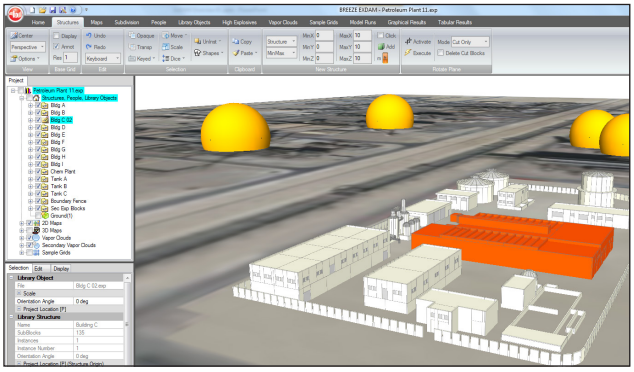
ExDAM

breeze
Modeling Software for EHS Professionals

Explosion Damage Assessment

BREEZE® ExDAM® (Explosion Damage Assessment Model) is a unique, efficient 3D explosion consequence modeling suite that allows users to predict injury and damage that result from the detonation of high explosive and vapor cloud explosions.



The state-of-the-art 3D graphical user interface of BREEZE ExDAM is easy to use and visually stunning.

ExDAM contains HExDAM® (High Explosive Damage Assessment Model) and VExDAM® (Vapor Cloud Explosion Assessment Model). These numerical models provide a fast and accurate means to predict structure damage and personal injury due to:

- Peak over-pressure (OP)
- Dynamic pressure (DP)
- Impulse (IP) distributions

Compared to simple explosion radius techniques, BREEZE ExDAM predicts the shielding effects provided by structures located near a blast. This enables a more detailed, precise, and meaningful damage/injury consequence analyses. Compared to complex CFD methods, ExDAM provides a computational alternative to full-physical modeling, which is:

- Easier and faster to perform
- Less dependent on operator expertise
- Allows for more and larger scenario modeling domains

Phenomenological Models

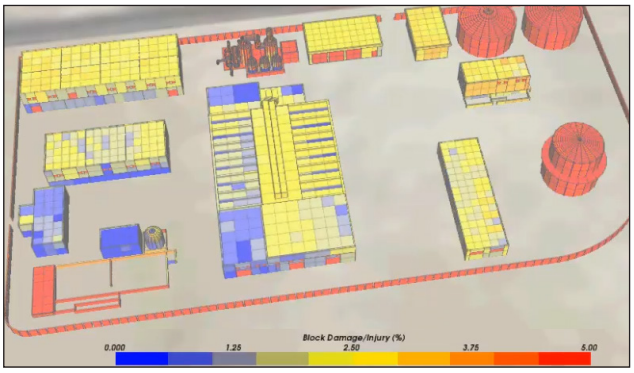
BREEZE ExDAM's explosion models predict shielding-adjusted peak incident pressures and subsequent percent structure/people damage/injury levels using empirical structure vulnerability data (i.e., observed pressure values which produce moderate and severe damage/injury levels at specific explosion yields).

Shielding Algorithm

The shielding algorithm in BREEZE ExDAM uses finite line doublets from potential theory to predict blast wave propagation passing around less damaged structures and passing through more damaged structures.

Damage to Structures

BREEZE ExDAM structures are composed of one or more blocks, each assigned a material. Pre-defined material options range from whole building construction types (e.g., multi-story office building) to structural component types (e.g., reinforced concrete slab). Structure block geometries and materials influence predicted peak incident pressure/impulse distributions and subsequent structure block damage levels.



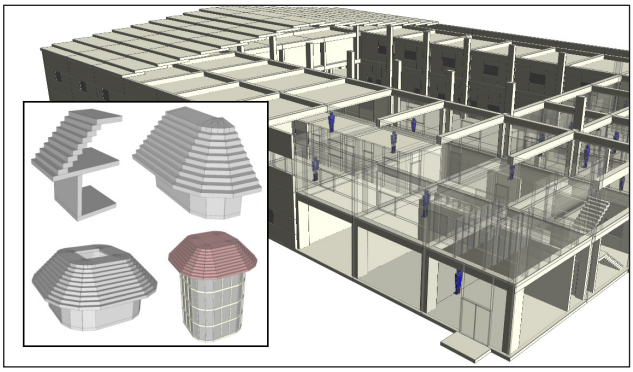
Building damage is displayed using color-coded 3D images.

Injury to People

Model male, female, and child bodies are incorporated in BREEZE ExDAM. The body models are composed of 28 total body components and 19 different body component types (i.e., eardrums, skull, larynx, cervical/thoracic/lumbar vertebrae, clavicle, humerus, radius, ulna, metacarpals, lungs, ribs).

Rapid Scenario Development

BREEZE ExDAM's block structures are fast and easy to create using the sophisticated user interface with numerous structure editing functions for scenario development. The functions include importing floor plans, sectional images and 3D surface data to guide project structure development.



Numerous structure editing functions are available for fast and easy scenario development.

Graphical and Tabular Results

BREEZE ExDAM provides extensive graphical and tabular results options to facilitate both analysis and documentation. Structure/People per-block incident pressure/impulse and damage/injury values are color-coded in the 3D display and listed in user-organized tables. Spatial pressure/impulse distributions can be displayed using sample grid contour planes, iso-surfaces, and volume rendering. Extensive animation and video capture options produce full-3D results documentation.

Non-CFD Model

BREEZE ExDAM does not predict the fluid flow and structural response physics of blast waves traveling through space/time and reflecting off surfaces. Consequently, ExDAM is not an appropriate simulation tool when precise time-variant pressure/impulse profiles are required or when reflected pressures/impulses have a significant influence on damage/injury levels. However, for most open-air explosion scenarios ExDAM is an accurate/efficient solution, especially when scenarios include complex structure geometries requiring the simulation of shielding effects. In general, ExDAM is a high performance solution when simple blast radius calculations are computationally not sophisticated enough and when detailed physical modeling (e.g., CFD) is not needed.

Application Uses

- Regulatory Compliance
- Explosion Consequence Analysis (ECA)
- Facility Siting Studies
- Locating Permanent and Portable Buildings (API 752/753)
- Overpressure Exceedance Analysis (OEA)
- Quantitative Risk Assessment (QRA)
- Consequence Mitigation Design and Testing
- Emergency Response Plan (ERP) Development
- Real-Time Emergency Response System
- Event Reconstruction and Forensics Analysis
- Security and Vulnerability Assessments
- Event Planning and Security
- Force Protection Modeling, Simulation, and Analysis
- Perimeter Analysis (Standoff Distance Determination)
- New Site/Facility Design

Project Examples

Visit breeze-software.com/ExDAM to view videos illustrating the use of BREEZE ExDAM in various scenarios:

1. Industrial plant siting analysis involving multiple potential vapor cloud explosion scenarios
2. Urban multi-story building external high explosive scenario
3. Large-scale city/residential high explosive scenario (analysis of the West, TX fertilizer plant explosion)
4. Small-scale IED terrorism event (analysis of the London subway bombing) as modeled by researchers at the University of Salzburg

For a demonstration of ExDAM or for more information, contact the BREEZE team at +1 (972) 661-8881 or breeze@trinityconsultants.com.

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