PROCESS INDUSTRY PRACTICES

COMPLETE REVISION
April 2017

Structural

PIP STC01015
Structural Design Criteria

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.

PUBLISHING HISTORY

December 1998	*Issued*
February 2002	*Technical Revision*
April 2002	*Editorial Revision*
August 2004	*Complete Revision*
February 2006	*Technical Correction*
September 2007	*Technical Correction*
April 2017	*Complete Revision*

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Table of Contents

1. Scope

This Practice describes the minimum requirements for the structural design of process industry facilities at onshore sites.

This Practice is intended to be used in conjunction with *PIP ARC01015*, *PIP ARC01016*, *PIP CVC01015*, *PIP CVC01017*, and *PIP CVC01018*, as applicable.

This Practice does not include design criteria for loads associated with transportation or lifting of modular structures.

This Practice provides triple references to *ASCE/SEI 7-10*, *IBC 2012*, and *IBC 2015*. The applicable code/standard shall be as required by the authority having jurisdiction (AHJ) and as specified in *PIP CVC01017*.

This Practice references U.S. codes and standards, but it can be applied globally. For projects in other countries, a thorough search of applicable codes and standards is required. Where more stringent than U.S. codes and standards, the local codes and standards shall govern. For projects in countries without applicable codes and standards, the U.S. codes and standards shall govern.

2. References

Applicable parts of the following Practices, industry codes and standards, and references 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 are used herein where appropriate.

2.1 Process Industry Practices (PIP)

- PIP ARC01015 - *Architectural and Building Utilities Design Criteria*
- PIP ARC01016 - *Building Data Sheet*
- PIP CVC01015 - *Civil Design Criteria*
- PIP CVC01017 - *Plant Site Data Sheet*
- PIP CVC01018 - *Project Data Sheet*
- PIP PCCWE001 - *Weighing Systems Design Criteria*
- PIP PCEWE001 - *Weighing Systems Guidelines*
- PIP REIE686/API RP686 - *Recommended Practice for Machinery Installation and Installation Design*
- PIP REIE686A - *Recommended Practice for Machinery Installation and Installation Design (Supplement to PIP REIE686/API RP686)*
- PIP STC01018 - *Blast Resistant Building Design Criteria*
- PIP STE05121 - *Application of ASCE Anchorage Design for Petrochemical Facilities*
- PIP STE03360 - *Heat Exchanger and Horizontal Vessel Foundation Design Guide*

2.2 Industry Codes and Standards

- American Association of State Highway and Transportation Officials (AASHTO)
  - *AASHTO Standard Specifications for Highway Bridges*
- American Concrete Institute (ACI)
  - ACI 318-11 - *Building Code Requirements for Structural Concrete and Commentary*
  - ACI 318-14 - *Building Code Requirements for Structural Concrete and Commentary*
  - ACI 318M-11 - *Building Code Requirements for Structural Concrete and Commentary (Metric)*
  - ACI 318M-14 - *Building Code Requirements for Structural Concrete and Commentary (Metric)*
  - ACI 350 - *Code Requirements for Environmental Engineering Concrete Structures and Commentary*
  - ACI 350M - *Code Requirements for Environmental Engineering Concrete Structures and Commentary (Metric)*
  - ACI 376 - *Code Requirements for Design and Construction of Concrete Structures for the Containment of Refrigerated Liquefied Gases and Commentary*
  - ACI 376M - *Code Requirements for Design and Construction of Concrete Structures for the Containment of Refrigerated Liquefied Gases and Commentary (Metric)*
- American Institute of Steel Construction (AISC)
  - AISC 341 - *Seismic Provisions for Structural Steel Buildings*
  - ANSI/AISC 360 - *Specification for Structural Steel Buildings*
- American Iron and Steel Institute (AISI)
  - AISI S100 - *North American Specification for the Design of Cold-Formed Steel Structural Members*
- American Petroleum Institute (API)
  - API Standard 650 - *Welded Steel Tanks for Oil Storage*
- American Society of Civil Engineers (ASCE)
  - ASCE/SEI 7-10 - *Minimum Design Loads for Buildings and Other Structures*
  - ASCE/SEI 37-14 - *Design Loads on Structures during Construction*
  - *Design of Blast-Resistant Buildings in Petrochemical Facilities* - Task Committee on Blast-Resistant Design of the Petrochemical Committee of the Energy Division of the American Society of Civil Engineers, 2010
  - *Guidelines for Seismic Evaluation and Design of Petrochemical Facilities* - Task Committee on Seismic Evaluation and Design of the Petrochemical Committee of the Energy Division of the American Society of Civil Engineers, 2011

  - *Wind Loads for Petrochemical and Other Industrial Facilities* - Task Committee on Wind-Induced Forces of the Petrochemical Committee of the Energy Division of the American Society of Civil Engineers, 2011

- American Society of Mechanical Engineers (ASME) / Canadian Standards Association (CSA)
  - ASME A17.1/CSA B44 - *Safety Code for Elevators and Escalators*

- ASTM International (ASTM)
  - ASTM A36/A36M - *Standard Specification for Carbon Structural Steel*
  - ASTM A193/A193M - *Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications*
  - ASTM A307 - *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength*
  - ASTM A354 - *Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners*
  - ASTM A500/A500M - *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*
  - ASTM A572/A572M - *Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel*
  - ASTM A615/A615M - *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*
  - ASTM A706/A706M - *Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement*
  - ASTM A992/A992M - *Standard Specification for Structural Steel Shapes*
  - ASTM A1064/A1064M - *Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete*
  - ASTM F1554 - *Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength*
  - ASTM F3125/ASTM F3125M - *Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions*

- American Welding Society (AWS)
  - AWS D1.1/D1.1M - *Structural Welding Code - Steel*

- American Wood Council (AWC)
  - ANSI/AWC NDS - *National Design Specification for Wood Construction*
  - *NDS Supplement - Design Values for Wood Construction*

- Crane Manufacturers Association of America (CMAA)
  - CMAA No. 70 - *Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes*