SECOND EDITION

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Guidelines for Seismic Evaluation and Design of Petrochemical Facilities

Task Committee on Seismic Evaluation and Design of Petrochemical Facilities



GUIDELINES FOR SEISMIC EVALUATION AND DESIGN OF PETROCHEMICAL FACILITIES

Second Edition

PREPARED BY Task Committee on Seismic Evaluation and Design of the Petrochemical Committee of the Energy Division of the American Society of Civil Engineers



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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 be a summary of current engineering knowledge and design practice, and present guidelines for the design of petrochemical facilities. They represent a consensus opinion of task committee members 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) Guidelines for Seismic Evaluation and Design of Petrochemical Facilities
- 5) Wind Loads for Petrochemical and Other Industrial Facilities

The ASCE Petrochemical Energy Committee was organized by A. K. Gupta in 1991 and initially chaired by Curley Turner. Under their leadership the five task committees were formed. More recently, the Committee has been chaired by Joseph A. Bohinsky and Frank J. Hsiu. The five reports were initially published in 1997.

Buildings 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. Additionally, new research in these areas and in blast resistant design has provided opportunities for improvement of the recommended guidelines. The ASCE has determined the need to update four of the original reports and publish new editions, based on the latest research and for consistency with current building codes and standards.

The ASCE Petrochemical Energy Committee was reorganized by Magdy H. Hanna in 2005 and the following four task committees were formed to update their respective reports:

- Task Committee on Anchor Bolt Design for Petrochemical Facilities
- Task Committee on Blast Design for Petrochemical Facilities
- Task Committee on Seismic Evaluation and Design for Petrochemical Facilities
- Task Committee for Wind Load Design for Petrochemical Facilities

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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 facilities and the seismic evaluation of existing facilities. Though the makeup of the committee and the writing of this document are directed at 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 a significant interest in the petrochemical industry in addressing the wide variation of design and construction practices and standards that are applied throughout the country with regards to the petrochemical industry. 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 it is recognized that it would be prohibitively expensive to retrofit existing facilities to meet current standards. It is also recognized that 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 on several areas which 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 which are not included in building codes.

For existing facilities, these guidelines provide evaluation methodologies which rely heavily on experience from past earthquakes, coupled with focused analyses. The guidelines emphasize methods to address seismic vulnerabilities which are not covered by building codes, but which can be identified by experienced engineers.

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

In helping to create a consensus set of guidelines, a number of key individuals dedicated significant amounts of time to formulating, writing, and reviewing in detail specific sections of this document. Those members are identified below.

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Finally, the task committee would like to acknowledge the numerous contributions made to this task committee by James Lee. James passed away during the preparation of this report update.

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