## Recommended Practice for Installation, Maintenance, and Lubrication of Pumping Units

API RECOMMENDED PRACTICE 11G FIFTH EDITION, NOVEMBER 2013

REAFFIRMED, JULY 2019



### **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.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

Classified areas may vary depending on the location, conditions, equipment, and substances involved in any given situation. Users of this specification should consult with the appropriate authorities having jurisdiction.

Users of this specification should not rely exclusively on the information contained in this specification. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein API is not undertaking to meet the duties of employers, service providers, 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 to comply with authorities having jurisdiction.

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

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 authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other 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.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 1220 L Street, NW, Washington, DC 20005.

#### Foreword

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.

Shall: As used in a standard, "shall" denotes a minimum requirement in order to conform to the specification.

Should: As used in a standard, "should" denotes a recommendation or that which is advised but not required in order to conform to the specification.

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 publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 1220 L Street, NW, Washington, DC 20005.

Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

## Contents

|   | P <sub>i</sub>  | age                               |
|---|---|-----------------------------------|
| 1   | Scope   | . 1                               |
| 2   | Normative References  | . 1                               |
| 3   | Terms and Definitions   | . 1                               |
| 4<br>4.1<br>4.2<br>4.3                        | Foundation and Site Preparation.  General.  Foundations Mounted on Grade  Foundations Mounted on Piles.   | . 3                               |
| 5   | Installation of Pumping Units Using Foundation Bolts and Grouting Between the Block and the Pumping Unit Base   | . 5                               |
| 6   | Installation of Pumping Units Using Cross-beam Clamps or Methods Other than Foundation Bolts  | . 6                               |
| 7.1<br>7.2<br>7.3<br>7.4<br>7.5<br>7.6<br>7.7 | Installation of Pumping Units on a Reinforced Concrete Portable Foundation.  General Base Orientation Site Preparation. Placement. Adjustment After Erection Bolts and Clamps Postinstallation Maintenance After Installation | . 7<br>. 7<br>. 7<br>. 8<br>. 8   |
| 3.1<br>3.2<br>3.3<br>3.4<br>3.5<br>3.6<br>3.7 | Installation of Portable Wide Base Pumping Units on a Board Mat Foundation  General  Base Orientation  Site Preparation  Placement  Adjustment After Mounting  Postinstallation  Maintenance of Board Mat Foundation.         | . 9<br>10<br>10<br>10<br>10<br>11 |
| 9.1<br>9.2<br>9.3                             | Lubrication of Pumping-unit Reducers.  General  | 12<br>12                          |
| 10  | Lubrication Difficulties  | 15                                |
| 11.2  | Basis for Selection of Lubricants   | 15<br>17                          |
| 12  | Lubrication of Pumping Unit Structural Bearings   | 18                                |
| 13.2<br>13.3                                  | Maintenance.  Wireline Maintenance.  V-belt Maintenance.  Brake System Maintenance.  Structural Connection Maintenance  | 18<br>19                          |

## **Contents**

|      |  | Page |
|------|--|------|
| 14   | Isolation/Restraint of Energy Sources—Lock-out/Tag-out Practice  | 23   |
| 14.1 | General  |      |
| 14.2 | Recommended Shutdown and Lock-out/Tag-out Practice for Pumping Units Equipped with Electric Motors             | 25   |
| 14.3 | Recommended Shutdown and Lock-out/Tag-out Practice for Pumping Units Equipped with Internal Combustion Engines |      |
| Figu | ıres   |      |
| 1    | Proper V-belt and Sheave Groove Interface (left) vs Worn Belt and Groove (right)                               | 20   |
| Tabl |  |      |
| 1    | Range of Operating Conditions for Gear Reducer   | 12   |
| 2    | Range of Operating Conditions for Chain Reducer  |      |
| 3    | Viscosity Recommendations for Gear Reducers (Typical Mineral Oil Based Lubricants)                             | 14   |
| 4    | Viscosity Recommendations for Chain Reducers   | 14   |
| 5    | Recommended Oil Condemning Limits for Use When Evaluating Used Oil Test Results                                | 15   |
| 6    | Difficulties: Cause Analysis and Remedy  | 16   |
| 7    | Recommended Grease Properties  |      |

# Recommended Practice for Installation, Maintenance, and Lubrication of Pumping Units

#### 1 Scope

This recommended practice provides guidance related to the proper installation, care, and maintenance of surface mounted beam pumping units, varieties of which are described in API 11E. Information provided in this document is of a general nature and is not intended to replace specific instruction provided by the pumping unit manufacturer. This document further establishes certain minimum requirements intended to promote the safe installation, operation, and servicing of pumping unit equipment.

#### 2 Normative References

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

API Specification 11E-2013, Specification for Pumping Units

#### 3 Terms and Definitions

For the purposes of this document, the following definitions apply.

#### 3.1

#### base

The basic frame or skid to which a pumping unit is assembled. Typically is the structural element that interfaces with or is clamped to the foundation.

#### 3.2

#### brake

Component of a pumping unit that is often composed of a disk or drum mounted on the reducer input shaft combined with a mechanism to impart a restraining friction torque and restrain the motion of all rotary joints.

#### 3.3

#### carrier bar

Part of the pumping unit that supports the load of the sucker rod string through the polished rod clamp.

#### 3.4

#### center bearing

Structural bearing assembly supporting the walking beam of a class 1 lever design pumping unit.

#### 3.5

#### certified installation print

Drawing reviewed and approved (stamped) by a licensed professional engineer competent in the areas of site preparation, foundations, and proper mounting requirements of heavy industrial equipment.

#### 3.6

#### cranks

Driving link in the four-bar linkage of a beam pumping unit that is located between the output shaft of the gear reducer and the pitman link.