

The ASSESS Facility Descriptor Module *CONF-890736-11*

S. E. Jordan and A. E. Winblad
Sandia National Laboratories,* Albuquerque, NM 87185

B. Key and S. Walker
Science & Engineering Associates, Inc., Albuquerque, NM 87110

T. Renis and R. Saleh
Lawrence Livermore National Laboratory,† Livermore, CA 94550

SAND--89-1601C

DE89 014070

ABSTRACT

The Facility Descriptor (Facility) module is part of the Analytic System and Software for Evaluating Safeguards and Security (ASSESS). Facility is the software application in the ASSESS system for modeling a nuclear facility's safeguards and security system to determine its effectiveness against theft of special nuclear material. The Facility module provides the tools for an analyst to define a complete description of a facility's physical protection system that can then be used by other ASSESS software modules to determine vulnerability to a spectrum of insider and outsider threats. The analyst can enter a comprehensive description of the protection system layout, including all secured areas, target locations, and detailed safeguards specifications. An extensive safeguard component catalog provides the reference data for calculating delay and detection performance. Multiple target locations within the same physical area may be specified, and the facility may be defined for two different operational states, such as dayshift and nightshift.

INTRODUCTION

The Facility Descriptor (Facility) module is part of the Analytic System and Software for Evaluating Safeguards and Security (ASSESS) [1] developed under contract to the US Department of Energy. Analysts use Facility to define all characteristics of physical protection systems including area and protection element dimensions, alarm assessment methods, passage restrictions, and installed safeguards. Other ASSESS modules then use the protection system models from Facility to analyze vulnerabilities against outsiders, insiders, and hand-off collusion between insiders and outsiders[2-4]. All ASSESS modules run on IBM-PC-compatible computers within Microsoft Windows®, a graphical user interface. Along

*This work was supported by the United States Department of Energy under Contract DE-AC04-76DP00789.

†This work was supported by the United States Department of Energy under Contract W-7405-ENG-48.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

with an efficient user interface based on Windows, Facility has new modeling and reporting capabilities that make it easy to manage the complex set of data that describe a physical protection system.

THE FACILITY DESCRIPTOR MODULE

This paper describes many of the salient features of the Facility Descriptor Module. Figure 1 shows the Facility application as it looks before a facility is defined.

The Facility interface provides two support windows, Diagram and Report, to display and manipulate all security system data. The Diagram window displays a representation of the facility and security system layout. The layout is created and modified in the Diagram window by creating or deleting areas and elements, indicating vehicle traversal limitations across areas, and naming objects. The Report window contains a dynamic, expandable report presenting all of the data associated with any object selected in the Diagram. The Report window is used to view and modify all security system settings in the facility. Each support window can be moved and sized independently inside the main Facility window. Facility provides both mouse and keyboard control.

Diagram

The Diagram window contains a schematic representation of a facility and its security system called an Adversary Sequence Diagram (ASD). The Diagram window in Figure 1 shows a facility as it appears when Facility is first started. This initial facility is the simplest security system that can be modeled by Facility; it consists of an unprotected target located in an unprotected target area surrounded by all points offsite. The ASD representing this simple facility consists of three horizontal rectangles stacked in the Diagram window. The top object in the window is Offsite, the world outside the facility boundary. Offsite is connected to the Target Area by two thin strips, called bypasses. The bypasses represent free passage between Offsite and the Target Area, which is the designated area where the Target always resides. The Target object always remains immediately below the

MASTER

HH
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Target Area; no other areas can be inserted between these two objects. The Target is represented as a rounded rectangle to distinguish it visually from rectangular areas. Because there is no security protecting the Target object in a new facility, the space between the Target Area and the Target is bypassed as well.

Any object in the Diagram window can be selected by the analyst. Selected objects are highlighted, and further information about the selected object is displayed in the Report window. If no object is selected, the Report window contains general information about the facility itself.

Anyone attempting to approach the Target from Offsite must first enter the Target Area. The Target Area, like all areas, has two dotted lines at each end of the area rectangle. These dotted lines mark a portion of the area known as the Traversal Indicators. The Traversal Indicators show how an area may be crossed. If the Traversal Indicators are empty, the area is said to be an interior area and can be traversed only on foot. Any traversal indicator can be changed to a zigzag marker, representing a tire track, to indicate that the area is an exterior area and can be crossed in a vehicle as well as on foot. Generally, several areas separate Offsite from the Target. Up to ten areas can be created in Facility. Figure 2 shows a representative facility as it would appear in the Diagram window.

When additional areas have been added, the Target may be reached only by penetrating each area in succession, beginning from Offsite. Transit time delays, such as the distance across an area, can be added in the Report window, but formal safeguards, such as detectors and barriers, are contained in security elements. Areas are separated from one another by Path Elements, represented by small rectangles connecting the two areas. The Target is protected inside the Target Area by Target Location Elements, which are represented by a circle connected to the Target Area. An element does not necessarily connect adjacent areas. For instance, a tunnel might begin Offsite and end in the Target Area, circumventing all areas in between. An element connecting nonadjacent areas is called a jump element and is represented differently in the ASD. A jump element has a tab containing a letter in place of the inner segment that would normally connect it to the following area. The letter indicates the destination area of the element. Areas are labeled by a letter just outside the Traversal Indicators.

Once an element has been added to the ASD, it is assigned a name and type, such as Fenceline, Gateway, or Personnel Portal. The analyst chooses the element type from a list in a dialog box. After an element has been assigned a type, the specific security safeguards and related data within the element may be entered in the Report window.

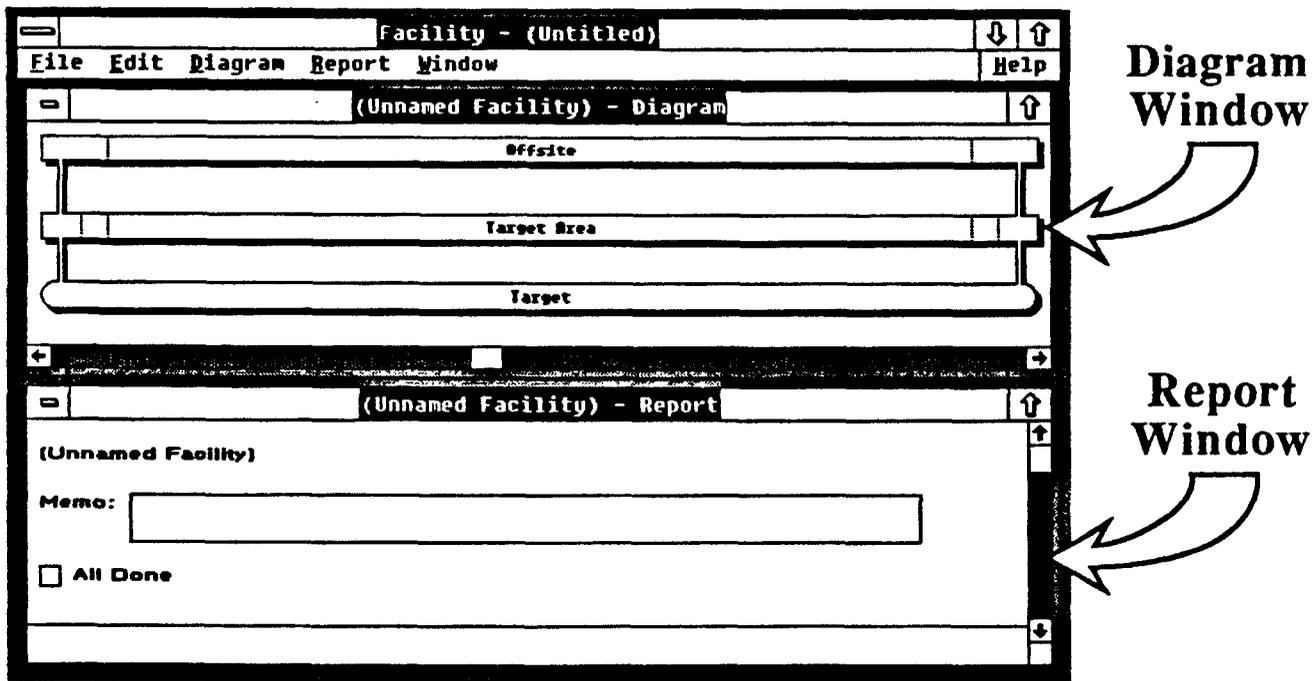


Figure 1. The Main Facility Descriptor Screen

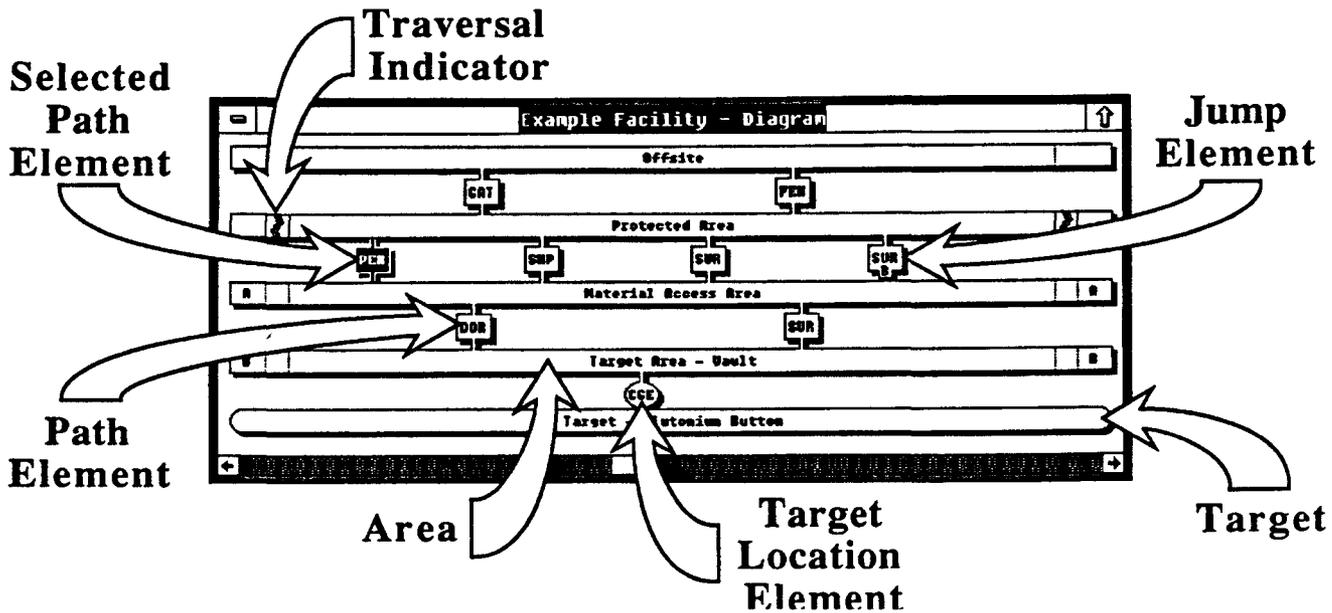


Figure 2. The Diagram Window

Report

The Report window displays all of the information associated with the selected object in the Diagram window. All reports have a heading at the top describing the associated object, a memo field for additional information, and a "done" box at the bottom to be checked when all data have been entered by the analyst. Each report has major headings for information specific to the selected object. For example, area reports include a heading to enter the dimensions of the area, and the target report has a heading for entering the attributes of the target in transport. The path element and target location reports are the most complex, with major headings to indicate the dimensions of the element, specific element characteristics, passage restrictions, and employed safeguards. Figure 3 shows the Report window for a Personnel Portal with its associated headings.

All major heading lines in the Report windows have a button showing a plus sign for expanding the heading to

see more information under that heading. Sections may contain further subheadings with buttons that lead to more detail. Expanded headings can also be compressed by pressing the button again. This feature gives the analyst the control to view security system data at any level of detail.

The Dimensions section contains fields showing the dimensions of an object, for example, the distance across an area or path element, or the size of the target. The Characteristics section has information about specific performance settings for the element. These settings include alarm assessment methods, traffic flow, and background radiation levels present in the element. The Passage section in a path element report has information about passage that is restricted across an element. Figure 4 shows the Report window with the Passage heading expanded.

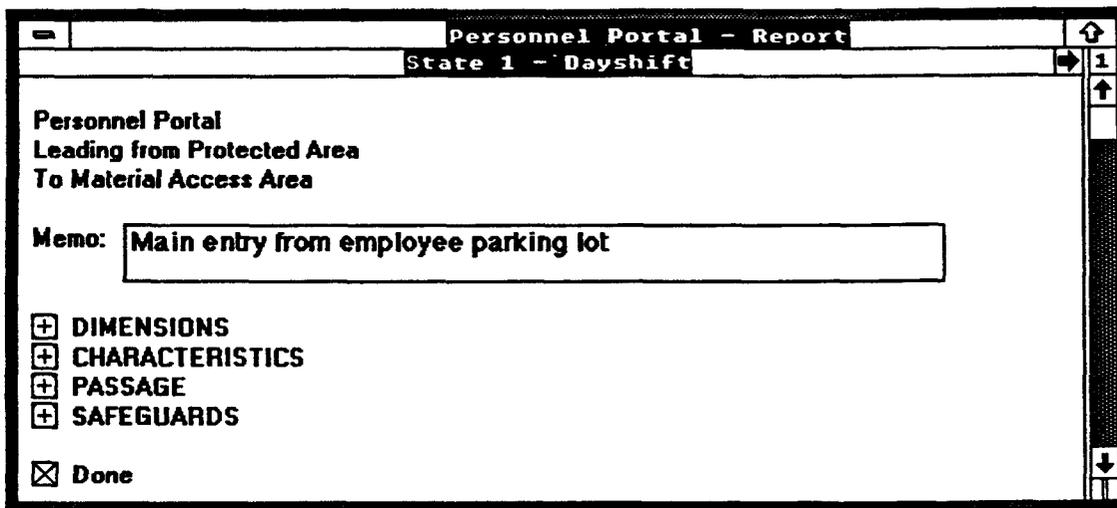


Figure 3. The Report Window

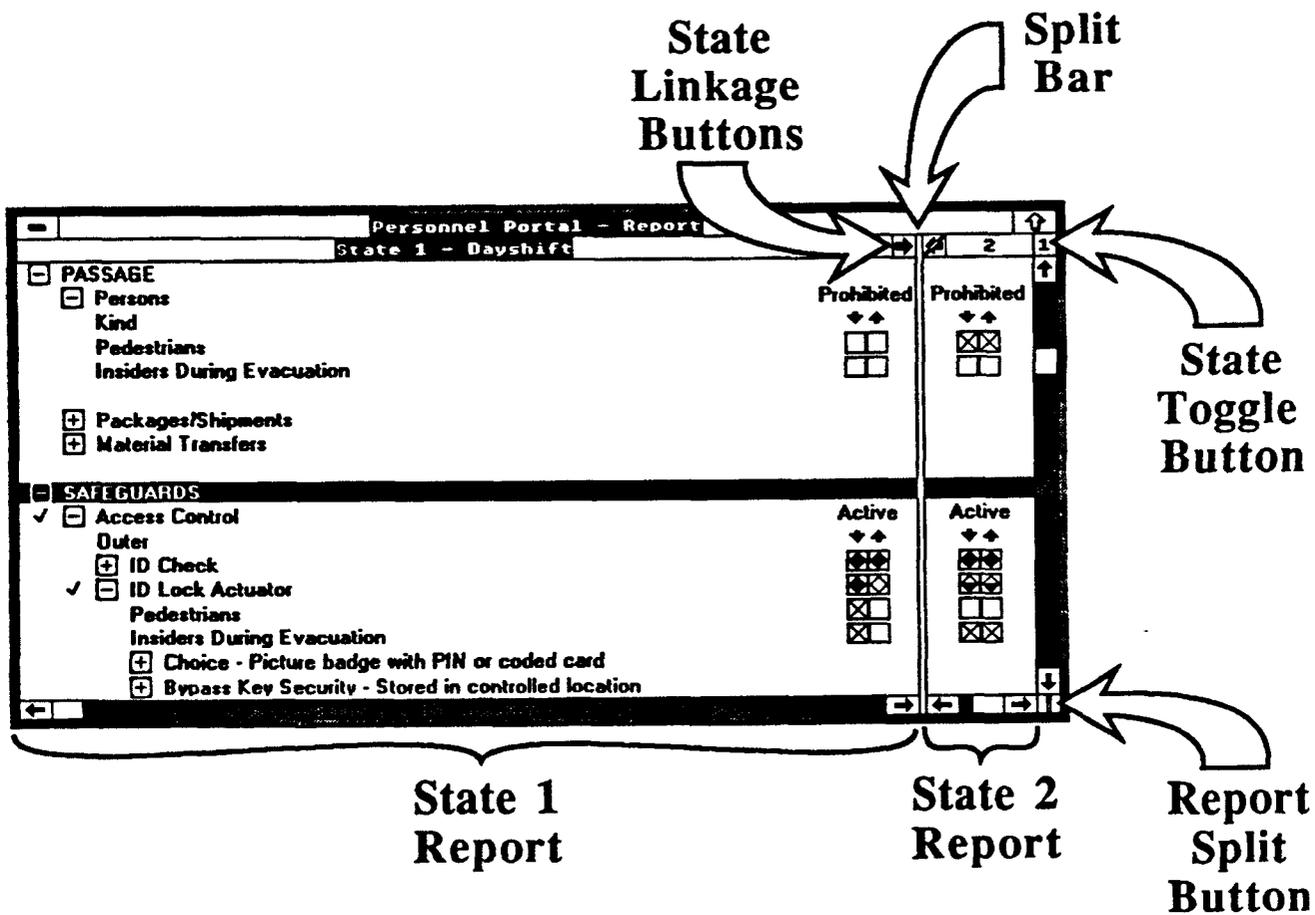


Figure 4. The Expanded Report Window

The section is divided into passage classes, such as Persons, Packages/Shipments, and Material Transfers. Each of these classes is further divided into specific instances of the class. The Persons class, for example, expands to offer Pedestrians and Insiders During Evacuation. Checkboxes on the Passage lines indicate whether classes of individuals or objects are prohibited from passing through the element to enter and/or exit the facility. The arrows above the checkboxes indicate direction of passage, down indicating entry and up indicating exit. If persons are allowed to pass through a portal, they will be subject to any active access control safeguards in the element.

The Safeguards section is the largest and most complex of the report, displaying all information associated with the safeguards in an element. Safeguards are organized into seven classes: Access Control, Contraband Detection, Special Nuclear Material (SNM) Detection, Material Transfer Control, Intrusion Detection, Access Delay, and Security Inspectors. The classes available in an element report depend on the type of element. For example, fence lines and surfaces do not provide access control. Expanding a safeguard class heading reveals all of the safeguards in the class that can be installed in the element. No safeguards are installed when a new element is created. Expansion of a safeguard line reveals choice and note headings. Many safeguards also show headings for specifying further information such as Bypass Key Security for a lock.

The analyst may install a safeguard by simply selecting a choice for the type of safeguard installed. Each safeguard line also has a pair of checkboxes on the right to indicate if the safeguard is active on entry to, or exit from, the facility. These checkboxes are similar to those found in the Passage section. Safeguards that may be active against some passage classes and not others are called passage dependent. For example, some Contraband Detection safeguards, such as metal and explosives detectors, are passage dependent since a metal detector might be used to check persons but not packages. These safeguards display a pair of "diamond boxes" on the right. A diamond box with a black diamond indicates that the safeguard is active against all passage groups in the corresponding direction. A diamond box with a hollow diamond indicates that the safeguard is not active against any passage group in the given direction.

Facility supports modeling of any two separate facility states, such as dayshift and nightshift. The state number and name is always shown at the top of the Report

window (Figure 4). Two buttons in the Report window control the display of reports for either state. Immediately above the vertical scroll bar on the right of the Report window is a button that toggles the Report window between states. The Report window can also display both state reports simultaneously to help the analyst enter and compare element data for each state. The button below the vertical scroll bar of the Report window splits the window down the middle, dedicating the left half to the state 1 report and the right to the state 2 report. The vertical "split" bar separating the reports can also be dragged left or right with the mouse to adjust the portion of the window dedicated to each state report. A custom split of the Report window can help when comparing information between states.

Also shown in Figure 4, next to the split bar, in the state title bars, are two buttons with black arrows pointing to each other. These control the transfer of information from one state to the other and are called the state linkage buttons. An unmodified arrow means any data entered in that state window are transferred to the other state. An arrow with a slash through it means that changes are not transferred across to the other state. This allows the analyst to easily enter data that are both identical and different between facility states.

The detailed performance characteristics of a safeguard may be viewed or redefined by selecting the safeguard choice and choosing Safeguard Performance from the Report menu. This causes a dialog box (Figure 5) to appear, showing the default performance values for the selected safeguard against all related threat equipment.

The performance values against outsider threats may be changed within the dialog box. If changes are made to the safeguard's performance characteristics, the report checks associated with the safeguard are shown with a number sign (#) to indicate that performance numbers have been redefined. The performance characteristics may be reset to the default values at any time.

Done Boxes

Each type of report has as its last line a checkbox to indicate that the entered data are complete. The analyst uses this feature to help track the large quantity of data that must be entered for a typical security system. The Facility report, obtained by clicking on the background of the Diagram, has an "All Done" box. This box, when checked, means that the entire facility is complete. The Diagram window can also display these Done Boxes on the facility layout.

Safeguard Performance State 1 - Dayshift		Performance Against Outsiders With...	
Inner Door		←	→
		Power Tools	
✓ C Hollow core metal		50	✓ ↑
D Lock/Hinge protected		90	
E Tempered glass panel		30	
F Security glass panel		120	
G 1/2 inch steel plate		120	
H Standard turnstile		30	↓
Modified Delay in Seconds:		70	
Note:	Modified	Defaults	
		OK Cancel	

Figure 5. The Safeguard Performance Dialog Box

Other Features

Facility can print diagrams and detailed text reports to any Windows-supported printer. The analyst can produce a complete set of documentation covering every aspect of a physical protection system from within Facility.

SUMMARY

Facility is the ASSESS module that provides the tools to define all characteristics of physical protection systems, including area and protection element dimensions, alarm assessment methods, passage restrictions, and installed safeguards. Other ASSESS modules then use the protection system descriptions from Facility to analyze vulnerabilities against a spectrum of insider and outsider threats.

REFERENCES

1. "An Overview of ASSESS - Analytic System and Software for Evaluating Safeguards and Security," T.D. Cousins, R.A. Al-Ayat, and J.C. Matter, INMM 30th Annual Meeting Proceedings, 1989.
2. "The ASSESS Outsider Analysis Module," A.E. Winblad, M. Snell, S.E. Jordan, B. Key, B. Bingham, and S. Walker, INMM 30th Annual Meeting Proceedings, 1989.
3. "A Comprehensive Method for Evaluating Safeguards Against the Insider Threat," R.A. Al-Ayat, T.A. Renis, R. Saleh, and C.J. Patenaude, INMM 30th Annual Meeting Proceedings, 1989.
4. "Hand-off Collusion Module of the ASSESS Program," D.S. Fortney, W.A. Romine, and M.K. Snell, INMM 30th Annual Meeting Proceedings, 1989.