Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment

ANSI/API SPECIFICATION 17D
SECOND EDITION, MAY 2011

EFFECTIVE DATE: FEBRUARY 1, 2013
[for Valve and Actuator Design Validation (Test Requirements) Only]

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ERRATA 2, JANUARY 2012
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ADDENDUM 1, SEPTEMBER 2015
ADDENDUM 2, SEPTEMBER 2019

ISO 13628-4 (Identical), Design and operation of subsea production systems—Part 4: Subsea wellhead and tree equipment

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Upstream Segment

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Affected Publication: ANSI/API Specification 17D/ISO 13628-4, *Design and Operation of Subsea Production Systems—Subsea Wellhead and Tree Equipment*, Second Edition, May 2011

Addendum 2

Section 2, Normative References:

The following reference shall be deleted:

> ISO 10423, *Petroleum and natural gas industries — Drilling and production equipment — Wellhead and christmas tree equipment*

Section 2, Normative References:

The following reference shall be added:

> API Spec 6A, *Specification for Wellhead and Tree Equipment*, 20th Edition, October 2010

Section 3 through Annex O:

All references to "ISO 10423" shall be changed to "API 6A".

Bibliography:

The following reference shall be added:

> ISO 10423, *Petroleum and natural gas industries — Drilling and production equipment — Wellhead and christmas tree equipment*

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13628-4 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

This second edition cancels and replaces the first edition (ISO 13628-4:1999), which has been technically revised.

ISO 13628 consists of the following parts, under the general title *Petroleum and natural gas industries — Design and operation of subsea production systems*:

— Part 1: General requirements and recommendations

— Part 2: Unbonded flexible pipe systems for subsea and marine applications

— Part 3: Through flowline (TFL) systems

— Part 4: Subsea wellhead and tree equipment

— Part 5: Subsea umbilicals

— Part 6: Subsea production control systems

— Part 7: Completion/workover riser systems

— Part 8: Remotely Operated Vehicle (ROV) interfaces on subsea production systems

— Part 9: Remotely Operated Tool (ROT) intervention systems

— Part 10: Specification for bonded flexible pipe

— Part 11: Flexible pipe systems for subsea and marine applications

A part 12, dealing with dynamic production risers, a part 14, dealing with High Integrity Pressure Protections Systems (HIPPS), a part 15, dealing with subsea structures and manifolds, a part 16, dealing with specifications for flexible pipe ancillary equipment, and a part 17, dealing with recommended practice for flexible pipe ancillary equipment, are under development.

Introduction

This second edition of ISO 13628-4 has been updated by users and manufacturers of subsea wellheads and trees. Particular attention was paid to making it an auditable standard. It is intended for worldwide application in the petroleum industry. It is not intended to replace sound engineering judgement. It is necessary that users of this part of ISO 13628 be aware that additional or different requirements can better suit the demands of a particular service environment, the regulations of a jurisdictional authority or other scenarios not specifically addressed.

A major effort in developing this second edition was a study of the risks and benefits of penetrations in subsea wellheads. All previous editions of both this part of ISO 13628 and its parallel API document Specification for Subsea Wellhead and Christmas Tree Equipment (Specification 17D) prohibited wellhead penetrations. However, that prohibition was axiomatic. In developing this second edition, the workgroup used qualitative risk analysis techniques and found that the original insight was correct: subsea wellheads with penetrations are more than twice as likely to develop leaks over their life as those without penetrations.

The catalyst for examining this portion of the original editions of the API and ISO standards was the phenomenon of casing pressure and its monitoring in subsea wells. The report generated by the aforementioned risk analysis has become API 17 TR3 and API RP 90. The workgroup encourages the use of these documents when developing designs and operating practices for subsea wells.

Care has also been taken to address the evolving issue of using external hydrostatic pressure in design. The original versions of both API 17D and ISO 13628-4 were adopted at a time when the effects of that parameter were relatively small. The industry's move into greater water depths has prompted a consideration of that aspect in this version of this part of ISO 13628. The high-level view is that it is not appropriate to use external hydrostatic pressure to augment the applications for which a component can be used. For example, this part of ISO 13628 does not allow the use of a subsea tree rated for 69 MPa (10 000 psi) installed in 2 438 m (8 000 ft) of water on a well that has a shut-in tubing pressure greater than 69 MPa (10 000 psi). See 5.1.2.1.1 for further guidance.

The design considerations involved in using external hydrostatic pressure are only currently becoming fully understood. If a user or fabricator desires to explore these possibilities, it is recommended that a thorough review of the forthcoming American Petroleum Institute technical bulletin on the topic be carefully studied.

The overall objective of this part of ISO 13628 is to define clear and unambiguous requirements that facilitate international standardization in order to enable safe and economic development of offshore oil and gas fields by the use of subsea wellhead and tree equipment. It is written in a manner that allows the use of a wide variety of technology, from well established to state-of-the-art. The contributors to this update do not wish to restrict or deter the development of new technology. However, the user of this part of ISO 13628 is encouraged to closely examine standard interfaces and the reuse of intervention systems and tools in the interests of minimizing life- cycle costs and increasing reliability through the use of proven interfaces.

It is important that users of this part of ISO 13628 be aware that further or differing requirements can be needed for individual applications. This part of ISO 13628 is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is theresponsibility of the vendor to identify any variations from this part of ISO 13628 and provide details.

Petroleum and natural gas industries — Design and operation of subsea production systems

Part 4: **Subsea wellhead and tree equipment**

1 Scope

This part of ISO 13628 provides specifications for subsea wellheads, mudline wellheads, drill-through mudline wellheads and both vertical and horizontal subsea trees. It specifies the associated tooling necessary to handle, test and install the equipment. It also specifies the areas of design, material, welding, quality control (including factory acceptance testing), marking, storing and shipping for both individual sub-assemblies (used to build complete subsea tree assemblies) and **complete** subsea tree assemblies.

The user is responsible for ensuring subsea equipment meets any additional requirements of governmental regulations for the country in which it is installed. This is outside the scope of this part of ISO 13628.

Where applicable, this part of ISO 13628 can also be used for equipment on satellite, cluster arrangements and multiple well template applications.

Equipment that is within the scope of this part of ISO 13628 is listed as follows:

a) subsea trees:

- tree connectors and tubing hangers,
- valves, valve blocks, and valve actuators,
- chokes and choke actuators,
- bleed, test and isolation valves,
- TFL wye spool,
- re-entry interface,
- tree cap,
- tree piping,
- tree guide frames,
- tree running tools,
- tree cap running tools,
- tree mounted flowline/umbilical connector,
- tubing heads and tubing head connectors,
- flowline bases and running/retrieval tools,
- tree mounted controls interfaces (instrumentation, sensors, hydraulic tubing/piping and fittings, electrical controls cable and fittings);

b) subsea wellheads:

- conductor housings,
- wellhead housings,
- casing hangers,
- seal assemblies,