

SECOND EDITION

Design of Blast-Resistant Buildings in Petrochemical Facilities

Task Committee on Blast-Resistant Design



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DESIGN OF BLAST-RESISTANT BUILDINGS IN PETROCHEMICAL FACILITIES

Second Edition

PREPARED BY
Task Committee on Blast-Resistant 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 Blast-Resistant Design

This report was prepared to provide guidance in the blast resistant design of petrochemical facilities. Though the makeup of the committee and the writing of this document are directed at petrochemical facilities, these guidelines are applicable to similar design situations in other industries. Those interested in this report should include structural design engineers with dynamic design training and experience as well as operating company personnel responsible to establish internal design and construction practices. The task committee was established because of a significant interest in the petrochemical industry in dealing with costly process accidents, in interpreting government safety standards, and in the desire to protect employees. One purpose of this report is to help provide some uniformity to the current mix of internal and published criteria.

This report is intended to be a State-of-the-Practice set of guidelines. The recommendations provided are based on published information and actual design. The report includes a list of references to provide additional information. The reference list emphasizes an emphasis on readily available commercial publications and government reports. Because of their relevance to this report, several publications deserve mention here. Two widely used documents dealing generally with blast resistant design are UFC 3-340-02 (formerly TM5-1300), *Structures to Resist the Effects of Accidental Explosions* from the Department of Defense and PDC-TR 06-08, *Single Degree of Freedom Structural Response Limits for Antiterrorism Design*, from the US Army Corps of Engineers' Protective Design Center.

In helping to create a consensus set of guidelines, a number of individual and groups provided valuable assistance and review. Reviewers included David Miller and Kieran Glynn. Assistance was also contributed by John Geigel, Anthony Emmons, and Sheng Wu.

Finally, the task committee would like to acknowledge the numerous contributions made to this task committee, the original report committee, and other technical committees over the years by James Lee. James passed away during the preparation of this report update.

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Table of Contents

Chapter 1: Introduction	1
1.1 Background	1
1.2 Purpose and Scope	2
1.3 Related Industry Guidelines, Specifications, & Codes	3
1.4 Blast Resistant Design Process	3
Chapter 2: General Considerations	6
2.1 Introduction	6
2.2 OSHA Requirements	6
2.3 Objectives of Blast Resistant Design	7
2.4 Buildings Requiring Blast Resistant Design	7
2.5 Siting Considerations	8
2.6 Offshore Facilities	9
2.7 Non-Building Structures, Equipment, & Infrastructure	9
Chapter 3: Determination of Loads	12
3.1 Introduction	12
3.2 Types of Explosions	12
3.3 Blast Wave Parameters	14
3.4 Determination of Vapor Cloud Design Overpressures	20
3.5 Building Blast Loading	24
3.6 Computational Fluid Dynamics	29
Appendix 3 Blast Load Example	31
Chapter 4: Types of Construction	34
4.1 Introduction	34
4.2 General Considerations	34
4.3 Common Systems for Petrochemical Buildings	35
4.4 Blast Resistant Modular Steel-Framed Buildings	39
4.5 Other Systems	45

Chapter 5: Dynamic Material Strength and Response Criteria	48
5.1 Introduction	48
5.2 Static Versus Dynamic Response	48
5.3 Resistance-Deflection Function	49
5.4 Material and Structural Element Types	50
5.5 Dynamic Material Properties	54
5.6 Deformation Limits	61
Appendix 5.A Summary Tables for Dynamic Material Strength	67
Appendix 5.B Summary Tables for Response Criteria	69
Chapter 6: Dynamic Analysis Methods	72
6.1 Introduction	72
6.2 Key Concepts	72
6.3 Equivalent Static Method	76
6.4 Single Degree of Freedom Systems	76
6.5 Multi-Degree of Freedom Systems	90
6.6 Applications	93
Appendix 6 Numerical Integration Method	97
Chapter 7: Design Procedures	100
7.1 Introduction	100
7.2 General Design Concepts	100
7.3 Member Design Process	104
7.4 Reinforced Concrete Design	106
7.5 Steel Design	109
7.6 Reinforced Masonry Design	113
7.7 Foundation Design	114
7.8 Design Against Projectiles	118
Chapter 8: Typical Details	120
8.1 Introduction	120
8.2 General Considerations	120
8.3 Enhanced Pre-Engineered Metal Building Construction	120
8.4 Masonry Wall Construction	120
8.5 Metal Clad Construction	121
8.6 Precast Concrete Wall Construction	121
8.7 Cast-in-Place Concrete Wall Construction	121

Chapter 9: Ancillary and Architectural Considerations	127
9.1 Introduction.....	127
9.2 General Considerations	127
9.3 Doors.....	127
9.4 Windows	131
9.5 Utility Openings.....	133
9.6 Interior Design Considerations	133
9.7 Exterior Considerations.....	134
Chapter 10: Evaluation and Upgrade of Existing Buildings.....	135
10.1 Introduction.....	135
10.2 Evaluation Strategies	135
10.3 Blast Resistant Upgrade Options	137
10.4 Upgrades for Structural Member Connections	139
10.5 Upgrades for Structural Framing Members	142
10.6 Upgrades for Metal Panel Wall and Roof Systems	144
10.7 Upgrades for Concrete Masonry (CMU) & Concrete Walls.....	146
10.8 Upgrade with Blast Resistant Shield Wall	152
10.9 Upgrades for Roof Systems	155
10.10 Wall and Roof Catch System Upgrades	156
10.11 Blast Resistant Shell Upgrades	157
10.12 Window Upgrades	159
10.13 Door Upgrades.....	161
Chapter 11: Shear Wall Building Design Example	164
11.1 Introduction.....	164
11.2 Structural System.....	164
11.3 Design Data.....	166
11.4 Exterior Walls (out-of-plane loads)	167
11.5 Roof Slab (in-plane loads)	174
11.6 Side Wall (in-plane loads).....	179
11.7 Roof Slab (out-of-plane loads).....	184
11.8 Roof Beams.....	191
11.9 Roof Beam Connection.....	197
11.10 Roof Girders	199
11.11 Roof Girder Connection	205
11.12 Columns	207
11.13 Column Base Plate and Anchor Bolt Design	213
11.14 Foundation	215