Design Calculations for Pressure-containing Equipment

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Introduction

It is necessary that users of this document be aware that further or differing requirements can be needed for individual applications. This document 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 the responsibility of the vendor to identify any variations from this document and provide details.

Units of Measurement

In this standard, data are expressed in both U.S. customary (USC) and metric (SI) units. For a specific order item, unless otherwise stated, only one system of units shall be used, without combining data expressed in the other system.

Rounding

Except as otherwise required by this specification, to determine conformance with the specified requirements, observed or calculated values are rounded to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding method of ASTM E29 or ISO 80000-1, Annex B, Rule A.

Conformance with this International Standard

A quality system applied to assist compliance with the requirements of this International Standard is typically implemented by the manufacturer. The manufacturer is responsible for conforming with all the applicable requirements of this standard. It is permissible for the purchaser to make any investigation necessary to be assured of conformance by the manufacturer and to reject any material that does not conform.

Design Calculations for Pressure-containing Equipment

1 Scope

This standard describes a design analysis methodology and requirements that apply to design verification of certain pressure-containing products and equipment in the oil and natural gas industry. The methods included in this document apply to designs where normative reference to this standard is made in an API product specification and to those components for which the methods of this standard are required or permitted.

Fatigue analysis is outside the scope of this document. Bolting allowable stresses are given in API product specifications and are outside the scope of this document.

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, except that new editions may be used on issue and shall become mandatory upon the effective date specified by the publisher or 12 months from the date of the revision (where no effective date is specified).

API Specification 6A, *Specification for Wellhead and Tree Equipment*

3 Terms, Definitions, and Symbols

3.1 Terms and Definitions

For the purpose of this document the following terms and definitions apply.

3.1.1
elastic analysis
Method of structural analysis based on the assumption that the material has a linear elastic stress-strain relationship and therefore does not account for yielding or plastic behavior.

3.1.2
extreme conditions
Conditions due to specified events such as seismic loading, wind loading, and wave loading in which loading is additive to the normal loading at operating conditions. See 5.3.2.3.

3.1.3
gross distortion
Distortion to the extent that the product no longer functions as intended.

3.1.4
gross structural discontinuity
Change in vessel shape, such as the junction of a cylinder and cone or a cylinder and head.

3.1.5
large-displacement analysis
Finite-element analysis wherein the stiffness of the elements is calculated based on their actual deformed geometry.