Isolating Potential Flow Zones During Well Construction

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Foreword

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A future planned standard, API RP 96, Deepwater Well Design Considerations, will identify considerations for use in deepwater well design. API Std 65-2 has been written to complement the objectives of API RP 90 and API RP 96 and their recommended practices.

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

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Isolating Potential Flow Zones During Well Construction

1 Scope

1.1 Overview

This standard contains practices for isolating potential flow zones, an integral element in maintaining well integrity. The focus of this standard is the prevention of flow through or past barriers that are installed during well construction. Barriers that seal wellbore and formation pressures or flows may include mechanical barriers such as seals, cement, or hydrostatic head, or operational barriers such as flow detection practices. Operational barriers are practices that result in activation of a physical barrier. Though physical barriers may dominate, the total system reliability of a particular design is dependent on the existence of both types of barriers.

1.2 Objectives

The objectives of this guideline are two-fold. The first is to help prevent and/or control flows just prior to, during, and after primary cementing operations to install or “set” casing and liner pipe strings in wells. Some of these flows have caused loss of well control. They threaten the safety of personnel, the environment, and the drilling rigs themselves. The second objective is to help prevent sustained casing pressure (SCP), also a serious industry problem.

API RP 90, provides guidelines on managing annular casing pressure (ACP) including SCP, thermal casing pressure, and operator-imposed pressure. These guidelines include monitoring, diagnostic testing, establishing the maximum allowable wellhead operating pressure (MAWOP), documenting annular casing pressure, and risk assessment methodologies.

1.3 Background and Technology Review

A detailed background and technology review are in Annex A. Historical data, perspectives, studies, statistics, lessons learned, etc. are included. All this information has been written to help explain how some practices work, have become proven or invalidated, or had performance limitations placed upon their application.

1.4 Conditions of Applicability

The process of barrier element selection and installation (including cement) is governed by the anticipated presence or absence of potential flow zones that require isolation for well integrity or regulatory purposes. This document applies only when it is deemed necessary that a potential flow zone be isolated. The guidance from this document covers recommendations for pressure-containment barrier (cement, packers, etc.) design and well construction practices that affect the zonal isolation process to prevent or mitigate annular fluid flow or pressure. These practices may also help prevent loss of well control (LWC) incidents and minimize the occurrence of SCP during well construction and production.

As presented earlier herein, 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. Included are those practices (well design, drilling, completion, etc.) that may positively or negatively affect pressure-containment barrier sealing performance along with methods to enhance the positive effects and to minimize any negative ones.

This document does not address shallow water flow zones in deepwater wells which are covered in API RP 65.

1.5 Well Planning and Drilling Plan Considerations

Annex B includes consideration in well planning and drilling plan determinations, such as evaluation for flow potential, site selection, shallow hazards, deeper hazard contingency planning, well control planning for fluid influxes, planning