Testing of Well Cements Used in Deepwater Well Construction

API RECOMMENDED PRACTICE 10B-3
SECOND EDITION, JANUARY 2016

REAFFIRMED, FEBRUARY 2020

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.

Users of this Recommended Practice 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.

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 recommended practice are as follows:

— the term “shall” denotes a minimum requirement in order to conform to the recommended practice;

— the term “should” denotes a recommendation or that which is advised but not required in order to conform to the recommended practice;

— the term “may” is used to express permission or a provision that is optional; and

— the term “can” is used to express possibility or capability.

Informative elements: As used in a standard, “informative” denotes elements that: identify the document, introduce its content and explain its background, development, and its relationship with other documents; or provide additional information intended to assist the understanding or use of the document.

Normative elements: As used in a standard, “normative” denotes elements that describe the scope of the document, and which set out provisions that are required to implement the standard.

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

Contents

Introduction

This document was prepared with input from oil and gas operators, service companies, and consultants. The testing methods contained in this document are based on experience gained in deepwater operating areas and shelf operations in locations with low seafloor temperatures. These testing methods may also be of utility in other areas where low ambient temperatures exist. The content of this document is not all inclusive and not intended to alleviate the need for detailed information found in textbooks, manuals, technical papers, or other documents. The formulation, adoption, and publication of API standards are not intended to inhibit anyone from using any other practices.

Users of this standard should be aware that further or differing requirements may be needed for individual applications. This standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this standard and provide details.

In this standard, where practical, US Customary units are included in brackets for information. The units do not necessarily represent a direct conversion of SI to US Customary units, or US Customary to SI. Consideration has been given to the precision of the instrument making the measurement. For example, thermometers are typically marked in one degree increments, thus temperature values have been rounded to the nearest degree.

In this standard, calibrating an instrument refers to assuring the accuracy of the measurement. Accuracy is the degree of conformity of a measurement of a quantity to its actual or true value. Accuracy is related to precision, or reproducibility of a measurement. Precision is the degree to which further measurements or calculations will show the same or similar results. Precision is characterized in terms of the standard deviation of the measurement. The results of calculations or a measurement can be accurate, but not precise, precise but not accurate, neither and both. A result is valid if it is both accurate and precise.

All instruments, gauges, timing devices, temperature measuring systems, material requirements, system calibrations, and operational instructions contained in API 10B-2 apply to this document.

Warning—The tests specified in this document require the handling of hot, pressurized equipment and materials that may be hazardous and can cause injury. Do not exceed manufacturer's safety limits. Only trained personnel should perform these tests.

Testing of Well Cements Used in Deepwater Well Construction

1 Scope

1.1 General

This recommended practice provides procedures for testing well cement slurries and cement blends for use in a deepwater environment or wells drilled in areas with a low seafloor temperature or areas where low well temperatures exist. For the purposes of this document the term “deepwater” includes areas where low seafloor temperatures exist, independent of water depth.

1.2 Applicability

The procedures contained in this document serve as guidance for the testing of well cement slurries used in deepwater well construction. Additionally, testing methods contained in this document (most notably at mudline conditions) may also be used in those circumstances where low seafloor temperatures are found at shallow water depths. These conditions are found in areas including the North Sea, Norwegian Sea, Barents Sea, Kara Sea, Beaufort Sea, Chukchi Sea, Caspian Sea, and Black Sea.

The test methods contained in this recommended practice, though generally based on API 10B-2, take into account the specialized testing requirements and unique wellbore temperature profiles found in deepwater wells or wells in areas with low seafloor temperatures. This document does not address the mitigation of shallow water flow zones in deepwater wells, which is addressed in API 65, *Cementing Shallow Water Flow Zones in Deepwater Wells*.

2 Normative References

The following referenced documents are indispensable for the application of this document. For undated references, the latest edition of the referenced document applies (including any addenda/errata). For dated references, only the edition cited applies. However, not all documents listed may apply to your specific needs. The body of the standard should be referred to for how these documents are specifically applied.

API Recommended Practice 10B-2, *Recommended Practice for Testing Well Cements*

For a list of other documents associated with this standard, see the Bibliography.

3 Terms and Definitions

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

3.1
additive
Material incorporated in a cement slurry to modify or enhance some desired property.

3.2
annulus
Space between the pipe and the wellbore wall or an outer pipe.

3.3
batch mix
Process of mixing the entire volume of cement slurry prior to placement in the wellbore.