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## Planning Composer

Tutorial through Beta Version 0.22

Susan D. Nachtigall and Beth A. Brucker

November 2004

### Facility Composer Suite

# Planning Composer

on target for  
building excellence

Suite of Criteria/Requirements-Based Design Tools  
ERDC / CERL <http://bc.cecer.army.mil/>

# **Planning Composer: Tutorial through Beta Version 0.22**

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Final Report

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**ABSTRACT:** While government design criteria commonly exist paper and web-page formats, few are expressed in a computable format. Current design systems provide no way to directly interact with these criteria. *Facility Composer* is a suite of tools designed for use by facility planners, designers, and engineers during the initial phases of facility planning and design. *Facility Composer* associates customer-specific, computable criteria with a growing facility model that continues throughout the life cycle of the facility. In *Facility Composer*, criteria can be associated with different project elements based on the appropriate level of detail, from the project to the site, the building, story, function, and down to the individual space. *Facility Composer's* ability to maintain a linkage between criteria and project elements: (1) helps ensure that critical criteria are followed, (2) helps organize criteria and makes them available at their point of use, and (3) simplifies creation, maintenance, and distribution of new criteria. This tutorial documents and illustrate the use of specific *Planning Composer* program features.

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## Conversion Factors

Non-SI\* units of measurement used in this report can be converted to SI units as follows:

<b>Multiply</b>	<b>By</b>	<b>To Obtain</b>
acres	4,046.873	square meters
cubic feet	0.02831685	cubic meters
cubic inches	0.00001638706	cubic meters
degrees (angle)	0.01745329	radians
degrees Fahrenheit	$(5/9) \times ({}^{\circ}\text{F} - 32)$	degrees Celsius
degrees Fahrenheit	$(5/9) \times ({}^{\circ}\text{F} - 32) + 273.15$	kelvins
feet	0.3048	meters
gallons (U.S. liquid)	0.003785412	cubic meters
horsepower (550 ft-lb force per second)	745.6999	watts
inches	0.0254	meters
kips per square foot	47.88026	kilopascals
kips per square inch	6.894757	megapascals
miles (U.S. statute)	1.609347	kilometers
pounds (force)	4.448222	newtons
pounds (force) per square inch	0.006894757	megapascals
pounds (mass)	0.4535924	kilograms
square feet	0.09290304	square meters
square miles	2,589,998	square meters
tons (force)	8,896.443	newtons
tons (2,000 pounds, mass)	907.1847	kilograms
yards	0.9144	meters

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\* *Système International d'Unités* ("International System of Measurement"), commonly known as the "metric system."

## Preface

This study was conducted for Headquarters, U.S. Army Corps of Engineers (HQUSACE) under Project “Fort Future”; Work Unit LK6K75-N, “Fort Future Facilities.” The technical monitors were Paul A. Howdyshell, CEERD-CF-M and Michael P. Case, CEERD-CF-N, Special Projects Officer for Fort Future.

The work was performed by the Engineering Processes Branch (CF-N) of the Facilities Division (CF), Construction Engineering Research Laboratory (CERL). The CERL Project Manager was Beth A. Brucker. Recognition is due to Jeff Heckel, Wayne Smith, Russ Northrup, William Zwicky, and Van Woods for their contribution to the development of the Facility Composer Suite of Tools. Also special recognition is due to Matthew R. Geaman and Ronnie B. Pride, Research Assistants from the University of Illinois, for contribution to this document. The technical editor was William J. Wolfe, Information Technology Laboratory. Donald K. Hicks is Chief, CEERD-CF-N, and L. Michael Golish is Chief, CEERD-CF. The associated Technical Director was Paul A. Howdyshell, CEERD-CF-M. The Director of CERL is Dr. Alan W. Moore.

CERL is an element of the U.S. Army Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers. The Commander and Executive Director of ERDC is COL James R. Rowan, and the Director of ERDC is Dr. James R. Houston.



# 1 Introduction

## Background

*Facility Composer* is a suite of tools for use by facility planners, designers, and engineers during the initial phases of facility planning and design. While originally developed to support the design of government facilities, *Facility Composer* is based on the general concepts of: (1) providing a method to effectively and creatively create and use criteria libraries, (2) providing support for architectural programming and project specific criteria specification during interactive design charrettes or at the designer's desktop, and (3) supporting the creative and analytical aspects of architectural conceptual design involving the creation of one or many solutions from the specified criteria in an intuitive design environment.

While not enforcing any particular design process, *Facility Composer* is designed to be able to support the process flow shown in Figure 1.

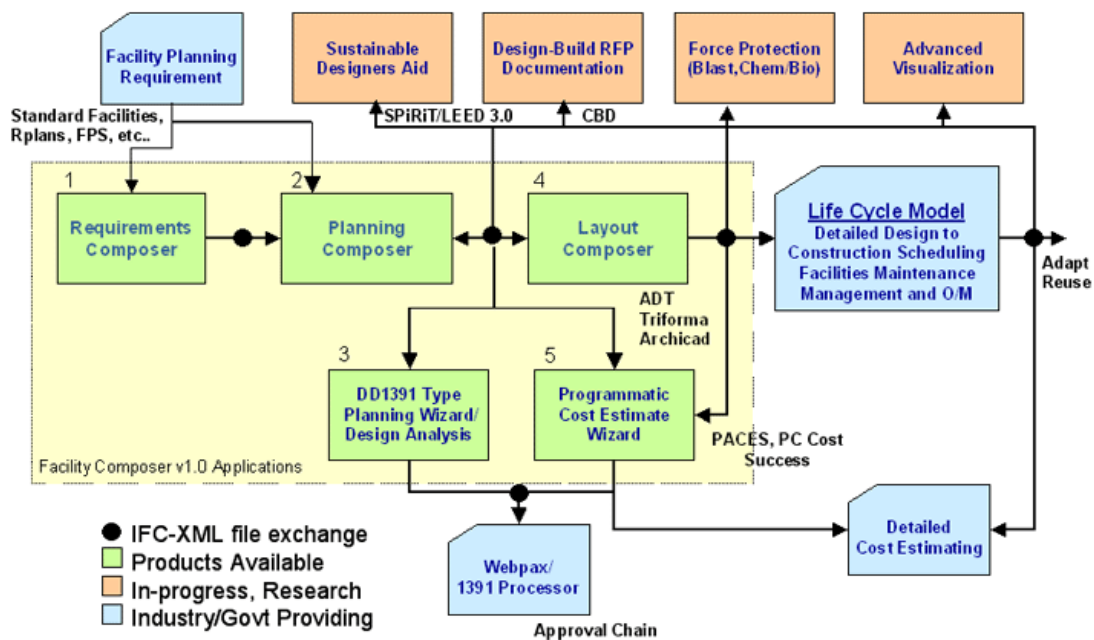


Figure 1. Facility Composer data flow.

The most important concept of *Facility Composer* is the program associates **customer-specific and computable criteria** with a growing facility model that continues throughout the life cycle of the facility. While many volumes of government design criteria exist in the form of design guides, regulations, technical manuals, and web pages, few, if any, of these are expressed in a computable format. In addition, current design systems do not provide a way to directly interact with these criteria, nor do they provide an efficient way to extend the functionality of an application to directly support criteria usage. With the evolution of facility modeling standards, these restrictions will be overcome by emerging design systems.

In *Facility Composer*, criteria can be associated with different project elements based on the appropriate level of detail, from the **project** to the **site**, the **building**, **story**, **function**, down to the individual **space**. For example, *Facility Composer* allows one to specify that a target schedule and cost be associated with a project, that masonry exterior walls and a steel structure be used on a building, that 32-Watt T-8 florescent lights be used in corridors and 50 foot-candles be maintained in the offices, and that a particular room will have VCT flooring. *Facility Composer's* ability to maintain a linkage between criteria and project elements (site, building, story, etc.) provides many benefits:

- It helps ensure that critical criteria are followed, and that desired characteristics are recorded and addressed.
- It helps organize criteria and makes it available at its point of use. It helps in defining criteria and can help in recording its rationale.
- It simplifies creation, maintenance, and distribution of new criteria. For example, as requirements that better implement sustainable design principles are developed, these are added to an organization's standard library for use in subsequent projects. These libraries are typically organized around facility type, but are not required to be.

It helps support rapid conceptual and detailed design & analysis (cost, structural, HVAC, energy, electrical, O&M, etc.) either directly or through standards, such as the [International Alliance for Interoperability's Industry Foundation Classes \(IAI-IFC\)](#) and [Building Lifecycle Interoperable Software \(BLIS\)](#).

Owners with numerous facility holdings, in particular, reap benefits from this approach as it helps ensure the initial design satisfies their corporate criteria, shortening the review process and avoiding "design by review." All of these benefits result in cost and time savings by reducing the number of user changes made late in the design process or during construction. Design quality is also enhanced, as many alternatives can be explored rapidly.

The primary tools in the *Facility Composer* application suite include:

- **Requirements Composer**, a web-based application that helps in the development of corporate and building specific criteria libraries
- **Planning Composer**, which helps users create an architectural program and to set values for project specific criteria
- **Layout Composer**, provides an environment for the designer/user to rapidly create 2D and 3D conceptual facility designs solutions
- **Wizards** that provide support for various discipline specific issues and assist in the completion of individual design tasks and calculations.

## Objective

This objectives of this work was to document and illustrate the use of the *Planning Composer* program.

## Approach

Principle functions of the *Planning Composer* program were reviewed, and steps for each function were outlined and illustrated.

## Scope

This work focuses on examples and discussions illustrating use of *Planning Composer*. This work assumes that the user has already acquired and installed the *Planning Composer* software. Installation procedures may be found in the *Planning Composer User's Guide*, Chapter 3.

## Mode of Technology Transfer

This work supports the implementation and use of *Planning Composer*, which is being developed as part of the Totally Integrated Project Delivery (TIPD) program. This report will be made accessible through the World Wide Web (WWW) at URL:

<http://www.cecer.army.mil>

## 2 Planning Composer Tutorial

Planning Composer is used to develop a facility “architectural” program and to add and set project specific criteria. This includes traditional information such as the total project area and allocation of area to specific architectural functions such as circulation and offices. It also contains discipline-specific criteria such as requirements for structural, electrical, HVAC, lighting, and plumbing. The level of detail in the architectural program varies from project to project, and can be specified as such in the system.

With just a few parameters set, the information in Planning Composer is sufficient to prepare a preliminary cost estimate and schedule. For example, it is acceptable to create a project that contains a list of architectural functions and their allocated areas without deciding how many buildings will be required. On the other hand, the planner may create a project with detailed information such as the number of buildings and the number of stories in each building. Obviously, the latter cost estimate will be more accurate. Typically, the planner will not create such a detailed program from scratch, but will copy it from a similar project and tailor it to suit the current customer’s needs. Users benefit from Planning Composer not only because it provides a method to capture, use, and reuse this explicit criteria, but also because it can often assist designers by providing a deeper understanding of the rationale behind certain decisions, from which other, better, solutions could be considered.

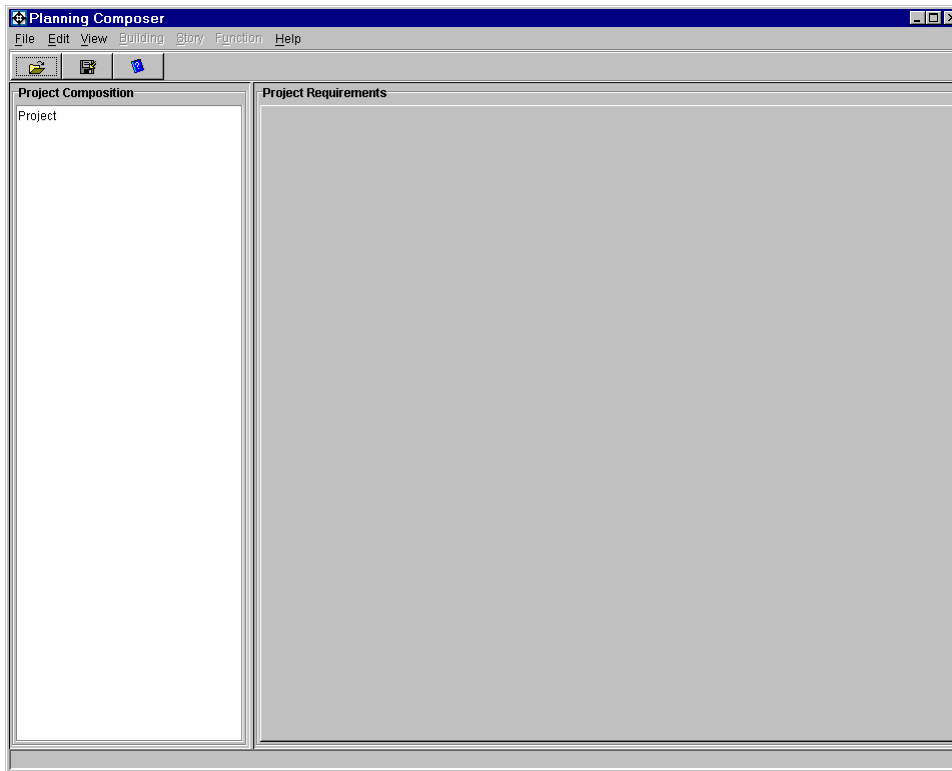
### Creating a New Project in Planning Composer

This chapter presents some practice exercises that demonstrate some of the key features of *Planning Composer* and also some possible approaches to using *Planning Composer* at different stages of the planning process.

Start **Planning Composer** by clicking on the desktop startup icon:



**Result:** The Main Planning Composer screen appears (Figure 2). The screen is currently blank.

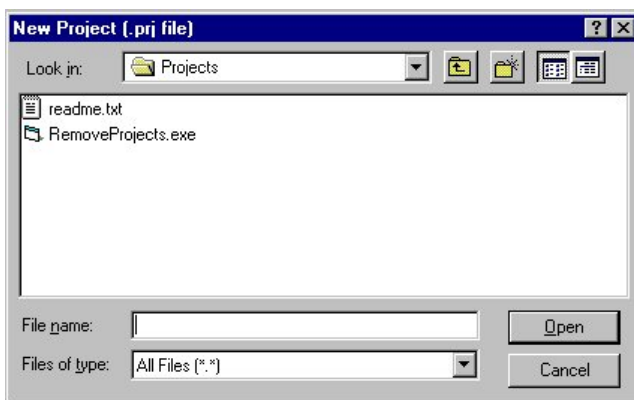


**Figure 2.** Main Planning Composer screen.


At this point, you may open an existing project if you have one, or you may create a new project, as we will do in this exercise.

From the **F**ile menu, choose **N**ew, and then **P**roject.

*Result:* The New Project dialog box opens (Figure 3).



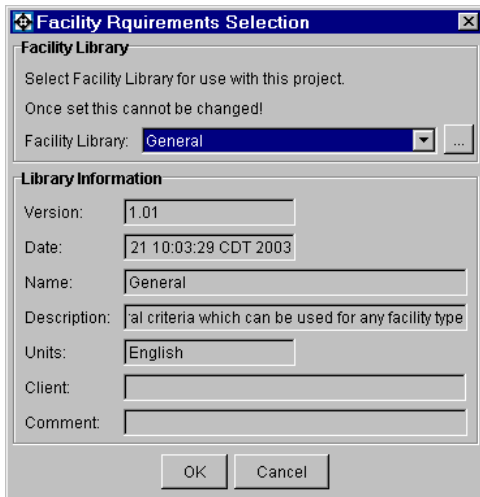
**Figure 3.** New Project dialog box.

Enter a meaningful file name for the new project and click the  button. (The name you choose will be assigned to the project file. A directory will also be

created using this name to hold the project data.) This example will call the new project, Project1.

## Setting the Default Library

The new project may take a moment or two to load, after which the **Facility Requirements Selection** dialog box will appear (Figure 4).



**Figure 4. Facility Requirements Selection dialog box.**

Here you will select the Facility Library for use with this project. At your site, you may have access to a number of libraries containing object criteria and function templates. The dropdown menu will display your options. If you have saved libraries, that do not appear in the dropdown bar, click the  button next to the dropdown bar to manually browse for your library. Once you have chosen a default or baseline facility library and committed by clicking the **OK** button, this library is permanently linked to your project and may not be changed at a later time, although additional libraries may be added over the course of the project by adding Components. If you need to access a different base library at some future date, you will need to create a new project.

The bottom portion of the **Facility Requirements Selection** dialog box displays the **Library Information**. Select a library in the top portion of the screen and view the information about this library here. Make special note of the **Units** field. This field specifies the unit of measure used for the criteria/requirements in this library. If the unit is set to Metric, then all linear measurements will be in millimeters and all area measurements will be in square meters; if the unit is English, then all linear measurements will be in feet and all area measurements

will be in square feet. This is an important consideration and may not be changed later, so choose a library whose units are appropriate for your project.

For this exercise, choose General – English. The standard unit for our project will be English units. Click the  button to complete the selection.

As stated previously, once the Facility Library has been set for the project, it cannot be changed.

**Result:** The main screen opens again (Figure 5). This time the **Project** and **Site** are displayed in the **Project Composition** panel. The name of the open project file appears across the top of the window, along with the base Unit and the Alternative name. (Alternatives will be discussed later in the manual.)

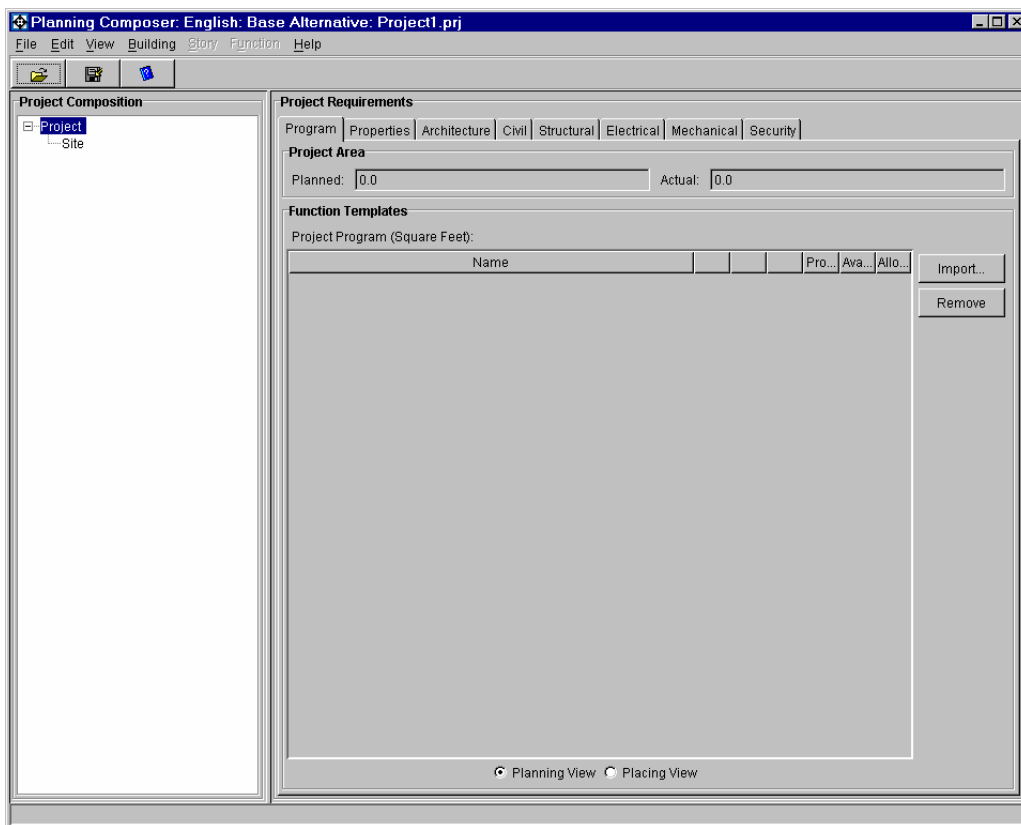


Figure 5. Main Planning Composer screen after opening a new project.

## Assigning Project and Site Codes

With the Project level highlighted in the Project Composition panel, click the **Properties** tab in the **Requirements** panel. Enter a project **Display Name**

(this sample uses CONF CENTER) and a descriptive **Name** for the project such as MIDWEST CONFERENCE & TRAINING CENTER. At the project level, you have the opportunity to provide some other project information. You may enter values for **Project Number**, **Fiscal Year**, **Prepared Date**, and **Prepared By**. The **Unit** field is already populated based on the library that you had previously chosen. Press the <ENTER> key to update the **Project Composition** tree.

In the **Project Composition** tree in the left portion of the screen, click the **Site** object. (Bear in mind that the right panel of the screen, **Requirements**, is directly linked to the current (or selected) object in the **Project Composition** tree or left panel of the screen. If **Site** is chosen, then the **Requirements** panel displays information specific to the site. If the **Project** is chosen, then the **Requirements** panel displays information that applies to the entire project.)

Click the **Properties** tab in the **Requirements** panel. Here is where you specify the basic site properties.

In the **Display Name** field, type a short code or label for this project. This example uses the display name, CHAMPAIGN. If you wish, use the **Name** field to enter a longer descriptive project name. At the site level you may also enter values for **City**, **State**, and **Zip Code**. Press the <ENTER> key when you have finished.

**Result:** The **Project Composition** tree is updated to display the site name (Figure 6).

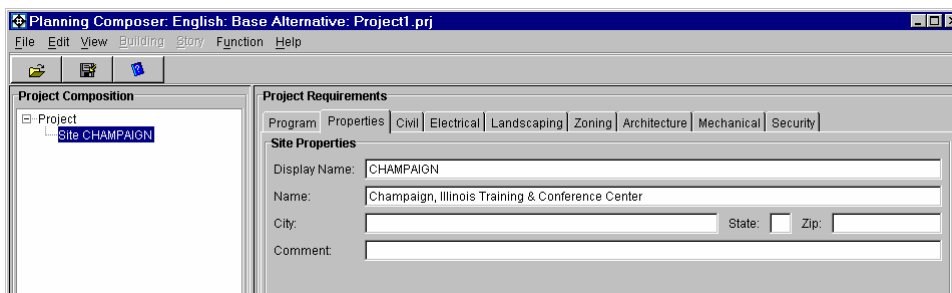


Figure 6. Project composition tree showing updated site name.

## Adding Function Templates to a Site

At the early conceptual stage of the planning process, the planner will begin to think about the functional requirements for the project. **Planning Composer** can streamline this process.



The library that we chose when the project was created contains a list of function templates that will be used as the preliminary building blocks in designing this concept and coming up with a very basic cost estimate for the center. Assume that this Conference Center contains the facilities, such as a parking lot, a main building with a large conference center and a building to house training facilities. Assume also that budget constraints will limit the final square footage for this center to approximately 50,000 sq ft of indoor space on a site of approximately 80,000 sq ft.

Begin by selecting Site CHAMPAIGN in the Project Composition tree.

Make sure that the **Program** tab is selected in the **Project Requirements** panel. The **Program** tab contains information related to the architectural program for the current object. Notice the **Planning View/Placing View** radio buttons on the bottom of this tab. For this tutorial, we will be using only the **Planning View**. The **Placing View** is used for projects for which space layout operations have already been performed. This function is used within Layout Composer (See Layout Composer User's Manual for more information). Click the **Import...** button next to the **Function Templates** grid (Figure 7).

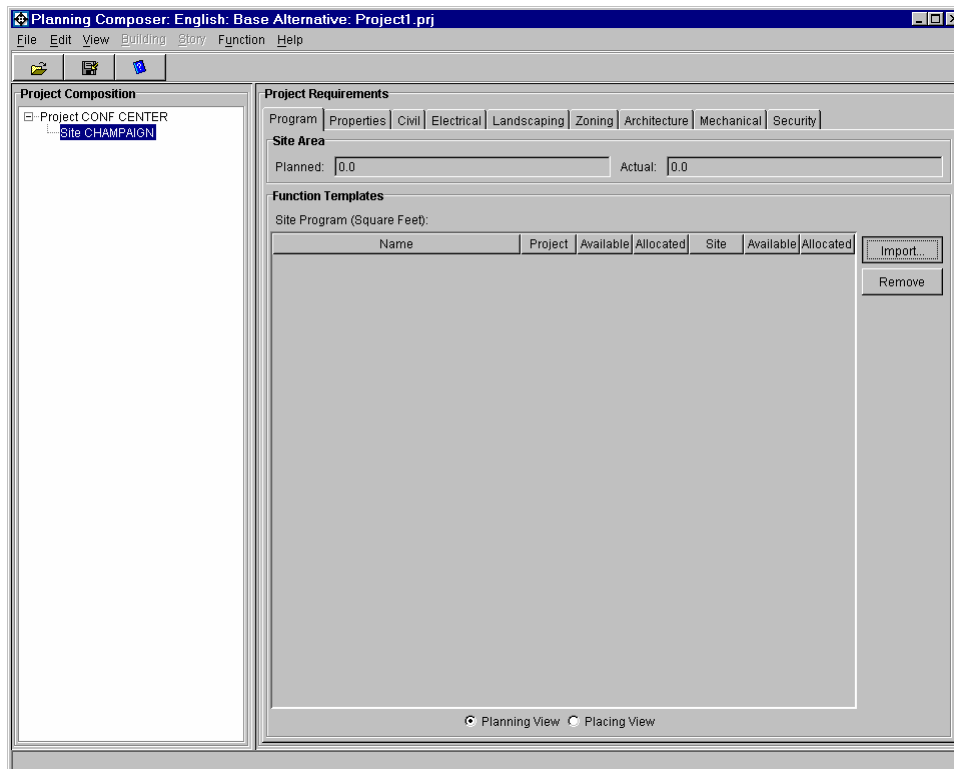
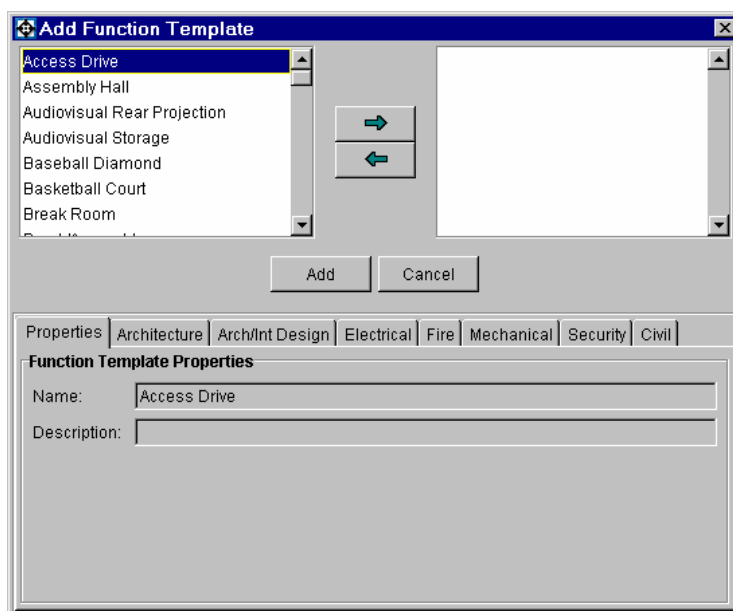



Figure 7. Import button for adding functions.

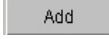
**Result:** The Add Function Template dialog box appears (Figure 8).



**Figure 8. Add Function Template Dialog Box.**

The left window displays the list of function templates that are contained in the Library. Click on one of the templates to select it. Note that the panel on the bottom of the screen changes. Click on the tabs to display the criteria/requirements that come “pre-loaded” with this template. The **Properties** tab displays the basic descriptors for the chosen template. The **Discipline** tabs (Architecture, Electrical, etc.) contain criteria/requirements specific to that particular discipline. The first six discipline tabs shown in Figure 8. (Architecture, Arch/Int Design, Electrical, Fire, Mechanical & Security) are standard and will be present for most templates. However, some function templates may include additional discipline tabs beyond the standard six. The template chosen in *Figure 8* contains an additional tab called “Civil.”

Begin adding templates to our site by selecting a function template for the parking lot. Use the scroll bars, arrow keys, and/or **PgUp/PgDn** keys to locate PARKING LOT in the template list, then click on it to select it. You may click the properties or discipline tabs to browse the criteria/requirements that have already been preloaded into this template. Once your selection has been made in the left panel, click on the  button (or simply double-click the function template name in the left panel). The selected template name will be copied to the right panel to indicate that it is ready to be added to the project. You may also add additional templates to this site, such as BASKETBALL COURT or RETENTION POND.

Click the  button to add all the function templates listed in the right panel of the dialog box to the site. At this point, the **Site Program** grid on the main screen will have been updated to include the added templates (Figure 9).

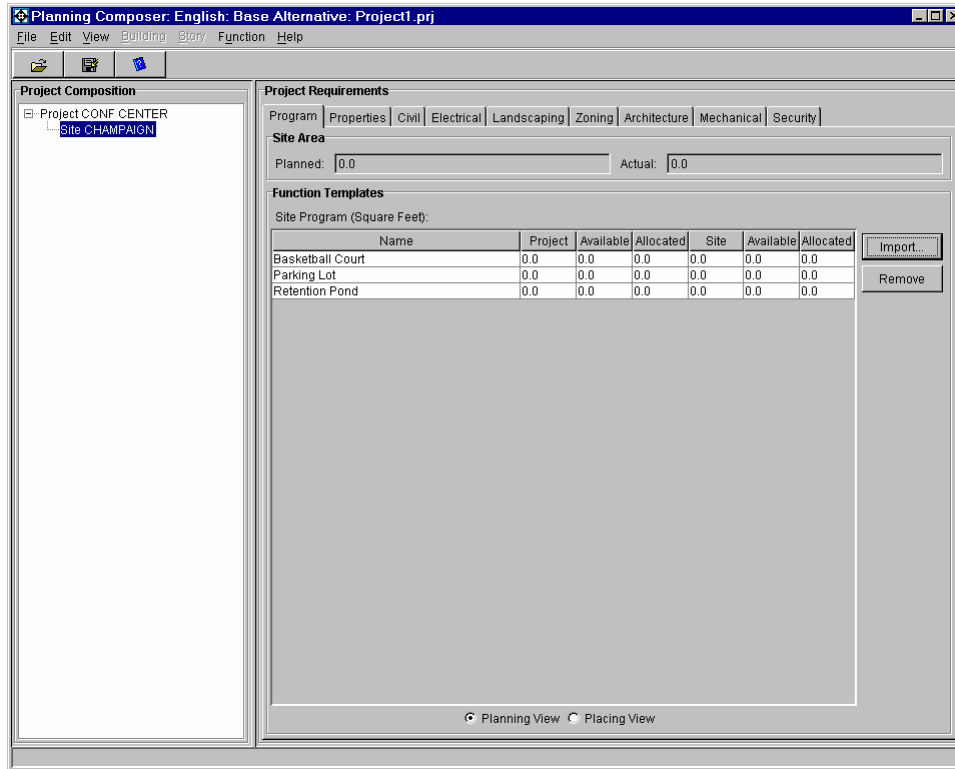


Figure 9. Site program with added architectural templates.

Assign a planned square footage for the parking lot function by double-clicking in the **Site** column in the **Parking lot** row of the grid, backspacing to clear the field, and then typing in a value of 20000. (If you need to widen a column to see the entire column entry or label, then position your mouse cursor over the vertical bar between columns until the arrow appears. Hold down the left mouse button and slide the bar to the desired width.) Notice that the right three columns (Site, Available & Allocated) refer to the space usage for the site level, while the left three columns (Project, Available & Allocated) refer to the space usage for the project level.

Now select **Project CONF CENTER** in the **Project Composition** Tree. Notice that the **Project Program** grid displays (Figure 10).

Name	Project	Available	Allocated
Basketball Court	0.0	0.0	0.0
Parking Lot	0.0	-20000.0	20000.0
Retention Pond	0.0	0.0	0.0

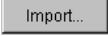
Figure 10. Project Program Showing Roll-Up from Site Program.

The new grid illustrates two key points. First, you will see that adding a function template at the site level automatically adds the template at the project level. The **Project** level is the top node of the **Project Composition** tree and will therefore display a roll-up of all function templates at all nodes beneath it. Secondly, notice that the “-20000” appears in red in the **Available** column. This reminds us that we are currently under-planned and that we need to “Plan” the 20,000 sq ft for the parking lot at the **Project** level.

Double-click in the **Project** column of the grid, backspace to clear the field and enter a value of 20000. Press the <ENTER> key or click in a different cell. The **Available** field changes to 0.



## Adding Function Templates to a Project

At this point, we are ready to add other function templates at the **Project** level.

With the project selected as the current object in the **Project Composition** tree, choose the **Program** tab. Click the  button next to the Architectural Function Templates grid

Use the **Add Function Template** dialog box to select these function templates and any others that you wish to include:

- ASSEMBLY HALL
- CLASSROOM
- COMMUNICATION CENTER
- CONFERENCE
- CORRIDOR
- ELECTRICAL ROOM
- LIBRARY
- OFFICE PRIVATE
- OFFICE SHARED.

Click the  button to choose each template, then once all selections are completed, click the  button.

**Note:** We have added two different templates for office space. This demonstrates the fact that templates for functions in the same general category (such as office space) may vary widely and represent a totally different set of criteria/requirements. Check the criteria/requirements carefully to find the best fit for your project.

## Adding Planned Areas to a Project Architectural Program

At this planning stage, you may want to assign some general space requirements to the architectural program for your project. You may have some general concept of how large the total project will be based on budget constraints, project specifications or occupancy requirements. If you do have some reliable estimates, this is the time to enter them into the **Planned** columns for these templates. This example uses the estimates shown in Figure 11.

Project Program (Square Feet):						
Name				Project	Available	Allocated
Assembly Hall				15000.0	15000.0	0.0
Basketball Court				4000.0	4000.0	0.0
Classroom				7000.0	7000.0	0.0
Communication Center				1000.0	1000.0	0.0
Conference				5000.0	5000.0	0.0
Corridor				0.0	0.0	0.0
Electrical Room				750.0	750.0	0.0
Library				2750.0	2750.0	0.0
Office Private				5000.0	5000.0	0.0
Office Shared				4500.0	4500.0	0.0
Parking Lot				20000.0	0.0	20000.0
Retention Pond				150.0	150.0	0.0

Figure 11. Adding planned areas to a project program.

After typing in each value, press the <ENTER> key. Notice that the **Planned** field in the **Project Area** portion of the screen reflects the total area that has been planned so far in all of the functional areas (Figure 12). (The **Actual Area** will remain at 0 until you place space objects. Placing space objects will be performed in **Layout Composer**.)


Project Area	
Planned: 65150.0	Actual: 0.0

Figure 12. Project area showing total planned area and total actual area.

We could close Project1 at this point having achieved a good first cut of our project program. Though the areas do not represent actual spaces at this time, a rough cost estimate could be generated based on our total area and general functional breakdown. We can also expand on Project1, add some layers of detail, and take the plan to the next level of detail.

## Adding a Building to a Project

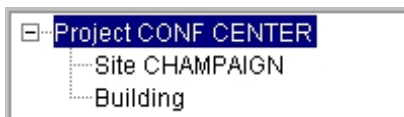
From the **File** menu, choose the **Save as Project** menu option. In the **Save as Project** dialog box, type Project2 into the **File Name** field and then click the

 button. This accomplishes several things, it: (1) saves our first project (Project1), (2) makes a copy of Project1, (3) names the copy Project2, and (4) opens it for editing. Creating an Alternative to the Project can also do this. Planning Composer allows the user to store multiple alternate plans or options all within the same base project. Alternatives will be explained later in this manual.

While Project1 is a bare bones plan consisting of two objects: a **Project** and a **Site**, Project2 will include the next obvious addition to any respectable architectural plan: **Buildings**.

In the **Project Composition** tree, select the **Project**. Right mouse click to bring up a pop-up menu of actions that can be performed at the project level. From the menu, choose **Add Building**. (This same task can be accomplished by choosing **Add Building** from the **Building** menu at the top of the screen.)

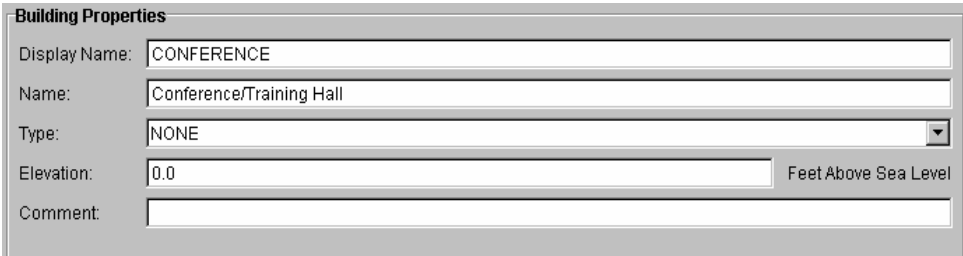
**Result:** A Building appears in the Project Composition tree (Figure 13).



**Figure 13. Project composition tree.**

Select the **Building** in the **Project Composition** tree. It is now the current object.

Click the **Properties** tab in the **Project Requirements** panel. Enter values into the fields as shown in Figure 14.



Building Properties	
Display Name:	CONFERENCE
Name:	Conference/Training Hall
Type:	NONE
Elevation:	0.0 Feet Above Sea Level
Comment:	

**Figure 14. Building properties tab.**

Repeat the previous two steps above to add a second building. Give this one a display name of TRAINING.

**Result:** Figure 15 shows the resultant **Project Composition** tree.

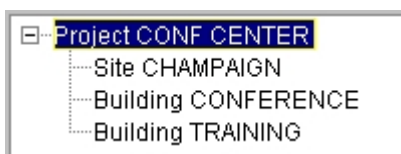


Figure 15. Project Composition tree.

Note that the name you enter in the **Display Name** field displays in the project composition tree.

## Adding Function Templates to a Building

Select the **Project** in the **Project Composition** tree. Select the **Program** tab in the **Project Requirements** panel.

A quick way to add a function template to a building instead of using the Import Button is by using the Drag and Drop method. Select the template in the **Project Program** grid, then holding down the left mouse button, drag and drop it onto the **Building** in the **Project Composition** tree.

To **Building CONFERENCE**, drag and drop these templates:

- ASSEMBLY HALL
- COMMUNICATION CENTER
- CONFERENCE
- CORRIDOR
- ELECTRICAL ROOM
- OFFICE PRIVATE
- OFFICE SHARED.

To **Building TRAINING**, drag and drop these templates:

- CLASSROOM
- COMMUNICATION CENTER
- CONFERENCE
- CORRIDOR
- ELECTRICAL ROOM
- LIBRARY.

Select each building in the **Project Composition** tree. Verify that the templates have now been copied to the **Building Program** for each of the buildings.

Select **Building TRAINING**. In the **Building** column for the “Communication Center” template, enter a planned area of 500 (Figure 16).

Building Program (Square Feet):						
Name	Project	Available	Allocated	Building	Available	Allocated
Classroom	7000.0	7000.0	0.0	0.0	0.0	0.0
Communication Center	1000.0	500.0	500.0	500.0	500.0	0.0
Conference	5000.0	5000.0	0.0	0.0	0.0	0.0
Corridor	0.0	0.0	0.0	0.0	0.0	0.0
Electrical Room	750.0	750.0	0.0	0.0	0.0	0.0
Library	2750.0	2750.0	0.0	0.0	0.0	0.0
Office Private	5000.0	5000.0	0.0	0.0	0.0	0.0
Office Shared	4500.0	4500.0	0.0	0.0	0.0	0.0

**Figure 16.** Building program showing planned area for an architectural template.

Immediately we know that 500 sq ft (out of the 1000 planned for the project) remain in the **Project Available** column for placing elsewhere in the project.

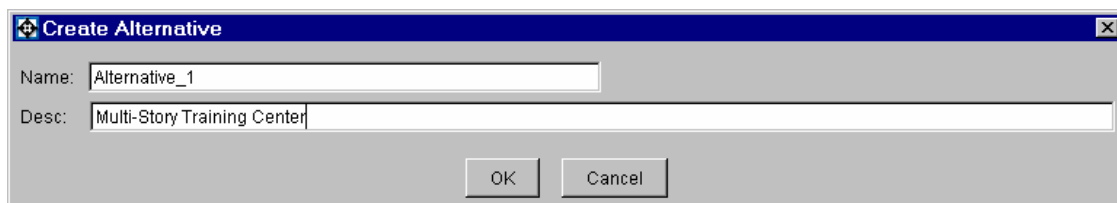
Select **Building CONFERENCE**. In the **Building** column for the “Communication Center” template, enter the remaining 500 sq ft.

## Creating an Alternative to a Project

Next, we will want to plan the usage of the Training Building in our project. Let us keep our options open at this point and experiment a little. One feasible plan may include a one-story building attached by a covered walkway to the Conference Building. An alternate plan might include a multi-story Training building. Planning Composer allows the user to store multiple alternate plans or options within the same project. These options are called **Alternatives**. Each new alternative is based on the **Base** plan. The **Base Alternative** is the name given to the initial alternative at project startup/creation. We will let our current plan be the base alternative and then branch off into a couple of different directions from here.


From the **File** menu, choose **Create Alternative**.

**Result:** The **Create Alternative** dialog box opens (Figure 17).



**Figure 17.** Create alternative dialog box.



The alternative is given a default Name of Alternative\_1, but you may change it if you wish by typing in the name of your choice. In the **Desc** field, add a description that will distinguish this plan from any other alternatives. Click the  button to continue.

**Result:** A confirmation box informs us the alternative was created (Figure 18).



Figure 18. Create alternative dialog.

Next, choose **Open Alternative** from the **File** menu.

**Result:** The **Open Alternative** dialog box opens (Figure 19).

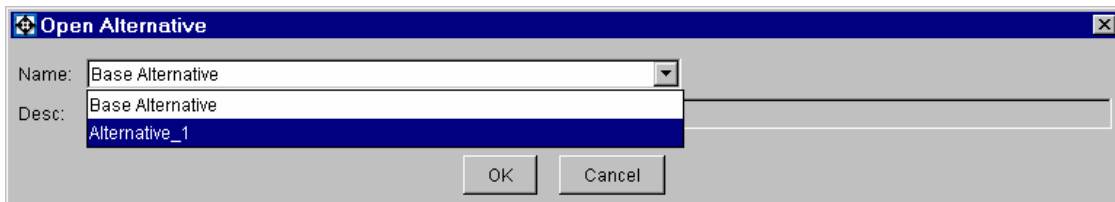






Figure 19. Open alternative dialog box.

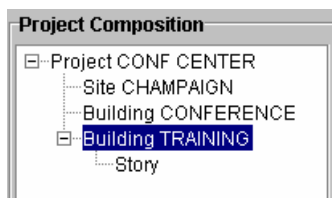
Click the arrow on the dropdown menu in the **Name** field. Note that the choices are **Alternative\_1** (the alternative just created) and the **Base Project**. Choose Alternative\_1, then click the  button.

## Adding a Story to a Building

Select **Building TRAINING** in the **Project Composition** tree, then right mouse click to reveal the pop-up menu. Choose **Add Story**. (Alternatively, select **Building TRAINING**, then select **Add Story** from the **Story** menu at the top of the screen.)

Notice that a  appears in the **Project Composition** tree next to the **Building TRAINING** object. The  indicates that the tree may be expanded at this point to reveal the next level. Click the  to expand the tree.

**Result:** A **Story** appears in the tree (Figure 20). It occupies the position one level below **Building TRAINING**.



**Figure 20.** Project composition tree with a story.

Repeat the step above to add an additional story to **Building TRAINING**.

Select the first **Story** object. Click the **Properties** tab and enter a **Display Name** of **T1**. In the **Name** field, enter a description such as **Training Center - Ground Floor**. Leave the **Elevation** value at **0** for now.

Select the second **Story** object. Click the **Properties** tab. This time enter **T2** into the **Display Name** field. Enter **Training Center - Second Floor** into the **Name** field. Again, leave the **Elevation** set to 0.

From the **View** menu, choose **Refresh**. Click the **+** next to **Building TRAINING**. Note that the stories may not be listed by the story **Display Name** or **Name** as you might expect. The stories are ordered in the **Project Composition** tree by the elevation values.

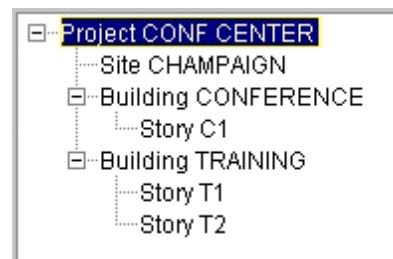
Select **Story T1**. On the **Properties** tab, set the **Elevation** to **0** feet (since this is the ground floor) and on the **Architecture** tab set the **Floor-to-Floor-Height** to **14** feet.

Select **Story T2**. On the **Properties** tab, set the **Elevation** to **13.33** feet and on the **Architecture** tab set the **Floor-to-Floor-Height** to **14** feet.

Refresh the tree again. This time the stories appear in proper order. The **Refresh View** feature is useful for displaying changes made to objects on the tree.

Now add a single story to **Building CONFERENCE**. Give it a **Display Name** of **C1** and an appropriate **Name**, **Elevation**, and **Height** (Figure 21).

**Note:** The **Project Composition** tree has gained some new branches. Notice the hierarchical relationship between the **Project**, **Site**, **Building** and **Story** objects.



## Adding Function Templates to a Story

Use the same Drag and Drop method used to copy function templates from the **Project** level to the **Building** level to copy function templates from the **Building** level to the **Story** level.

**Figure 21. Single story added to Building CONFERENCE.**

Select **Building CONFERENCE**. Click the **Program** tab. Drag and drop ALL the function templates to **Story C1** from **Building CONFERENCE**.

**Hint:** A quick way to select all the function templates is to select the first template, then while holding down the <SHIFT> key, select the last template.

Select **Building TRAINING**. Click the **Program** tab. Drag and drop ALL the function templates from **Building TRAINING** to **Story T1**.

An alternate method for adding function templates to a story is to select **Story T1** under **Building TRAINING**, then click the **Program** tab. Click the  button next to the **Architectural Function Templates** grid. This opens the **Add Function Template** dialog box. Locate and double-click the function template called AUDIOVISUAL STORAGE. Click the  button to complete the addition.


**Note:** Since the AUDIOVISUAL STORAGE template had not previously been added to **Building TRAINING**, it would be added to the building level at this point. Adding a template to a “lower” node of the project hierarchical structure automatically adds it to the higher nodes. In other words, adding a template at the **Story Program** level, also adds that template to the **Building Program** and **Project Program**. This is because the **Building Program** includes a roll-up of all of the **Story Programs** for that building. The **Project Program** includes a roll-up of all architectural programs in the entire project.

## Adding Project Specific Criteria/Requirements to an Object

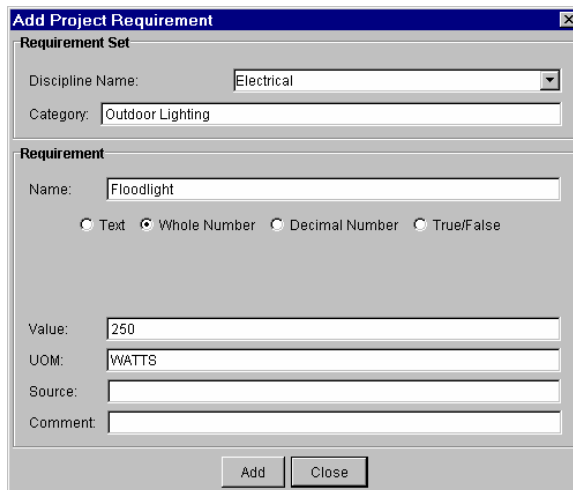
We may add custom design criteria/requirements to any object in the **Project Composition** tree. Suppose that we need to stipulate some special outdoor lighting criteria/requirements for the Training Center entrance. These criteria/requirements will be specific to **Building TRAINING**. These criteria/requirements will not be copied to the template library.

Select the **Building TRAINING**. Seven pre-defined tabs are labeled in the Project Requirements panel: **Architectural, Electrical, Fire, Mechanical, Structural, Civil, & Security**. These tabs are used to store criteria/requirements in any of these different disciplines or categories. Depending on the library that you loaded at project creation, you may have inherited some building-specific criteria/requirements. You may click the discipline tabs to browse this data if it exists.

Click the **Electrical** tab. If there were no lighting requirements loaded for this building at project creation time, the notation “No Requirements Defined” will be displayed on the **Lighting** tab for this site.

Click the  button.

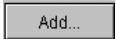
**Result:** The Add Project Requirements dialog box opens (Figure 22).



**Figure 22.** Add project requirements dialog box.

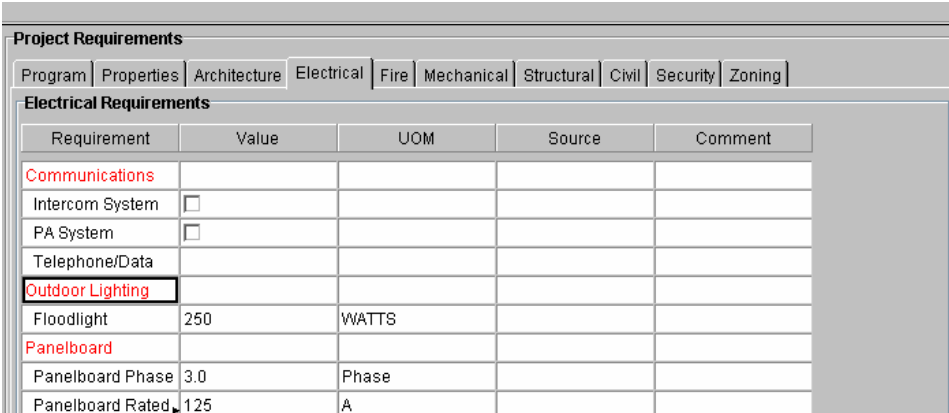
Choose Electrical from the dropdown menu for **Discipline Name**. Decide on a name for this **Category**. Enter a descriptive **Name** for the **Requirement**. Since this requirement requires a numerical parameter, we will choose the Whole Number data type radio button.

There are four data types to choose from. The data type choices include: (1) **Text** for textual data such as “Incandescent,” (2) **Decimal** for numerical values that will include decimal places such as “0.00056,” (3) **Whole Number** for numerical values without decimal places such as “100” or “-50” and (4) **True/False** where the only allowed values are either “True” or “False.” Enter the criteria **Value** (in this case 250) and enter the **UOM** (unit of measure) in which the value is recorded. (We used WATTS.) The **Source** field can be used to designate the source or regulation that has initiated this requirement. The **Comment** field provides a place to document any additional information about the requirement.

Click the  button when field entry is complete.

Since we will not be adding any more Project Requirements at this point, click the  button to return to the **Electrical** tab.

**Result:** The criteria that we added appears in the **Electrical** Tab criteria grid (Figure 23).



Project Requirements				
Electrical Requirements				
Requirement	Value	UOM	Source	Comment
<b>Communications</b>				
Intercom System	<input type="checkbox"/>			
PA System	<input type="checkbox"/>			
Telephone/Data				
<b>Outdoor Lighting</b>				
Floodlight	250	WATTS		
<b>Panelboard</b>				
Panelboard Phase	3.0	Phase		
Panelboard Rated	125	A		

**Figure 23.** Project requirements panel showing added requirement.

**Note:** It is worth noting some special properties of the criteria grid. These properties are true for criteria that the user adds as well as for criteria that come from a library. The criteria grid displays the **Category** name in red. Values that appear in black are editable. Generally speaking for criteria that comes from the startup library, the **Value** column and **Comment** column are editable, while the **UOM** and **Source** columns are not. A non-editable field appears in gray on the grid. The **Comment** field provides a place for the user to add any additional information about the requirement. It is especially useful for annotating the reason when a user decides to over-ride the default value from a library with a project-specific value.

## Adding a New Discipline tab

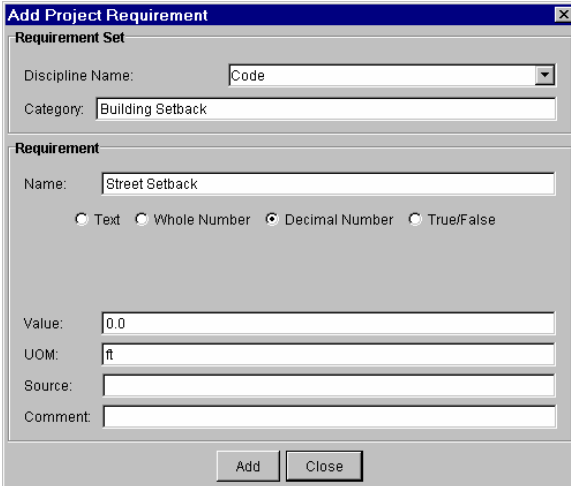
In addition to the outdoor lighting, perhaps we need to provide some code information regarding the required street setback for the building. This requirement does not clearly fall into any of the existing discipline tabs. It would be handy to add a new discipline called: Code.

Select the **Building TRAINING** once again.

Select any of the **Discipline** tabs in the **Project Requirement** panel.

Click the  button.

This time, instead of choosing any of the existing tabs from the **Tab Name** drop-down menu, type Code into the **Discipline Name** field (Figure 24).



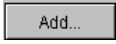

The screenshot shows a dialog box titled "Add Project Requirement". It is divided into two main sections: "Requirement Set" and "Requirement".

- Requirement Set:**
  - Discipline Name:** A dropdown menu with "Code" selected.
  - Category:** A text field containing "Building Setback".
- Requirement:**
  - Name:** A text field containing "Street Setback".
  - Data Type:** Four radio buttons: "Text", "Whole Number", "Decimal Number" (which is selected), and "True/False".
  - Value:** A text field containing "0.0".
  - UOM:** A text field containing "ft".
  - Source:** An empty text field.
  - Comment:** An empty text field.

At the bottom of the dialog box are two buttons: "Add" and "Close".

**Figure 24.** Add project requirement dialog box showing addition of a new discipline tab.

Enter Building Setback into the **Category** field and Street Setback into the **Name** field for this requirement. Click the Decimal Number data type radio button, enter 0.0 into the **Value** field and enter ft into the **UOM** field. You may also add a **Source** and **Comment** if you wish.

Click the  button and then the  button and the new Discipline Tab will appear. Click on the new **Code** tab.

**Result:** The **Project Requirements** panel contains a tab labeled **Code** containing the new requirement (Figure 25).

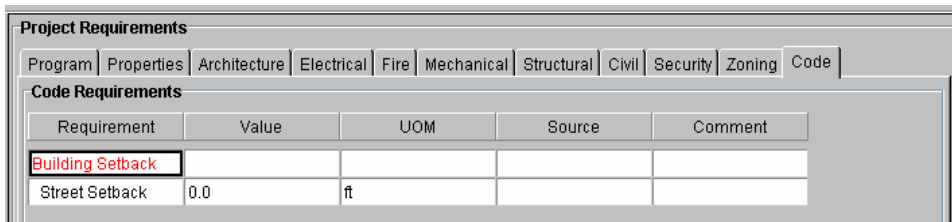


Figure 25. Project requirements panel showing new discipline tab and requirement.

## Adding a Function to a Story

So far we have talked about function templates. We know that they come from a library. We know they represent a set of criteria associated with a specific function or need that the project must address. We know that they can be added to Facility Composer objects, namely **Projects**, **Sites**, **Buildings**, and **Stories** for general planning purposes. The template is used to create the next object in our **Project** hierarchical structure: **Functions**.

You are probably familiar with the concept of a template. You may have used a drawing template for a drafting project or a word processing template to create a document. The template supplies the pattern or starting point for creating an object. In general, you supply the substance to make the object unique and useful to you. In this case, the function that you add to your building project will be customized to the specific needs of your client. Though the template provides a rough cut, the **Function Instance** provides a precise fit for your project.

Select **Story T1** in **Building TRAINING**. Right-mouse click to display the pop-up menu. Select **Add Function**. (Alternatively, Select **Add Function** from the **Function** menu at the top of the screen.)

**Result:** The **Add Function Instance** dialog box opens (Figure 26).

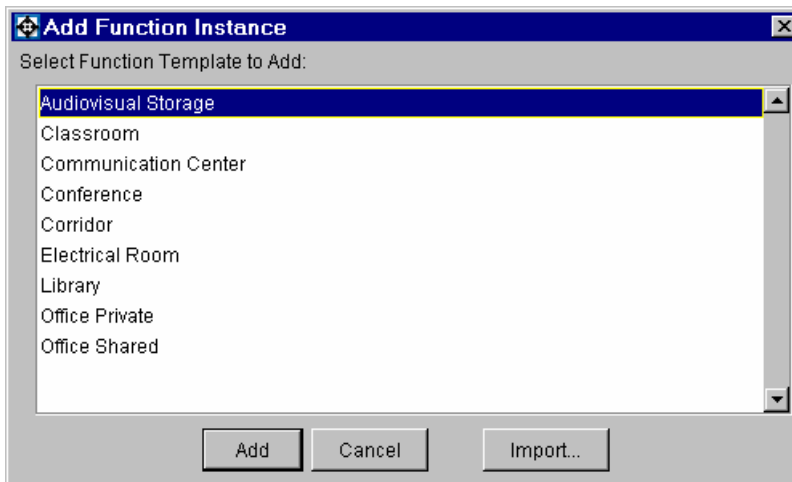


Figure 26. “Add function” instance dialog box.

Note that all the function templates that have been added to this story appear in the list. We would like to add a function to the story for all of these templates. To select all, you can either hold down the <CTRL> key and select each of the templates or select the first one, hold down the <SHIFT> key and select the last one. Then click the  button. Also note that by clicking the  button you can return to the Add Function Template dialog box and add templates that you had not added previously.

Click the  that now appears next to the **Story T1** object. The **Project Composition** tree expands to reveal the new functions (Figure 27). (If you cannot see the entire function name in the **Project Composition** panel, then drag to the right the bar located between the **Project Composition** panel and **Project Requirements** panel. Or, slide to the right the scroll bar on the bottom of the **Project Composition** panel.)

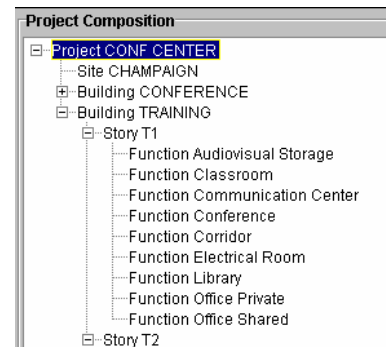
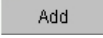



Figure 27. New functions in Project Composition tree..

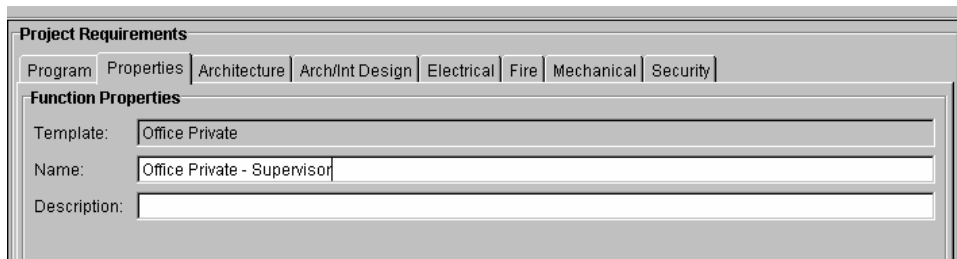
Next, Select **Story T2** for **Building TRAINING**. Notice that we have added no templates to **Story T2** yet. Right-click on **Story T2** and choose **Add Function** from the pop-up menu. Once again, the **Add Template Instance** dialog appears. You will notice that the templates that have been added at the **Building** level appear in the dialog box. When no templates exist at the **Story** level, Planning Composer looks for templates at the next higher (or **Building**) level. Select CLASSROOM, CONFERENCE, CORRIDOR, OFFICE PRIVATE, and OFFICE SHARED. (Hold down the <CTRL> key and select each one.) Then click



the  button to create **Story T2** functions based on these five templates. Click the  next to **Story T2** in the **Project Composition** tree to display the five new **Function** objects.

## Changing Function Attributes

Select the Function OFFICE PRIVATE on Story T2. Click the Properties tab (Figure 28).



**Figure 28. Properties tab for an architectural template showing renamed template.**

On this tab, you see the name of the template on which this function was based and the name of this function. Currently, the function name is the same as the template name. Change the function name to OFFICE PRIVATE – SUPERVISOR. Press the <ENTER> key.

Choose the **Electrical** tab. Hopefully, lighting requirements will already exist for this function and look something those shown in Figure 29. If this is not the case, then follow the steps for **Adding Project Specific Criteria/Requirements** and add the requirement **Illuminance Required**.

Requirement	Value	UOM	Source	Comment
<b>Communications</b>				
PA Speakers	None			
PA Speakers Local	None			
Telephone Outlet	0	Total		
Telephone Outlet Type	Wall			
Telephone/Data	0	Total		
Telephone/Data Device	[not set]			
<b>Lighting</b>				
Accent Light Quantity	0	Total		
Accent Light Source	None			
Accent Light Type	None			
Emergency Fixture	0	Total		
Emergency Fixture Type	None			
General Illumination	Fluorescent			
General Illumination Quantity	0	Total		
General Illumination Type	Fluorescent Lay-ins			
Illuminance Required	30.0	fc		
Switch Type	Single			
<b>Loads</b>				
Electronic Equipment	0.0	kW		
Lighting Load	0.0	watts per square		

Figure 29. Project requirements panel showing function attribute to be changed.

Change the **Illuminance Required** value from 0.0 to 30.0.

Select **Function OFFICE PRIVATE** under **Story T1**. On the **Properties** tab, enter OFFICE PRIVATE – SUPERVISOR into the **Name** field. This will name this function the same as the **Function OFFICE PRIVATE – SUPERVISOR** function for **Story T2**. We can do so **ONLY** because both of these functions are based on the same function template, namely “OFFICE PRIVATE.” The advantage of doing this is that we inherit the criteria that we previously entered for this **function OFFICE PRIVATE – SUPERVISOR**. This illustrates an important concept when dealing with functions: Functions with the same name have the same criteria. Click the **Electrical** tab to verify.

Though these functions do not represent actual spaces at this time, they provide the groundwork for the next phase of **Facility Composer**, namely **Layout Composer**. For the present time, you may do some general space planning by entering the **Planned Areas** into the **Building Programs** and **Story Programs**.

## Adding Planned Areas to a Building Architectural Program

Earlier, we planned space usage at the **Project** level. A next logical step would be to breakdown our space planning further by assigning planned areas at the **Building** level, the **Story** level and to the **Function** level. We will plan the **Building** level first. However, there is no reason that you could not begin with the **Story** or **Function** levels if you wish. The **Planning Composer** program is designed to be flexible so that space planning could be approached from the top-down or from the bottom-up. Either way, the user can arrive at the same final goal, which is to achieve a space allocation plan for a project.

Recall that our project plan calls for approximately 65,150 sq ft with approximately 41,000 sq ft dedicated to buildings. We have two buildings in our plan, a **CONFERENCE** building and **TRAINING** Building. Assume that the list of functional templates that we have added is complete and comprehensive. That said, we may begin to break down our space allocation. Allow approximately 21,000 sq ft for the Conference Center, approximately 20,000 for the Training Center (10,000 per story).

Select **Building CONFERENCE** in the **Project Composition** tree. Select the **Program** tab. The Building Program grid will appear (Figure 30).

Now enter preliminary values into the **Building** column for each of the various functions. Note the relationships between the columns as you enter values. The **Planned Area** total at the top of the **Building Program** panel (Figure 31) keeps you apprised of the planned total area for the current building. The first three columns after the function name in each row display project level area values. The **Available** column in this block is useful because it displays the area that is still available to be planned at the project level. If this value is negative or displayed in red, the area has been over-planned at the project level.

Building Area							
Planned: 19400.0				Actual: 0.0			
Function Templates							
Building Program (Square Feet):							
Name	Project	Availa...	Allocat...	Building	Availa...	Allocat...	
Audiovisual Storage	0.0	-400.0	400.0	400.0	400.0	0.0	
Classroom	7000.0	0.0	7000.0	7000.0	7000.0	0.0	
Communication Center	1000.0	0.0	1000.0	500.0	500.0	0.0	
Conference	5000.0	1000.0	4000.0	1000.0	1000.0	0.0	
Corridor	0.0	-1900.0	1900.0	900.0	900.0	0.0	
Electrical Room	750.0	0.0	750.0	350.0	350.0	0.0	
Library	2750.0	0.0	2750.0	2750.0	2750.0	0.0	
Office Private	5000.0	2000.0	3000.0	2500.0	2500.0	0.0	
Office Shared	4500.0	0.0	4500.0	4000.0	4000.0	0.0	

Figure 30. Sample building program for building CONFERENCE.

Building Area						
Planned: 20900.0			Actual: 0.0			
Function Templates						
Building Program (Square Feet):						
Name	Project	Availa...	Allocat...	Building	Availa...	Allocat...
Assembly Hall	15000.0	0.0	15000.0	15000.0	15000.0	0.0
Communication Center	1000.0	0.0	1000.0	500.0	500.0	0.0
Conference	5000.0	1000.0	4000.0	3000.0	3000.0	0.0
Corridor	0.0	-1900.0	1900.0	1000.0	1000.0	0.0
Electrical Room	750.0	0.0	750.0	400.0	400.0	0.0
Library	2750.0	0.0	2750.0	0.0	0.0	0.0
Office Private	5000.0	2000.0	3000.0	500.0	500.0	0.0
Office Shared	4500.0	0.0	4500.0	500.0	500.0	0.0

Figure 31. Sample building program for building TRAINING.

## Adding Planned Areas to a Story Architectural Program

A next step, if you choose, is to assign **Planned Areas** at the **Story** level. For **Building TRAINING** in our example (Figure 32), you may enter **Planned Area** values for **Story T1** and **Story T2**. Total Planned area for both stories combined should be close to the total planned area for the building that we previously estimated at 20,000 sq ft.

Enter **Planned Area** values for each story until you achieve the desired breakdown.

Story Area						
Planned: 10400.0			Actual: 0.0			
Function Templates						
Story Program (Square Feet):						
Name	Building	Availa...	Allocat...	Story	Availa...	Allocat...
Audiovisual Storage	400.0	0.0	400.0	400.0	400.0	0.0
Classroom	7000.0	5000.0	2000.0	2000.0	2000.0	0.0
Communication Center	500.0	0.0	500.0	500.0	500.0	0.0
Conference	1000.0	0.0	1000.0	1000.0	1000.0	0.0
Corridor	900.0	0.0	900.0	900.0	900.0	0.0
Electrical Room	350.0	0.0	350.0	350.0	350.0	0.0
Library	2750.0	0.0	2750.0	2750.0	2750.0	0.0
Office Private	2500.0	1500.0	1000.0	1000.0	1000.0	0.0
Office Shared	4000.0	2500.0	1500.0	1500.0	1500.0	0.0

Figure 32. Sample story program for Story T1, building TRAINING.

## Adding Planned Areas to a Function Architectural Program

A final step is to plan area at the **Function** level. The **Area Desired** dialog box provides the user a great deal of flexibility in entering planned areas at this level.

Select Function Office Shared on Story T1.

**Result:** The Function Program grid should look like the grid displayed in Figure 33.

Function Program (Square Feet):						
Name	Story	Available	Allocated	Function	Available	Actual
Office Shared	1500.0	1500.0	0.0	0.0	0.0	0.0

**Figure 33. Function program grid.**

Click the mouse over the “0.0” in the **Function** column in the grid.

**Result:** The **Area Desired** dialog box opens (Figure 34).

**Figure 34. Area desired dialog box.**

Click on the arrow in the **Target (=)**dropdown list box (Figure 35) and observe the choices for entering planned area.

**Figure 35. Choices for added planned area at the function level.**

For **Function Office Shared**, we will choose the **Area/Person (x \* occupancy)** option, because we want to base our planned area on office occupancy (Figure 36).

Figure 36. “Area desired” dialog box – “occupancy per person” option.

Enter 100 into the **Area Per Person** field. Enter 5 into the **Occupant Load** field. Then click the  button. Notice that the **Function** planned area in the Function Program grid changes to 500 sq ft.

## Generating a Report

Three types of reports can be generated at this time. This exercise will go through the steps of generating a Programmed Area Report. Chapter 3 of the *Planning Composer User’s Guide* describes how to generate a Function Usage or Full Project Listing report.

### Programmed Area Report

From the File menu, choose Report, and then Programmed Area Report.

**Result:** Programmed Area Report Dialog box appears (Figure 37).

**Facility Composer Project Definition Report**

**Project Information**  
 Display Name: Army Reserve Training Facility  
 Name: San Jose Training Facility  
 Number: 3125  
 FY: 2005  
 Units: English

**Program Information**  
 Function Templates

Name	Planned	Actual
Classroom	1200.0	0.0
Generic Type 2	1225.0	0.0
Locker Room	1800.0	0.0
Office Full Time Private	1280.0	0.0
Unit/Individual Storage 16 x 32	0.0	0.0
Unit/Individual Storage 32 x 32	0.0	0.0
Vending Alcove	48.0	0.0
Supply Room	240.0	0.0
Administrative Support	120.0	0.0
Chair Storage	300.0	0.0
Comidor	2543.0	0.0
Generic Type 3	0.0	0.0
Physical Fitness	1600.0	0.0
Vault Configuration 4	400.0	0.0
Electronic & Communication Repair	120.0	0.0
Facility Maintenance	800.0	0.0

1 of 6.

**Figure 37. Programmed area report.**

Next, Click the Print button at the top of the dialog and select a location to save the report.

**Note:** Make sure when you name the file to “Save As” that you also enter the extension \*.pdf You will need a copy of Adobe Acrobat Reader to view this document.

### 3 Conclusion

In *Facility Composer*, criteria can be associated with different project elements based on the appropriate level of detail, from the project to the site, the building, story, function, down to the individual space. Owners with numerous facility holdings, in particular, reap benefits from this approach as it helps ensure the initial design satisfies their corporate criteria, shortening the review process and avoiding “design by review.” All of these benefits result in cost and time savings by reducing the number of user changes made late in the design process or during construction. Design quality is also enhanced, as many alternatives can be explored rapidly.

*Planning Composer*, one of the primary tools in the Facility Composer suite, helps users create an architectural program and to set values for project specific criteria. This has documented and illustrated the use of the Planning Composer program.



## Glossary

Term	Definition
Actual Area (Placing View)	(Compare to Planned Area) The area of the selected object as determined by Facility Composer; the program calculates this value by totaling the areas of all spaces placed at this object level.
Allocated Area (Planning View)	The total area that has been allocated (assigned) to a function for a particular level of project hierarchy. For example, the total area allocated to a particular function might be different for the story level, building level, and project level.
Assigned Function	(See Function) A function that was explicitly added to a program by the user.
Attribute	(Compare to Requirement) Physical characteristics of an object; for example, the name, height, and elevation of a story.
Building	An object in the Project Composition hierarchy. A building object contains information related to a single freestanding physical structure and can be further broken down by stories, functions, and spaces.
Function	A function can be related to other functions through three different means: <ol style="list-style-type: none"> <li>1. A specialization relationship can exist where one function is the parent function and the other function is the child function, for example, the relationship between an office and private office. A private office is a specialization of the office. The office is the parent function and the private office is the child function.</li> <li>2. A spatial containment relationship can exist where one function physically contains another function, for example, the relationship between a lobby and the reception area. sub-function.</li> <li>3. The final relationship is that of assigned and unassigned functions. This type of relationship supports the "roll-up" capability through item programs.</li> </ol>
Function Template	A Function definition from a library. Templates are the parents of specific <i>function instance</i> objects added to project elements (site, story, etc.)
Function Instance	Function objects created from function templates and assigned to project elements. All function instances created from the same function template aggregate their areas for project planning purposes.
Object	An element (or node) in the Project Composition structure. Since there is a hierarchical relationship between all objects in this structure the structure is often referred to as a "tree." The PROJECT object occupies the highest level of the hierarchy. From highest level to lowest level, the other objects include: BUILDING (and SITE), STORY, FUNCTION, and SPACE.
Planned Area	The total area for the selected project element, or for a specific function at a particular level in the project hierarchy (project, building, etc.) as determined and entered by the user. This value expresses the estimated and desired area for this object. In later stages of project development when spaces have been placed, the Actual Area value will be compared to the Planned Area value to determine how closely the project layout is meeting the initial plan.

<b>Term</b>	<b>Definition</b>
Program	A group of function templates added to a Project, Site, Building, or Story project element for planning purposes. Planned areas are typically assigned during program development.
Project	A set of information pertaining to a building/construction project. In Facility Composer, the project object occupies the highest level of the Project Composition tree. All information for a Facility Composer project is stored in a PRJ file and directory that the user names on project creation. In Facility Composer, only one project may be opened at a time.

# REPORT DOCUMENTATION PAGE

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<b>14. ABSTRACT</b>  While government design criteria commonly exist paper and web-page formats, few are expressed in a computable format. Current design systems provide no way to directly interact with these criteria. <i>Facility Composer</i> is a suite of tools designed for use by facility planners, designers, and engineers during the initial phases of facility planning and design. <i>Facility Composer</i> associates customer-specific, computable criteria with a growing facility model that continues throughout the life cycle of the facility. In <i>Facility Composer</i> , criteria can be associated with different project elements based on the appropriate level of detail, from the project to the site, the building, story, function, and down to the individual space. <i>Facility Composer's</i> ability to maintain a linkage between criteria and project elements: (1) helps ensure that critical criteria are followed, (2) helps organize criteria and makes them available at their point of use, and (3) simplifies creation, maintenance, and distribution of new criteria. This tutorial documents and illustrate the use of specific <i>Planning Composer</i> program features.					
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