Seismic Evaluation and Design of Petrochemical and Other Industrial Facilities

Third Edition

Task Committee on Seismic Evaluation and Design of Petrochemical Facilities

ASCE

Seismic Evaluation and Design of Petrochemical and Other Industrial Facilities

Third Edition

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ASCE Petrochemical Energy Committee

This publication is one of five state-of-the-practice engineering reports produced to date by the ASCE Petrochemical Energy Committee. These engineering reports are intended to summarize current engineering knowledge and design practice and present guidelines for the design of petrochemical facilities. They represent a consensus opinion of the task committee members who are active in their development. These five ASCE engineering reports are

1. *Design of Anchor Bolts in Petrochemical Facilities*,
2. *Design of Blast Resistant Buildings in Petrochemical Facilities*,
3. *Design of Secondary Containment in Petrochemical Facilities*,
4. *Seismic Evaluation and Design of Petrochemical and Other Industrial Facilities*
   (Note:First and second editions were titled *Guidelines for Seismic Evaluation and Design of Petrochemical Facilities*, and the name was modified for the third edition at the request of ASCE Publications), and
5. *Wind Loads for Petrochemical and Other Industrial Facilities*.

A. K. Gupta organized the ASCE Petrochemical Energy Committee in 1991, which was initially chaired by Curley Turner. Under their leadership the five task committees were formed, initially publishing the five reports in 1997. The Committee was subsequently chaired by Joseph A. Bohinsky and Frank J. Hsiu. In 2005, Magdy H. Hanna reorganized the ASCE Petrochemical Energy Committee, and the following four task committees were formed to update their respective reports:

- Task Committee on Anchorage Design,
- Task Committee on Blast-Resistant Design,
- Task Committee on Seismic Evaluation and Design for Petrochemical Facilities, and
- Task Committee for Wind-Induced Forces.

Building codes and standards have changed significantly since the publication of these five reports, specifically in the calculation of wind and seismic loads and analysis procedures for anchorage design. In addition, new research in these areas and in blast-resistant design has provided opportunities to improve the recommended guidelines. ASCE has determined the need to update two of the original

reports and publish new editions based on the latest research and for consistency with current building codes and standards.

In 2014, the Energy Division Executive Committee Chair J. G. (Greg) Soules requested the following two task committees to update their respective reports:

- Task Committee on Seismic Evaluation and Design of Petrochemical Facilities, and
- Task Committee for Wind-Induced Forces.

Current ASCE Petrochemical Energy Committee

James R. (Bob) Bailey	Exponent—Chairman
J. G. (Greg) Soules	CB&I Storage Tank Solutions LLC

The ASCE Task Committee on Seismic Evaluation and Design of Petrochemical Facilities

This revised document was prepared to provide guidance in the seismic design of new petrochemical and other industrial facilities and the seismic evaluation of existing facilities.Though the committee membership and the intent of this document are directed to petrochemical facilities, these guidelines are applicable to similar situations in other industries. The intended audience for this document includes structural design engineers, operating company personnel responsible for establishing seismic design and construction standards, and local building authorities.

The task committee was established because of the petrochemical industry's significant interest in addressing the wide variation of petrochemical-industry-related design and construction practices and standards that are applied throughout the country.Another primary purpose was to address the need for consistent evaluation methodologies and standards for existing facilities. Most governing building codes and design standards address only new design, and clearly retrofitting existing facilities to meet current standards would be prohibitively expensive. Furthermore, standards for new design do not address all of the conditions that may be found in existing facilities.

These guidelines are intended to provide practical recommendations in several areas that affect the safety of a petrochemical facility during and following an earthquake.

In the area of new design, these guidelines emphasize interpretations of the intent of building codes as applied to petrochemical facilities and practical guidance on design details and considerations that are not included in building codes.

For existing facilities, these guidelines provide evaluation methodologies that rely heavily on experience from past earthquakes, coupled with focused analyses. The guidelines emphasize methods to address seismic vulnerabilities that building codes do not cover, but that experienced engineers can identify.

This book also provides background information and recommendations in several areas related to seismic safety where the structural engineer may interact with other disciplines and with plant operations. These areas include seismic hazards, contingency planning, and post-earthquake damage assessment.

The original version of this document, published in 1997, was developed by a committee of industry representatives chaired by Mr. Gayle S. Johnson. A reconstituted committee led by Mr. J. G. (Greg) Soules created the second edition, published in 2011.

For this third edition, several key individuals dedicated significant amounts of time to formulating, writing, and reviewing in detail specific sections of this document. Those members are identified as follows.

The ASCE Task Committee on Seismic Evaluation and Design of Petrochemical Facilities

J. G. (Greg) Soules, P.E., S.E., SECB
CB&I Storage Tank Solutions LLC
Chair

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