Openhole Isolation Equipment

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

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Introduction

This Specification has been developed by users/purchasers and suppliers/manufacturers of openhole isolation equipment intended for use in the petroleum and natural gas industry worldwide. This Specification is intended to give requirements and information to both parties in the selection, manufacture, testing, and use of openhole isolation equipment. Further, this Specification addresses supplier/manufacturer requirements that set the minimum requirements with which suppliers/manufacturers shall comply to claim conformity with this Specification.

This Specification has been structured to allow for grades of increased requirements both in quality control and design validation. These variations allow the user/purchaser to select the grade required for a specific application for openhole isolation equipment.

The quality grades provide the user/purchaser the choice of requirements to meet a specific preference or application. Additional quality requirements may be specified by the user/purchaser as supplemental requirements.

Standard design validation grades provide the user/purchaser the choice of requirements to meet a specific preference or application. Design validation grade V3 OH is the minimum grade and represents equipment where the validation method has been defined by the supplier/manufacturer. The complexity and severity of the validation testing typically increases as the grade number decreases.

Users of this Specification should be aware that requirements above those outlined in this Specification may be needed for individual applications. This Specification is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this Specification.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process. This Specification was initiated utilizing information provided by the Advanced Well Equipment Standards Group RP 3362.

Openhole Isolation Equipment

1 Scope

This Specification covers requirements and guidelines for openhole isolation equipment and bridge plugs as defined herein. Openhole isolation equipment includes swellable packers, inflatable packers, expandable packers, and openhole packers that are designed for use in the petroleum and natural gas industries. This Specification provides requirements for design verification, design validation, manufacturing, quality, shipping, handling and storage, and related supporting topics.

Included within this Specification are four Annexes, of them, B and C are normative, and A and D are informative.

Requirements for the end connections to the well conduit are not included in this Specification. Also not covered are downhole anchoring devices (see API 11D1); cup style packers; and requirements for the application, installation, and use of openhole isolation equipment. Equipment and technology that are covered by other API specifications and standards are exempted from this specification, such as:

— production packers,

— liner hanger systems,

— service tools,

— test tool packers.

Repairs, remanufacturing, and redress are excluded from this Specification.

2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Spec 5CRA, *Specification for Corrosion Resistant Alloy Seamless Tubes for Use as Casing, Tubing and Coupling Stock*

API Specification 5CT, *Specification for Casing and Tubing*

API Spec Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ASNT RP SNT-TC-1A [1], *Non-Destructive Testing*

ASTM D412 [2], *Standard Test Methods for Vulcanized and Thermoplastic Elastomers—Tension*

ASTM D429, *Standard Test Methods for Rubber Property—Adhesion to Rigid Substrates*

ASTM D638, *Standard Test Method of Tensile Properties of Plastics*

ASTM D1414, *Standard Test Methods for Rubber O-Rings*

[1] American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York, 10036.
[2] American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohoken, PA 19427-2959.

ASTM D1415, *Tentative Method of Testing for International Hardness of Vulcanized Natural and Synthetic Rubbers*

ASTM D1708, *Standard Test Method for Tensile Properties of Plastics by Use of Microtensile Specimens*

ASTM D2140, *Standard Practice for Calculating Carbon-Type Composition of Insulating Oils of Petroleum Origin*

ASTM D2240, *Standard Test Method for Rubber Property—Durometer Hardness*

ISO 37 [3], *Rubber, vulcanized or thermoplastic—Determination of tensile stress–strain properties*

ISO 2859-1, *Sampling procedures for inspection by attributes—Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 3601-1, *Fluid power systems—O-rings—Part 1: Inside diameters, cross-sections, tolerances and designation codes*

ISO 3601-3, *Fluid power systems—O-rings—Part 3: Quality acceptance criteria*

ISO 9712, *Non-destructive testing—Qualification and certification of NDT personnel*

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in API Q1 and the following apply.

3.1
assembly
Product comprised of more than one component.

3.2
base elastomer
An elastomer family of materials with common property limits such as HNBR, FKM, EPDM.

3.3
base elastomer formulation
A base elastomer mixed with additives to achieve physical properties that enhance performance.

3.4
bridge plug
Mechanical device used for blocking fluid (liquid or gas) communication within a conduit when installed (not installed in a design receptacle or conduit).

3.5
component
An individual part of an assembly.

3.6
conduit
Casing, tubing or liner, metallic, or nonmetallic.

3.7
design margin
Ratio of the material yield stress divided by the actual design stress in a given component.

NOTE Design margins account for a level of reduced performance capability to compensate for uncertainties in the loading (applied stress) and intrinsic variation in the mechanical properties such as yield strength, ultimate strength, endurance strength, modulus of elasticity that have distribution about their mean value.

[3] International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Genevea 20, Switzerland.