

Underbalanced Drilling Operations

API RECOMMENDED PRACTICE 92U
FIRST EDITION, NOVEMBER 2008

REAFFIRMED, APRIL 2013

ADDENDUM, NOVEMBER 2015



AMERICAN PETROLEUM INSTITUTE

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Upstream Segment

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Recommendations presented in this publication are based on this extensive and wide-ranging industry experience. The goal of these recommended practices is to assist the oil and gas industry in promoting personnel safety, public safety, integrity of the underbalanced drilling equipment, and preservation of the environment for land and offshore underbalanced drilling operations and these recommended practices are published to facilitate the broad availability of proven, sound engineering and operating practices. This publication does not present all of the operating practices that can be employed to successfully conduct underbalanced drilling operations. Practices set forth herein are considered acceptable for accomplishing the jobs described; however, equivalent alternative installations and practices may be utilized to accomplish the same objectives. The formulation and publication of API recommended practices is not intended, in any way, to inhibit anyone from using other practices. Furthermore, individuals and organizations using these recommended practices are cautioned that underbalanced drilling operations must comply with requirements of applicable federal, state, or local regulations and these requirements should be reviewed to determine whether violations may occur.

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Foreword

These guidelines (recommended practices), prepared by the IADC Underbalanced Operations and Managed Pressure Drilling Committee consisting of representatives from various IADC member companies, represent a composite of the practices employed by various operating companies, service companies and drilling contractors in underbalanced drilling operations. In some cases, a reconciled composite of the various practices employed by these companies was utilized. The Committee acknowledges the Canadian Association of Drilling Contractors (CAODC), the Canadian Association of Petroleum Producers (CAPP), Petroleum Services Association of Canada (PSAC) and the Alberta Energy Utilities Board (AEUB), and in particular the Drilling and Completions Committee (DACC) for their effort in developing guidelines related to underbalanced drilling in the Canadian environment, which are the basis for this document. This publication is under the jurisdiction of the American Petroleum Institute, Upstream Segment's Executive Committee on Drilling and Production Operations.

Underbalanced drilling is used globally on new wells and to deepen or side-track from existing well bores. Underbalanced drilling operations are being conducted with full regard for personnel safety, public safety, and preservation of the environment in such diverse conditions as urban sites, wilderness areas, ocean platforms, deepwater sites, very hot barren deserts, cold weather areas including the arctic environment and wildlife refuges. As tools and equipment continually improve and develop, the technology has been applied in many geological formations including oil and gas reservoirs and on sour wells thus driving the need for globally accepted standards and safe operating practices.

Furthermore, this publication includes use of the verbs "shall" and "should" whichever is deemed the most applicable for the specific situation.

For the purposes of this publication, the following definitions are applicable.

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.

Changes in the uses of these verbs are not to be effected without risk of changing the intent of recommendations set forth herein.

Recognizing the varying complexity and risk associated with drilling wells classified as IADC Level 1 as compared to IADC Level 4 or 5, this document is prepared from the perspective of an IADC Level 1 or 2 well. Therefore, the end-user is advised to replace the verb "should" with "shall" for wells classified as IADC Level 4 or 5.

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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, 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.

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, N.W., Washington, D.C. 20005.

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

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Underbalanced Drilling Operations

1 Scope

1.1 Purpose

The purpose of these recommended practices is to provide information that can serve as a guide for planning, installation, operation and testing of underbalanced drilling equipment systems on land and offshore drilling rigs [barge, platform, bottom-supported, and floating with surface blowout preventers (BOP) installed] thereby ensuring consideration of personnel safety, public safety, integrity of the underbalanced drilling (UBD) equipment, and preservation of the environment for onshore and offshore UBD operations (including tripping of drill string).

The UBD system is composed of all equipment required to safely allow drilling ahead in geological formations with pressure at surface and under varying rig and well conditions. These systems include: the rig circulating equipment, the drill string, drill string non return valves (NRV), surface BOP, control devices (rotating or non-rotating) independent of the BOP, choke and kill lines, UBD flowlines, choke manifolds, hydraulic control systems, UBD separators, flare lines, flare stacks and flare pits and other auxiliary equipment. The primary functions of these systems are to contain well fluids and pressures within a design envelope in a closed flow control system, provide means to add fluid to the wellbore, and allow controlled volumes to be withdrawn from the wellbore.

1.1.1 Managed pressure drilling (Category A) and mud cap drilling (Category C) techniques as defined in the IADC *Well Classification System for Underbalanced Operations and Managed Pressure Drilling* are not included in this publication. The phrase managed pressure drilling or the acronym MPD is only used in this document in the context of the IADC *Well Classification System*.

1.1.2 Sub-sea BOP stacks and marine risers are not dealt with in this document.

1.2 Well Control

During UBD and tripping operations, primary well control is based on flow and pressure control using specialized equipment and procedures. If an unplanned event occurs, secondary well control is provided by the rig's BOP equipment as in conventional drilling and tripping operations. Procedures and techniques for conventional well control are not included in this publication (refer to API 59).

1.3 Blowout Preventer (BOP) Installation

Procedures for installation and testing of conventional and sub-sea BOPs are not included in this publication unless alternative procedures are recommended for the UB operation. Refer to API 53 for information regarding installation and testing of BOPs in a conventional drilling operation.

1.4 Installation of Underbalanced Drilling Control Devices (UBD-CDs)

Procedures for installation and testing of both rotating and non-rotating UBD-CDs are included in this publication.

1.5 Equipment Arrangements

Recommended equipment arrangements, as set forth in this publication, are adequate to meet most well conditions. It is recognized that other arrangements may be equally effective and can be used in meeting well requirements safely and efficiently.

1.6 Extreme Temperature Operations

Underbalanced operations (UBO) may be conducted in areas of extremely low and high ambient air temperatures. As a result, these considerations are area specific and shall be evaluated on a project-by-project basis. Where appropriate, ambient air temperature considerations are addressed within this document.

1.7 Control System Accumulator Capacity

Additional BOP equipment is sometimes required for an underbalanced operation. If additional BOP equipment is added to an existing system, the accumulator capacity shall be verified per API 53, which provides capacity guidelines to ensure that the volumetric demands of the control system piping, hoses, fittings, valves, BOPs, and other related equipment are met.

2 Referenced Standards

2.1 Standards

The following standards contain provisions, which through reference in this text constitute provisions of this standard. All standards are subject to revision and users are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

API Specification 5CT/ISO 11960:2004 ¹, *Specification for Casing and Tubing*

API Specification 5D, *Specification for Drill Pipe*

API Specification 6A/ISO 10423:2003, *Specification for Wellhead and Christmas Tree Equipment*

API Specification 7, *Specification for Rotary Drill Stem Elements*

API Recommended Practice 7C-11F, *Recommended Practice for Installation, Maintenance, and Operation of Internal-Combustion Engines*

API Specification 7G, *Recommended Practice for Drill Stem Design and Operating Limits*

API Specification 7K/ISO 14693:2003, *Specification for Drilling and Well Servicing Equipment*

API Recommended Practice 7L, *Inspection, Maintenance, Repair and Remanufacture of Drilling Equipment*

API Specification 7NRV, *Specification on Non-Return Valves*

API Recommended Practice 14C, *Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms*

API Specification 14E, *Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems*

API Recommended Practice 14F, *Design, Installation, and Maintenance of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class 1, Division 1 and Division 2 Locations*

API Specification 16A/ISO 13533:2001, *Drill Through Equipment*

¹ International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.