PROCESS INDUSTRY PRACTICES

August 2022

Pipeline

PIP PLC00004
Piping Stress Analysis Criteria for ASME B31.4 and B31.8 Metallic Piping

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

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Table of Contents

1. Scope

This Practice provides minimum requirements for analyzing the flexibility of metallic piping systems. This Practice describes piping flexibility analysis parameters and applications, and documentation requirements.

2. References

Applicable parts of the following Practice and industry codes and standards shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles will be used herein where appropriate.

2.1 Process Industry Practices (PIP)

– PLC00005 - *Design of ASME B31.8 Metallic Pipeline Systems within Facilities*

2.2 Industry Codes and Standards

- American Society of Civil Engineers (ASCE)
  – ASCE 7 - *Minimum Design Loads for Buildings and Other Structures*
- American Society of Mechanical Engineers (ASME)
  – ASME Boiler and Pressure Vessel Code
  Section VIII - *Pressure Vessels*
  – ASME B31.4 - *Pipeline Transportation Systems for Liquids and Slurries*
  – ASME B31.8 - *Gas Transmission and Distribution Piping Systems*
  – *ASME* B31J - *Stress Intensification Factors (i-Factors), Flexibility Factors (k-Factors), and Their Determination for Metallic Piping Components*
- Welding Research Council (WRC)
  – WRC 107 (see WRC 537)
  – WRC 537 - *Precision equations and enhanced diagrams for local stresses in spherical and cylindrical shells due to external loadings for implementation of WRC Bulletin 107*
  – WRC 297 - *Local Stresses in Cylindrical Shells Due to External Loadings on Nozzles - Supplement to WRC 107*
- Energy Institute (EI)
  – *Guidelines for the Avoidance of Vibration Induced Fatigue Failure in Process Pipework*

3. Requirements

3.1 General

3.1.1 All piping systems shall be evaluated and, if appropriate, analyzed for applicable conditions in accordance with *ASME B31.4*, *ASME B31.8*, and this Practice.

3.1.2 The most severe, anticipated, coincident pressure and temperature conditions shall be considered to evaluate the flexibility and sustained load analyses for each anticipated operating condition. Design conditions (pressure and temperature) shall be set in accordance with *ASME B31.4-2016* subparas 401.2.2.2 and 401.2.3.7. For *ASME B31.8-2018* see paras 805.2.1 and 805.2.2.