

# DYNAMIC ANALYSIS AND DESIGN OF BLAST LOADED STRUCTURES

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**Baker Engineering and Risk Consultants, Inc.** (BakerRisk) has gained extensive experience in blast design and evaluation of protective structures over the last 20 years. Applications have included the design of new blast resistant buildings, blast containment chambers, and structural upgrades to existing buildings for industry and government. BakerRisk has developed a wide range of constructible engineering solutions for our clients by combining practical construction experience with research and development capabilities. Through our involvement in accident investigations, structural blast testing, and advanced analyses, we have gained a fundamental understanding of how buildings and structures respond under blast loading and their modes of failure.

## Services Offered

- Analysis of conventional construction to evaluate performance under blast loads
- Upgrade of conventional construction to resist moderate blast loads for personnel and equipment protection
- Conceptual design of new facilities to determine optimal siting and construction requirements while meeting blast criteria
- Design of new buildings to resist the effects of close-in explosions
- Design of “Enhanced-Conventional” construction to resist moderate blast loads from nearby explosion or far-field blast loads
- Blast containment chambers for explosion testing, containment of processes involving explosion of flammable vapors or chemicals, and for disposal or transport of suspected subversive devices
- Upgrade of existing blast resistant buildings to enhance blast capacity
- Design or evaluate barricades used to control fragments and suppress blast from potential explosions
- Support during construction to resolve issues which could effect blast hardened facilities and explosion safety
- Counter terrorist structural mitigation techniques to new and existing structures

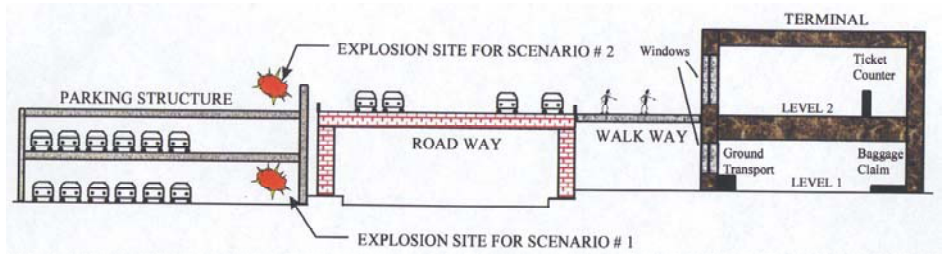


# BAKERRISK STRUCTURAL DESIGN AND ANALYSIS

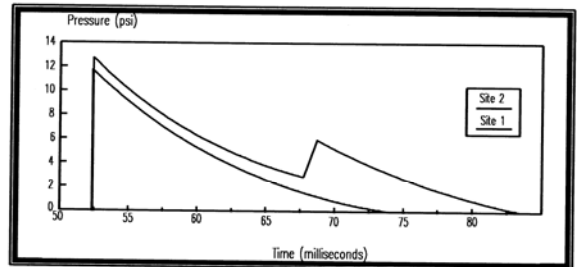
## Types of Structures

- Control Rooms
- Explosives Bays
- Containment Vessels
- Bunkers
- Storage Magazines
- Airport Terminals
- Large Government Buildings
- Buildings adjacent to potential explosions

## Airport Terminal Bombing Analysis



## Blast Loads on Terminal Windows



## Types of Analyses Performed

- Single Degree of Freedom
- Multi Degree of Freedom
- Finite Element Analyses
- Siting Studies
- Physical Security
- Leakage Studies
- P-i/Energy Solutions

## Loading Condition

- Accidental Initiation of High Explosives or Propellants
- Explosion Tests
- Terrorist Threats
- Unconfined Vapor or Dust Explosions
- Confined Vapor or Dust Explosions
- Weapon Effects

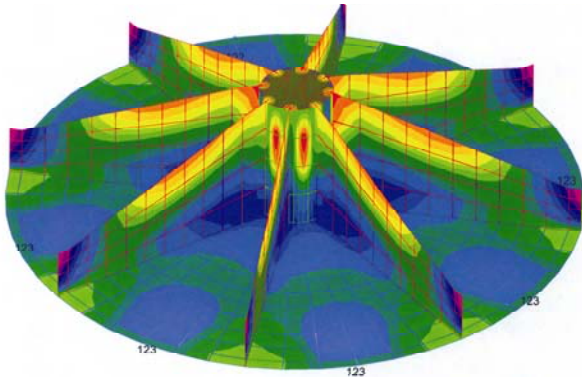
## Construction Types Designed or Analyzed

- Reinforced Concrete
- Precast Concrete
- Reinforced Masonry
- Unreinforced Masonry
- Steel-Frame Buildings
- Pre-Engineered Buildings
- Wood Structures

## Design Criteria and Manuals

- TM5-1300 "Structures to Resist the Effects of Accidental Explosions"
- ASCE Report – "Design of Blast Resistant Buildings in Petrochemical Facilities"
- ESL-TR-87-57 – "Protective Construction Design Manual"
- TM5-885-1 – "Fundamentals of Protective Design for Conventional Weapons"
- DAHS – "Design and Assessment of Hardened Structure"

## FEA Mesh for Blast Chamber Door



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