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Development Center

## Layout Composer User's Guide Through Beta Version 0.22

Susan D. Nachtigall and Beth A. Brucker

November 2004

**Facility Composer Suite**

An aerial photograph of a large, multi-story building complex with a brown roof and brick walls. A black target symbol, consisting of a central dot and a circle with crosshairs, is overlaid on the image. The background is a light blue sky with clouds.

**Layout Composer**  
on target for  
building excellence

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

# Layout Composer User's Guide: Through Beta Version 0.22

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Final Report

Approved for public release; distribution is unlimited.

Prepared for U.S. Army Corps of Engineers  
Washington, DC 20314-1000

Under Work Unit No. LK6K75-N

**ABSTRACT:** *Layout Composer* is one of the Facility Composer suite of tools, created for use by facility planners, designers, and engineers during the initial phases of facility planning and design. In Facility Composer, customer-specific and computable criteria are associated with a growing facility model that continues throughout the life cycle of the facility. Facility Composer's ability to maintain a linkage between criteria and project elements (site, building, story, etc.) is beneficial in that it: (1) helps in defining criteria and recording their rationale; (2) helps ensure that critical criteria are followed, and that desired characteristics are recorded and addressed; (3) helps organize criteria and makes them available at their point of use; and (4) simplifies creation, maintenance, and distribution of new criteria. This work has developed user documentation for the *Layout Composer* application, to help users rapidly create 2D and 3D conceptual facility designs solutions.

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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. Howdysshell, 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. Howdysshell, 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

## *Description of Facility Composer*

*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.

Although *Facility Composer* does not enforce any particular design process, the program is designed to support the process flow shown in Figure 1.

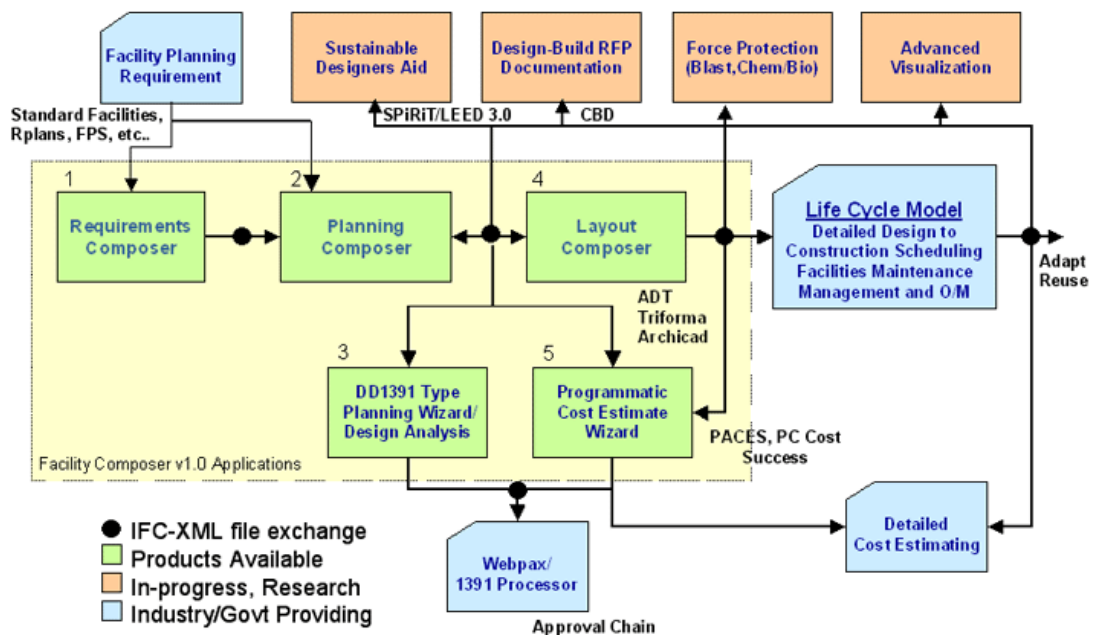


Figure 1. Facility Composer data flow.



The most important concept of *Facility Composer* is that **customer-specific and computable criteria are** associated 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**, and 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 in defining criteria and can help in recording their rationale.
- It helps ensure that critical criteria are followed, and that desired characteristics are recorded and addressed.
- It helps organize criteria and makes them available at its point of use.
- 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.

*Facility Composer* 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 user changes late in the design process or during construction. Design quality is also enhanced, as many alternatives can be explored rapidly.

### ***Facility Composer Tools***

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***, which 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**

The overall objective of this project is to develop and field the *Facility Composer* software suite. The objective of this specific part of the project was to develop user documentation for the *Layout Composer* application, to help users rapidly create 2D and 3D conceptual facility designs solutions.

### **Approach**

Researchers investigated how 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. *Layout Composer* was programmed to enable users to rapidly create 2D and 3D conceptual facility designs solutions. Steps were outlined to familiarize users with the automated process of creating one or more alternative solutions that meet the criteria/requirements for a given project, assigning architectural functions to each story, and sizing and arranging spaces to meet customer needs.

### **Mode of Technology Transfer**

This report will be made accessible through the World Wide Web (WWW), as a laboratory publication through the CERL website, at URL:

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

and directly to users through the *Facility Composer* website, at URL:

<https://ff.cecer.army.mil/fc>

## 2 Layout Composer

*Layout Composer* is a conceptual design tool in the Facility Composer suite that assists designers and architectural programmers in creating layouts. The designer uses the criteria/requirements established in the *Planning Composer* to create one or more alternative solutions that meet the criteria/requirements for the project. Designers may refine the criteria/requirements as they explore particular issues in the design. Buildings and stories are key elements in *Layout Composer* (unlike *Planning Composer*, in which these elements are optional). The designer assigns architectural functions to each story, sizing and arranging spaces to meet the customer's needs. System selections are optional, although the structural system, and wall and roof systems are typically chosen. Regardless, the set of default criteria/requirements associated with each architectural function is sufficient to use Design Wizards to create a preliminary design and detailed cost estimate.

### Installation

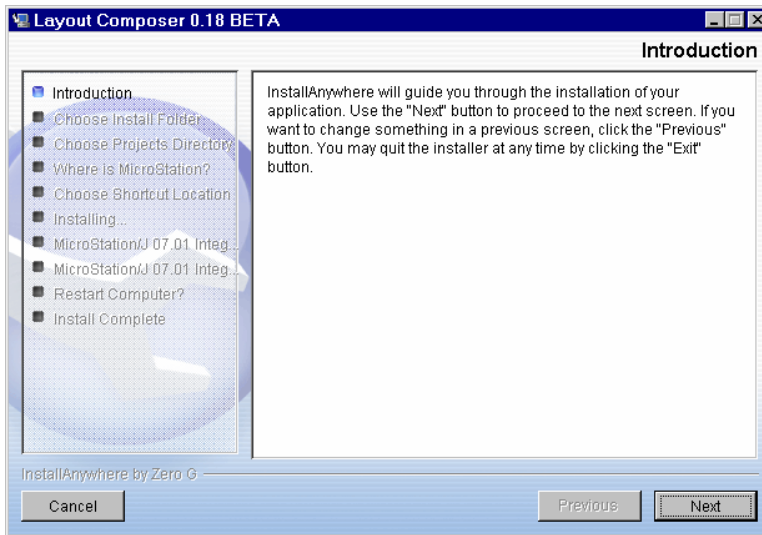
#### **System Requirements**

- *Layout Composer* requires approximately 35 MB of hard disk space.
- Bentley MicroStation/V8 (version 8) must already be installed.

#### **Running the Install Program**

*Layout Composer* is delivered on CD or via the Web. You may choose to install the program directly from either source, or you can first save the compressed installation file on your hard drive.

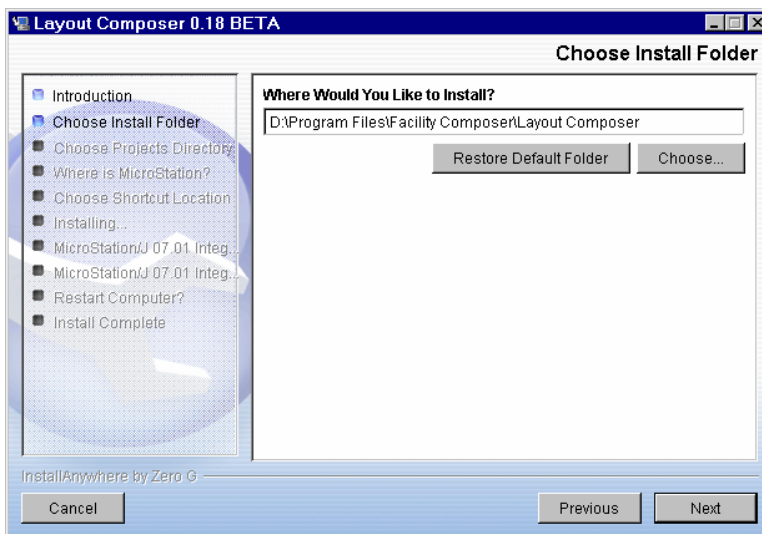
If you choose to install directly, the installation file will automatically decompress and start the install process. If you have saved the install file to your hard drive, double click on it to start the install. In either case, the installer Introduction dialog appears (Figure 2).



**Figure 2. Installation introduction.**

The installer will lead you through the process described below.

Click the **Next** button. (As you proceed, you may use the **Previous** button to back and change settings made earlier.) The Choose Install Folder dialog (Figure 3) should now appear.



**Figure 3. Choose install folder.**

The default installation location is displayed in the edit box. To designate a location other than the default, you can type it in the edit box or click the **Choose...** button. A file browser dialog (Figure 4) will appear, allowing you to select a different location. To return to the default location, click the **Restore Default Location** button.

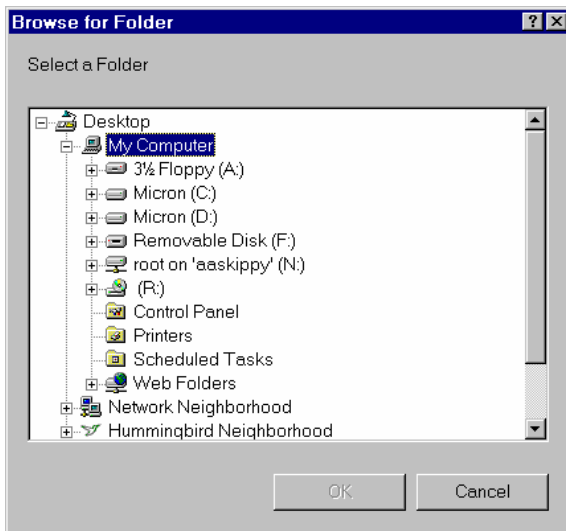


Figure 4. Location browser dialog.

Once you've selected a location, click the **Next** button. The Choose Projects Directory dialog (Figure 5) will appear. The default installation location is displayed in the edit box. To select a location other than the default, you can type it in the edit box or click the **Choose...** button. A file browser dialog will appear, allowing you to select a different location. To go back to the default location originally listed in the Choose Projects Directory dialog, click the **Restore Default Location** button.

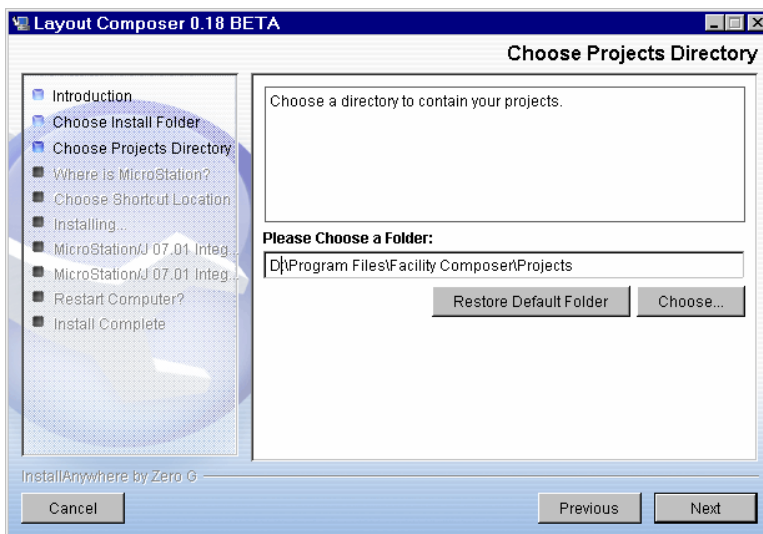


Figure 5. Choose projects directory dialog.

Once you've selected a location, click the **Next** button. The Choose Shortcut Location dialog (Figure 6) will appear.

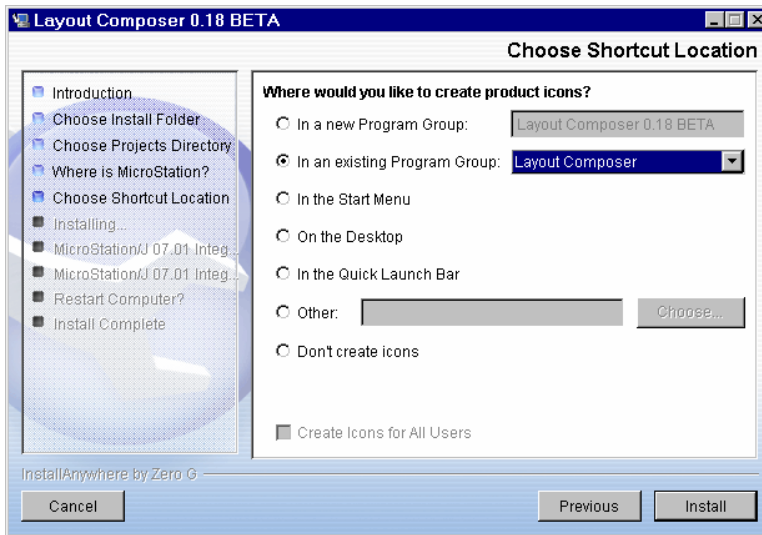


Figure 6. Choose shortcut location.

Use the radio buttons to designate where application icons or shortcuts should go. If you choose to create a new program group, its default name will be “Planning Composer,” but you can type in a new name in the edit box. If you select an existing program group, use the drop-down menu to the right of the radio button to select the desired group. If you select Other, use the edit box to enter a path and location, or click the **Choose...** button to display a browser dialog that will allow you to select a different location. When finished, click Install. A progress dialog (Figure 7) containing the Facility Composer splash screen will appear during the installation process.

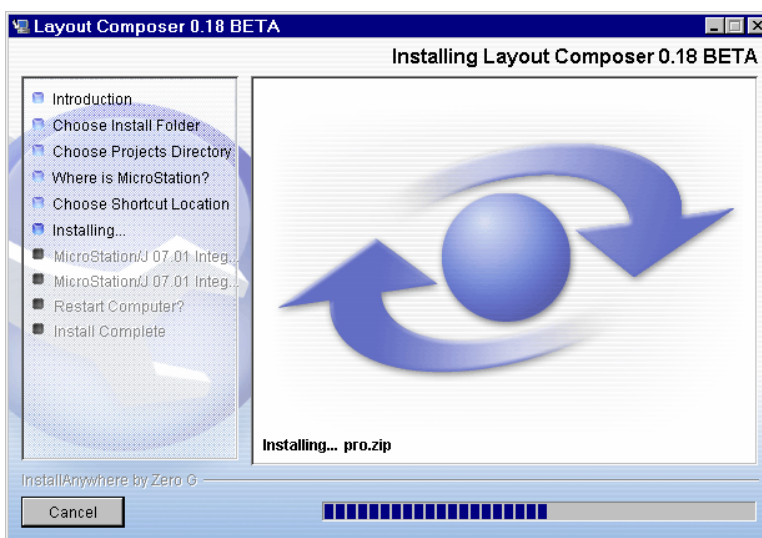
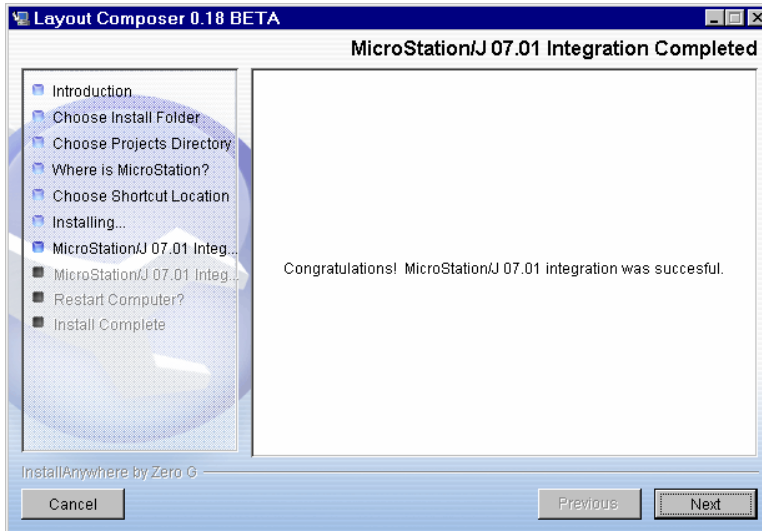


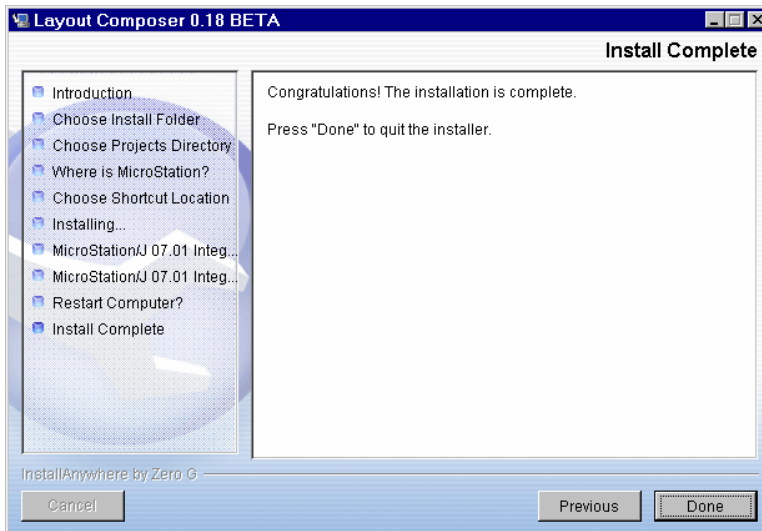
Figure 7. Installation progress dialog.

When installation is complete, a dialog (Figure 8) will appear, indicating that integration with MicroStation/V8 was successful.



**Figure 8. Integration with MicroStation/V8 successful.**

Click the **Next** button and the Install Complete dialog (Figure 9) will appear.



**Figure 9. Installation complete dialog.**

When the Install Complete dialog appears, click done to complete the installation. Then, click "Next." One more dialog will appear briefly with the message "Install Anywhere Is Cleaning Up."


## Using Layout Composer

### *Tutorial – Laying Out a Project in Layout Composer*

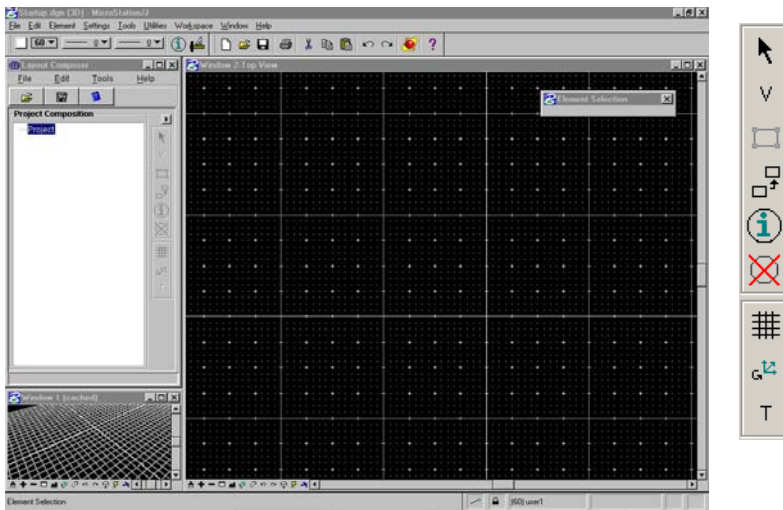
This chapter will present a few practice exercises designed to demonstrate some key features of *Layout Composer*. The user should already be familiar with *Planning Composer* and the basic steps for creating a new project. Otherwise, please refer to the *Planning Composer* documentation\* before proceeding with these exercises. We also assume that the user is familiar with some basic features of MicroStation/V8.

**Please Note:** For visual clarity, many of the images of drawing elements in this chapter are displayed as a negative image, that is “Black-Upon-White.” When you use *Layout Composer* in its standard display mode, you will see a “White-Upon-Black” image in the standard design window (**Window 2**). See illustration below.

### *Opening Layout Composer*

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



**Result:** The Main *Layout Composer* screen (Figure 10) appears. The screen is currently blank.



**Figure 10.** Main layout composer screen.

\* Susan D. Nachtigall and Beth A. Brucker, *Planning Composer Tutorial: Through Version 0.22*, ERDC/CERL SR-04-30, and *Planning Composer User's Guide: Through Version 0.22*, ERDC/CERL SR-04-31 (Engineer Research and Development Center, Construction Engineering Research Laboratory [ERDC-CERL], November 2004),



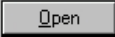
The *Layout Composer* window is located in the top left corner of the screen. You will immediately notice its similarity to the left half of the *Planning Composer* screen. The **Project Composition** tree should already be familiar from *Planning Composer*. If you click the **Expand** button, , the familiar **Requirements** panel expands into view as well. (When the **Requirements** panel is expanded, use the **Collapse** button, , to close it again.) The one main difference you see in *Layout Composer* is the addition of a vertical tool bar that does not exist in *Planning Composer* (visible directly to the right of the layout composer screen in Figure 10). The exercises that follow will use many of these tools in this toolbar. Appendix A to this report shows other available toolbars.

Other parts of the screen include the **MicroStation/V8 Toolbar, Window (View) 1** and **Window (Top View) 2**. The **MicroStation/V8 Toolbar** appears across the top of the screen. Many of the standard MicroStation/V8 operations can be performed using these tools. **View 1** provides a three dimensional view of the design space. It also has its own toolbar for manipulating this view. **Top View 2** occupies the right half of the screen. Most of the space placement functions are performed in this window.

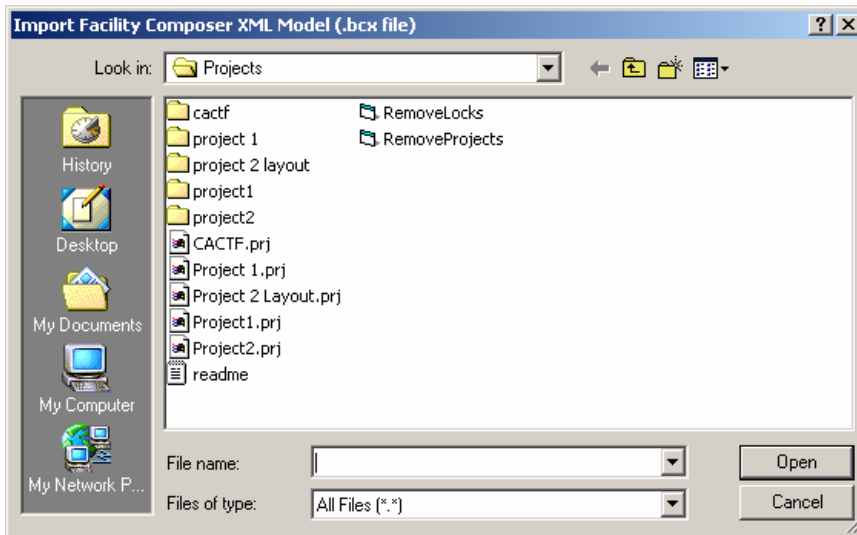
### ***Importing a Project***

Begin by importing the Project already created in the *Planning Composer* tutorial.

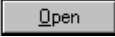
From the **F**ile menu in the *Layout Composer* window, choose **Import>Import Model from Facility Composer XML ...** (Figure 11).

*Please Note:* Once you have created a project in *Layout Composer* you can open it by choosing **Open Project** from the **F**ile menu in the *Layout Composer* window, clicking on the *Layout Composer* Project.pri file you wish to open, then clicking the  button.

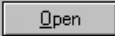
**Result:** The **Import Facility Composer XML Model** dialog box opens.



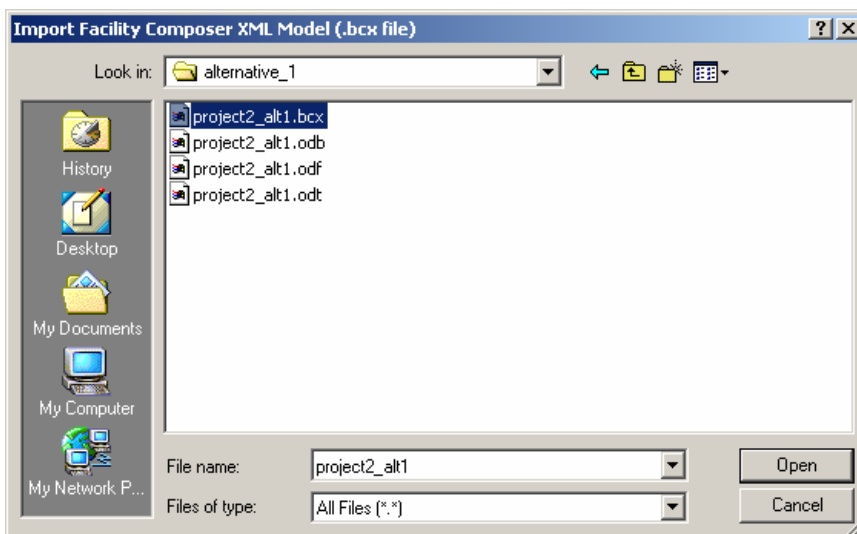
**Figure 11. Import Facility Composer XML.**

Click on the folder of the sample project created in the *Planning Composer* Tutorial, Project 2. Then click the  button.

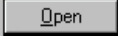
**Result:** The **Import Facility Composer XML Model** dialog box loads showing the contents of the Project 2 folder.

Click on the alternative 1 folder. Open the alternative\_1 folder. Then click the  button.

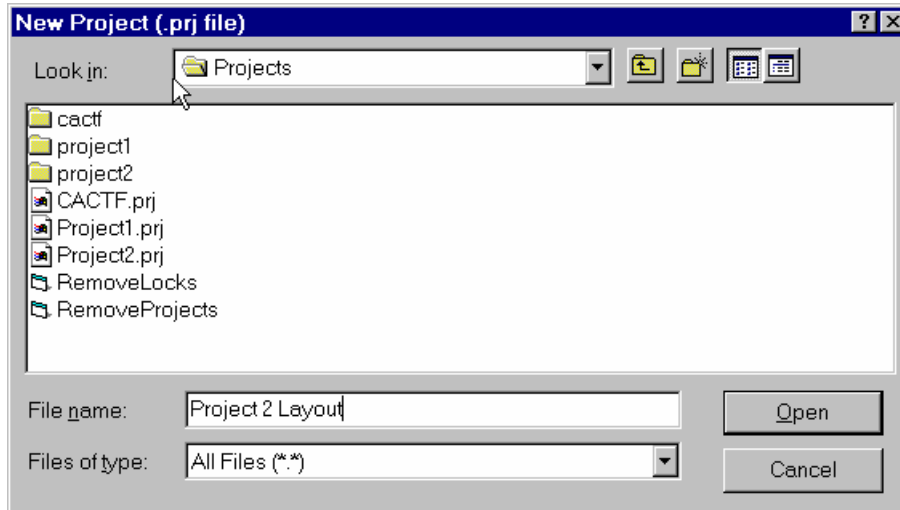
**Result:** The **Import Facility Composer XML Model** dialog box loads showing the contents of the alternative\_1 folder (Figure 12).



**Figure 12. Alternative folder view.**

Click on Project 2\_alt1.bcx file. Then click the  button.

**Result:** The **New Project** dialog box opens (Figure 13).




**Figure 13.** New Project dialog.

Type a name for the new *Layout Composer* Project. For example, Project 2 Layout.

**Result:** The new project loads in *Layout Composer*.

### **Changing Desired Values in a Project**

Take some time to browse the objects in this project. Expand the **Requirements** window by clicking the **Expand** button .

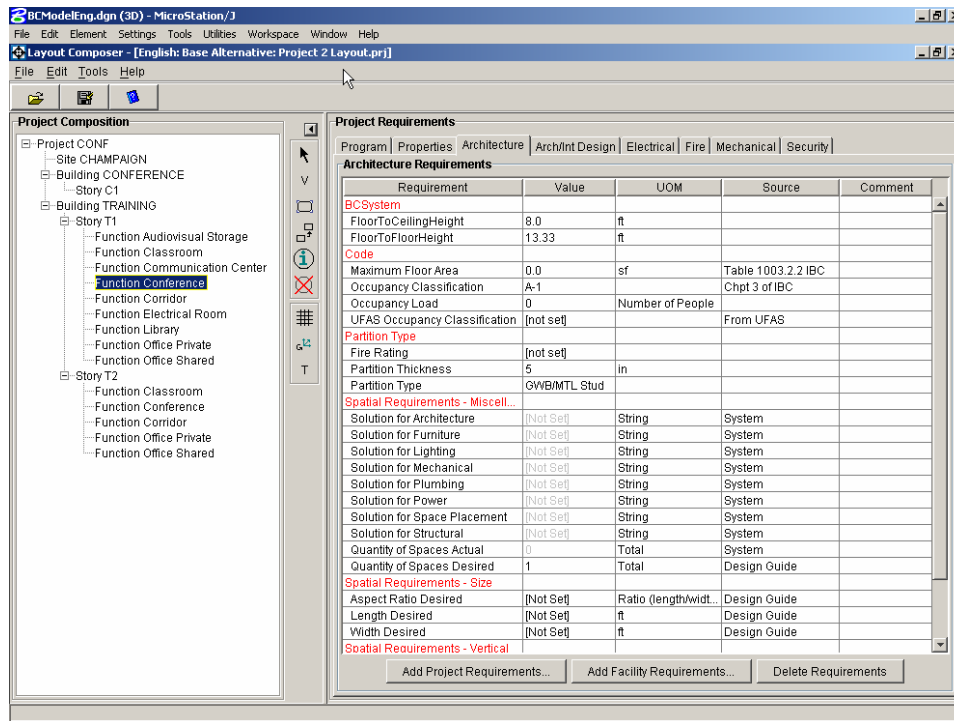
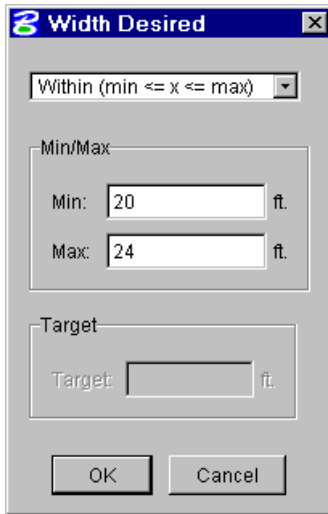


Figure 14. Expanded requirement panel showing architecture tab requirements.


In **Building TRAINING** select the **Function Classroom** on **Story T1**. Click the **Architecture** tab in the **Project Requirements** panel. Figure 14 shows the resulting menu.

Note the column labeled **Value**. If **[Not Set]** appears in this column, then a value has not yet been specified or determined for this property. When **System** appears in the **Source** column, then the value appears dimmed. This indicates that **Layout Composer** will supply this value once an object placement has occurred. If a property value appears in black, then the user is able to supply or edit the value.

In the Requirement column, find **Width Desired** under the sub-heading **Spatial Requirements – Size**. Click in the **Value** column for the **Width Desired** requirement. When the Width Desired dialog box loads (Figure 15), choose **within** from the pull down menu. This indicates that the user should specify a minimum/maximum range for this value.



**Figure 15. Width desired dialog.**

Enter a value for each and click the  button.

**Result:** The **Requirements** grid is updated to display the new range for desired width (Figure 16).

Width Desired	20-24	ft	Design Guide
---------------	-------	----	--------------

**Figure 16. Architectural criteria showing updated min/max range.**

Enter a similar range for the requirement, **Length Desired (Min/Max)**.

Collapse the **Requirements** panel by clicking the **Collapse** button, .

### ***Placing a Dynamically-Sized Rectangular Space***

So far, we have used the program to plan desired areas and desired attributes for our project. Now we will create some spaces that will fill those desired needs.

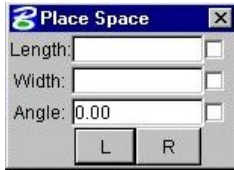
Once again, select the **Function Classroom** on **Story T1**. We will use this function to create and place a rectangular space in the design grid.

This function happens to be for a dynamically-sized space. We know this because it lacks any explicit fixed dimensions. A DYNAMICALLY-SIZED space has variable or changeable dimensions. This is in contrast to a FIXED-SIZED space, which we will address later in this chapter.

Left-click the **Place.Rectangular** tool on the vertical toolbar: 



Or, you may select the menu option, **Tools | Place | Space (Rectangle)**. A third option is to right click on **Function Classroom** under Story T1 in the Project composition tree, and choose **Place New Space(s)**.

**Result:** The **Place Space** dialog box opens (Figure 17).



**Figure 17. Place space dialog box.**

Left-click on the **Design Grid** to place your first point. Now, move your mouse over the grid without clicking and watch the image of the space change size with your movement. If you wanted to, you could now click a second point and complete your classroom placement. However, we will use the **Place Space** dialog box to help size the space more precisely.

The **Place Space** dialog box has fields in which you may enter values for the placement **Length**, **Width**, and **Angle**. The   buttons can be used to change the placement angle in 45-degree increments.

Enter 10 into the **Width** field, and then click the **Lock** check-box just to the right of the **Width** field. Now move the mouse over the grid once again. Notice that the placement tool is behaving differently. The space is locked at a width of 10; however both the **Length** and the placement **Quadrant** may still be controlled by the mouse.

Click a second point to complete the classroom space placement.

Use the MicroStation/V8 Zoom command to zoom in for a better view of the space just placed. You can read the labels clearly. Note that the space is labeled with its dimensions as well as its area (Figure 18).

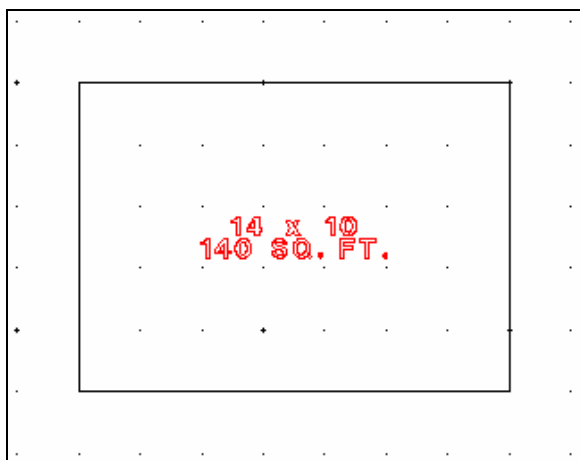




Figure 18. Placed space.

Observe the **Project Composition** tree. Click the  icon next to the **Function Classroom** and expand the tree.


Select the **Space** object that now appears beneath the **Function Classroom** object.

Expand the **Requirements** panel by clicking the  icon. Click the **Architecture** tab. Observe that the **Area Actual**, **Length Actual**, and **Width Actual** attributes now have values. These fields are filled in by the system whenever a space is placed.

This demonstrates some key behaviors regarding *Layout Composer*:

- When you place a **Function** object, you create a **Space** object. (Spaces are the only objects that can actually be placed.)
- A placed **Space** has a **Name** (which is initially blank), **Length**, **Width**, and **Area**.

Now click the **Properties** tab. Enter a name for this space (such as Classroom 101) into the **Name** field. Hit the <ENTER> key.

Collapse the **Requirements** panel  and notice that the space name now appears on the space graphic.

Continue adding DYNAMICALLY-SIZED RECTANGULAR spaces until your layout matches that shown in Figure 19. We have added another classroom, elevator, corridor, two conference rooms, electrical space, and a lobby. Enter a name for each space as described earlier.

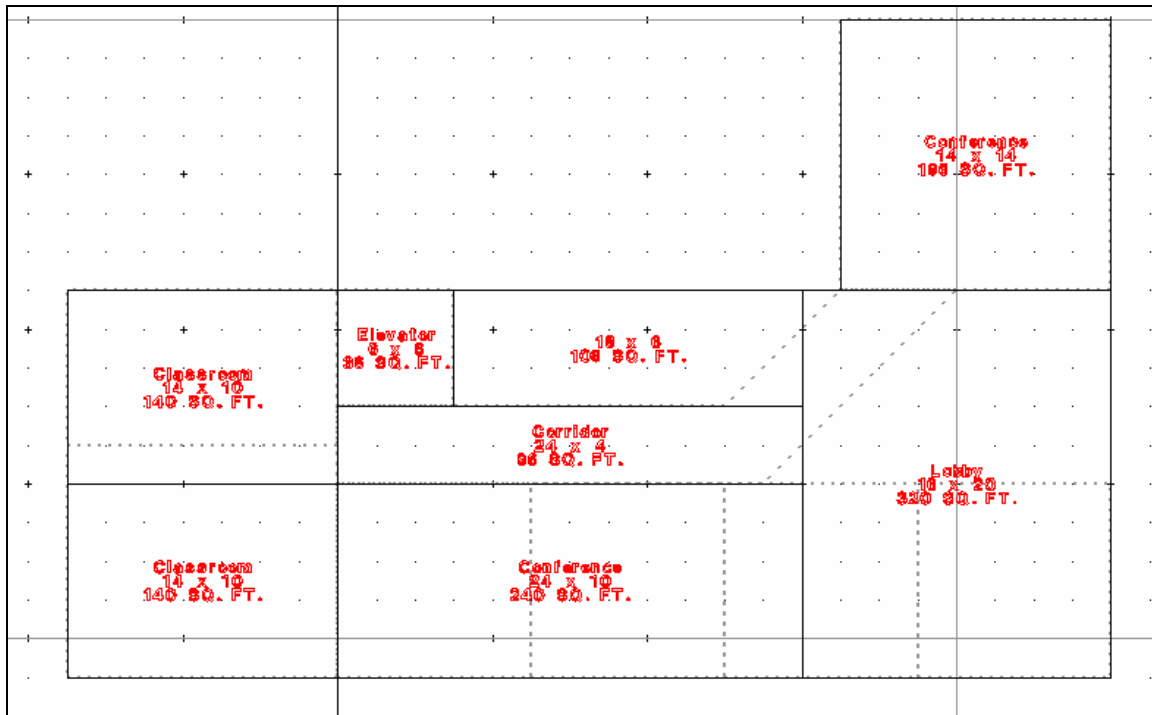


Figure 19. First floor layout.

### ***Placing a Dynamically-Sized Non-Rectangular (Polygonal) Space***

Select **Story T2** of **Building Training**. Note that view changes. **Story T1** now appears as a dim outline graphic to indicate that it is no longer the active story.

Expand the **Requirements** panel.

On the **Properties** tab for **Story T2**, we need to set the **Elevation**. (Elevation = Number of Feet above Sea Level).


Review the **Properties** for **Story T1**. The **Elevation** for **Story T1** is 0 (zero) ft above sea level. The **Floor-to-Floor-Height** is 20 ft. Switch back to the **Properties** tab for **Story T2**. Set the **Elevation** to 20 ft. All spaces for **Story T2** will be now be placed on a plane at the designated elevation of 20 ft.

Select **Function Corridor**. Note that we have picked this function for two particular reasons: (1) this function is NOT for a FIXED-SIZE space, and (2) since corridors are not always rectangular in shape, it lends itself nicely to demonstrating the placement of a non-rectangular space.




Select the **Properties** tab for this function and review its properties. Note especially the **Floor-to-Floor-Height** field. Here is where you specify the height of the space that you will place when you place this function. (Height=Top of Slab to Top of Floor distance.) The current setting for the height for this function is 13.33 ft. We will go ahead and keep this value.

Collapse the **Requirements** panel.

Choose **Place.Polygon** tool from the toolbar: 

Or, you may select the menu option, **Tools | Place | Space (Polygon)**

**Note:** If the polygon tool is not currently showing on the toolbar, then left click and hold the **Place.Rectangle** icon, . This activates the fly-out button bar.

Now you may see and select the **Place.Polygon** tool.

**Result:** You have activated the polygon placement mode. Prompts appear in the lower-left hand corner to guide you through the placement process.



Click the grid to place the first point. Enter the next point. You will note that the first segment (space outline) is created. Continue to enter points to construct additional line segments (space boundaries) until you have completely enclosed the polygonal space. Placement will be completed either when the last point is close to the starting point or when the user right-clicks the mouse (Figure 20).

Select the new corridor space in the **Project Composition** tree. (You may first need to expand the **Function Corridor** tree object to display and select the new space.)

Expand the **Requirements** panel. Use the **Properties** tab, **Name** field, to assign a name to this space.

Next, select the **Architecture** tab and review the criteria.

Collapse the **Requirements** panel.

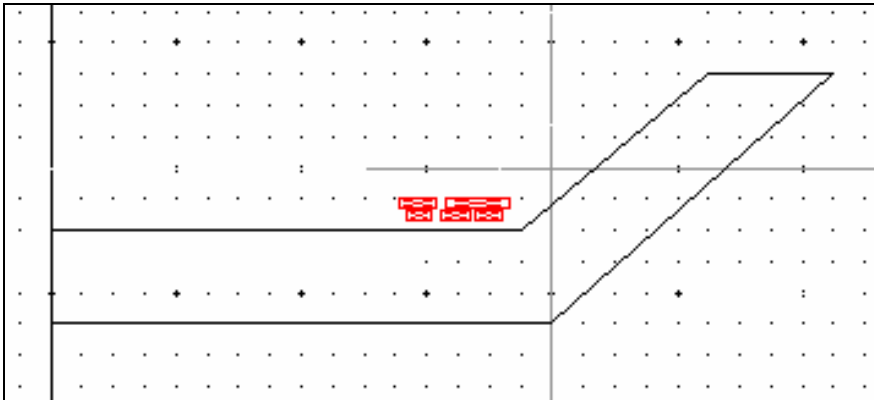


Figure 20. Placed polygonal space.

### Copying a Space

Copying a space can be a real time-saver when you have many similar spaces to create. First, create a space for **Function Office** as described in the section for creating Dynamically Places Spaces above. Name the space **Office A**. In this exercise, we will create a bank of Offices all modeled after **Office A** space that we created above.

Select the **Modify.Copy** tool from the toolbar:



Or, you may select the menu option **Tools | Modify | Copy ...**

**Result:** Copy Mode is activated. The prompt in the lower-left corner instructs us to select the space to be copied.

Left-click on the **Office A** space to select it. The color changes to indicate that the space is selected (Figure 21).

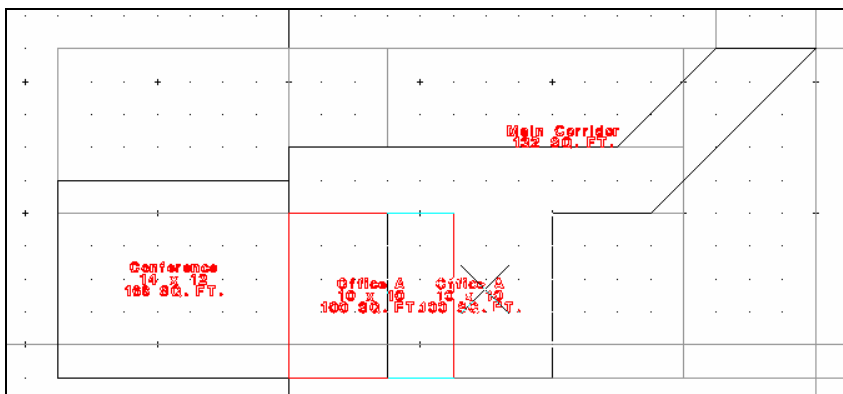
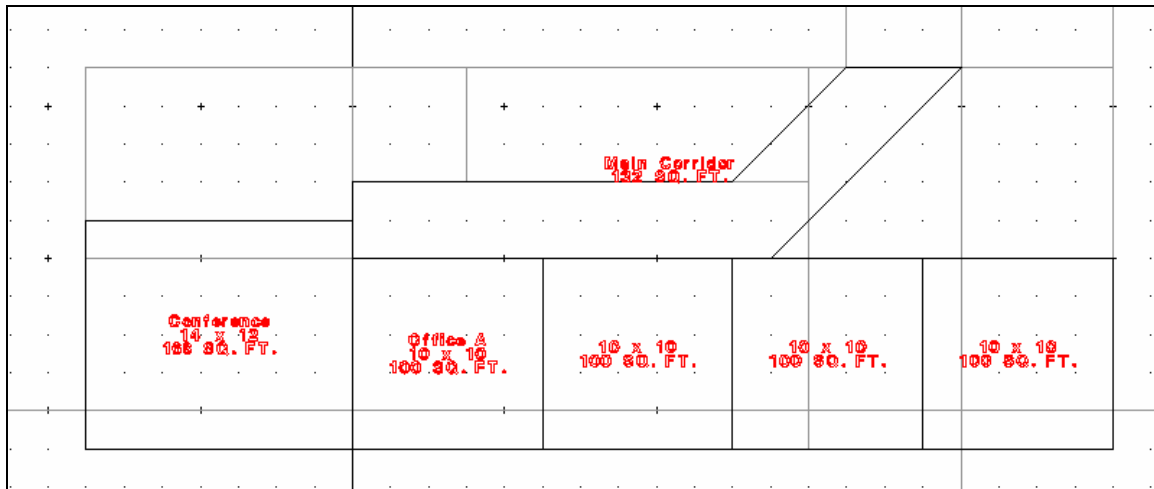


Figure 21. Copying a space.

Move the mouse slightly. Notice that the space has been copied and an image of the copy appears on the grid ready for placement. You need only to position the space and click to drop it into place.

**Result:** A new space nearly identical to the original is created and placed. One difference is that the **Office A** name is NOT copied. The **Name** field on the copy space is left blank and ready for a name of your choice. You may not realize it at first, but you are still in copy-mode. Click to select the office copy space. Position and click to place a second copy of the space. Repeat to place a third copy (Figure 22).

**Result:** We have just created an entire suite of Offices in just a couple of steps.



**Figure 22.** A series of copied spaces.

While we are still on story **T2**, continue placing spaces until your second floor layout matches the layout in Figure 23. In addition to the Main Corridor, we have added three conference rooms, four offices, and an elevator. After completing the placements, name the new spaces.

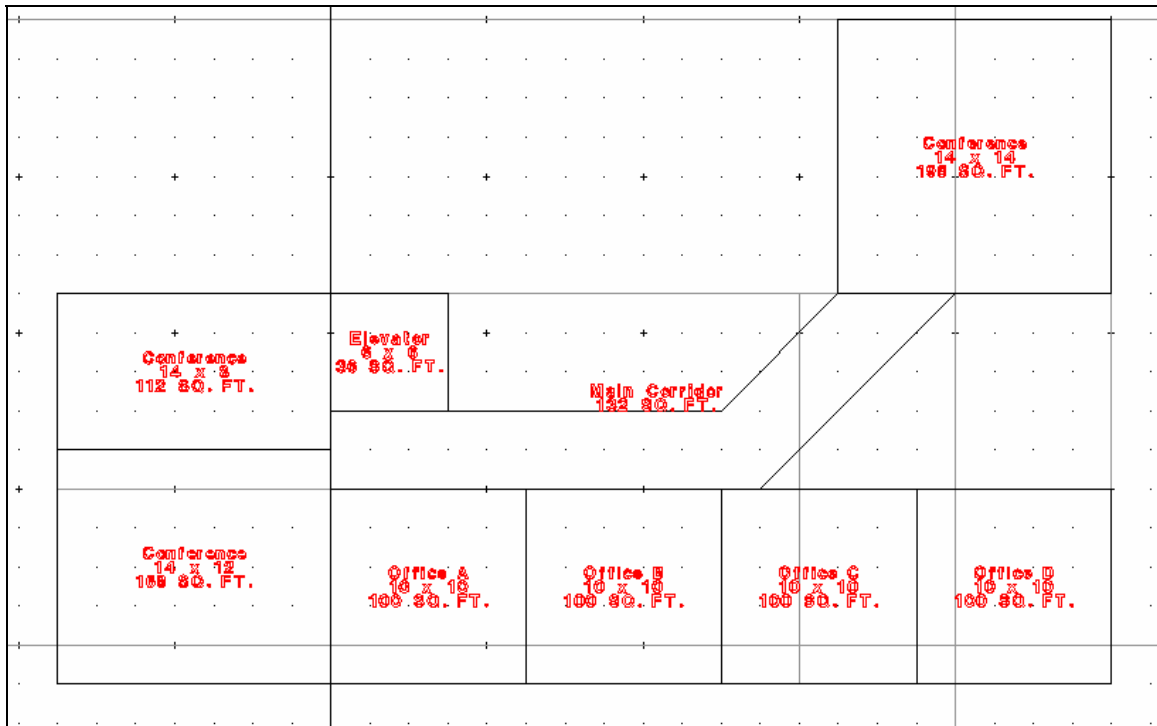


Figure 23. Second floor layout.

### ***Planned Area versus Actual Area***

By now, we have added several spaces to our project. We will take a moment to assess how well our layout matches the original plan for this project.

Expand the **Requirements** window.

Select **Story T2** in the **Project Composition** tree and then choose the **Program** tab. Make sure that the **Placing View** radio button is at the bottom of the **Requirements** window.


**Result:** The **Story Program** for **Story T2** looks something like listing shown in Figure 24.

Story Area						
Planned: 1786.0			Actual: 1044.0			
Function Templates						
Story Program (Square Feet):						
Name	Building	Available	Actual	Story	Available	Actual
Classroom	7000.0	6720.0	280.0	0.0	0.0	0.0
Conference	1000.0	88.0	912.0	500.0	24.0	476.0
Corridor	900.0	672.0	228.0	250.0	118.0	132.0
Elevator	72.0	0.0	72.0	36.0	0.0	36.0
Office Private	2500.0	2500.0	0.0	0.0	0.0	0.0
Office Shar...	4000.0	3600.0	400.0	1000.0	600.0	400.0

**Figure 24. Story program showing planned and actual areas.**

We can measure our progress in laying out this story, by evaluating this **Story Program**. For a planned total area of 1786 sq ft for this story, we have actually placed 1044 sq ft. Total planned area is further broken down by planned area per function (row). The **Actual** column for each function row displays a total (or roll-up) of all spaces created from that function. For example, we see that we have placed 400 sq ft of office space out of the 1000 sq ft of office space planned for this story. From the **Available** and **Actual** columns, we have an indication of how far we have progressed in space placement at the Building level.

### **Changing the Viewing Option**

When you first open *Layout Composer*, the view that you see in **Window (Top View) 2** (by default) is a Top-View of your project. This view is named: **Above/Current/Below – Simple**. However, there are a number of other viewing options from which you may choose. Open the **Tools | View | View Options** menu. (You may also use the fly-out button bar to select this option: ). Experiment with the different viewing choices. One view that is especially useful is called “**Above/Current/Below – Color By Function.**”

From the **Tools | View | View Options** menu, choose **Above/Current/Below – Color By Function**, then click the  button. Figure 25 shows the result.

Select Story **T1**. Then try Story **T2**.

**Result:** The view that you see uses a different color code for each of the spaces based on the function that was used to create the space. This view displays the functional layout of your project in a visually concise manner.

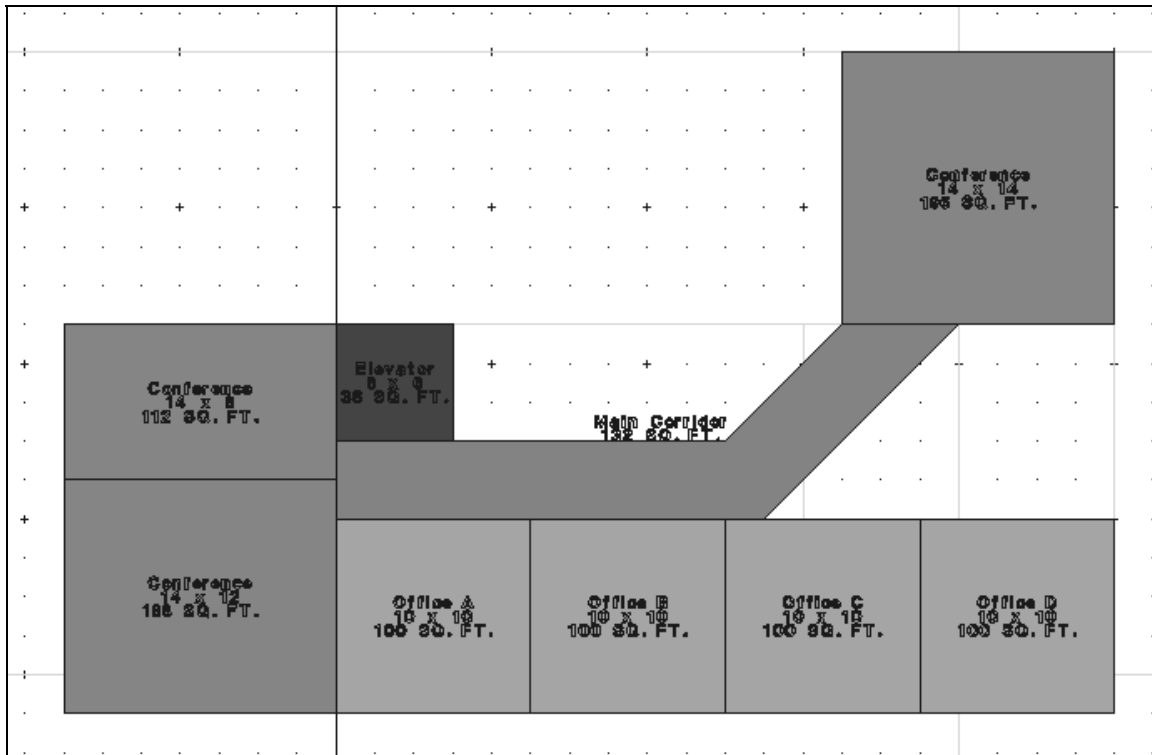




Figure 25. Viewing the Project using the “Color-by-Function” viewing option.

### Viewing the Model in Three Dimensions

As you have been adding spaces to your project, you will have noticed the three-dimensional model of your project taking shape in **Window (View) 1** (Figure 26). This exercise demonstrates some of the capabilities and benefits of 3-D viewing in *Layout Composer*.

**Note:** There may be times in which the 3-D model in **Window (View) 1** becomes “out-of-sync” with the 2-D model in **Window (Top View) 2**. If this happens, close **Window (View) 1** using the standard close icon, . Reopen **Window (View) 1** by choosing the MicroStation/V8 menu item at the top of the screen: **Windows | Open/Close | 1**

Focus your attention on **Window (View) 1** in the lower left corner of the screen. You may want to reposition and widen this window. (You may do so using standard Windows functions: Click and drag on the top bar to reposition; Click and drag on the right edge of the window to widen it.)

Click the zoom tool  on the bottom of the window. Center the X icon over your building and click until the image is at a good size for viewing. Right click to deactivate zoom mode.

**Result:** If you have precisely followed all the instructions in this tutorial up to this point, you may be in for a bit of a surprise. The 3-D model displays a rather unsightly gap between the first and second stories. A discrepancy in our model that may have escaped us in two dimensions has become quite apparent in the third dimension.

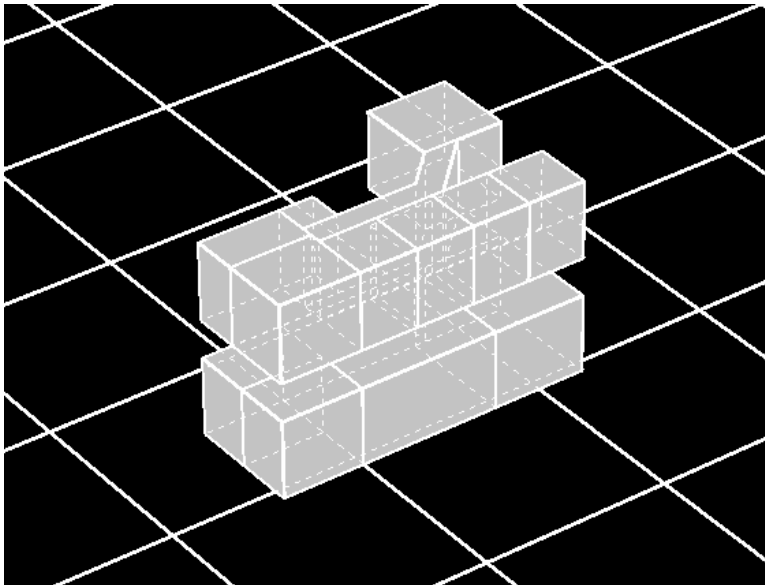


Figure 26. 3-D view of project.

We need to expand the **Requirements** panel to investigate the problem. (You may need to minimize or move **Window (View) 1** out of the way to see the **Requirements** panel.)

Select **Story T1**. Choose the **Properties** tab. Note the **Elevation**: \_\_\_\_\_. Choose the **Architecture** Tab and note the **Floor-to-Floor Height**: \_\_\_\_\_.

Next, select **Story T2**. Choose the **Properties** tab. Note the **Elevation**: \_\_\_\_\_. Choose the **Architecture** Tab and again note the **Floor-to-Floor Height**: \_\_\_\_\_.


Select each function on each story. Check the **Floor-to-Floor Height** value for each. The height will be the same for all the sample functions that we have chosen. Note the **Floor-to-Floor Height**: \_\_\_\_\_ here.


Finally, select each space under each function. A space created from a function will inherit the **Floor-to-Floor Height** criterion from the function. Therefore the **Floor-**

to-Floor **Height** value for each of the spaces will be the same in this instance. Note the Space Floor-to-Floor **Height** here: \_\_\_\_\_.

By now you will likely have discovered the inconsistency in our model. The stories were created with a height of 20 ft. They are placed on planes 20 ft apart in vertical distance. The spaces that have been created have a height of 13.33 ft. Therefore, the gap appears in the 3-D model. One way to fix the problem would be to change the height of the two stories of **Training Building** to 13.33 ft. Then, change the elevations for **Stories T1, and T2** to 12.0, and 25.33 ft, respectively. Return to the 3-D model in **Window (View) 1** and observe the change.

### ***Dynamic Viewing in Three Dimensions***

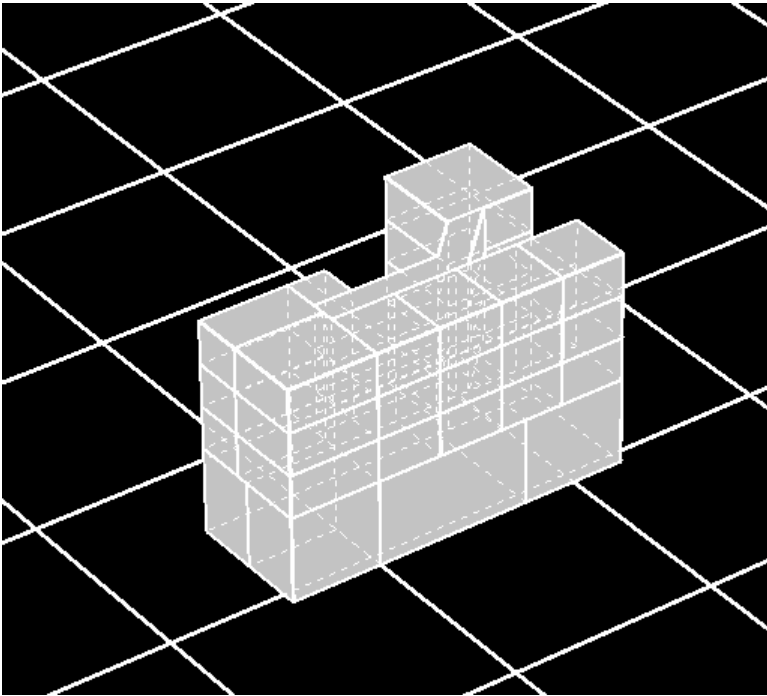
Maximize **Window (View) 1** using the standard Windows maximize button in the upper right corner of the window. Minimize the **Layout Composer** window. Finally, use the **Zoom** tool  at the bottom of **Window (View) 1** to expand your 3-D image.

MicroStation/V8 uses a mechanism called “Tentative Snapping” to set up a 3-D image for dynamic viewing. To activate Tentative Snapping, select the **View.Rotate Dynamic** tool at the bottom of **Window (View) 1** (Figure 27): 

Pick a point on your 3-D model (it works best if you choose a corner) and click BOTH the left and right mouse buttons simultaneously. (This point will become the point about which the model will rotate.) If you have done this successfully, a cross-hair graphic appears on the model.

If you do not see a cross-hair image like the one that appears in Figure 27, then re-select the **View.Rotate Dynamic** tool and try again.

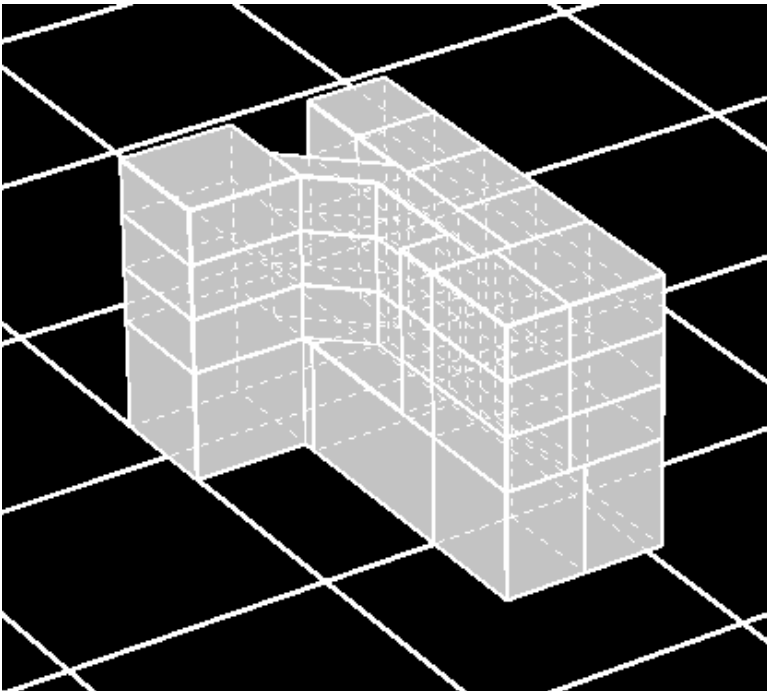




**Figure 27. Placing a rotation point for dynamic 3-D Viewing.**

If you are satisfied with the placement of the cross-hair, left-mouse click to “Accept.”

Slowly move your mouse and rotate the image. Right-mouse click when you are ready to stop the rotation.



**Figure 28. Dynamic viewing of the project in 3-D.**

Using the basic *Layout Composer* tools, add other spaces to this project. Appendix A contains an overview of the tools that are available from the *Layout Composer Vertical Toolbar*. When you have finished experimenting, return to the 3-D model and rotate the model to review the results.

### 3 Conclusion

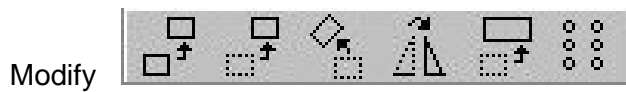
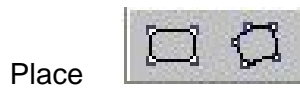
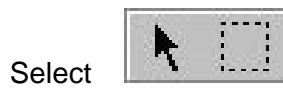
The most important concept of *Facility Composer* is that customer-specific and computable criteria are associated with a growing facility model that continues throughout the life cycle of the facility. *Facility Composer's* ability to maintain a linkage between criteria and project elements (site, building, story, etc.) provides many benefits:

- It helps in defining criteria and can help in recording their rationale.
- It helps ensure that critical criteria are followed, and that desired characteristics are recorded and addressed.
- It helps organize criteria and makes them available at their point of use.
- 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.

This work has developed user documentation for the *Layout Composer* application, to help users rapidly create 2D and 3D conceptual facility designs solutions.

# Appendix A: Tool Bars


## Vertical Tool Bar - Overview



### Fly-Out Button Bar – Bar Detail


**Select**

Select.Select  
Select.Fence



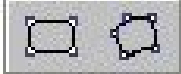
**View**

View Settings  
View Zoom In  
View Zoom Out  
View Zoom All  
View Rotate Dynamic  
View Top  
View Bottom  
View Front  
View Back  
View Left  
View Right  
View Left Isometric  
View Change Perspective  
View Grid  
View Previous  
View Next




**Place**

Place.Rectangle  
Place.Polygon




**Modify**

Modify.Copy  
Modify.Move  
Modify.Rotate  
Modify.Mirror  
Modify.Scale  
Modify.Array




**Analysis**

Info.Information  
Info.Measure



**Delete**

Delete Element



## Glossary

Term	Definition
Actual Area (Placing View)	(Compare to Planned Area) The area of the selected object as determined by Facility Composer; it 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: <ul style="list-style-type: none"> <li>• 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>• A spatial containment relationship can exist where one function physically contains another function, for example, the relationship between a lobby and the reception area. The lobby is the super-function and the reception area is the sub-function.</li> <li>• The final relationship is that of assigned and unassigned functions. This type of relationship supports the “roll-up” capability through item programs.</li> </ul>
Function Template	A Function definition from a library. Templates are the parents of specific function instance 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.

Term	Definition
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.

