Hydraulic Fracturing—Well Integrity and Fracture Containment

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Introduction

This document on well integrity has two areas of focus and is limited to onshore wells. The first is to design and execute the well plan such that useable quality groundwater is isolated and protected during the drilling and subsequent fracture stimulation operations. The second is to design and construct the well and install well equipment to meet the expected fracture load requirements.

Fracture containment combines those parameters that are existing, those that can be established at installation, and those that can be controlled during execution as follows:

— existing—formation parameters with associated range of uncertainties;

— established—well barriers and integrity as created during well construction;

— controllable—fracture design and execution parameters.

Although the typical industry-wide practices associated with well construction are similar, there are considerable variations in the details of individual well design and construction due to varying geologic, environmental, regulatory, and operational settings and requirements. These practices are the result of operators gaining localized and specific knowledge based on experience, along with the development and improvements associated with technology. These experiences and practices are communicated and shared via academic training, professional and trade association literature, and industry standards and publications. Well and fracture design is an iterative and collaborative process balancing equipment limitations and economics with regulatory and technical requirements.

API 65-2 and other standards under development address topics covering the design, construction, and operation of onshore wells that are important and closely related to the subject of well integrity and containment of hydraulic fracturing treatments.

This document provides technical guidance only, and practices included herein may not be applicable in all regions and/or circumstances. This document does not constitute legal advice regarding compliance with legal or contractual requirements or risk mitigation. Where regulatory requirements are mentioned, it is not intended to be all inclusive. The operator is responsible for determining compliance with applicable legal requirements.

Hydraulic Fracturing—Well Integrity and Fracture Containment

1 Scope

1.1 This document contains recommended practices for onshore well construction and fracture stimulation design and execution as it relates to well integrity and fracture containment. The provisions in this document relate to the following two areas.

a) Well integrity: the design and installation of well equipment to a standard that

   — protects and isolates useable quality groundwater,

   — delivers and executes a hydraulic fracture treatment, and

   — contains and isolates the produced fluids.

b) Fracture containment: the design and execution of hydraulic fracturing treatments to contain the resulting fracture within a prescribed geologic interval. Fracture containment combines those parameters that are existing, those that can be established at installation, and those that can be controlled during execution:

   — existing—formation parameters with associated range of uncertainties;

   — established—well barriers and integrity as created during well construction;

   — controllable—fracture design and execution parameters.

1.2 The guidance from this document covers recommendations for pressure containment barrier design and well construction practices for onshore wells that will undergo hydraulic fracture stimulation. This document is specifically for wells drilled and completed onshore, although many of the provisions are applicable to wells in coastal waters.

1.3 This document does not attempt to address the full well life cycle of well operations although a brief paragraph on fracture stimulation for re-entries is included in 5.10. This document is not a detailed well construction or fracture design manual. This document does not apply to continuous injection operations such as water disposal, water-flooding or cuttings re-injection wells, or any other continuous injection operation.

1.4 API 100-2 is a companion document that also contains recommended practices applicable to the planning and operation of hydraulically fractured wells. This document includes recommendations for managing environmental aspects during well planning, construction, and execution.

2 Normative References

The following referenced documents are indispensable for the application of 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 Standard 65-2, *Isolating Potential Flow Zones During Well Construction*

API Recommended Practice 100-2, *Environmental Aspects Associated with E&P Operations Including Hydraulic Fracturing*