BOP Shear Ram Performance Test Protocol

API TECHNICAL REPORT 16TR1
FIRST EDITION, JULY 2018

ERRATA 1, OCTOBER 2018

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.

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 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.

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

Users of this TR should not rely exclusively on the information contained in this document. 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, 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 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 manufacturer or supplier of that material, or the material safety data sheet.

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.

Copyright © 2018 American Petroleum Institute

Date of Issue: October 2018

Affected Publication: API Technical Report 16TR1, *BOP Shear Ram Performance Test Protocol*, First Edition, July 2018

Errata 1

Section 8: Equation (2) shall be displayed as follows:

$$P_{SHR} = \left[(Pc \cdot Ac) - (Po \cdot Ao) \right] / Ac \qquad (2)$$

Figure 4 shall be replaced with the following:

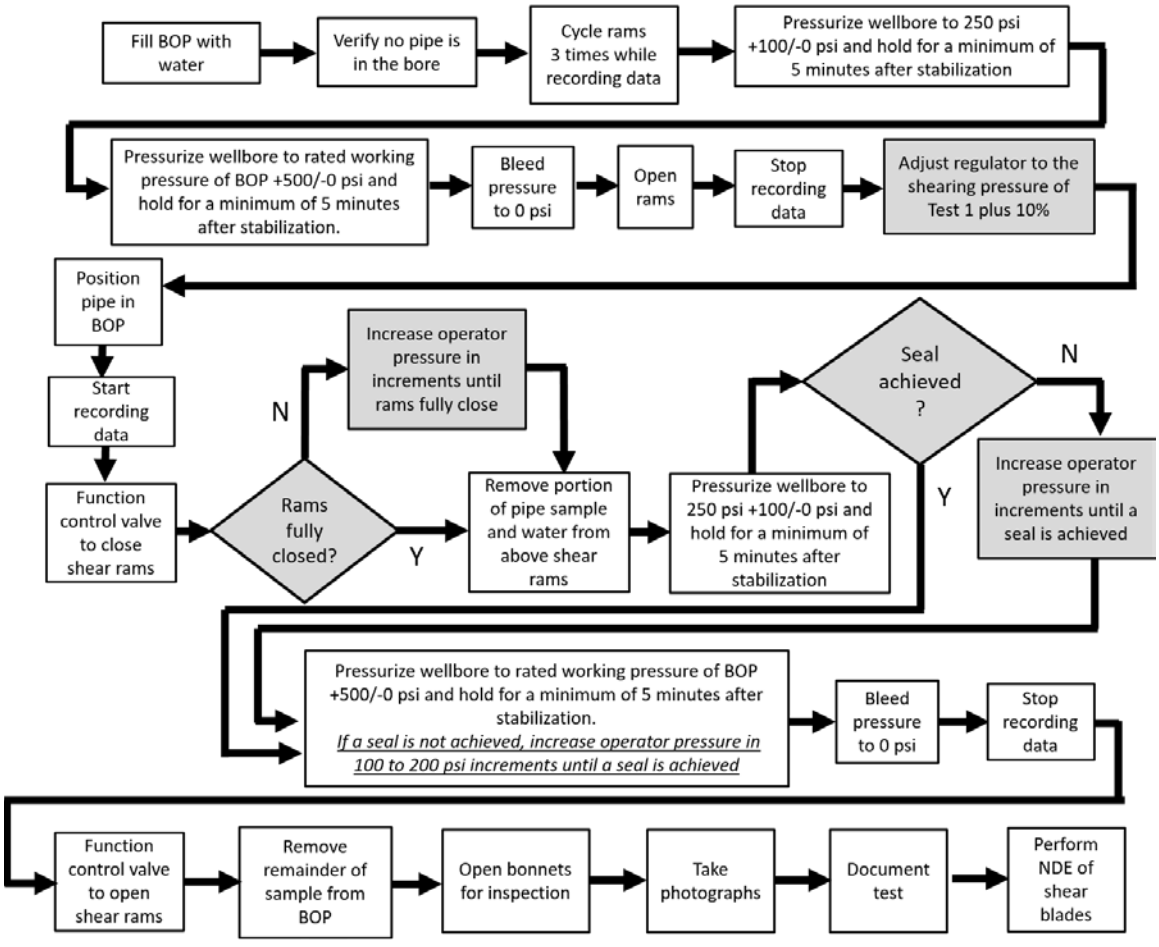
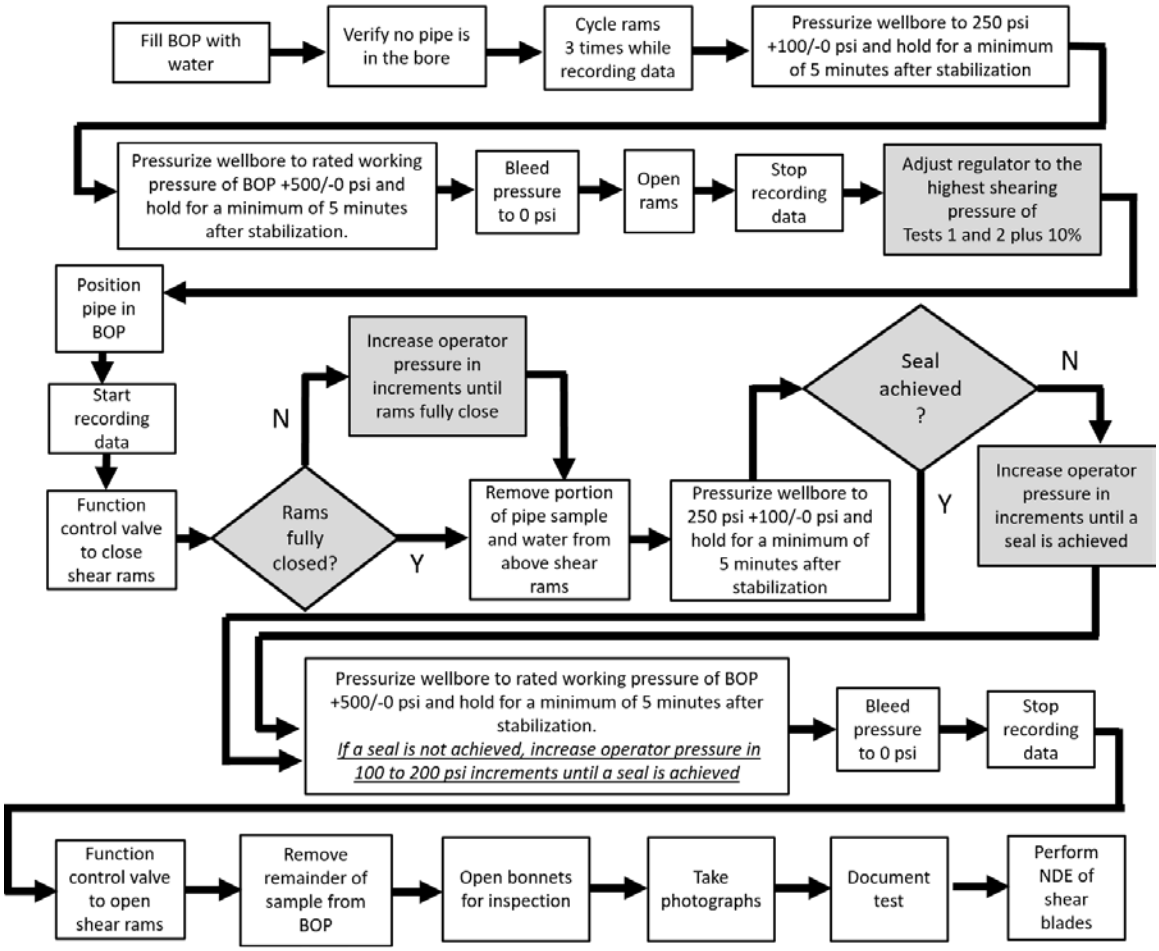


Figure 5 shall be replaced with the following:



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 patents.

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 in order to conform to the standard.

Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required in order 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, 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 and updated quarterly 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

Page

1 Scope . . . 1
2 Normative References . . . 1
3 Definitions and Nomenclature . . . 1
3.1 Definitions . . . 1
3.2 Abbreviations . . . 2
4 Test Equipment . . . 3
4.1 General . . . 3
4.2 Blowout Preventer (BOP) . . . 3
4.3 BOP Operator . . . 3
4.4 Shear Ram . . . 3
4.5 Instruments . . . 4
5 Test Samples . . . 4
5.1 Pipe Description . . . 4
5.2 Pipe Properties . . . 4
6 Shear Test Procedure . . . 5
6.1 Pipe Test Sample Preparation . . . 5
6.2 Test Procedure Summary . . . 6
6.3 Procedure-Test 1 . . . 9
6.4 Procedure-Test 2 . . . 11
6.5 Procedure-Test 3 . . . 13
7 Post Shear Measurements . . . 13
8 Calculations . . . 13
9 Documentation . . . 14
Annex A (informative) Example Data Sheet . . . 16
Annex B (normative) Shear Results Summary Table . . . 21
Bibliography . . . 22

Figures
1 Typical Initial Dimension Locations . . . 5
2 Test Sample Length Requirement . . . 6
3 Test 1 Outline . . . 7
4 Test 2 Outline . . . 8
5 Test 3 Outline . . . 9
6 Shear Pipe Setup . . . 10

BOP Shear Ram Performance Test Protocol

1 Scope

This document outlines the standardized test protocol, including data and reporting requirements, for performing sealing and nonsealing blowout preventer (BOP) shear ram performance tests. This protocol determines the parameters that can support field system performance and confidence in successful shearing and sealing.

This document is not intended to be used for qualifying BOP shear rams or as a factory acceptance test (FAT) procedure.

Qualification and FAT of BOP shear rams is per API 16A.

2 Normative References

The following referenced documents are essential when considering the examples outlined in 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 Spec 16A, *Specification for Drill-through Equipment*, 2017

API Spec 16D, *Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment*

ASTM A370[1], *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM E165, *Standard Practice for Liquid Penetrant Examination for General Industry*

ASTM E709, *Standard Guide for Magnetic Particle Testing*

ASTM A388, *Standard Practice for Ultrasonic Examination of Steel Forgings*

3 Definitions and Nomenclature

3.1 Definitions

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

3.1.1
blind shear ram
Closing and sealing component in a ram blowout preventer that first shears the tubular in the wellbore and then seals off the bore or acts as a blind ram if there is no tubular in the wellbore.

3.1.2
closing ratio
Area of the operator piston exposed to the closing operating pressure, divided by the cross-sectional area of the piston shaft exposed to the wellbore pressure.

3.1.3
non-sealing shear ram
Closing component in a ram blowout preventer that is capable of shearing or cutting certain tubulars, but does not seal.

[1] ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, Pennsylvania, 19428-2959, www.astm.org.