

# Specification for Subsurface Sucker Rod Pumps and Fittings

API SPECIFICATION 11AX  
TENTH EDITION, MARCH 1996

EFFECTIVE DATE: OCTOBER 31, 1996



# **Specification for Subsurface Sucker Rod Pumps and Fittings**

**Exploration and Production Department**

API SPECIFICATION 11AX  
TENTH EDITION, MARCH 1996

EFFECTIVE DATE: OCTOBER 31, 1996



## SPECIAL NOTES

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

API is not undertaking to meet the duties of employers, manufacturers, or suppliers to warn and properly train and equip their employees, and others exposed, concerning health and safety risks and precautions, nor undertaking their obligations under local, state, or federal laws.

Information concerning safety and health risks and proper precautions with respect to particular materials and conditions should be obtained from the employer, the manufacturer or supplier of that material, or the material safety data sheet.

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

Generally, API publications are reviewed and revised, reaffirmed, or withdrawn at least every 5 years. Sometimes a one-time extension of up to 2 years will be added to this review cycle. This publication will no longer be in effect 5 years after its publication date as an operative API publication or, where an extension has been granted, upon republication. Status of the publication can be ascertained from the API Authoring Department [telephone (202) 682-8000]. A catalog of API publications and materials is published annually and updated quarterly by API, 1220 L Street, N.W., Washington, D.C. 20005.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API *standard*. Questions concerning the interpretation of the content of this document or comments and questions concerning the procedures under which this standard was developed should be directed in writing to the director of the Exploration and Production Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

API standards are published to facilitate the broad availability of the information contained therein. These documents are not intended to obviate the need for applying sound engineering judgment regarding when and where this information should be utilized. The formulation and publication of API standards is not intended in any way to inhibit anyone from using any other data, information, or practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

## FOREWORD

This recommended practice is under the jurisdiction of the API Subcommittee on Standardization of Field Operating Equipment.

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

*Note:* Conversions of English units to International System (SI) metric units are provided throughout the text of this specification in parentheses, e.g., 6 in. (152.4 mm). SI equivalents have also been included in all tables. English units are in all cases preferential and shall be the standard in this specification. Products are to be marked in the units in which ordered unless there is an agreement to the contrary between the purchaser and the manufacturer. The factors used for conversion of English units to SI units were taken from API Publication 2564, and are listed below:

1 inch (in.) = 25.4 millimeters (mm) exactly  
1 foot (ft) = 0.3048 meters (m) exactly

*Attention Users:* Portions of this publication have been changed from the previous edition. The location of significant changes has been marked with a bar in the margin. The bar notation is not used for strictly editorial changes that were necessitated by reformatting of this publication. The bar notations in the margins are provided as an aid to users, but API makes no warranty as to the accuracy of such bar notations.

API publications may be used by anyone desiring to do so. Every effort has been made by the institute to assure the accuracy and reliability of the data contained in them; however, the institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

Suggested revisions to this recommended practice are invited and should be submitted in writing to the director of the Exploration and Production Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

# CONTENTS

	Page
1 SCOPE .....	1
2 REFERENCES .....	1
3 PUMP DESIGNATION .....	1
4 DESIGN CONTROL .....	4
4.1 General .....	4
4.2 Design Development .....	4
4.3 Design Documentation .....	4
4.4 Design Verification .....	4
4.5 Design Review .....	4
4.6 Design Changes .....	4
5 PUMP ASSEMBLIES .....	4
6 PUMP COMPONENT PARTS .....	16
7 MEASUREMENT, TESTING, AND GAUGING .....	48
7.1 Equipment .....	48
7.1.1 General .....	48
7.1.2 Calibration .....	48
7.2 Personnel .....	48
7.3 Inspection and Testing .....	48
7.3.1 Component Parts .....	48
7.3.2 Barrels .....	48
7.3.3 Plungers .....	48
7.3.4 Ball and Seat Assemblies .....	49
7.3.5 Pump Assemblies .....	49
8 MARKING .....	49
8.1 Product Marking .....	49
8.1.1 Component Part and Subassembly Marking .....	49
8.1.2 Assembly Marking .....	49
8.2 Method of Marking .....	49
8.3 Monogrammed Parts or Assemblies .....	49
9 MATERIALS .....	50
10 THREADED CONNECTIONS .....	54
APPENDIX—MARKING REQUIREMENTS FOR API MONOGRAM LICENSEES .....	65
Figures	
1—Pump Designations .....	3
Tables	
1—Pump Designations .....	2
RHA—Rod, Stationary Heavy Wall Barrel, Top Anchor Pump .....	5
RHB—Rod, Stationary Heavy Wall Barrel, Bottom Anchor Pump .....	6
RHT—Rod, Traveling Heavy Wall Barrel, Bottom Anchor Pump .....	7
RWA—Rod, Stationary, Thin Wall Barrel, Top Anchor Pump .....	8
RWB—Rod, Stationary Thin Wall Barrel, Bottom Anchor Pump .....	9
RWT—Rod, Traveling Thin Wall Barrel, Bottom Anchor Pump .....	10

Tables (Continued)	
TH—Tubing, Heavy Wall Barrel Pump	11
RSA—Rod, Stationary Thin Wall Barrel, Top Anchor, Soft-Packed Plunger Pump	12
RSB—Rod, Stationary Thin Wall Barrel, Bottom Anchor, Soft-Packed Plunger Pump	13
RST—Rod, Traveling Thin Wall Barrel, Bottom Anchor, Soft-Packed Plunger Pump	14
TP—Tubing, Heavy Wall Barrel, Soft-Packed Plunger Pump	15
2—Default Tolerances	16
Master Part Numbering System	17
B11—Barrel, Thin Wall	19
B12—Barrel, Heavy Wall (Rod Pump)	19
B13—Barrel, Heavy Wall (Tubing Pump)	20
B14—Barrel, Heavy Wall (Soft-Packed Rod Pump)	20
B15—Barrel, Heavy Wall (Soft-Packed Tubing Pump)	21
B21—Bushing Valve Rod	21
B22—Bushing, Seat, Barrel Cage	22
B23—Bushing, Cage To Puller	22
C11—Cage, Top Open	23
C12—Cage, Top Plunger	23
C13—Cage, Closed, Pin Plunger	24
C14—Cage, Closed Barrel	24
C15—Cage, Closed, Box Plunger	25
C16—Cage, Standing Valve	25
C17—Cage, Top Plunger	26
C21—Connector, Upper Barrel	26
C22—Connector, Box Plunger	27
C31—Coupling, Extension	27
C32—Coupling, Pull Tube, Upper	28
C33—Coupling, Pull Tube, Lower	28
C34—Coupling, Tubing	29
C35—Coupling, Barrel	29
C36—Coupling, Barrel, Lower (Soft-Packed Tubing Pump)	30
C37—Coupling, Barrel (Soft-Packed Tubing Pump)	30
G11—Guide, Valve Rod	31
N11—Nipple, Seating, Cup Type (Rod Pump)	31
N12—Nipple, Seating, Mechanical Bottom Lock	32
N13—Nipple, Seating, 2 Cup Type (Tubing Pump)	32
N14—Nipple, Seating, Mechanical Top Lock	33
N21—Nipple, Extension, Upper	33
N22—Nipple, Extension, Lower	34
P11—Plug, Pull	34
P12—Plug, Seat	35
P21—Plunger, One Piece	35
P22—Plunger, Assembled	36
P23—Plunger, Box End (Tubing Pump)	36
P24—Plunger, Soft-Packed	37
P31—Puller, Standing Valve	37
R11—Rod, Valve	38
Valve Rod Length PL	38
S11—Seating Mandrel, Cup (Type HR) (Rod Pump and Fittings)	39
S12—Seating Cup (Type HR) (Rod Pump)	40
S13—Seating Cup Ring (Type HR)	41

Tables (Continued)

S14—Seating Cup Nut (Type HR) . . . . .	41
S15—Seating Cup Bushing, Top Anchor . . . . .	42
S16—Seating Coupling, Bottom Anchor . . . . .	42
S17—Seating Mandrel, Cup (Type HR) (Tubing Pump) . . . . .	43
S18—Seating Cup (Type HR) (Tubing Pump) . . . . .	43
S19—Seating (Type HR) (Soft-Packed Tubing Pump) . . . . .	44
S21—Seating Assembly, Mechanical Top Lock . . . . .	44
S22—Seating Assembly, Mechanical Bottom Lock . . . . .	45
T11—Tube Pull . . . . .	46
Pull Tube Length, PL . . . . .	46
V11—Valve, Ball and Seat . . . . .	47
3—Sampling Procedures . . . . .	48
A—Pump Barrel Materials, Plated Barrels . . . . .	50
B—Pump Barrel Materials, Case Hardened . . . . .	51
C—Pump Barrel Materials, Non-Hardened . . . . .	51
D—Pump Materials For Balls And Seats . . . . .	51
E—Pump Cage Materials . . . . .	52
F—Pump Materials For Pull Tubes, Valve Rods And Fittings . . . . .	52
G—Pump Materials For Seating Cups . . . . .	53
H—Pump Plunger Materials, Spray Metal Coated . . . . .	53
I—Pump Plunger Materials, Plated . . . . .	53
B Thread Connection, Gauge Details . . . . .	54
C Thread Connection . . . . .	55
F Thread Connection . . . . .	56
H Thread Connection . . . . .	57
L Thread Connection . . . . .	58
P Thread Connection . . . . .	59
S—Details Of All Straight Threads Used In API Subsurface Pumps and Fittings . . . . .	60
X—Wrench Flat Dimensions . . . . .	63

# Specification for Subsurface Sucker Rod Pumps and Fittings

## 1 Scope

This specification covers rod pumps and tubing pumps in commonly used bore sizes. Sufficient dimensional requirements are provided to assure interchangeability and standardization of all component parts; however, details of design are not specified. Standard materials are specified.

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

## 2 References

**2.1** This specification includes by reference, either in total or in part, the most recent editions of the following API, industry, and government standards, unless a specific edition is listed:

### API

- Spec 5B *Specification for Threading, Gaging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads*
- RP 11AR *Recommended Practice for Care and Handling Sucker Rod Pumps*

### ASME<sup>1</sup>

- B1.1 *Unified Inch Screw Threads (UN and UNR Thread Form)* (1989 Edition)

### ASNT<sup>2</sup>

- SNT-TC-1A *Personnel Qualifications and Certification in Nondestructive Testing* (1988 Edition)

### ASTM<sup>3</sup>

- A 370 *Standard Test Methods and Definitions for Mechanical Testing of Steel Products* (1992 Edition)
- E 18 *Standard Methods of Tests for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials* (1992 Edition)
- E 165 *Standard Practice for Liquid Penetrant Inspection Method* (1991 Edition)

<sup>1</sup>American Society of Mechanical Engineers, 1950 Stemmons Freeway, Dallas, Texas 75207-3109.

<sup>2</sup>American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, Ohio 43228-0518.

<sup>3</sup>ASTM, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428.

- E 384 *Standard Test Method for Microhardness of Materials* (1989 Edition)

### Military Standard

- 105E *Single Sampling Plan for Normal Inspection*

### NACE<sup>4</sup>

- MR-01-76 *Standard Recommended Practice Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment* (1992 Edition)

## 3 Pump Designation

**3.1** The basic types of pumps and letter designation covered by this specification are shown in Table 1.

**3.2** Complete pump designations, as shown in Figure 1, include:

- Nominal tubing size.
- Basic bore diameter.
- Type of pump, including type of barrel and location and type of seating assembly.
- Barrel length.
- Plunger length.
- Total length of extensions when used.

Example: A 1¼ in. (31.8 mm) bore rod type pump with a 10 ft (3.048 m) heavy wall barrel and 2 ft (0.610 m) of extensions, a 4 ft (1.219 m) plunger, and a bottom cup type seating assembly for operation in 2¾ in. (60.3 mm) tubing, would be designated as follows:

20-125 RHBC 10-4-2

Note: Metallic materials for subsurface sucker rod pumps for hydrogen sulfide environments are listed in NACE MR-01-76.

**3.3** In addition to the pump designation described in 3.2, the purchaser must provide the following additional information:

- Barrel material.
- Plunger material.
- Plunger clearance (fit).
- Valve material.
- Length of each extension.

<sup>4</sup>National Association of Corrosion Engineers, P. O. Box 218340, Houston, Texas 77218-8340.