

Field Verification of Rig Devices for Oil and Gas Well Drilling Operations

API RECOMMENDED PRACTICE 8FV1
FIRST EDITION, OCTOBER 2024



American
Petroleum
Institute

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. The use of API publications is voluntary. In some cases, third parties or authorities having jurisdiction may choose to incorporate API standards by reference and may mandate compliance.

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.

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 used. 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, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001-5571.

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.

The verbal forms used to express the provisions in this document are as follows.

- Shall: As used in a standard, “shall” denotes a minimum requirement to conform to the standard.
- Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required to conform to the standard.
- May: As used in a standard, “may” denotes a course of action permissible within the limits of a standard.
- Can: As used in a standard, “can” denotes a statement of possibility or capability.

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, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001. 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, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001, standards@api.org.

Currently in preview, click buy full version

Contents

	Page
1 Scope.....	1
2 Normative References	1
3 Terms, Definitions, and Abbreviations.....	2
3.1 Terms and Definitions	2
3.2 Abbreviations and Symbols	3
4 Fundamental Equations.....	4
4.1 General.....	4
4.2 Static Torque Equation.....	4
4.3 Dynamic Torque Equation.....	4
4.4 Error Equations.....	4
5 Safety.....	5
6 Influences on Readings	5
7 Documentation Review.....	6
8 Surface-applied Rotary Torque Field Verification.....	7
8.1 General.....	7
8.2 Considerations.....	8
8.3 Static Surface-applied Rotary Torque Procedure with Test Instrument—Load Cell.....	8
8.4 Static Surface-applied Rotary Torque Procedure with Test Instrument—Strain Gauge Data Sub.....	11
9 Hydraulic Iron Roughneck Make-up Torque Field Verification	14
9.1 General.....	14
9.2 Considerations.....	14
9.3 Hydraulic System Verification Procedure with Test Instrument—Hydraulic Pressure Test Gauge	14
9.4 Static Iron Roughneck Make-Up Torque Procedure with Test Instrument—Strain Gauge Data Sub.....	16
10 Push Rod Cathead Make-up Torque Field Verification	17
10.1 General.....	17
10.2 Considerations.....	17
10.3 Static Torque Procedure for Test Instrument—Load Cell (Test Fixture).....	17
10.4 Static Torque Procedure for Test Instrument—Load Cell (Tong Arrangement).....	19
11 Hook Load Field Verification	22
11.1 General.....	22
11.2 Considerations.....	22
11.3 Procedure—Rig Control System and Electronic Data Recorder (EDR) Hook Load Reading Offsetting and Scaling and Single Point Hook Load Verification.....	22
11.4 Hook Load Verification Procedure between Rig Control System and EDR.....	23
12 Rotational Speed Field Verification.....	23
12.1 General.....	23
12.2 Rotational Speed Procedure with Test Instrument—Digital Tachometer	24
12.3 Rotational Speed Procedure for Test Instrument—Strain Gauge Data Sub.....	24
12.4 Rotational Speed Procedure for Test Instrument—Manual Count.....	25

Contents

	Page
13 Block Position Field Verification	26
13.1 General	26
13.2 Procedure for Absolute Position of the Blocks	26
13.3 Procedure for Draw Works Encoder Check (Block Position)	27
14 Pressure Field Verification	28
14.1 General	28
14.2 Considerations	28
14.3 Pressure Procedure for Test Instrument—Pressure Device	28
15 Pump Rate and Output Volume Field Verification	29
15.1 General	29
15.2 Pump Rate Output Volume Procedure for Test Instrument—Tank Pit Volume	29
Annex A (informative) Example Forms for Recording Readings	31
Annex B (normative) Moment Arm Length Correction	41
Bibliography	42

Figures

1 Example of a Load Cell Setup	10
2 Example of a Strain Gauge Data Sub Setup	13
3 Example of a Load Cell Setup with Cathead and Test Fixture	19
4 Example of a Load Cell Setup	21
A.1 Example Form for Recording Readings: Surface-applied Rotary Torque Device Verification with Load Cell	32
A.2 Example Form for Recording Readings: Surface-applied Rotary Torque Device Field Verification with Strain Gauge Data Sub	33
A.3 Example Form for Recording Readings: Iron Roughneck Hydraulic System Verification	34
A.4 Example Form for Recording Readings: Iron Roughneck Torque Verification	35
A.5 Example Form for Recording Readings: Cathead Force Verification with Load Cell on Test Fixture	36
A.6 Example Form for Recording Readings: Cathead Force Verification with Load Cell via Tong Arrangement	37
A.7 Example Form for Recording Readings: Rotational Speed Verification	38
A.8 Example Form for Recording Readings: Absolute Position for Blocks	39
A.9 Example Form for Recording Readings: Encoder Check for Block Position	39
A.10 Example Form for Recording Readings: Pressure Verification	40
A.11 Example Form for Recording Readings: Pump Rate Output Volume	40
B.1 Correction Factor (C) for Calculation of Effective Moment Arm Length Given Horizontal (θ_H) and Vertical (θ_V) Angles (in degrees)	41

Tables

1 Example Test Torques	11
-------------------------------------	----

Field Verification of Rig Devices for Oil and Gas Well Drilling Operations

1 Scope

This document contains field verification procedures for critical drilling rig devices used in drilling operations. Its purpose is to promote and maintain the quality and consistency of field verification processes for device management and operational capabilities.

The critical drilling rig devices addressed in this recommended practice are for:

- a) surface-applied rotary torque;
- b) make-up torque;
- c) hook load;
- d) rotational speed;
- e) block position;
- f) pressure; and
- g) pump rate.

This recommended practice does **NOT** address the following:

- accuracy requirements;

NOTE Accuracy requirements for a given application are determined by the operator, drilling contractor, and/or service company.

- device calibration or actions to correct accuracy issues (in respect to results of field verification and accuracy requirements);

NOTE Field verification can be performed after the corrective action to check if the corrective action resolves the accuracy issue.

- the frequency and/or trigger events for field verification.

NOTE Results from field verification can be used to determine the frequency and trigger events.

These procedures apply to rotary drilling rigs. Special considerations may have to be made for floating, slant, other nontraditional fixed rigs, and workover rigs.

2 Normative References

The following referenced document is indispensable for the application of this recommended practice. For a dated reference, only the edition cited applies. For an undated reference, the latest edition of the referenced standard applies (including any addenda/errata).

- A.1 Specification Q2, *Quality Management System Requirements for Service Supply Organizations for the Petroleum and Natural Gas Industries*