{2}$ (41.3)	3 $\frac{1}{4}$ (82.6)	25.30 (7.62, 9.14)	2.3, 4, 6, 8, 10, 12	$\frac{27}{16}$ $^{+0.005}_{-0.010}$ (55.6 $^{+0.13}_{-0.25}$)	3 $\frac{3}{8}$ (85.7)	$\frac{3}{16}$ (4.76)	$^{+0.010}_{-0.020}$ ($^{+0.254}_{-0.508}$)

¹Minimum length exclusive of fillet.

²The length of box-and-pin rods shall be measured from contact face of pin shoulder to contact face of box.

³The length of sucker and pony rods shall be measured from contact face of pin shoulder to contact face on the field end of the coupling.

⁴S.I. equivalents of pony rod lengths are: 0.41, 0.61, 0.91, 1.22, 1.83, 2.44, 3.05 and 3.66 m.

⁵Dimension D_f of $\frac{5}{8}$ in. (15.9 mm) box-and-pin rods shall be 1.375 ± 0.015 in. (34.92 ± 0.38 mm).

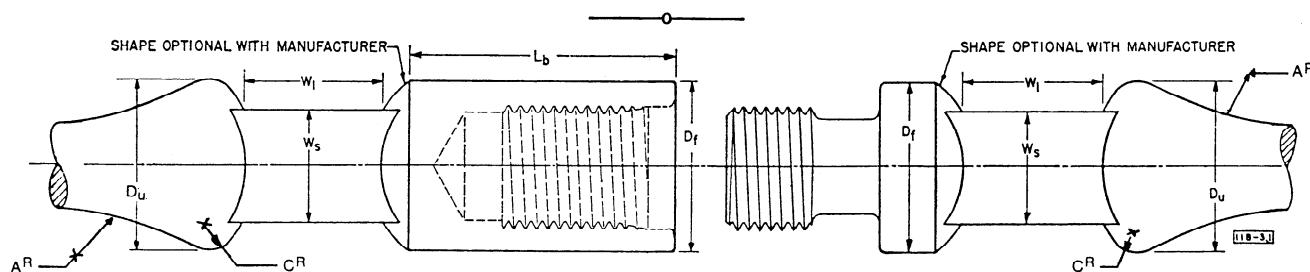


FIG. 3.1
**GENERAL DIMENSIONS FOR SUCKER-ROD
BOX AND PIN ENDS**

See Table 3.1

See Sect. 5 for details of shouldered connection.

SECTION 3B THREE-PIECE SUCKER RODS

3B.1 Three-piece sucker rods shall conform to all dimensional specifications for the given size rod except that portion immediately adjacent to the tapered end may have a diameter not to exceed $\frac{1}{4}$ inch (6.35 mm) greater than the rod body nominal diameter. The transition from the end piece diameter to the rod body diameter shall be rounded or angled. (Sharp corners which might hang up in the rod elevators shall not be allowed.)

3B.2 The threaded end pieces of three-piece rods shall be made up on the body in a manner which will allow them to withstand the torque values in Table 1 at any temperature between -50°F and 500°F without unscrewing or coming apart in any manner. There should not be a dead fluid area at the body-end connection

nor should a dead fluid area develop under storage or normal use. The connection must not deteriorate when cycled over a temperature range of -50°F to 500°F or over any stress range from the API modified Goodman diagram for the class rod.

TABLE 1

Size (in.)	Torque (ft. lb.)
$\frac{1}{2}$	90
$\frac{3}{8}$	180
$\frac{3}{4}$	300
$\frac{7}{8}$	450
1	675
$1\frac{1}{8}$	900

SECTION 4 COUPLINGS AND SUBCOUPLINGS

4.1 Couplings. Couplings furnished to this specification shall have the same size connection on each end. They shall conform to the dimensions stipulated in Table 4.1 or Table 4.2, whichever is applicable. Threading may be continuous or discontinuous at the manufacturer's option and shall conform to the requirements of Section 5.

4.2 Subcouplings. Subcouplings furnished to this specification shall be of two types as illustrated in

Fig. 4.1 and shall conform to the dimensions stipulated in Table 4.1 or Table 4.2, whichever is applicable. Threading shall conform to the requirements of Section 5. The outside diameter of the box-and-box subcouplings (Type I) shall conform to the W dimension given in Table 4.1 or Table 4.2 for the larger specified connection. The outside diameter of the box-and-pin subcouplings (Type II) shall conform to the W dimension given in Table 4.1 or Table 4.2. The length N_L shall be optional with the manufacturer.

TABLE 4.1
FULLSIZE COUPLINGS AND SUBCOUPLINGS
(All dimensions in inches followed by equivalent in mm. See Fig. 4.3.)

1	2	3	4	5	6
Nominal Coupling Size*	Outside Diameter +0.005 -0.010 W	Length Min. N_L	Length of Wrench Flat W_L^{**}	Dist. Between Wrench Flats $0-\frac{1}{32}$ (0-8mm) W_f	Used With Min. O.D. Tubing Size
$\frac{5}{8}$ (15.9)	$1\frac{1}{2}$ (38.1)	4 (101.6)	$1\frac{1}{4}$ (31.8)	$1\frac{3}{8}$ (34.9)	$2\frac{1}{16}$ (52.4)
$\frac{3}{4}$ (19.1)	$1\frac{5}{8}$ (41.3)	4 (101.6)	$1\frac{1}{4}$ (31.8)	$1\frac{1}{2}$ (38.1)	$2\frac{3}{8}$ (60.4)
$\frac{7}{8}$ (22.2)	$1\frac{3}{4}$ (46.0)	4 (101.6)	$1\frac{1}{4}$ (31.8)	$1\frac{5}{8}$ (41.3)	$2\frac{7}{8}$ (73.0)
1 (25.4)	$2\frac{3}{16}$ (55.6)	4 (101.6)	$1\frac{1}{2}$ (38.1)	$1\frac{7}{8}$ (47.6)	$3\frac{1}{2}$ (88.9)
$1\frac{1}{8}$ (28.6)	$2\frac{3}{8}$ (60.3)	$4\frac{1}{2}$ (114.3)	$1\frac{5}{8}$ (41.3)	$2\frac{1}{8}$ (53.9)	$3\frac{1}{2}$ (88.9)

*Also size of rod with which coupling is to be used.

**Minimum length exclusive of fillets.

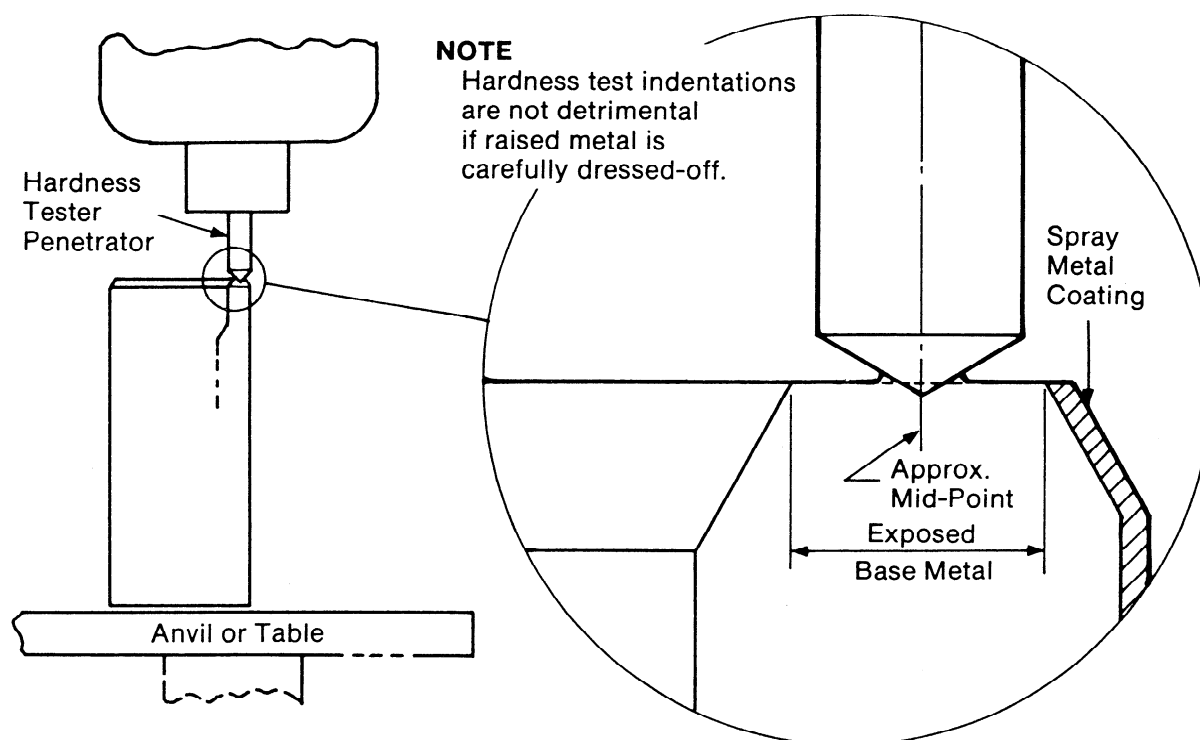


FIG. 4.1
ROCKWELL A HARDNESS
DETERMINATION OF BASE METAL

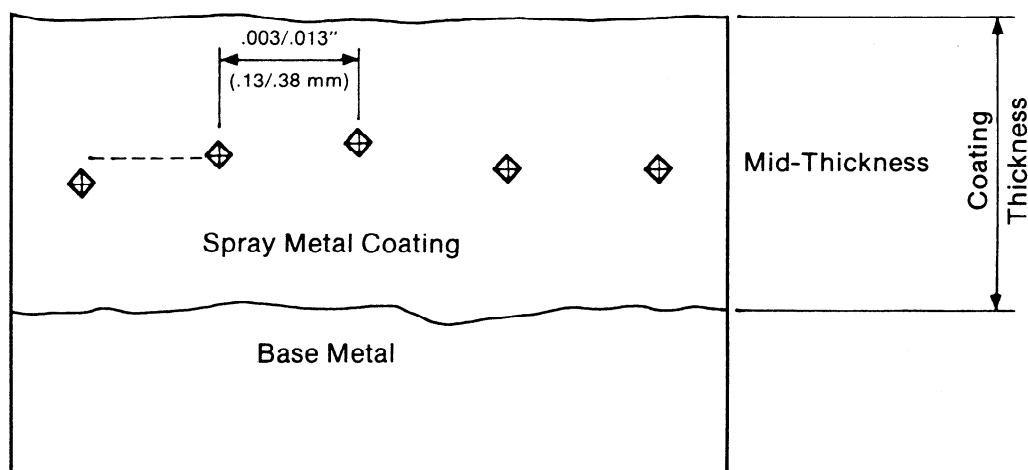


FIG. 4.2
VICKERS MICROHARDNESS
DETERMINATION OF SPRAY METAL COATING