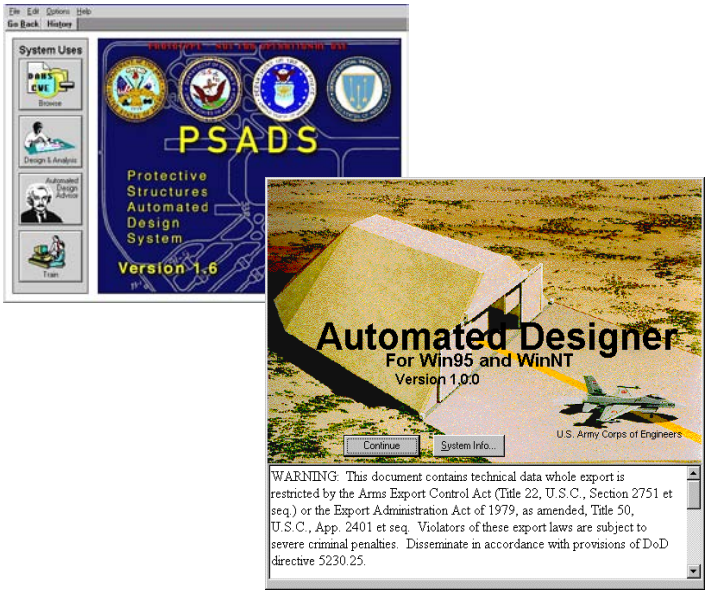
PSADS Automated Designer

BACKGROUND

In 1998, the joint services technical manual "Design and Analysis of Hardened Structures to Conventional Weapons Effects" (Army TM 5-855-1, AFPAM 32-1147(1), NAVFAC P-1080, DSWA DAHSCWEMAN-97) was issued. At the same time, the first version of the Protective Structures Automated Design System (PSADS 1) was issued. PSADS contains a hypertext version of the manual along with a suite of 13 independent support codes. This manual and its support codes constituted a major leap in protective structures design guidance and support. In the last few years, the DAHS CWE manual has been updated and is now published as UFC 3-340-01, June 2002. PSADS 2 includes the updated manual and was released in April 2003 for worldwide distribution to U.S. Government agencies and their contractors, as well as ABCA and NATO militarily aligned member countries.



FEATURES

An important feature of PSADS is the Automated Design Advisor, which guides the designer through the methodology more quickly and accurately. This feature, not implemented in version 1, is included in the current release of PSADS 2 under the label of Automated Designer. The initial version of Automated Designer implements only a limited amount of the manual material. Included are the design/analysis of reinforced concrete slabs for airblast and/or fragment load, direct concrete spall effects, penetration of weapons into several types of media, and prediction of weapon fragmentation and fragment penetration into several types of media.

FUTURE OF AUTOMATED DESIGNER

Future expansion of Automated Designer's capabilities is envisioned. It has the ability to save large amounts of time in the design/analysis process and should be a welcome tool to the protective design community.

POINT OF CONTACT

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Protective Design Center

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Blast Design Training

COURSE DESCRIPTION

The U.S. Army Corps of Engineers Protective Design Center offers this course to acquaint practicing engineers with the procedures that are used to design structures to resist the effects of detonation of terrorist high-explosive devices. Materials covered serve as an excellent introduction to blast resistant structural design similar to that required by UFC 4-010-01, if required standoff distances cannot be provided. The course is well suited for practicing senior structural engineers who would like to develop their skills in the analysis and design of structures subjected to highly transient dynamic loading from an explosion. The course also provides familiarization with terminology, methodologies, the Single-Degree-of-Freedom Blast Effects Design Spreadsheets (SBEDS) and SBEDS for windows that will aid in the review of consulting engineers' blast resistant designs.

The course content is primarily based on the tri-service documents - "Structures to Resist the Effects of Accidental Explosions" (UFC 3-340-02) and "Design and Analysis of Hardened Structures to Conventional Weapons Effects" (UFC 3-340-01). Additional sources are used when they represent the best state of the art practices.

MAJOR TOPICS

Major topics include Blast Loads on Structures; Principals of Structural Dynamics; Dynamic Material Properties; Allowable Response Criteria; Design of Steel Structures; Reinforced Concrete Structures; Masonry Structures; Glazing; Doors; Building Systems; Frames; SBEDS; and Special Considerations. A majority of this material is focused on the Single-Degree-of-Freedom methodology.

CLASS TIME

Time during the five day course is equally split between lectures that provide the theoretical basis of the design process and hands-on utilization of government and commercially developed software specifically for blast analysis and design. High-speed test video and post-test photography is provided to compliment the course material. Typical example design problems and their solutions will be presented. The course also offers opportunities to discuss specific design considerations that individuals may be facing in the near future. An electronic reference library as well as established-practical design software related to blast resistant design is provided to attendees.

WHO SHOULD ATTEND?

The contents of this class contain information that is For Official Use Only. Therefore, attendees are limited to representatives of US government agencies. The class is intended for structural engineers that have a good grasp of traditional structural engineer design principles.

LOCATION AND REGISTRATION

One open-registration class is presented each year. Contact the Blast Design Class Registrar at:

Phone: (402) 995-2393
Email: **PDC.Web@usace.army.mil**

Additionally, Mobile Training Teams (MTTs) can teach the Blast Design class at the sponsor's location. The sponsor is responsible for all expenses related to bringing the class to their location. The sponsor manages the student registration and is responsible for providing the training facility. For other questions, or to host a class, contact the Training Program Manager at:

Phone: (402) 995-2930
email: **PDC.Web@usace.army.mil**

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Component Explosive Damage Assessment Worksheet (CEDAW)

BACKGROUND

The Component Explosive Damage Assessment Worksheet (CEDAW) is an Excel© based tool for the assessment of structural components subjected to airblast loads from explosives using pressure-impulse (P-i) methodology.

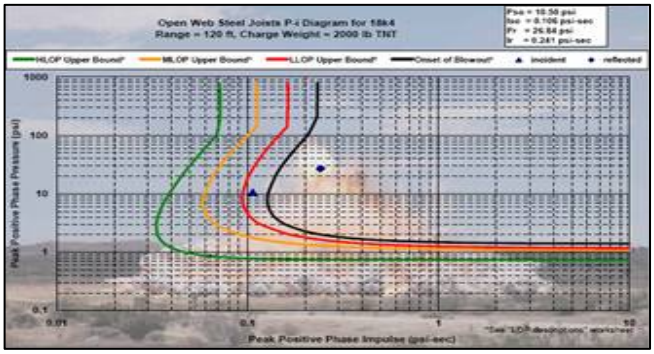
CEDAW will calculate the P-i and associated charge weight-standoff (CW-S) relationships for 11 common structural elements. The user enters basic structural geometry, component boundary conditions, material properties, response mode, and threat (charge weight and standoff distance). CEDAW then generates the P-i and CW-S diagrams with threat parameters shown for graphical interpretation of the expected level of protection. CW-S plots for both fully reflected and side-on pressures are provided. Standard materials and members can be selected from dropdown menus, and various support conditions can be selected for one-way and two-way members.

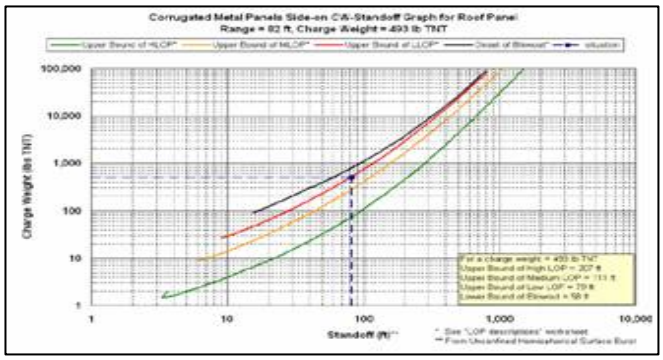
CEDAW produces the P-i diagrams for a specific component by unscaling dimensionless P-i relationships for each component. The CW-S charts are produced by applying the Kingery-Bulmash relationships for HE explosives in a hemispherical surface burst configuration. Because there is no iterative process involved, results are produced almost instantaneously.

While intended for the assessment of existing structures, the CW-S charts produced by CEDAW are also suitable for preliminary siting studies for proposed structures.

INTENDED USER

CEDAW was developed for structural engineers with solid knowledge of structural dynamics and blast effects. This tool is not for the non-structural engineer. CEDAW will aid the engineer in assessment of the member, but the actual assessment of members, connections, and supporting structure is the full responsibility of the engineer.





DISTRIBUTION

Distribution Statement A: Approved for public release; distribution is unlimited.

POINT OF CONTACT

U.S. Army Corps of Engineers
Protective Design Center

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Web Page: https://pdc.usace.army.mil/software/cedaw
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Single-Degree-of-Freedom Blast Effects Design Spreadsheet (SBEDS)

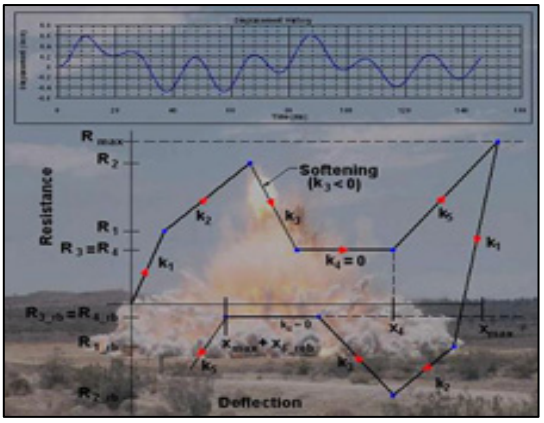
BACKGROUND

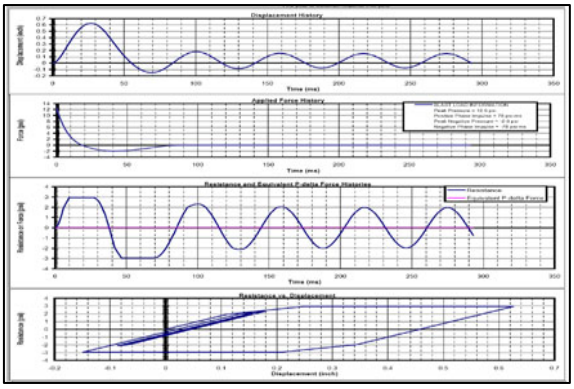
The Single-Degree-of-Freedom Blast Effects Design Spreadsheet (SBEDS) is an Excel© based tool for the design and analysis of structural components subjected to dynamic loads, such as airblast from explosives, using single-degree-of-freedom (SDOF) methodology. SBEDS is based on UFC 3-340-01 and UFC 3-340-02, but draws on other sources where improved methodologies are available.

The user can select from a library of common component types, then enter parameters related to the component geometry, support conditions, material properties and loading. Based on these inputs SBEDS will calculate the SDOF properties and dynamic response o the component. SBEDS can also generate Pressure-impulse (P-i) curves of the component for use in assessments or preliminary designs.

The component library includes masonry, concrete, steel, aluminum, cold-formed, and wood members. The user can select standard component shapes and materials using drop-down menus, or can manually input the component section and material properties. Dropdown menus are used to specify support conditions, load distribution, and modes of response (i.e. flexural, compression membrane and tension membrane). In addition to common structural components, SBEDS can also evaluate the dynamic response of a general SDOF system.

Static and dynamic axial loads, either uniformly distributed or concentrated, are accommodated for many components. Loads can be input by the user directly or using pressure-time history files, or can be calculated by SBEDS based on a user-specified explosive and standoff.





INTENDED USER

SBEDS was developed for structural engineers with solid knowledge of structural engineering, dynamics, and blast effects. This tool is not for the non-engineer. SBEDS is suited for preliminary design or final design when used by a skilled engineer. SBEDS will aid the engineer in design of the member, but the actual design of members and connections is the full responsibility of the engineer.

DISTRIBUTION

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Security Engineering Cost Analysis Tool (SECAT)

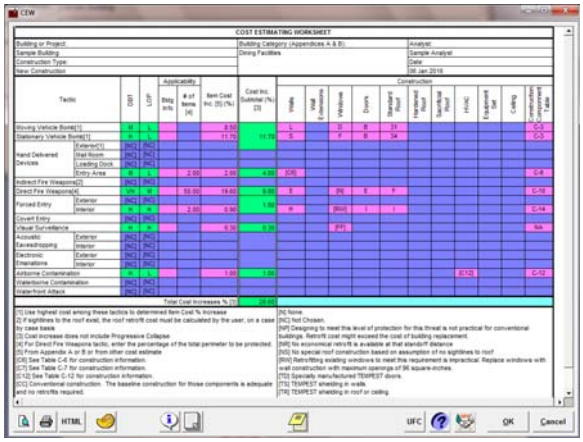
BACKGROUND

Security Engineering Cost Analysis Tool (SECAT) is a Windows-based program created to assist users through the planning phase of a facility's protective system design. SECAT assists the user in developing planning level security costs as defined in UFC 4-020-01 DoD Security Engineering Facility Planning Manual.

SEPA2 is a wholly owned government program.

US Army has certified SEPA2 as net worthy

SEPA2 is based on Unified Facilities Criteria (UFC) 4-020-01, DoD Security Engineering Facility Planning Manual.



INTENDED USER

The users of SEPA include installation facility planning teams.

DISTRIBUTION

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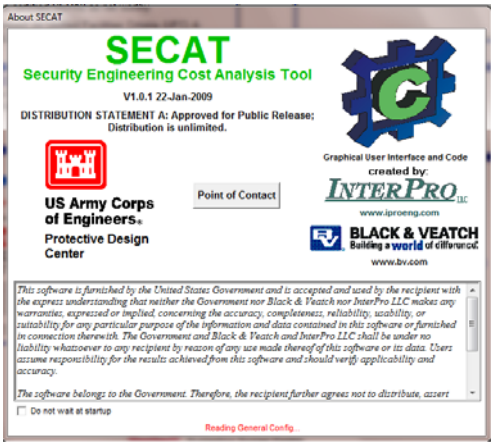

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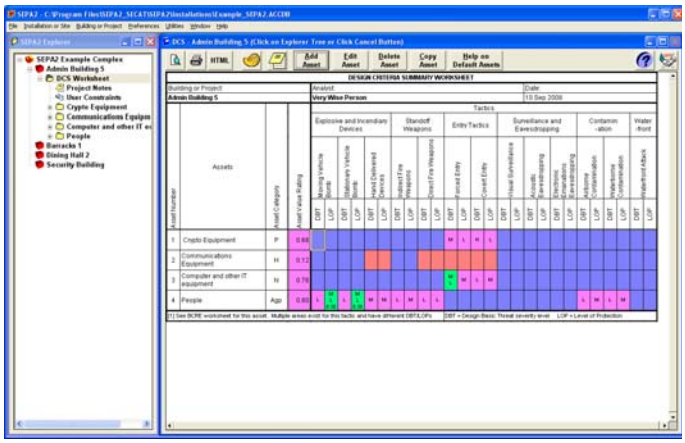
Security Engineering Planning Assistant (SEPA2)

BACKGROUND

Security Engineering Planning Assistant (SEPA2) is a Windows-based program created to assist users through the planning phase of a facility's protective system design. SEPA2 automates the Risk Analysis procedure defined in UFC 4-020-01 DoD Security Engineering Facility Planning Manual. The Risk Analysis procedure includes looking at the types of potential aggressors and their tactics. SEPA2 develops the threat level and the appropriate level of protection based on the users inputs.

SEPA2 is a wholly owned government program.

US Army has certified SEPA2 as net worthy



INTENDED USER

The users of SEPA include installation facility planning and Vulnerability Assessment teams.

DISTRIBUTION

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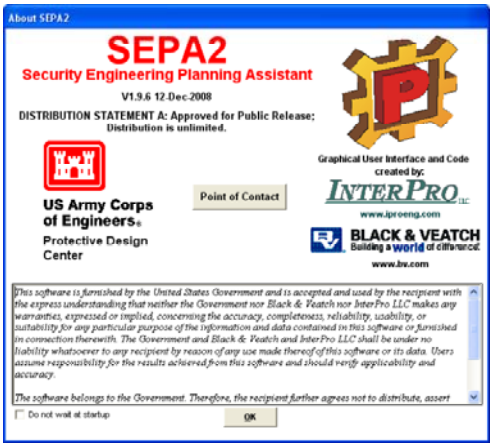

POINT OF CONTACT

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Vulnerability Assessment & Protection Option (VAPO)

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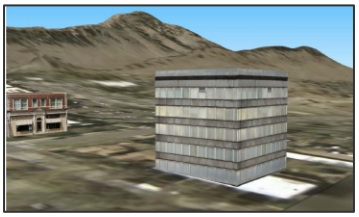
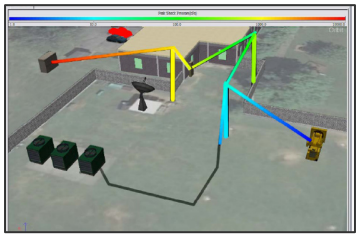
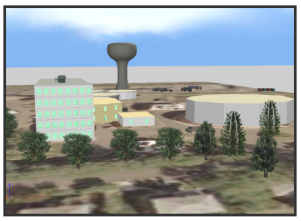
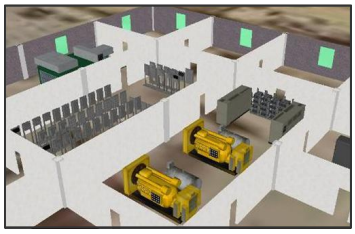
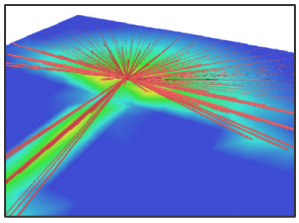
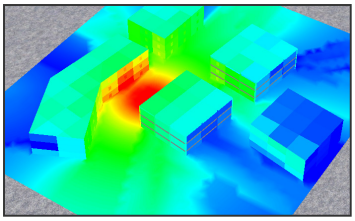
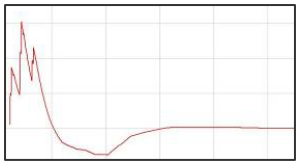
The rise of terrorist threats from foreign and local entities continues to rise, and US and allied combat forces, government employees and contractors face the real threat of death or injury at their workplace by the use of an explosive device and other WMD. In response to these and emerging threats, DTRA developed the fast running weapons effects prediction tool, VAPO.

VAPO Usage

- Vulnerability Assessments
- Force Protection Planning
- Novice to Expert Users

VAPO Models and Analysis

- Threats
  - Explosives: Small to Large IEDs
  - CBRN
  - Effects from 3D Terrain
- Human Injury
- Structural Components and Damage
  - Steel, Reinforced Concrete, Masonry & Wood
  - Windows and Doors
  - Single-Degree-of-Freedom Models
  - Default and Custom Pressure-Impulse Curves
- Building Collapse
- Per Component Level Analysis
- Infrastructure Damage and Cascading Effects
- Vehicle Barriers
- Protective Planning Options

Overhead images and terrain courtesy of the USGS.

Questions and Comments
vapo.help@dtra.mil

Defense Threat Reduction Agency & USSTRATCOM Center for Combating WMD

www.dtra.mil

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Mission

The Defense Threat Reduction Agency safeguards America and its allies from Weapons of Mass Destruction (chemical, biological, radiological, nuclear and high explosives) by providing capabilities to reduce, eliminate, and counter the threat, and mitigate its effects.

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