

# **SMS with BUILDER User Guide**

**Version 3.3**

October 6, 2015



# Welcome to the Sustainment Management System

The Sustainment Management System (SMS) with BUILDER™ Version 3.3 is the newest product in the SMS under development by the U.S. Army Corps of Engineers at its Engineering Research and Development Center-Construction Engineering Research Laboratory (ERDC-CERL) in Champaign, IL. Depending on a user's needs and licensing, the new SMS framework provides Web-based access to the latest versions of BUILDER and/or ROOFER™, automated tools that support engineering and facility management decisions regarding when, where, and how best to maintain buildings and their key components.

While the Sustainment Management System is being developed for military installations, it is applicable for any organization with facility management responsibilities. License agreements providing access to the SMS technology are available from multiple providers.

## BUILDER

BUILDER uses as its primary condition measure a condition index (CI) rating on a 0-to-100 point scale. The condition index for each Component-Section is computed from inspection data that records the type, severity, and density of each distress found. Deterioration curves developed from experience over time show the optimal point at which work should be done to avoid more costly rehabilitation projects later.

A recent addition to the SMS is the functionality index (FI). The FI is the primary functionality measure and uses a 0-to-100 point scale in keeping with the SMS design philosophy. The functionality index is computed from assessment data that records the functionality issues present in the building and the severity and density of those issues. Based on the assessment data, building modernization requirements can be identified.

With the assistance of the Scenarios simulation engine included as part of BUILDER, managers can develop long-range work plans based on a sound investment strategy. By providing an objective description of condition (core BUILDER functionality) and an automated means of exploring various options

under different budget scenarios (Scenarios), BUILDER and Scenarios together make multi-year work plans easier to formulate and funding requests easier to justify. The goal is optimal facility performance for the dollars invested.

As a BUILDER user, your are invited to stop by the [SMS Community User's Group Website](#) for the latest information, announcements, links to documents, and discussion forums.

## ROOFER

ROOFER uses standard inspection procedures and numerical indexes for assessing condition. A roof's condition is determined based on distress data collected during visual inspections; for insulated membrane roofs, additional information is provided by nondestructive moisture surveys and gravimetric analysis of core cuts.

The inspection data provide the information needed to generate condition indexes for the major roof components and an overall roof condition index (RCI). Component indexes for the membrane (MCI), flashing (FCI) and insulation (ICI) comprise the RCI for low-slope membrane roofs. For asphalt shingle roofs, two component indexes, the shingle condition index and the FCI, comprise the RCI. These indexes provide an objective, consistent measure of roof condition, repairs needed, and waterproof integrity.

ROOFER enables building managers to rate their present roof condition, prioritize projects, and optimally allocate the budget. At the project level, ROOFER can help select repair and replacement strategies and identify work requirements. In the long term, this technology results in maximized roof conditions using available funds.

As a ROOFER user, please stop by the [SMS Community User's Group Website](#) for the latest information, announcements, links to documents, and discussion forums.

Developed by U.S. Army ERDC-CERL

10/6/2015

# Table of Contents

---

<b>What's New in BUILDER 3.3 .....</b>	<b>7</b>
<b>Getting Started with BUILDER .....</b>	<b>8</b>
How To Navigate BUILDER™ 3.3 .....	8
User Links .....	9
Main Menu .....	9
Toolbar .....	10
Navigation Ribbon .....	10
Navigation Tree .....	10
Content Area .....	11
Recognizing Common BUILDER Icons .....	12
Establishing Selection Criteria .....	16
User Preferences .....	18
<b>Performing Inventory .....</b>	<b>21</b>
Inventory Overview .....	21
Adding, Editing, or Deleting an Organizational Group .....	23
Add an Organization .....	23
Edit Organization Data .....	25
Delete an Organization .....	27
Additional Organizational Data .....	27
Adding, Editing, or Deleting a Site .....	29
Add a Site .....	29
Edit Site Data .....	30
Delete a Site .....	33
Additional Site Data .....	34

---

Adding, Editing, or Deleting a Complex .....	36
Add a Complex .....	37
Edit Complex Data .....	38
Delete a Complex .....	39
Additional Complex Data .....	39
Adding, Editing, or Deleting a Building .....	43
Add a Building .....	43
Edit Building Inventory Data .....	45
Delete a Building .....	52
Using the Building Status Property .....	53
Using Building Status to Track Non-Current Buildings .....	55
Systems, Components, and Sections .....	57
Identifying Systems, Components and Sections .....	57
BUILDER Systems/Components .....	61
Adding, Viewing, or Deleting a System .....	63
Adding, Viewing, or Deleting a Component .....	68
Adding, Editing, or Deleting a Section .....	72
Section Details .....	80
Rapid Inventory Methods .....	82
Rapid Inventory Methods Overview .....	82
Copying a Building .....	85
Copy Sections .....	87
Using Rapid Inventory Estimation to Populate Buildings .....	89
Using Building Templates .....	92
<b>How To Export to BuilderRED .....</b>	<b>110</b>
Exporting Data and Images to BuilderRED .....	110

---

Time Limits on Editing Inspections .....	114
Known Issue with Image Export from Builder .....	115
Exporting Just Data to BuilderRED .....	115
Time Limits on Editing Inspections .....	119
<b>Performing Condition Assessment (Inspections) .....</b>	<b>120</b>
Condition Assessment Overview .....	120
Choosing a Condition Assessment Method .....	121
Overview of CSCI Computation .....	123
Condition Index Roll-Ups .....	124
Performing Condition Assessments (Inspections) .....	124
Distress Survey Procedures .....	128
Distress Survey Data .....	138
Direct Rating Procedures .....	141
Direct Rating Data .....	149
Paint Rating Procedures .....	151
Using Sampling in Condition Assessments .....	156
Using the Rapid Inspection Method .....	159
Knowledge-Based Inspection Scheduling .....	163
Overview .....	163
Overview .....	168
Introduction .....	168
Inspector Qualifications .....	192
Knowledge-Based Condition Assessment Manual Appendixes .....	198
APPENDIX A – DISTRESS SURVEY DEFINITIONS .....	198
APPENDIX B – BUILT-UP ROOFING DISTRESS SURVEY DEFINITIONS .....	200

---

APPENDIX C – SINGLE PLY ROOFING DISTRESS SURVEY	
DEFINITIONS .....	202
APPENDIX D – SHINGLE ROOFING (SR) DISTRESS SURVEY	
DEFINITIONS .....	203
APPENDIX E - DIRECT CONDITION RATING DEFINITIONS .....	205
APPENDIX F - PAINT RATING DEFINITIONS .....	206
<b>Functionality Assessment .....</b>	<b>208</b>
Functionality Assessment Overview .....	208
Functionality Assessment Tiers .....	208
Functionality Assessment Sets .....	209
Functionality Index Computation: Overview .....	210
Adding Functional Areas to a Building .....	212
Prerequisite .....	212
Add a Functional Area Using BUILDER .....	212
Entering Functional Area Data .....	214
Adding Inventory to Functional Areas .....	215
Prerequisite .....	215
Add Inventory to a Functional Area Using BUILDER .....	215
Add Inventory to a Functional Area Using BuilderRED .....	216
Performing First Tier Functionality Assessments .....	218
Prerequisites .....	218
Create a First Tier (Building) Functionality Assessment in BUILDER .....	218
Functionality Assessment Data Overview .....	221
Fill In the Functionality Assessment .....	222
Performing Second Tier Functionality Assessments .....	224
Prerequisites .....	224
Create a Second Tier Functionality Assessment in BUILDER .....	224

---

Functionality Assessment Data .....	226
Fill In the Functionality Assessment .....	228
	230
<b>Work Planning Overview .....</b>	<b>231</b>
Work Items .....	231
Creating Work Items .....	231
Standards, Policies, and Policy Sequences Overview .....	233
Adding and Editing Standards .....	238
Adding and Editing Policies .....	243
Adding and Editing Policy Sequences .....	248
Viewing Work Items .....	250
Navigating the Work Items .....	250
Adding and Deleting Work Items .....	252
Exporting the Work Plan to Excel .....	252
Creating and Editing a Section-Level Work Item .....	252
Work Item Cost Analysis .....	258
Creating and Editing a Building-Level Work Item .....	261
Creating and Editing a Project .....	265
Creating a Work Prioritization Scheme .....	270
Prioritizing Work Items .....	282
Funding Work Items .....	284
Entering Anticipated Funding Levels .....	285
<b>Scenarios .....</b>	<b>290</b>
Scenarios Overview .....	290
Advantages of Using Scenarios .....	292
Scenarios Overview .....	293

---

Scenario Management .....	295
Scenario Analysis .....	308
Copying a Work Plan from a Scenario .....	310
<b>Reports .....</b>	<b>312</b>
Using the Report Viewer .....	312
<b>Tools .....</b>	<b>314</b>
Importing Data from BRED .....	314
Administration .....	315
Application Settings .....	315
Security .....	318
Manual Condition Rollup .....	324
Library .....	326
Viewing and Editing Cost Data .....	326
Viewing and Editing Inflation Rates .....	332
Viewing and Editing Service Life Data .....	334
Acknowledgments .....	339
History .....	340
Copyright Warning .....	342
Disclaimer .....	342
<b>Glossary .....</b>	<b>343</b>
<b>Index .....</b>	<b>347</b>

# What's New in BUILDER 3.3

The following enhancements have been made in BUILDER 3.3:

- **New Building-level Work Items triggers**
  1. Building replacement is triggered when the Building Condition Index (BCI) falls below the configured BCI value as set in Standards and Policies.
  2. Modernization is triggered when the Functionality Index is below the configured threshold. See Functionality Standards for more information.
- **Building-Level Work Items Available in Scenarios**

In BUILDER Version 3.3, Scenarios will include Building-level work items when the Building Condition Index or Functionality Index warrants it.
- **Functionality Improvements**
  1. Functionality Assessment questions allow image attachment.
  2. BuilderRED (BRED) now supports functionality assessments.
- **Account Management/Support**

Users can now reset their own passwords when they've been forgotten. The account's email address must be set before this feature can be used. .
- **Login Improvements**

Users no longer need to configure their browser's popup blocker settings to exempt BUILDER.

# Getting Started with BUILDER

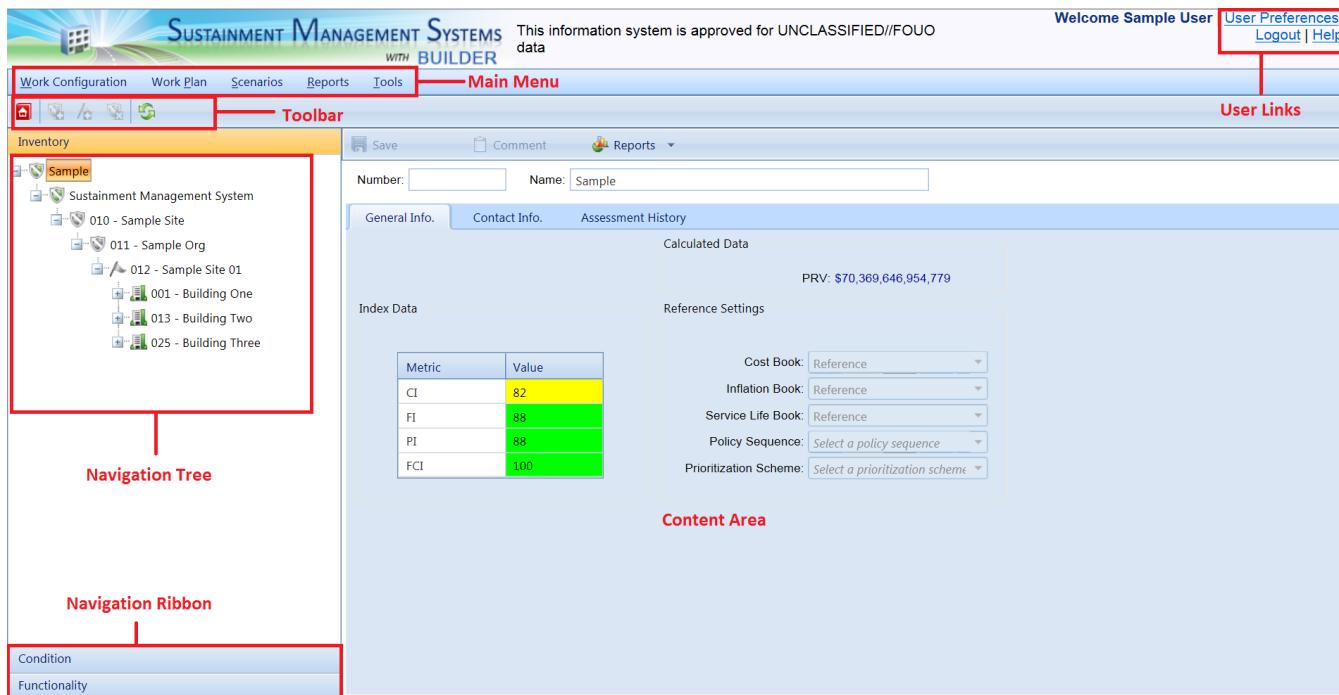
Before using BUILDER for the first time, you should get familiar with the menus, navigation scheme, and common icons. See "Navigating BUILDER" and "Recognizing the Common Icons" sections below.

If you are setting up an organization scheme for asset inventory, then "Establishing Selection Criteria" below is also a must-read, along with the material in the Inventory section.

The section on "User Preferences" addresses your user email address, password, and (optional) CAC registration; the default view you wish to start BUILDER with; and preferred unit of measure (English vs. metric).

## How To Navigate BUILDER™ 3.3

After opening the BUILDER™ website and logging into BUILDER 3.3, a screen similar to the one shown below will appear:



The BUILDER user interface has the following main areas, each of which is described in greater detail below:

- Main Menu
- User Links
- Toolbar

- Navigation Ribbon
- Navigation Tree
- Content Area

## **User Links**

The User Links area has these options:

- **User Preferences.** This option allows you to change the unit of measure; clear all the locks on the database records; or change the password to your database.
- **Logout.** Clicking this option causes you to logout, or sign-off, of BUILDER. After logging out of BUILDER , you will no longer be able to view or edit data until you are logged back in.
- **Help.** This option launches a context-sensitive help file pertaining to the current BUILDER screen.

## **Main Menu**

The Main Menu has the following options:

- **Work Configuration.** Clicking Work Configuration will give you a drop-down list providing you with the work configuration options for [Standards & Policies](#), Policy Sequences, [Prioritization Schemes](#), and [Funding](#). The **Return** button, near the upper left corner of the screen. will return you to the Main Menu page.
- **Work Plan.** Clicking Work Plan brings you to the table of details about each work plan item. For more information, see the [Work Plan](#). The **Return** button, near the upper left corner of the screen. will return you to the Main Menu page.
- **Scenarios.** Clicking Scenarios allows you to create scenarios and to perform Scenario Management or Scenario Analysis/Visualization. (The Scenario Management option may be slow to load.) The **Return** button, located upper left, will return you to the Main Menu page.

**Note:** Microsoft Silverlight 5 is required for Scenario Management to operate.

- **Reports.** Clicking Report brings up a pop-up box listing report formats to choose from. The **Close** button (in the upper left corner of the pop-up box) will return you to the Main Menu page.
- **Tools.** Clicking **Tools** will allow you to Import data from [BRED](#) or to import an image archive, perform **Administration** ([Application Settings](#), [Security](#), and [Manual Condition Roll-Up](#)), or access a Library ([Cost](#), [Inflation](#), [Service](#)

[Life](#), or Component Importance Indexes). The **Return** button, near the upper left corner of the screen, will return you to the Main Menu page.

## **Toolbar**

The options displayed on the toolbar will vary, depending on the currently active level (Organization, Site, Complex, etc.).

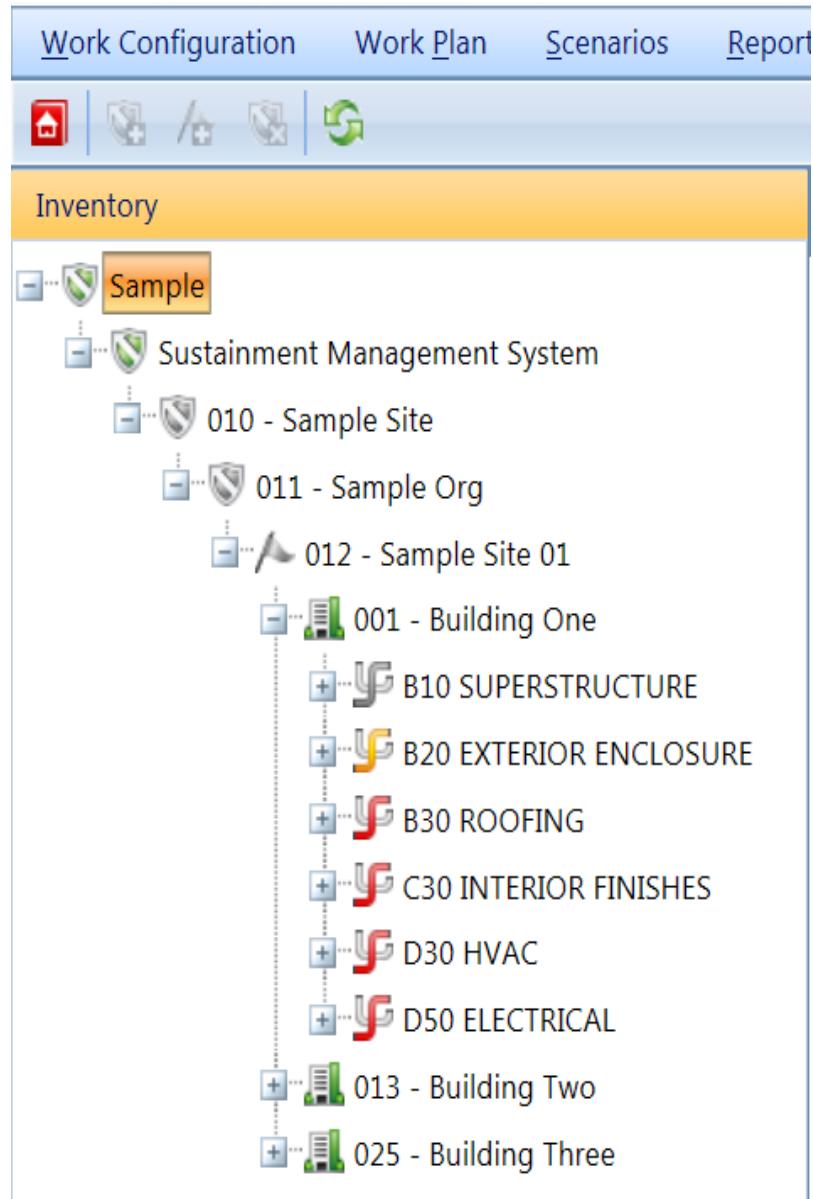
## **Navigation Ribbon**

In the left viewing pane, the Navigation Ribbon allows you to quickly select between the following navigation trees:

- **Inventory.** The Inventory tree is the default view in the left viewing pane. If either Condition or Functionality is visible instead of the Inventory tree, then clicking on the Inventory ribbon will replace that tree with the Inventory tree. Navigating the Inventory tree is described in the next section, Navigation Tree. After an inventory level is chosen in the tree, placing the mouse over the Inventory option will cause a sub-menu to drop-down providing you with additional inventory options for the selected level. See the [Inventory Overview](#) for more information.
- **Condition.** Clicking on the Condition Assessment ribbon will show the condition assessment tree in the navigation tree. Navigating the Condition tree is described in the next section, Navigation Tree. After a condition assessment level is chosen in the tree, placing the mouse over the Condition Assessment option will cause a sub-menu to drop-down providing you with additional condition assessment options for the selected level. See the [Condition Assessment Overview](#) for more information.
- **Functionality.** Clicking on the Functionality Assessment option will show the functionality assessment tree in the navigation tree. Navigating the Functionality tree is described in the next section, Navigation Tree. After a functionality assessment level is chosen in the tree, placing the mouse over the Functionality Assessment option will cause a sub-menu to drop-down providing you with additional functionality assessment options for the selected level. See the [Functionality Assessment Overview](#) for more information.

## **Navigation Tree**

The Navigation Tree, in the left-hand viewing area, allows you to select the different levels of the tree and to view data related to the level in the context area. Shown below is an example of the inventory tree.



Here, the tree can be expanded by clicking on the "+" next to an inventory level or collapsed by clicking on the "-" next to an inventory level. To select a particular inventory level, left or right-click on it. The information pertaining to that inventory level will be displayed in the content area. While the example described above is for the inventory tree, the condition assessment and functionality assessment trees are navigated in the same manner.

## **Content Area**

The content area displays the specific information pertaining to the current item selected in the navigation tree. Shown below is an example of what would appear in the content area if a Component-Section was selected in the inventory

navigation tree. If you wish to view information pertaining to a different item, navigate the tree to the item and select it by clicking on it.

The screenshot shows the BUILDER software interface for managing buildings. At the top, there's a toolbar with 'Save', 'Comment', and 'Reports' buttons, and a breadcrumb navigation path '012 - Sample Site 01 > 001 - Building One'. Below the toolbar, the building number 'Building No: 001' and name 'Building Name: Building One' are displayed. A tab bar at the top of the main content area includes 'General Info', 'Additional Info', 'Assess. History', 'Work Item History', 'Systems at a Glance', and 'Attachments (0)'. The 'General Info' tab is selected. Under 'General Info', there are fields for 'Building Use' (set to '891024 - BUILDING HOUSING MISCELLANEOUS UTILITY PLANT'), 'Building Type' (dropdown), 'Current Status' (set to 'Active'), 'Construction Type' (set to 'Permanent'), 'Area' (4,300 SF), 'Year Constructed' (1985), and 'Number of Floors' (1). To the right of these fields are sections for 'Mission Dependency Index' (MDI: 42, with a checkbox to override automated updates), 'Status' (checkboxes for 'Historic' and 'Child-Occupied Facility'), and 'Condition' (table showing BCI, BFI, BPI, and FCI all at 100). On the far left, there's a section for 'ISR Rating' and 'Replacement Cost' (\$758,860), with a checkbox to override automated replacement cost. To the right of the condition table is a 'Functionality' section with a table showing various issues and their ratings (all 100). The overall interface is light blue and white, with some green and red highlights for certain values.

## Recognizing Common BUILDER Icons

Listed alphabetically below are the common command, toolbar, and menu buttons you will encounter when using BUILDER, along with their definitions.

**Tip:** It is a good idea to become familiar with these icons before using BUILDER.

Icon	Description
	ADD BUILDING. Click this button to add a Building to a Site.
	ADD COMPLEX. Click this button to add a Complex to a Site.
	ADD COMPONENT. Click this button to add a Component to a System.
	ADD ORGANIZATION. Click this button to add an Organization.

	ADD SECTION. Click this button to add a Section to a Component.
	ADD SITE. Click this button to add a Site to an Organization.
	ADD SYSTEM. Click this button to add a System to a Building.
	NEW/ADD. Click this button to create a new record. The type of record to be created is determined by where the NEW button is located. For example, if the button is next to a dropdown list, clicking the NEW button will create a new entry in that list. If the button is above a grid, clicking the NEW button will create a new line in the grid, i.e. a new record of whatever is being displayed in the grid. If the NEW button is in the window toolbar, clicking it will create a new item of the type being displayed in the window.
	BUILDING. Designates a Building.
	BUILDING TEMPLATE. Click this button to bring up a list of available building templates.
	CANCEL. Click this button to cancel changes that have been made to the data since the last save. Changes made to data on the screen are not stored in the database until the SAVE button is clicked. Clicking CANCEL will cause recent changes to the data on the screen to be overwritten by data from the database.
	CHECK SPELLING. Click this button to check spelling in document.
	CLOSE. Click this button to close an open window.
	COMMENT. Click this button if you wish to enter a comment. The scope of the comment is determined by the location of the button. A COMMENT button in the window toolbar is used for comments regarding the item displayed in the window. A COMMENT button next to a dropdown list allows you to add comments about the current item selected in the list.
	COMPLEX. Designates a Complex.

	COPY INVENTORY TO ANOTHER BUILDING. Click this button to copy inventory to another building.
	CREATE INVENTORY USING TEMPLATE. Click this button to create an inventory using a template
	CREATE WORK ITEMS.
	DELETE. Click this button to delete a selected record. The record to be deleted is determined by where the DELETE button is located. For example, if the button is next to a drop-down list, clicking the DELETE button will delete the record identified by the current selection in the list. If the button is above a grid, clicking the DELETE button will delete the current selected record in the grid (designated by an arrow in the left most column). If the DELETE button is in the window toolbar, clicking it will delete the item being viewed in the window and generally close the window since no data will then be available for display.
	DELETE BUILDING. Click this button to delete a Building.
	DELETE COMPLEX. Click this button to delete a Complex.
	DELETE COMPONENT. Click this button to delete a Component.
	DELETE SECTION. Click this button to delete a Section.
	DELETE SITE. Click this button to delete a Site.
	DELETE SYSTEM. Click this button to delete a System.
	EDIT. Click this button to edit a selected record.
	EXIT. Click this button to close an open window.
	EXPORT. Click this button to export your data.
	EXPORT TO BRED. Click this button to export your data to a BUILDER Rapid Entry Data (BRED) file.
	FILE SAVE. Click this button to save the file.
	GENERATE. Click this button to generate analysis results. This may be for inspection schedules, work items, or IMPACT scenarios.

	HELP. Click this button to access the online help features of BUILDER.
	IMAGES. Click this button if you wish to add a image. The scope of the image is determined by the location of the button. An IMAGE button in the window toolbar is used for images of the item displayed in the window.
	IMPORT. Click this button to import your data.
	LOCKED RECORD. This indicates that the selected record is locked. When it is locked, the record cannot be edited. This may be the case either because the record is checked out or the user does not have permission.
	OK. This check mark designates acceptance in the comments box.
	ORGANIZATION. This is the highest order in the BUILDER navigation tree.
	RAPID INVENTORY ESTIMATION. Click this icon to get a Rapid Inventory Estimation.
	REFRESH. Click this button to refresh the inventory tree to reflect the latest data edits. Note that refreshing the tree collapses all expanded nodes.
	REPORTS. Click this button to select and view standard reports. The types and scope of the reports are determined by where the REPORTS button is located. A REPORTS button in the window toolbar is used for reports on the item displayed in the window.
	ROLL-UP. Click this button to manually roll up performance metrics for a Building, Complex, Site, or Organization.
	SAVE. Click this button to permanently save and store changes to the data.
	SECTION. Designates a Section.
	SITE. Designates a Site.
	SYSTEM. Designates a System.
	UNLOCKED RECORD. This indicates that the selected

record is unlocked. See also LOCKED RECORD.

## Establishing Selection Criteria

Several features of BUILDER™ require that you specify criteria that will be used in deciding whether a Building, Component-Section, or work item belongs to a particular group. Each instance where you must establish selection criteria presents you with a grid similar to the one shown below:

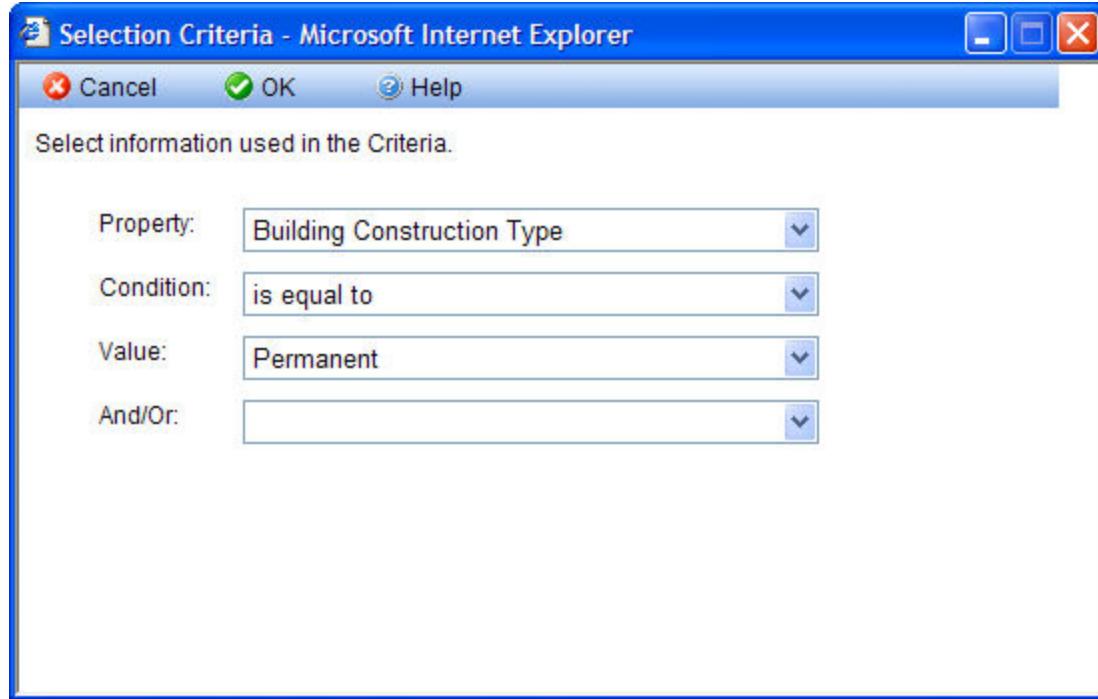
The screenshot shows a software interface for establishing selection criteria. At the top, there are two tabs: "Defining Property" (disabled) and "Selection Criteria" (selected). Below the tabs is a message: "Refine the record selection process by adding and deleting criteria." To the right of the message are three buttons: "Add", "Edit", and "Delete". The main area is a grid with four columns: "Property", "Condition", "Value", and "And/Or". There is one row in the grid, which represents the criteria: "Building Construction Type" is equal to "Permanent".

Property	Condition	Value	And/Or
Building Construction Type	is equal to	Permanent	

Selection criteria constructed in this grid have been designed to be easily read. If you are familiar with SQL selection statements used with database management systems, the structure and wording of the criteria in the grid should look familiar. Each row of the grid represents one full statement in the list of criteria. Each statement is connected to the others by "And" or "Or". The association of statements is from the left, i.e. "A and B or C" is actually "(A and B) or C."

### How To Create a New Selection Criterion

To create a new statement in the selection criteria grid, click the **Add** button in the top right corner of the Selection Criteria tab. The Selection Criteria pop-up window will appear:



Select the property to be used in the statement from the Property drop-down list. After you have selected the property, the Condition drop-down list will populate with appropriate condition statements. Select a condition from the list. Depending on the property, you will then either enter the Value or select it from a drop-down list of available choices. Finally, if multiple selection criteria will be used, select the proper connector ("And" or "Or") statement. Click the **OK** button to save the selection criterion; or, if you do not wish to create the selection criteria, click the **Cancel** button.

#### Important Points:

- It is possible to create a list of selection criteria containing contrary statements. BUILDER has no way of determining or preventing this, and will simply return no items satisfying the selected criteria.
- Condition Index (CI) properties of all inventory items use "-1" as the value of the CI when the CI is unknown. If you use a statement such as "CI is less than X," then you should also add ("And") the statement "CI is greater than or equal to 0" so as not to include all of the items of unknown CI.

#### How To Edit an Existing Selection Criterion

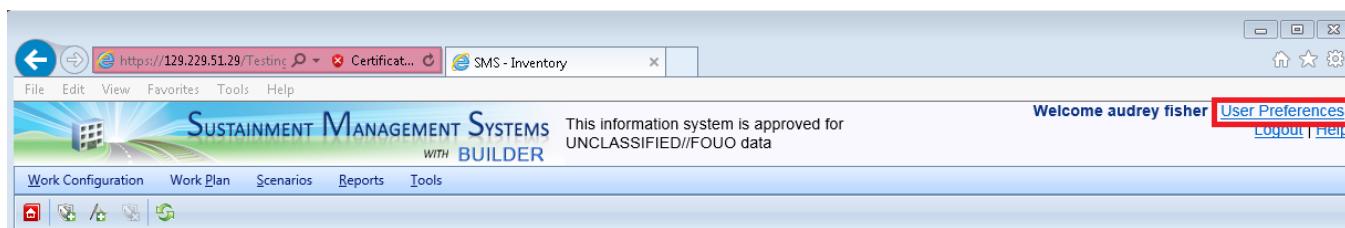
To edit an existing selection criterion, click on it in the selection criteria grid and click the **Edit** button in the top right corner of the tab. Again, the Selection Criteria pop-up window will open, and you can edit the Property, Condition, Value, and connector (And/Or) elements.

## How To Delete an Existing Selection Criterion

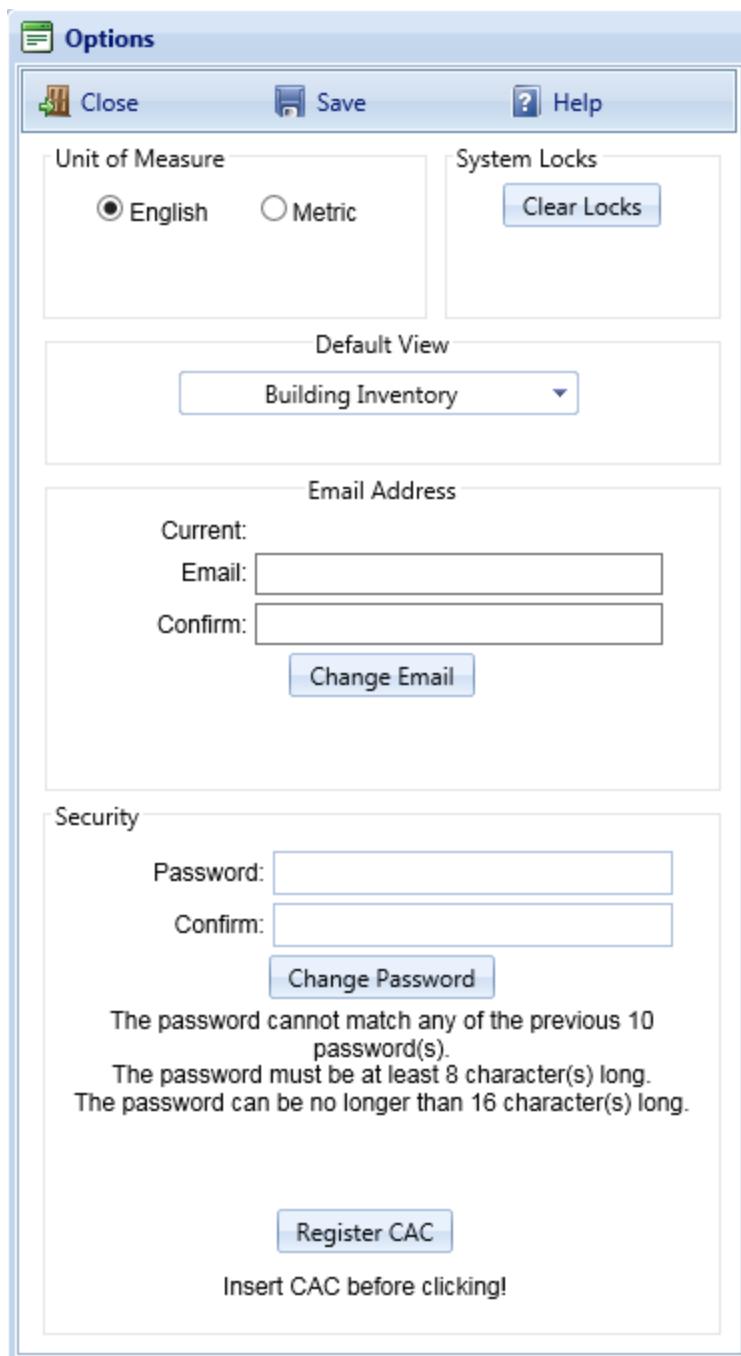
To delete an existing selection criterion, click on it in the selection criteria grid and click the **Delete** button in the top right corner of the tab.

## User Preferences

The User preferences window allows you to change your default BUILDER view, to change the unit of measure, to clear all the locks on the database records, or to change the password to your database. To edit the user preferences, select [User Preferences](#) from the top right hand corner of the home page.



The User Preferences window will appear:



From this window, the following data can be edited:

- **Unit of Measure**. Select the unit of measure, **English** or **Metric**, to be used for the database.
- **System Locks**. Click the **Clear Locks** button to clear all the user locks and allow for all data to be edited.

- **Default View.** Expand the dropdown list and select between Building Inventory, Condition Assessment, and Functionality Assessment as your default view when using BUILDER.
- **Email Address.** Your current email address will appear above the two text boxes. To change your email address,
  1. Enter the new address in the first text box.
  2. Enter the new email address again in the second text box to confirm it.
  3. Click the **Change Email** button.
- **Security.** If you wish to change your login password,
  1. Enter the new password.
  2. Retype it to confirm.
  3. Click the **Change Password** button.
- In the Security section, you also have the option to register a smartcard (CAC) to log in with.

## **How To Save Your New User Preferences**

After editing any of the data, click the **Save** button to save your changes to the database.

## **How To Cancel User Preference Changes**

- A. If you have not clicked the **Save** button, you can simply click the **Close** button (upper left corner of the User Preferences options window) to exit the User Preferences options window without saving your changes.
- B. If you already clicked **Save**, then you will need to change the options back to the way you want them, and click **Save**.

## **How to Exit the User Preferences Options Window**

**Important:** Make sure to save any changes you want before exiting. With the exception of changing your email or password, changes to the User Preferences options are *not* saved until you click the **Save** button.

Click the **Close** button to close the User Preferences window.

# Performing Inventory

After higher-level work configuration task have been established, the next step in the process of using BUILDER to track real property assets and their condition is to perform a full inventory of assets.

**NOTE:** Depending on manpower and other considerations, you may choose to perform inventory and initial inspections (condition assessment) at the same time.

## Inventory Overview

Your BUILDER™ inventory serves as the foundation for all that you will do with the BUILDER application. The first step in using BUILDER is to construct a database that describes the physical inventory you manage. That process of putting the data into BUILDER will probably be your single most intensive effort in working with the program, but it is a one-time effort that can be aided by features that may allow you to import data from other Systems, [copy Buildings](#), use [Building templates](#) when multiple Buildings have a single design, or to use [Rapid Inventory Estimation](#) using embedded models to estimate Building composition.

Begin by grouping your Buildings into logical management units, typically by their geographic regions, which are represented by [Site records](#) in the BUILDER database. The Site provides a natural way to group Buildings and to apply properties that are regional in nature, such as the cost of operations and maintenance (O&M) work and the heating, ventilation and cooling (HVAC) climate.

Next, you [create Building records](#) for the Buildings at one of your Sites. A Building record includes critical information such as how the Building is used, its size, age, and number of floors. You will find that BUILDER also allows you to store, at your option, a variety of other information about a Building, such as applicable [family housing data](#). You will also be able to establish a [mission dependency index](#) to measure quantitatively how critical the Building is to the mission for which it is used.

After you have created a Building record in the BUILDER inventory, you will be able to add records that describe the various physical items that are part of the Building: the doors, walls, windows, plumbing fixtures, heating units, etc. At the elemental level, these items are called Component-Sections, or simply Sections. Component-Sections are the management unit in BUILDER. You inspect them and plan work for them, and BUILDER applies its condition assessment algorithms to them in calculating their condition index. BUILDER uses embedded data and automated processes to determine a wealth of information about each

Component-Section: its expected service life, its likely subcomponents and how their condition affects the Section as a whole, and the cost of replacing, painting, repairing, and removing it. As you might imagine, for an automated system to be able to do all of this, there are some strict rules about how you define Component-Sections. Creating the Component-Section records is the most difficult and time-consuming aspect of creating the BUILDER inventory.

You begin by working down to the Component-Sections hierarchically, starting with the major Systems of a Building. There are 17 of these Systems in BUILDER, and they are specified by the ASTM UNIFORMAT II Classification for Building Elements (Level 2).

**Note:** BUILDER Versions 2.x and older supported a decomposition of 12 systems. If you are working with the 12-system legacy decomposition, talk to your SMS support agent about transitioning to UNIFORMAT II.

Create the Systems by selecting each applicable System from a pick list. Each System is further decomposed into Components (UNIFORMAT Level 3 elements). Again, you will create the Component records by selecting from a pick list of Components applicable to a given system. See [BUILDER Systems and Components](#) for a list of each decomposition's Systems and their typical Components.

Once you have created records for a System and for a Component of that System, you are ready to create Component-Section records that actually represent the physical items in your Building belonging to particular Systems and Components. For example, a System might be of type "Exterior Enclosure" and one of its Components might be "Exterior Doors." The Component-Section records represent the physical exterior doors in your Building. Some of the doors maybe glass personnel doors, some may be metal overhead doors. A Component-Section consists of items in the Building that all belong to the same Component and, moreover, are all of the same type and material/equipment category. In this example, you will have to create at least two records to represent the exterior doors: one for the glass personnel doors and one for the metal overhead doors. You will have considerable flexibility in how you group similar items together to form a Component-Section.

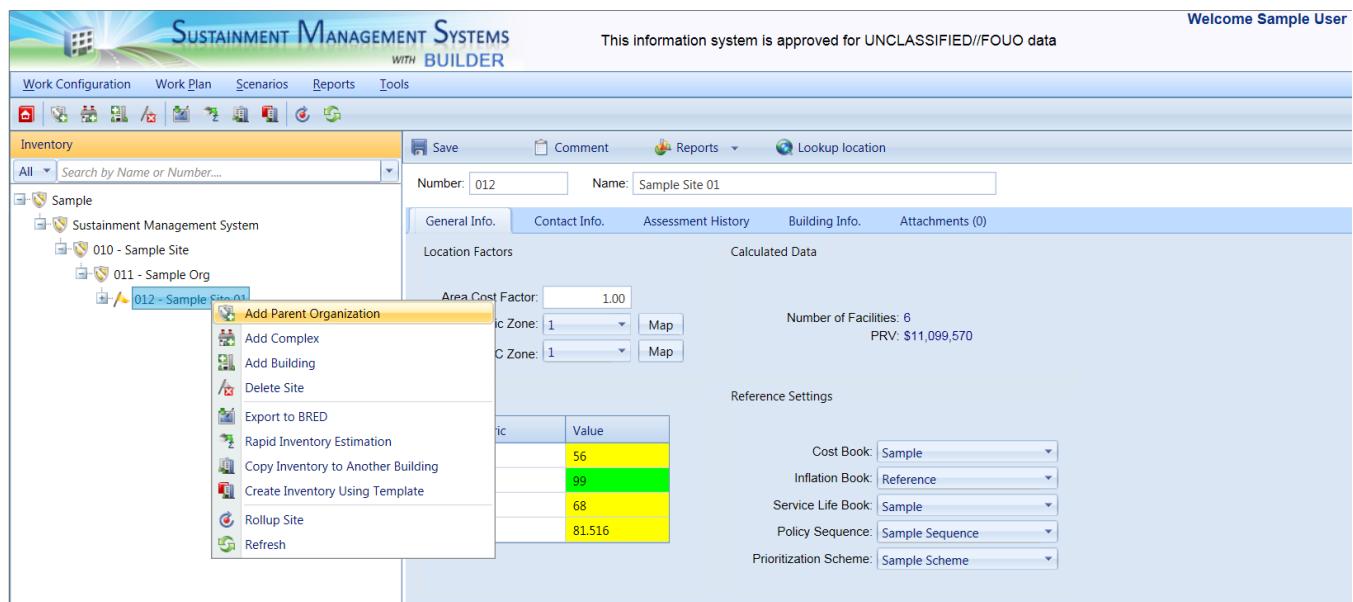
Once a Component-Section has been identified by Component type and material/equipment category, BUILDER will have sufficient information to establish a clear link between the Section and the embedded data and computations that it brings to the process in order to help you with your management tasks. Details, examples, and some suggestions about how to make the process of completing your BUILDER inventory are contained in the topic [Identifying Systems, Components and Sections](#).

# Adding, Editing, or Deleting an Organizational Group

BUILDER™ 3.3 is an enterprise level program. As such, its inventory can contain Buildings at a number of different Sites. It is possible that multiple Sites are managed together, as in a region, and therefore should be arranged together. If this is the case, BUILDER allows for multiple sites to be arranged together in an Organizational Group.

## Add an Organization

To add a sub Organizational group (001 - Sample Org) under a main group, select the main group to add this subgroup to, and click the **Add Organization** button on the navigation menu. Alternatively, you can create a Parent Organization group by selecting a Site, and choosing Add Parent Organization.



After this, the following data is required for the Organization:

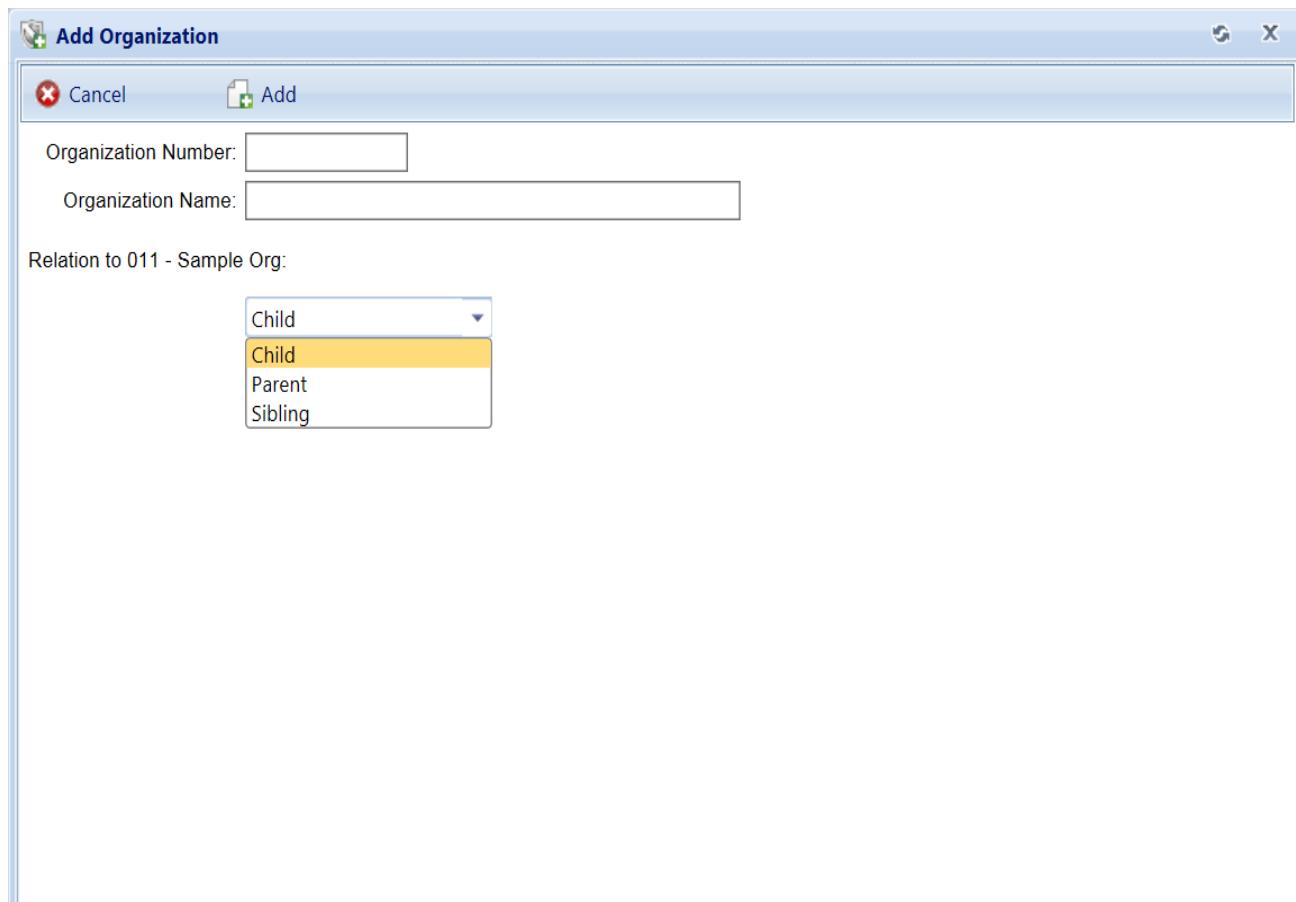
- **Organization Number.** Enter the identifying number for the group, limited to 12 alphanumeric characters. You may leave this blank if you wish to supply only a name. You must enter at least a Organization name or Organization number and the combination of the two must be unique among the Organizations in your database.
- **Organization Name.** Enter the identifying name for this Organization, limited to 50 alphanumeric characters. You may leave this blank if you wish to supply only a number. You must enter at least a Organization name or

Organization number and the combination of the two must be unique among the Organization in your database.

- **Relation.** Specify the relation of the group being created to the selected Organization or Site on the inventory tree. There are three options for the relation:

- Child - The Organization will be placed under the selected Organization. Note that Child Organization can only be created when an Organization is selected in the inventory tree.
- Parent - The Organization will be placed above the selected Organization or Site.
- Sibling - The Organization will be placed at the same level as the selected Organization or Site.

**Note:** The top level Organization may not have a sibling organization.



Once the required data are entered, click the **Add** button to create the Organization. To close the window without creating the Organization, click the **Close** button.

## Edit Organization Data

To edit data for a specific Organization, select the Organization in the inventory tree.

The screenshot shows the SMS software interface. The title bar reads "SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER" and "Welcome Sample User". The top menu bar includes "Work Configuration", "Work Plan", "Scenarios", "Reports", and "Tools". Below the menu is a toolbar with icons for Save, Comment, and Reports. The left side features an "Inventory" tree view with nodes like "Sample", "Sustainment Management System", "010 - Sample Site", "011 - Sample Org" (which is selected), "012 - Sample Site 01", "013 - Complex 1", "014 - Complex 2", and "001 - Building One". The main content area has tabs for "General Info.", "Contact Info.", and "Assessment History". Under "General Info.", there is a "Calculated Data" section showing "PRV: \$11,099,570" and an "Index Data" table:

Metric	Value
CI	56
FI	99
PI	68
FCI	81.516

On the right, there are "Reference Settings" with dropdown menus for "Cost Book", "Inflation Book", "Service Life Book", "Policy Sequence", and "Prioritization Scheme", all set to "Sample".

### Toolbar

- **Save**. Use this button to save the changes you have made to the Organization data.
- **Comment**. Use this button allows you to add, edit, and view comments about the Organization.
- **Reports**. Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to Organization inventory. See [Using the Report Viewer](#).

### General Information

Initially after an Organization is selected in the inventory tree, the general information tab is shown and the following information can be edited:

- **Organization Number and Name.** You may edit the Organization Number and Name as you wish. Organization Number is allowed to contain 12 characters; Organization Name is allowed 50 characters.
- **Index Data (Read-Only).**
  - **Organization Condition Index (CI).** The Organization CI displays the average CI of the buildings in the Organization, weighted by replacement cost. This metric provides an overall sense of the condition of the group as a whole.

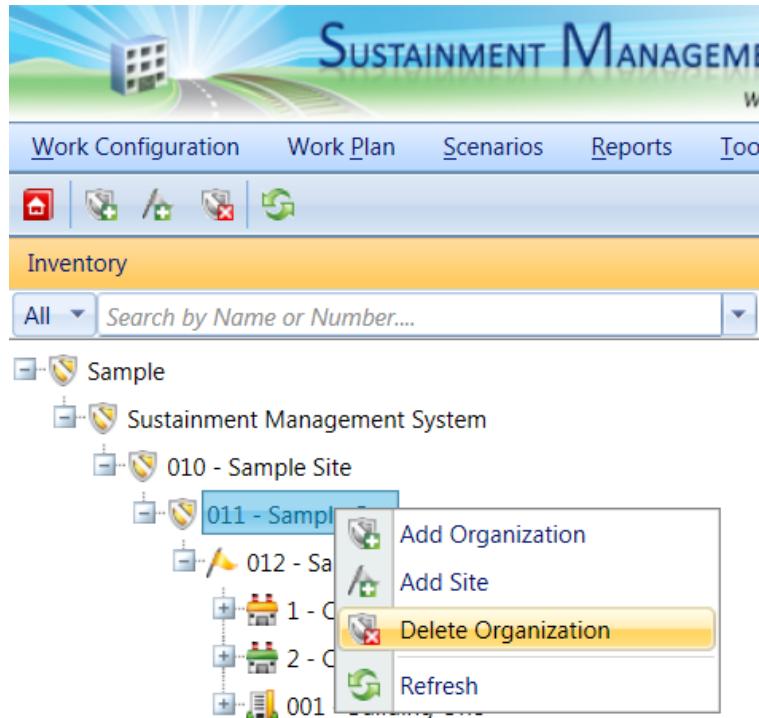
- **Organization Functionality Index (FI).** The Organization FI displays the average FI of the buildings in the Organization, weighted by replacement cost. This metric provides an overall sense of the functionality of the Organization as a whole.
- **Organization Performance Index (PI).** The Organization PI displays the average PI of the buildings in the Organization, weighted by replacement cost. This metric provides an overall sense of the performance of the Organization as a whole.
- **Calculated Data** (Read-Only).
  - PRV. The calculated data includes the aggregate present replacement value (PRV) of the buildings in the group.
- **Reference Settings.**
  - **Cost Book.** Select the [cost book](#) from the dropdown list you wish to use for the entire inventory of the Organization. The cost book selected will provide inventory replacement costs for inventory.
  - **Service Life Book.** Select the [service life book](#) from the dropdown list you wish to use for the entire inventory of the Organization. The service life book selected will estimate the remaining service life of component-sections in the inventory on the basis of its life expectancy and condition. Also, the service life is used in estimating a rate of deterioration in the condition index of a Component-Section when no more than one inspection has been recorded.
  - **Policy Sequence.** Select the [policy sequence](#) from the dropdown list you wish to use for the entire inventory of the Organization. The policy sequence selected will establish the order of precedence for applying policies so that only one standard is chosen for the inventory in the building.
  - **Prioritization Scheme.** Select the [prioritization scheme](#) from the dropdown list you wish to use for the entire inventory of the Organization. The prioritization scheme selected will prioritize and rank your work plan in a quick, objective, repeatable, and representative method with the touch of a button.

It is important to note that reference data can be set at the Organization and Site level. If this data is set at both levels, the reference settings at the Site level will overwrite the reference settings at the Organization level.

In addition to the general information for the Organization described above, more information can be added and viewed on the [contact information and condition trends tab](#).

## **Delete an Organization**

To delete an Organization, select the Organization in the inventory tree, and click the **Delete Organization** button.



**Warning:** if you delete an Organization, you also delete all inventory (Complexes, Buildings, Systems, Components, and Sections) in that Organization. This is a significant step to take and should only be done when you are certain that you wish to clear the entire inventory of the group you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## **Additional Organizational Data**

Additional Organizational data is displayed and can be edited on the contact information and condition trends tabs when a group is selected in the inventory tree.

This screenshot shows the SMS software interface. The top navigation bar includes 'Work Configuration', 'Work Plan', 'Scenarios', 'Reports', and 'Tools'. The main title is 'SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER'. A message at the top right says 'This information system is approved for UNCLASSIFIED//FOUO data' and 'Welcome Sample User'. The left sidebar shows a tree structure with 'Sample' selected, which further branches into 'Sustainment Management System', '010 - Sample Site', '011 - Sample Org', and '012 - Sample Site 01'. A context menu is open over '012 - Sample Site 01' with options like 'Add Parent Organization', 'Add Complex', 'Add Building', 'Delete Site', etc. The main content area displays 'General Info.' tab details: Number 012, Name Sample Site 01, Location Factors (Area Cost Factor 1.00, Bic Zone 1, C Zone 1), Calculated Data (Number of Facilities: 6, PRV: \$11,099,570), Reference Settings (Cost Book: Sample, Inflation Book: Reference, Service Life Book: Sample, Policy Sequence: Sample Sequence, Prioritization Scheme: Sample Scheme), and a table of values.

### Contact Information Tab

The contact information for the organization can be viewed and edited by selecting the CONTACT INFORMATION tab.

This screenshot shows the SMS software interface with the 'Contact Info.' tab selected. The left sidebar shows the same tree structure as the previous screenshot. The main content area displays contact information fields: Name (empty), Address (empty), City (empty), State (empty), Zip Code (empty), Phone # (empty), Fax # (empty), Email (empty), and WWW (empty).

All of the additional organizational information is optional. It includes data regarding the official point of contact (POC) for the organization:

- POC Name.** Enter the name of the organization point of contact, limited to 30 alphanumeric characters.
- Address.** Enter the official street address of the organization, limited to 30 alphanumeric characters).

- **City.** Enter the city of the organization, limited to 15 alphanumeric characters.
- **State.** Enter the state of the organization, limited to 2 alphanumeric characters.
- **Zip Code.** Enter the zip code of the organization, limited to 10 alphanumeric characters.
- **Phone Number.** Enter the phone number of the organization POC, limited to 20 alphanumeric characters.
- **FAX Number.** Enter the FAX number of the organization POC, limited to 20 alphanumeric characters.
- **Email Address.** Enter the email address of the organization POC, limited to 75 alphanumeric characters.
- **WWW.** Enter the World Wide Web (WWW) URL address for the organization, limited to 75 alphanumeric characters.

#### *Assessment History Tab*

The Assessment History tab provides a graph of the condition, functionality, performance, and FCI history of the Organization, displaying the Organization CI, Organization FI, Organization PI, and Organization FCI over time.

6

## **Adding, Editing, or Deleting a Site**

A BUILDER inventory can contain Buildings at a number of different geographic locations. Several properties of Buildings and their Components are determined or affected by the Building's geographic location, most critically the area cost factor, a multiplier which adjusts national average labor/material/equipment costs to local costs. Additional location data includes the HVAC zone and seismic zone of the Site. Knowing the geographic location of a Building is extremely important, therefore BUILDER requires you to create a Site record for each geographic location before you can add Buildings to the database.

### **Add a Site**

To add a new Site, select the **Add Site** button from the navigation menu.



On this screen, enter the following required data for the Site:

- **Site Number** -Enter the identifying number for the Site, limited to 12 alpha-numeric characters. You may leave this blank if you wish to supply only a name. You must enter at least a Site name or Site number and the combination of the two must be unique among the groups in your database.
- **Site Name** -Enter the identifying name for this Site, limited to 50 alpha-numeric characters. You may leave this blank if you wish to supply only a number. You must enter at least a Site name or Site number and the combination of the two must be unique among the groups in your database.

Additionally, you have the option of using factors (area cost factor, seismic zone, and HVAC zone) from existing locations in the BUILDER system by marking the "Use factors from following location:" checkbox and choosing a location from the dropdown lists.

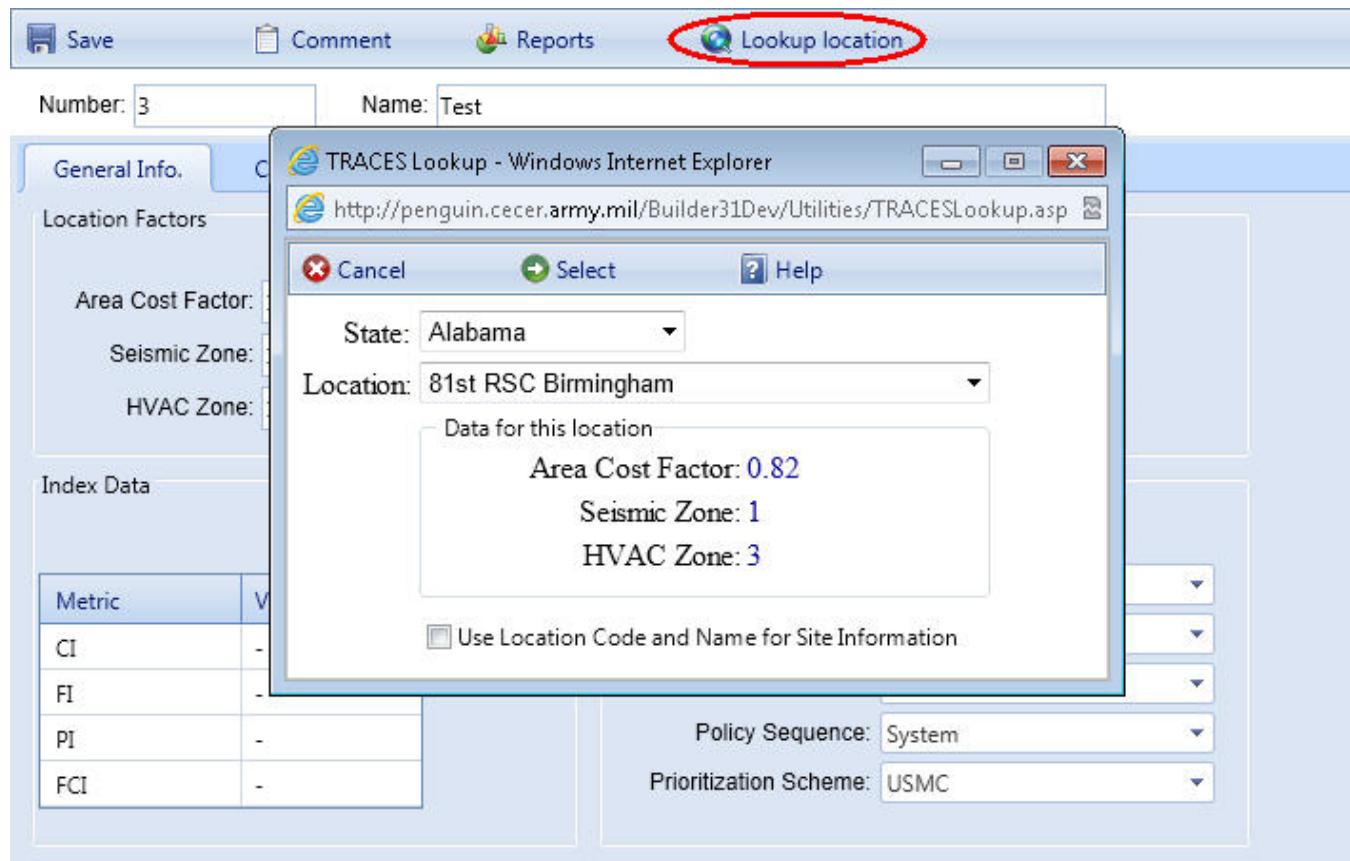
Once the required data are entered, click the **Add** button to create the Site. To close the window without creating the Site, click the **Cancel** button.

### **Edit Site Data**

To edit the data for a specific Site, select the Site in the inventory tree.

## Toolbar

- **Save** - Use this button to save the changes you have made to the Site data.
- **Comment** - Use this button allows you to add, edit, and view comments about the Site.
- **Reports** - Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to Site inventory. See [Using the Report Viewer](#).
- **Lookup Location** - Use this button to launch the site selection window.



Select the state and then the location within that state of your Site. The location list includes Department of Defense installations and most major cities in the United States. After the state and location are selected, click the **Select** button to automatically fill in the required data fields on the location screen. If you click the **Cancel** button, you will return to the Location screen without making changes. If your particular Site is not listed, choose a location close to your Site and edit the name afterward.

## **General Site Information**

Initially after a Site is selected in the inventory tree, the general information tab is shown with the following information:

- **Site Number and Name.**

You may edit the Site Number and Name as you wish. Site Number is allowed to contain 12 characters; Site Name is allowed 50 characters.

- **Location Factors:**

- Area Cost Factor -The area cost factor is a multiplier used to adjust national average cost for labor/materials/equipment to local costs. It is generally a number between 0.8 and 1.2 for continental U.S. locations, but it can be even greater than 2.0 in high-cost geographic locations.
- Seismic Zone -The seismic zone is an integer from 1 to 7 following the Federal Emergency Management Agency's (FEMA) U.S. seismic zoning. Determine your Site's seismic zone by using the **Select** button on the toolbar or by consulting the seismic map of the U.S. seismic zones, which can be accessed by clicking the MAP button next to the Seismic Zone text box.
- HVAC Zone -The HVAC zone is an integer from 1 to 11. Determine your Site's HVAC zone by using the **Select** button on the toolbar or by consulting the map of the U.S. HVAC zones, which can be accessed by clicking the MAP button next to the HVAC Zone text box.

- **Index Data (Read-Only):**

- Site Condition Index (CI) -The Site CI displays the average CI of the Buildings in the Site, weighted by replacement cost. This metric provides an overall sense of the condition of the Site as a whole.
- Site Functionality Index (FI) -The Site FI displays the average FI of the Buildings in the Site, weighted by replacement cost. This metric provides an overall sense of the functionality of the Site as a whole.
- Site Performance Index (PI) -The Site PI displays the average PI of the Buildings in the Site, weighted by replacement cost. This metric provides an overall sense of the performance of the Site as a whole.
- Site Facility Condition Index (FCI) -The Site FCI represents the total maintenance and repair costs for the Site, normalized by the total Site PRV. This metric provides an overall sense of deferred repair work.

- **Calculated Data (Read-Only):**

- # of Facilities -Displays the number of Buildings included in the Site inventory.

- PRV -Displays the total present replacement value of the Buildings at the Site computed by adding the individual Building replacement costs.

- **Reference Settings:**

- Cost Book -Select the [cost book](#) from the dropdown list you wish to use for the entire inventory of the group. The cost book selected will provide inventory replacement costs for inventory.
- Service Life Book -Select the [service life book](#) from the dropdown list you wish to use for the entire inventory of the group. The service life book selected will estimate the remaining service life of Component-Sections in the inventory on the basis of its life expectancy and condition. Also, the service life is used in estimating a rate of deterioration in the condition index of a Component-Section when no more than one inspection has been recorded.
- Policy Sequence -Select the [policy sequence](#) from the dropdown list you wish to use for the entire inventory of the group. The policy sequence selected will establish the order of precedence for applying policies so that only one standard is chosen for the inventory in the Building.
- Prioritization Scheme -Select the [prioritization scheme](#) from the drop-down list you wish to use for the entire inventory of the group. The prioritization scheme selected will prioritize and rank your work plan in a quick, objective, repeatable, and representative method with the touch of a button.
- Inflation Set -Select the [inflation set](#) from the dropdown list you wish to use for the entire inventory at that Site. This will apply inflation cost factors to estimate repair costs for multi-year IMPACT scenarios.

It is important to note that reference data can be set at the group and Site level. If this data is set at both levels, the reference settings at the Site level will overwrite the reference settings at the group level.

In addition to the general information for the Site described above, more information can be added and viewed on the [other tabs](#) at the top of the screen.

## **Delete a Site**

To delete a Site, select the Site in the inventory tree and click the Delete Site option.

It is important to note that deleting a Site deletes all inventory (Complexes, Buildings, Systems, Components, and Sections) in that Site. This is a significant step to take and should only be done when you are certain that you wish to clear the

entire inventory of the Site you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## **Additional Site Data**

Additional Site data is displayed and can be edited on the General Information tab, the contact information tab, and the building information tab when a Site is selected in the inventory tree.

### **Contact Information Tab**

The Contact Information for the Site may be viewed and edited by selecting the CONTACT INFORMATION tab.

Save Comment Reports Lookup location

Number: 012 Name: Sample Site 01

General Info. **Contact Info.** Assessment History Building Info. GIS Layers Attachments (0)

Name: John Doe  
Address: 123 Any Street  
City: Best City  
State: IL  
Zip Code: 61802  
Phone #: 618-867-5309  
Fax #: 555-555-5555  
Email: John.Doe@email.com  
WWW: helloworld.com

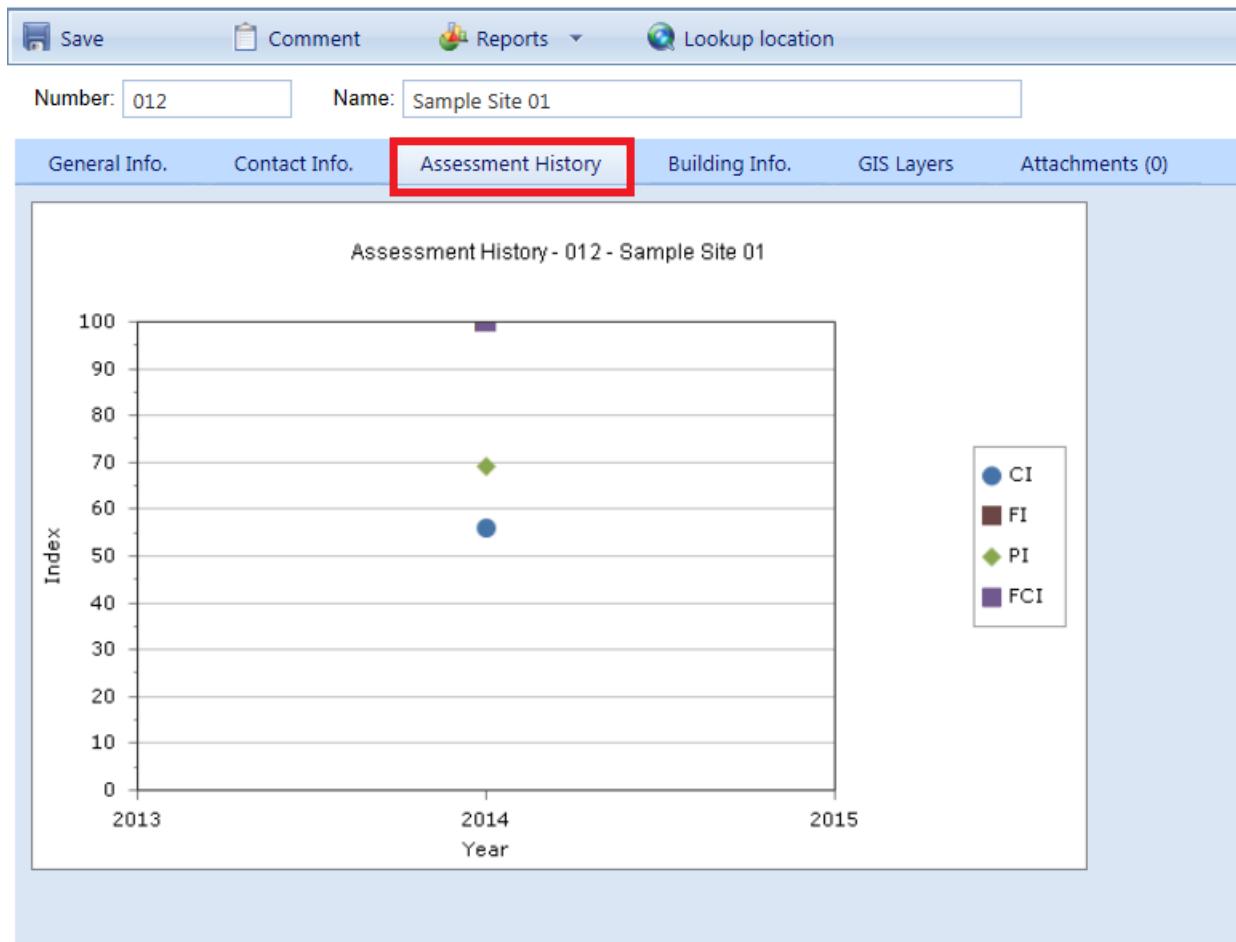
All of the additional Site information is optional. It includes data regarding the official point of contact (POC) for the location:

- **POC Name** -Enter the name of the site point of contact, limited to 30 alphanumeric characters.
- **Address** -Enter the official street address of the site, limited to 30 alphanumeric characters).
- **City** -Enter the city of the site, limited to 15 alphanumeric characters.
- **State** -Enter the state of the site, limited to 2 alphanumeric characters.

- **Zip Code** -Enter the zip code of the site, limited to 10 alphanumeric characters.
- **Phone Number** -Enter the phone number of the site POC, limited to 20 alphanumeric characters.
- **FAX Number** -Enter the FAX number of the site POC, limited to 20 alphanumeric characters.
- **Email Address** -Enter the email address of the site POC, limited to 75 alphanumeric characters.
- **WWW** -Enter the World Wide Web (WWW) URL address for the site, limited to 75 alphanumeric characters.

### Assessment History Tab

The Assessment History tab provides a graph of the condition, functionality, and performance history of the Site, displaying the Site CI, Site FI Site PI, and Site FCI over time.



## Building Information Tab

Basic information regarding the Buildings at the Site is available under the BUILDING INFORMATION tab. All of the data shown on this tab is read-only.

The screenshot shows a software application window with a toolbar at the top containing 'Save', 'Comment', 'Reports', and 'Lookup location'. Below the toolbar, there are input fields for 'Number' (012) and 'Name' (Sample Site 01). A navigation bar includes tabs for 'General Info.', 'Contact Info.', 'Assessment History', 'Building Info.' (which is highlighted with a red box), 'GIS Layers', and 'Attachments (0)'. An 'Export' button is located above the main data table. The main area displays a table with columns: Facility, Area, PRV, BCI, BFI, BPI, and FCI. The data rows are:

Facility	Area	PRV	BCI	BFI	BPI	FCI
001 - Building One	4,300	\$0	42	100	59	100.000
013 - Building Two	7,140	\$1,664,000	58	100	70	100.000
025 - Building Three	30,000	\$7,050,000	56	100	69	100.000
026 - Building Four	2,000	\$236,710		100	100	100.000

- **Facility** -Displays the Building number and name of each Building at the Site.
- **Area** -Displays the square footage of each Building at the Site.
- **Present Replacement Value (PRV)** -Displays the total present replacement value (PRV) of each Building at the Site.
- **Building Condition Index (BCI)<sup>1</sup>** -Displays the current BCI<sup>2</sup> of each Building at the Site.
- **Building Functionality Index (BFI)<sup>3</sup>** -Displays the current BFI of each Building at the Site.
- **Building Performance Index (BPI)** -Displays the current BPI of each Building at the Site.
- **Building Facility Condition Index (FCI)** -Displays the current FCI of each Building at the Site.

Additionally, the Site CI, Site FI, Site PI and Site FCI are shown at the top of the tab, which are the average of each index of the Buildings at the Site, weighted by replacement cost. Finally, all the information on this tab can be exported to a Microsoft Excel spreadsheet by clicking the EXPORT TO EXCEL button at the bottom of the screen.

## Adding, Editing, or Deleting a Complex

<sup>1</sup>Building Condition Index - a condition rating for the overall building.

<sup>2</sup>Building Condition Index - a condition rating for the overall building.

<sup>3</sup>Building Functionality Index - computed from the results of a functionality assessment.

BUILDER allows you to subdivide a Site into regions called Complexes. This is especially useful if your inventory has a large number of Buildings at a single location. Each Building may belong to at most one Complex. You may choose not to use complexes at all, in which case buildings will be listed directly under their Site in the inventory tree. If you do create complexes, you may also have buildings at your Site that are not assigned to any Complex. In this case, you may choose either to list unassigned buildings directly under their Site or to have a Complex named "Unassigned" which will have all such buildings listed under it in the inventory tree.

## Add a Complex

To add a new Complex to a Site, select the Site on the inventory tree and then either (a) right-click and select Add Complex from the dropdown options, or (b) click the Add Complex icon on the toolbar above the navigation pane.

Metric	Value
CI	56
FI	100
PI	69
FCI	100

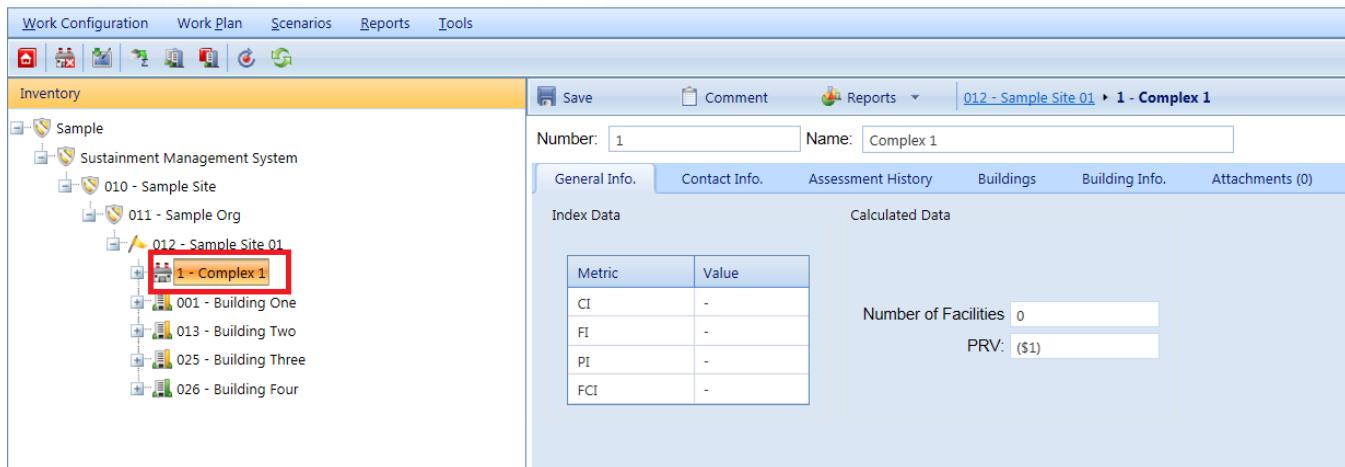
On this screen, enter the following required data for the Complex:

- Number.** Enter the identifying number for the Complex, limited to 12 alpha-numeric characters. You may leave this blank if you wish to supply only a name. You must enter at least a Complex name or Complex number and the combination of the two must be unique among the groups in your database.
- Name.** Enter the identifying name for the Complex, limited to 12 alpha-numeric characters. You may leave this blank if you wish to supply only a number. You must enter at least a Complex name or Complex number and the combination of the two must be unique among the groups in your database.

Once the required data are entered, click the **Add** button to create the Complex. To close the window without creating the Complex, click the **Cancel** button.

## Edit Complex Data

To edit the data for a specific Complex, select the Complex in the inventory tree.



### Toolbar

- **Save**. Use this button to save the changes you have made to the Complex data.
- **Comment**. Using this button allows you to add, edit, and view comments about the Complex.
- **Reports**. Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to Complex inventory. See [Using the Report Viewer](#).

### General Complex Information

Initially after a Complex is selected in the inventory tree, the general information tab is shown with the following information:

- **Complex Number and Name.** You may edit the Complex Number and Name as you wish. Complex Number is allowed to contain 12 characters; Complex Name is allowed 50 characters.
- **Index Data (Read-Only).**
  - Complex Condition Index (CI). The Complex CI displays the average CI of the buildings in the Complex, weighted by replacement cost. This metric provides an overall sense of the condition of the Complex as a whole.

- Complex Functionality Index (FI). The Complex FI displays the average FI of the buildings in the Complex, weighted by replacement cost. This metric provides an overall sense of the functionality of the Complex as a whole.
- Complex Performance Index (PI). The Complex PI displays the average PI of the buildings in the Complex, weighted by replacement cost. This metric provides an overall sense of the performance of the Complex as a whole.
- Complex Facility Condition Index (FCI). The Complex FCI represents the total maintenance and repair costs for the Complex, normalized by the total Complex PRV. This metric provides an overall sense of deferred repair work.
- **Calculated Data (Read-Only).**
  - # of Facilities. Displays the number of Buildings included in the Complex inventory.
  - PRV. Displays the total present replacement value of the Buildings at the Complex computed by adding the individual building replacement costs.

## **Delete a Complex**

To delete a Complex, select the Complex in the inventory tree and click the Delete Complex icon on the toolbar above the navigation pane.

**Important:** Deleting a Complex deletes all inventory (Buildings, systems, components, and sections) in the Complex. This is a significant step to take and should only be done when you are certain that you wish to clear the entire inventory of the Complex you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## **Additional Complex Data**

Additional Complex data is displayed and can be edited on the contact information, building information, condition trends, and buildings tabs when a Complex is selected in the inventory tree.

### *Contact Information Tab*

The contact information for the Complex may be viewed and edited by selecting the **Contact Info.** tab.

Save Comment Reports 012 - Sample Site 01 > 1 - Complex 1

Number: 1 Name: Complex 1

General Info. Contact Info. Assessment History Buildings Building Info. Attachments (0)

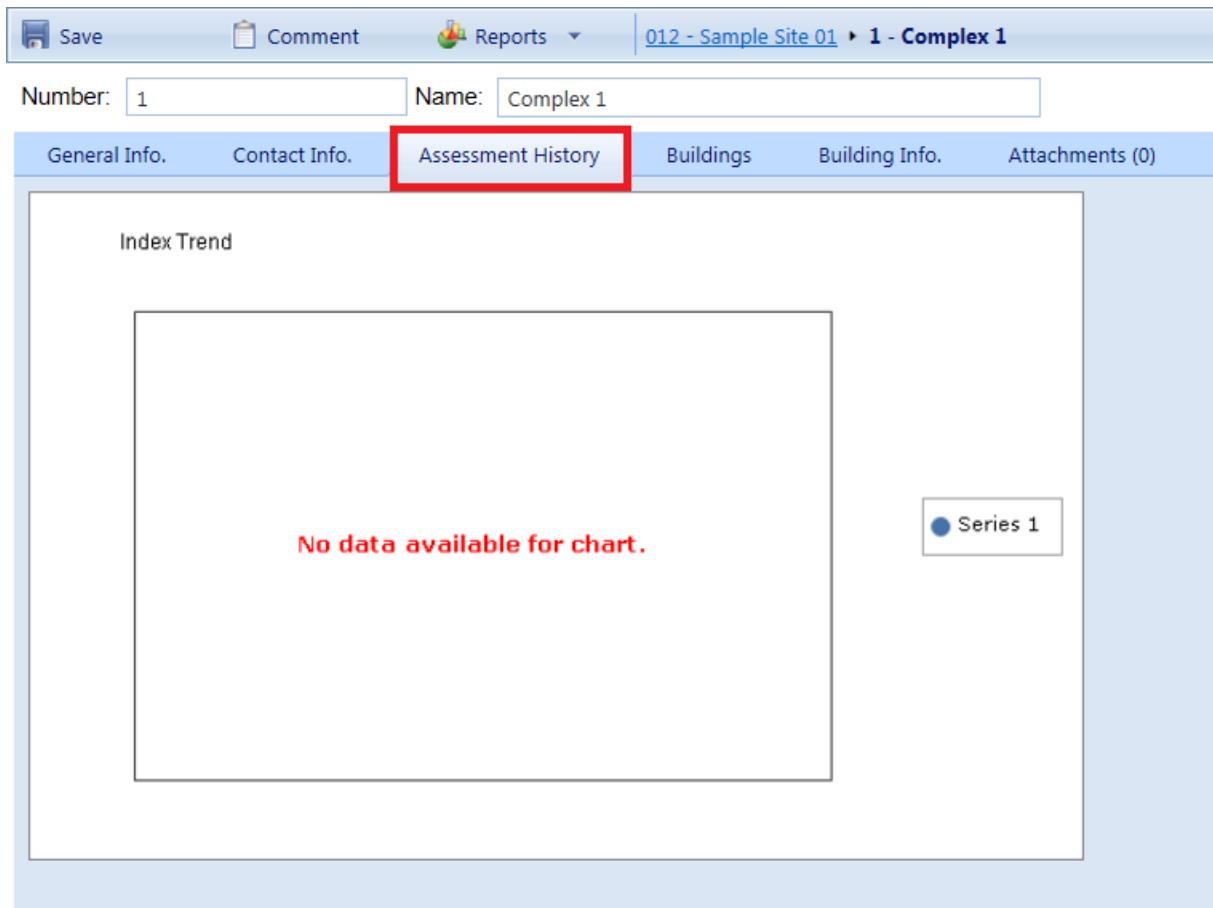
Name: John Doe  
Address: 123 Any Street  
City: Best City  
State: IL  
Zip Code: 61802  
Phone #: 618-867-5309  
Fax #: 555-555-5555  
Email: John.Doe@email.com  
WWW: helloworld.com

All of the additional Complex information is optional. It includes data regarding the official point of contact (POC) for the location:

- **POC Name.** Enter the name of the complex point of contact, limited to 30 alphanumeric characters.
- **Address.** Enter the official street address of the complex, limited to 30 alphanumeric characters.
- **City.** Enter the city of the complex, limited to 15 alphanumeric characters.
- **State.** Enter the state of the complex, limited to 2 alphanumeric characters.
- **Zip Code.** Enter the zip code of the complex, limited to 10 alphanumeric characters.
- **Phone Number.** Enter the phone number of the complex POC, limited to 20 alphanumeric characters.
- **FAX Number.** Enter the FAX number of the complex POC, limited to 20 alphanumeric characters.
- **Email Address.** Enter the email address of the complex POC, limited to 75 alphanumeric characters.
- **WWW.** Enter the World Wide Web (WWW) URL address for this complex, limited to 75 alphanumeric characters.

### *Assessment History Tab*

The Assessment History tab provides a graph of the condition, functionality, performance and FCI history of the Complex, displaying the Complex CI, Complex FI, Complex PI and Complex FCI over time.



### *Buildings Tab*

The Buildings tab lists the buildings currently assigned to the Complex. Buildings can be assigned or removed from the Complex on this tab. The buildings are broken into two columns on this tab:

- **Unassigned Buildings.** Lists the buildings at the Site that are not assigned to a Complex.
- **Assigned Buildings.** Lists the buildings assigned to the current Complex.

Select the desired building and use the arrow keys to move unassigned buildings onto the assigned list or to remove buildings from the assigned list to the unassigned list. Only buildings that are not assigned to a Complex will appear in the list on the left. If you wish to move a building from one Complex to another, you must remove it from the first Complex before you can add it to the second.

### *Building Information Tab*

Basic information regarding the Buildings in the Complex can be viewed by selecting the **Building Info** tab. All of the data shown on this tab is read-only.

Facility	Area	PRV	BCI	BFI	BPI	FCI
013 - Building Two	7,140	\$1,664,000	58	100	70	100.000
025 - Building Three	30,000	\$7,050,000	56	100	69	100.000
026 - Building Four	2,000	\$236,710	100	100	100	100.000

- **Facility**. Displays the building number and name of each Building in the Complex.
- **Area**. Displays the square footage of each Building in the Complex.
- **PRV** . Displays the Present Replacement Value of each Building in the Complex.

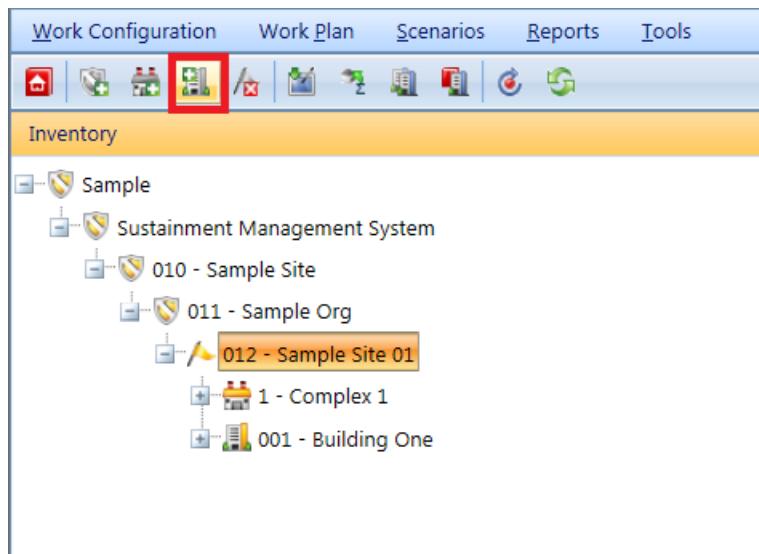
- **BCI (BCI<sup>1</sup>)**. Displays the current **Building Condition Index** of each Building in the Complex.
- **BFI**. Displays the current Building Functionality Index of each Building in the Complex.
- **BPI**. Displays the current Building Performance Index of each Building in the Complex.
- **FCI**. Displays the current Building Facility Condition Index of each Building in the Complex.

Additionally, the Complex CI, Complex FI Complex PI and Complex FCI are shown at the top of the tab, which are the average of each index of the Buildings in the Complex weighted by replacement cost. Finally, all the information on this tab can be exported to a Microsoft Excel spreadsheet by clicking the **Export** button, located below the General Info tab

## Adding, Editing, or Deleting a Building

### *Add a Building*

After a [Site has been created](#), you can add the actual Buildings to your inventory (in this case the Site is Sample Site 01). To add a Building, select the Site you wish to add the Building to in the inventory tree and click the **Add Building** button from the navigation menu.



The data required to be supplied when adding a Building includes:

---

<sup>1</sup>Building Condition Index - a condition rating for the overall building.

- **Building Number.** Enter the identifying number for the Building, limited to 12 alphanumeric characters. Note that because the Building Number is alphanumeric instead of numeric, the alphabetic ordering of Buildings in a list will follow character order rather than number order; for example, Building number 10 will be listed before Building number 2. You may avoid this situation by using leading zeros in your numbering system, e.g. use 02 or 002 or 0002 instead of 2, depending on the maximum number of digits you use in numbering Buildings.
- **Building Name.** Enter the identifying number for the Building, limited to 12 alphanumeric characters. The use of single quotes, double quotes, and ampersands is discouraged as these characters occasionally interfere with query formation. The Building Number and Building Name you enter will be concatenated into a string that must be a unique display identifier for the Building at its location.
- **Building Use.** Select the Building Use from the dropdown list that most closely matches the Buildings use. If you are a Department of Defense activity, BUILDER should display familiar category codes for your service.
- **Construction Type.** Select the construction type from the dropdown list that matches the Building. Construction type options include:
  - Permanent
  - Semi-Permanent
  - Temporary
  - Leased
- **Status.** Select the appropriate status of the Building from the dropdown list. See [Using the Building Status Property](#) for more information. Status type options include:
  - Active
  - Vacant
  - To be transferred
  - To be demolished
  - To be acquired
  - To be built
  - Transferred
  - Demolished

The default status is "Active." The last four of these values indicate that the designated Building is not currently part of the inventory, and two others indicate that the Building will be removed from the inventory in the future. In essence, the [Building Status property](#) allows you to enter future Buildings into the inventory and to plan for their maintenance in IMPACT even though they are not presently owned.

In addition, the Building Status property allows you to keep records for Buildings that are no longer in the physical inventory. Such records are ignored in processes that should only consider current Buildings, such as condition roll-ups and work planning.

- **Year Built.** Enter the year construction of the Building was completed. This data element determines the age of the Building, which is a critical factor in BUILDER's decision-making processes.
- **Number of Floors.** Enter the number of floors of the Building. This data element is used to estimate the size of the Building's footprint by dividing the area by the number of floors.
- **Area.** Enter the gross area of the Building.

This data is required because BUILDER's internal algorithms generally have parameters determined by the Building's Building Use, size, age, number of floors, status, and construction type, so it is essential that the information be provided as a part of creating the Building record.

The screenshot shows a Windows-style dialog box titled "Add Building". At the top left is a "Cancel" button with a red "X" icon, and at the top right are standard window control buttons for "Minimize", "Maximize", and "Close". Below the title bar are two buttons: "Cancel" with a red "X" icon and "Add" with a green plus sign icon. The main area contains several input fields and dropdown menus:

- "Building No." field
- "Building Name" field
- "Building Use" dropdown menu
- "Const. Type" dropdown menu set to "Permanent"
- "Status" dropdown menu set to "Active"
- "Year Built" field
- "No. of Floors" field set to "1"
- "Area" field followed by "SF" units

When you have entered the required data, click the **Add** button to create the Building. The Building Summary window will open to allow you to immediately [edit the Building data](#). To close the window without creating the new Building, click the **Cancel** button.

## **Edit Building Inventory Data**

To view and edit Building inventory data, select the Building in the Inventory Tree.

The screenshot shows the Sustainment Management System interface. On the left, there is a navigation tree under 'Inventory' labeled 'Sample'. A red box highlights '012 - Sample Site 01' and '001 - Building One'. The main window title is '012 - Sample Site 01 > 001 - Building One'. The 'General Info' tab is selected. The building number is '001' and the name is 'Building One'. The building use is '891024 - BUILDING HOUSING MISCELLANEOUS UTILITY PLANT' and the type is 'BUILDING'. The current status is 'Active', construction type is 'Permanent', area is '4,300 SF', year constructed is '1985', and number of floors is '1'. The mission dependency index (MDI) is shown as a progress bar with a value of '42'. There is a checkbox to override automated updates. The functionality table shows the following data:

Metric	Value
BCI	42
BFI	100
BPI	59
FCI	100

The status section includes 'Historic' and 'Child-OccUPIED Facility' checkboxes. The functionality table shows the following data:

Issue	Rating
Location	100
Cultural Resources	No
Building Size and Configuration	100
Structural Adequacy	100
Access	100

## Toolbar

- **Save.** Use this button to save the changes you have made to the Building data.
- **Comment.** Use this button allows you to add, edit, and view comments about the Building.
- **Reports.** Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to Building inventory. See [Using the Report Viewer](#).

## General Information

Initially after a Building is selected in the inventory tree, the general information tab is shown with the following information, all of which is required:

- **Building Number.** Enter the identifying number for the Building, limited to 12 alphanumeric characters. Note that because the Building Number is alphanumeric instead of numeric, the alphabetic ordering of buildings in a list will follow character order rather than number order; for example, Building number 10 will be listed before Building number 2. You may avoid this situation by using leading zeros in your numbering system, e.g. use 02 or 002 or 0002 instead of 2, depending on the maximum number of digits you use in numbering buildings.
- **Building Name.** Enter the identifying number for the Building, limited to 12 alphanumeric characters. The use of single quotes, double quotes, and ampersands is discouraged as these characters occasionally interfere with query formation. The Building Number and Building Name you enter will be

concatenated into a string that must be a unique display identifier for the Building at its location.

- **Building Use.** Select the Building Use from the dropdown list that most closely matches the buildings use. If you are a Department of Defense activity, BUILDER should display familiar category codes for your service.
- **Current Status.** Select the appropriate status of the Building from the dropdown list. See [Using the Building Status Property](#) for more information.

Status type options include:

- Active
- Vacant
- To be transferred
- To be demolished
- To be acquired
- To be built
- Transferred
- Demolished

The default status is "Active." The last four of these values indicate that the designated Building is not currently part of the inventory, and two others indicate that the Building will be removed from the inventory in the future. In essence, the [Building Status property](#) allows you to enter future buildings into the inventory and to plan for their maintenance in IMPACT even though they are not presently owned. In addition, the Building Status property allows you to keep records for buildings that are no longer in the physical inventory. Such records are ignored in processes that should only consider current buildings, such as condition roll-ups and work planning.

- **Effective Year of Status.** When you choose a Building Status other than the default "Active" status, you must also provide a year in which the permanent status will take effect. For vacant, demolished, and transferred buildings, the effective year is the year the action occurred. For future "To be" statuses, the effective year is the year the future event will occur, i.e. the year the building is actually built, acquired, transferred, or demolished.
- **Construction Type.** Select the construction type from the dropdown list that matches the building. Construction type options include:

- Permanent
- Semi-Permanent
- Temporary
- Leased

- **Year Built.** Enter the year that construction of the building was completed. This data element determines the Building's age, which is a critical factor in BUILDER's decision-making processes.
- **Number of Floors.** Enter the number of floors of the building. This data element is used to estimate the size of the building's footprint by dividing the area by the number of floors.
- **Area.** Enter the gross area of the building.

In addition to the general information data described above, this tab displays some data calculated by BUILDER including:

- **ISR Rating.** (Read-Only). This is a U.S. Army-specific data field. If you are managing an Army site for which Installation Status Report data has been imported into BUILDER, this color rating will correspond to the building's primary use ISR rating.
- **Replacement Cost.** This data element contains the current replacement cost for a building with the same Area (size)and Building Use as the current Building, under current construction standards. BUILDER provides a cost module to estimate the replacement cost. If you leave the manual override checkbox blank, the cost module will update the replacement cost using the default [cost book](#), adjusted for [inflation](#) and [geographic location](#), when costs are updated. If you mark the manual override checkbox, the cost module will not affect this Building's replacement cost, and you will have to periodically update its replacement cost manually to account for inflation.
- **Mission Dependency Index.** The availability of the Mission Dependency Index (MDI) is the result of on-going U.S. Navy research to develop a process for computing a 0-100 index that measures how critical the facility is to the overall mission of its owner. This measure is one of several being developed to allow user input to shape an automated planning process that uses metrics and rules for their application to identify and prioritize budget allocations and work plans. See [Mission Dependency Index Overview](#) for more information.
- **Index Data** (Read-Only). All of the indices below are updated every time a [CI roll-up](#) is performed.
  - **Building Condition Index** (BCI) - The BCI measures the condition of the Building as a whole. It is computed by averaging the condition indices of the Building's systems, weighted by the replacement costs of the systems.
  - **Building Functionality Index** (BFI) - The BFI measures the functionality of the Building as a whole. It is computed from the results of a [functionality assessment](#) of the Building as a whole.

- **Building Performance Index (BPI)** - The BPI measures the overall performance of the Building as a whole. It is computed using a weighted combination of the BCI and BFI.
  - **Facility Condition Index (FCI)** - The (FCI) is the industry standard index calculated by dividing the total cost of necessary repairs in the Building divided by the replacement cost of the Building. In BUILDER, the total cost of necessary repairs is estimated by summing the individual section repair costs.
- **Status**
- **Family Housing** (Read-Only) - This checkbox indicates whether or not the Building is family housing. It is automatically marked if the Building Use type is residential. If the checkbox is marked, you can save more data about each dwelling unit by clicking the button. See [Family Housing Data](#) for information on the data that can be entered.
  - **Historic Building** (Read-Only) - This checkbox indicates whether the building is historic. It is automatically marked if a functionality assessment has been performed on the Building and it has been determined that the building is historic or contains cultural resources.
  - **Child-Occupied Facility** - This checkbox indicates whether or not the facility is child-occupied. You can mark or un-mark this box as appropriate.
  - **Functionality** (Read-Only) - Displayed in this grid is a list of the functionality issues with deficiencies in the Building. Only functionality issues with a FI below the threshold set in the functionality standard will be shown here.

In addition to all of data described above, the other tabs at the top of the screen allow for [additional information](#) regarding the Building to be added, viewed, and edited.

### Additional Building Data



Additional Building data is displayed and can be edited on the additional information, condition trends, work item history, and systems at a glance tabs when a Building is selected in the inventory tree.

#### *Additional Information Tab*

The additional Building information is accessed from the general Building inventory screen by selecting the ADDITIONAL INFORMATION tab.

SUSTAINMENT MANAGEMENT SYSTEMS  
WITH BUILDER

This information system is approved for UNCLASSIFIED//FOUO data

Work Configuration Work Plan Scenarios Reports Tools

Inventory

Sample

- Sustainment Management System
  - 010 - Sample Site
    - 011 - Sample Org
      - 012 - Sample Site 01
        - 001 - Building One
          - B10 SUPERSTRUCTURE
          - B20 EXTERIOR ENCLOSURE
          - B30 ROOFING
          - C30 INTERIOR FINISHES
          - D30 HVAC
          - D50 ELECTRICAL
        - 013 - Building Two
        - 025 - Building Three

Save Comment Reports 012 - Sample Site 01 • 001 - Building One

Building No: 001 Building Name: Building One

General Info Additional Info Assess. History Work Item History Systems at a Glance Attachments (0)

Building Dimensions

Building Perimeter: LF

Add	Description	Length	Width
No records to display.			

POC Name:

Phone:

E-Mail:

Street:

City:

State:  Zip:

Architect:

Contractor:

Documents:

All of the additional Building information is optional and includes:

#### *Point of Contact*

- **POC Name** -The name of the point of contact for the Building, limited to 30 characters.
- **Phone** -The Building POC's phone number, limited to 20 characters.
- **Email** -The Building POC's Email address, limited to 75 characters.

#### *Address*

- **Street** -The Building's street address, limited to 30 characters.
- **City** -The city portion of the Building's address, limited to 15 characters.
- **State** -The state portion of the Building's address, limited to 2 characters.
- **Zip** -The zip code of the Building's address, limited to 10 characters.

#### *Building Design*

- **Architect** -Lists the architects of the Building. Add and delete names by using the adjacent buttons. Each architect's name is limited to 30 characters.
- **Contractor** -Lists the contractors of the Building. Add and delete names by using the adjacent buttons. Each contractor's name is limited to 30 characters.

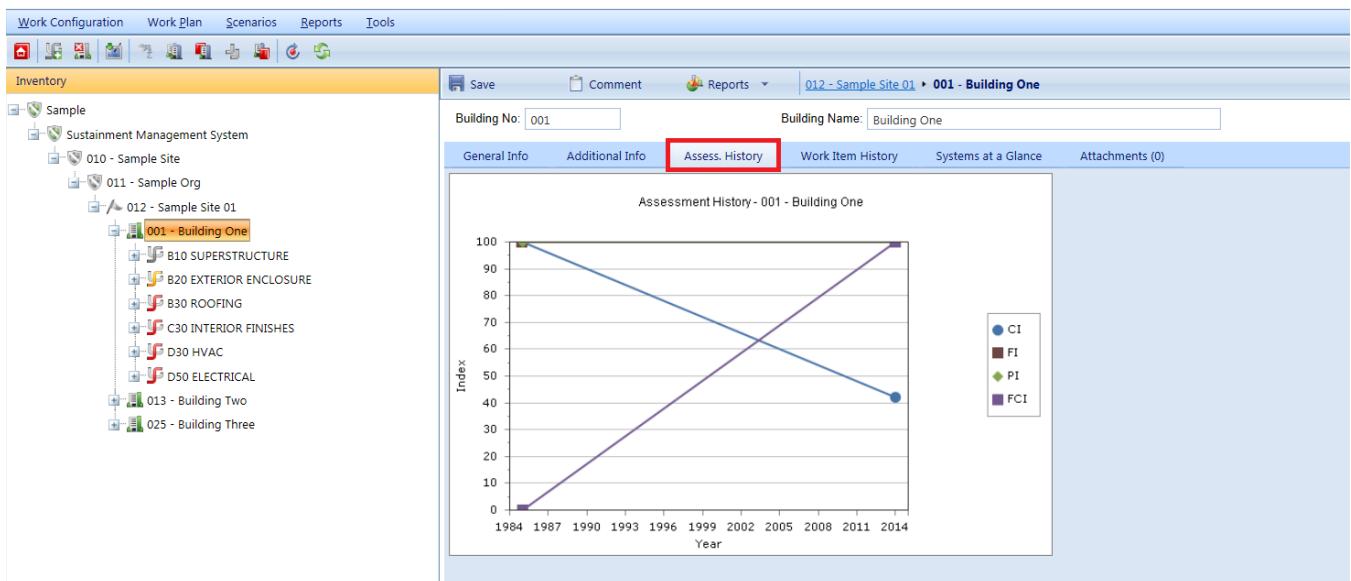
- **Documents** -Lists the documents related to the Building. Add and delete document names by using the adjacent buttons. Each document's name is limited to 24 characters.

### *Dimensions*

- **Perimeter** -Enter the linear measure of the perimeter of the Building.
- **Description** -Enter a description of the distinct areas of the Building you wish to add dimensions for. For example, you may list "East Wing/West Wing", or "Offices/Library/Warehouse", or "Public Areas/Secure Areas." Each description is limited to 50 characters. Use the ADD DIMENSION and DELETE DIMENSION buttons to add and delete items from the list.
- **Length** -Enter the length of the area identified in the description.
- **Width** -Enter the width of the area identified in the description.

### *Assessment History Tab*

The Assessment History Trends tab displays two graphs showing how different metrics in the Building have changed over time. The graph on the right displays the condition, functionality, performance and FCI history of the Building (by displaying the BCI, BFI, BPI, and FCI) from the year the Building was constructed to the current fiscal year.



### *Work Items History*

The Work Item History tab shows a list of the work items that have been performed and/or are scheduled to be performed in the Building. The work items can

be filtered by FY, status, System, Component, or section using the dropdown lists on the screen. For more information on work items, see the [Work Planning Overview](#).

Description	Activity	Cost	Status
No records to display.			

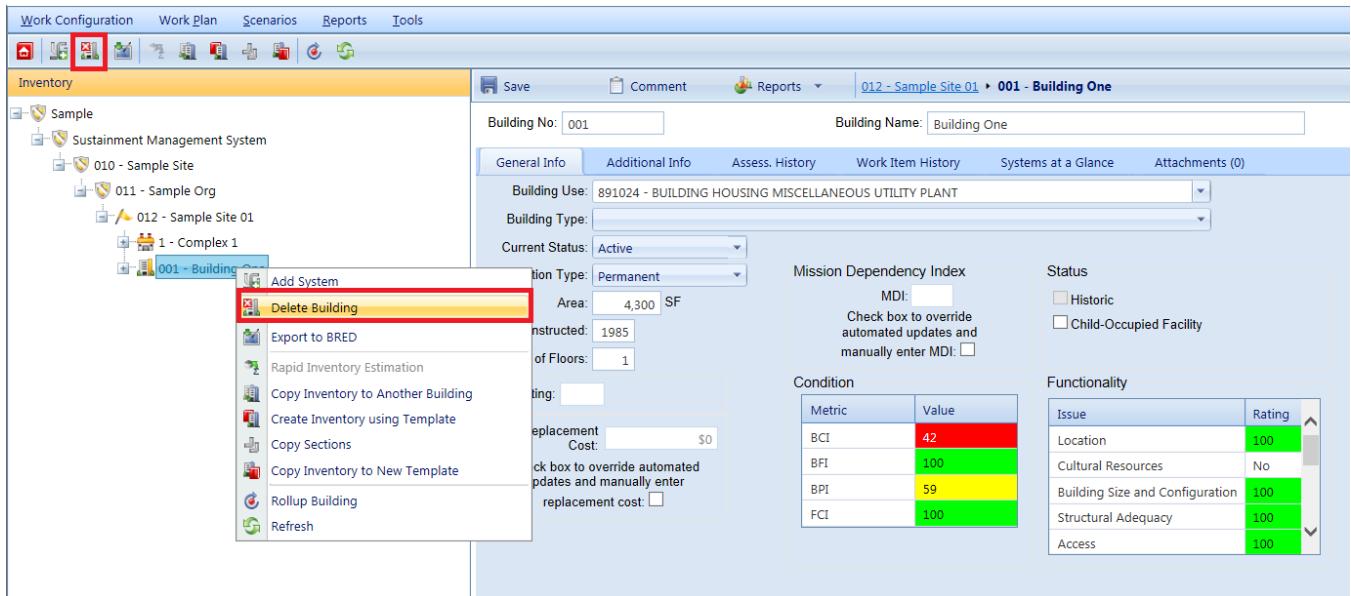
### ***Systems at a Glance Tab***

Basic information regarding the systems in the Building can be viewed by selecting the SYSTEMS AT A GLANCE tab. The systems at a Glance tab shows the systems inventoried in the Building, each system's condition index (SCI), and the replacement cost of each system. All of the data shown on this tab is read-only.

Description	SCI	Replacement Cost
B10 SUPERSTRUCTURE	-	\$258,637
B20 EXTERIOR ENCLOSURE	84	\$27,006
B30 ROOFING	45	\$9,962
C30 INTERIOR FINISHES	8	\$880,249
D30 HVAC	30	\$10,870
D50 ELECTRICAL	8	

### ***Delete a Building***

To delete a Building, select the Building in the Inventory tree and click the **Delete Building** button. You can also right-click a Building and delete it from there.



It is important to note that deleting a Building deletes all the inventory (Systems, Components, and Sections) in the Building. This is a significant step to take and should only be done when you are certain that you wish to clear the entire inventory of the Building you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

Instead of deleting a Building, you can use the [Building Status](#) property to mark buildings that have been demolished or transferred to another owner. With this method, the Building's records remain in the database, but the Building is ignored in processes that should only consider current buildings. See [Using Building Status to Track Non-Current Buildings](#).

### ***Using the Building Status Property***

The Building Status property allows you to maintain database records for buildings not currently in your physical inventory, whether for historical purposes or future planning. A Building's current status is used in the decision processes of both BUILDER and Scenarios, and it is the basis for a number of useful capabilities, including allowing you to:

- Define [policies](#) so that buildings scheduled for demolition are maintained at a lower standards than might generally apply. Simply use the Building Status as one of the attributes used to define a policy and assign standards as appropriate to each status type.
- Define work [prioritization schemes](#) that consider future changes in Building Status in prioritizing work items. This can be done by using the Building

Status as an initial split in your prioritization scheme and assigning weights appropriate for each status type (probably using 0).

- weight for non-current status types).
- Plan for the maintenance load of buildings to be added to your inventory in the future by [analyzing a Scenario](#).
- Change the status of a building dynamically during a Scenario simulation to study the effects of a changing inventory on the budget and the work load.

The Building Status property is set on the [Building Summary](#) screen and has one of the following values:

- **Active** -This is the default Building Status. Use this status for buildings that are currently in use. This status is the end status for buildings with status "To be built" or "To be acquired."
- **Vacant** -This status replaces the "Vacant" checkbox property used in earlier versions of BUILDER. Use this status for buildings that are currently in your physical inventory but not in use.
- **To be transferred** -Use this status for buildings that will be transferred to another owner in the future. The effective year of this status is the year in which the transfer will take place. No BUILDER or Scenarios cost is associated with such a transfer. However, maintenance policies may be associated with this status that yield different standards than would ordinarily be in effect.
- **To be demolished** -Use this status for buildings that will be demolished in the future. The effective year of this status is the year in which the building is to be demolished. In a Scenarios simulation, a Building-level work item to demolish the building will be generated, including a cost estimate for the work. In addition, maintenance policies may be associated with this status that lower the standards usually required for this type of building.
- **To be acquired** -Use this status to enter inventory records for an existing building prior to its acquisition. The effective year of this status is the year in which the building is expected to be acquired. You will be able to edit the building and inspection data for this type of building, and BUILDER's condition and remaining service life predictions will be applied based on the inspection data entered. In this way, you will be able to estimate the maintenance requirements of such a building prior to its acquisition. In a Scenarios simulation, this feature allows you to acquire buildings as the simulation progresses.
- **To be built** -Use this status to enter inventory records for a new building prior to its commissioning for occupancy. The effective year of this status is

the year in which the building is expected to be recognized as part of your physical inventory. In BUILDER, you will be able to edit the building data on the Building Summary screen but will not be able to add inspection records until the status changes to "Active." In a Scenarios simulation, this feature allows you to add new buildings dynamically as the simulation progresses.

- **Transferred** -Use this status to force BUILDER's automated processes for condition/service life assessment and work planning to skip the building but leave the inventory and inspection records intact. The effective year for this status is the year in which the transfer takes place. This status is the end status of the "To be transferred" status.
- **Demolished** -Use this status to remove a building from BUILDER's automated processes for condition/service life assessment and work planning but leave the inventory and inspection records intact. The effective year for this status is the year in which the building is demolished. This status is the end status of the "To be demolished" status.

The last four of these values indicate that the designated building is not currently part of the inventory, and two others (to be transferred and to be demolished) indicate that the building will be removed from the inventory in the future. In essence, the Building Status property allows you to enter future buildings into the inventory and to plan for their maintenance in Scenarios even though they are not presently owned. In addition, the Building Status property allows you to keep records for buildings that are no longer in the physical inventory. Such records are ignored in processes that should only consider current buildings, such as condition roll-ups and work planning.

When you [delete a Building](#), you actually remove all database records associated with that building. If you wish to keep the records, whether for historical purposes, analysis, or possible transfer to another BUILDER database (perhaps the building is being transferred from one property book to another), you should simply set the Building Status property to an appropriate value.

### ***Using Building Status to Track Non-Current Buildings***

The Building Status property allows you to have records in your BUILDER™ database for Buildings that are not currently in your physical inventory. This is useful for Buildings at both ends of the life-cycle. You may keep records for Buildings that have been demolished or transferred, and you may add Buildings planned for future construction or acquisition.

#### *Adding Buildings To Be Built or Acquired in the Future*

Using the Building Status property, it is possible to enter Buildings into the database before they are actually in the physical inventory. This includes Buildings

under construction (designated with status "To be built") and existing Buildings being considered for acquisition from another owner (designated with status "To be acquired"). With the Building Status property, you will be able to assess short-term work requirements for newly acquired existing Buildings and to plan long-term maintenance requirements for future Buildings using Scenarios.

If you enter records for a Building with status "To be acquired", you may record inspection results prior to acquisition. The BUILDER processes that determine remaining service life and condition prediction will track the condition of the Building after it is first entered and prior to acquisition. With this information, BUILDER will be able to generate a work plan for the Building to upgrade it to the standards established by an appropriate policy sequence. Such information could be invaluable in planning for the load such a Building will place on both short and long term budgets.

If you enter a Building with status "To be built", you may not record new inspections until the status changes to "Active". The BUILDER processes that determine remaining service life and condition prediction will skip such a Building, under the assumption that quality assurance during the construction process will force all Systems to a CI of 100 prior to commissioning. The advantage of entering the Building before it is built is that you may include it in Scenarios to measure its long-term effects on work plans and budgets. That is, the Scenario can change the status of a new Building to "Active" at a scheduled time and begin treating it as a normal Building with predictable deterioration rates and work requirements.

#### *Keeping Records for Buildings That Have Been Demolished or Transferred*

In earlier versions of the BUILDER application, the only way to eliminate a Building from the automated assessment and planning processes used by BUILDER and Scenarios was to [delete the Building](#). With this approach, all records related to the Building were actually deleted from the database. The Building Status property gives you another option.

If you have records in the BUILDER database for a Building which is to be demolished or transferred to another owner, you can keep the inventory, inspection, and work history records in the BUILDER database but make the Building invisible to BUILDER's automated processes simply by changing the Building's status to "Demolished" or "Transferred".

Here is a summary of the BUILDER/Scenarios approach to a Building with status "Demolished" or "Transferred":

- Inventory records are locked. You will be unable to change the Building's data properties or its composition.

- Condition and Functionality Assessment records are locked. You will be unable to change existing records or to add new records.
- Work Planning records are locked. You will be unable to change existing records or to add new records.
- The Building's cost data will not be affected by annual cost updates at the beginning of the calendar year.
- The CI and RSL values for the Building and its Systems/Components/Sections will not be updated.
- The Building will not be considered during automatic work generation.
- If the Building will not appear in Scenarios simulations.
- If the Building's status is changed to "Demolished" or "Transferred" during a Scenarios simulation, it will have records for the years prior to its status change and then will be treated as it is in BUILDER. That is, there will be no further updates of data, no new inspections, no changes in condition or service life, etc.

## **Systems, Components, and Sections**

### ***Identifying Systems, Components and Sections***

After you have [created a building](#) and entered its required data elements, you should identify the Systems, Components and Sections in the building. Your decomposition of a building into its Systems and the decomposition of those Systems into Components will be very straightforward. The formation of Sections, however, will require some thought on your part. BUILDER manages buildings at the Section level, and you will inspect Sections and plan work for Sections.

BUILDER's representation of Building Sections has been designed to be very flexible. With flexibility comes choices; choices that add complexity to the process. Pay particular attention to the Defining Sections section below. In addition to adding the Systems, Components, and Sections manually, BUILDER provides several mechanisms to speed the inventory process including [Copying a Building](#), [Building Templates](#), and using the [Embedded Building Models](#).

### **Defining Systems**

Systems are used to help you organize the records for the actual physical items in your Building. You may create only one System of each System type for any given Building. In creating a new System for a Building, the list of choices for the new System will only include those Systems not already created for the Building. See [Adding, Viewing, and Deleting a System](#) for details.

## **Defining Components**

Like Systems, Components are used to help organize the records of the actual physical items in the Building. The Components that can be added to a System will depend on the System representation you have chosen for the Building. You may create only one Component of each type for each System. In creating a new Component, the list of choices will only include those Components of the appropriate System that have not already been created. See [Adding and Viewing a Component](#) for details.

If you have a Component that is not in the list of available Component types, please contact your SMS support agent. BUILDER does not have a feature for user-defined Components. Each Component has a number of data elements associated with it (varieties of types and materials, costs, service lives, standard units of measure, inspectable subcomponents, etc.) which must be researched before the Component can be added.

## **Defining Sections**

Building Sections are the key structures in a BUILDER inventory. The System and Component structures are organizational in nature, serving to categorize what is in a building into manageable groups. Building Sections actually represent the physical items of a Building, belong to a particular Component, and have the following properties:

- Component Type
- Material/Equipment Type
- Quantity
- Age
- Whether or not it is painted, and, if so, when it was last painted and paint type

BUILDER has been designed to be flexible in allowing you to represent your Building's Sections in a number of ways to support how you intend to manage them. Some examples may be helpful:

- Building A has 5 exterior doors (System: Exterior Closure, Component: Exterior Door). Four of the doors are metal personnel doors and the fifth is a metal overhead door. Because there are two different types of doors (personnel, overhead), you will have to create at least two Sections. In this situation, you should create a Section for the metal overhead door and enter the appropriate data about it. You do not need to create a Section name for this door since there is only one. For the four metal personnel doors, if you intend to manage them as a unit, create one more Section and enter the

appropriate data about the doors. Again, you do not need to enter a Section name because you are only creating one Section of this material and type.

- Building A has 5 exterior doors (System: Exterior Closure, Component: Exterior Door). You lease Building A to two tenants X and Y. Two metal personnel doors and a metal overhead door are in the tenant X area, and the other two metal personnel doors are in the tenant Y area. Because you plan to inspect and maintain the doors by tenant, you create three Sections:
  - Tenant X Metal Personnel with quantity 2
  - Tenant X Metal Overhead with quantity 1
  - Tenant Y Metal Personnel with quantity 2.

When you create each Section for Tenant X, you use "Tenant X" as the name of the Section. Do the same for Tenant Y. In fact, you may want to name every Section (especially Interior Construction Sections) in the Tenant X area "Tenant X". When you inspect the Building, you can use the Section name to distinguish Sections belonging to each of the tenants.

- Building A has two reciprocating 20-ton chillers (System: HVAC, Component: Cooling Unit/Plant). If they are the same age and you plan to manage them as a unit, then create one Section with quantity 2. However, if you want to manage them individually, or if they were installed at different times and may therefore have different maintenance requirements, then create two Sections of quantity 1 each. Since both Sections have the same equipment type (Reciprocating 20-30 Ton) and component type (Chillers), you will have to have distinct Section Names for the two Sections. You may use their barcode IDs as the Section names of you wish.
- Building B has 50 interior wood personnel doors, all alike and all installed when the building was built. You originally create one Section with quantity 50 for these doors. You may have several years of inspection data regarding the doors, which have deteriorated uniformly over time. With the current inspection, however, two of the doors are found to be severely damaged and will have to be replaced. If the two doors remain in their original Section, inspection samples for these two doors will have to be marked as "non-representative". When the condition index is calculated, the condition of the two doors, which are only 4% of the Section, will have only a small impact on the overall Section CI. Since you will be replacing the two doors, perhaps with a different quality of door since they may be subject to higher user abuse, you should use component sectioning to isolate the two doors. To do this, reduce the original Section quantity to 48. Then create a new Section for the two damaged doors and enter the current inspection data for this new Section, which will then have a low CI.

From these examples you can see that some thought will have to be given to how you decompose a Building into Sections. Hopefully, you can also see that BUILDER is flexible enough to allow you to manage at the level of detail that you choose. See [Adding and Editing a Section](#) for details.

## Inventory Suggestions

It is not necessary to do a complete inventory initially. Implementation funds and/or time may be limited, so it is possible and permissible to begin with only some of the Component-Sections and expand the inventory on an as-needed basis. If the desire is to begin with a limited set, the following suggestions are made:

- Focus on the Components that are most critical to building function
- Focus on the Components that traditionally dominate M&R needs.

When sectioning, a few rules of thumb are offered:

- To avoid a data burden, use the smallest number of Sections possible to meet managerial needs. For example, it is usually not necessary to individually Section every room, each exterior wall, etc.
- Since material differences (e.g. wood vs. masonry) are criteria for sectioning, only create Sections for material differences when the quantity is significant enough to warrant individual management attention. For example, an exterior wall may be made of wood, but a few square feet of wall is made of masonry, essentially for decoration. The wood wall is clearly a Section, but what about the masonry? Should it be its own Section? If the masonry quantity is a mere fraction of the wood and work would be accomplished on the masonry at the same time as the wood (in other words, the entire wall is being managed as a unit), then there is no need to create a Section just for the masonry. However, if the quantities of both the wood and masonry are significant, then create Sections for both.
- Equipment sectioning should be thought out carefully when multiple units of the same equipment are present. For example, there may be three air handling units of the same type, age, etc. In this case, there could be one Section with the quantity of three, or three Sections with the quantity of one. Which approach should be taken? If the desire is to manage them as essentially one unit as far as planning repair and replacement, then one Section will suffice. However, if it is expected that over time, they will be replaced individually, etc, then each should be its own Section.
- Obtaining accurate an accurate quantity can be difficult, and often times there are many sources for obtaining quantity. These include drawings, actual measurement or count, or other records. It must be understood that

the more detailed or accurate the count or measurement, the more costly it is to collect the data. Extracting information from records, including drawings, and doing a field validation is the most costly. Reasonable estimates within reasonable error are very acceptable as it will result in reasonable error in BUILDER's analyses. For example, the wall finish may truly be 10,634 SF. An estimate of 11,000 SF will suffice for planning purposes especially if the cost to get the true value is twice that for an estimate. Component-Sections that cover an area (SF or SM) are the most difficult to obtain with precision whereas those that are "each" are the easiest. Generally, field count the "each" Component-Sections and estimate the others. The estimates can be refined in the future when projects are developed for M&R work.

- *Care should be taken when establishing Year Built/Renewed.* Error here will result in erroneous remaining service lives and add error to the projected year when M&R should be performed. Experience has shown, however, that sometimes the year in which Component-Sections were replaced, rehabilitated, or initially installed/constructed is truly unknown as the records are no longer available. In those cases, make a reasonable estimate and mark the "Estimated" checkbox. Often, there are people who will remember when that work was done, at least in a generalized way (e.g. early 1990's). Fortunately, through subsequent inspections and condition assessments, the Year Installed/Built becomes less important, as BUILDER's prediction models will use the condition assessment information to adjust the remaining service life and to predict when M&R will be required in the future.

## **BUILDER Systems/Components**

To divide a Building into Systems and Components, BUILDER uses the ASTM UNIFORMAT II classification for building elements (Level 2 and 3):

Level 2	Level 3
A10 Foundations	A1010 Standard Foundations A1020 Special Foundations A1030 Slab on Grade
A20 Basement Construction	A2010 Basement Excavation A2020 Basement Walls
B10 Superstructure	B1010 Floor Construction B1020 Roof Construction
B20 Exterior Closure	B2010 Exterior Walls B2020 Exterior Windows B2030 Exterior Doors

B30 Roofing	B3010 Roof Coverings B3020 Roof Openings
C10 Interior Construction	C1010 Partitions C1020 Interior Doors C1030 Specialties
C20 Staircases	C2010 Stair Construction C2020 Stair Finishes
C30 Interior Finishes	C3010 Wall Finishes C3020 Floor Finishes C3030 Ceiling Finishes
D10 Conveying Systems	D1010 Elevators D1020 Escalators & Moving Walks D1030 Material Handling Systems
D20 Plumbing	D2010 Plumbing Fixtures D2020 Domestic Water Distribution D2030 Sanitary Waste D2040 Rain Water Drainage D2050 Special Plumbing Systems
D30 HVAC	D3010 Energy Supply D3020 Heat Generating Systems D3030 Cooling Generation Systems D3040 Distribution Systems D3050 Terminal & Package Systems D3060 Controls & Instrumentation D3070 Special HVAC Systems & Equipment D3080 Systems Testing & Balancing
D40 Fire Protection	D4010 Fire Protection Sprinkler Systems D4020 Stand Pipe & Hose Systems D4030 Fire Protection Specialties D4040 Special Electrical Systems
D50 Electrical	D5010 Electrical Service & Distribution D5020 Lighting & Branch Wiring D5030 Communication & Security Systems D5040 Special Electrical Systems
E10 Equipment	E1010 Commercial Equipment E1020 Institutional Equipment E1030 Vehicular Equipment E1040 Other Equipment
E20 Furnishings	E2010 Fixed Furnishings E2020 Movable Furnishings

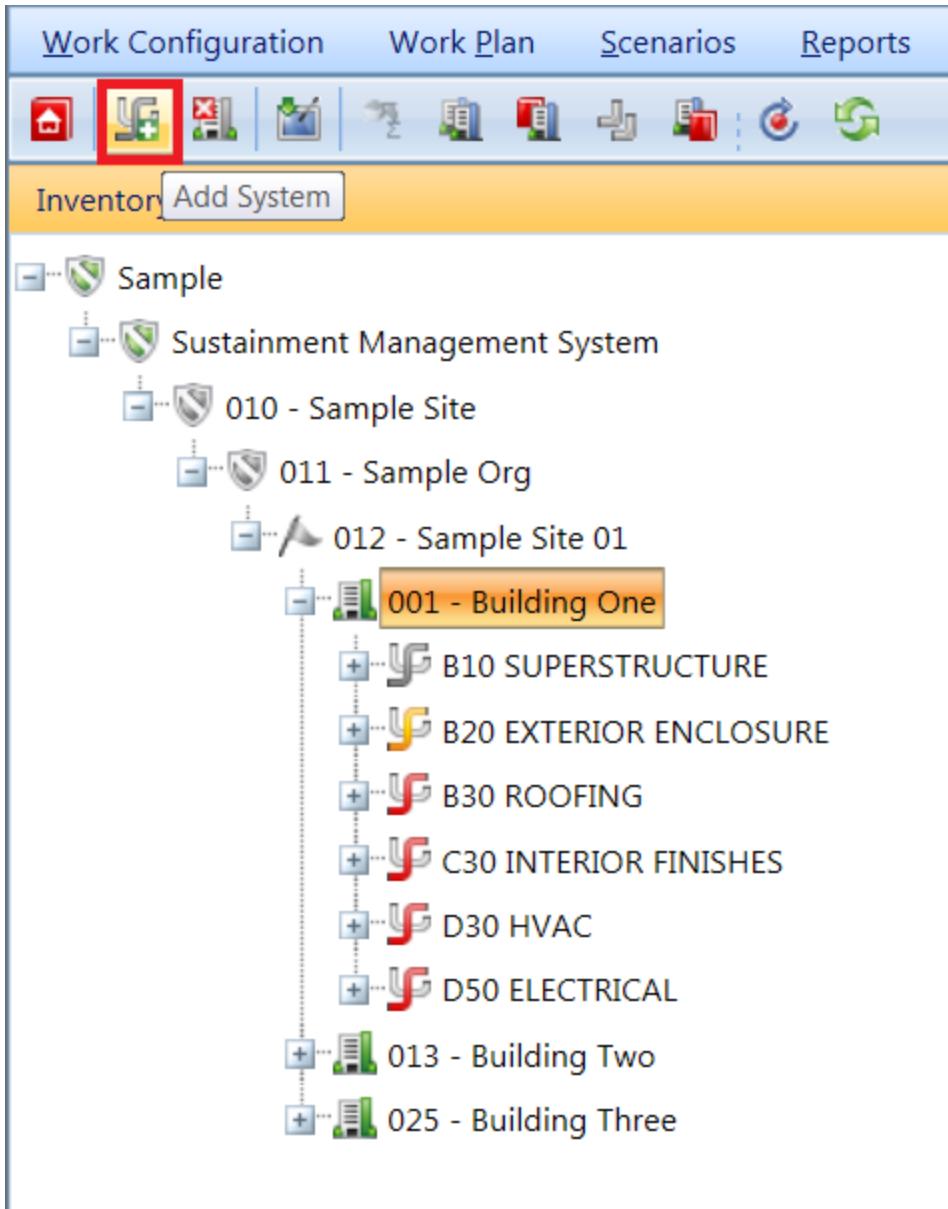
F10 Special Construction	F1010 Special Structures F1020 Integrated Construction F1030 Special Construction Systems F1040 Special Facilities F1050 Special Controls & Instrumentation
F20 Selective Building Demolition	F2010 Building Elements Demolition F2020 Hazardous Components Abatement

### ***Adding, Viewing, or Deleting a System***

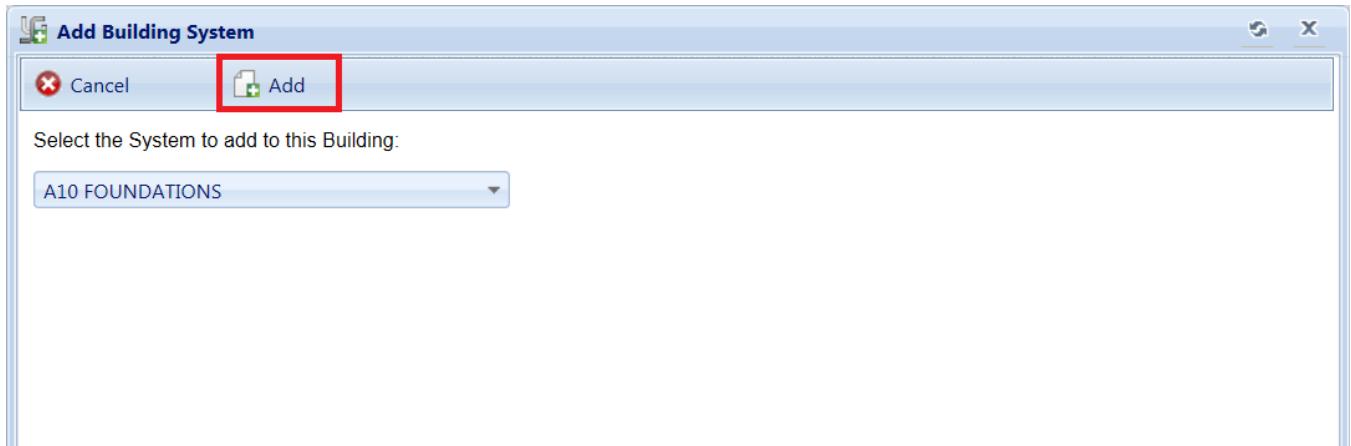
Please be sure to read the topic [Identifying Systems, Components and Sections](#) before proceeding with this topic.

#### **Add a System**

A new system can be added to an existing Building by selecting the Building in the Inventory tree and clicking the **Add System** button.



The context area of the BUILDER screen will appear as shown below.



Select the System you wish to add to the Building from the dropdown list and click **Add** to add the System. If you do not wish to add a System to the building, click the **Cancel** button.

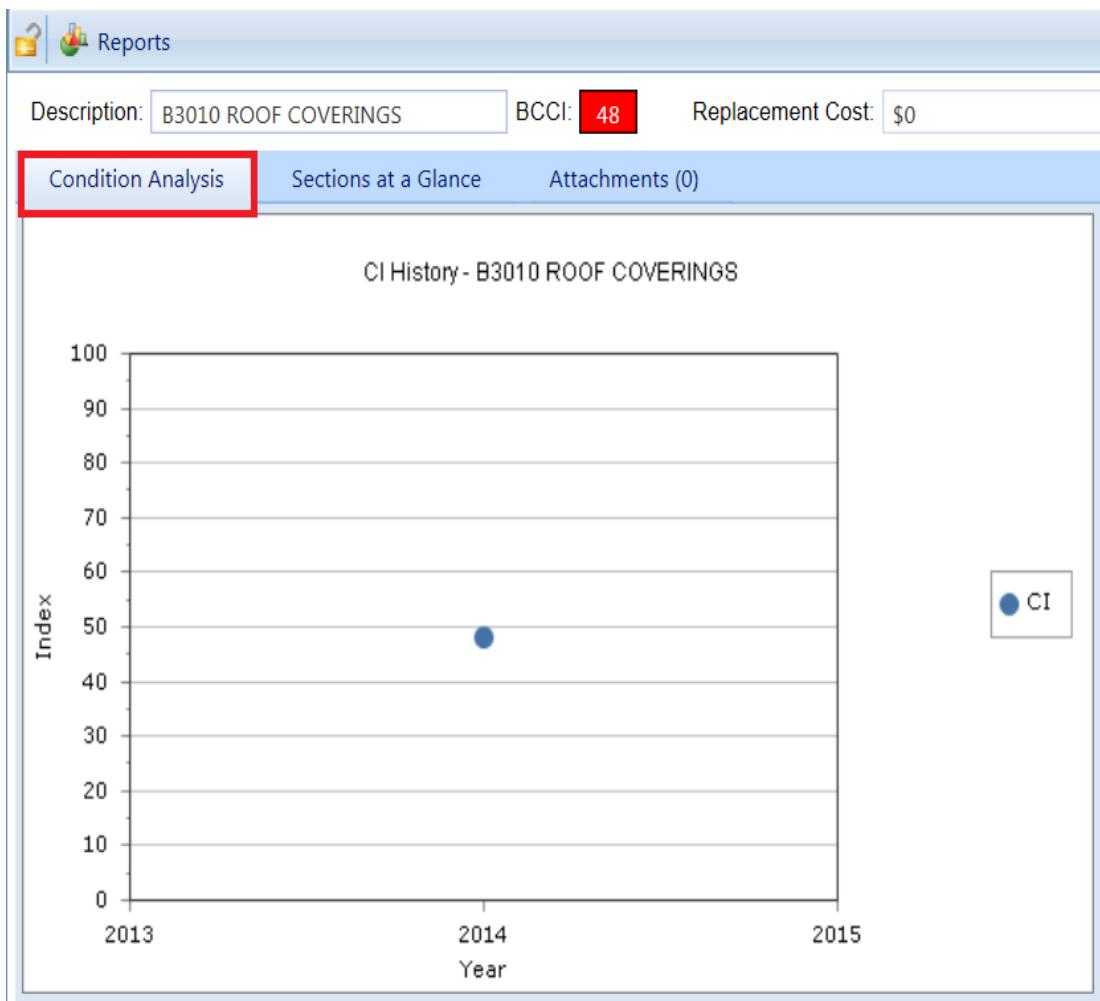
**Note:** each Building can contain only one system of each type. The dropdown list for adding a system will display only the system types that do not already exist in the building.

### **View a System**

Data for an existing System can be viewed by selecting the System in the Inventory tree. At the top of the context area, the System description, System condition index (SCI), and System replacement cost are shown. Additional information regarding the System is found in the different tabs and is described below.

#### *Condition Analysis Tab*

The Condition Analysis tab displays a graph of the CI history of the System over time.



### *Components at a Glance Tab*

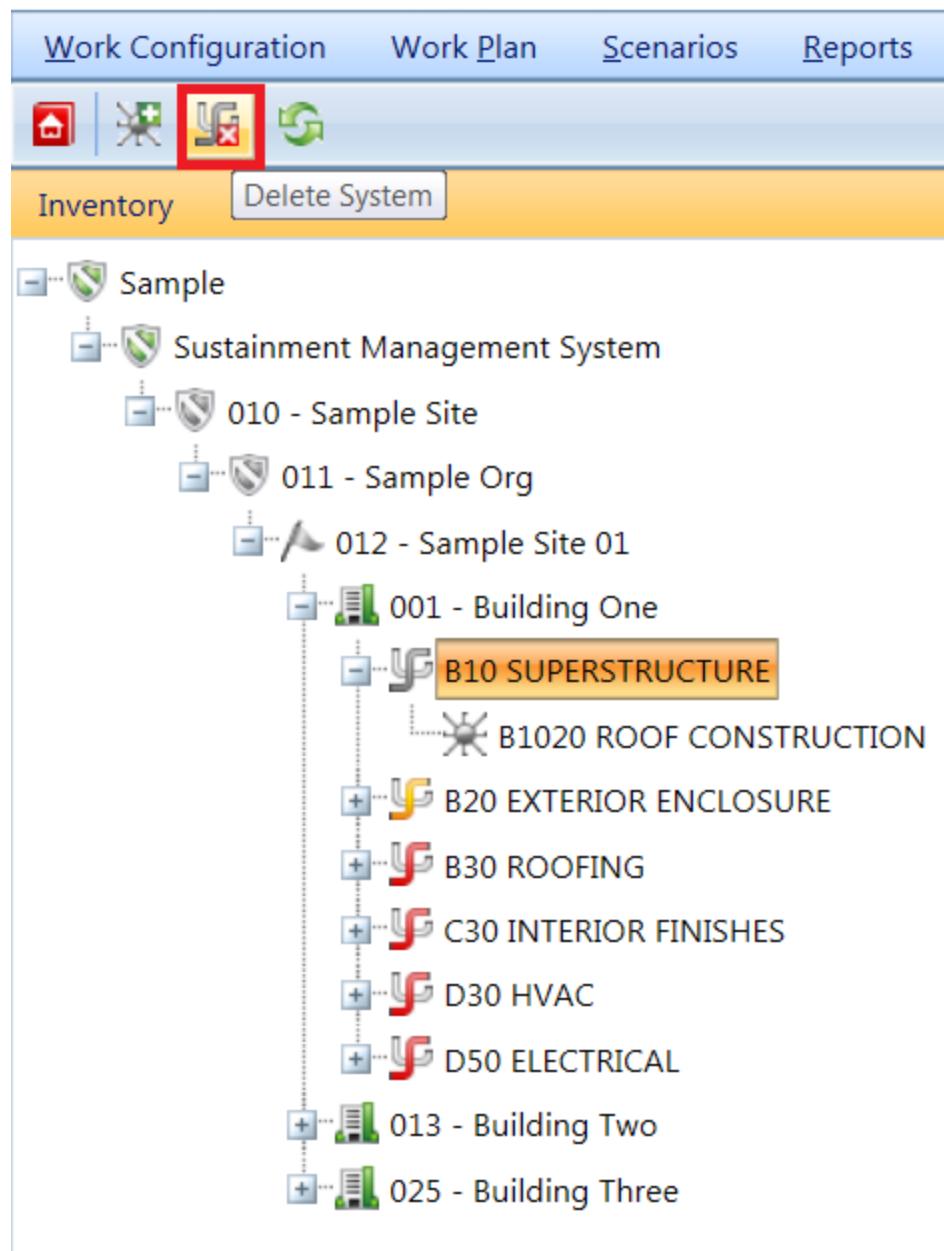
Basic information regarding the Components in the System can be viewed by selecting the "Components at a Glance" tab. The components at such a tab shows the Components inventoried in the system, each Building Component's condition index (BCCI), and the replacement cost of each Component. All of the data shown on this tab is read-only.

Condition Analysis    Components at a Glance    Attachments (0)

Description	BCCI	Replacement Cost
B2010 EXTERIOR WALLS	93	\$230,695
B2030 EXTERIOR DOORS	8	\$27,942

## Delete a System

To delete a System from a Building, select the System in the Inventory tree and click the **Delete System** button on the menu toolbar.



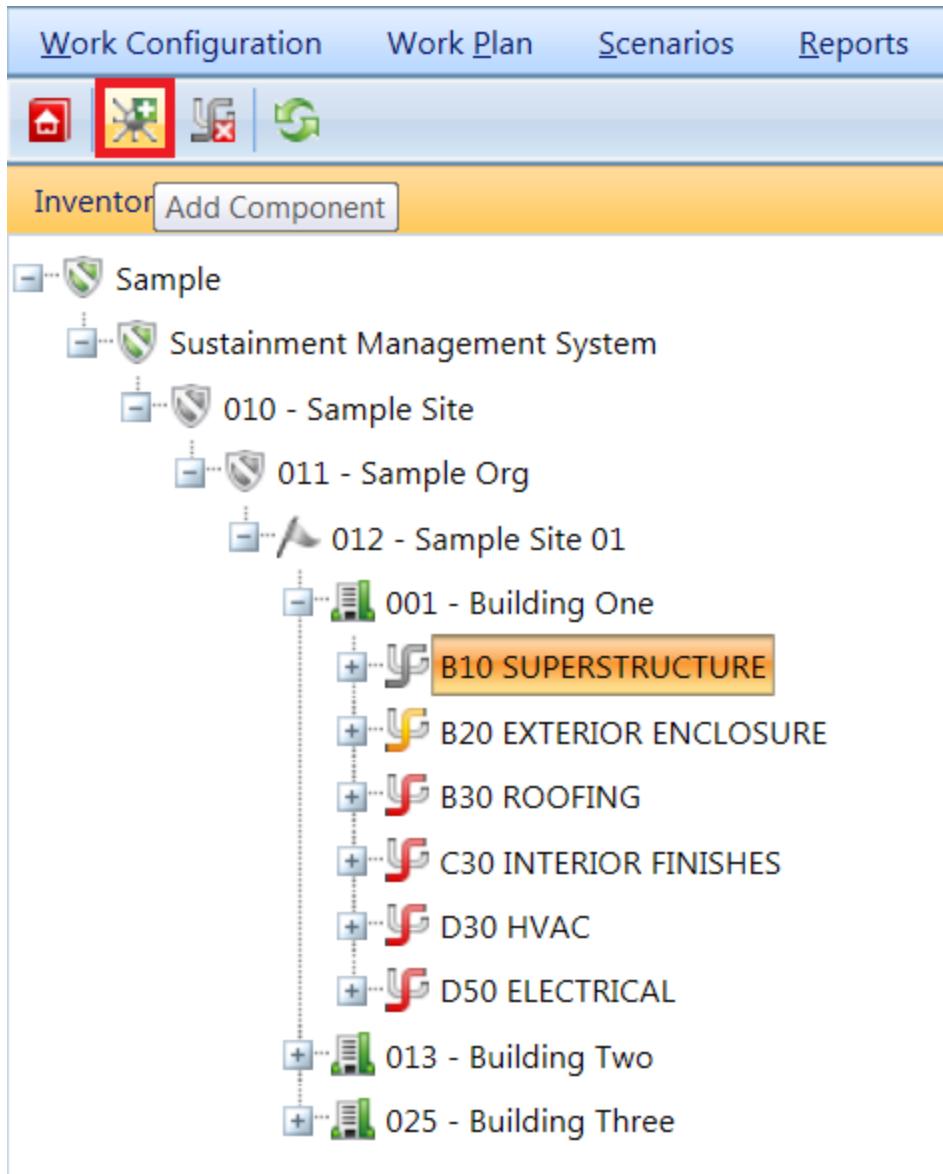
It is important to note that deleting a System will delete all inventory (Components and Sections) in the System. This is a significant step to take and should only be done when you are certain that you wish to clear the entire inventory of the System you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## ***Adding, Viewing, or Deleting a Component***

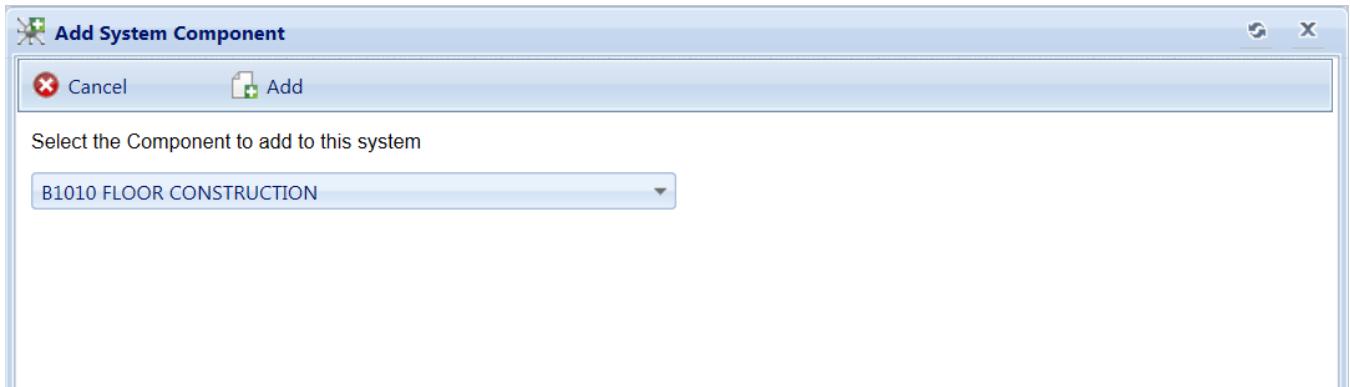
Please be sure to read the topic [Identifying Systems, Components and Sections](#) before proceeding with this topic.

### **Add a Component**

A new Component can be added to an existing System by selecting the System in the Inventory tree and clicking the **Add Component** button.



The context area of the BUILDER screen will appear as shown below.



Select the Component you wish to add from the dropdown list and click **Add** to add the component. If you do not wish to add a Component to the System, click the **Cancel** button.

**Note:** each System can contain at most one Component of each type.

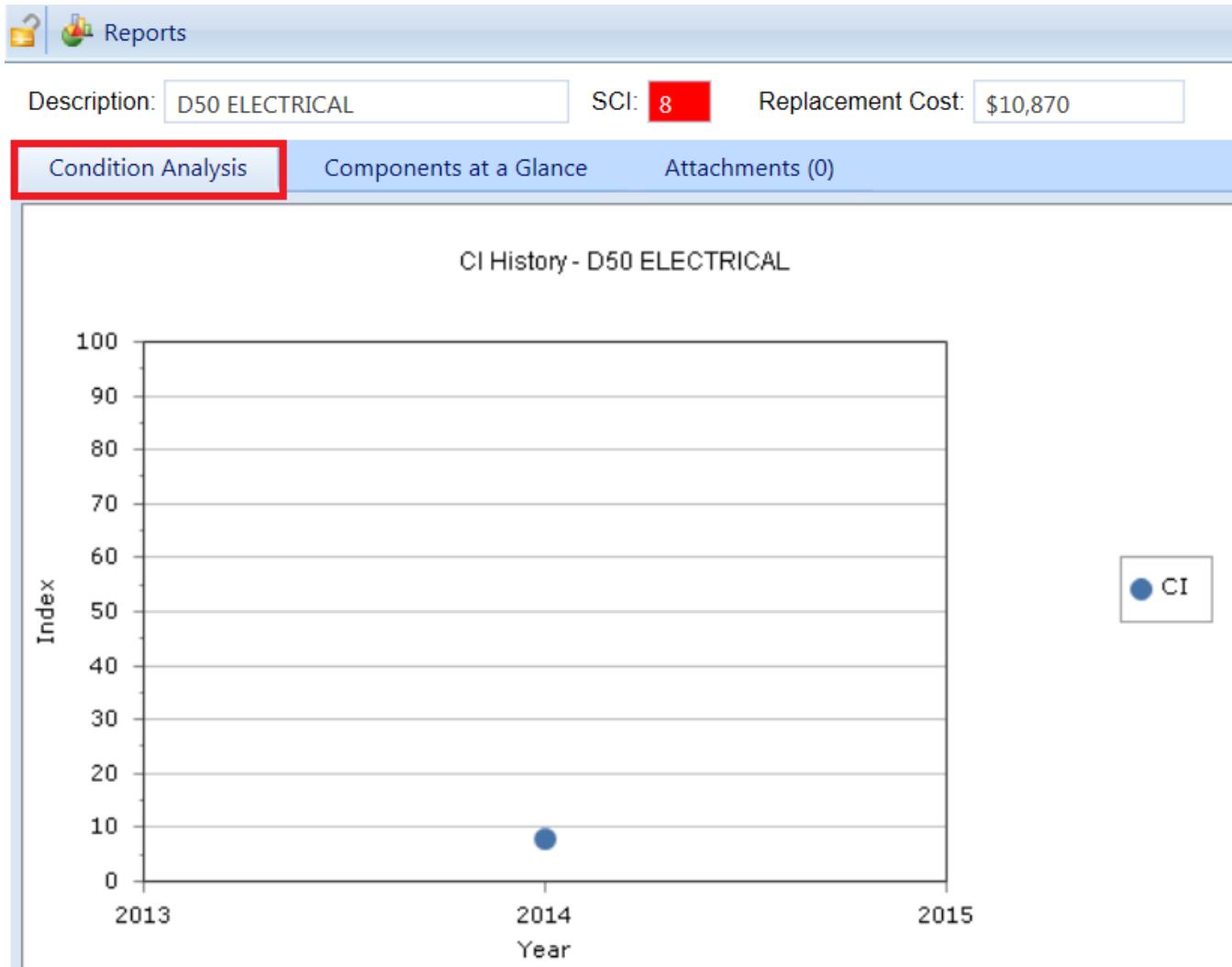
The dropdown list for adding a Component will display only the component types that do not already exist for the System.

### **View a Component**

Data for an existing Components can be viewed by selecting the Component in the Inventory tree. At the top of the context area, the component description, Building Component condition index (BCCI), and component replacement cost are shown. Additional information regarding the component is found in the different tabs and is described below.

#### **Condition Analysis Tab**

The Condition History tab displays a graph of the CI history of the Component over time.



### Components at a Glance Tab

The Components at a Glance tab shows the selected Component in the system, each Component's BCCI, and each Section's replacement cost. The replacement cost is computed from BUILDER's cost models based on Component type and quantity, and the BCCI is computed based on condition assessment data for the Section.

Reports

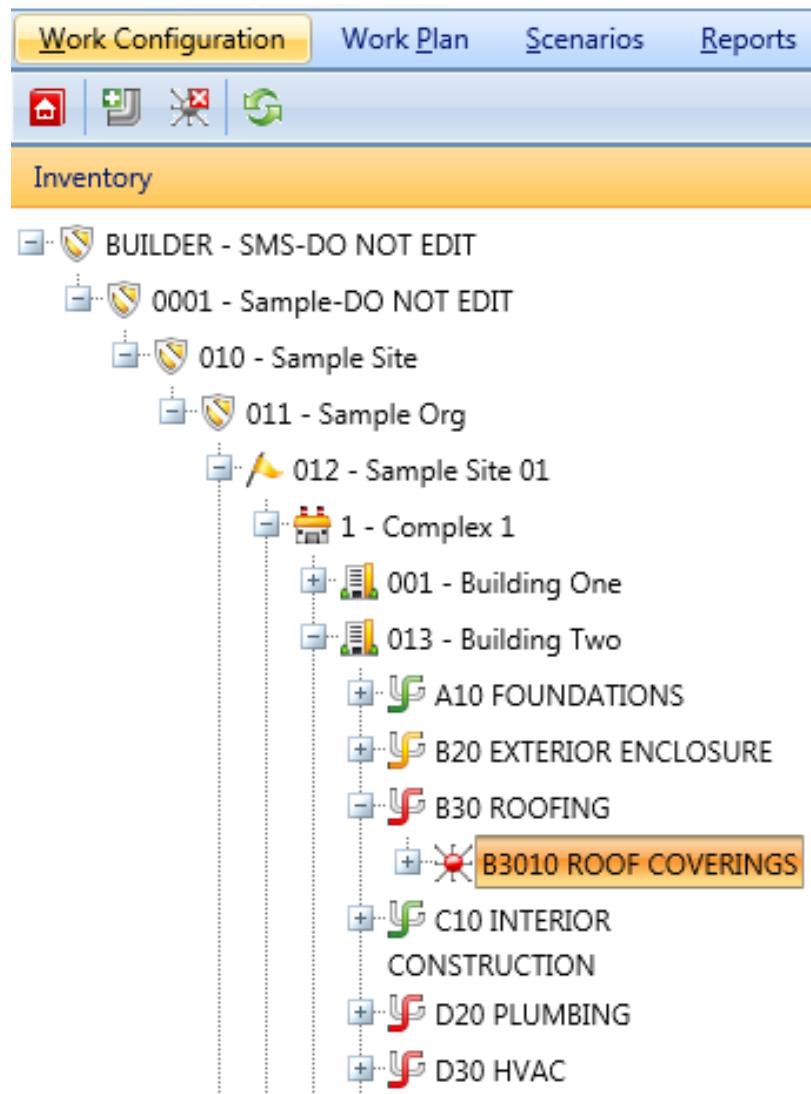
Description: D50 ELECTRICAL      SCI: 8      Replacement Cost: \$10,870

Condition Analysis    Components at a Glance    Attachments (0)

Description	BCCI	Replacement Cost
D5020 LIGHTING & BRANCH WIRING	8	\$10,870

## Delete a Component

To delete a Component from a System, select the Component in the Inventory tree, right-click it, and select **Delete**.



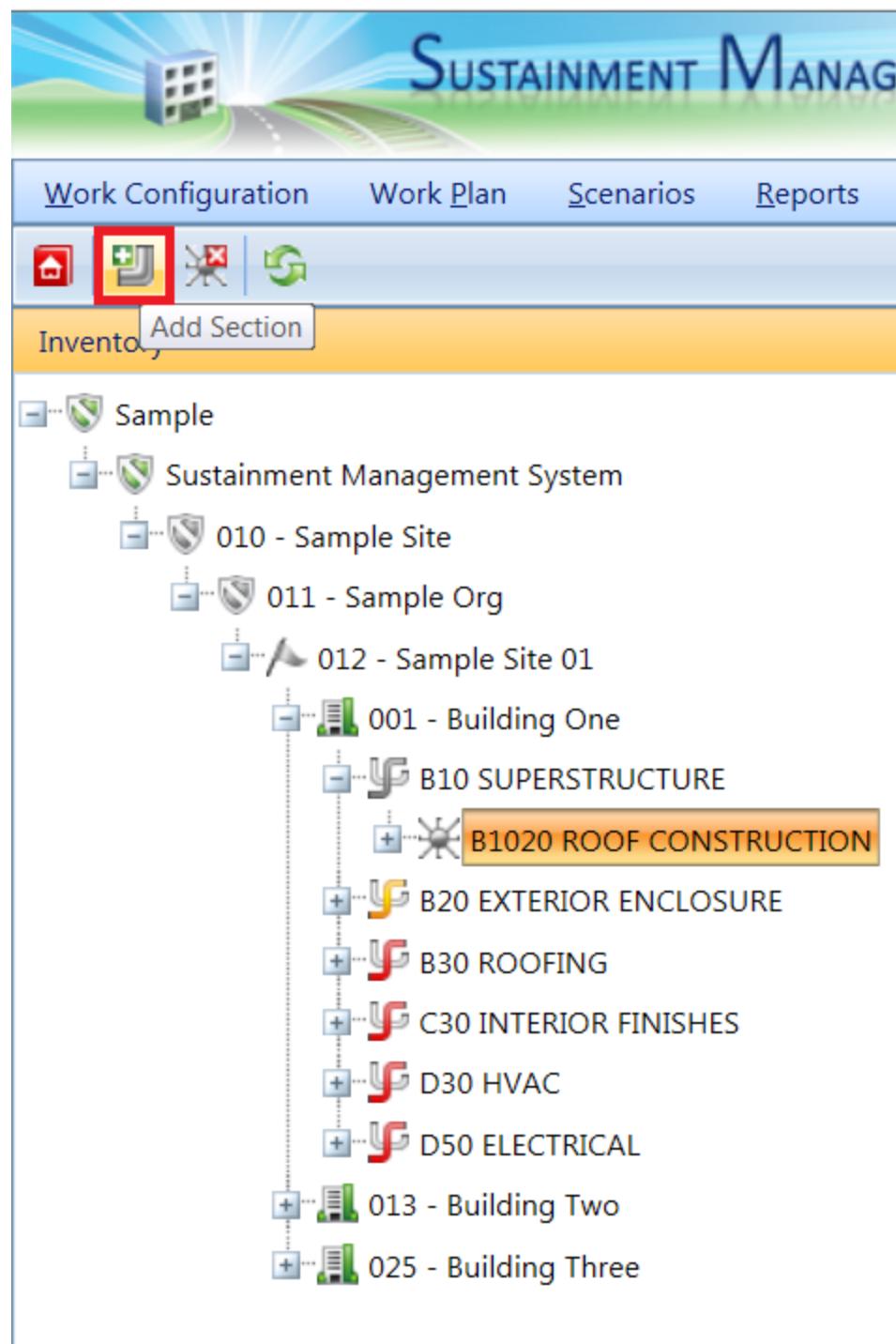
It is important to note that deleting a Component will delete all Sections in the Component. Be sure that you wish to take this action. This is a significant step to take and should only be done when you are certain that you wish to clear the entire inventory of the Component you have selected. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## ***Adding, Editing, or Deleting a Section***

Please be sure to read the topic [Identifying Systems, Components and Sections](#) before proceeding with this topic.

### **Add a Section**

A new Section can be added to an existing component by selecting the component in the inventory tree and clicking the **Add Section** button.



The context area of the BUILDER screen will appear as shown below.

The screenshot shows a software dialog box titled "Add Component Section". The interface includes a "Cancel" button and an "Add" button. There are five input fields: "Section Name" (set to "N/A"), "Material Category" (set to "B102001 STRUCTURAL FRAME"), "Component Subtype" (set to "General"), "Quantity" (set to "SF"), and "Year Built/Renewed" (set to "1985"). A checkbox labeled "Estimated" is checked next to the year field. Below the quantity field is a checkbox labeled "Painted/Coated".

Before adding the Section, the following data must be recorded:

- **Section Name.** Enter the name of the Section. A Section is described by its name, its material/equipment category, and its component subtype. You may have multiple Sections of the same material/equipment category and component subtype, but each such Section must have a unique name. A given Section name may be used, however, for the Sections of different Systems and Components, which allows the Section name to be used in organizing your inventory and condition assessment procedures. For example, you may use the Section name "Room 101" for the floor, walls, doors, plumbing, HVAC etc. Sections in Room 101. When inspecting Room 101, all of the Building Sections with the name "Room 101" can be easily selected. To simplify the process of creating multiple types of Sections with the same Section name, the Section Name property includes a dropdown list of current Section names for the building. You may either type in a new Section name or choose a name from the dropdown list.
- **Material/Equipment Category.** Select the material/equipment category of the Section from the dropdown list. Each component has a set of distinct material/equipment categories. For example, a "Door" component has material categories "Wood", "Metal", "Glass", etc.
- **Component Subtype.** Select the component subtype of the Section from the dropdown list. Each component type and material/equipment category has a set of distinct component subtypes. For example, a "Door" component with material category "Wood" has component subtypes of "Personnel", "Overhead", etc.
- **Quantity.** Enter the quantity of the Section.
- **Year Built/Renewed.** Enter the four-digit year the Section was built (or installed if equipment) or renewed. If you have no record of the year the Section was last replaced, you can enter an estimated year and mark the

"Estimated" checkbox. Initially, BUILDER algorithms estimate the year the Section was last replaced. The default value is the Building's year of construction if the age of the building is less than 1.5 times the expected service life of the Section. If the estimating algorithm is used or you are unsure of when the Section was built/renewed, make sure you mark the "Estimated" checkbox.

- **Painted/Coated.** Mark this checkbox if Section is painted or has a surface coating.
- **Year Painted/Coated.** If the Section is marked as painted/coated, enter the four-digit year the Section was last painted. If you have no record of the year the Section was last painted/coated, you can enter an estimated year and mark the "Estimated" checkbox. Initially, BUILDER algorithms estimate the year in which the Section was last painted/coated. The default value is the Building's year of construction if the age of the building is less than 1.5 times the expected paint life of the Section. If the estimating algorithm is used or you are unsure of when the Section was last painted/coated, make sure you mark the "Estimated" checkbox.
- **Paint/Coating Type.** If the Section is marked as painted/coated, select the paint/coating type from the dropdown list.

After adding the Section data, click the **Add** button to add the Section to your inventory. If you do not wish to add the Section, click the **Cancel** button to close the form.

## Edit Section Data

Data for a given Section can be viewed and edited by selecting the Section in the inventory tree.

General Info.	Section Details	Condition Trend	Inspection History	Attachments (0)
Quantity: 5,629 SF Year Built/Renewed: 1985 Age: 29 RSL: 46 Painted: <input checked="" type="checkbox"/>	Latest Inspection Date: 01/01/1985 CSCI: 100			
Current Estimated Condition CSCI: 99				

Toolbar

- **Save.** Use this button to save the changes you have made.
- **Comment.** Use this button allows you to add, edit, and view comments about the Section.
- **Images.** Use this button to add and remove images of the Section.
- **Reports.** Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to Section inventory. See [Using the Report Viewer](#).

### *General Information Tab*

After a Section is selected in the inventory navigation tree the General Information tab is shown, and all of the Section data described above can be edited.

The screenshot shows the SMS software interface with the General Information tab selected. The left sidebar displays a hierarchical navigation tree for a 'Sample' site, including '010 - Sample Site', '011 - Sample Org', and '012 - Sample Site 01'. Under '012 - Sample Site 01', there are categories like 'B10 SUPERSTRUCTURE', 'B1020 ROOF CONSTRUCTION', 'B20 EXTERIOR ENCLOSURE', and 'B2010 EXTERIOR WALLS'. A specific section, 'B201001 EXTERIOR CLOSURE Brick Veneer w/CMU Backup', is highlighted with a red box. The main workspace shows the 'General Info.' tab selected, displaying various data fields. The 'Section Name' field is set to 'N/A'. The 'Material Category' is listed as 'B201001 EXTERIOR CLOSURE' and the 'Component Subtype' is 'Brick Veneer w/CMU Backup'. Other visible fields include 'Quantity: 5,629 SF', 'Latest Inspection Date: 01/01/1985', 'CSCI: 100', 'Year Built/Renewed: 1985' (with a checked 'Estimated' checkbox), 'Age: 29', 'RSL: 46', 'Painted: [checkbox]', and 'Current Estimated Condition CSCI: 93'.

Additional data on this tab includes:

- **Age (Read-Only).** Displays the age of the Section calculated from the Year Installed/Built.
- **RSL (Read-Only).** Displays the remaining [service life](#), in years, of the Section. The remaining service life is calculated during the [CI roll-up process](#) using age, Section service life, and Section condition index trend.
- **Last Inspection (Read-Only).** Displays the date that the last condition assessment was performed on the Section. Also displayed is the Component-Section condition index (CSCI) computed on the inspection date based on the assessment results. If the Section is painted, the Coating Condition Index (CCI) computed at the last inspection date will also be shown.
- **Current Estimated Condition (Read-Only).** Displays the estimated CSCI based on service life and condition index trend. The estimated CSCI is computed during the [CI roll-up process](#), a process that should be performed on a regular basis. If the Section is painted, the CCI computed at the last inspec-

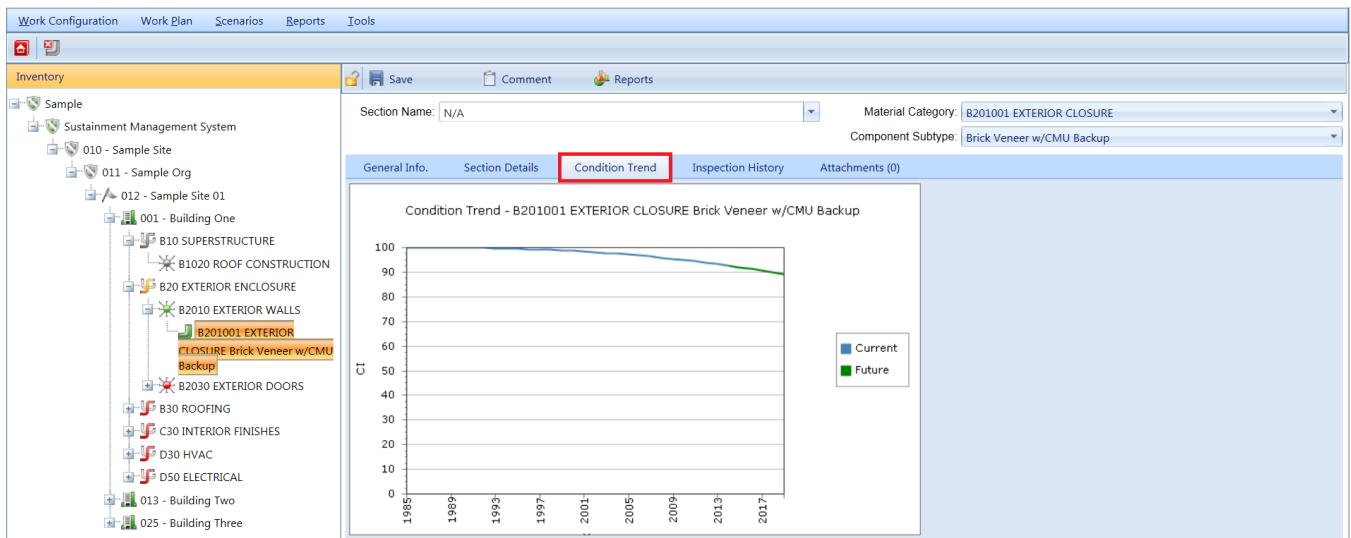
tion date will also be shown. If the Section is painted, the current estimated CCI will also be shown.

### Section Details Tab

In addition to the General Information tab, you can store additional data about the Section in the [Section Details](#).

### Condition Trend Tab

The Condition Trend tab shows the trend of the CSCI based on inspection information, as well as the projected CSCI trend into the future based on observed deterioration rates and expected service life.



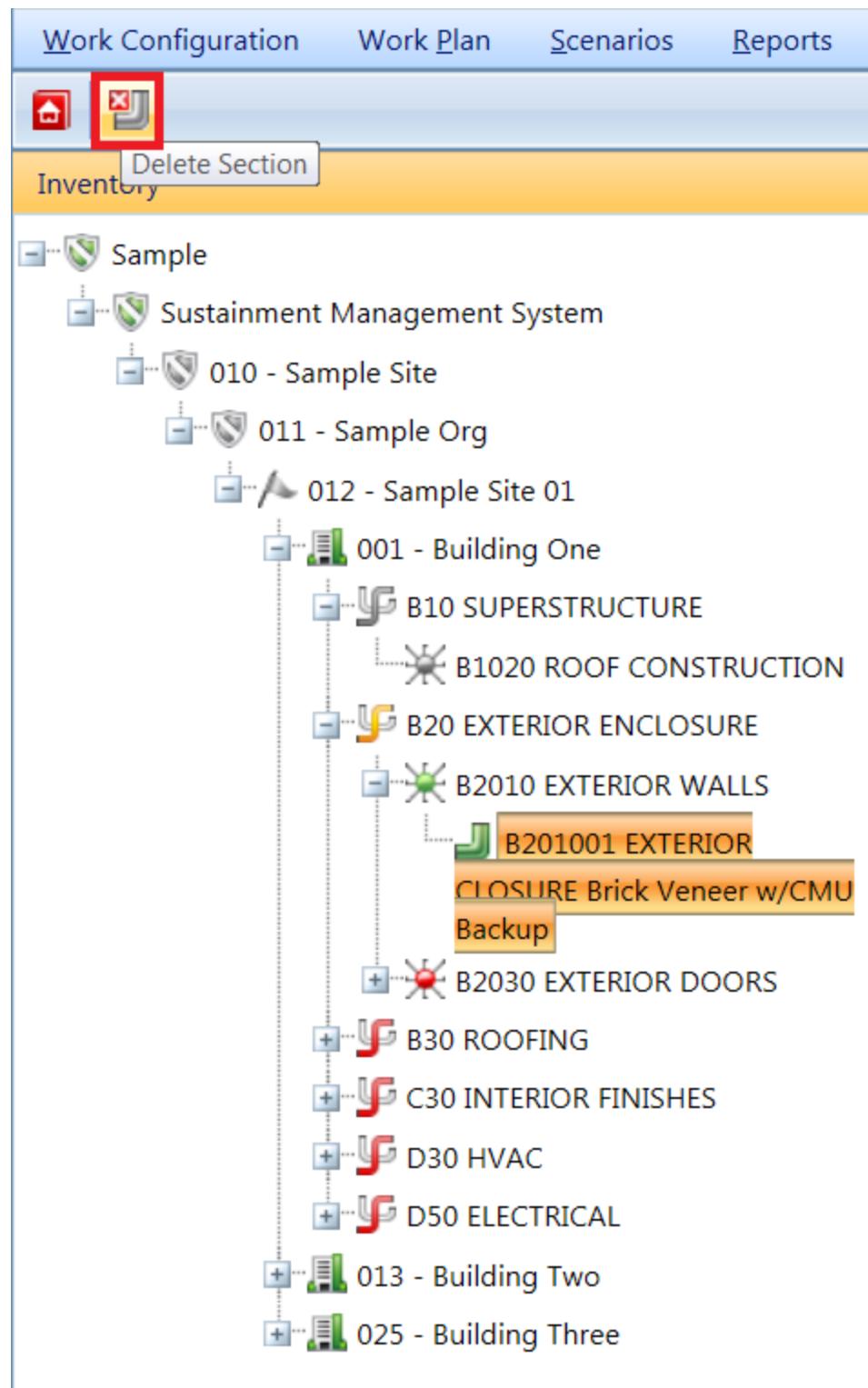
### Inspection History Tab

The Inspection History tab displays a graph of the CSCI history of the Section over time, based on inspection information.

The screenshot shows the Work Configuration software interface. On the left, there is an 'Inventory' tree view under 'Sample'. The tree includes categories like Sustainment Management System, 010 - Sample Site, 011 - Sample Org, 012 - Sample Site One, 001 - Building One, and various sub-sections such as B10 SUPERSTRUCTURE, B1020 ROOF CONSTRUCTION, B20 EXTERIOR ENCLOSURE, B2010 EXTERIOR WALLS, B201001 EXTERIOR CLOSURE (which is highlighted in orange), B2030 EXTERIOR DOORS, B30 ROOFING, C30 INTERIOR FINISHES, D30 HVAC, and D50 ELECTRICAL. Below this are 013 - Building Two and 025 - Building Three. On the right, a detailed view of the 'B201001 EXTERIOR CLOSURE Brick Veneer w/CMU Backup' section is shown. The top bar has buttons for Save, Comment, and Reports. Below that, fields show 'Section Name: N/A', 'Material Category: B201001 EXTERIOR CLOSURE', and 'Component Subtype: Brick Veneer w/CMU Backup'. A tab labeled 'Inspection History' is selected and highlighted with a red box. Below this, a chart titled 'Inspection History - B201001 EXTERIOR CLOSURE Brick Veneer w/CMU Backup' displays an index from 0 to 100 against a year from 1984 to 1986. The chart shows a single data point at approximately 95 in 1985. A legend indicates a blue circle represents 'CI'.

## Delete a Section

To delete a Section, select the Section in the Inventory Tree, right-click it, and select Delete.

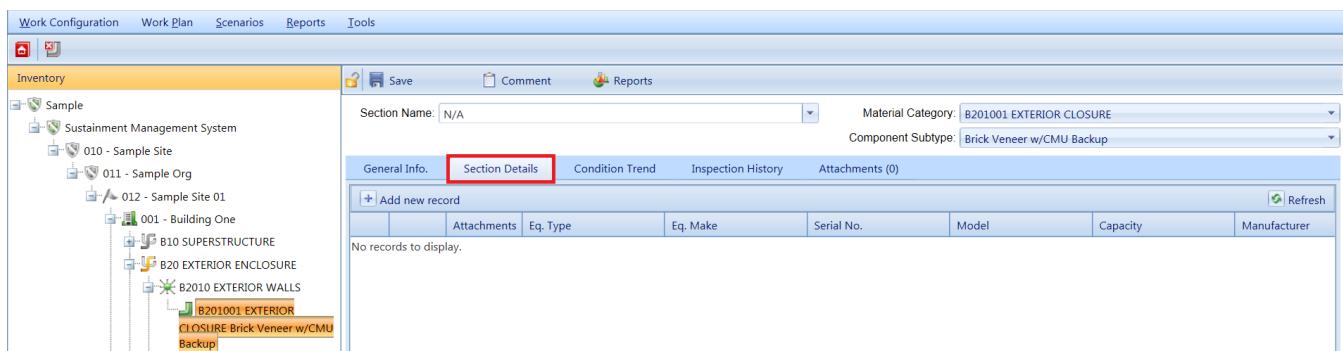


This is a significant step to take and should only be done when you are certain that you wish to clear the Section you have selected from the inventory in the

building. Making frequent backups of your inventory database will protect you from significant data losses if mistakes in deleting are made.

## Section Details

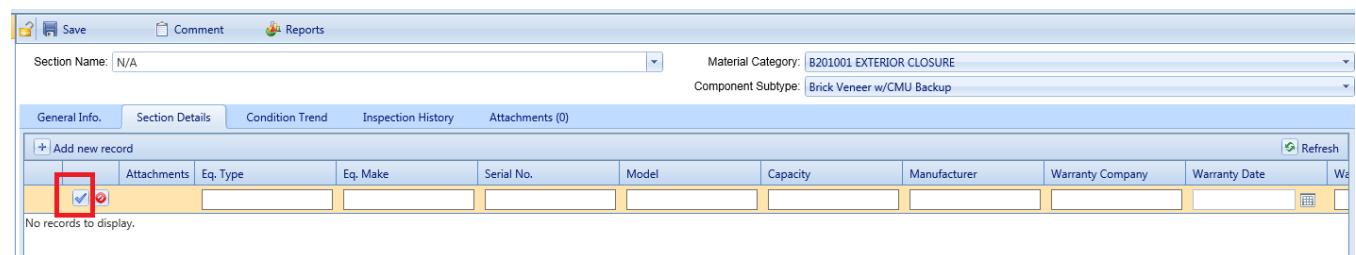
Section details include critical information regarding warranties, model number, manufacturer, equipment serial numbers and property identifiers, and location. After defining a Section, you may add details regarding individual items of equipment or constructed elements at the **Section Details** tab, as shown below.



### Add Section Details

To add Section details,

1. Click **Add new record**.
2. Enter information (fields are described in Section Detail Data below).
3. **IMPORTANT:** after entering the information, click the checkmark icon(see illustration below)
4. To exit the record without saving the data, click the Cancel icon next to the checkmark icon.
5. When finished with entries, or intermittently, click **Save** on the Toolbar.



### Toolbar

- **Save.** Use this button to save the changes you have made to the Section detail.

- **Comment.** Use this button to add, edit, and view comments about the Section details.
- **Images.** Use this button to add and remove images of the Section.

## Edit Section Detail Data

Because Section detail data can be recorded for equipment and non-equipment Section types, some of the data elements may not apply to a particular Component-Section. Simply fill in the applicable data fields and leave the non-applicable fields blank. Section detail data that can be entered includes:

- **ID Number** (Required for individual items of equipment; not used for non-equipment Section types). Enter the identifier for the individual equipment, limited to 20 alphanumeric characters.
- **Equipment Type.** Enter the equipment type of the Section, limited to 50 alphanumeric characters.
- **Equipment Make.** Enter the equipment make of the Section, limited to 30 alphanumeric characters.
- **Serial Number.** Enter the serial number of the Section, limited to 30 alphanumeric characters.
- **Model.** Enter the Section model, limited to 20 alphanumeric characters.
- **Capacity.** Enter the capacity of the Section, limited to 70 alphanumeric characters.
- **Manufacturer.** Enter the manufacturer of the Section, limited to 40 alphanumeric characters.
- **Warranty Company.** If the Section has a warranty, enter each warranty company, which is limited to 50 alphanumeric characters each. For each Section, two warranty companies may be listed.
- **Warranty Date.** If the Section has a warranty, select each warranty date using the dropdown calendar. For each Section, two warranty dates may be listed, numbered to match the warranty company.
- **Location.** Enter the Section location, limited to 40 alphanumeric characters.
- **Date Manufactured.** Select the date the Section was manufactured using the dropdown calendar.
- **Control Type/Make.** Enter the Section control type or make, limited to 50 alphanumeric characters.
- **Year Installed.** Enter the 4-digit year the Section was installed.
- **Comment.** Enter comments about the Section.

# Rapid Inventory Methods

## ***Rapid Inventory Methods Overview***

One of the most time-consuming aspects of inventory is the decomposition of a Building into its Systems, Components, and Sections. To help with this Building decomposition, BUILDER™ has three alternative methods designed to help you quickly establish an inventory database for your Buildings:

1. Rapid Inventory Estimation using embedded Building models
2. Copying the inventory of one Building into another
3. Creating and using Building templates

The icons for these methods sit side by side on the BUILDER toolbar at the inventory levels where they are available for use:



### **Rapid Inventory Estimation**

BUILDER provides a set of embedded Building models complete with an initial breakdown into Systems, Components, and Sections based on the Building Use Type, size, age, and number of floors. These Building models were established by the Department of Defense under the Unified Facilities Criteria (UFC) system and published in the DoD Facilities Pricing Guide.

### *Embedded Building Model Styles*

When using BUILDER's Rapid Inventory Estimation, you have a choice between two model styles:

1. The default (generic) model identifies and creates likely components, but creates sections of unknown material/equipment type and unknown component type. For example, if the generic model creates a section of 10 doors, the material type will be set to "Unknown" and component type will also be set to "Unknown."
2. The DoD model identifies a specific material/equipment type and component type for each section. For example, the DoD model may create a section of 10 doors of material type "Metal" and component type "Personnel."

### **Choosing a Style**

Some factors to consider when choosing are:

- Level of retained control desired by your organization. If you use the default model, material type and component type are not specified by the model, and there is a lower chance that your Building will contain inaccurate information that has not yet been updated. The need for intervention at that level of detail will be more obvious when using the default embedded model.
- Perceived amount of similarity between your Building(s) and the DoD model details. The judgment call here is whether it will be less work to
  - a. check the accuracy of material/equipment type and component type in entries fully filled in by the DoD model, and change the details where they differ from actual; or
  - b. methodically fill in material/equipment type and component type for lower-level entries filled in by the default model...or perhaps this detailed level of information will not be needed right away.

#### *Usage Tip*

After applying either Building style model, you will be able to edit the data for each Building to increase accuracy. This refinement of the data can be done gradually over time as your needs require and as more accurate data becomes available.

#### *Embedded Building Model Availability*

A limited selection of embedded Building models is available. Your SMS support agent should be able to provide you with a list of the Building Use codes for which a model is available.

#### *Getting Started*

For instructions on using embedded Building models, see Using Rapid Inventory Estimation to Populate Buildings.

#### **Copying Inventory from Another Building**

One method that eases the data input process is copying a Building's inventory from one Building into another. This provides a starter set of Systems, Components, and Sections to be refined; the amount of refinement needed will depend on the amount of similarity between the structures.

This inventory creation method is especially useful if you have a number of Buildings in your inventory that were all built at the same time using the same plans and specifications.

**Note:** If you have more than two or three Buildings or facilities that are very similar to each other, you should consider creating a Building template. (see the next section)

For instructions, see Copying a Building.

## **Creating and Using Building Templates**

The Building template feature is designed to ease the inventory development process in BUILDER. If your physical inventory contains a number of structures that are essentially of the same design and composition, you can establish a Building template for that design to use as a "cookie cutter" and then apply an automated process with the template to create matching Buildings in your BUILDER inventory with little additional effort.

A Building template looks very much like a Building in BUILDER. Every data element belonging to a template or one of its substructures has a corresponding data element in a building. A template has general Building data such as use, size, and number of floors as well as a decomposition into Systems, Components, and Sections (including section details). If the template is designated as family housing, then you may specify data about each dwelling unit regarding number of rooms and types and makes of appliances. A template does not have data that is specific to each Building such as its year of construction, its condition ratings, its costs, its location, etc.

### *Preparation*

The template feature is designed to be used as an initial step in the construction of your inventory database. However, in order to achieve the greatest benefit from using templates, you must be very familiar with BUILDER's approach to inventing a Building. See [Adding a Building](#) and [Identifying Systems, Components and Sections](#) for important information regarding how Buildings and their template counterparts are structured in the database.

### *Methods*

BUILDER offers several methods for creating a template:

- You can create a template by inputting each data element in much the same way that you create a Building. See [Managing the Template Library](#) for instructions regarding this method.
- Since each Building in your inventory database has all of the comparable data elements of a template, you may create a template quickly by [copying an existing Building's data into a template](#).

- You can [import templates](#) from another user's template library for use in your own library. This import capability is especially useful for military installations, which may have many Buildings constructed from a few standard service-wide designs.

#### *Usage Tip*

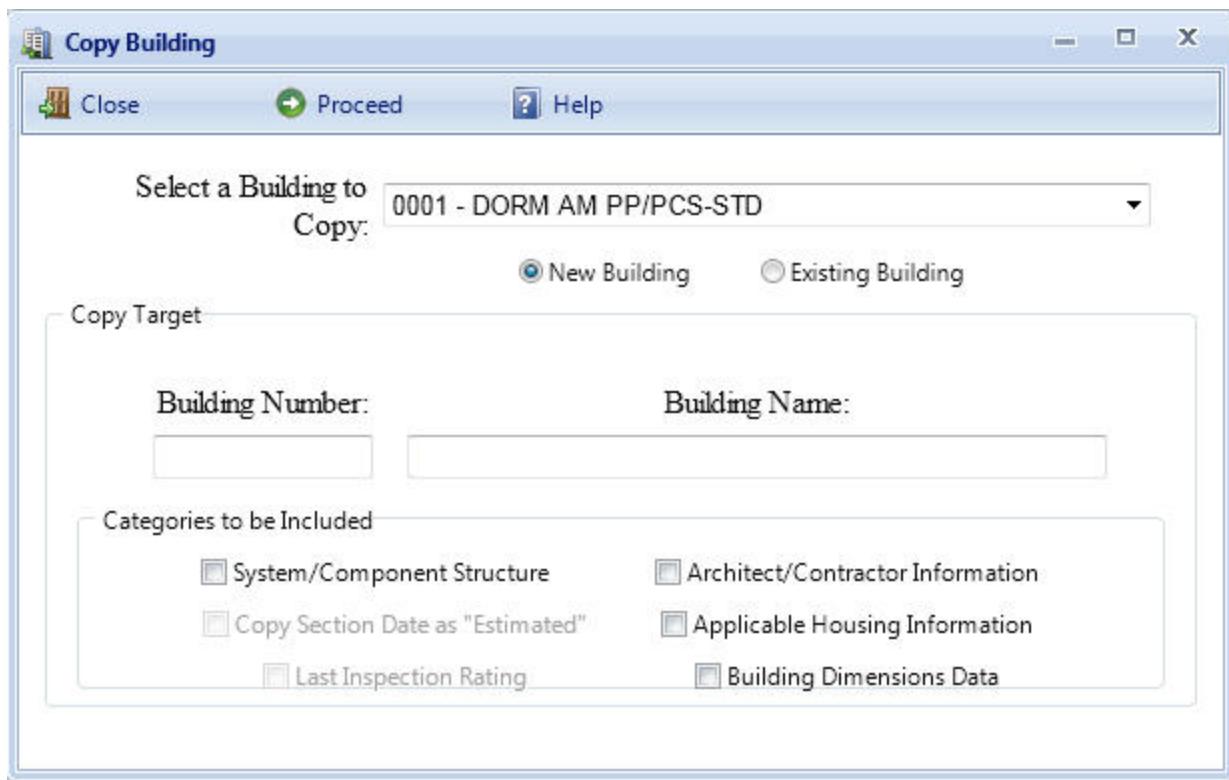
Once a template is established, a Building with the same design can be created in an automated fashion by copying the template data into the appropriate Building data elements. This process can save hours of manual input if you have multiple Buildings for which the template applies. See [Creating Building Inventory Using Templates](#) to learn how to use a template to create or expand the data for one Building at a time and for multiple Buildings at the same time.

### ***Copying a Building***

BUILDER™ has been designed to help you quickly establish an inventory database for your buildings. One of the most time-consuming aspects is the decomposition of a building into its systems, components, and sections. One method that eases the data input process is copying a building's inventory from one building to another. This feature is very useful if you have a number of buildings in your inventory that were all built at the same time using the same plans and specifications.

Before you can copy a building's inventory from one building to another, you must first [create the building](#) and complete its inventory as fully as possible, including all of the related building data. Once the building has been created, select it in the inventory tree; once it is highlighted, right-click and select  **Copy Inventory to Another Building** from the dropdown list.

The Copy Building window will appear, and the building whose inventory you wish to copy should appear in the Select Building to Copy dropdown list.



In the Copy Target section of the window, select whether you want to copy that building's inventory to a New Building or into an Existing Building. If you select a New Building, you must supply Building Number and Building Name. If you select an Existing Building, a list of buildings currently in the inventory will be shown and you can select the building you wish to copy the inventory to.

In the Record Categories to be Included section of the window, check all of the categories you wish to have copied to the new/existing building. The following record categories can be copied to the new/existing building:

- System/Component Structure. Marking this checkbox will copy all of the systems, components, and sections to the new/existing building.
- Copy Section Date as "Estimated". Marking this checkbox will mark all of the section install dates in the new/existing building as estimated. This checkbox can only be marked if the System/Component Structure checkbox is marked.
- Last Inspection Rating. Marking this checkbox will copy the last condition assessment rating for each section to the new/existing building. This checkbox can only be marked if the System/Component Structure checkbox is marked.
- Architect/Contractor Information. Marking this checkbox will copy all of the [architect and contractor information](#) to the new/existing building.

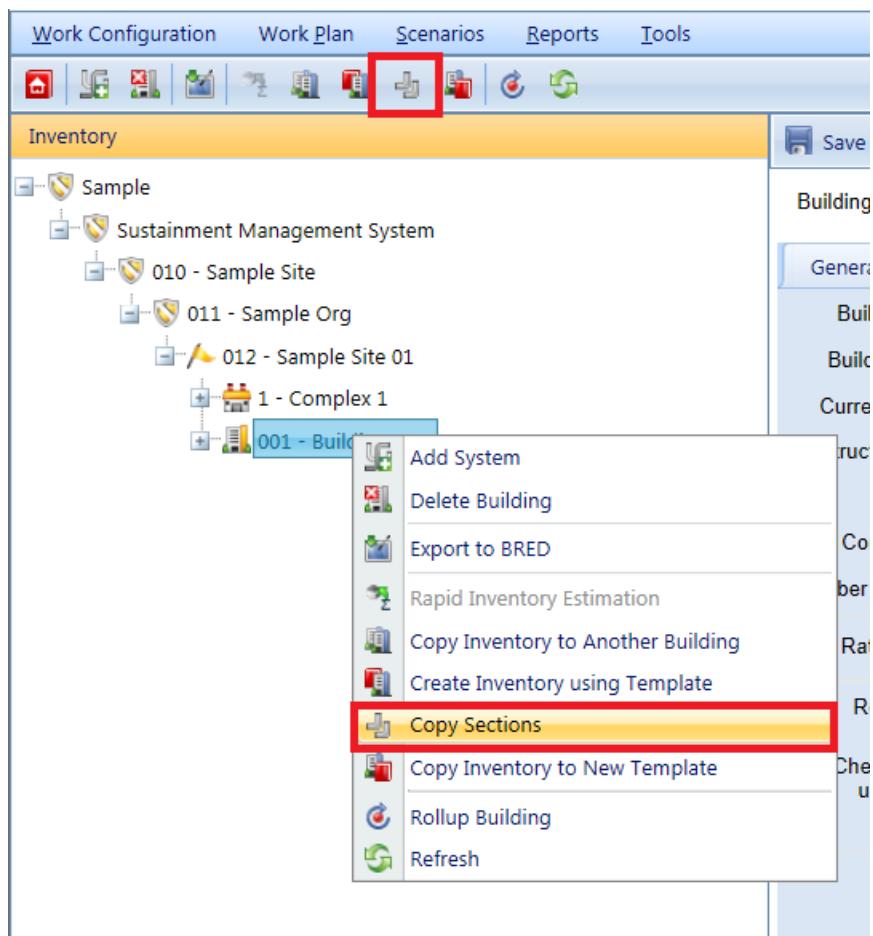
- Applicable Housing Information. Marking this checkbox will copy all of the [housing information](#) from the family housing screen to the new/existing building.
- Building Dimension Data. Marking this checkbox will copy all of the [dimension data](#) to the new/existing building.

Click the **Proceed** button to start the copy process. After the copy process is complete, you can edit all of the copied building's records if adjustments are necessary. If you do not wish to copy the building, click the **Close** button.

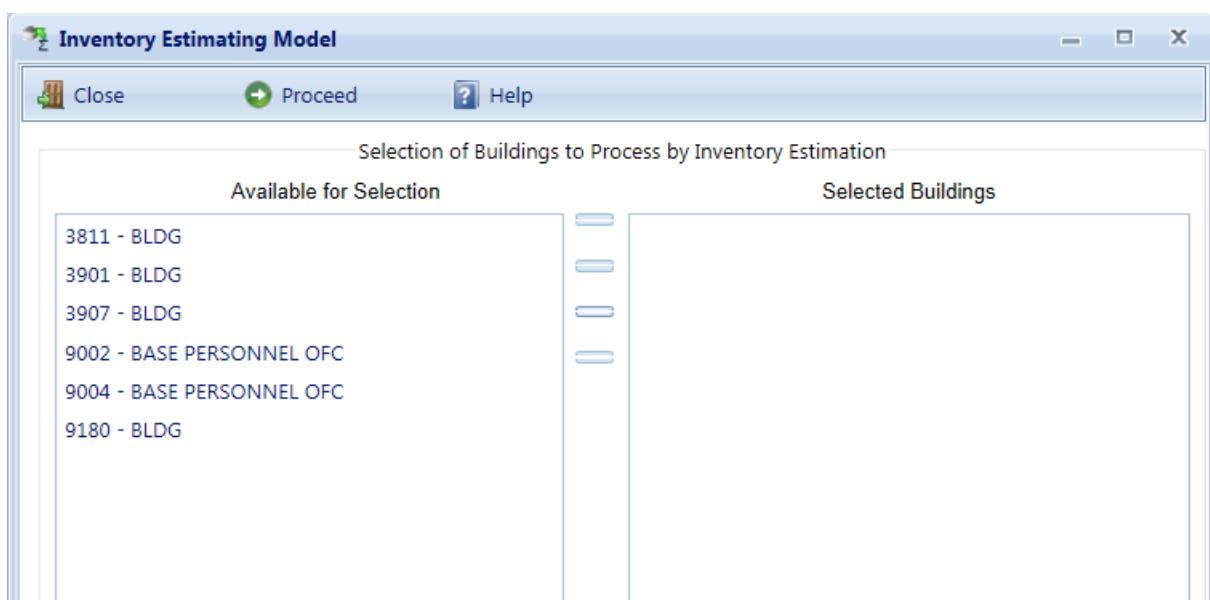
## ***Copy Sections***

BUILDER™ has been designed to help you quickly establish an inventory database for your buildings. One of the most time-consuming aspects is the decomposition of a building into its systems, components, and sections. One method that eases the data input process is the Copy Sections tool, which allows you to copy pre-existing sections from one area of a building to another area of the same building. An example of when to use this tool is in a multistory building with similar or identical inventory on multiple floors. The first floor can be inventoried and then copied to other floors, saving time and reducing inventory costs.

To use the copy sections tool, select the building you wish to copy the sections in from the inventory tree and click the Copy Sections button. Alternatively, you can right-click on the building and select **Copy Sections**.



After your selection, the Copy Sections Window will appear.



In the copy sections window, enter the following data:

- **Name to Copy** (Required). Choose the existing section name to copy from the dropdown list. All sections that match the selected name will be copied as new sections.
- **Replacement Name** (Required). Enter the replacement name for the copied sections. The replacement name will appear as the section name for the copied sections.
- **Copy Comment** (Optional). Mark the "Copy Comments" checkbox if you wish to copy the comments associated with the copied sections and associate them with the replacement sections also.
- **Set Installed Date as "Estimated" for all sections being copied** (Optional). Mark this checkbox if you want all of the replacement sections' year installed to be marked as estimated.

After all of the data has been entered, click the **Proceed** button in the toolbar to copy the sections. The copied sections will be added to the database and appear on the inventory tree. If you do not wish to copy the sections, click the **Cancel** button.

### ***Using Rapid Inventory Estimation to Populate Buildings***

Using BUILDER™'s Rapid Inventory Estimation tool and embedded building models, you can quickly establish an inventory of Systems, Components, and Sections for any qualified building or facility. For more background information, see Rapid Inventory Methods Overview

The selection of embedded building models is limited. Model availability depends on the Use Type of the building.

**Note:** An alternative method of quickly establishing an inventory database for a newly created building is to copy the inventory of another building into it.

#### **Prerequisites**

##### *Create the Building(s)*

Before the Rapid Inventory Estimation tool can be deployed, someone must first [create the building\(s\)](#) and enter the general building information, such as year of construction or area.

### *Determine Model Availability*

The availability of an embedded building model for Rapid Inventory Estimation depends on the Building's Use Type code number. Your SMS support agent should be able to supply you upon request with a list of Use Type code numbers for which building models are embedded in your version of BUILDER.

Another way to determine if Rapid Inventory Estimation is active for a Building you have created is to right-click on the Building in the Inventory navigation tree. If Rapid Inventory Estimation is not available for that Building's Use Type, the text "Rapid Inventory Estimation" will be grayed out in the right-click menu listing.

**Note:** Rapid Inventory Estimation is available only when you are in the Inventory navigation tree.

Only a limited number of building models have been embedded into BUILDER.

### *Decide on Model Style*

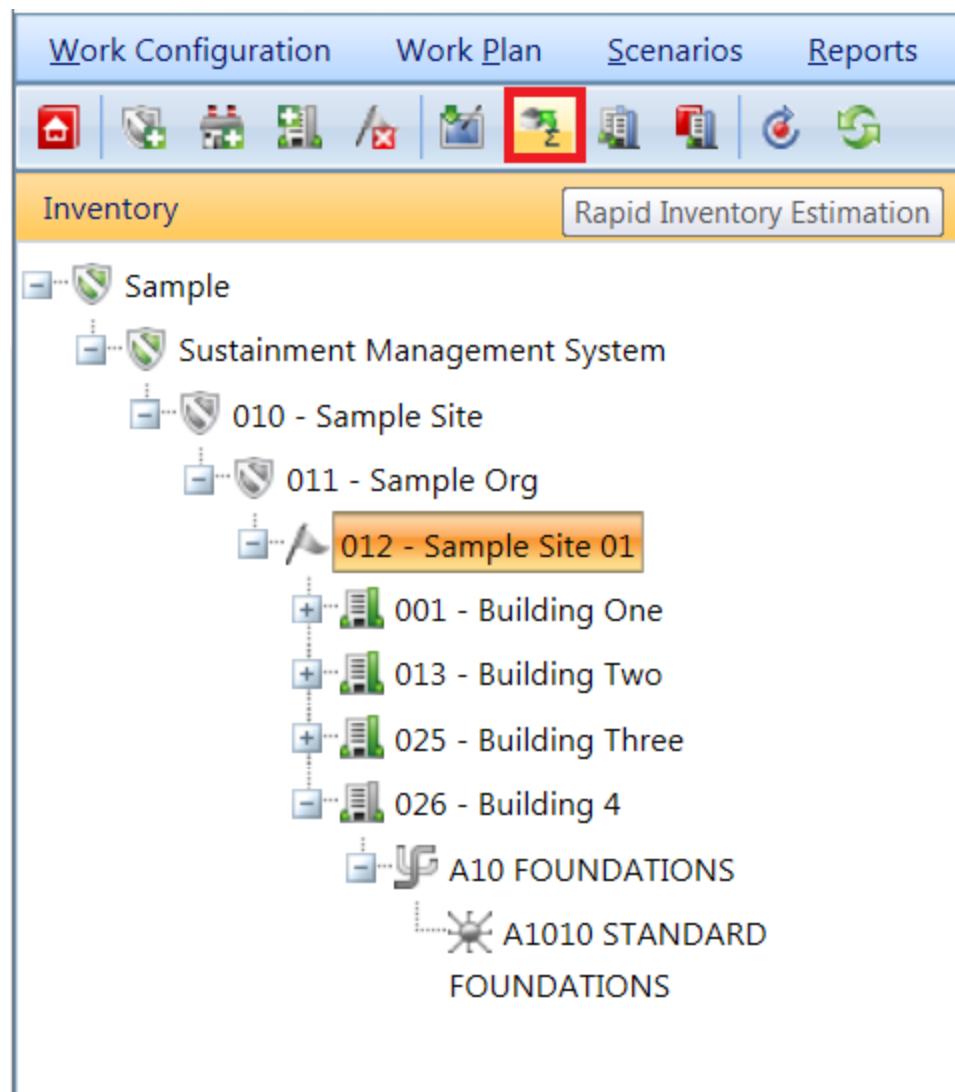
When using BUILDER's Rapid Inventory Estimation, you will need to choose between two model styles:

1. The default (generic) model identifies and creates likely components, but creates sections of unknown material/equipment type and unknown component type. For example, if the generic model creates a section of 10 doors, the material type will be set to "Unknown" and component type will also be set to "Unknown."
2. The DoD model identifies a specific material/equipment type and component type for each section. For example, the DoD model may create a section of 10 doors of material type "Metal" and component type "Personnel."

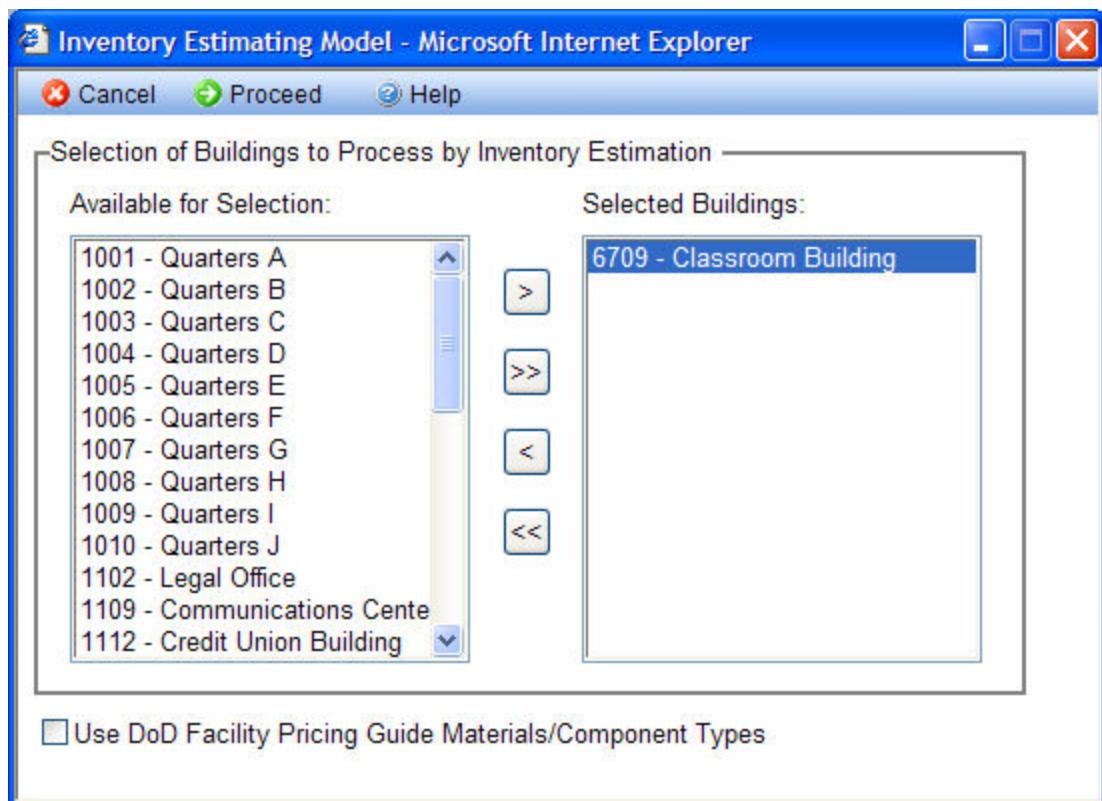
### **How To Populate Buildings with Rapid Inventory Estimation**

Once the buildings are created,

1. Select the smallest organizational node in the inventory tree that contains all the buildings to be populated using the embedded models.
2. With that node selected, click the Rapid Inventory Estimation button in the BUILDER toolbar. Alternatively, right-click the node and select **Rapid Inventory Estimation** from the dropdown menu.



The "Inventory Estimating Model" window will appear.



To perform Rapid Inventory Estimation,

1. Select the buildings you wish to estimate the inventory for using the embedded models on the Available for Selection list and use the directional buttons to move them to the Selected Buildings list. If you wish to use the DoD model for this process, check the box at the bottom of the window, otherwise the generic model will be used.

Click **Proceed** to start the estimation process. When the process is complete, you will be able to review and edit the systems, components, and sections created during the estimation. If you do not wish to estimate the inventory of the building(s), click **Cancel**.

### ***Using Building Templates***

BUILDER has been designed to help you quickly establish an inventory database for your Buildings. One of the most time-consuming aspects is the decomposition of a Building into its Systems, Components, and Sections. The Building Template feature is designed to ease the inventory development process in BUILDER. If your physical inventory contains a number of Buildings that are essentially of the same design and composition, you can establish a template for that design to use as a "cookie cutter" and then apply an automated process with the template to create the matching Buildings in your BUILDER inventory with little additional effort.

A Building template looks very much like a Building in BUILDER. Every data element belonging to a template or one of its substructures has a corresponding data element in a building. A template has general building data such as use, size, and number of floors as well as a decomposition into Systems, Components, Sections (including Section details). If the template is designated as family housing, then you may specify data about each dwelling unit regarding number of rooms and types and makes of appliances. A template does not have data that is only known for each specific building, such as its year of construction, its condition ratings, its costs, its location, etc.

The template feature is designed to be used as an initial step in the construction of your inventory database. However, in order to achieve the greatest benefit from using templates, you must be very familiar with BUILDER's approach to inventoring a Building. See [Adding a Building](#) and [Identifying Systems, Components and Sections](#) for important information regarding how Buildings and their template counterparts are structured in the database.

BUILDER offers several methods for creating a template:

- You can create a template by inputting each data element in much the same way that you create a Building. See [Managing the Template Library](#) for instructions regarding this method.
- Since each Building in your inventory database has all of the comparable data elements of a template, you may create a template quickly by [copying an existing Building's data into a template](#).
- You can [import templates](#) from another user's template library for use in your own library. This import capability is especially useful for military installations, which may have many Buildings constructed from a few standard service-wide designs.

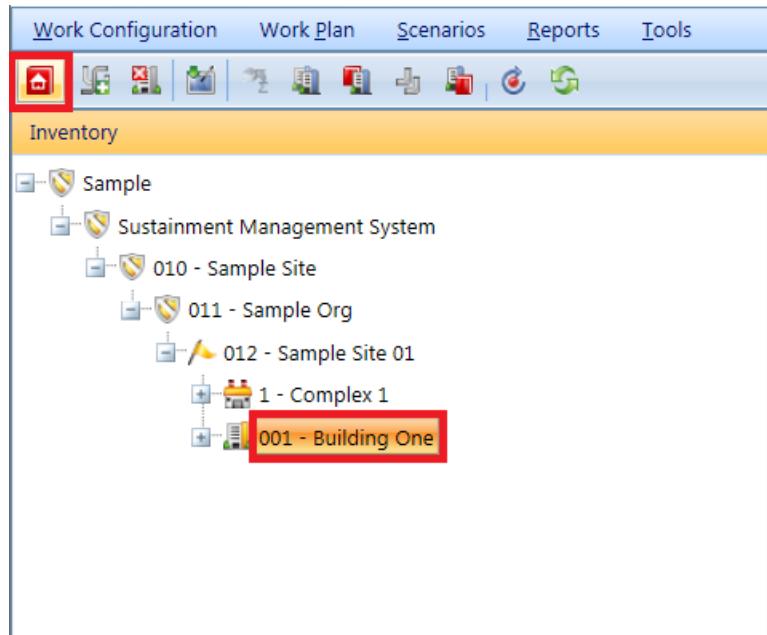
Once a template is established, a building with the same design can be created in an automated fashion by copying the template data into the appropriate Building data elements. This process can save hours of manual input if you have multiple Buildings for which the template applies. See [Creating Building Inventory Using Templates](#) to learn how to use a template to create or expand the data for one Building at a time and for multiple Buildings at the same time.

## **Managing the Template Library**

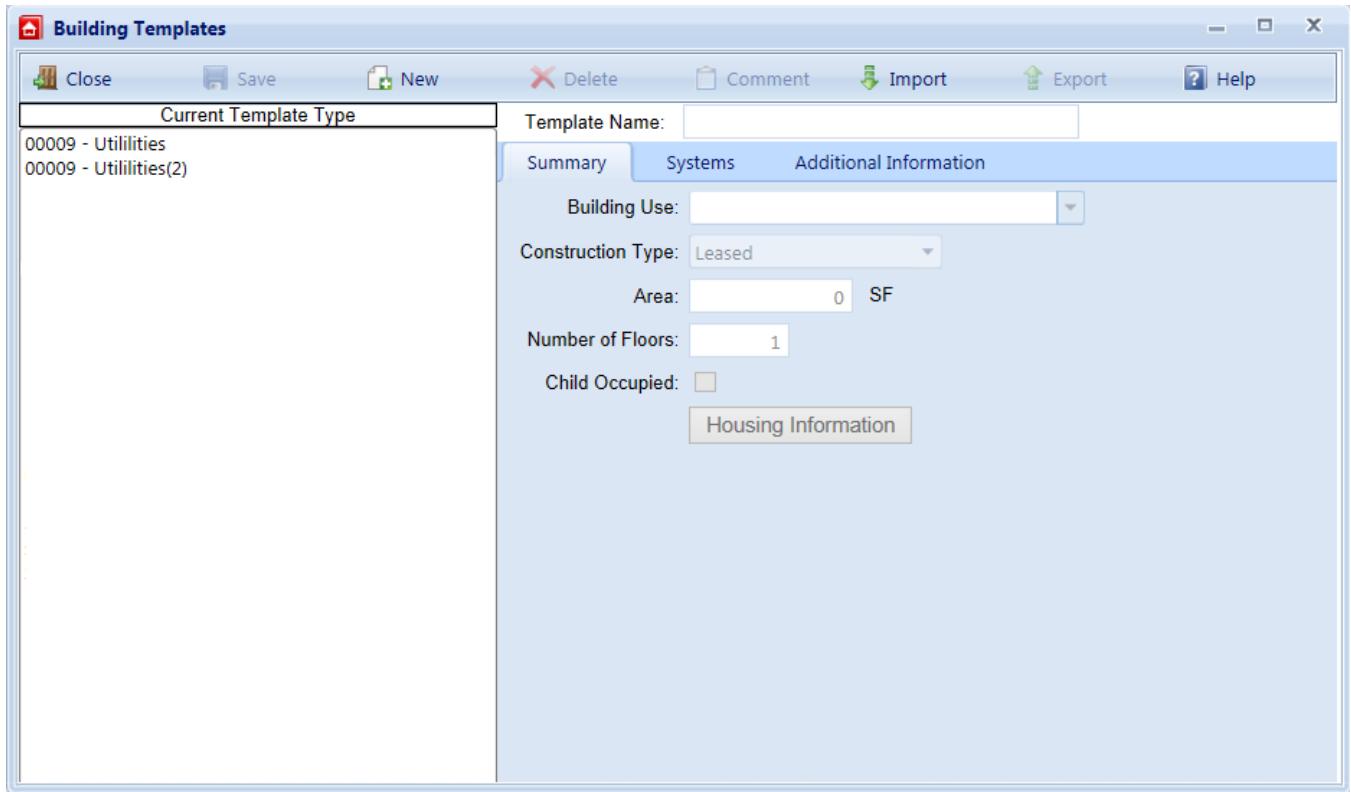
Building templates provide a convenient method for rapidly creating your building inventory when you have multiple buildings with the same design and composition. A template stores the basic data about a generic building and can be used to create many buildings at one time using an automated process that cop-

ies the structure of the template to each desired building. For more information about templates, see [Using Building Templates](#).

BUILDER™ stores all of the templates in your database in a template library. From the template library you are able to manually add, edit, and delete templates in your database. To manage the template library, click the Building Templates button from the navigation menu.



The Building Template window will appear.



The Building Templates window lists the current templates in the library on the left side and the data for the selected template on the right side. The data on the different tabs are described below.

### Toolbar

- **Close.** Use this button to close the Building Template window.
- **Save.** Use this button to save the changes you have made to the building templates.
- **New.** Use this button to create a new template.
- **Delete.** Use this button to delete the template currently selected.
- **Comment.** Use this button to add, edit, and view comments for the template.
- **Import.** Use this button to [import templates](#) from other sources.
- **Export.** Use this button to [export templates](#) to other sources.

### Summary Information Tab

The following data appears on the Summary Information tab and can be edited.

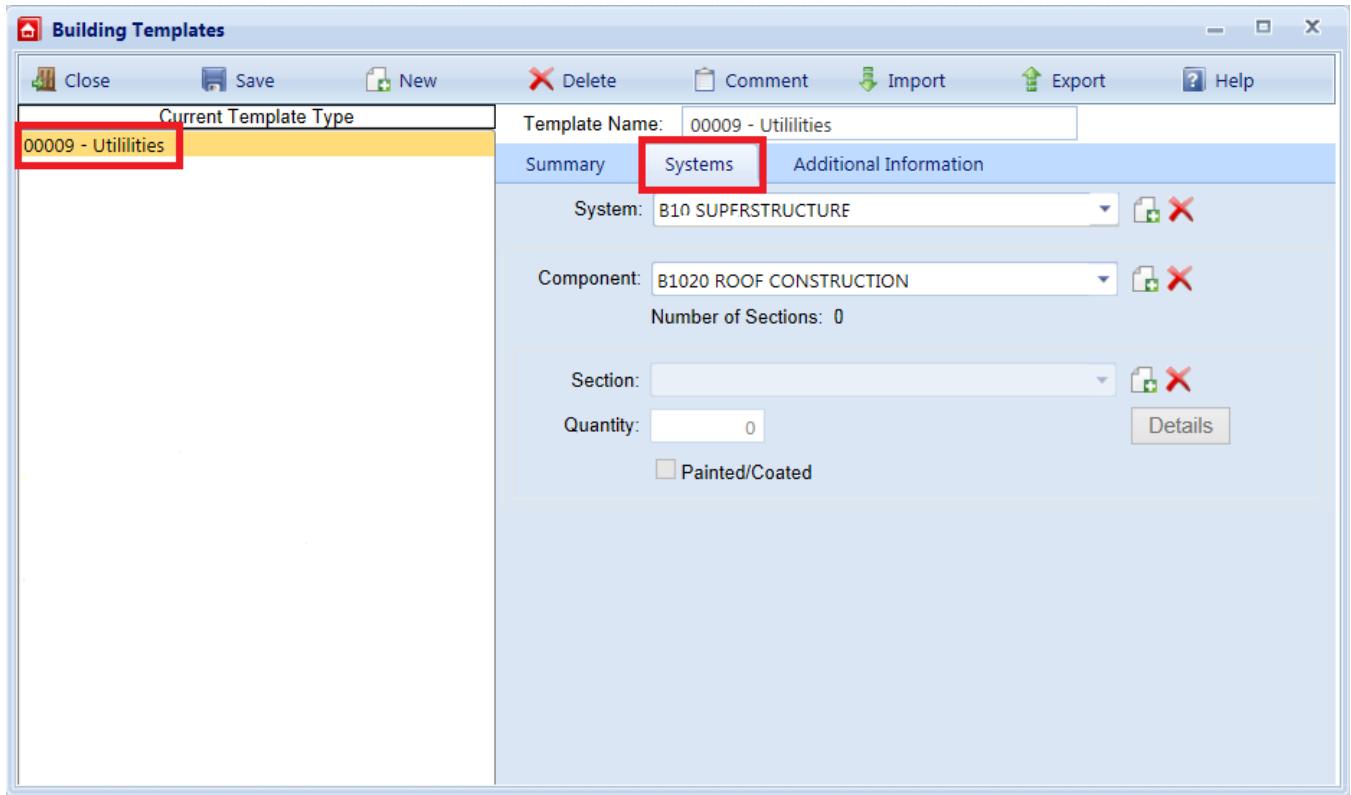
- **Name (Required).** Enter the name that will appear in the template list and must be unique among the templates in your library. If you expect to create a large template library, especially if you anticipate sharing your library with others or importing other user's templates, then the name you choose here

should be sufficiently descriptive of the building type to allow it to be safely and efficiently selected for use. Consider using a combination of its Building Use type with a specific model or style description. The use of single quotes, double quotes, and ampersands is discouraged as these characters occasionally interfere with query formation.

- **Building Use.** Select the building use from the dropdown list that most closely matches the buildings use.
- **Construction Type.** Select the construction type from the dropdown list that matches the building. Construction type options include:
  - Permanent
  - Semi-Permanent
  - Temporary
  - Leased
- **Area** (Required). Enter here the gross area of the building.
- **Number of Floors** (Required). Enter the number of floors in the building.
- **Child-Occupied.** Mark this checkbox if the facility is child-occupied.
- **Housing Information.** If the template is residential in nature (single family dwelling, multi-family dwelling, apartment building), then you can save more information about each dwelling unit, including the number of rooms by type and available appliances. This follows the pattern of [Family Housing Data](#) for a building, except that data regarding house numbers, dates and warranties is omitted.

## Systems Tabs

The Systems tab gives you access to the data regarding the decomposition of the building into systems, components, and sections.



Note that this tab is arranged hierarchically, with systems containing components which contain sections. Use the buttons to the right of each respective dropdown list to add or delete inventory to the template. Once a system is added, you may define components for that system. Once a component is added you may define sections for that component. This follows the same pattern used for buildings, except that building-specific data (e.g. condition, age, year installed or built, year painted, and warranty dates and companies) is not used for templates. See [Identifying Systems, Components and Sections](#) for a description of how buildings are decomposed by system.

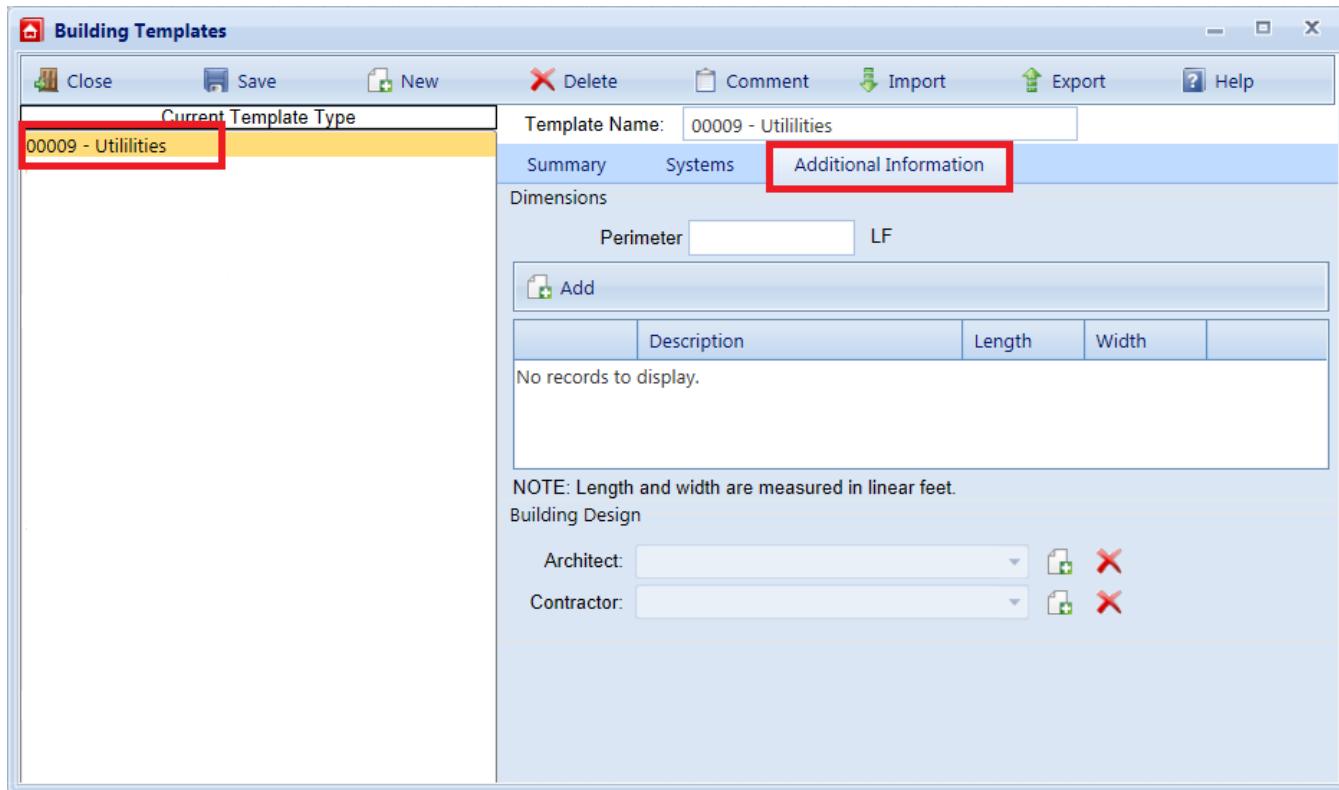
Each section has two data elements for input:

- **Quantity.** Enter the quantity of the section.
- **Painted/Coated.** Mark this checkbox if section is painted or has a surface coating.

Additional data for the section can be added by clicking the **Details** button, which will launch the [Section details](#) window. The data element displayed for each component, Number of Sections, is a rollup value from the Section-level and is read-only.

## Additional Information Tab

The Additional Information tab provides a location to store additional building data.



The data that can be recorded on this tab includes:

### Dimensions

- **Perimeter.** Enter the linear measure of the perimeter of the building.
- **Description.** Enter a description of the distinct areas of the building you wish to add dimensions for. For example, you may list "East Wing/West Wing", or "Offices/Library/Warehouse", or "Public Areas/Secure Areas." Each description is limited to 50 characters. Use the ADD DIMENSION and DELETE DIMENSION buttons to add and delete items from the list.
- **Length.** Enter the length of the area identified in the description.
- **Width.** Enter the width of the area identified in the description.

### Building Design

- **Architect.** Lists the architects of the building. Add and delete names by using the adjacent buttons. Each architect's name is limited to 30 characters.

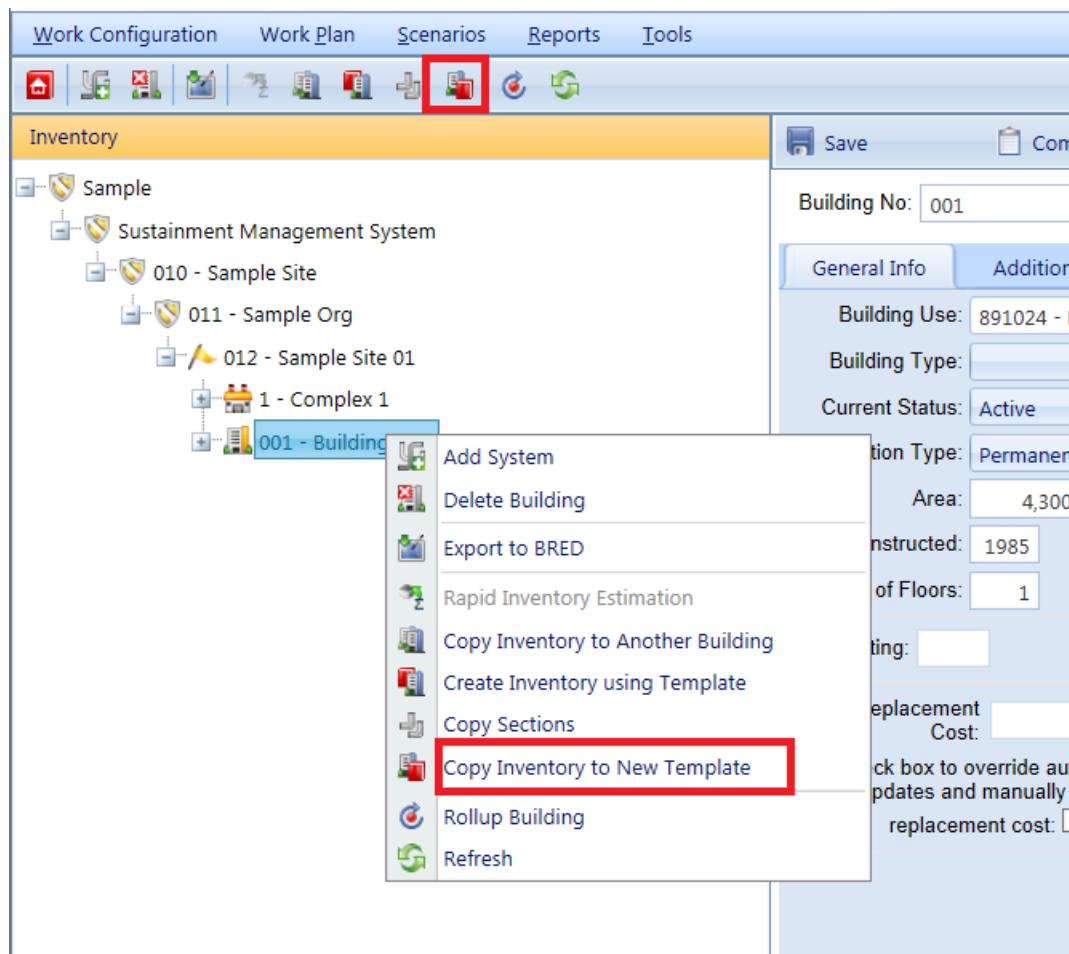
- **Contractor.** Lists the contractors of the building. Add and delete names by using the adjacent buttons. Each contractor's name is limited to 30 characters.

## Copying Building Inventory to a Template

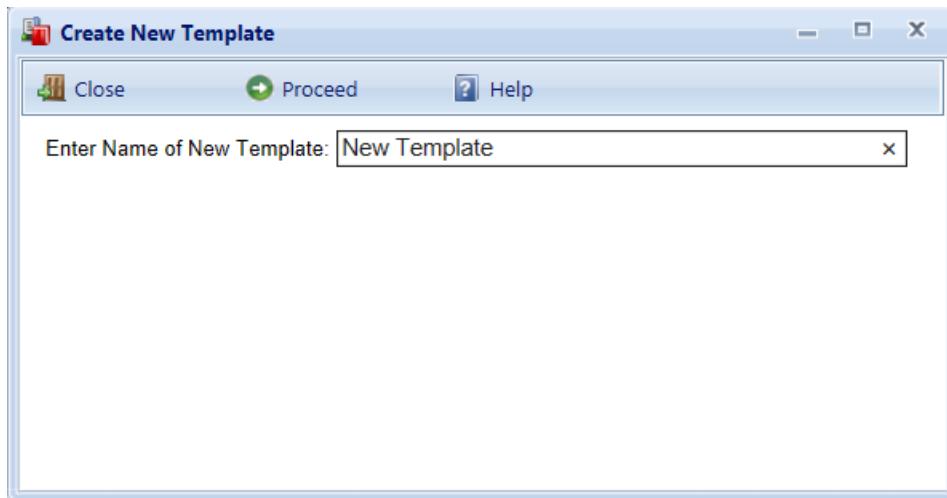
Building templates provide a convenient method for rapidly creating your building inventory when you have multiple buildings with the same design and composition. A template stores the basic data about a generic building and can be used to create many buildings at one time using an automated process that copies the structure of the template to each desired building. For more information about templates, see [Using Building Templates](#).

To create a template by copying a building in your inventory,

1. Select the Building in the inventory tree.
2. Right-click the building and select **Copy Inventory to New Template** from the dropdown list. Alternatively, you can click the **Copy Inventory to New Template** button as shown below:



The Copy Building to Template window will appear.



Enter the name of new template, which must be unique among the templates in your library, and click the **Proceed** button to create the template. Click **Close** if you do not wish to create the template.

Note that if you expect to create a large template library, especially if you anticipate sharing your library with others or importing other user's templates, then the name you choose here should be sufficiently descriptive of the building type to allow it to be safely and efficiently selected for use. The template name is allowed to be an alphanumeric string of 50 characters or less and the use of single quotes, double quotes, and ampersands is discouraged as these characters occasionally interfere with query formation.

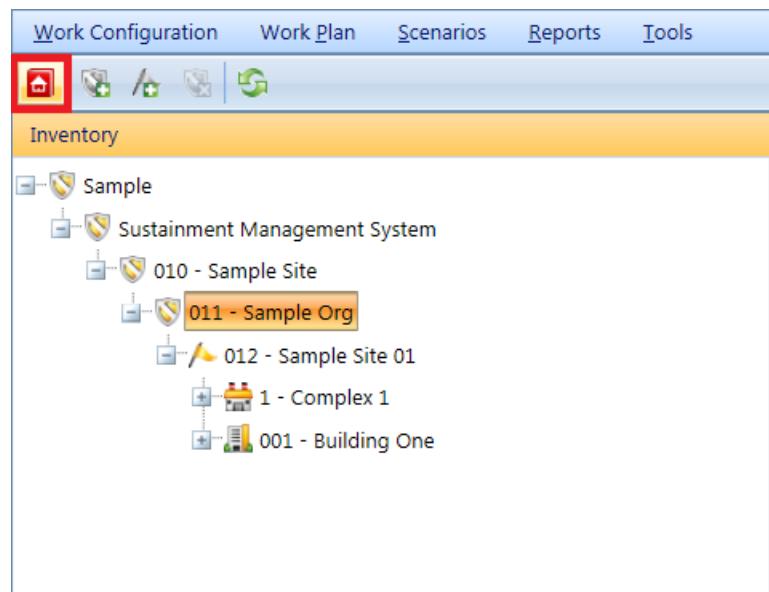
### **Importing and Exporting Building Templates**

Building templates provide a convenient method for rapidly creating your building inventory when you have multiple buildings with the same design and composition. A template stores the basic data about a generic Building and can be used to create many Buildings at one time using an automated process that copies the structure of the template to each desired Building. For more information about templates, see [Using Building Templates](#).

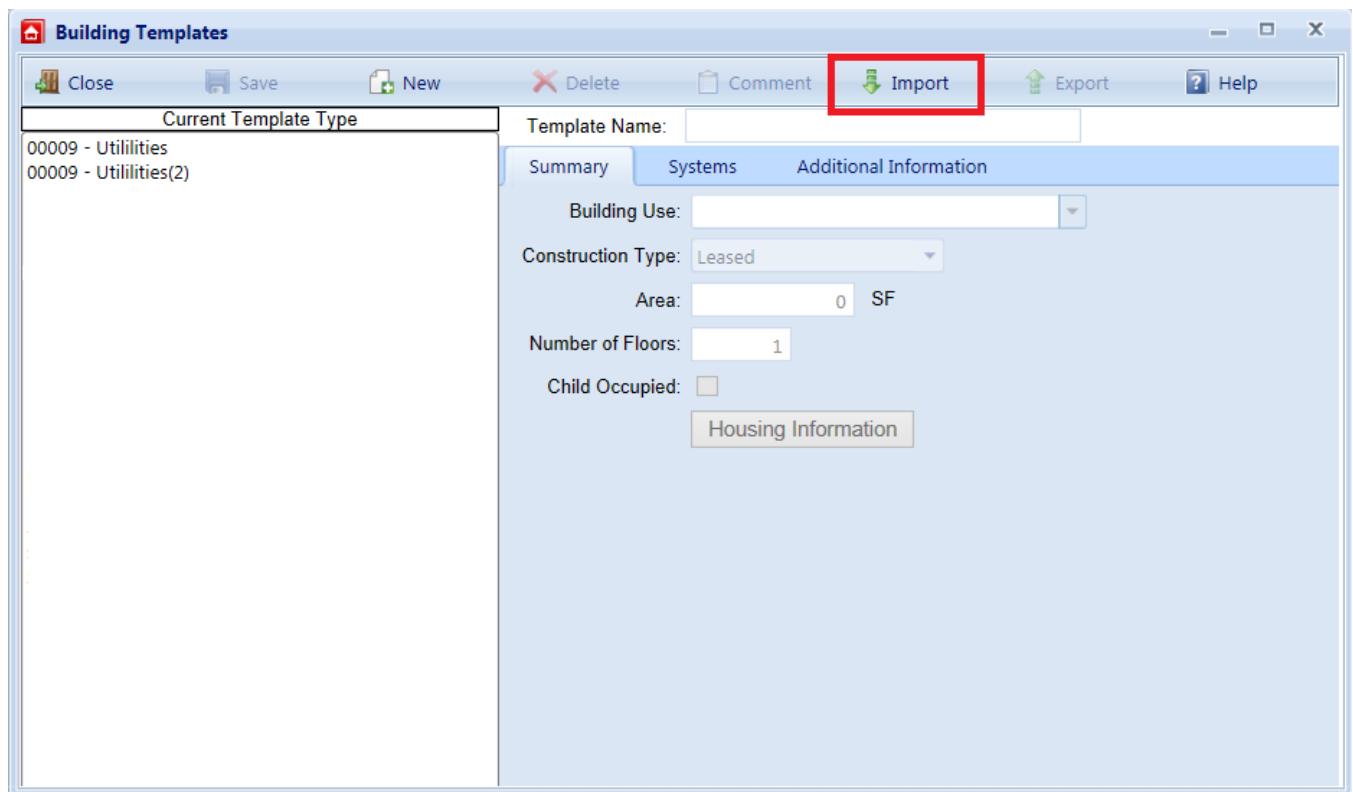
BUILDER™ allows for different users to share Building templates by importing and exporting individual templates. This capability is especially useful for military installations, which may have many buildings constructed from a few standard service-wide designs.

#### **Importing Building Templates**

To import a template, open the template library by clicking the **Building Templates** button from the navigation menu.



The Building Template window will appear. Select **Import** from the toolbar and the Import Template window will appear.

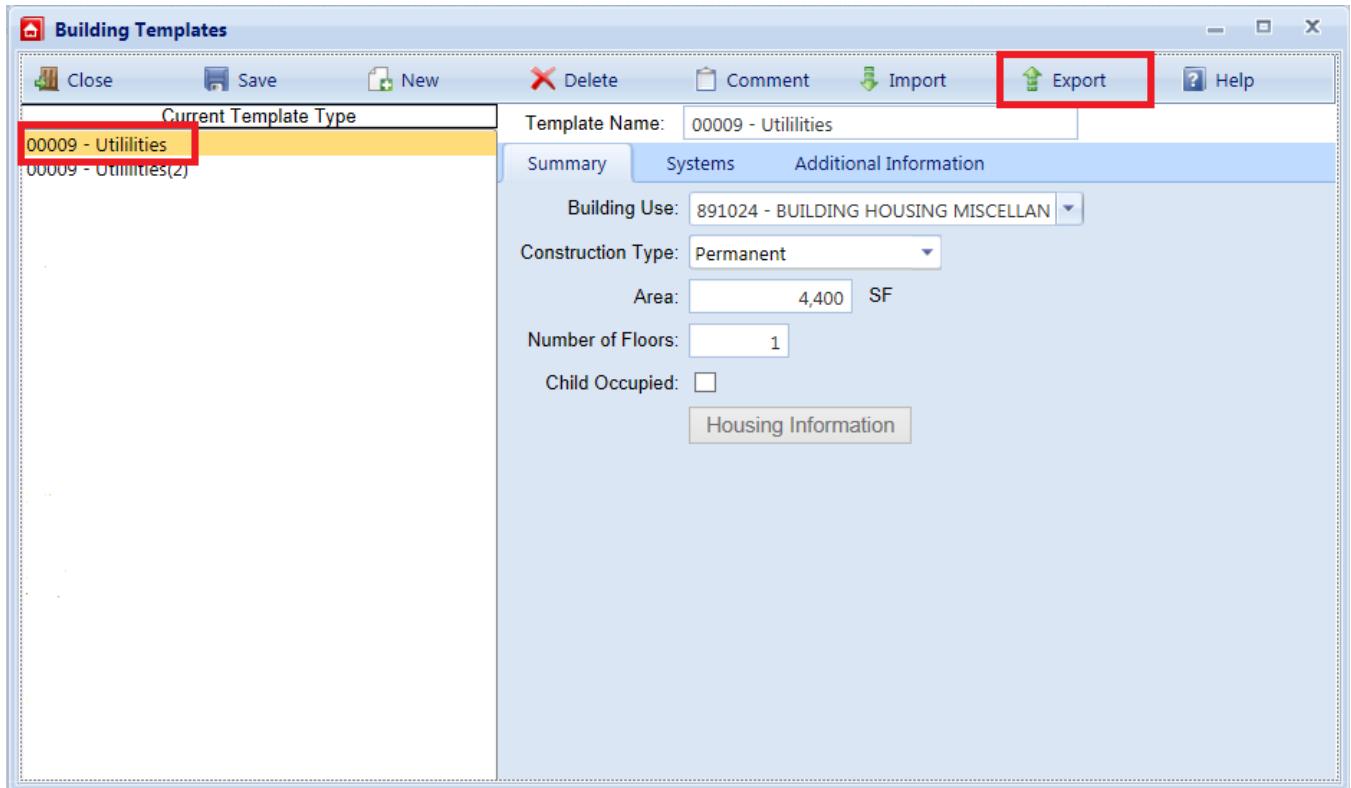


Use the **Browse** button to locate the template you wish to import into your template library, and click **Proceed**. If you do not want to import a template, click the **Cancel** button.

Before BUILDER imports your selections, checks of unique identifiers (internal data hidden from view) and template names are performed to avoid conflicts between your current template library and the templates being imported. If duplicate identifiers are found, the selected template will not be imported since it already exists in your library. If you are attempting to import a template with the same name but a different unique identifier as an existing template in your library, then the importing process will stop with an error message indicating the problem templates. If you still wish to import the problem templates, change the names of the corresponding templates in your library so that they are distinct from the templates you wish to import. See [Managing the Template Library](#) for instructions regarding changing the name of a template in your library.

Note that the Building Use property of a template is dependent on the user category (Army, Navy, Air Force, Civilian, etc.). If you are managing an installation from one user category but importing building templates from a different user category, then the template Building Use properties will not match any of the building uses in your list. When you view each imported template, the Building Use property will be blank. You will have to select an appropriate Building Use property from your list of uses for each imported template. The template name can be used help choose an appropriate use.

## Exporting Building Templates



To export a template, highlight it on the left side of the Building Template window and select **Export** from the toolbar.

After the template has been successfully exported, you will be asked if you want to save or open the exported template. If you choose to save the template, you will be prompted for a path and file name for the exported template. The saved exported template can then be sent to other BUILDER users to be utilized in their template libraries. If you choose to open the exported template after the export is complete, the template will be open as a XML document.

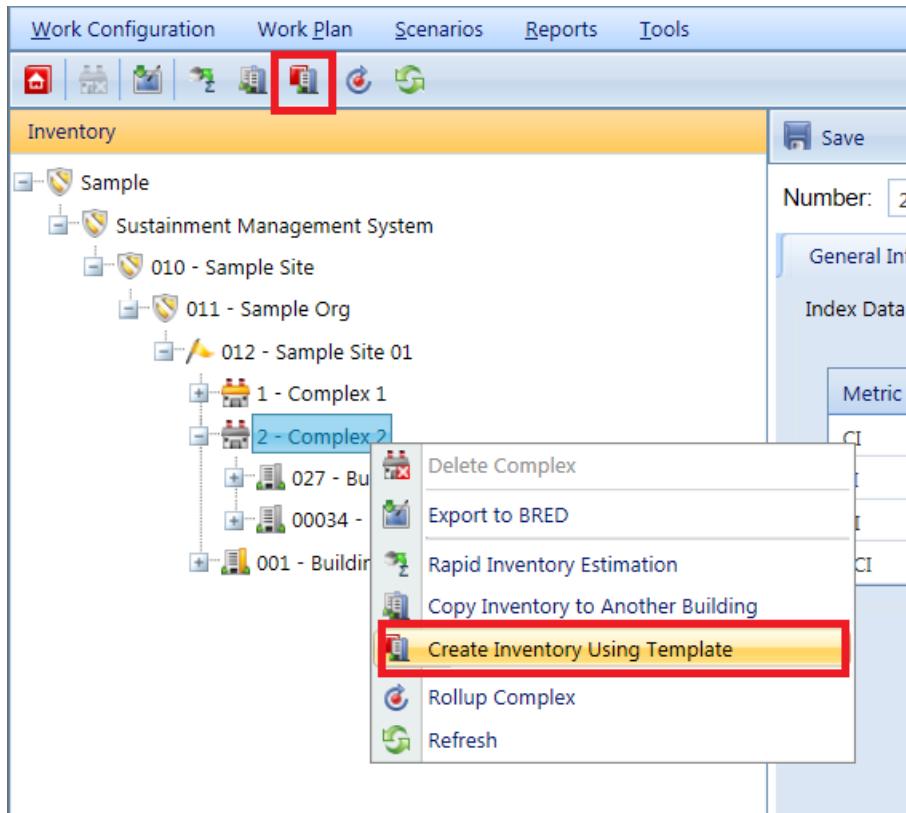
### **Creating Building Inventory Using Templates**

Building templates provide a convenient method for rapidly creating your Building inventory when you have multiple Buildings with the same design and composition. A template stores the basic data about a generic Building and can be used to create many Buildings at one time using an automated process that copies the structure of the template to each desired Building. For more information about templates, see [Using Building Templates](#).

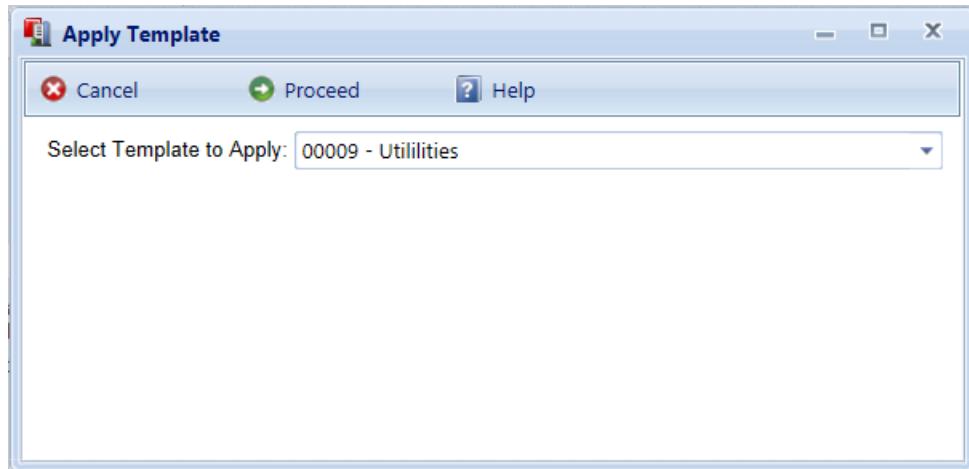
### **Creating Building Inventory for a Single Existing Building Using Templates**

Once you have created a template, you can use it to create Building inventory. If you have a single existing Building and wish to expand its inventory using the template,

1. Select the Building in the inventory tree.
2. Take a look at the general information for the Building to make sure that the data for important properties such as Building Use, Area, and number of floors is correct.
3. If you still wish to expand its inventory using the template, right-click the Building whose inventory you wish to copy, and select the **Create Inventory Using Template** option. Alternatively, you can click the **Create Inventory Using Template** button as shown below:



The Apply Template window will appear.



Select the template you wish to apply to the Building from the dropdown list, and click **Proceed**. If no Systems have been created for the Building prior to this point, the template's Systems, Components, Sections, and Section details will be copied to the Building. However, if the Building already has Systems, the template's structure of Systems will *not* be copied to it.

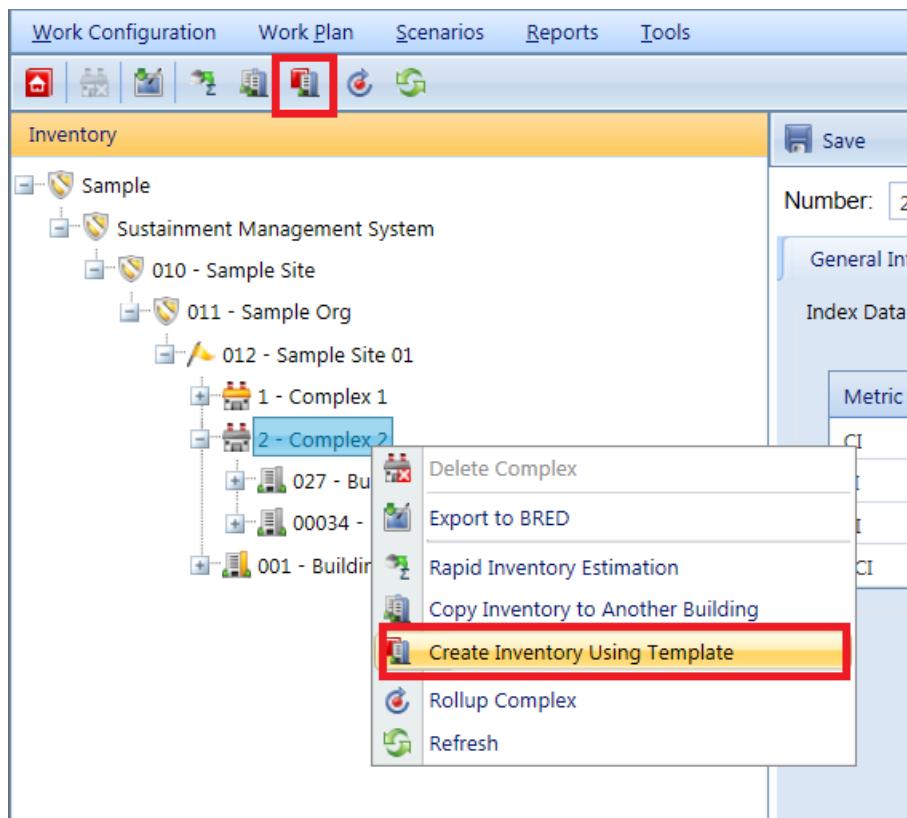
When the template process is complete, you will be able to select each of the newly created Systems, Components, and Sections in the inventory tree and to edit the new data if adjustments need to be made. This same pattern applies to building dimensions, architects, contractors, and family housing records. That is, each of these template lists will be copied to the Building if and only if the Building's corresponding list is empty. Otherwise, the Building's existing list will be left unedited.

If you do not wish to apply the template to the Building, click the **Close** button.

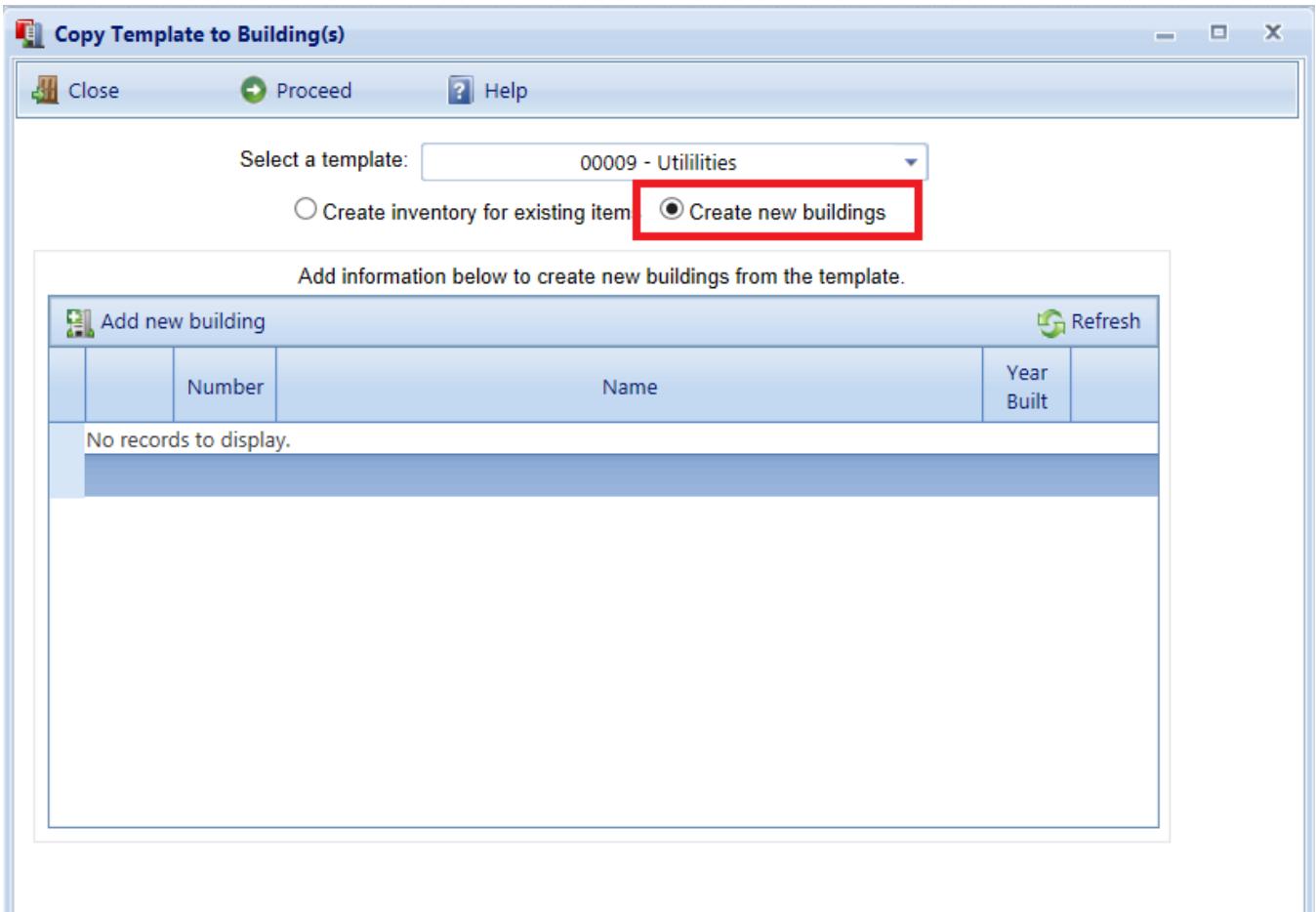
**Creating Building Inventory for Multiple Buildings Using Templates**

The most efficient way to use templates is to create the inventory for multiple Buildings at a time. To create inventory for multiple Buildings using a template,

1. Select the smallest organizational item in the inventory tree that contains all of the Buildings that will have inventory created using the template.
2. Click the **Create Inventory Using Templates** button, as shown below:



The Apply Template to Multiple Building window will appear if the **Create new building** radio button is selected:



When applying a template to multiple buildings, you have the option of either creating new buildings with the template or applying the template to multiple existing buildings. Each option is described below.

#### Create New Buildings Option

The window shown above illustrates when the **Create new Buildings** option is chosen. For this option, use the **Add Building** button to add a new building to the grid. For each new building a number and/or name must be entered. If you wish to delete any of the buildings from the list, highlight the row in the grid and click the **Remove Building** button.

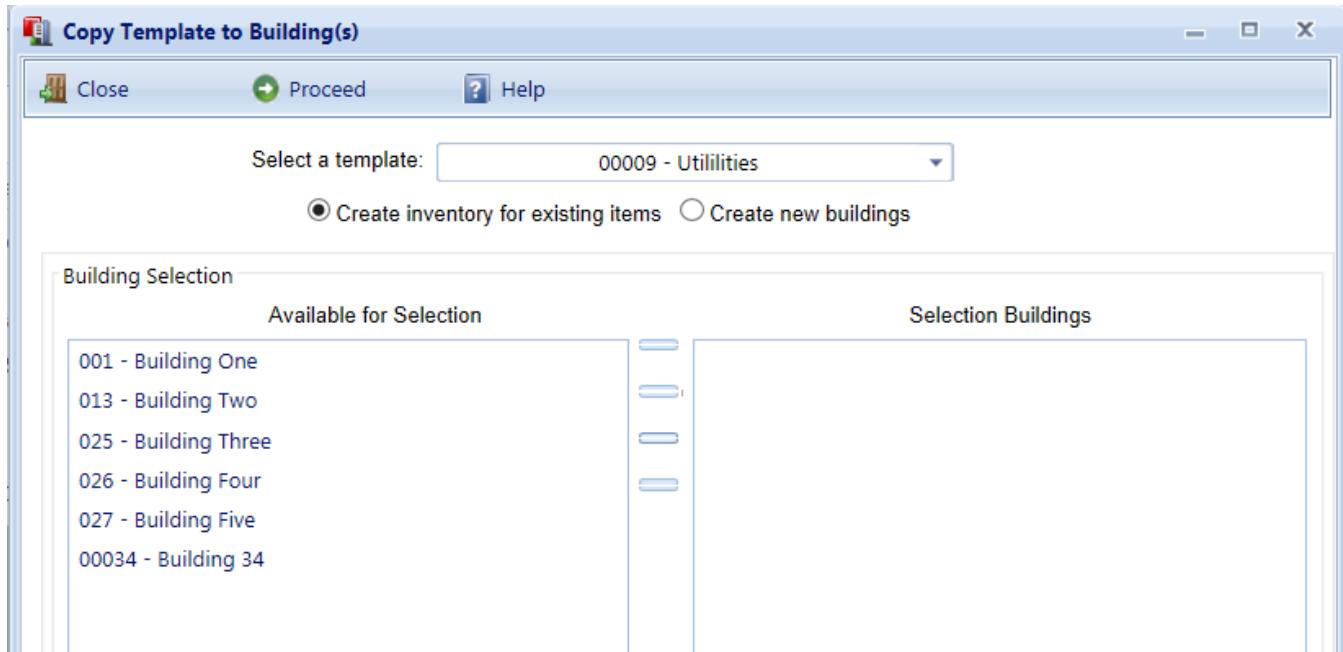
When you listed all of the new buildings you wish to create using the template in the grid, click the **Proceed** button to start the process that will create each building and copy the template data to it. This process may take a minute or so for each building, depending upon the complexity of the template's data structure.

When the process is complete, the new buildings will be available for editing. In particular, critical information that applies to each specific building should be added immediately, especially the year of construction and dates associated with

sections since these data elements are used extensively in BUILDER's algorithms. Finally, when you have completed your inventory input, you should use the [cost estimating tool](#) to establish current costs for all buildings and their substructures.

### Create Inventory for Existing Items Option

If you choose to create inventory for existing items, then the Apply Template to Multiple Buildings will appear as shown below:



In this window, the complete list of buildings Available for Selection at the selected inventory level will be displayed on the left. Select the Buildings you wish to expand using the selected template and use the arrow buttons to move the buildings to the Selected Buildings list. When the Selected Buildings list is complete, click the **Proceed** button.

When you do this, existing general information for each building will be replaced with the template data. If no Systems have been created for a Building, the template's Systems, Components, Sections, and Section details will be copied to it. However, if a Building already has Systems, the template's Systems structure will not be copied to it. This same pattern applies to building dimensions, architects, contractors, and family housing record. That is, each of these template lists will be copied to a building if and only if the Building's corresponding list is empty. Otherwise, the Building's existing list will be left untouched.

When the process is complete, edit each Building to add or verify critical data elements such as the year of construction, dates associated with sections, and all quantities since these data elements are used extensively in BUILDER's

algorithms. Finally, when you have completed your inventory input, you should use the [cost estimating tool](#) to establish current costs for all Buildings and their substructures.

# How To Export to BuilderRED

You can choose to export items to BuilderRED (aka BRED) either with or without the images that are linked to these items.

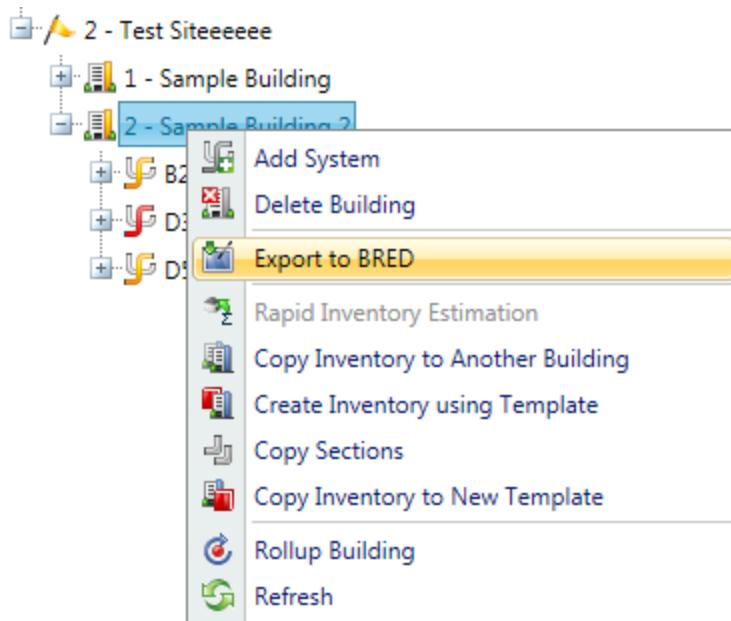
*Best Practice Recommendation #1:* Some Facilities (Buildings) within your Site can already contain several hundred photos. If you know beforehand that you will not need to view or edit these existing photos in BuilderRED, the best practice is to just download the BRED file without images.

*Best Practice Recommendation #2:* 800 pixels is the recommended maximum width and maximum height for images to be used in BuilderRED.

The next section describes how to export both data and images to BuilderRED. For instructions on exporting data without images, see **Exporting Data Alone to BuilderRED**

## Exporting Data and Images to BuilderRED

1. In the BUILDER navigation tree, right-click the lowest level node (Site, Complex, or Building) that contains the items you wish to export.
2. Select the “Export to BRED” option:

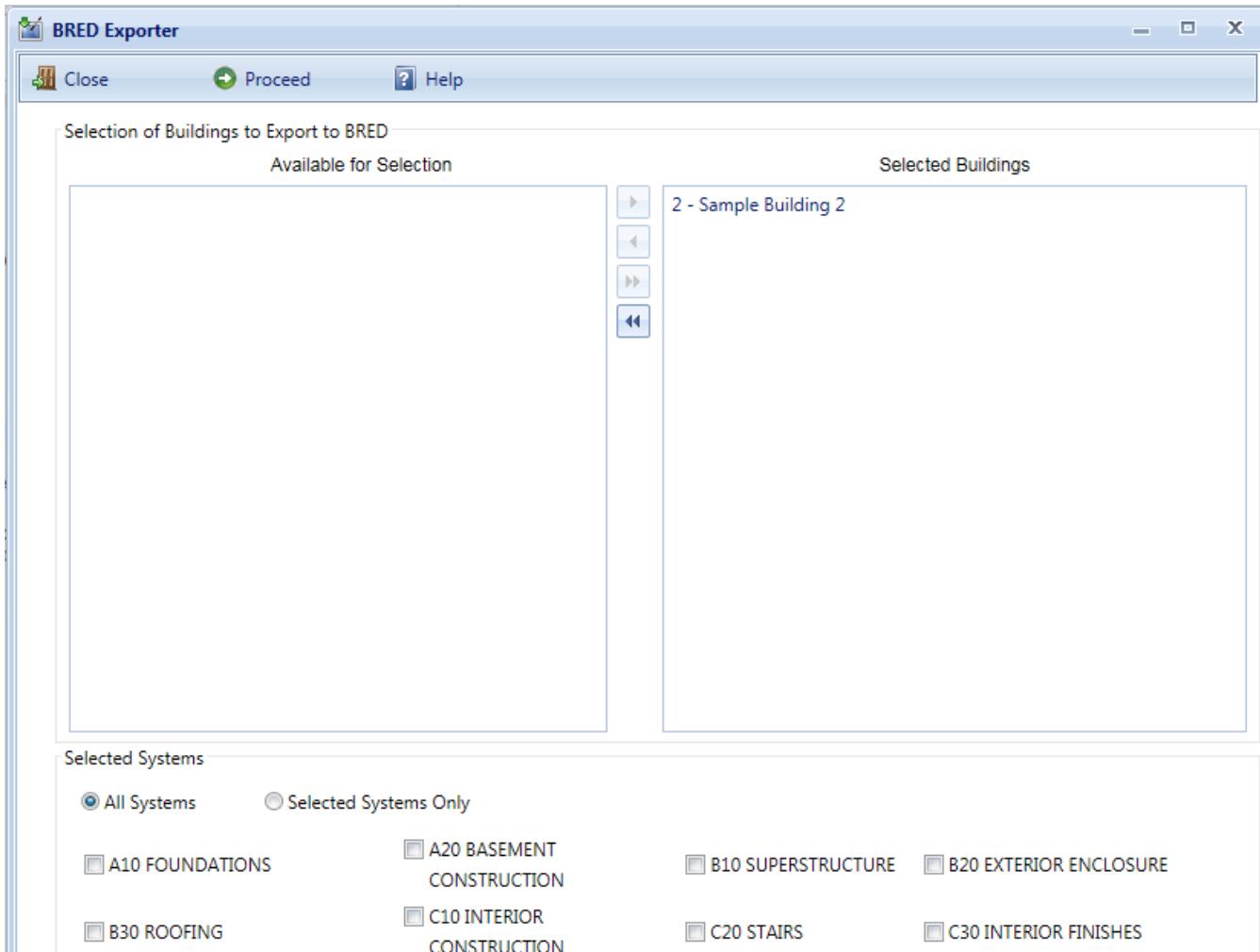


3. In the BRED Exporter window, highlight the building(s) you want to export, using the arrows to move buildings in or out of the Selected Buildings list. Click here to see different ways you can select buildings.<sup>1</sup>

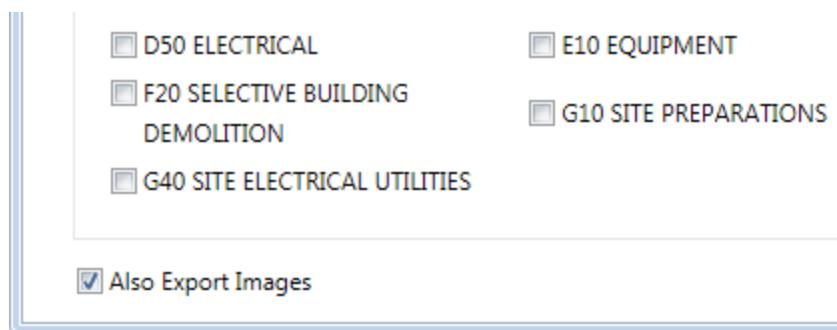
---

1

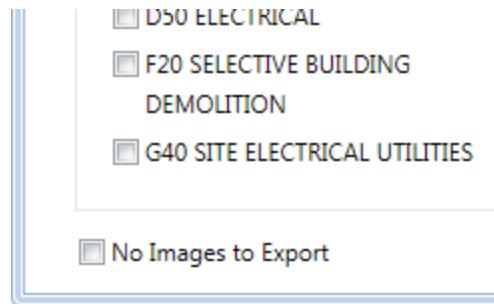
All buildings	Use the double arrow.
One building	Click on the building.
Multiple buildings, contiguous in the list	Click on the first building; then hold <b>SHIFT</b> and click on the last building.
Multiple buildings, not contiguous in the list	Click on the first building; then hold down <b>CTRL</b> and click on the last building.
To deselect a highlighted building from the list	Hold down <b>CTRL</b> and click on the building.



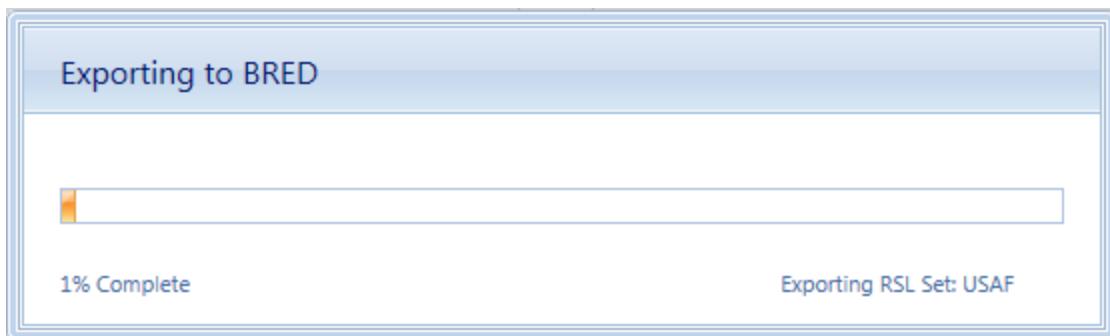
4. Once the desired buildings are in the Selected Buildings column, do one of the following in the lower section of the BRED Exporter window:
  - a. Choose "All Systems" (radio button; this is the default), or
  - b. Select specific systems (using radio button and checkboxes).
5. (Optional) In order to download images with the BRED file, you must select "Also Export Images" at the bottom of BRED Exporter Window, as shown below:



**Note:** If instead of “Also Export Images” you see “No Images to Export” it means that the Building(s) you have selected to export do(es) not currently have any images:



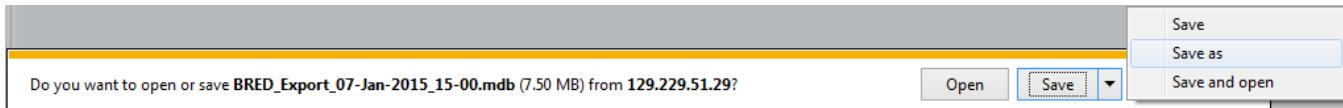
6. To start the export, click the **Proceed** button near the top of the window. A *progress bar will display as the BRED database file is downloaded*:



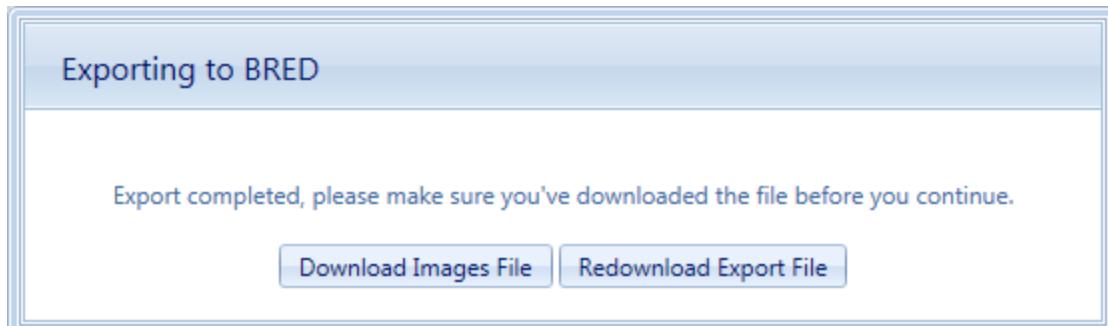
By clicking the **Proceed** button, the following tasks area accomplished:

- A Microsoft Access database is created, which will be identified by the path and name you choose after the export has completed. The database will contain the inventory and condition assessment data for the selected systems in the buildings in the Selected Buildings list. This database is accessible to a computer with the BRED software, where inventory and/or condition assessment data can be recorded. Once complete, this file can be imported into BUILDER to add the new data is added to the database.
- The building inventory records of the selected systems that were exported are locked so changes cannot be made to them in BUILDER while being edited with BRED. The records are unlocked when the BRED data is imported back into the database.

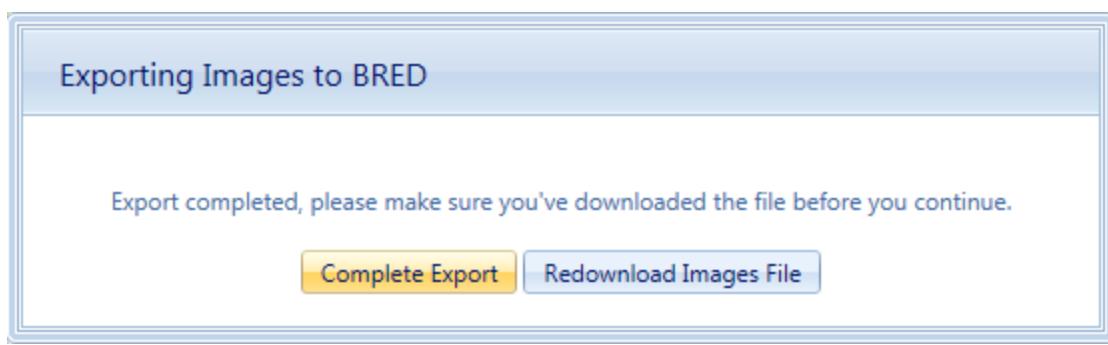
7. After the database file has successfully downloaded, select the “Save As” option to choose a file location for it:



8. If the BRED file did not download correctly, select “Redownload Export File.” Otherwise, select “Download Images File” to start the second download (the download of the images file into BRED):



9. After the second download completes, click “Save As” and choose the **same file location** as your BRED database file.
10. Lastly, select “Complete Export” to finish the export process:



### ***Time Limits on Editing Inspections***

Once the export is complete, you can use BuilderRED to collect Inventory data or perform Inspections. Note that it is a common standard to have a 30-day time limit from the date of an Inspection to edit the Inspection or the comments in it. This time limit applies both in BuilderRED and after the data has been imported back into BUILDER.

## **Known Issue with Image Export from Builder**

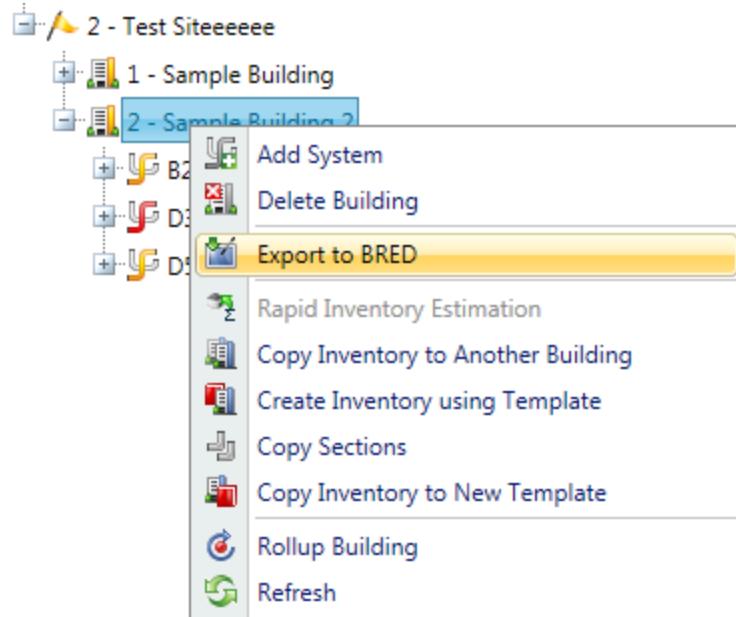


If the BRED Export error message shown above displays after you try to download the image file from BUILDER, that indicates that somewhere in the exported files there is an attachment (such as a PDF, an Excel file, etc.) that is not an image. The workaround is to export the Building(s) without images.

## **Exporting Just Data to BuilderRED**

This section outlines the procedure to export data from BUILDER to BuilderRED without any of the associated image files.

1. In the BUILDER navigation tree, right-click the lowest level node (Site, Complex, or Building) that contains the items you wish to export.
2. Select the “Export to BRED” option:

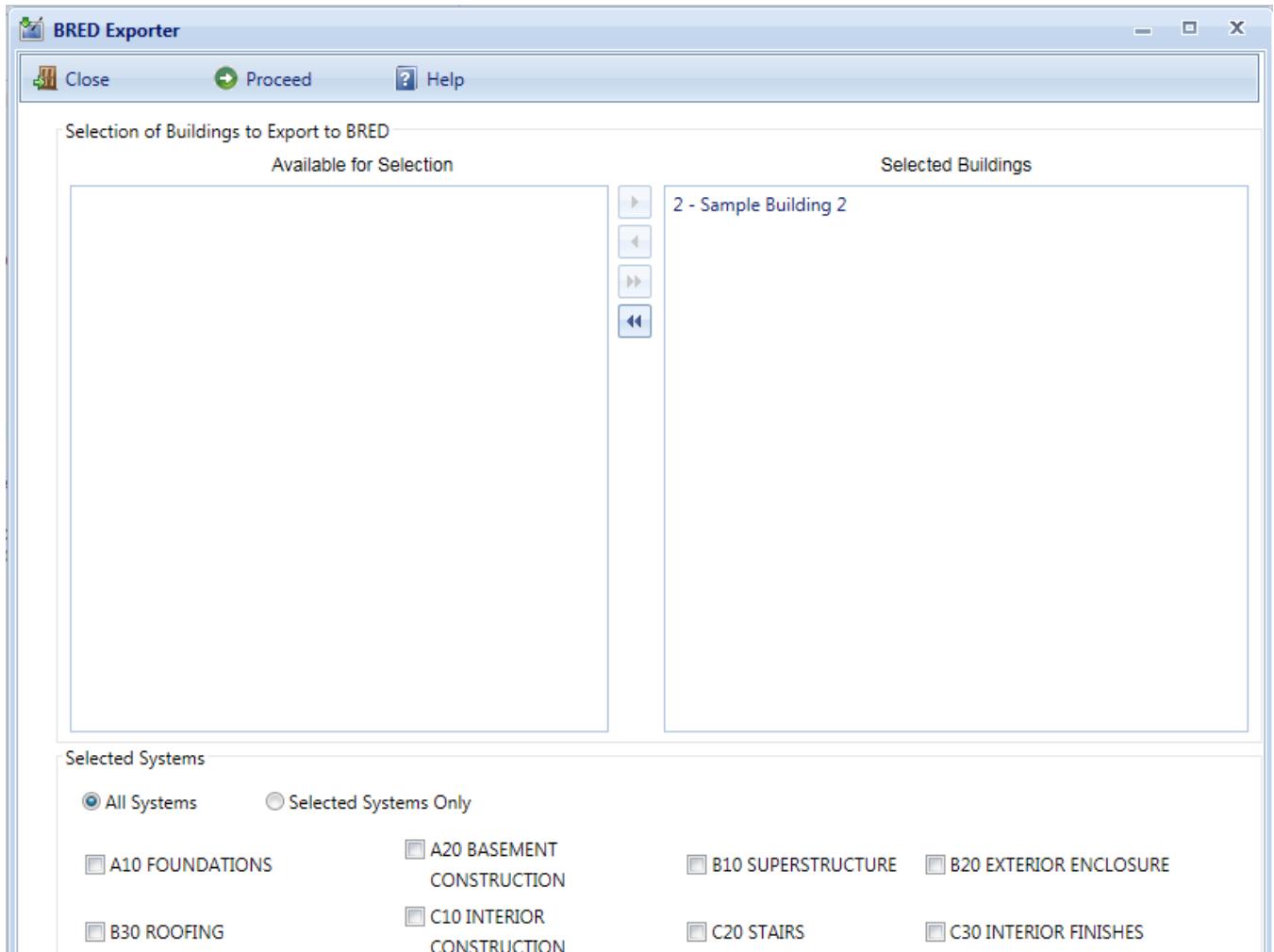


3. In the BRED Exporter window, highlight the building(s) you want to export, using the arrows to move buildings in or out of the Selected Buildings list. Click here to see different ways you can select buildings.<sup>1</sup>

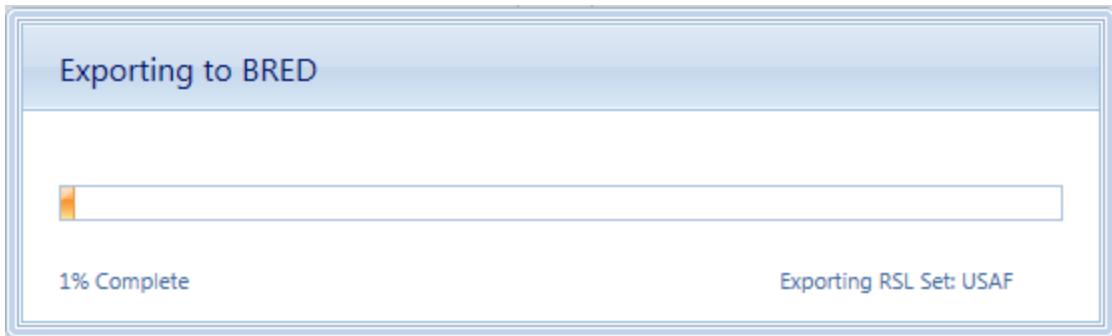
---

1

All buildings	Use the double arrow.
One building	Click on the building.
Multiple buildings, contiguous in the list	Click on the first building; then hold <b>SHIFT</b> and click on the last building.
Multiple buildings, not contiguous in the list.	Click on the first building; then hold down <b>CTRL</b> and click on the last building.
To deselect a highlighted building from the list	Hold down <b>CTRL</b> and click on the building.

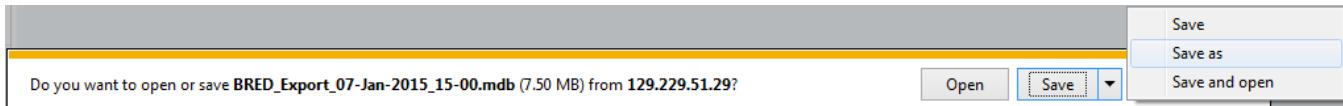


4. Once the desired buildings are in the Selected Buildings column, do one of the following in the lower section of the BRED Exporter window:
  - a. Choose "All Systems" (radio button; this is the default), or
  - b. Select specific systems (using radio button and checkboxes).
5. In order to download the BRED file without downloading the associated images, make sure that the "Also Export Images" checkbox at the bottom of the BRED Exporter Window is *not* checked.
6. To start the export, click the **Proceed** button near the top of the window. A *progress bar will display as the BRED database file is downloaded*:



By clicking the **Proceed** button, the following tasks area accomplished:

- A Microsoft Access database is created, which will be identified by the path and name you choose after the export has completed. The database will contain the inventory and condition assessment data for the selected systems in the buildings in the Selected Buildings list. This database is accessible to a computer with the BRED software, where inventory and/or condition assessment data can be recorded. Once complete, this file can be imported into BUILDER to add the new data is added to the database.
  - The building inventory records of the selected systems that were exported are locked so changes cannot be made to them in BUILDER while being edited with BRED. The records are unlocked when the BRED data is imported back into the database.
7. After the database file has successfully downloaded, select the “Save As” option to choose a file location for it:



8. If the BRED file did not download correctly, select “Redownload Export File.” Otherwise, select “Complete Export” to finish the export process:

## Exporting to BRED

Export completed, please make sure you've downloaded the file before you continue.

[Complete Export](#)

[Redownload Export File](#)

### ***Time Limits on Editing Inspections***

Once the export is complete, you can use BuilderRED to collect Inventory data or perform Inspections. Note that it is a common standard to have a 30-day time limit from the date of an Inspection to edit the Inspection or the comments in it. This time limit applies both in BuilderRED and after the data has been imported back into BUILDER.

# Performing Condition Assessment (Inspections)

Once inventory of your real property has been entered into BUILDER, you can establish an inspection schedule and perform inspections. Knowledge-Based Inspection Scheduling is a valuable tool provided by BUILDER for establishing an inspection schedule.

**NOTE:** Depending on manpower and other considerations, you may choose to perform inventory and initial inspections (condition assessment) at the same time.

## Condition Assessment Overview

BUILDER offers two condition assessment types, [distress surveys](#) and [direct ratings](#), and allows for [sampling](#) for both. Neither type yields a detailed engineering assessment, but both types are designed to satisfy facility management data requirements regarding inventory condition and expected work requirements. In keeping with other aspects of BUILDER's design, every effort has been made to speed the process and ease the burden of [performing condition assessments](#).

Included in the SMS is a portable application, [BUILDER Remote Entry Database \(BuilderRED, or BRED\)](#), which is designed to run on a Windows Operating System and can be used on a Windows tablet or laptop by inspectors at the inspection site. Condition assessment data may be entered quickly and easily at the inspection site in BuilderRED and [imported to BUILDER](#) after the assessments. Additionally, BUILDER has a [rapid inspection tool](#) for quick and easy input of direct condition ratings.

If you have not already done so, you should familiarize yourself with the contents of the [Knowledge-Based Condition Assessment Manual for Building Component Sections](#). This manual contains descriptions of both types of condition assessment, distress definitions, inspector qualifications, instructions for sampling, and general information about BuilderRED (BRED).

**Note:** The contents of the Knowledge-Based Condition Assessment Manual are contained in the following sections of the downloadable printed documentation for SMS with BUILDER: Distress Survey Procedures; Direct Rating Procedures; Paint Rating Procedures; Knowledge-Based Condition Assessment Manual Overview, and Knowledge-Based Condition Assessment Appendixes.

## ***Choosing a Condition Assessment Method***

The BUILDER condition assessment process is designed to require the minimal data needed to make good managerial decisions about where attention and resources need to be focused. When a Building is new or when inspecting a relatively new Component-Section with a long expected service life, using a direct condition rating will probably be sufficient. As a Component-Section begins to deteriorate, more data can be gathered during the inspection using a distress survey. When the inspection data or condition index trend indicates a problem requiring some type of work effort, an off-line development of project specifications can carry the burden of collecting more detailed data. The goal is to inspect more often and concentrate project development efforts on the M&R work for which you are most likely to allocate resources. More detail is provided in the [Condition Assessment Manual](#).

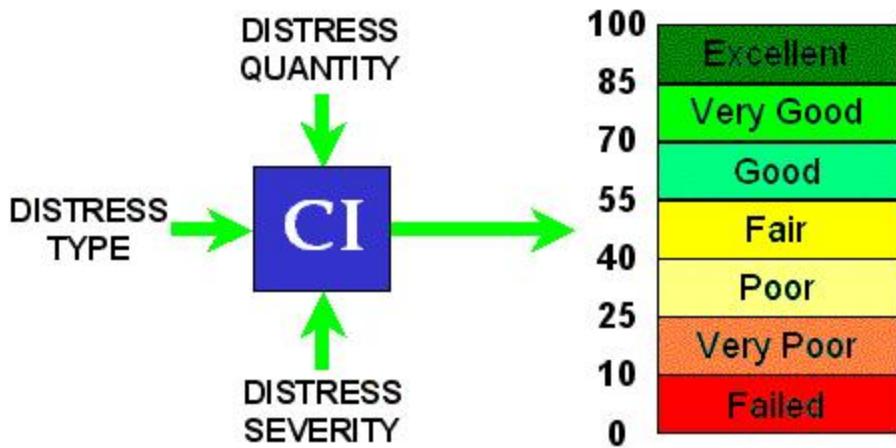
BUILDER also has a [Knowledge-Based Inspection Scheduling](#) tool. This tool is designed to select from your entire inventory a subset of Component-Sections that should be considered for inclusion in the next round of condition assessments. Additionally, the feature is able to determine the condition assessments method to perform.

## ***Distress Survey Overview***

When performing a distress survey, inspectors record information about a Component-Section by recording the distresses on each subcomponent of the Component-Section. Each distress is given a severity rating (low, medium, or high) and density range (quantity) based on established criteria. BUILDER uses this inspection information to calculate the Component-Section Condition Index (CSCI), which is then tied to Maintenance and Rehabilitation (M&R) costs to form the basis for **M&R**<sup>1</sup> planning and budgeting. This process is illustrated by the diagram shown below.

---

<sup>1</sup>Maintenance and Repair



### Direct Rating Overview

When performing a direct condition rating, the inspector enters a color rating describing the Section's condition according to the diagram shown below.

RATING	DETERIORATION	M&R NEEDS
Green + Green Green -	Minor Deterioration	Routine Maintenance or Minor Repair
Amber + Amber Amber -	Moderate Deterioration	Necessary Repair or Replacement
Red + Red Red -	Significant Deterioration	Major Rehabilitation or Replacement

The rating for the Component-Section is determined by first choosing one of the three color bands (green, amber, or red) that corresponds to the amount of deterioration observed and the **M&R**<sup>1</sup> needs of the Component-Section. Then within that color band, one of three ratings is chosen according to whether the observed condition falls at the top, middle, or bottom of the color band. Each color rating is specifically defined in [Appendix E](#) of the [Condition Assessment Manual](#). The

---

<sup>1</sup>Maintenance and Repair

color rating chosen produces a CSCI, which is calibrated to match the ratings that would result if a distress survey had been done.

## ***Overview of CSCI Computation***

For both condition assessment types, the CSCI is computed by first calculating a deduct value from the assessment data and subtracting the deduct value from 100. The deduct value computation differs for each condition assessment method and is described below.

### **Distress Survey CSCI Computation**

For distress surveys, the combination of distress type, severity level, and density of the subcomponents of the Section are used to determine the deduct value for the individual subcomponents. The deduct values for each combination of distress, severity, and density were determined during ERDC-CERL's research effort using rating values from a team of experts.

It should be noted that if more than one distress exists, the sum of the deduct values for the distresses present must be corrected. This is because as additional distress types and/or severity levels occur on the subcomponent, the impact of a given distress on the condition rating becomes less. This correction correlates the expert panel's ratings and the computed indexes. The correction factor is a function of the summed total of the individual deduct values, a minimum individual deduct value, and the number of different distress types and severity level combinations found. The correction factor values were developed from the rating panel data and are applied directly to the deduct value to produce a corrected deduct value.

After all the subcomponent condition indexes are determined for a Component-Section, the CSCI (or sample unit condition index SUCI if sampling is used) is computed based on the individual subcomponent CI's and their weight factors. If sampling is used, the sample unit indexes for each Component-Section are aggregated into a CSCI by computing the average of the representative samples weighted by size. All calculations are made at the time an inspection is entered.

### **Direct Rating CSCI Computation**

For direct ratings, the color rating chosen directly corresponds to a deduct value for the Component-Section. Using this deduct value, the CSCI can be easily computed. If sampling is used for the Component-Section, a sample unit condition index will be computed at each sample location and aggregated into a CSCI by computing the average of the representative samples weighted by size.

## **Condition Index Roll-Ups**

The preceding sections described how a condition index is computed for a Component-Section after an inspection. The inspection CI's form the basis for computing a current CI for all inventory items in the hierarchy. CSCI's are [rolled-up](#) hierarchically to condition indexes for each component (BCCI), system (SCI), the Building as a whole (BCI), the Site, and the group. Collectively, trends can be monitored, and M&R can be scheduled accordingly.

- **Component CI (BCCI)** - For each Component, the BCCI is computed by taking the average of its Sections' CI's, weighted by replacement cost.
- **System CI (SCI)** - For each system, the SCI is computed by taking the average of its component CI's weighted by replacement cost.
- **Building CI (BCI)** - For each Building, the BCI is computed by taking the average of its system CI's weighted by replacement cost.
- **Complex CI** -The Complex CI is computed by taking the average of the BCI's of each Building in the Complex weighted by replacement cost.
- **Site CI** - The Site CI is computed by taking the average of the BCI's of each Building at the Site weighted by replacement cost.

## **Performing Condition Assessments (Inspections)**

In BUILDER, condition assessments are performed at the Section level. To enter a Section inspection, select the Condition tab in the navigation window of the BUILDER application.

Work Configuration   Work Plan   Scenarios   Reports

Inventory

Sample

Sustainment Management System

010 - Sample Site

011 - Sample Org

012 - Sample Site 01

001 - Building One

013 - Building Two

025 - Building Three

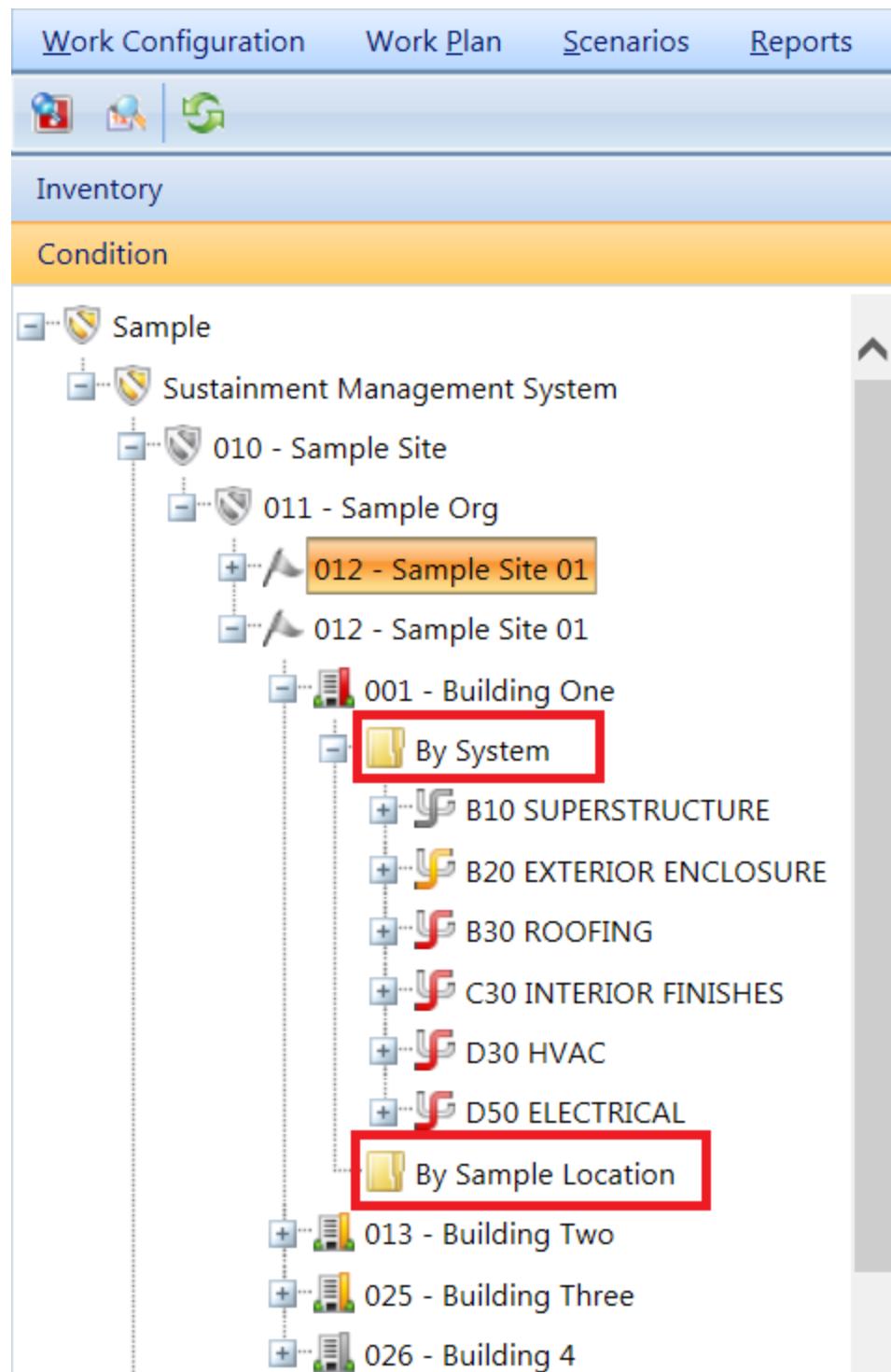
026 - Building 4

Condition

Functionality

## **Add a New Inspection**

When adding a new Section inspection, you must navigate the BUILDER tree to the Building that you want to add an inspection to. Once there you will have an option to perform a condition assessment based on system ([Direct Rating](#) or [Dis-tress Survey](#)) or by [sample location](#).



Please follow the links above to learn how to perform the different types of condition assessments.

## ***Distress Survey Procedures***

### **Introduction**

The distress survey is the most accurate, reproducible, and consistent condition survey approach. It also provides a record of what's wrong with the Component-Section. The survey procedure involves visually inspecting each subcomponent present in the desired Component-Section. The distress types, their severity levels, and their quantity or density discovered for each subcomponent are recorded. The recommended distress survey applications are discussed in detail in the [Overview](#) section.

### ***Distress Definitions***

Different sets of distress definitions are provided in this manual. Appendix A lists the distress set applicable to all Building components, except built-up, single-ply, and asphalt shingle roofing surfaces and flashings. Those roofing distresses were developed for use with the ROOFER™ component of the SMS and are provided in Appendices [B](#), [C](#), and [D](#), respectively. They are used with BUILDER to facilitate consistency.

At the beginning of each appendix are general notes regarding application, density estimation, and other items of importance. These should be reviewed regularly to ensure a consistent application.

It is expected that inspectors will have the distress definitions handy for ready reference. This can be accomplished electronically through BRED, paper form, or both. Do not rely solely on memory for the definitions. Experience has shown that unnecessary error will result in certain situations, even from seasoned inspectors, if guesswork is used. If uncertain about a distress type or severity level, look it up!

### ***Beginning the Distress Survey***

#### **Getting Started**

Prior to actually conducting the distress survey, all planning must be accomplished. The Buildings and systems associated with the scheduled component-sections will need to be downloaded to **BRED**<sup>1</sup> from BUILDER. This topic was discussed in the [BUILDER overview](#).

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

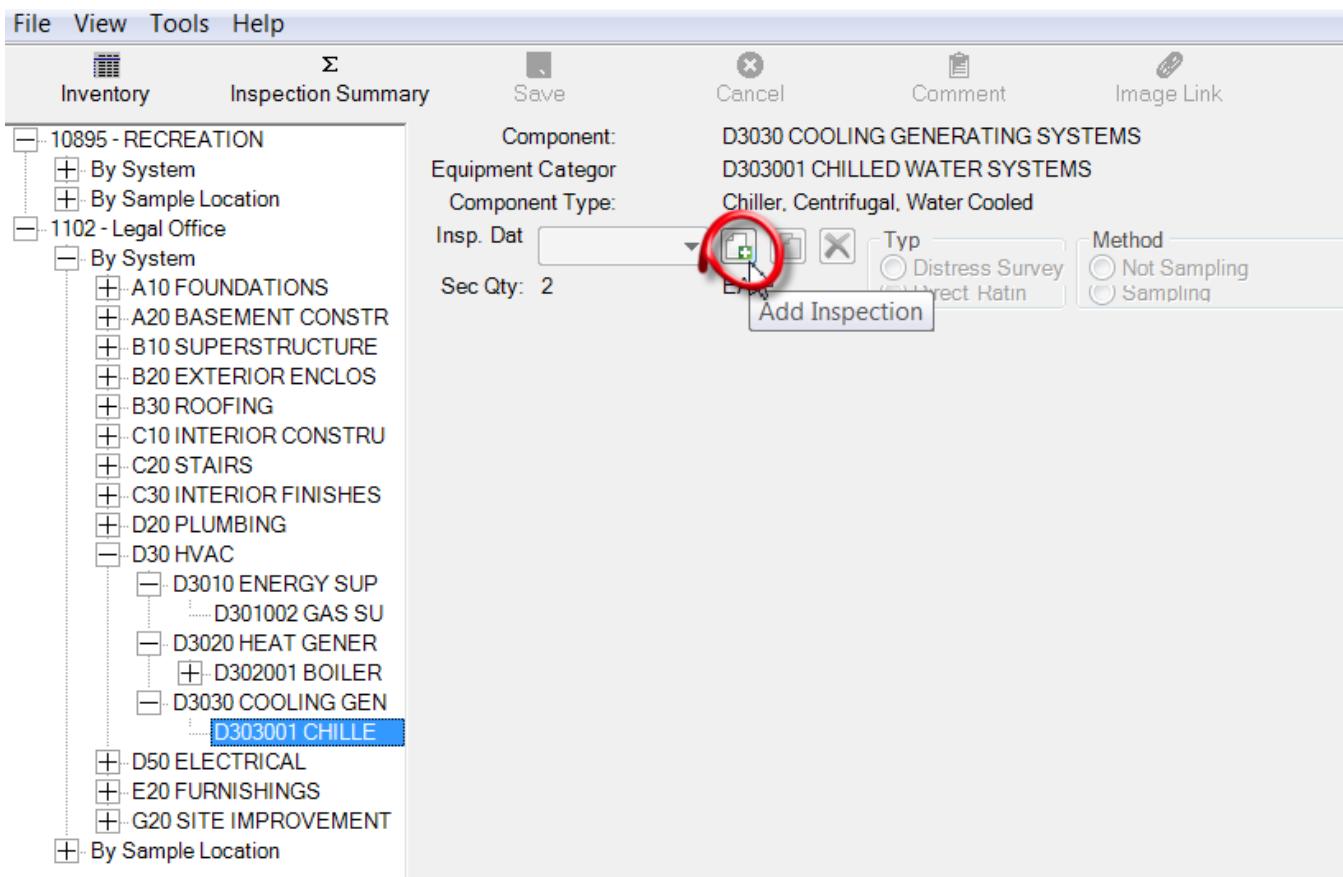
### *Selecting the Component-Section, Distress Survey Option, Sample Location, and Quantity*

Referring back to [Figure 6](#) the Component-Section to inspect will be chosen from the tree. The selection may come from the component list or the sample list depending on whether or not sampling is being used. The most recent last inspection date, quantity, and results will be shown as displayed in [Figure 8](#) (no sampling) or Figure 9 (with sampling) if the last inspection was a distress survey. (If the last inspection was a direct rating or if the Component-Section is painted, the display will look different. Direct ratings are discussed in [Chapter 3](#) and paint ratings are addressed in [Chapter 4](#)). Other past inspection dates may be chosen from the date drop-down list. From here a new inspection may be made from scratch or made from a copy of past inspection data based on the past date chosen. This is done by pressing either the **New Inspection** (as shown in figure 8) or **Copy Inspection** button next to the **Add Inspection** button. The current date and Component-Section quantity will Be the default. If the inspection is new, the **distress survey** radio button should be selected to display the distress survey grid. For new inspections, the quantity will default to the Component-Section quantity. The actual amount used for a given sample (if sampling is used) will need to be recorded along with the sample location.

Refer to the **BRED**<sup>1</sup> help file for details on specific operations.

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)



**Figure 8. Adding an Inspection to a BRED file.**

### *Subcomponent Selection*

BUILDER distress surveys are conducted on a subcomponent-by-subcomponent basis for each Component-Section. However, subcomponents are not specifically inventoried in BUILDER. Number of subcomponents may vary depending on the specific Component-Section as constructed or installed in a given building.

BUILDER and **BRED**<sup>1</sup> address this. When the distress survey screen is accessed a listing of all possible subcomponents is provided. This is shown in Figures 9 and 10. Since BUILDER initially does not know which subcomponents are present and which ones are not, their presence is defaulted to "N/A" (not applicable). Those that are present MUST have either the "Defect Free" box checked or the applicable distresses recorded as discussed below. After the data are loaded and saved, the subcomponents will be resorted with those present listed at the top.

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

Builder RED - C:\

File View Tools Help

Inventory Inspection Summary Save Cancel Comment Image Link

Component: C2010 STAIR CONSTRUCTION  
 Material Category: C201001 INTERIOR AND EXTERIOR STAIRS  
 Component Type: Exterior Stairs - Concrete (12 Riser Flight)

Insp. Dat: 2/26/2013      Typ  Not Sampling Method  
 Sec Qty: 4 EA  Direct Rating  Sampling

Samp. Qty: 4 EA Location: Initial Sample

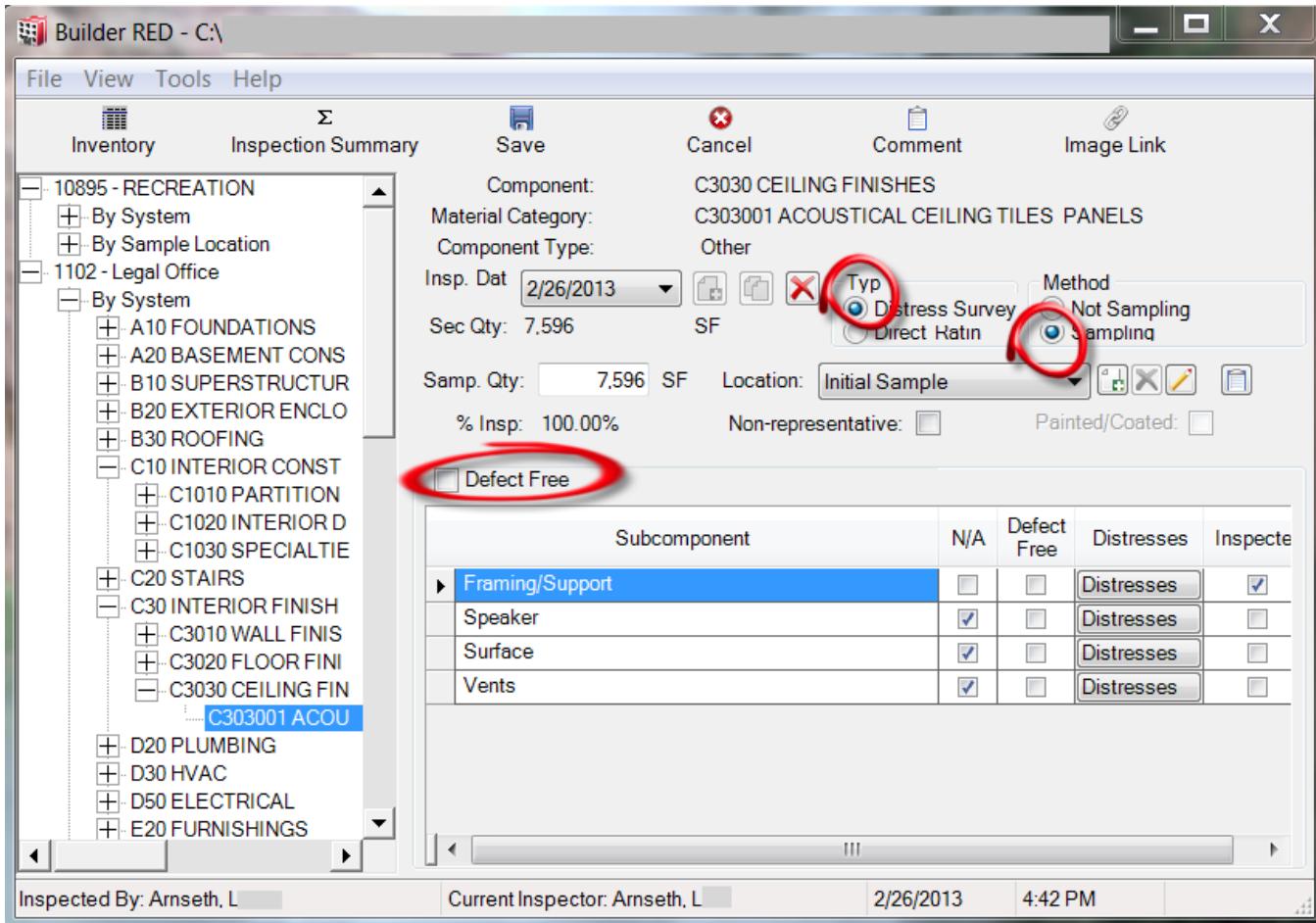
% Insp: 100.00% Non-representative:  Painted/Coated:

Defect Free

Subcomponent	N/A	Defect Free	Distresses	Inspected
Landing/Stoop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button"/> Distresses	<input checked="" type="checkbox"/>
Nosing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="button"/> Distresses	<input checked="" type="checkbox"/>
Railing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="button"/> Distresses	<input type="checkbox"/>
Risers/Surface/Treads	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="button"/> Distresses	<input type="checkbox"/>
Supports	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="button"/> Distresses	<input type="checkbox"/>
Wall	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="button"/> Distresses	<input type="checkbox"/>

Inspected By: Arnseth, L Current Inspector: Arnseth, L 2/26/2013 4:27 PM

Figure 9. BRED Distress Survey Screen (No Sampling)



**Figure 10. Distress Survey Screen (with Sampling)**

If subcomponents are present, but marked “N/A” then all of the condition indexes will be computed at lower levels than they really are. Thus, it is imperative that great care be taken with this detail.

There is one exception to the subcomponent “N/A” and “Defect Free” requirement discussed above. If ALL of the subcomponents present are “Defect Free” a global declaration can optionally be made by checking the “Defect Free” check-box (see Figures 9 and 10). Selecting "Defect Free" in this case can be a time saver.

#### *Recording Distresses and Other Data with BRED*

Referring to Figures 9 and 10, the **Distresses** button on the subcomponents row is pressed to record all distresses. Look for the presence of distresses and for each found record the applicable distress type, severity level and density range (or distress quantity) for that subcomponent. Particular care must be taken to adhere to the definitions and notes for each distress (Appendices A through D).

When completed, inspect the next subcomponent. When all of the sub-components have been inspected, the inspection for that Component-Section or sample (if sampling) is completed. The process repeats for the next Component-Section or sample. Figure 11 shows a completed distress survey for a given sub-component.

Distress	Severity	Density	Subcompon_	Distress_	Critic_	ESC	ESC	Date
			Qty (Optional)	(Optional)			Number	Com...
► Stained/Dirty	Low	>25% - 50%	15	5	<input type="checkbox"/>	<input type="checkbox"/>		
Damaged	Low	>5% - 10%	15	1	<input type="checkbox"/>	<input type="checkbox"/>		
Damaged	Medium	>10% - 25%	15	2	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 11. Completed Distress Survey for a Subcomponent

### Copying a Previous Distress Survey

As stated above that re-inspection of previously defined Component-Section sample units is strongly recommended. Doing this permits the copying of the last distress survey. Reinspecting the same Component-Section sample unit is STRONGLY recommended. All of the distresses, severity levels and densities for all subcomponents will be copied into the current inspection. If no work has been accomplished since the last inspection, all of the past distresses will be present. Their severity levels may be worse, the quantity or density may be more, and additional distresses may be present, of course. But for those that are the same, only verification is needed, thus saving time and effort plus adding to consistency and reproducibility. Any changes can be recorded through the edit command. New distresses will be added as they would be for a new inspection.

To help keep track that all copied sample locations have been inspected and the data has been saved for each one sample, the sample location combo box will have a yellow background until all sample locations have been saved for the

current inspection. This is illustrated in Figure 12. After all are saved, the background will revert to white.

Subcomponent	N/A	Defect Free	Distresses	Inspected	Paint N/A	Paint D/F	Paint Rating
Door Frame	<input type="checkbox"/>	<input type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>
Hardware	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>
Motor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>
Signage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>
Surface	<input type="checkbox"/>	<input type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>
Window Glass	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<b>Distresses</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>N/A</b>

Figure 12. Distress Survey Copy Component-Section Sample Locations Shown in Yellow

### *Distress Density vs. Distress Quantity*

There are three primary reasons for collecting distress quantity data:

- Estimating density is not permitted or desired (business process decision)
- Computing actual density
- Quantify/refine work needs

A BUILDER distress survey permits the inspector to record the measured distress quantities or record an estimate of density within predefined ranges. If quantities

of subcomponent and distresses are entered, then BUILDER or **BRED**<sup>1</sup> will compute the density. The “Overview” chapter discussed the differences and intent of the two different approaches.

Simply recording an estimate of density is faster than recording quantity data, but it is also prone to error. Sometimes estimating density may be difficult or it may be found to be too inaccurate. If so, the distress quantities may be entered into **BRED**<sup>2</sup> (or BUILDER), and the appropriate density range will be computed. This is illustrated in [Figure 10](#).

If distress quantities are used, the subcomponent quantity will also need to be entered so that density can be computed. Since subcomponents are not inventoried, BUILDER will rarely know what their values are. (There are some instances when they are the same as the Component-Section or sample quantity). The subcomponent quantity can be estimated or measured.

Sometimes, using a unit count instead of an area or length measurement will speed the inspection by eliminating the need to measure and compute a sub-component area or length, provide for the necessary density computation, and offer an advantage of giving a logical repair measurement. For example, there may be 16 sq ft of damaged ceiling tiles in a room that is 120 sq ft. This could have also been gathered by counting two tiles out of the 15 present. Plus, now the repair quantity is known (i.e. two tiles). Thus, using a unit count is an alternate unit-of-measure for the subcomponent. With **BRED**<sup>3</sup> the subcomponent unit-of-measure is displayed (see [Figure 10](#)). If the alternative unit count is used as the unit-of-measure, mark the checkbox for Alternative UM "Each" to indicate that this method was used. The example in [Figure 10](#) used this approach.

#### *Multiple Severity Levels*

Most distress types have more than one severity level defined. When conducting a distress survey the inspector must be aware that more than one severity level for a given distress type may be present in the same Component-Section sub-component. As an example, [Figure 10](#) shows two different severity levels present for the same distress type.

#### *Critical Distresses*

[Figure 10](#) shows a check-box labeled “Critical.” This box should be checked to trigger a repair within the first year of a work plan even if there is still a remaining

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>3</sup>BUILDER Remote Entry Database (BuilderRED)

maintenance life (RML) for the Component-Section. Refer to the discussion in [Chapter 1](#). Thus, checking “Critical” overrides the **RML**<sup>1</sup> for work planning. “Critical” can also be used to denote “Stop Gap” repairs prior to a future planned project.

#### *Emergency Service Calls (ESC)*

The “**ESC**<sup>2</sup>” check-box (see Figure 10) is used to flag the need for a quick, relatively inexpensive, emergency or service call to correct a problem found during the inspection. This is different than the “Critical” flag stated above. **ESC**<sup>3</sup> is smaller in scope, represents unplanned work, and will be acted on in a few hours (emergency call) or days (service call).

*“Critical” and “ESC” should not be used together.*

If an emergency or service call has been issued from a previous inspection and an **ESC**<sup>4</sup> number and completion date (if completed) have been entered into BUILDER, the number and date will be seen in **BRED**<sup>5</sup>. If the past inspection is copied into a current inspection, this distress will most likely be deleted since it should no longer be present.

#### *Recording Distress Data without BRED*

Distress surveys can be accomplished without **BRED**<sup>6</sup>. The BUILDER set-up compact disk provides sample worksheets that can be used instead of **BRED**<sup>7</sup>. Revised or custom worksheets can be created or the information can be recorded free form. The key is recording the proper data for later entry into BUILDER.

#### *Recording Distress Data without Sampling*

For each Component-Section, record the system, component name, identifying Section name (if used, e.g. Roof Section A), material (or equipment) type, and/or component type. These descriptors will uniquely identify the Component-Section being inspected. Then identify and record all distress types, severity levels, and density ranges (or subcomponent quantity and distress quantity) for the

---

<sup>1</sup>Remaining Maintenance Life

<sup>2</sup>Emergency Service Calls

<sup>3</sup>Emergency Service Calls

<sup>4</sup>Emergency Service Calls

<sup>5</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>6</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>7</sup>BUILDER Remote Entry Database (BuilderRED)

subcomponents present. An example of a completed "Distress Survey without Sampling" worksheet is shown below as Figure 13.

BUILDER EMS Distress Survey Worksheet (without Sampling)									
Building ID: <u>918</u>			Date: <u>8/24/98</u>			Inspector: <u>Mike S.</u>			
System	Component	Section ID	Category/Type	Subcomponent	Distress	Sev	Density	Paint Rtg	
Roofing	Surface	Roof A	Metal / Standing Seam	Surface	Leaks	H	2-5%	-	
		"	"	"	Patched	L	11-25%	-	
		"	"	"	Patching	L	6-10%	-	
	"	Roof C	"	Asphalt / Roll	Surface	Ponding	M	2-5%	-
	"		"	"	Splits	L	0-0.1%	-	
	"		"	"	Holes, Cuts (Non-penetrating)	L	0.1-1%	-	
	"		"	"	Debris and Veg	L	0-0.1%	-	
	"		Roof Drainage	Roof A	Metal / Ext.	Gutter	L	2-5%	G
	"		"	"	Downspout	Loose	M	6-10%	G
	"		"	Roof B	Metal / Ext.	Splash Block	M	6-10%	-
"	"	"	"	Cracks	L	2-5%	-		
"	"	"	"	Missing	L	2-5%	-		
Sheet <u>1</u> of <u>1</u>									
Density Ranges: < 0.1%; 0.1-1%; 1-5%; 5-10%; 10-25%; 25-50%; >50%									

**Figure 13. Example Distress Survey without Sampling Worksheet**

#### *Recording Distress Data with Sampling*

For each Component-Section included in the sample, record the system, component name, identifying Section name (if used, e.g. Roof Section A), material (or equipment) type, component type, sample quantity, and whether the sample is representative or not. These descriptors will uniquely identify the Component-Section being inspected. Then identify and record all distress types, severity levels, and density ranges (or subcomponent quantity and distress quantity) for the sub-components present. An example of a completed "Distress Survey with Sampling" worksheet is shown below as Figure 14.

## **BUILDER EMS Distress Survey Worksheet (by Sampling)**

Building ID: 571 Date: 6/30/98 Inspector: Mike M. Sample Location: Room 113

Sheet 1 of 1

Density Ranges: < 0.1%; 0.1-1%; 1-5%; 5-10%; 10-25%; 25-50%; >50%

**Figure 14. Example Distress Survey by Sampling Worksheet**

## *Distress Survey Data*

When the **distress survey type** radio button is selected for the condition assessment, the context area of the BUILDER screen will look similar to the window below.

Save Comment Reports N/A • 11/8/2011

Inspection Attachments (0)

Inspection Date: 3/29/2013 <input type="button" value=""/>	Type <input type="radio"/> Direct Rating <input checked="" type="radio"/> Distress Survey	Method <input checked="" type="radio"/> Not Sampling <input type="radio"/> Sampling	Results CSCI: <span style="background-color: green; color: white;">95</span>	
<input type="checkbox"/> Defect Free	SUCI:			
Subcomponent	N/A	D/F	Distresses	Insp.
Burner Assembly	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Controls	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Firebox/Fire Tubes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Fuel System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Piping/Fittings/Valves	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Pressure Vessel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>
Wiring/Connections	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<a href="#">Distresses</a>	<input type="checkbox"/>

From this screen, the following data regarding the condition assessment can be recorded:

- **Defect Free All Checkbox.** If no distresses are found on any sub-components, mark this checkbox to speed data entry. Marking this box will check all subcomponents as Defect Free (D/F).
- **Paint Defect Free All Checkbox** If all subcomponents are painted and the paint is defect free everywhere, marking this checkbox will check all sub-components as Paint D/F.
- **Section Subcomponents** BUILDER's database includes a list of possible subcomponents for the current Section. The subcomponents are listed in grid format and require the following data:
  - **Subcomponent** (Read-Only)- Displays the name of a subcomponent.
  - **N/A Checkbox** - Mark this box if the subcomponent is not applicable to this Section. Initially, this checkbox is marked for each sub-component.
  - **D/F Checkbox** - Mark this box if the subcomponent is defect free. Checking this box will automatically uncheck the N/A checkbox.

- **Distresses** - If the subcomponent is applicable but not defect free, click the **Distresses** button to launch the Distresses window shown below.

The screenshot shows a software window titled "Distresses". The toolbar includes "Save", "Copy", and "Help" buttons. The header displays "Component: D3020 HEAT GENERATING SYSTEMS" and "Section: D302001 BOILERS Gas, Hot Water". Below this, the "Subcomponent" field is set to "Burner Assembly" and the "Subcomponent UM" field is set to "EA". A checkbox for "Alternative UM 'Each'" is checked. The main area contains a grid with the following data:

	Distress	Severity	Subcomponent Qty	Distress Qty	Density	Critical	ESC	ESC Num	ESC Date	
	Noise/Vibration Excessive	Low	1	1	<= 0.1%	<input type="checkbox"/>	<input type="checkbox"/>			<a href="#">Help</a>
	Leaks	Medium	1	1	<= 0.1%	<input type="checkbox"/>	<input type="checkbox"/>			<a href="#">Help</a>

In this window, use the **Add new record**, **Edit**, or **Delete Distress** buttons in the toolbar to add, edit, or remove distresses from the grid. Use the **Copy** button to copy distresses from similar subcomponents that have already been inspected on other Sections. For each distress, the following data can be entered:

- **Distress Type**(Required) - Select the type of distress present on the sub-component from the drop-down list. See [Appendix A](#) in the [Condition Assessment Manual](#) for definitions of all the distresses.
- **Severity** (Required) - Select the severity of the distress from the drop-down list. The applicable severities for each distress type are listed and defined in [Appendix A](#) in the [Condition Assessment Manual](#).
- **Subcomponent Quantity** - Enter the subcomponent quantity in the unit of measure listed above the grid. When the subcomponent's unit of measure is "Each" and the unit of measure listed in the Subcomponent UM field is not, mark the Alternative UM "Each" checkbox and then enter the number of sub-components.
- **Distress Quantity**- Enter the quantity of the subcomponent that has the distress in the unit of measure listed above the grid. When the subcomponent's unit of measure is "Each" and the unit of measure listed in the Sub-component UM field is not, mark the Alternative UM "Each" checkbox and then enter
  - the number of subcomponents with the distress.
- **Density** (Required) - Select the density of the distress from the drop-down list. The formulas used to compute the density for each distress type are listed in the definitions of the distresses in [Appendix A](#) in the [Condition Assessment Manual](#). If both the subcomponent and distress quantity have

been entered for a distress, the density will be computed and chosen automatically.

- **Critical Checkbox** - Mark this checkbox if the distress on the subcomponent is critical. Marking this checkbox will make the [work item](#) created for this Section "Must Do."
- **Emergency Service Call (ESC) Checkbox** - Mark this checkbox if the distress on the subcomponent requires an ESC.
- **ESC Number** - If an ESC was issued to respond to this distress, enter its number for your records in this field.
- **ESC Date** - If an ESC was issued to respond to this distress and has been completed, enter the date of completion in this field. Distresses with completed service calls are assumed to have no effect on the subcomponent condition.

Note that you may not have two distresses of the same type, severity, and density. Such a pair of distresses should be combined into one row with an increased density value.

- **Inspected Checkbox** - (Read-Only) If distresses have been recorded for the subcomponent or the subcomponent is marked D/F, then the "Inspected" checkbox will be marked automatically.

If the Section is marked as painted, the following columns are added to the grid for each subcomponent to record the following data:

- **Paint N/A Checkbox** - Mark this checkbox if the subcomponent is not painted or not applicable to this Section. Initially, this checkbox is marked for each subcomponent.
- **Paint D/F Checkbox** - Mark this checkbox if the subcomponent is painted and the paint is defect free. Marking this box automatically unchecks the Paint N/A checkbox.
- **Paint Rating** - If the subcomponent is applicable and painted but the paint is not defect free, select an appropriate rating for from the dropdown list. See [Appendix F](#) in the [Condition Assessment Manual](#) for a detailed description of each paint rating.

## ***Direct Rating Procedures***

### **Introduction**

The direct condition rating procedure is a less accurate, but faster method for performing a condition survey. It involves visually inspecting each Component-Section, evaluating the entire Component-Section against a set of rating criteria,

and selecting the appropriate rating. The recommended use of the direct ratings is described in the [Overview](#) section.

## Direct Rating Definitions

### *Rating Interpretation*

The direct rating approach consists of three broad categories described as "Green," "Amber," and "Red." "Green" implies that the Component-Section is suffering little, if any, serviceability loss due to degradation, and some sustainment (preventive maintenance or minor repairs) may be needed, but not significant enough to place on a corrective maintenance work plan. "Red" implies serious serviceability problems due to degradation and significant restoration or sustainment is needed in the form of major repair, rehabilitation or replacement. "Amber" (or yellow) ratings represent the middle and imply a sense of caution. Further analysis may be needed (i.e. a distress survey).

Each rating category is also divided into threes and are denoted by high (+), low (-), and middle. The (+) and (-) ratings serve as transitional ratings between "Green" and "Amber" and "Amber" and "Red."

Table 2 shows the direct rating definitions. The descriptive text is applicable to an entire Component-Section, or if sampling, a Component-Section sample. The definitions are not intended to totally or exactly describe all Component-Section situations. Rather, the rating intent, as described above should be adhered to in the inspection. The direct rating definitions are repeated in [Appendix E](#) for ready reference.

It is likely that situations will arise that are not clearly defined in the rating definitions and it may seem like two or more ratings might be appropriate. When this situation occurs chose the rating that best fits the situation. Table 2 is provided to help differentiate the ratings. However, before assigning a rating, think carefully of the intent behind the "Green," "Amber," "Red" rating definitions and apply accordingly.

Mechanical and electrical (e.g. HVAC) component-sections may require careful thought regarding serviceability loss. Total serviceability loss may occur due to some minor reasons (e.g. broken wire, failed switch, etc.) In these situations, the overall Component-Section condition may be "Green" because perhaps only a minor fix will correct the serviceability problem.

Table 2. Direct Condition Rating Definitions

Rating	SRM <sup>1</sup> Needs	Rating Definition
--------	------------------------	-------------------

<sup>1</sup>Sustainment, Restoration, & Modernization

			Entire Component-Section or Component-Section sample free of observable or known distress
Green (+)	Sustainment consisting of possible preventive maintenance (where applicable)	No Component-Section or sample serviceability or reliability reduction. Some, but not all, minor (non-critical) subcomponents may suffer from slight degradation or few major (critical) subcomponents may suffer from slight degradation.	
Green	Sustainment consisting of possible preventive maintenance (where applicable) and minor repairs (corrective maintenance) to possibly few or some sub-components.	Slight or no serviceability or reliability reduction overall to the Component-Section or sample. Some, but not all, minor (non-critical) subcomponents may suffer from minor degradation or more than one major (critical) subcomponent may suffer from slight degradation.	
Green (-)		Component-Section or sample serviceability or reliability is degraded, but adequate. A very few, major (critical) subcomponents may suffer from moderate deterioration with perhaps a few minor (non-critical) subcomponents suffering from severe deterioration.	
Amber (+)		Component-Section or sample serviceability or reliability is definitely impaired. Some, but not a majority, major (critical) subcomponents may suffer from moderate deterioration with perhaps many minor (non-critical) subcomponents suffering from severe deterioration.	
Amber (-)	Sustainment or restoration to any of the following: Minor repairs to several sub-components; or Significant repair, rehabilitation, or replacement of one or more subcomponents, but not enough to encompass the Component-Section as a whole; or Combinations thereof	Component-Section or sample has significant serviceability or reliability loss. Most subcomponents may suffer from moderate degradation or a few major (critical) subcomponents may suffer from severe degradation.	
Red (+)	Sustainment or restoration required consisting of major repair, rehabilitation, or replacement to the Component-Section as a whole.	Significant serviceability or reliability reduction in Component-Section or sample. A majority of subcomponents are severely degraded and others may have varying degrees of degradation.	
Red		Severe serviceability or reliability reduction to the Component-Section or sample such that it is barely able to perform. Most subcomponents are severely degraded.	

Red (-)	Overall Component-Section degradation is total. Few, if any, subcomponents salvageable. Complete loss of Component-Section or sample serviceability.
---------	--

\* In this context, evaluating serviceability and reliability is to ask the question, "Since the Component-Section has one or more purposes for its existence, is it doing what it is supposed to do without disruption?" Certain subcomponent degradation may or may not prevent the Component-Section from reliably performing as desired. Consider both serviceability and reliability of the Component-Section and the extent (how many, importance, and magnitude) of subcomponent degradation when rating.

#### *Abbreviated Rating Approach*

As a result, the abbreviated direct rating approach should accomplish the same result, although with slightly more Condition Index variability due a less rigorous data collection process, as the Distress Survey approach, provided the following guidelines are followed (in conjunction with the guidelines presented in the condition assessment manual:

- 1) Consider the primary function of the component and determine the level of loss of this function (if any) due to condition deterioration. This determines the GREEN, AMBER, RED nominal rating.
- 2) Consider the secondary functions of the component and determine the less of loss of these functions due to condition deterioration. This may result in a plus or minus adjustment from the nominal rating. A simplified rating matrix using this schema is shown below.

Table 3. Direct Condition Rating Definitions- Abbreviated Table

Loss of Primary Function	Loss of Secondary Functions		
	Minimal Moderate Significant		
	None	G+	G
Partial	A+	A	A-
Significant	R+	R	R-

In the case of an exterior door component, considering the primary and secondary functions discussed above, examples of primary function loss for each level include:

- None – No loss of function, door provides a barrier to unwanted movements, while remaining fully operational.

- Partial – Noticeable deterioration to frame, surface, or weather stripping/seals which may allow partial movement when closed, and/or door is less than fully operational. Safety is not an issue.
- Significant – Deterioration to components of door assembly which allow significant potential for unwanted movement, and/or significant operational issues due to damage or misalignment of frame, door, or hardware, which may present a safety issue.

Likewise, considering secondary function loss for each level based on the chart above:

- Minimal – None/minimal loss of aesthetics or thermal/moisture control
- Moderate – Moderate loss of aesthetics due to faded paint or slight corrosion
- Significant – Significant loss of aesthetics and/or inability to control thermal/air movements

Note: These are forward looking assessments which should consider the potential for additional loss in function, so this rating should not just consider the current loss of function, but also any expected loss over the next inspection/repair planning cycle (typically annual). For example, if a component is observed to be fully functional at the time of the inspection, but due to age or observed distresses, it is reasonable to expect a reduction in function in the near-term, that reduction in function should be considered in the rating. It is worth noting that some systems may have components that are new but still have deficiencies that could affect existing or future function.

### *Two-Step Rating Process*

The rating process should consist of two steps. The first step is the determination of the general “Green,” “Amber,” “Red” rating. Fundamentally, the thought process should be, “Is it Green? – yes or no.” If no, “Is it Red? – yes or no.” If no, it must be Amber. The second step is the possible refinement with a (+) or (-). This thought process should follow, “Is it at the high (+) end? – yes or no.” If no, “Is it at the low (-) end? – yes or no.” If no, there is no (+) or (-) to apply.

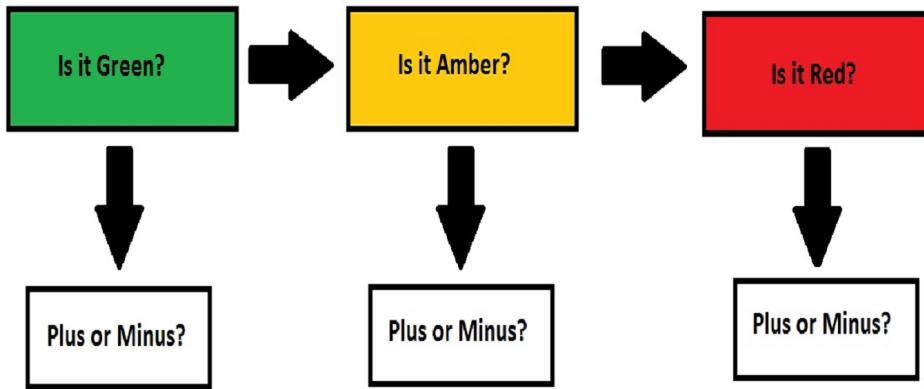


Figure 15. Direct Rating thought process

## Conducting a Direct Condition Rating Inspection with BRED

### Getting Started

Prior to actually conducting the direct condition rating survey, all planning must be accomplished. The Buildings and systems associated with the scheduled component-sections will need to be downloaded to **BRED**<sup>1</sup> from BUILDER. This topic was discussed above.

### Selecting the Component-Section, Direct Rating Option, Sample Location, and Quantity

Referring to Figure 6 the Component-Section to inspect will be chosen from the tree. The selection may come from the component list or the sample list depending on whether or not sampling is being used. The most recent last inspection date, quantity, and results will be shown as displayed in Figure 16 (no sampling) or Figure 17 (with sampling) if the last inspection was a distress survey. (If the last inspection was a distress survey or if the Component-Section is painted, the display will look different. Distress surveys were discussed in Chapter 2 and paint ratings will be addressed in Chapter 4). Other past inspection dates may be chosen from the date drop-down list. From here a new inspection may be made from scratch or made from a copy of past inspection data based on the past date chosen. This is done by pressing either the **New Inspection** or **Copy Inspection**

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

button next to the date field. The current date and Component-Section quantity will be the default information loaded. If the inspection is new, the **direct rating** radio button should be selected to display the direct rating choices. For new inspections, the quantity will default to the Component-Section quantity. The actual amount used for a given sample (if sampling is used) will need to be recorded along with the sample location.

Refer to the **BRED**<sup>1</sup> help file for details on specific operations.

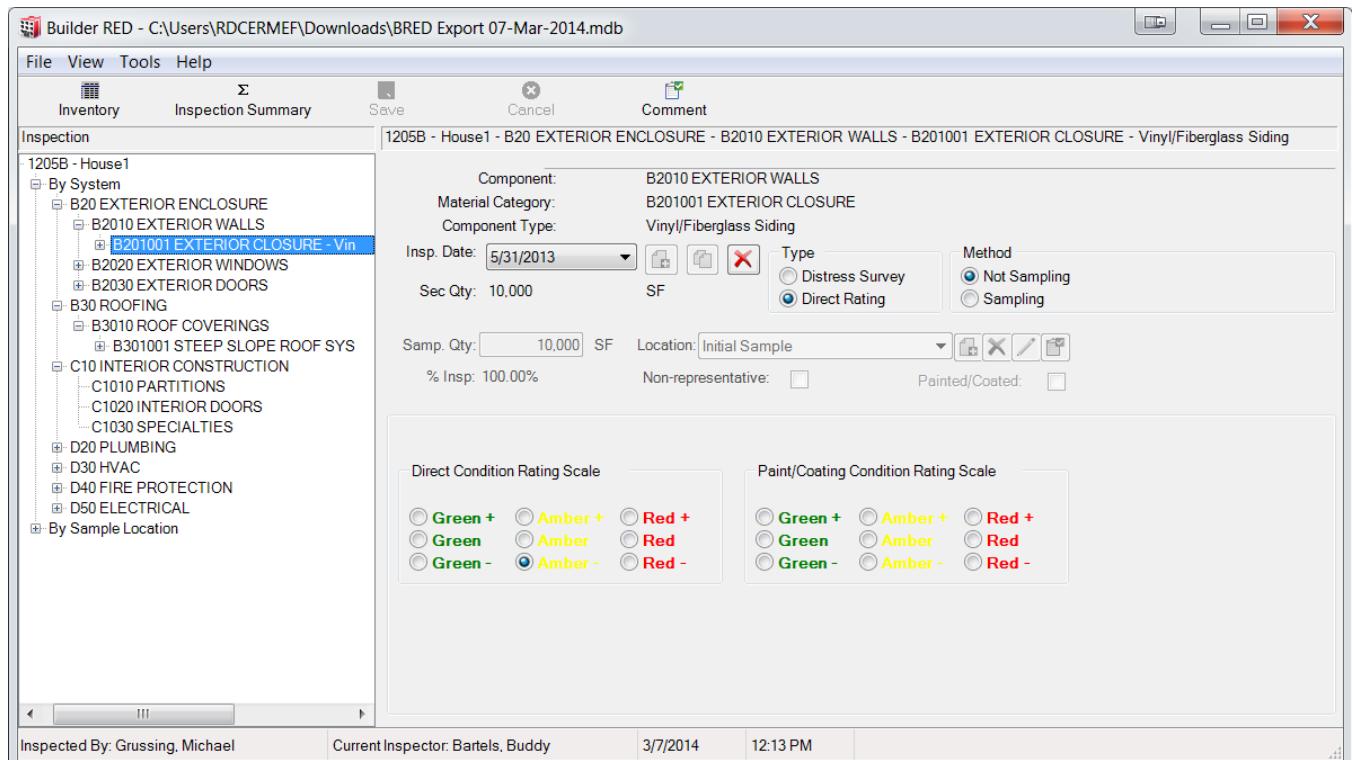
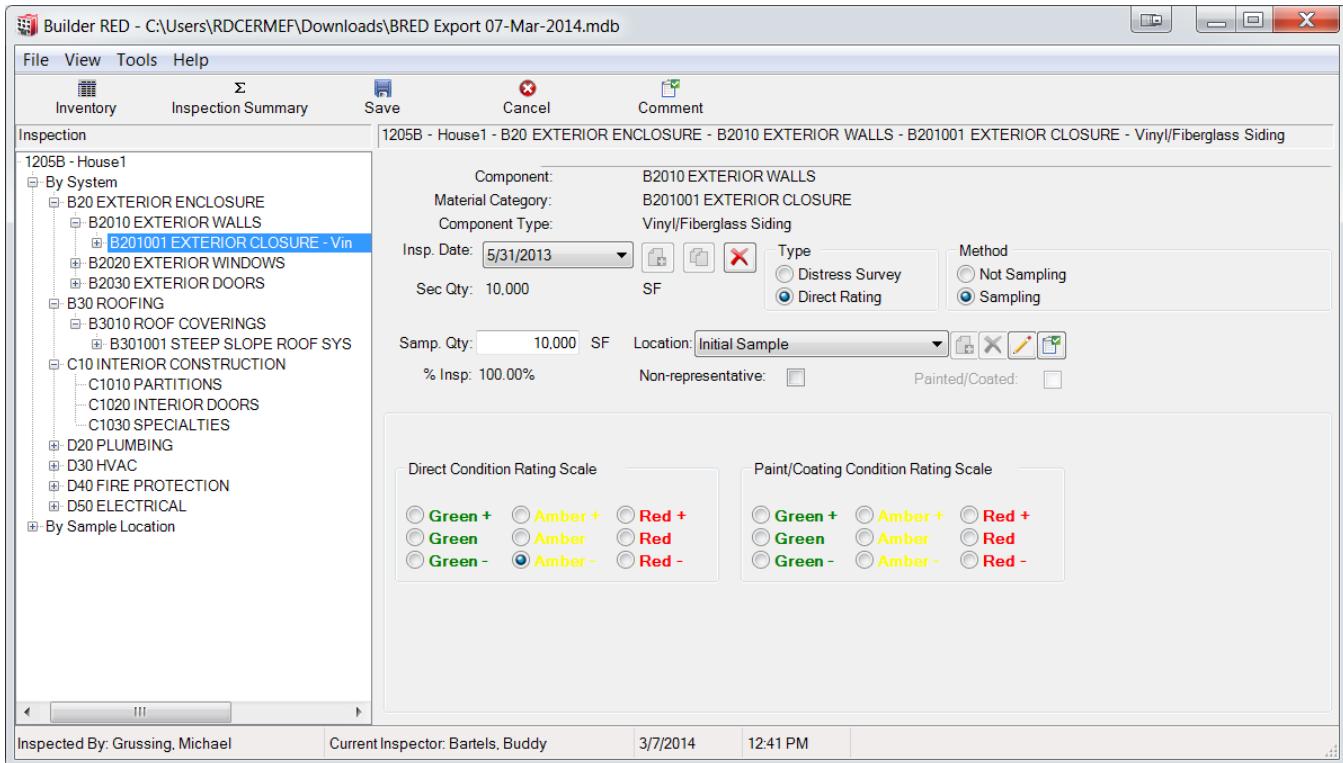


Figure 16. BRED Direct Rating Screen (No Sampling)

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)



**Figure 17. Direct Rating Screen (with Sampling)**

### *Recording Direct Ratings*

Referring to Figures 16 and 17, only the appropriate rating button needs to be selected to complete the survey. Keep in mind that the rating applies to the entire Component-Section or Component-Section sample. Individual subcomponents are not rated. Particular care must be taken to adhere to the direct rating definitions given in [Table 2](#) and [Appendix E](#) and the rating intent described above. When completed, inspect the next sample or repeat for the next Component-Section.

### *Copying a Previous Direct Rating*

It was stated previously that re-inspection of previously defined Component-Section sample units is STRONGLY recommended. Re-inspecting previously defined sample units permits the inspector to copy the last direct rating into this inspection. The rating can be changed, if necessary, if the inspection findings are different.

To help keep track that all copied sample locations have been re-inspected, the sample location combo box will have a yellow background as illustrated in Figure

18. After all sample locations are re-inspected and saved, the background will revert to white, thus indicating that all sample locations have been re-inspected.

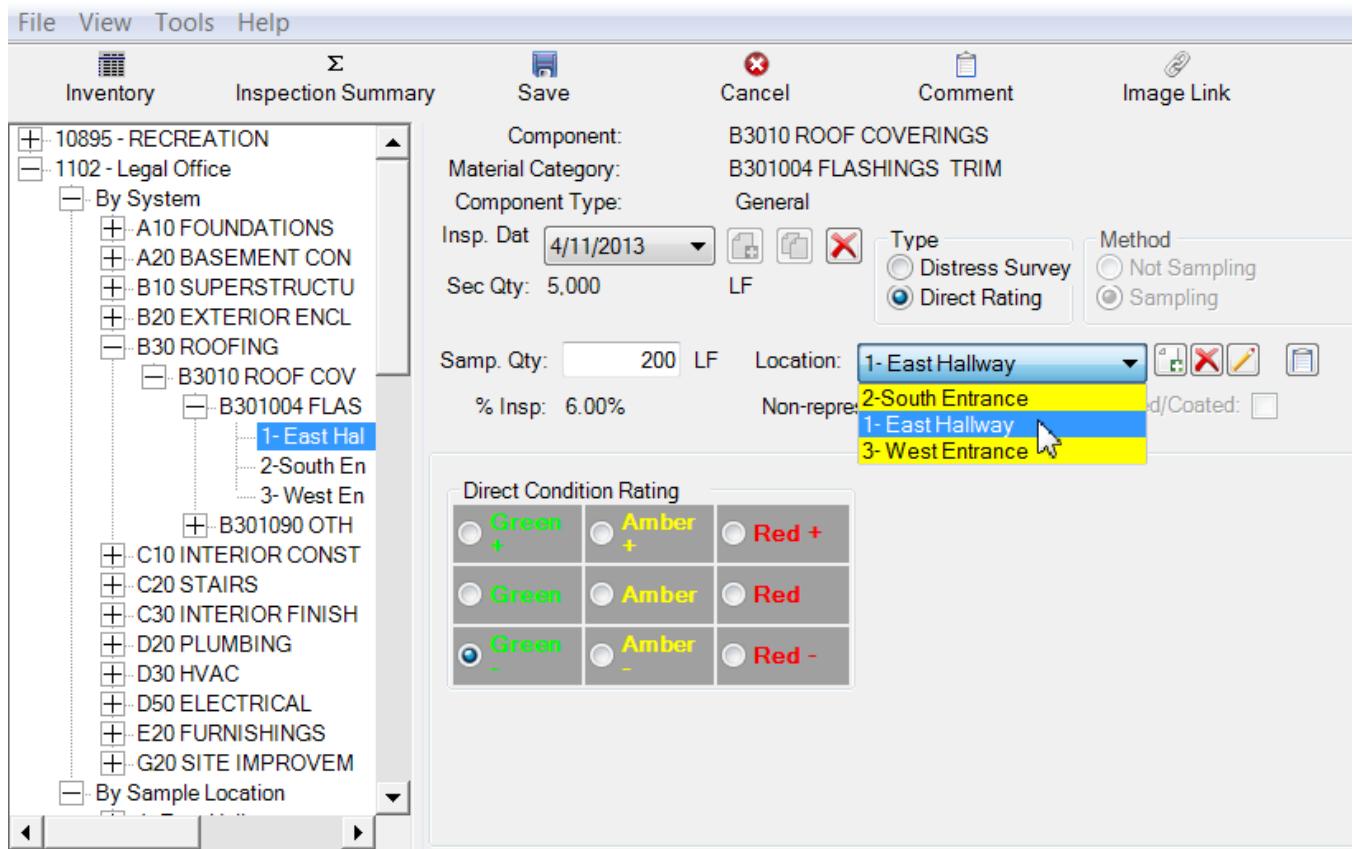


Figure 18. Direct Rating Copy Component-Section Sample Locations Shown in Yellow

### **Direct Rating Data**

To be able to access the Direct Rating window, you need to use the Condition panel bar on the left hand side to navigate to Site/Complex/ Building/ and "By System". After selecting "By System" you will need to drill down to the Component Section where the inspections and ratings are performed. The window below will indicate this level:

New	Copy	Delete	Reports
Section Name: D303002 DIRECT EXPANSION SYSTEMS Condenser, DX, Air Cooled			
Section Qty: 1 EA			
Inspection Date	Inspector		
11/03/2011	Inspector, Joe		
01/01/1998			

From this window, select "New" inspection or an Inspection Date. The next window will provide the choice of Type of Survey: Direct Rating or Distress Survey. When the direct rating type is chosen for the condition assessment, the context area of the BUILDER screen will look similar to the window below.

Save	Comment	Reports	N/A • 3/29/2013									
<input checked="" type="checkbox"/> Inspection	<input type="checkbox"/> Attachments (0)											
Inspection Date: <input type="text" value="3/29/2013"/>	Type <input checked="" type="radio"/> Direct Rating <input type="radio"/> Distress Survey	Method <input checked="" type="radio"/> Not Sampling <input type="radio"/> Sampling	Results CSCI: <input type="text"/>									
Direct Condition Rating Scale <table border="1"> <tr> <td><input type="radio"/> Green +</td> <td><input type="radio"/> Amber +</td> <td><input type="radio"/> Red +</td> </tr> <tr> <td><input type="radio"/> Green</td> <td><input type="radio"/> Amber</td> <td><input type="radio"/> Red</td> </tr> <tr> <td><input type="radio"/> Green -</td> <td><input type="radio"/> Amber -</td> <td><input type="radio"/> Red -</td> </tr> </table>				<input type="radio"/> Green +	<input type="radio"/> Amber +	<input type="radio"/> Red +	<input type="radio"/> Green	<input type="radio"/> Amber	<input type="radio"/> Red	<input type="radio"/> Green -	<input type="radio"/> Amber -	<input type="radio"/> Red -
<input type="radio"/> Green +	<input type="radio"/> Amber +	<input type="radio"/> Red +										
<input type="radio"/> Green	<input type="radio"/> Amber	<input type="radio"/> Red										
<input type="radio"/> Green -	<input type="radio"/> Amber -	<input type="radio"/> Red -										

On this screen, select the appropriate color rating for the Section in the Direct Condition Rating Scale box. See [Appendix E](#) in the [Condition Assessment Manual](#) for a detailed description of each color rating. Additionally, the appropriate color rating in the Paint/Coating Condition Rating Scale box should be selected if the Component-Section is marked as painted. See [Appendix F](#) in the [Condition Assessment Manual](#) for a detailed description of each paint color rating. Note that both ratings allow you to enter a comment by clicking the **Comment** button in the rating scale boxes.

## ***Paint Rating Procedures***

### **Introduction**

BUILDER requires that paint inspection not be done as a separate inspection from the Component-Section itself. Both must be done with the same inspection date.

During an inspection, the inspector will likely find many components that have a painted or coated surface, such as varnishes, stains, and water seals, in addition to the traditional latex and oil-based paints (note in BUILDER, the terms painting and coating are used interchangeably). When painted or coated surfaces exist for a component, the condition of that coating is usually evaluated and rated separately from the overall condition of the component itself. This is because work activities related to re-painting or re-coating can usually be performed separate from any other repairs that may occur. It is thus important to have a separate condition scale that reflects just the coating, do determine when performing these activities are most prudent.

It is important to note however that the condition of the paint is one of the most influential factors in the condition of the overall component, since it is typically serves as a protective barrier against environmental elements and external forces of deterioration. As a result, the paint coating on a component serves a critical preservation function for the component substrate, and while the paint is typically rated separate from the overall condition, it can be a significant indicator of underlying problems with the overall component. Because of this, when a coating rating is performed, it is always done in conjunction with the overall component rating. In other words, the coating rating and overall component rating are performed by the same inspector on the same date, and are recorded on the same inspection record.

### ***Do all “Coated” Components receive a paint rating?***

Just about any component may conceivably be classified as painted, including many types of HVAC and Electrical equipment. However, a paint rating may not be necessary for all these components. In general, paint and coatings will only be rated when repainting or resealing is an expected recurring work activity for that component. The activities include such items as resealing a wood deck, repainting interior walls, or revarnishing wood stairs. In the case of factory finishes applied to the enclosure of HVAC equipment, these coatings would not typically be rated separately via a paint rating because recurring recoating is not likely for these finishes.

### *When is Paint Rated?*

Almost any Component-Section may be painted, however, that doesn't necessarily mean that the paint on that Component-Section should be evaluated separately from the Component-Section itself.

Generally, paint and coatings will be inventoried and rated when repainting/resealing is an expected recurring work activity. These include such items as resealing a wooden deck, repainting interior walls, and re-varnishing a set of wooden stairs. Inventorying and rating will get these activities triggered and placed on the work plan. If only minor subcomponents are painted (e.g. steel handrails on a set of concrete stairs), the concrete stair Component-Section will usually not be inventoried as being painted. Any paint problems on the handrail will be considered through the inspection of that subcomponent. It is for that reason why "paint" problems are addressed in some of the distress definitions in [Appendix A](#).

Paint/coatings will only be rated when the Component-Section is declared "painted/coated" in the BUILDER inventory. BUILDER inventory procedures address when a Component-Section is considered painted (or coated). Fundamentally, there are two factors to consider when deciding when paint/coatings will be inventoried. The first is the significance of the paint/coating to the Component-Section as a whole. Some Component-Sections consist of two or more subcomponents of which not all may be painted. Those subcomponents that are painted may be but a small portion of the overall Component-Section. Second, many Component-Section subcomponents have "factory" applied paint finishes. Generally, these are applied to preserve the subcomponent and are rarely painted on a periodic basis. Thus, the paint life is often the Component-Section life.

### *Paint/Coating Rating Definitions*

The paint or coating on a component is performed similar to the direct condition rating approach discussed previously. Here, a Green, Amber, or Red condition range is first determined, and then a (+) or (-) modifier is given if the coating condition is at the upper or lower end of that range. This same paint rating approach is performed, regardless of whether the overall component is being inspected using a distress survey or a direct rating assessment. The one different being that in a distress survey inspection, the direct condition paint ratings are applied at a subcomponent level (get screen shot of distress survey), while in a direct survey inspection, one paint rating is given for the overall component (get screen shot of direct rating). In addition, if sampling is used, a paint rating can be provided for each sample.

Paint rating guidelines for each rating are provided in table 4 below, and are based on a combination of coating deterioration and density. As mentioned above, the direct rating approach consists of three broad categories (nine total categories defined by the % Deteriorated) described as Green, Amber, and Red. Green implies that the paint or coating is suffering little, if any, serviceability loss due to degradation, and some sustainment (touch up painting) may be needed, but not significant enough to place on a corrective maintenance work plan. This is reflected in the small % Deteriorated. Red implies serious serviceability problems due to degradation and significant repainting or recoating (usually to the entire Component-Section or Component-Section sample) is needed. As can be seen, relatively low percentages of deterioration warrant significant repainting or recoating. This is primarily due to aesthetics. Amber (or yellow) ratings represent the middle and suggest that repainting or recoating is needed soon.

The definitions are listed in Table 4, below and are repeated in Appendix E for ready reference.

Table 4. Paint/Coating Rating Criteria

<b>Rating</b>	<b>% Deteriorated</b>	<b>Relative Amount Deteriorated</b>
Green (+)	0.00-0.03	Up to about 1" x 4" in a 8' x 10' area; 1/32" in a 10' length; or 3 in 10,000
Green	0.03 – 0.10	Between about 1" x 4" and 1"x 12" in a 8' 10' area; 1/32" and 1/8" in a 10' length; or 3 and 10 in 10,000
Green (-)	0.10 – 0.30	Between 1" x 12" and 3" x 12" in a 8' x 10' area; 1/8" and 3/8" in a 10' length, or 1 and 3 in 1000
Amber (+)	0.30 – 1.00	Between 3" x 12" and 10" x 12" in a 8' x 10' area; 3/8" and 1 1/4" in a 10' length; or 3 and 10 in 1000
Amber	1.00 – 3.00	Between 10" x 12" and 18" x 18" in a 8' x 10' area; 1 1/4" and 3 3/4" in a 10' length; or 1 and 3 in 100
Amber (-)	3.00 – 10.0	Between 1' x 2 1/2" and 1' x 8' in a 8' x 10' area; 3 3/4" and 12" in a 10' length; or 3 and 10 in 100
Red (+)	10.0 – 17.0	Between 1' x 8' and 1 3/4' x 8' in a 8' x 10' area; 1' and 1 3/4' in a 10' length; or 10 and 17 in 100
Red	17.0 – 33.0	Between 1 3/4' x 8' and 3 1/3' x 8' in a 8' x 10' area; 1 3/4' and 3 1/3' in a 10' length; or 17 and 33 in 100
Red (-)	33.0 - 100	Greater than 1/3 of area, length, or amount

## Paint/Coating Rating Procedures

### Distress Survey

When performing a distress survey, each painted/coated subcomponent shall also be rated. This is shown in Figure 19 if **BRED**<sup>1</sup> is used. (Note: the screen is slightly different if sampling is used, but it is not shown here for brevity). The applicable rating will be chosen from the paint rating drop-down list. Any sub-components not painted will not have a rating. Recall from [Figure 8](#) that if the Component-Section is not inventoried as painted/coated, the paint/coating portion of the screen is not visible. In those cases and when certain subcomponents are painted the paint will be evaluated as part of the subcomponent distress.

If a distress survey is being copied for re-inspection (see [Chapter 2](#)), the paint ratings copy over as well.

If **BRED**<sup>2</sup> is not used, each subcomponent needs to be appropriately marked as shown in Figure 19 (no sampling).

The screenshot shows the Builder RED software interface. The menu bar includes File, View, Tools, and Help. The toolbar has icons for Inventory, Inspection Summary, Save, Cancel, and Comment. The main window displays an inspection for '013 - Building Two - C10 INTERIOR CONSTRUCTION - C1010 PARTITIONS - OFFICE - C101001 FIXED PARTITIONS - Wall - Drywall w/Stud Framing'. On the left, a tree view shows categories like A10 FOUNDATIONS, B20 EXTERIOR ENCLOSURE, and C10 INTERIOR CONSTRUCTION. The right side shows detailed information: Component: C1010 PARTITIONS, Material Category: C101001 FIXED PARTITIONS, Component Type: Wall - Drywall w/Stud Framing. The inspection date is 3/24/2014, and the sample quantity is 2,500 SF. The type is set to 'Distress Survey' and method to 'Not Sampling'. The 'Painted/Coated' checkbox is checked. Below this is a table for 'Defect Free' and 'Paint/Coating Defect Free (D/F)'. The table has columns for Subcomponent, N/A, Defect Free, Distresses, Inspected, Paint N/A, Paint D/F, and Paint Rating. Rows include Connections, Frame/Supports, Insulation, Joints, Surface, Trim, and Wall. Most rows show 'Distresses' checked under 'Defect Free' and 'Painted/Coated' checked under 'Paint Rating'. At the bottom, there's an 'Inspected By:' field and a timestamp of 3/24/2014 2:10 PM.

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

**Figure 19. Distress Survey Screen When Component-Section Painted/Coated**

### *Direct Condition Rating*

When performing a direct condition rating, evaluate the Component-Section paint or coating in its entirety. The “% Deteriorated” is to be based on the painted portions only. Refer to Figure 20 for marking paint ratings in BRED. (Note: the screen is slightly different if sampling is not used, but it is not shown here for brevity).

Recall from [Figure 14](#) that if the Component-Section is not inventoried as painted/coated, the paint/coating portion of the screen is not visible. In those cases and when certain subcomponents are painted the paint will be evaluated as part of the overall Component-Section rating.

If a direct rating is being copied for re-inspection (see Chapter 3), the paint ratings copy over as well.

If BRED is not used, the paint rating is recorded as shown in Figure 20 (with sampling).

The screenshot shows the BRED software interface with the following details:

- File Bar:** File, View, Tools, Help.
- Toolbar:** Inventory, Inspection Summary, Save, Cancel, Comment.
- Inspection Details:**
  - Inspection ID: 013 - Building Two - C10 INTERIOR CONSTRUCTION - C1010 PARTITIONS - OFFICE - C101001 FIXED PARTITIONS - Wall - Drywall w/Stud Framing
  - Component: C1010 PARTITIONS
  - Material Category: C101001 FIXED PARTITIONS
  - Component Type: Wall - Drywall w/Stud Framing
  - Insp. Date: 3/24/2014
  - Type: Distress Survey (radio button)
  - Method: Sampling (radio button)
  - Sec Qty: 2,500 SF
  - Samp. Qty: 2,500 SF
  - Location: Initial Sample
  - % Insp: 100.00%
  - Non-representative:
  - Painted/Coated:
- Rating Scales:**
  - Direct Condition Rating Scale:** Radio buttons for Green +, Green, Green -, Amber +, Amber, Amber -, Red +, Red, Red -.
  - Paint/Coating Condition Rating Scale:** Radio buttons for Green +, Green, Green -, Amber +, Amber, Amber -, Red +, Red, Red -.
- Bottom Status Bar:** Inspected By: Fisher, Mark; Current Inspector: Fisher, Mark; Date: 3/24/2014; Time: 2:13 PM.

**Figure 20. Direct Rating Screen When Component-Section Painted/Coated**

## ***Using Sampling in Condition Assessments***

Performing a condition survey inspection by sampling should be done when the Component-Section in question is

- large,
- complex, and/or
- discontinuous.

In a practical sense, this means that the entire Component-Section is not readily viewable.

The decision to sample or not will be a judgment call made by the inspector based on size of the Building and quantity of Component-Sections. Sampling rates, as long as they meet the minimum addressed below, are up to the discretion of the inspector and/or organizational policy. Both sampling and non-sampling approaches can be used in the same Building for different Component-Sections.

In addition to the data described in [Performing Condition Assessments](#), the following data is also required for condition assessments that are performed using sampling:

- **Sample Qty** - Enter the quantity of the Section inspected at the current sample location.
- **% Inspected** - (Read-Only) - Displays the total percentage of the Section that has been inspected for the current inspection date. This value is calculated by summing the sample quantities of all sample locations and dividing by the Section quantity.
- **Sample** - Displays the location name of the sample. When selecting the button  adjacent to this field allows you to
  -  Add a new sample location.

Inspection Date:	11/3/2011	<input type="button" value=""/>	Type	<input checked="" type="radio"/> Direct Rating <input type="radio"/> Distress Survey	Method	<input type="radio"/> Not Sampling <input checked="" type="radio"/> Sampling	Results	CSCI: <span style="background-color: green; color: white; padding: 2px;">95</span>									
Inspector:	Inspector: Inspector, Joe																
Sample Qty:	5	EA	Sample:	Default Inspection Sample			<input type="button" value=""/>	<input type="button" value="Add Sample"/> <input type="button" value="Edit Sample"/> <input type="button" value="Delete Sample"/> <input type="button" value="Sample Comment"/>									
Inspected:	100%																
<p>Direct Condition Rating Scale</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><input type="radio"/> Green +</td> <td><input type="radio"/> Amber +</td> <td><input type="radio"/> Red +</td> </tr> <tr> <td><input checked="" type="radio"/> Green</td> <td><input type="radio"/> Amber</td> <td><input type="radio"/> Red</td> </tr> <tr> <td><input type="radio"/> Green -</td> <td><input type="radio"/> Amber -</td> <td><input type="radio"/> Red -</td> </tr> </table>									<input type="radio"/> Green +	<input type="radio"/> Amber +	<input type="radio"/> Red +	<input checked="" type="radio"/> Green	<input type="radio"/> Amber	<input type="radio"/> Red	<input type="radio"/> Green -	<input type="radio"/> Amber -	<input type="radio"/> Red -
<input type="radio"/> Green +	<input type="radio"/> Amber +	<input type="radio"/> Red +															
<input checked="" type="radio"/> Green	<input type="radio"/> Amber	<input type="radio"/> Red															
<input type="radio"/> Green -	<input type="radio"/> Amber -	<input type="radio"/> Red -															

You can create the new location from existing sample locations or create a new sample location.

- Edit the current sample location name.
  - Delete the current sample name.
  - Add comments regarding the current sample.

• **Non-Representative** - Mark this checkbox if the condition of the current sample is not representative of the Component-Section as a whole. Representative samples are those that are in a “typical” condition for the Component-Section as a whole. This does not mean that they are exactly in the same condition. Some variation is expected. Non-representative samples are those that are not in typical condition for the Component-Section as a whole. This can be either significantly better or worse condition. Non-representative samples are considered isolated and thus have less of an influence on the condition index than representative samples.

## *Representative Sample Creation and Selection*

- A general walk through of the Building is recommended prior to selecting samples to ensure that they are representative.
  - Use discrete Building discontinuities (e.g. entire rooms, wall corners) to help delineate sample boundaries especially when the quantity has a unit of measure of square feet (square meters) or linear feet (meters).
  - When part of the Building (i.e. specific room) is selected for sampling, it is recommended, but not required, that all of the Component-Sections present at that location be inspected as part of the sample (e.g. all Component-Sections for all Systems found in a room).

- Specific Component-Sections with a unit-of-measure of “each” should most often be sampled individually, (e.g. sample five of 25 interior doors as five separate samples).
- Sample sizes for Component-Sections with a unit-of-measure of “each” need not be restricted to one.
- Sample sizes are often situation specific. Try to have them of approximate equal size, but be practical. There will be situations when this is not possible or practical.
- Ensure that all samples are properly identified as to location, including room number or name, if applicable, (think of the next person – can he/she easily find this location?).
- When sampling is used for a given condition survey inspection cycle, either the distress survey or the direct condition rating approach may be used for a given Component-Section. However, do not combine the methods for a given Component-Section (i.e. distress survey for one sample and direct condition rating for another sample).

#### *Minimum Representative Sample Quantities*

- The numbers of representative (as to condition) samples to be taken of a specific Component-Section with the unit-of-measure of “each” are:
  - One (1) sample when the Component-Section quantity is 1-4.
  - Two (2) samples when the Component-Section quantity is 5-9.
  - At least three (3) samples when the Component-Section quantity is 10 or more.
  - AND a minimum of 10% of the Component-Section quantity.
- The number of representative (as to condition) samples to be taken of a specific Component-Section with the unit-of-measure of square feet (square meters) or linear feet (meters) are:
  - One (1) sample when the number of potential samples is 1-4.
  - Two (2) samples when the number of potential samples is 5-9.
  - At least three (3) samples when the number of potential samples is 10 or more.
  - AND a minimum of 10% of the Component-Section quantity.

#### *Sampling Suggestions*

- Specific rooms inside of a Building (e.g. “Room 110”), where all of the various Component-Sections in that room would be sampled (e.g. ceiling, walls, wall finish, floor, floor covering, light fixtures, etc.).

- Exterior wall locations (e.g. “North Wall,” etc.), where all Component-Sections included in that wall would be sampled (e.g. wall surface, doors, windows, awnings, lights, etc.).
- A Component-Section consisting of ten roof ventilating fans (all ten are the same), samples could be “Fan 1”, “Fan 2”, etc.
- Interior doors denoted by room number (e.g. a hallway has many doors leading to rooms, so select the requisite number of doors with each door being a sample).
- Specific structural columns, beams, frames, trusses.
- A specific Component-Section (e.g. fireplace) with a quantity greater than one, but still a small number (e.g. two or three) and they are geographically separated such that they cannot be inspected together. Inspect each one as a sample with a specific location. All need to be inspected to be in conformance with the minimum sample quantity addressed above.
- If an entire Component-Section happens to be co-located at a defined sample location where other Component-Sections were sampled (e.g. a fireplace in a room selected for sampling of walls, ceiling, flooring, etc.), that Component-Section can either be included in the sample location or simply inspected without sampling.
- In general, do what makes sense, but ensure that the rules are followed.

## Using the Rapid Inspection Method

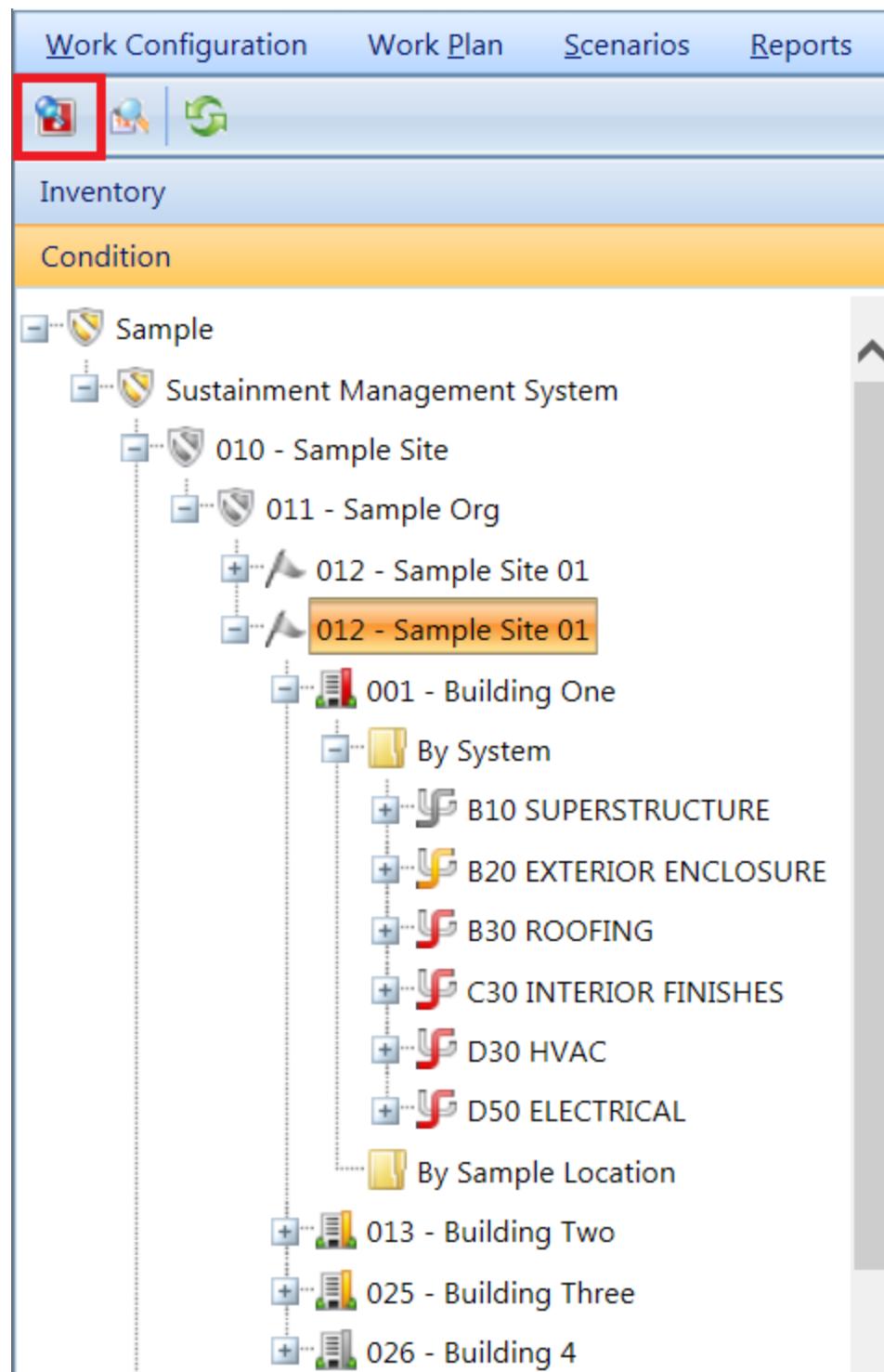
In an effort to speed the data input process, BUILDER offers a rapid inspection method feature for rapidly creating direct condition assessment records. Here are some examples of situations in which the feature might be used:

1. You have just renovated a family housing complex, and multiple systems have been completely replaced in every house. You need to record these new conditions in your BUILDER database.
2. You have just completed your BUILDER inventory, have very limited resources for a physical inventory but have staff members who are intimately knowledgeable of conditions in most of your Buildings.
3. You structured your BUILDER inventory so that every door, window, room wall/floor/ceiling, etc. is identified as a Component-Section (see the inventory for 1131 Administration Building in the Example database as an illustration of this). Now that you have to perform an assessment, you find that every door, window, room wall/floor/ceiling, etc. must have its own inspection record but you want to do a quick walkthrough of the building and record component ratings for everything.

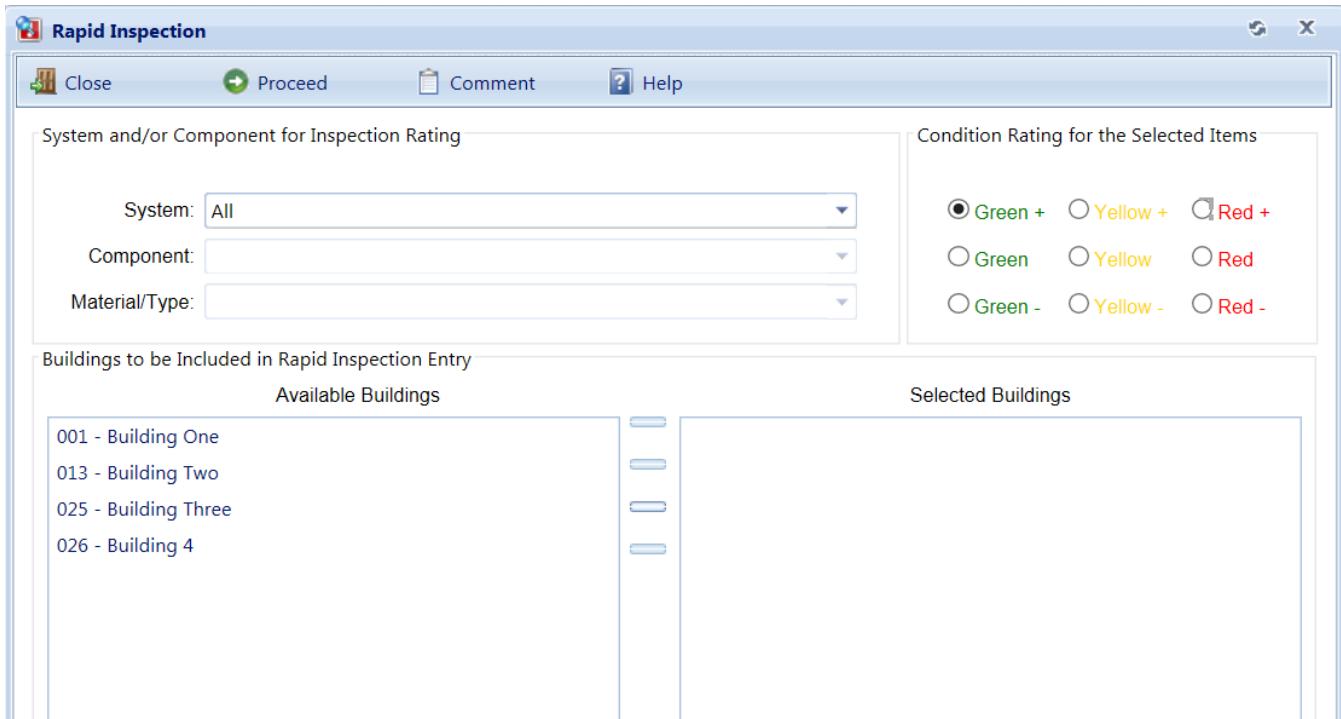
In all of these situations, you want to input condition ratings for Systems or Components for which you already know the rating. This is when Rapid Inspection can be very handy.

To launch the Rapid Inspection window:

1. Highlight the smallest organizational node (Site, Complex, or Building) in the condition assessment tree that contains all of the Buildings that the rapid inspection will be used in.
2. Right-click the node and select **Rapid Inspection** from the dropdown list.  
Alternatively, click the **Rapid Inspection** icon on the inspection toolbar menu:



The Rapid Inspection window will appear:



The following data are required before you can proceed with the rapid inspection process:

- **System and/or Component for Inspection Rating**- Select the system for which inspections are to be created from the dropdown list. If you do not specify a component, then every Component-Section belonging to that kind of system in a selected Building(s) will have an assessment created for it. However, if you specify a component but not a Material/Type, then every Component-Section belonging only to that kind of component in a selected Building(s) will have an assessment created for it. Finally, if you specify a Material/Type, then every Component-Section of that material and type in the selected Building(s) will have an assessment created for it.
- **Condition Rating for the Selected Items** - Select a Condition Rating for all of the inspections to be created.
- **Buildings to be Included in Rapid Inspection Entry** - Select the Buildings for which condition assessments are to be created by using the arrow keys to build the list of Selected Buildings from the Available Building list.

You may also enter a comment to be recorded with every inspection created by clicking the **Comment** button in the toolbar. When all data has been entered, click the **Proceed** button to initiate the rapid inspection process. If you do not wish to perform the rapid inspection, click the **Close** button.

For the examples discussed above, here is how this feature may have been used:

1. You know that all of the roofs were rebuilt in the family housing complex. Select all of the houses, select Roofing as the system, and select G+ as the rating. Clicking **Proceed** will create an inspection record with condition rating G+ for every Component-Section in the roofing system of every selected house.
2. Have each staff member sit down sequentially with BUILDER to do the following process: Select sets of Buildings within his/her expertise that all have the same known condition for certain Systems or Components. Use the Rapid Inspection feature to create inspections as appropriate. If two staff members happen to input records for the same Component-Section, the later rating will overwrite the earlier rating if the ratings are done on the same day. (BUILDER allows only one inspection record per day per Component-Section.)
3. You have scanned the interior doors in your walk-through of the Building, and they are all in good condition (rating G). Your inventory has 50 interior door Component-Sections, each door identified with the room it is in. Use rapid inspection by selecting the Building, selecting Interior Construction/Interior Doors, and selecting condition rating G. Clicking **Proceed** will automatically create 50 inspection records, one for each interior door Component-Section.

## Knowledge-Based Inspection Scheduling

### Overview

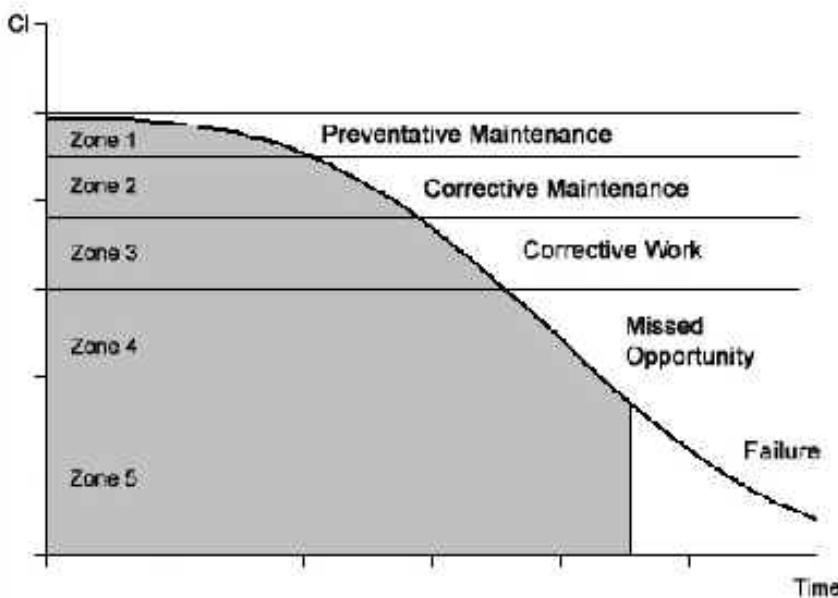
The Knowledge-Based Inspection (KBI) feature in BUILDER is designed to select from your entire inventory a subset of Component-Sections that should be considered for inclusion in the next round of condition assessments. Additionally, the feature is able to determine the type of condition assessments to perform. The selection algorithm is based on pieces of data (knowledge) associated with the Component Section that are compared with user-defined parameters.

**Note:** The KBI feature is an optional tool. It can assist in selecting candidates for condition assessment if other structured programs for scheduling inspections are lacking.

For an explanation of the Knowledge-Based Inspection Principles., please refer to the [Condition Assessment Manual](#) for

## Determining When to Perform a Condition Assessment

As stated above, the **KBI**<sup>1</sup> feature needs to compare knowledge about the Component-Section with user-defined parameters to determine when condition assessment are to be performed. These parameters are input when [creating a standard](#) and must be input for each of the five condition zones shown in the figure below. See the [Knowledge-Based Condition Assessment Manual](#) for explanation of each condition zone.



The user-defined parameters for the KBI feature and include:

- **CI Lower Bound.** The lower bound of the **CI**<sup>2</sup> range of the condition zone. Providing the lower bound for each zone breaks the condition curve as shown above.
- **Maximum Inspection Interval.** The maximum amount of time, in years, between condition assessments in each condition zone.
- **Number of Inspections in Zone.** The maximum number of condition assessments that should be performed in each condition zone.
- **Degradation Factor.** The ratio of the maximum relative rate of deterioration to the expected rate of deterioration when a condition assessment is triggered. That is, if the deterioration rate were set to 2, any measured deterioration rate greater than twice the expected rate would trigger another inspection.

---

<sup>1</sup>Knowledge-Based Inspection

<sup>2</sup>Condition Index

Based on the projected **CI**<sup>1</sup> of the Component-Section, the **KBI**<sup>2</sup> feature determines which range the Component-Section is in, and how many inspections to perform in that range. It then calculates the time between inspections to accomplish this. This interval is compared to the maximum inspection interval, and the lesser of the two becomes the allowable inspection interval.

When the time since the last inspection becomes greater than the allowable interval between condition assessments, the Component-Section is flagged for inclusion into the next round of assessments. In addition, if the rate of deterioration of the CI seen by the last condition assessment is greater than the allowable rate of deterioration determined by the deterioration factor discussed above, the Component-Section will also be flagged for inclusion into the next round of assessments.

### Determining the Type of Condition Assessment to Perform

Once the **KBI**<sup>3</sup> program selects the subset of recommended Component-Sections for inclusion into the next round of assessments, it must determine the method that will be used for each condition assessment. Based on the CI range that the component is projected to be in, the general guidelines below apply.

Range	Procedure
1	Direct
2	Distress
3	Distress
4	Direct
5	Direct

In some instances, a more detailed level of condition assessment may be warranted regardless of the guidelines recommended above. If a more detailed assessment was performed previously, the same method will be recommended again for zones 1 - 3. This means, for example, if the Component-Section is still in range 1 and the previous condition assessment method was a distress survey, the KBI program would recommend a distress survey be performed.

### Using the KBI Feature in BUILDER 3.3

To use the **KBI**<sup>4</sup> feature in BUILDER , click the Inspection Schedule button from the inspection navigation toolbar, as shown in the image below. Alternatively,

---

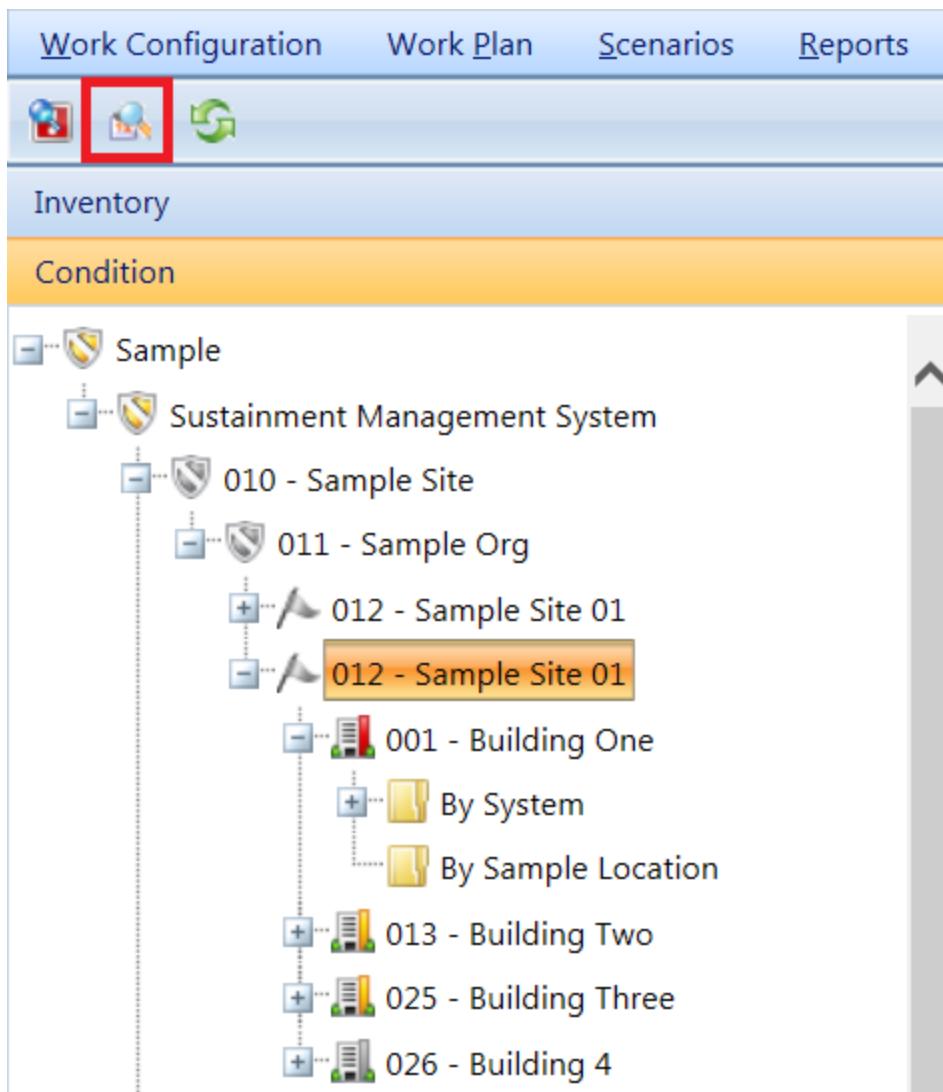
<sup>1</sup>Condition Index

<sup>2</sup>Knowledge-Based Inspection

<sup>3</sup>Knowledge-Based Inspection

<sup>4</sup>Knowledge-Based Inspection

right-click the location in the Condition navigation tree and select **Inspection Schedule** from the dropdown list.



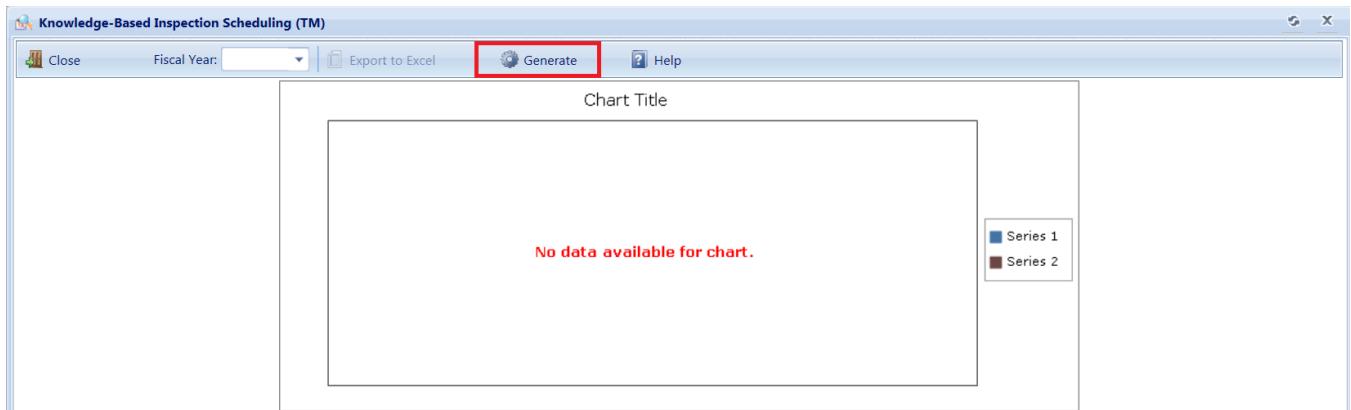
The Knowledge-Based Inspection Scheduling window will appear.

#### Toolbar

- **Close** - Use this button to close the Knowledge-Based Inspection Scheduling window.
- **Export to Excel** - Use this button to export the current inspection schedule to a Microsoft Excel spreadsheet.
- **Generate Items** - Use this button to generate a new inspection schedule.

## Creating an Inspection Schedule

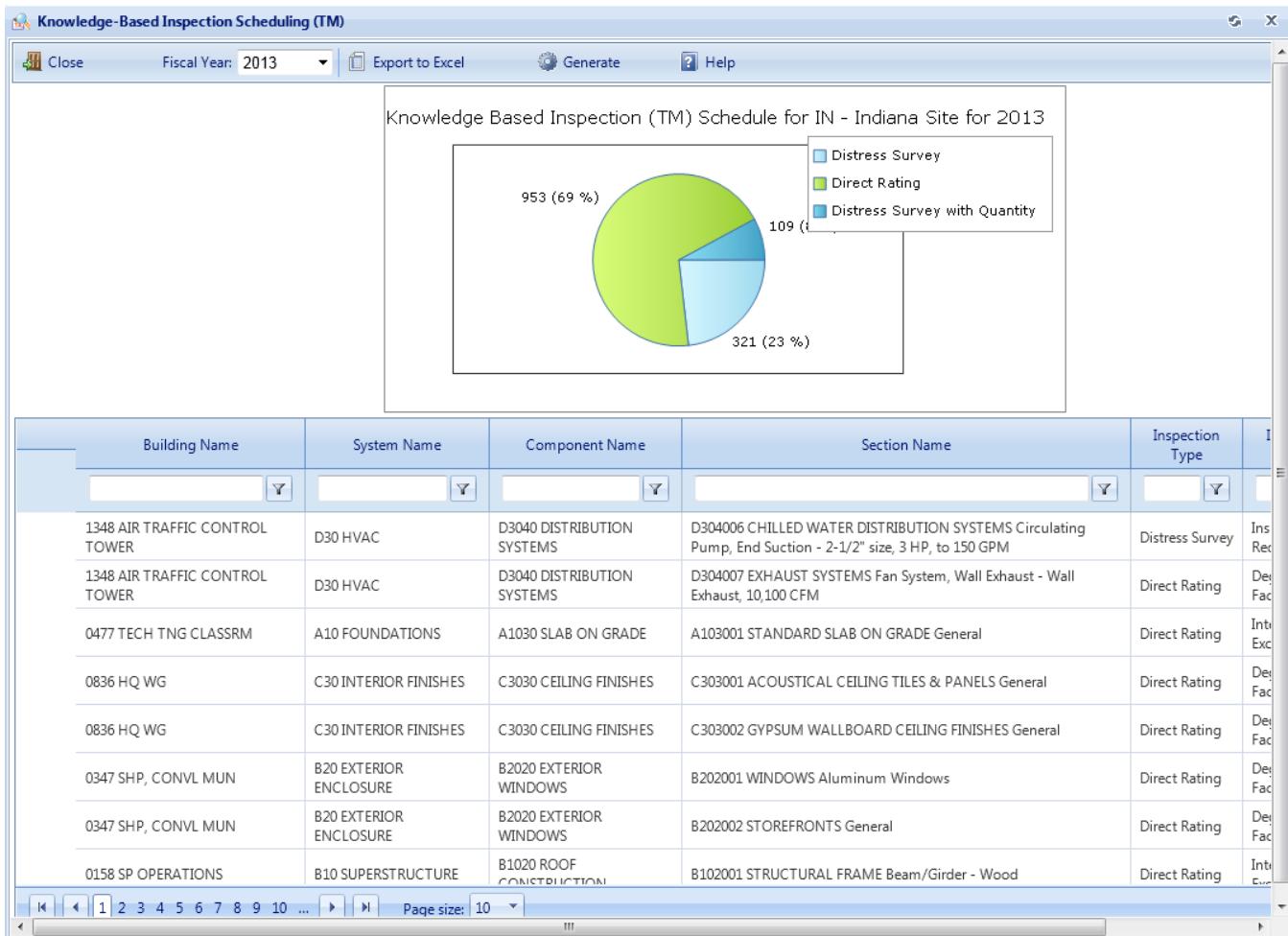
To create a Knowledge-Based Inspection Schedule click the **Generate** button in the toolbar.



The Generate Inspection Schedule window will appear. Using the [policy sequence](#) defined in the [Site data](#), the **KBI**<sup>1</sup> Schedule will be generated and shown in the window. The schedule can then be exported to a Microsoft Excel spreadsheet by clicking the **Export to Excel** button in the toolbar. It is important to note that generating a new inspection schedule will delete the current inspection schedule.

---

<sup>1</sup>Knowledge-Based Inspection



## Overview

### Introduction

Facility Condition Assessment (FCA) is one of the primary processes of a facility life cycle asset management program. The **FCA**<sup>1</sup> process results in a better understanding of the physical condition and readiness of an organization's facilities, along with the reliability of their systems and components. It also helps identify work candidates for facility sustainment/restoration/modernization (SRM) repair projects. It is a critical aspect of the shift towards a proactive versus reactive facility management strategy. Instead of keeping facilities operational by relying primarily on corrective repairs (after a system or component has failed due to significant loss of function), it focuses on condition-based repairs which can be planned prior to failure. A condition-based approach can result in higher performing facilities at lower life-cycle cost.

---

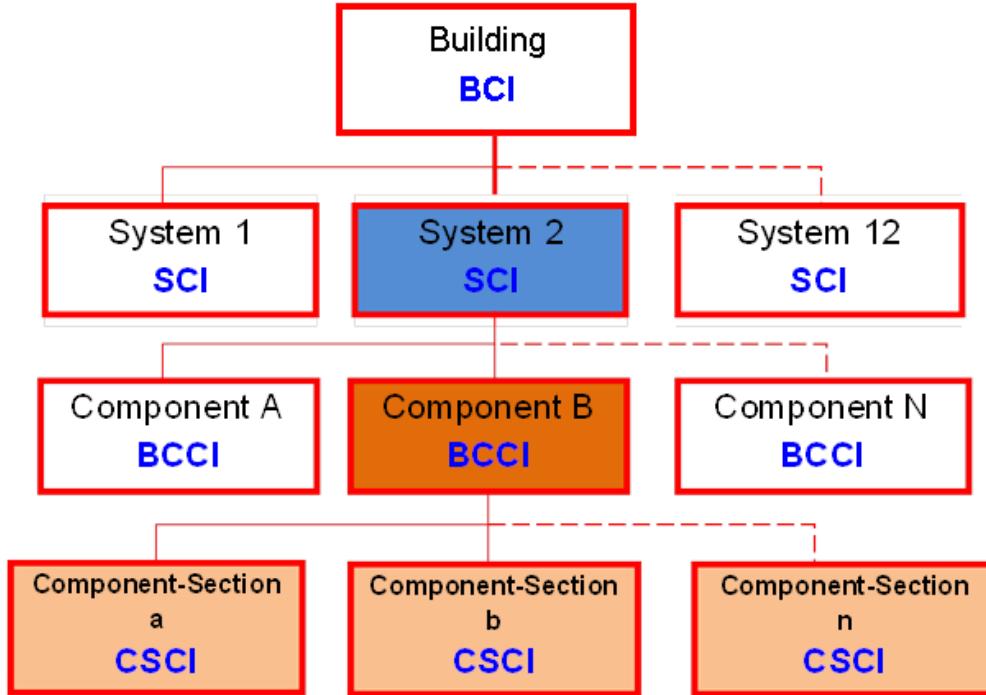
<sup>1</sup>Facility Condition Assessment

This manual describes the procedures for performing FCA inspections for facility related components using the Sustainment Management System (SMS) with BUILDER™. These condition surveys are not detailed engineering assessments, preventive maintenance inspections, or specialized inspections, but they do satisfy the requirements necessary for routine facility management activities including long-range budgeting and **SRM**<sup>1</sup> planning. The facility assessment process provides an objective and generalized framework to better identify problem areas that will require a more thorough investigation through detailed or specialized assessments to diagnose specific problems.

Prior to performing a Facility Condition Assessment, knowledge of the Building's systems and components present is necessary, since assessments are done against these components, not against the Building as a whole. This information about the systems and components that make up a building is called the BUILDER Inventory. BUILDER has a vast library of predefined component types that an assessor will select from, and the inventory collection process involves identifying the type, quantity, and year installed for all pertinent components. These components are also organized into systems and sub-systems according to the Uniformat classification hierarchy. When a specific instance of a component is recorded, this is called a Component-Section in BUILDER, and represents a single component assembly or collection of like components to be managed as a single unit. In this manual, the term "component" may be used interchangeably to mean a Component-Section. The BUILDER facility condition assessment process discussed in this manual directly supports the computation of a condition index for Building Component-Sections, known as the Component-Section Condition Index (CSCI), which is the fundamental metric used in BUILDER. The CSCI is aggregated to compute a condition index metric at the system level (SCI), Building level (BCI), and site/organizational level.

---

<sup>1</sup>Sustainment, Restoration, & Modernization



**Figure 1. Condition Index Hierarchy**

A condition-based building repair strategy requires condition information be collected at a component level, and that this condition information relate to loss of component function. Every component of a Building has a primary function that it performs. This function is the reason that the component was constructed or installed in the Building. It may also serve a number of secondary or tertiary functions. For example, for a door component, the primary function is to provide safe entry/egress of authorized movements while limiting unwanted movements of people (security), or other objects (water or moisture). The secondary functions would relate to aesthetics, and thermal and air control, among others.

Over the course of a building component's life in service, it will likely experience a deterioration of its physical condition due to general aging, use in service, and exposure to a number of external or environmental factors. This CONDITION DETERIORATION is manifested in DISTRESS(es) which adversely affect that component's current and future ability to perform its primary and/or secondary functions. These distresses include cracks, leaks, holes, corrosion, overheating, excessive vibration, animal/insect damage, as well as general deterioration or damage. These distresses can be observed during a condition assessment process. As a result, the fundamental purpose of a condition assessment process is to measure (qualitatively and/or quantitatively) a component's ability to perform its required functions, considering the presence of accumulated distress.

There are two levels of the condition assessment process in BUILDER. The most detailed approach, the Distress Survey, involves the individual identification and recording of the type and nature of distresses observed for a component. The presence of these distresses recorded, in addition to the severity and density, results in a condition index metric which directly relates to the level of condition deterioration, and indirectly to the loss of function due to this deterioration.

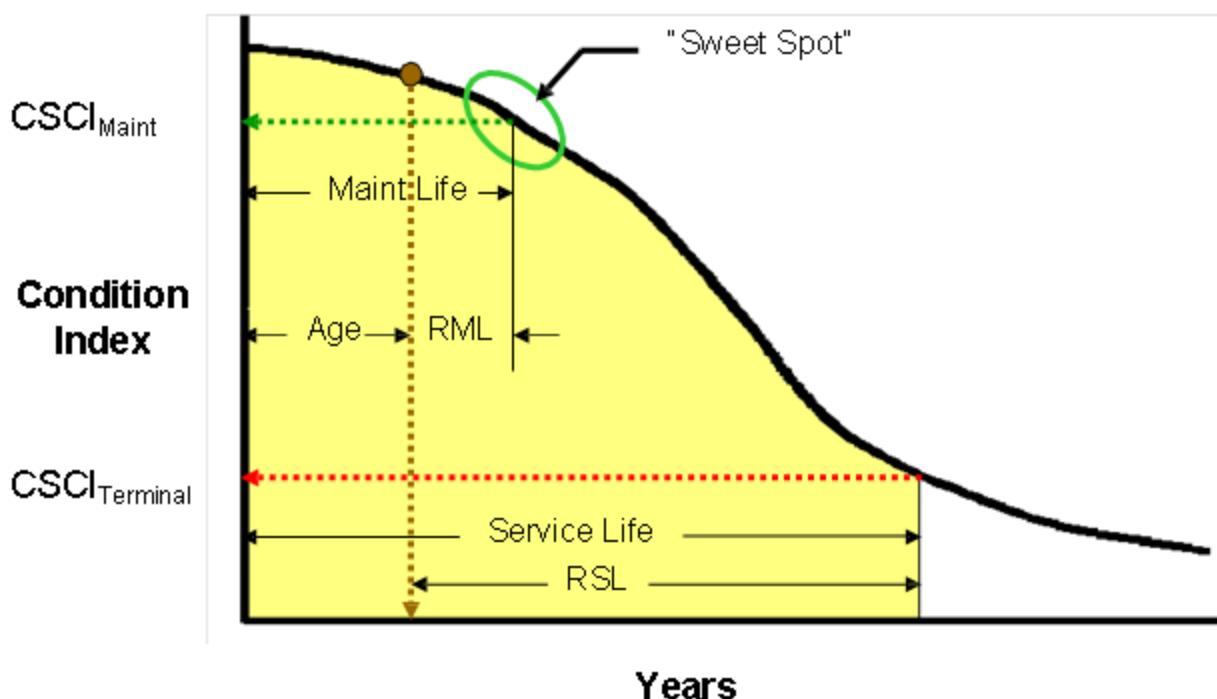
A less labor intensive approach in terms of data recording (but not necessarily in terms of observation time), is the Direct Rating method, where a single qualitative rating is assigned to the component based on condition observations (taking all distresses into account). This also results in a condition index metric which relates to the level of deterioration and the loss of function. This abbreviated Direct Rating approach is often better suited to initial baseline assessments where the components are inventoried and data is initially loaded into BUILDER.

Both condition assessment methods discussed above require accurate and thorough physical observations during the assessment process. This sometimes may require an invasive (but non-destructive) look at the internal subcomponents of a component, if applicable (considering safety). It typically requires interviewing building occupants or maintainers to capture variations in component performance (versus what can currently be observed during an inspection). These assessments do not take the place of regulatory or specialized inspections, but may indicate the need for such. The intent of these assessments is a resulting metric that accurately reflects its current and future loss of function, if any of individual components and thus the systems that they make up.

BUILDER has default expected service life values for all possible Component-Sections. These values are a compilation derived from several sources, and serve as an initial gross estimate. In reality, the actual values can have a wide range due to the multitude of variables that affect how long something will last. One of the reasons for performing a condition assessment is to establish and calibrate the predicted condition index vs. age curve as illustrated in Figure 2. From this, the RML and the RSL can be more accurately estimated. In BUILDER, the default service life values serve as an initial “seeding” of the prediction models and give a reasonable estimate of life. As condition data are added over time, the service life (and more importantly the remaining service lives) are automatically adjusted in BUILDER to give better estimates as to when a specific Component-Section is expected to fail and must be replaced or rehabilitated.

The most efficient point in the life cycle when corrective action should be performed is rarely near or after the failure state has occurred. In this context, corrective action is a broad term that encompasses maintenance and/or repair work associated with reducing or eliminating the distresses (cracks, deterioration, damage, etc.) negatively affecting a Component-Section. As these distresses

accumulate, the Component-Section approaches what is referred to as the "sweet spot" (see Figure 2) for maintenance and repair. The theoretical "sweet spot" is a narrow range of **CSCI**<sup>1</sup> values that represent the economically optimum condition where maintenance/repair work should be performed. Performing maintenance work when the Component-Section condition is in this range minimizes the penalty costs incurred from deferring maintenance and results in life cycle cost savings. In general, the theoretical "sweet spot" is a **CSCI**<sup>2</sup> range of 70 to 80 based on the associated condition index scale. The practicable "sweet spot" represents a User defined condition standard for triggering work. The standard, which can be different for different Component-Sections, is a minimum desired condition level. This standard is based on desired performance and risk criteria, including building use, building importance, component importance, etc. Variables to this include building use, building importance (represented by the Mission Dependency Index [MDI]), component importance, and other factors. (Note: In this context "maintenance" is a broad term that encompasses all work associated with reducing or eliminating the distresses found in a Component-Section. It does not mean preventive maintenance).



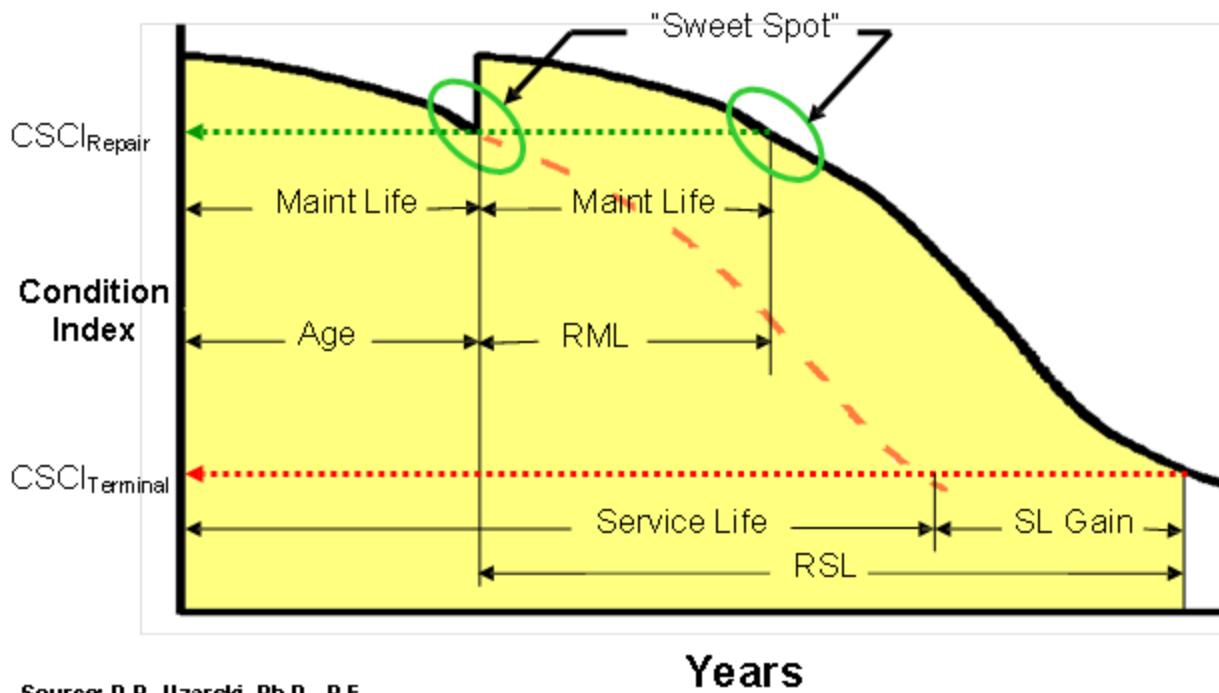
Source: D.R. Uzarski, Ph.D., P.E.

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

Figure 2. Component-Section Life Cycle Condition Curve

When a Component-Section is replaced, the life cycle curve essentially resets, using condition and service life information measured over the previous component's life cycle, to predict future deterioration rates and life. Performing maintenance and/or repair does not reset the life cycle curve. Instead, the **CSCI**<sup>1</sup> experiences a step increase and remaining service life is consequently extended. The service life extension (measured in terms of years) is a function of the extent of the work performed (as represented by **CSCI**<sup>2</sup> gain) and the age when the work was completed. In theory, maximum **CSCI**<sup>3</sup> gain from repair is to a value of 100, but the post-work **CSCI**<sup>4</sup> will be less if not all of the distresses are eliminated, as is usually the case. A new maintenance life is also set. Figure 3 displays these concepts.



Source: D.R. Uzarski, Ph.D., P.E.

Figure 3. Component-Section Life Cycle Condition Curve after Maintenance

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

<sup>3</sup>Component-Section Condition Index - a condition rating for the component section

<sup>4</sup>Component-Section Condition Index - a condition rating for the component section

## **Knowledge-Based Condition Survey Inspection Types**

BUILDER offers different types of condition survey inspections. Each is described in detail in subsequent chapters in this manual. The purpose here is to address what they are and their suggested application. Sampling (discussed in detail later in this chapter) is permitted for all of the approaches and desired if the Component-Section is large, complex, and/or discontinuous.

Building Component-Section condition survey inspections encompass:

- Distress surveys with distress quantities
- Distress surveys with distress density
- Direct condition ratings
- Paint ratings

### **Distress Survey with Distress Quantities**

The distress survey procedure with distress quantities is the most accurate and reproducible approach. It also provides a record of the type of distresses present (e.g. cracked), their severity levels (e.g. High), and their quantity (e.g. 20 LF) for the Component-Section. It also provides for an accurate computation of density. This survey type can be accomplished at any time as it provides the most complete picture of the Component-Section and, thus, provides information of maximum value for a range of managerial decision support needs (discussed below). However, this survey is also the most time consuming and expensive to accomplish.

### **Distress Survey with Density Estimation**

The distress survey procedure is similar to that with distress quantities except the quantities are not normally recorded. Since quantities are not recorded, density cannot be computed. Instead, the density (distress quantity divided by sub-component amount) is estimated within a predefined range. The utility value of the information is less than if the quantities were recorded, but the process is faster and more economical. However, the error rate is higher. Distress quantities may be collected for the basis of computing density on those occasions when estimating is difficult or uncertain.

### **Direct Ratings**

The direct condition rating procedure is a less accurate, but faster method for performing a condition survey. It involves visually inspecting each Component-Section, evaluating that item against a set of rating criteria, and selecting the appropriate rating. No information is collected regarding distresses.

## **Paint Ratings**

Paint ratings are used to evaluate painted surfaces. Based on the original work of Marshall, et al. from the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL), the rating is similar to direct ratings.

Normally, when sampling is applied to Component-Sections, sampling is applied to the paint (if painted), as well.

## **Knowledge-Based Condition Survey Inspection Objectives**

Several objectives result from performing condition surveys. These include:

- Determine quantitative condition of the Component-Section using the Component-Section Condition Index (**CSCI**<sup>1</sup>),
- Determine the aggregate (roll-up) condition indexes for the Building component (**BCCI**<sup>2</sup>), system (**SCI**<sup>3</sup>), Building (**BCI**<sup>4</sup>), and higher,
- Provide a measurable condition history trend,
- Compute measurable condition deterioration rates,
- Calibrate life cycle condition prediction model curve (refine the **CSCI**<sup>5</sup>) (Figure 2),
- Compute (or re-compute) the remaining maintenance life from condition model trends based on the established “sweet spot,”
- Determine the broad scope of work for planning purposes, including a scoping cost estimate for future maintenance or Component-Section replacement,
- Determine at what point replacement becomes a more viable option than repair,
- Compute (or re-compute) the remaining service life , and
- Provide a quality control for completed work (post-work assessment).

---

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Building Component Condition Index

<sup>3</sup>System Condition Index - a condition rating for the building system.

<sup>4</sup>Building Condition Index - a condition rating for the overall building.

<sup>5</sup>Component-Section Condition Index - a condition rating for the component section

Every time a condition survey inspection is performed on a Component-Section the **CSCI**<sup>1</sup> will be computed for it. Additionally, all of the roll-up **CI**<sup>2</sup>'s will be updated as well. Also, the rate of deterioration, remaining service life and remaining maintenance lives are also computed. BUILDER always displays the **CSCI**<sup>3</sup> as of the last inspection, the estimated **CSCI**<sup>4</sup>, and the remaining service and remaining paint lives (if painted) as of the current calendar day.

### Suggested Condition Survey Inspection Type Applications

Table 1 lists the condition survey inspection purpose or objective and the type of survey that can be conducted to meet that purpose. As can be seen, the distress survey with distress quantities satisfies all of the purposes. However, sometimes this is an "overkill" of inspection resources. Inspection savings will result by matching the least costly method to satisfy the need.

Table 1. Condition Survey Inspection Matrix by Objective

Objective	Distress with Qty	Distress	Direct
1. Determine Condition of Component-Section ( <b>CSCI</b> ) <sup>5</sup>	Best	Better	Good
2. Determine Roll-Up Condition of System, Building, etc.	Best	Better	Good
3. Provide a Condition History	Best	Better	Good
4. Compute Deterioration Rates	Best	Better	Limited
5. Calibrate <b>CSCI</b> <sup>6</sup> Prediction Curves	Best	Better	Limited
6. Compute/Re-compute <b>RML</b> <sup>7</sup>	Best	Better	Limited
7. Determine Broad Scope of Work for Planning	Good	Limited	Limited
8. Establish when Cost Effective to Replace	Better	Good	No
9. Compute/Re-compute <b>RSL</b> <sup>8</sup>	Best	Good	Limited

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Condition Index

<sup>3</sup>Component-Section Condition Index - a condition rating for the component section

<sup>4</sup>Component-Section Condition Index - a condition rating for the component section

<sup>5</sup>Component-Section Condition Index - a condition rating for the component section

<sup>6</sup>Component-Section Condition Index - a condition rating for the component section

<sup>7</sup>Remaining Maintenance Life

<sup>8</sup>Remaining Service Life

10. Quality Control (Post-work Assessment)	Better	Good	No
--	--------	------	----

Although different condition survey inspection approaches can be used for the same objective, there are various factors that need to be considered when selecting the appropriate one. The first relates to where on the life cycle curve the Component-Section is estimated to reside at the time of inspection. Figure 4 displays in a general sense the type of sustainment/restoration (i.e. work) needs based on condition. Figure 5 matches a suggested condition survey inspection type to condition in support of those work needs. For example, if the **RML**<sup>1</sup> is believed to be years away, a direct rating may suffice. However, if the **RML**<sup>2</sup> is believed to be a year or less, and it is desired to do the work to correct the deficiencies, the distress survey with quantities is needed.

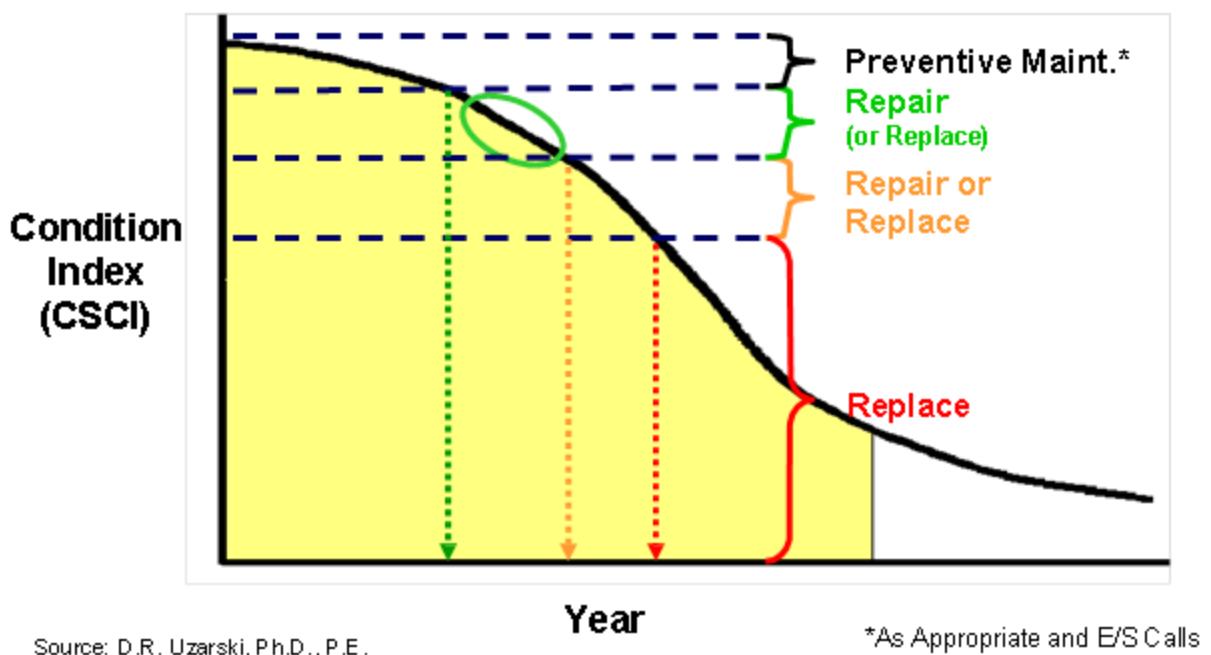


Figure 4. General Sustainment/Restoration Needs Based on Condition

<sup>1</sup>Remaining Maintenance Life

<sup>2</sup>Remaining Maintenance Life

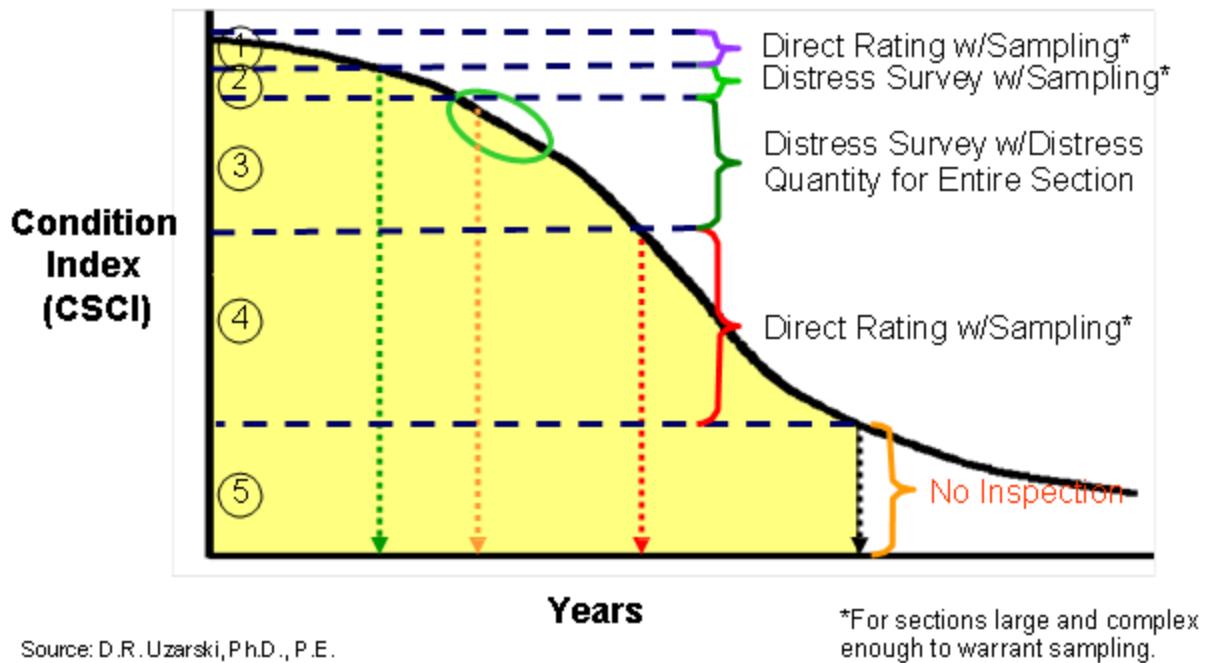


Figure 5. Suggested Condition Survey Inspection Types for Specific Condition Ranges (Zones)

### Condition Zones

In general, each condition zone indicated in Figure 5 will have its own condition survey inspection requirements. These are addressed below.

#### Zone 1 – “Preventive Maintenance (PM) Sustainment” Zone

Zone 1 is the “PM Sustainment” zone. However, although no work (other than preventive maintenance and/or emergency/service calls, if needed) is planned for this zone, condition surveys are needed to satisfy objectives 1 through 6 (see Table 1). Direct ratings and paint ratings satisfy this requirement. (Note: computing the **RSL**<sup>1</sup> is not of prime consideration here, since it will typically be well into the future). Also, although future work requirements (objective 7) are generated from these surveys, most often those requirements will occur past the normal planning horizon.

Objective 10, quality control (post-work assessment), is also accomplished in this zone because of the increase in **CSCI**<sup>2</sup> from the work performed. If the post-work assessment of the Component-Section reveals a “Defect Free” condition, either

<sup>1</sup>Remaining Service Life

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

the distress survey or the direct rating approach may be used. If the intent was not to attain a “Defect Free” condition, the distress survey (with quantities or density estimation) should be done to document the remaining distresses. This survey should be done as soon as practicable after the work is completed. (Note: Unless overridden by a condition survey, BUILDER assumes a post-work CSCI<sup>1</sup> of 95 unless the Component-Section is replaced. Replacement gives a CSCI<sup>2</sup> of 100.)

#### *Zone 2 - “Corrective Maintenance (CM)” Approach Zone*

Zone 2 is the “CM Approach” zone. Although no work (other than preventive maintenance and/or emergency/service calls, if needed) is usually planned for this zone, condition assessment surveys are needed to satisfy purposes 1 through 7 (see Table 1). However, since the corrective maintenance “sweet spot” is being approached, a greater precision to the condition assessment is needed. Thus, the distress survey with density estimation is suggested.

The CSCI boundary between Zone 1 and Zone 2 is a function of the beginning of the “Sweet Spot” zone (Zone 3, discussed next). That CSCI value, rate of deterioration, and the desired long-range work plan horizon (e.g. five years) are used to compute the Zone 1/Zone 2 boundary. For example, if the “Sweet Spot” CSCI value is 70, the rate of deterioration is 2 points/year, and the long-range work plan horizon is five years (five year plan), the “Sweet Spot” approach zone begins at a CSCI of 80.

#### *Zone 3 – “Appropriate Corrective Maintenance” Zone*

Zone 3 is the “Appropriate Corrective Maintenance” zone and is defined by the “sweet spot.” Meeting the objective of quantifying distresses for work accomplishment (objective 8) is most important. This quantification is needed to refine the scope of the work and accurately estimate the cost in preparation of funding and work accomplishment. This creates a “job” for the “job jar.” To do this, a distress survey type (not a direct survey) with distress quantities is recommended. Objectives 1 through 6 will also be met, but they are of secondary importance at this point. Sampling can be used for this, but if sampling is accomplished, 100% should be done. Paint ratings, if painted, will normally be accomplished at the same time. If it is determined that not all of the Component-Section requires work, consideration should be made to split the existing Component-Section into two or more parts.

---

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

Figure 5 shows that this zone extends past the “sweet spot.” Due to competing priorities, budget constraints, and other factors, not all work will be executed as planned or the plan may require that some work be deferred. With deferment comes continued degradation that must be documented through a distress survey with distress quantities. Also, continued degradation may progress to the point where replacement becomes the preferred alternative. Objective 9 calls for that analysis and is met here. The key here is the timing of these surveys. Timing will be discussed below under the topic of “Knowledge-Based Condition Survey Inspection Timing and Frequency.”

The **CSCI**<sup>1</sup> boundary between Zone 2 and Zone 3 (the hitting of the “sweet spot”) is set by the facility manager. It is based on two factors. One is economic criteria for minimizing the penalty cost that accrues from deferring work. The second is the condition standard at which the Component-Section should not drop below. Often the economic criterion is rolled into the setting of the standard. Technically, the boundary should be “sweet spot” minus one year to allow for a quantification of scope and the addition of the work to the job jar “just in time” for the next annual, well defined and scoped work plan. This boundary is set in BUILDER and serves as the “trigger point” for executing (or at least identifying the Component-Section candidates from which to prioritize) work.

The “sweet spot” need not be the same for all Buildings or Building Component-Sections. Building importance (as measured by the Mission Dependency Index or other means) and component importance are criteria to use. The idea is that the most important or critical inventory will be maintained to a higher level than the least important inventory.

#### *Zone 4 – “Missed Opportunity” Zone*

Often (and unfortunately) the condition of Component-Sections will degrade well past the “sweet spot” before work is accomplished on it. In the “Missed Opportunity” zone, life remains for the Component-Section, but the degradation is such that replacement or major rehabilitation is now the best option from an economic perspective. The replacement or rehabilitation may be either sustainment or restoration depending on whether or not the degradation is more or less “normal” or clearly premature, respectively. Once in this zone, the primary objective is to determine how much life remains (objective 10). The direct rating satisfies this goal. Since replacement is warranted, there is no longer a need to document distresses. Since painting will be included in the replacement or rehabilitation (if the Component-Section is painted), there is no longer a need to do paint ratings. The

---

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

estimated **CCI**<sup>1</sup> will be used in the **CI**<sup>2</sup> roll-ups as that will provide sufficient accuracy. Objectives 1 through 5 and 7 are also met.

### **Zone 5 – “Dead” Zone**

At this point, the Component-Section is past its service life. For all practical purposes, it is dead and immediate replacement or major restoration is the only viable option (assuming that the Component-Section is still needed). No further condition surveys are needed. The estimated **CSCI**<sup>3</sup> value satisfies objectives 1 through 3. All of the other objectives either cannot be met or they are meaningless with **CSCI**<sup>4</sup>s so low. If the Component-Section is past its normally expected service life the work would be considered sustainment. If the “death” is premature, the work would be considered restoration.

### *Exceptions*

The generalized discussion above applies to a great many Component-Sections. However, there will be situations and/or Component-Sections that dictate a different condition survey inspection strategy. Four such situations are described below. Other specific situational based possibilities may occur in practice.

**Non-maintainable** Occasionally, a Component-Section is not maintainable (other than applicable preventive maintenance). In these cases, it will be simply replaced when needed. This generally involves two cases. The first is a run-to-failure option with minimal disruption due to the failure. An example would be an inexpensive bathroom exhaust fan. This is a low risk situation. Condition surveys are not really needed in this situation. High risk situations, however, require that replacement be accomplished prior to failure because of the magnitude of the resulting disruption. An example would be a sump pump in a high water table area. In this case, the “sweet spot” is set at a point in time prior to the end of the service life. The number of years ahead is based on the tolerable risk. (The determination of service life is NOT an exact science.)

**Sub-Component Accessibility** Distress surveys require the viewing and recording of distress data for each subcomponent of the parent Component-Section. Direct ratings, on the other hand, are focused on the entire Component-Section (or

---

<sup>1</sup>Coating Condition Index

<sup>2</sup>Condition Index

<sup>3</sup>Component-Section Condition Index - a condition rating for the component section

<sup>4</sup>Component-Section Condition Index - a condition rating for the component section

sample thereof). Unfortunately, sometimes not all of the subcomponents are readily visible during a routine condition survey. This situation is likely for certain HVAC components, especially when in operation. Thus, even though a distress survey may be warranted, it may not be possible, necessitating a direct rating.

**Catastrophic Event** A catastrophic event, (e.g. storm damage, fire, etc.), will alter the life cycle curve for a Component-Section. Often after a catastrophic event, some type of condition survey inspection will be required. The type will depend of the nature and extent of the damage and the urgency for repair.

**Rapid Rate of Deterioration or Short Service Life** These are related in that Zone 1 and possibly Zone 2 may be skipped because the “sweet spot” is rapidly approaching.

### **Knowledge-Based Condition Survey Inspection Timing and Frequency**

Thus far, the discussion has focused on the type of condition survey inspection to perform. Nothing has been said about when or how often they should be accomplished. Traditionally, the frequency of condition survey inspections is set on some sort of a fixed schedule. They may be two year, three year, or something else based on facility importance, available funding, policy and doctrine, and other factors. Unfortunately, some Component-Sections will be inspected too often and others will not be inspected often enough.

### **Knowledge-Based Condition Survey Inspection Scheduling Concept**

The knowledge-based condition survey inspection (KBCSI) approach (US Patent 7,058,544) abandons the fixed schedule approach in favor of a flexible one based on supporting the objectives described above. The **KBCSI**<sup>1</sup> approach looks at the expected **CSCI**<sup>2</sup>s of all of the Component-Sections and uses that information to compute values for **RSL**<sup>3</sup>, **RML**<sup>4</sup>, condition zone location, and rate of deterioration and uses those criteria, plus others, and recommends those Component-Sections for condition survey inspection in a given year. Implementing flexibility requires an understanding of the criteria involved and setting the applicable value to the variable used in the criteria.

#### **Scheduling Criteria**

The criteria for scheduling are listed below, followed by an explanation.

---

<sup>1</sup>Knowledge-Based Condition Survey Inspection

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

<sup>3</sup>Remaining Service Life

<sup>4</sup>Remaining Maintenance Life

- Facility (Building) importance,
- Component-Section importance,
- Service life,
- Remaining service life,
- Maintenance life,
- Remaining maintenance life,
- Rate of deterioration,
- Condition zone,
- Condition standards, and
- Maximum time frame between condition surveys.

In the future, other criteria can be used to help schedule a condition survey. Specific criterion may include, but are not limited to: Specific distress tracking, service-call history, and preventive maintenance history.

#### *Building Importance*

Logically, the Buildings that are most important should demand more attention than the Buildings that are least important. Importance is measured by the Mission Dependency Index. If a **MDI**<sup>1</sup> analysis has not been performed, building use can be used as a surrogate metric.

#### *Component-Section Importance*

Also, logically the Component-Sections that are most important or critical to building usefulness should demand more attention than the Component-Sections that are least important. A metric for measuring Component-Section has been developed by **ERDC-CERL**<sup>2</sup>. As an alternative, building importance could be used as a variable.

#### *Service Life*

All other factors being equal, Component-Sections with shorter service lives need to be inspected more often than those with longer lives because less change is expected from year to year.

---

<sup>1</sup>Mission Dependency Index - measures the relative importance of a Building

<sup>2</sup>U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory

### *Remaining Service Life*

Remaining service life is important when the component resides in zones 1 and 5. In zone 1, if the **RSL**<sup>1</sup> is long, inspection is needed less often than if it is a short service life. Also, in zone 4, condition survey inspections should be scheduled at specific points prior to **RSL**<sup>2</sup> going to zero.

### *Maintenance Life*

Component-Sections with shorter maintenance lives need to be inspected more often than those with longer lives because less change is expected from year to year. If the frequency is too far apart, it is possible to slip by the “sweet spot” between condition surveys.

### *Remaining Maintenance Life*

The remaining service life will set the timing for condition surveys. **RML**<sup>3</sup> minus one year is a key time for performing a condition survey inspection. Also, as the IMPACT program (developed by **ERDC-CERL**<sup>4</sup>) and deployed with BUILDER will recommend work needed in future years, which can then be imported back into BUILDER. This forms the basis for the long range work plan. Scheduled year minus one year should be a condition survey inspection with distress quantities.

### *Rate of Deterioration*

Component-Sections that are rapidly deteriorating need to be inspected more often, especially if the deterioration rate is greater than expected.

### *Condition Zone*

As discussed above, the condition zone serves to determine the type of condition survey to perform. It also affects frequency when viewed with **RML**<sup>5</sup> and **RSL**<sup>6</sup>.

---

<sup>1</sup>Remaining Service Life

<sup>2</sup>Remaining Service Life

<sup>3</sup>Remaining Maintenance Life

<sup>4</sup>U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory

<sup>5</sup>Remaining Maintenance Life

<sup>6</sup>Remaining Service Life

### *Condition Standards*

Standards affect condition zone range, building importance, and Component-Section importance, which in turn affect condition assessment frequency.

### *Maximum Time frame between Condition Surveys*

Applying the above criteria may result in specific Component-Sections not getting a condition survey inspection for several years. This criteria assures that no more than a certain number of years transpire between condition surveys.

### **Creating Knowledge-Based Condition Survey Inspection Plans**

BUILDER Version 3.0 was the first version that with a feature for creating condition survey inspection plans. Version 3.3 continues to provide users with this feature. Users may use any or all of the criteria described above for establishing the timing and frequencies for Component-Section inspections in a given year. Users can set the desired variables for the criteria.

Implementing BUILDER requires creating and populating the BUILDER database that includes the collection of system inventory data. Usually an initial condition survey inspection is also conducted of all Component-Sections. The **KBCSI**<sup>1</sup> approach is recommended here, too. Not only will the appropriate condition survey type be selected, but also some Component-Sections may not require a condition survey at that time. Likely candidates for "no condition survey" are those that have a service life and are relatively new, and those that are past their service life. However, the user is cautioned that in order for **KBCSI**<sup>2</sup> to properly plan, the inventory must be first collected and accurate, especially as to material/equipment type, component type, and age. The use of rapid data modeling approaches for inventory may result in considerable error. (Refer to BUILDER Inventory Manual). This error may result in **KBCSI**<sup>3</sup> assigning an incorrect condition survey type and year.

### **Preventative Maintenance Inspections (PMI) and Condition Surveys**

Preventive maintenance inspections (PMI), when implemented, are conducted periodically to inspect, clean, adjust, replace (or clean) filters, or otherwise maintain certain Building components, particularly equipment. These **PMI**<sup>4</sup>s provide an opportunity for PM inspectors to perform distress surveys of all of the sub-components associated with a specific component. This is due to the

---

<sup>1</sup>Knowledge-Based Condition Survey Inspection

<sup>2</sup>Knowledge-Based Condition Survey Inspection

<sup>3</sup>Knowledge-Based Condition Survey Inspection

<sup>4</sup>Preventative Maintenance Inspection

subcomponent access afforded by the PMI<sup>1</sup>. Having PM<sup>2</sup> inspectors do these surveys will overcome the difficulty (and sometime impossibility) of performing distress surveys by other building inspectors during the course of a routine building inspection. As discussed earlier, a lack of subcomponent accessibility limits condition surveys to direct ratings.

### **Inspecting Through Sampling**

Sampling is a way of breaking up the assessment of large or spatially dispersed components into more manageable parts, each part being assessed individually. The use of sampling can also potentially provide some efficiencies in the assessment process, because the sum of the individual sample quantities need not equal the overall quantity of the component.

Performing a condition survey inspection by sampling should be done when the component is large, complex, and/or discontinuous. In a practical sense, this means that the entire component is not readily viewable. Depending on organizational policies or guidance to the inspector, sampling may not always be allowed, but if it is, the decision to sample or not will be a judgment call made by the inspector based on building size and component amount. Sampling rates (above the minimum addressed below) are up to the discretion of the inspector and/or organizational policy. Both sampling and non-sampling approaches can be used in the same building for different component. Samples may be representative or non-representative.

Representative samples are those that are in a "typical" condition for the Component-Section as a whole. This does not mean that they are exactly in the same condition. Some variation is expected. Non-representative sample are those that are not in typical condition for the Component-Section as a whole. This can be either significantly better or worse condition. The designation as "representative" or not will affect the condition index. Non-representative samples are considered isolated and thus have less of an influence on the condition index than representative samples.

### **Representative Sample Creation and Selection**

Representative sample locations and sample sizes are determined by the layout of the given building. There are a few simple rules to follow.

- A general walk through of the building is recommended prior to selecting samples to ensure that they are representative.

---

<sup>1</sup>Preventative Maintenance Inspection

<sup>2</sup>Preventive Maintenance

- Use discrete building discontinuities (e.g. entire rooms, wall corners,) to help delineate sample boundaries especially when the quantity has a unit of measure of square feet (square meters) or linear feet (meters).
- When an area of the building (i.e. specific room) is selected for sampling, it is recommended, but not required, that all of the Component-Sections present at that location be inspected as part of the sample (e.g. all Component-Sections for all systems found in a room)
- Specific Component-Sections with a unit-of-measure of “each” should most often be sampled individually, (e.g. sample five (5) of twenty five (25) interior doors as five (5) separate samples).
- Sample sizes for Component-Sections with a unit-of-measure of “each” need not be restricted to one (see discussion below on “The Importance of Sample Locations”).
- Sample sizes are often situation specific. Try to have them of approximate equal size, but be practical. There will be situations when this is not possible or practical.
- Ensure that all samples are properly identified as to location, including room number or name, if applicable, (think of the next person/inspector – can he/she easily find this location?).
- When sampling is used for a given condition survey inspection cycle, either the distress survey or the direct condition rating approach may be used for a given Component-Section. However, do not combine the methods for a given Component-Section (i.e. distress survey for one sample and direct condition rating for another sample).

### **Minimum Representative Sample Quantities**

The number of representative (as to condition) samples to be taken of a specific Component-Section with the unit-of-measure of “each” are:

- One (1) sample when the Component-Section quantity is 1-4.
- Two (2) samples when the Component-Section quantity is 5-9.
- At least three (3) samples when the Component-Section quantity is 10 or more.
- AND a minimum of 10% of the Component-Section quantity.

The number of representative (as to condition) samples to be taken of a specific Component-Section with the unit-of-measure of square feet (square meters) or linear feet (meters) are:

- One (1) sample when the Component-Section quantity is 1-4.
- Two (2) samples when the Component-Section quantity is 5-9.

- At least three (3) samples when the Component-Section quantity is 10 or more.
- AND a minimum of 10% of the Component-Section quantity.

### **Sampling Suggestions**

- Specific rooms inside of a building (e.g. “Room 110”), where all of the various Component-Sections in that room would be sampled (e.g. ceiling, walls, wall finish, floor, floor covering, light fixtures, etc.).
- Exterior wall locations (e.g. “North Wall,” etc.), where all Component-Sections included in that wall would be sampled (e.g. wall surface, doors, windows, awnings, lights, etc.).
- A Component-Section consisting of ten roof ventilating fans (all ten are the same), samples could be “Fan 1”, “Fan 2”, etc.
- Interior doors denoted by room number (e.g. a hallway has many doors leading to rooms, so select the requisite number of doors with each door being a sample).
- Specific structural columns, beams, frames, trusses.
- A specific Component-Section (e.g. fireplace) with a quantity greater than one, but still a small number (e.g. two or three) and they are geographically separated such that they cannot be inspected together. Inspect each one as a sample with a specific location. All Component-Sections will need to be inspected to be in conformance with the minimum sample quantity addressed above.
- If an entire Component-Section happens to be co-located at a defined sample location where other Component-Sections were sampled (e.g. a fireplace in a room selected for sampling of walls, ceiling, flooring, etc.), that Component-Section can either be included in the sample location or simply inspected without sampling.
- In general, do what makes sense, but ensure that the rules are followed.

### **Non-Representative Samples**

- Inspect non-representative Component-Sections in addition to the required representative sample quantity amounts.
- Ensure that the non-representative samples are designated as such.

## Unusual Condition Situations

Recall, a primary objective for conducting condition survey inspections is to compute a **CSCI**<sup>1</sup> for the Component-Section. This **CSCI**<sup>2</sup> is used for a variety of purposes including developing work plans. Also, it was stated above, that non-representative samples should be inspected and classified so, when warranted. These non-representative samples may be in significantly worse condition than the Component-Section as a whole and may merit work sooner than the Component-Section as a whole (i.e. the work cannot wait until the remainder of the Component-Section deteriorates to the point of needing work). In these cases, it is possible that BUILDER will not trigger work for the Component-Section because the overall condition does not warrant it (the **CSCI**<sup>3</sup> may be in the “Do Nothing” zone). These situations offer managerial alternatives. One alternative is that the distresses can be “flagged” for early work (discussed in the next chapter). Another is that Component-Section can be split with the portion that is significantly worse forming its own Component-Section. An example is a Component-Section of structural columns in a warehouse. Generally, they are in condition where no work actions are needed EXCEPT one column that was severely damaged by a forklift. Splitting this one column into its own Section with its resulting low **CSCI**<sup>4</sup> is an option.

## Sampling to Quantify Work Needs

Sampling may also be used when a distress survey with distress quantity is used to quantify/refine work needs. However, the sampling rate must be increased to 100%. For Component-Sections with a unit-of-measure of square feet (square meters) or linear feet (meters) the choice to sample or not is based on convenience. It may be easier to record all on a smaller sample-by-sample basis than for an entire Component-Section. Component-Sections with a unit-of-measure of “each” should always be inspected individually when work needs are being quantified. For example, if a Component-Section consists of ten (10) roof ventilating fans, each fan would be a separate sample and each would be inspected. Thus, ten (10) samples would result.

---

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>Component-Section Condition Index - a condition rating for the component section

<sup>3</sup>Component-Section Condition Index - a condition rating for the component section

<sup>4</sup>Component-Section Condition Index - a condition rating for the component section

## The Importance of Sample Locations

The importance of sample locations cannot be overemphasized. The above topics briefly touched upon sample locations, but two important considerations of inspection data management (past, present, and future) and field data collection practicalities are addressed below.

First, the sample location creation possibly provides a basis for collecting condition survey data for a number of different Component-Sections. For example if a room were chosen as a location, the walls, ceiling, light fixtures, etc. could all be inspected and associated with the same location. This can be very useful for future inspections even if all of the Component-Sections are not inspected in a given cycle, because a method of sorting inspection data is by sample location. These locations can be used year after year and will be illustrated later in this manual.

Second, the creation of sample locations will affect sampling rates and sizes. It was stated earlier that Component-Sections with the unit-of-measure of “each” should be sampled individually. However, sometimes this is impractical. If a sample location has been created that covers a specific area, such as a room, the Component-Section may have a quantity of more than one in that room. A logical clustering of individual items may form a practical basis for a sample. An example would be a Component-Section quantity of one-hundred (100) light fixtures in a building. A room being sampled may have four fixtures out of that total Component-Section quantity. The intent would be to not inspect each light fixture in the sample location room. Rather, all four light fixtures would encompass a single sample. Under these circumstances it becomes important to make all sample sizes roughly the same for a given Component-Section. That is, avoid one sample of four (4) lights and another sample of forty (40) lights.

## BUILDER Remote Entry Database (BuilderRED/BRED)

To facilitate the condition survey inspection process, BUILDER Remote Entry Database (BuilderRED, or BRED) software was developed for use with pen-based electronic clipboards, laptop computers, and desktop computers. The most current version of **BRED**<sup>1</sup> is 3.1.7 and was used for this manual's screen shots.

**BRED**<sup>2</sup> is a Windows™ 98/NT/2000/XP/7 Vista application. Use of this electronic method of data collection is optional, but it does offer the following advantages over paper forms. These include:

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

- Distress definitions are available on screen,
- Recorded condition survey data are easily uploaded into the BUILDER database,
- Data loading from paper to computer is eliminated, reducing error and saving time,
- Previous condition survey data and sample locations are available on-screen,
- Drop-down lists of the Component-Sections pertaining to the inspected building are provided,
- The condition survey checklists are provided on screen,
- Component-Section amounts are displayed on-screen,
- A tally is provided that shows the number of samples and percent sampled,
- Inventory can be collected for loading into BUILDER, and
- Inventory can be verified and updated during the condition survey.

There are some challenges, as well. These include:

- Battery life is limited possibly necessitating the carrying of spare batteries,
- There is an additional piece of equipment to carry,
- The pen-based computer can feel heavy and awkward,
- Under bright sunlight conditions, the screen may be hard to read (depending on model), and
- If a computer crashes or software malfunction occurs, productivity suffers.

The illustration of **BRED**<sup>1</sup> usage will be introduced in the remaining chapters of this manual, but is beyond the manual scope to describe detailed **BRED**<sup>2</sup> operations. A help file is provided with the **BRED**<sup>3</sup> software that covers the range of operations and usage, including data transfer.

Virtually any pen-based tablet computer or laptop may be used to operate BRED. **BRED**<sup>4</sup> will also work on desktop computers. Normally these computers, as purchased, have sufficient memory and disk space. **BRED**<sup>5</sup> does require Windows™ 98, 2000, XT, or XP to operate. Windows™ ME will not work. Also, pen-based tablet computers should not be confused with palm type computers. **BRED**<sup>6</sup> will not work with the latter.

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>3</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>4</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>5</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>6</sup>BUILDER Remote Entry Database (BuilderRED)

## **Inspection Dates of Record**

Each Component-Section in a given building need not be inspected on a given day. In fact, in many instances this will be impossible. However, each Component-Section must be associated with a given date for each inspection cycle. Even if inspecting the Component-Section takes more than one day, only one date shall be reported. If multiple dates are reported, BUILDER will interpret these as totally different inspections. Reasons why the inspection of a Component-Section may take more than one day are: Component-Section amount or complexity, weather interruptions, accessibility, item location, inspector sickness, emergencies, and other priorities.

**BRED**<sup>1</sup> automatically provides for a five (5) day inspection window. Once an inspection date is established for a given Component-Section condition survey inspection, inspectors have five days to complete the survey. The addition of more data, such as another sample, any time within the five days will automatically be associated with the established date.

## ***Inspector Qualifications***

To do a proper condition survey inspection, it is important that the inspector be qualified in the specific task. This entails recognition of the various sub-components, their applicable distress types and severity levels. Also, the inspector must be able to accurately estimate density and measure quantity. Technicians well-versed in civil/architectural, electrical, and mechanical systems will be qualified as inspectors. A team approach will be needed if a single inspector is not well-versed in one or more of these areas.

There may be components present that require inspection by certified personnel. This may include such items as elevators, boilers, fire protection equipment, etc. When present, those components must be inspected as per their prescribed procedures. The results of these specialized inspections should be translated into BUILDER for management use and condition analysis.

Prior to commencing a round of periodic condition survey inspections, it is strongly recommended that inspectors undertake refresher training on the procedures. This will involve:

- Reviewing the distress and component rating definitions,
- Practicing estimating density,
- Practicing measuring quantity,

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

- Reviewing sampling procedures,
- Preparing the survey forms (if used),
- Using the BUILDER Remote Entry Database (BRED) (if used), and
- Performing a practice survey at a benchmark building.

An eye trained for proper observation and an accompaniment by simple diagnostic tests, where applicable, are critical to quality inspections. Know what to look for and record accurately.

## **Condition Survey Inspection Process Tasks**

### **Pre-Condition Survey Tasks**

Prior to performing a condition survey inspection, the inspector must become familiar with the Component-Sections present, building layout, and past inspection findings and sample locations (if any). The BUILDER database can be accessed for this information. Various reports should be run to help the inspector become familiar with the upcoming task.

If **BRED**<sup>1</sup> is to be used (discussed below), the desired Buildings and systems that are to be inspected will be first downloaded from BUILDER and loaded into **BRED**<sup>2</sup>. If BRED is not being used, ensure that an ample supply of blank condition survey worksheets are available. These are provided separately in electronic (Microsoft EXCEL) form with your BUILDER install set. Some inspectors prefer to forgo the worksheets and create their own or record “free form.” All approaches are acceptable, provided correct and accurate data are collected and the results can be easily transferred into BUILDER.

If available, a review should be made of the service call history for the building to see if any of the Component-Sections to be inspected have a “history” since the last condition survey. Recurring problems can translate into distress information even if not apparent at the time of the condition survey. Also, even “one-time” calls can sometimes help explain the reason for observed stains, patches, etc.

Assemble any tools and safety equipment needed for the inspection. These include:

- This manual, especially the distress definitions (perhaps reduced to pocket size),
- Binoculars and mirror (for viewing hard to reach places),
- Flashlight,

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

- Twenty-five (25) foot tape and electronic or laser tape or small measuring wheel,
- Screwdriver, awl, pliers, hammer or mallet,
- Voltmeter, clip-on ammeter, circuit and GFI tester,
- Infrared surface thermometer,
- Ladder,
- Level and plumb bob,
- Camera (if desired for supplementary documentation).

## **Getting Started with BRED**

Prior to actually conducting the condition survey, all planning must be accomplished. This topic was discussed above and includes the knowledge-based scheduling, inventory review, etc. The Buildings and systems associated with the scheduled Component-Sections will need to be downloaded to BRED from BUILDER. Generally, only download enough for a day or two of work.

If the survey is an initial one (no previous inspection), the decision to sample or not and the minimum amount to sample needs to have been made prior to inspecting. Inspectors should always have the discretion to increase the number of samples, if needed, to get a better representation of condition. The actual choice of samples will be made during the inspection. Ensure that they are well spaced and truly representative. Reviewing sampling procedures (described above) is recommended.

If the survey is a re-inspection, it is STRONGLY recommended that the same previously defined sample locations be chosen. If any of those locations are inaccessible, choose substitutes. Always be aware of situations that may demand more representative samples or additional samples be taken. This may be where larger than normal variation is occurring and the inspector feels more representative samples are needed to get an accurate **CSCI**<sup>1</sup> or where uncommon conditions arise necessitating non-representative samples be surveyed. This latter case should be rare.

Once Buildings are downloaded from BUILDER into **BRED**<sup>2</sup>, all Component-Sections and previously defined sample locations are available to the inspector via the tree structure on the left of the **BRED**<sup>3</sup> desktop (see Figure 6). Note: To go the

---

<sup>1</sup>Component-Section Condition Index - a condition rating for the component section

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>3</sup>BUILDER Remote Entry Database (BuilderRED)

"Inventory" click on "Inspections" to toggle between the two commands when you are in the **BRED**<sup>1</sup> software.

Samples can be accessed from the tree in two ways. The first is by the "By Sample Location" portion on the tree (See Figure 6). A second approach is to drill down through "By System" portion of the tree. As shown on Figure 6, this is illustrated for exterior windows. The tree expands down to show the sample locations. If samples have not been previously defined, there will be no sample locations.

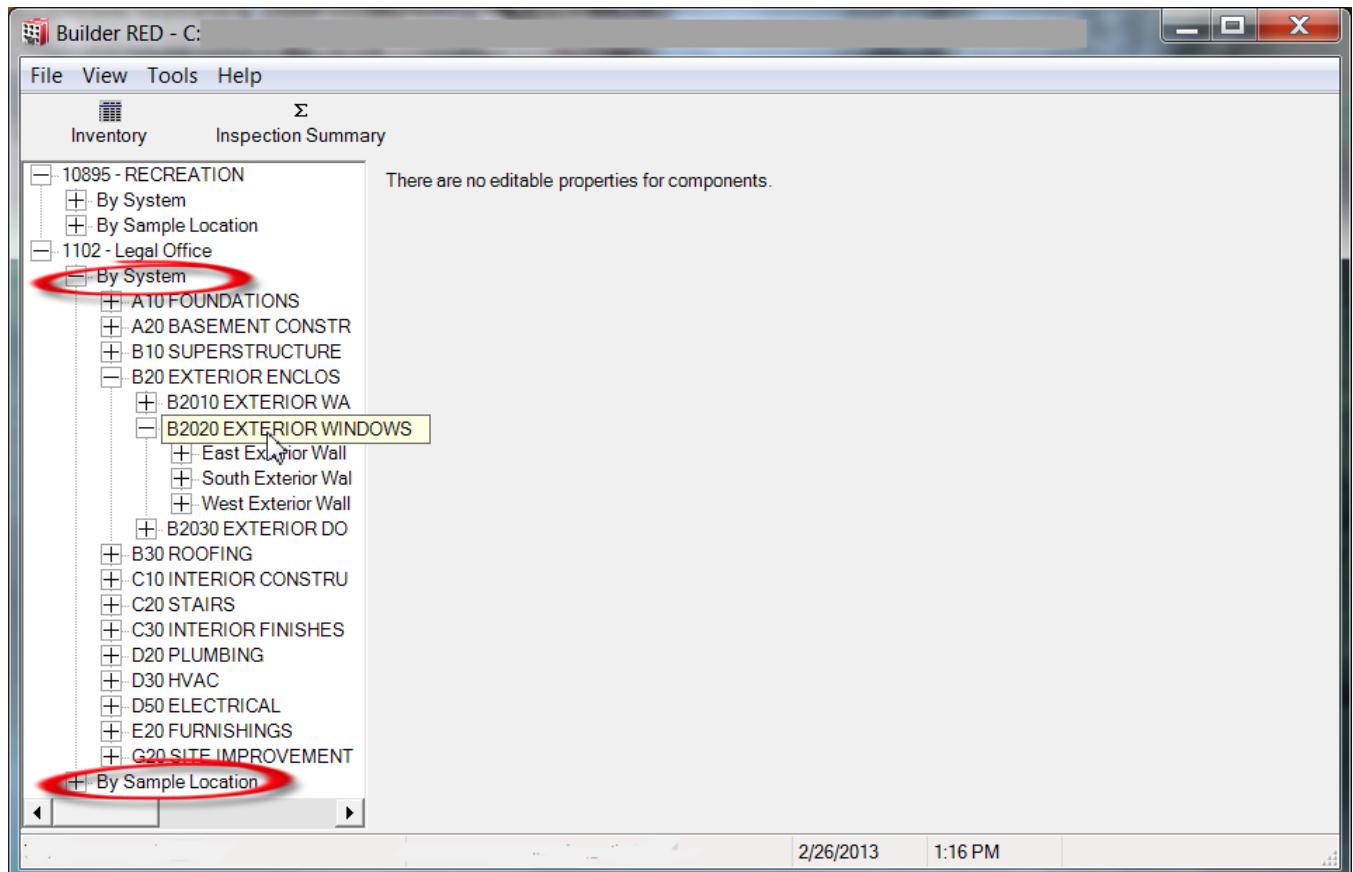


Figure 6. BRED Desktop Illustrating the Component/Sample Location Selection Tree

### Performing the Condition Survey Inspection

A condition survey inspection is more than walking through a building, observing and recording problems. It also involves discussing building conditions with the building manager and occupants. Certain problems may not be obvious or they may be intermittent. A discussion with the people who work or live in the spaces can bring these to the forefront.

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

Certain Building Component-Sections are very difficult, if not impossible, to observe. These may include insulation, structural members, plumbing piping, electrical wiring, and a host of others, depending on the building. When difficult observation occurs, look for subtle clues to ascertain condition. These can include uneven floors, out-of-plumb walls, water stains, sawdust, musky odors, sagging roof ridge lines, discoloration from overheating, unusual noises, etc.

Additionally, certain special buildings, due to their complexity and/or use, will require extra time and attention to detail during the inspection process. Sampling rates may need to be increased or not used at all for certain Component-Sections.

If available, the equipment logs, often kept in the mechanical rooms (or elsewhere) are an excellent source of information to review. They can provide insight to problems and a record of maintenance/work performed.

An interview with the mechanics (HVAC, etc.) is recommended. Typically, certain equipment will be running and cannot be shut down for an inspection and other equipment may not be turned on (e.g. heating units in summer). Often, too, certain subcomponents may not be visible to an inspector. Thus, the interview process can reveal problems (i.e. distresses) that may otherwise be missed. For example, is a pump not running because it is not currently needed for use or is it inoperable?

Other issues include:

- Plan the most efficient inspection sequence and path through the building,
- Record the condition survey findings for later transfer into BUILDER,
- Refer frequently to the direct rating and distress definitions provided in this manual,
- Ensure that all assigned Component-Sections are inspected,
- Ensure that sample unit naming conventions are followed,
- Ensure that the sampling procedures, when used, are followed,
- When re-inspecting and sampling, use the previous sample unit locations, if possible,
- When sampling, be observant to “non-typical” conditions that warrant a non-representative sample inspection,
- Keep track of the inspection summary (discussed below), and
- Be observant to any situation that may warrant inspection, even if the Component-Section is not on the inspection list.

Finally, for safety and efficiency, it is often best to have inspectors work in pairs.  
Work safe!

## Keeping Track of What Has Been Inspected

The “Inspection Summary” button (see Figure 6) provides a tally of the inspection (both distress surveys and direct ratings). As the condition survey continues, the summary updates to provide a status. This helps to ensure that Component-Sections are not missed and that the sample targets are met. Figure 7 displays an example.

Inspection Tally								
Drag a column header here to group by that column.								
	Building	Component	Section Description	Section Qty	UM	No Sam	Sample	Percent Insp
▶	1102 - Legal Office	B2010 EXTERIOR WALLS	South Exterior Wall - B201001	500	SF	1	500	100%
	1102 - Legal Office	B2020 EXTERIOR WINDOW	West Exterior Wall - B202001	2	EA	1	2	100%
	1102 - Legal Office	C1010 PARTITIONS	C101007 INTERIOR GLAZIN	13030	SF	1	13030	100%
	1102 - Legal Office	C1010 PARTITIONS	South Exterior Wall - C10100	13100	SF	1	13100	100%
	1102 - Legal Office	C1020 INTERIOR DOORS	Wood-Personnel - C102001 S	38	EA	1	38	100%
	1102 - Legal Office	C1020 INTERIOR DOORS	West Exterior Wall - C102090	38	EA	1	38	100%
	1102 - Legal Office	D3010 ENERGY SUPPLY	D301002 GAS SUPPLY SYS	200	MBH	1	200	100%
	1102 - Legal Office	D3020 HEAT GENERATING	D302001 BOILERS - General	200	MBH	1	200	100%

Figure 7. Example Inspection Summary

## Post-Condition Survey Tasks

If the inspection findings were recorded on the paper forms, go to the inspection feature in BUILDER and enter the data. If the findings were recorded in BRED<sup>1</sup>, upload the data into BUILDER through the data import feature. Experience has shown that it is easy to make data recording errors if not careful. Review the data immediately after recording to ensure accuracy and make any necessary corrections. The data should be reviewed again after loading into BUILDER for a final quality check.

Refer to the BuilderRED (BRED) help file for details on specific operations.

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

# **Knowledge-Based Condition Assessment Manual**

## **Appendices**

### **APPENDIX A – DISTRESS SURVEY DEFINITIONS**

#### **General Notes**

- These distresses are intended to apply generically to all subcomponents that collectively form building component-sections.
- Structural component-sections and subcomponents must be viewed from a loss of structural integrity perspective. A severity level of High must be recorded should the presence of any distress type compromise the structural integrity of the Component-Section or subcomponent.
- High severity must be recorded for any distress type, regardless of density, that is resulting in an unacceptable health, life/safety, or security risk.
- There are two general rules. One, if a certain distress type is a special case of another distress type, only record the special case. Two, if a certain distress type results from the existence of another distress, record both. Pay particular attention to the notes provided for each distress definition. They often address the application of these rules.
- Where multiple severity levels are present for a given distress type on a given subcomponent, record each separately with the appropriate amount or density, unless stated otherwise for a given distress type. The total amount or density for all severity levels cannot exceed 100%.
- Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BuilderRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BuilderRED.
- Some of the distress definitions described herein make note of a “replacement unit.” Certain component-sections are a collection of units. Examples of this are tiles (ceiling, floor, etc.). If the logical work action for these units is to replace some or all of them (e.g. a cracked ceiling tile will be replaced), then the distress quantity and/or density should reflect the area, length, or quantity of the distressed units rather than the distress itself.
- If during the course of the inspection additional occurrences are found of distress-severity combinations for a given Component-Section subcomponent or subcomponent sample (if sampling), adjust the distress quantity or distress density as necessary.
- Density ranges, when recorded instead of distress quantities, can be estimated as described in Table A1.

- Some subcomponents have a unit of measure of “Each.” Distress densities may apply to the entire unit or a unit portion as indicated in the definitions below. Density must first be applied to an entire unit and then applied across multiple units, if present. For example, if a fan belt has been chewed by a rodent, the distress density for that unit would be 100% regardless of how much of the belt has been chewed because the belt as a whole is adversely affected. But if there are three belts present and the other two are free of that same distress, the density will drop to 33%.
- Distresses for built-up, single-ply, and asphalt shingle roofing (membrane, flashing, etc.) shall follow the ROOFER™ SMS definitions provided in Appendices B through D. Densities may be estimated or distress quantities may be recorded.

Table A1. Distress Density Estimation Visual Clues

<b>Density (%)</b>	<b>Visual Cue (when applicable)</b>
<b>&gt;0-0.1%</b>	Difficult to notice even by careful observation, especially if spotty. (up to about 1" x 12" in a 8' x 10' area; 1/8" in 10' length; or 1 in 1000)
<b>&gt;0.1-1%</b>	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10" x 12" in a 8' x 10' area; 1-1/4" in 10' length; or 1 in 100)
<b>&gt;1-5%</b>	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1' x 4' in a 8' x 10' area; 6" in 10' length; or 1 in 20)
<b>&gt;5-10%</b>	Easily noticeable even if spotty; more than a mere fraction. (up to about 1' x 8' in a 8' x 10' area; 1' in 10' length; or 1 in 10)
<b>&gt;10-25%</b>	Readily noticeable, but less than 1/4 of area, length, or amount.
<b>&gt;25-50%</b>	Very noticeable, but less than 1/2 of area, length, or amount.
<b>&gt;50-&lt;100%</b>	Overwhelmingly noticeable; greater than 1/2 of area, length, or amount.
<b>100%</b>	Entire area, length, or amount.

### Distress Summary Listing

- [Animal/Insect Damaged](#)
- [Blistered](#)
- [Broken](#)
- [Capability/Capacity Deficient](#)
- [Clogged](#)
- [Corroded](#)
- [Cracked](#)

- [Damaged](#)
- [Deteriorated](#)
- [Displaced](#)
- [Efflorescence](#)
- [Electrical Ground Inadequate or Unintentional](#)
- [Holes](#)
- [Leaks](#)
- [Loose](#)
- [Missing](#)
- [Moisture/Debris Contaminated](#)
- [Noise/Vibration Excessive](#)
- [Operationally Impaired](#)
- [Overheated](#)
- [Patched](#)
- [Rotten](#)
- [Stained](#)

## **APPENDIX B – BUILT-UP ROOFING DISTRESS SURVEY DEFINITIONS**

### **General Notes**

- These definitions are applicable to built-up roofing (BUR) surfaces and flashing components.
- Where multiple severity levels are present for a given distress record each separately.
- Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/**BRED**<sup>1</sup>. If distress densities are recorded, distress quantities will be blank in BUILDER/**BRED**<sup>2</sup>.
- If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
- To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below in Table B-1, but may not be applicable for certain distresses.

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

- These distress definitions are reproduced from Membrane and Flashing Condition Indexes for BuiltUp Roofs, Volume II: Inspection and Distress Manual, [USACERL Technical Report M-87/13](#) by Shahin, Bailey, and Brotherson.

Table B-1. Built-up Roofing Distress Density Estimation Visual Cues

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice, even by careful observation; especially if spotty. (up to about 1" x 12" in a 8' x 10' area; $\frac{1}{8}$ " in a 10' length)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty. Careful observation usually needed, if spotty. (up to about 10" x 12" in a 8' x 10' area; $1\frac{1}{4}$ " in a 10' length)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1' x 4' in a 8' x 10' area; 6" in 10' length)
>5-10%	Easily noticeable even if spotty, more than a mere fraction. (up to about 1' x 8' in a 8' x 10' area; 1' in a 10' length)
>10-25%	Readily noticeable, but less than $\frac{1}{4}$ of area or length.
>25-50%	Very noticeable, but less than $\frac{1}{2}$ of area or length.
>50-<100%	Overwhelmingly noticeable; greater than $\frac{1}{2}$ of area or length.
100%	Entire area or length.

### Built-up Roofing (BUR) Distress Summary Listing

- [\(BUR\) Base Flashing](#)
- [\(BUR\) Metal Cap Flashing](#)
- [\(BUR\) Embedded Edge Metal](#)
- [\(BUR\) Flashed Penetrations](#)
- [\(BUR\) Pitch Pans](#)
- [\(BUR\) Interior Drains and Roof Level Scuppers](#)
- [\(BUR\) Blisters](#)
- [\(BUR\) Ridges](#)
- [\(BUR\) Splits](#)
- [\(BUR\) Holes](#)
- [\(BUR\) Surface Deterioration](#)
- [\(BUR\) Slippage](#)
- [\(BUR\) Patching](#)
- [\(BUR\) Debris and Vegetation](#)

- [\(BUR\) Improper Equipment Supports](#)
- [\(BUR\) Ponding](#)

## ***APPENDIX C – SINGLE PLY ROOFING DISTRESS SURVEY DEFINITIONS***

### **General Notes**

1. These definitions are applicable to Single Ply (SP) roofing surfaces and flashing components.
2. Where multiple severity levels are present for a given distress record each separately.
3. Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BuilderRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BuilderRED.
4. If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
5. To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below in Table C-1, but may not be applicable for certain distresses.
6. These distress definitions are reproduced from Membrane and Flashing Condition Indexes for Single-Ply Membrane Roofs-Inspection and Distress Manual, [USACERL Technical Report FM-93/11](#) by Bailey, Brotherson, Tobiasson, Foltz, and Knehans.

Table C-1. Single Ply Roofing Distress Density Estimation Visual Clues

Density (%)	Visual Cue (when applicable)
>0 - 0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1" x 12" in a 8' x 10' area; 1/8" in 10' length)
>0.1 - 1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10" x 12" in a 8' x 10' area; 1-1/4" in 10' length)
>1 - 5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1' x 4' in a 8' x 10' area; 6" in 10' length)
>5 - 10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1' x 8' in a 8' x 10' area; 1' in 10' length)
>10 - 25%	Readily noticeable, but less than 1/4 of area or length.
>25 - 50%	Very noticeable, but less than 1/2 of area or length.

<b>&gt;50 - &lt;100%</b>	Overwhelmingly noticeable; greater than 1/2 of area or length.
<b>100%</b>	Entire area or length.

## Single Ply (SP) Roofing Distress Summary Listing

1. [\(SP\) Base Flashing-Membrane Material](#)
2. [\(SP\) Base Flashing-Coated Metal](#)
3. [\(SP\) Metal Cap Flashing](#)
4. [\(SP\) Embedded Edge Metal](#)
5. [\(SP\) Flashed Penetrations](#)
6. [\(SP\) Pitch Pans](#)
7. [\(SP\) Interior Drains and Roof Level Scuppers](#)
8. [\(SP\) Splits](#)
9. [\(SP\) Ridges](#)
10. [\(SP\) Holes, Cuts, and Abrasions](#)
11. [\(SP\) Defective Seams](#)
12. [\(SP\) Surface Coating Deterioration](#)
13. [\(SP\) Membrane Deterioration](#)
14. [\(SP\) System Securement Deficiencies](#)
15. [\(SP\) Membrane Support Deficiencies](#)
16. [\(SP\) Patching](#)
17. [\(SP\) Debris and Vegetation](#)
18. [\(SP\) Improper Equipment Supports](#)
19. [\(SP\) Ponding](#)

## APPENDIX D – SHINGLE ROOFING (SR) DISTRESS SURVEY DEFINITIONS

### General Notes

- These definitions are applicable to shingled roofing (SR) surfaces and flashing components.
- Where multiple severity levels are present for a given distress record each separately.
- Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/**BRED**<sup>1</sup>. If distress densities are recorded, distress quantities will be blank in BUILDER/**BRED**<sup>2</sup>.

---

<sup>1</sup>BUILDER Remote Entry Database (BuilderRED)

<sup>2</sup>BUILDER Remote Entry Database (BuilderRED)

- If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
- To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below in Table D-1, but may not be applicable for certain distresses.
- These distress definitions are reproduced from ROOFER™: Steep Roofing Inventory Procedures and Inspection and Distress Manual for Asphalt Shingle Roofs, [CERL Technical Report 99/100](#) by David M. Bailey.

Table D-1. Shingle Roofing (SR) Distress Density Estimation Visual Clues

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1" x 12" in a 8' x 10' area; 1/8" in 10' length)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10" x 12" in a 8' x 10' area; 1-1/4" in 10' length)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1' x 4' in a 8' x 10' area; 6" in 10' length)
>5-10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1' x 8' in a 8' x 10' area; 1' in 10' length)
>10-25%	Readily noticeable, but less than 1/4 of area or length.
>25-50%	Very noticeable, but less than 1/2 of area or length.
>50-<100%	Overwhelmingly noticeable; greater than 1/2 of area or length.
100%	Entire area or length.

### Distress Summary Listing

- [\(SR\) Step Flashing](#)
- [\(SR\) Metal Cap Flashing](#)
- [\(SR\) Edge Metal](#)
- [\(SR\) Valley Flashing](#)
- [\(SR\) Ridge/Hip Shingles](#)
- [\(SR\) Metal Apron Flashing](#)
- [\(SR\) Flashed Penetrations](#)
- [\(SR\) Ridge/Hip Vents](#)
- [\(SR\) Pitch Pans](#)
- [\(SR\) Interior Gutters](#)
- [\(SR\) Age Deterioration](#)

- [\(SR\) Holes/Splits/Missing Shingles](#)
- [\(SR\) Unsealed/Unlocked Tabs](#)
- [\(SR\) Lumps/Ridges/Sags](#)
- [\(SR\) Exposed Fasteners](#)
- [\(SR\) Stains/Rust/Fungus/Mildew](#)
- [\(SR\) Debris and Vegetation](#)
- [\(SR\) Patching](#)
- [\(SR\) Improper Equipment Supports](#)

## **APPENDIX E - DIRECT CONDITION RATING DEFINITIONS**

Table E-1. Direct Condition Rating Definitions

Rating	SRM <sup>1</sup> Needs	Rating Definition
Green (+)	Sustainment consisting of possible preventive maintenance (where applicable)	Entire Component-Section or Component-Section sample free of observable or known distress
Green	Sustainment consisting of possible preventive maintenance (where applicable) and minor repairs (corrective maintenance) to possibly few or some subcomponents.	No Component-Section or sample serviceability or reliability reduction. Some, but not all, minor (non-critical) subcomponents may suffer from slight degradation or few major (critical) subcomponents may suffer from slight degradation. Slight or no serviceability or reliability reduction overall to the Component-Section or sample. Some, but not all, minor (non-critical) subcomponents may suffer from minor degradation or more than one major (critical) subcomponent may suffer from slight degradation.
Green (-)	Sustainment or restoration to any of the following: Minor repairs to several subcomponents; or Significant repair, rehabilitation, or replacement of one or more subcomponents, but not enough to encompass the Component-Section as a whole; or Combinations thereof	Component-Section or sample serviceability or reliability is degraded, but adequate. A very few, major (critical) subcomponents may suffer from moderate deterioration with perhaps a few minor (non-critical) subcomponents suffering
Amber (+)		

<sup>1</sup>Sustainment, Restoration, & Modernization

<b>Amber</b>	from severe deterioration. Component-section or sample serviceability or reliability is definitely impaired. Some, but not a majority, major (critical) subcomponents may suffer from moderate deterioration with perhaps many minor (non-critical) subcomponents suffering from severe deterioration.
<b>Amber (-)</b>	Component-section or sample has significant serviceability or reliability loss. Most subcomponents may suffer from moderate degradation or a few major (critical) subcomponents may suffer from severe degradation.
<b>Red (+)</b>	Significant serviceability or reliability reduction in component-section or sample. A majority of subcomponents are severely degraded and others may have varying degrees of degradation.
<b>Red</b>	Sustainment or restoration required consisting of major repair, rehabilitation, or replacement to the component- section as a whole.
<b>Red (-)</b>	Severe serviceability or reliability reduction to the Component-Section or sample such that it is barely able to perform. Most subcomponents are severely degraded. Overall Component-Section degradation is total. Few, if any, subcomponents salvageable. Complete loss of Component-Section or sample serviceability.

## APPENDIX F - PAINT RATING DEFINITIONS

Table F-1. Paint/Coating Rating Definitions

Rating	% Deteriorated	Relative Amount Deteriorated
<b>Green (+)</b>	0.00-0.03	Up to about 1" x 4" in a 8' x 10' area; 1/32" in a 10' length; or 3 in 10,000
<b>Green</b>	0.03 – 0.10	Between about 1" x 4" and 1" x 12" in a 8' x 10' area; 1/32" and 1/8" in a 10' length; or 3 and 10 in 10,000

<b>Green (-)</b>	0.10 – 0.30	Between 1" x 12" and 3" x 12" in a 8' x 10' area; $\frac{1}{8}$ " and $\frac{3}{8}$ " in a 10' length, or 1 and 3 in 1000
<b>Amber (+)</b>	0.30 – 1.00	Between 3" x 12" and 10" x 12" in a 8' x 10' area; $\frac{3}{8}$ " and $1\frac{1}{4}$ " in a 10' length; or 3 and 10 in 1000
<b>Amber</b>	1.00 – 3.00	Between 10" x 12" and 18" x 18" in a 8' x 10' area; $1\frac{1}{4}$ " and $3\frac{3}{4}$ " in a 10' length; or 1 and 3 in 100
<b>Amber (-)</b>	3.00 – 10.0	Between 1' x $2\frac{1}{2}$ ' and 1' x 8' in a 8' x 10' area; $3\frac{3}{4}$ " and 12" in a 10' length; or 3 and 10 in 100
<b>Red (+)</b>	10.0 – 17.0	Between 1' x 8' and $1\frac{1}{4}$ ' x 8' in a 8' x 10' area; 1' and $1\frac{3}{4}$ ' in a 10' length; or 10 and 17 in 100
<b>Red</b>	17.0 – 33.0	Between $1\frac{3}{4}$ ' x 8' and $3\frac{1}{3}$ ' x 8' in a 8' x 10' area; $1\frac{1}{4}$ ' and $3\frac{1}{3}$ ' in a 10' length; or 17 and 33 in 100
<b>Red (-)</b>	33.0 - 100	Greater than 1/3 of area, length, or amount

# Functionality Assessment

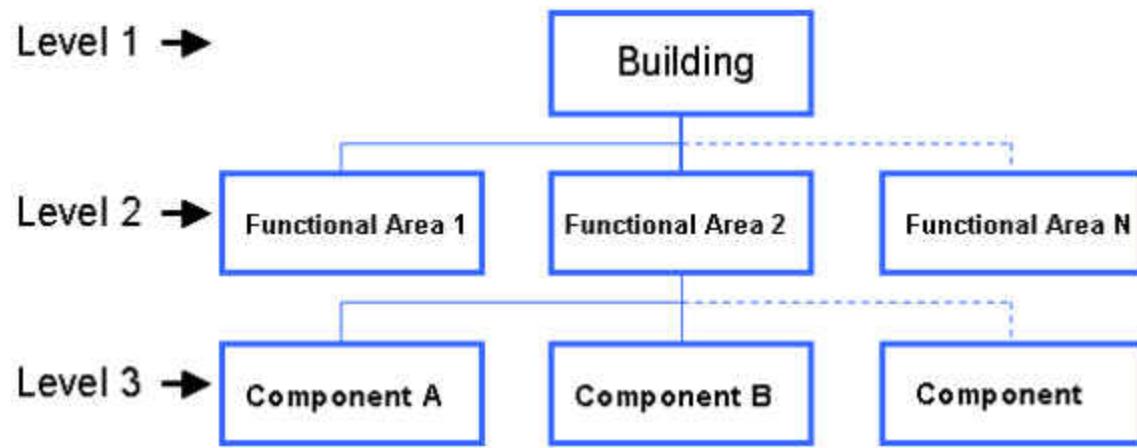
## Functionality Assessment Overview

BUILDER has the ability to perform functional assessments on Buildings to measure their "functionality" state. The functionality state relates to the Building's suitability to function as intended and required for mission. The functionality state is distinct from, and determined independently from, the physical condition state.

Although the functionality assessment is *not* a detailed engineering assessment, it does satisfy the requirements necessary for routine Building facility management activities, including long range budgeting and modernization planning. It also helps to quickly identify problem areas that need more detailed assessments. There may be times when detailed engineering assessments may be required to diagnose specific problems.

### ***Functionality Assessment Tiers***

Functional assessments are structured into a three-tiered, top-down approach that narrows the focus and is able to provide greater assessment detail to the identified problem issues. This approach saves effort, reduces cost, and focuses attention where needed. It also allows the process of identifying and developing modernization requirements to efficiently flow from a broad strategic planning phase to a detailed execution phase. The assessment approach encompasses the three levels shown below.



In BUILDER 3.3, functionality assessments can be performed at the first and second tiers (Building and Functional Area levels). Later versions will include a third tier (Component-Section level) for functionality assessments.

### **First Tier (Building Level) Assessment: Overview**

The first tier of the functionality assessment is a fast, scoping Building level assessment. Using a limited set of questions (listed in [First Tier Functionality Issues and Sub-Issues](#)) that address general functionality issues throughout the Building, the first tier provides a quick and accurate way to

1. Rule out from further assessment issues that are not a problem,
2. Identify issues that will require further assessment at the next tier level, and
3. Compute the Building Functionality Index (BFI).

This level of assessment should be performed when an overall indication of the functionality of the Building is desired and when areas that will require further assessment need to be identified.

### **Second Tier (Functional Area Level) Assessment: Overview**

The second tier of the functionality assessment is a methodical Building functional area assessment. This level of assessment produces more accurate results than the first tier but it is also more time consuming and expensive to perform, because it is performed multiple times due to multiple functional areas. In the second tier, a complete list of functionality questions (see [Second Tier Functionality Issues and Sub-Issues](#)) is used to

1. Identify the specific functionality deficiencies in each functional area,
2. Compute the Functional Area Functionality Index, and
3. Refine the BFI.

This level of assessment should be used when the functionality deficiencies within functional areas need to be identified and when the results of the first tier need to be refined.

### ***Functionality Assessment Sets***

At any assessment tier level, when you create a new assessment, the BUILDER Functionality module will ask which type of Assessment Set to create. Each Assessment Set created represents a snapshot of the facility's functionality state of a certain type at a point in time.

The following assessment sets are built in to BUILDER Version 3.3:

1. **Functionality.** This is the baseline assessment set in BUILDER.
2. **Cultural Resources.**
3. **HPSB<sup>1</sup> Facility.** This assessment set, High Performance and Sustainable Building, examines the area of energy efficiency.

---

<sup>1</sup>High Performance and Sustainable Building

These assessment sets can be created and assessed at either of the Functionality tiers mentioned above.

## ***Functionality Index Computation: Overview***

Functionality assessments directly support the computation of a functionality index (FI) for a Building as a whole, and for the functional areas within the Building. These indices are known as the Building Functionality Index (BFI) and the Functional Area Functionality Index (FAFI), respectively, and they were developed for assessing Building functionality. Both the BFI and FAFI are general obsolescence metrics that address issues related to user requirements, technical obsolescence, and regulatory/code compliance at the Building level and functional area level, respectively.

All FI metrics are based on a scale of 0-100, which matches the scale used in BUILDER for condition indices (**BCI**<sup>1</sup>, **SCI**<sup>2</sup>, **SCCI**<sup>3</sup>, and **CSCI**<sup>4</sup>). BUILDER contains the model algorithms that compute the FIs automatically once the functionality assessment data are entered. The algorithms use the data entered regarding the functionality issues present in the Building, the severity of the issues, and the density of each issue to calculate the BFI. This process is illustrated by the figure below.

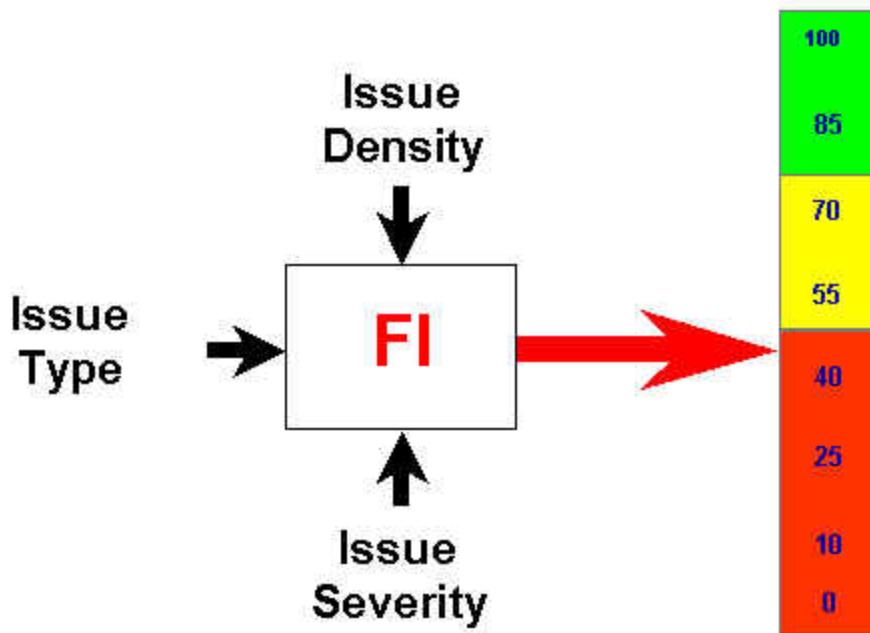
---

<sup>1</sup>Building Condition Index - a condition rating for the overall building.

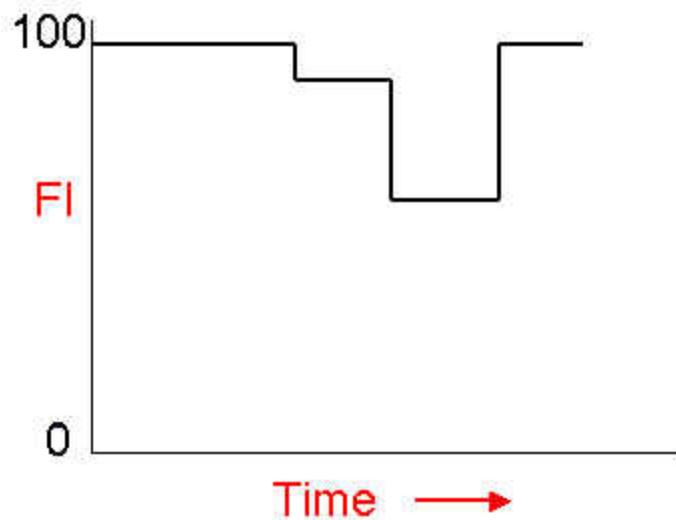
<sup>2</sup>System Condition Index - a condition rating for the building system.

<sup>3</sup>System Component Condition Index - a condition rating for the system component

<sup>4</sup>Component-Section Condition Index - a condition rating for the component section



It is important to note that the FI metrics are step functions over time, unlike the smooth, continuous functions seen in BUILDER's condition indices. This is because functionality, unlike condition, is not an ongoing process. The functionality of a Building or of a functional area depends on user needs, technical obsolescence, and compliance with code or regulations. These factors do not change gradually, but rather at discrete points in time. These discrete changes are reflected in the "steps" in the FI over time. The figure below shows an example FI over time.



# Adding Functional Areas to a Building

In BUILDER 3.3, you can separate a Building into Functional Areas. *This must be done before Performing Second Tier Functionality Assessments.* This Help topic covers how to add a Functional Area using BUILDER. Functional Areas can also be added in the field using BuilderRED.

**Note:** In BUILDER, Functional Areas are visible only in the Functionality navigation tree.

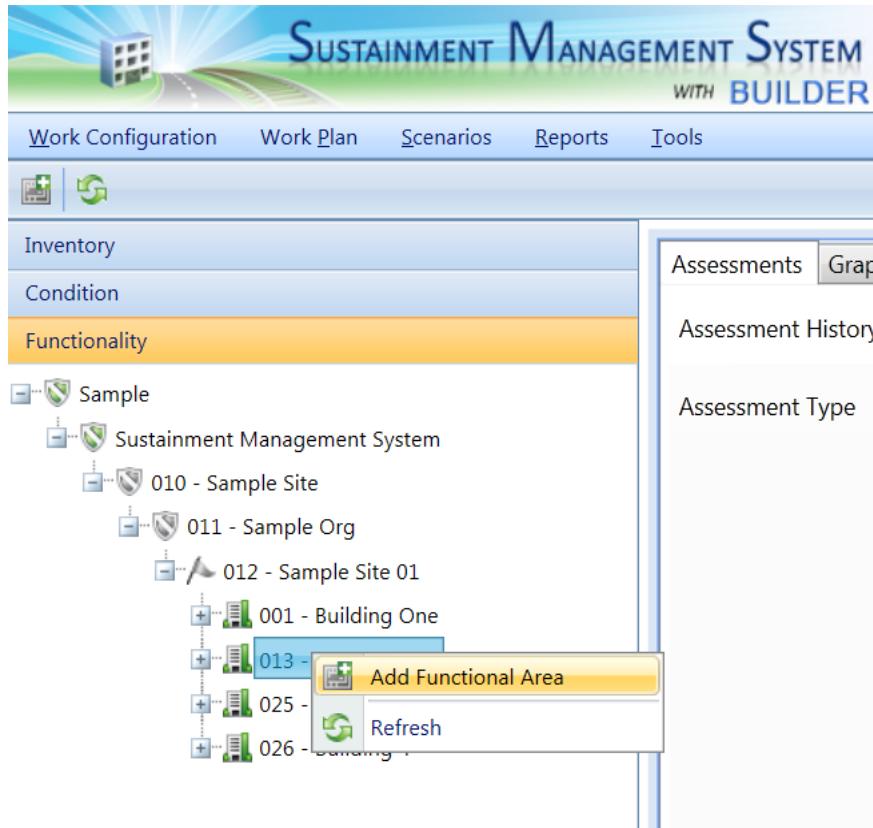
## Prerequisite

Microsoft Silverlight 5 is required for BUILDER's Functionality features.

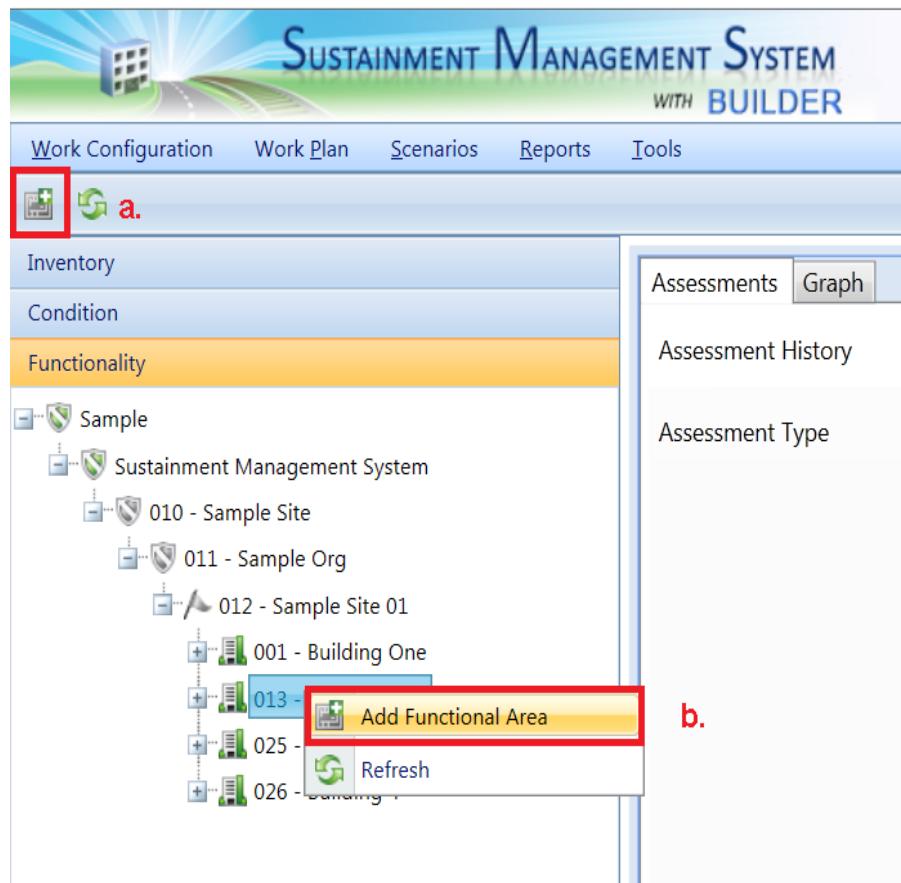
## Add a Functional Area Using BUILDER

To add a Functional Area to a Building in the BUILDER software,

1. Select the **Functionality** ribbon in the lower left corner of the BUILDER application. Once you do so, this ribbon will move above the navigation tree.
2. In the Functionality tree, navigate to the desired Building and select it.



3. After selecting your Building, you can either
  - a. Click the **Add Functional Area** button in the main toolbar above the tree; or
  - b. Right-click the Building and select **Add Functional Area** from the dropdown list:



4. In the New Functional Area popup window, enter the following required data for the Functional Area:
  - **Area Name** - Enter the name of the Functional Area.
  - **Area Type** - Select the Functional Area type from the dropdown list provided. BUILDER allows you to choose from 26 different Functional Area types.
  - **Use Type** - Select the use type of the Functional Area from the dropdown list. This dropdown list contains the same use type options available for Building Use when Adding a Building or Editing Building Inventory Data in Inventory mode.
  - **Size (Area)** - Enter the size or area of the Functional Area.
5. After completing the entries, create the Functional Area by clicking **Add** on the toolbar. The Functional Area will be created in the Building, and the

content pane will now focus on the newly created Functional Area, as depicted in the image below in the Entering Functional Area Data section.

**Note:** If you do not wish to create the Functional Area, click **Cancel** on the toolbar.

## Entering Functional Area Data

The screenshot shows the Sustainment Management System with BUILDER interface. On the left, there is a navigation tree for a building's components. In the center, a dialog box titled 'Save' is open for 'Functional Area Settings'. The 'Name' field is set to 'service'. The 'Area' field shows '150 SF'. The 'FI' (Functional Index) field is '-1'. The 'Area Type' is set to 'Administration Area'. The 'Use Type' dropdown contains '214425 - VEHICLE MAINTENA'. Below the dialog, there are three tabs: 'Components' (selected), 'Assessments', and 'Graph'. The 'Components' tab lists several building systems: A10 FOUNDATIONS, B20 EXTERIOR ENCLOSURE, B30 ROOFING, C10 INTERIOR CONSTRUCTION, D20 PLUMBING, D30 HVAC, and D50 ELECTRICAL.

From this screen, all of the data described above can be edited, and the following functionality is available:

- **FI (Read-Only)** - Displays the current **FAFI**<sup>1</sup> of the selected Functional Area. The current FAFI is computed using the results of the active functionality assessment for the Functional Area.
- **CI (Read-Only)** - Displays the current CI of the Functional Area. In BUILDER, the current CI is computed using an average of the section CI's in the Functional Area, weighted by replacement cost. In BuilderRED, the CI is the Condition Index that was exported from BUILDER; this metric will be updated only after importing inventory back into BUILDER and performing a roll-up.
- **Components Tab** - At this tab, you can add Systems, Components, and/or Component Sections from the Building's inventory to the Functional Area. See Adding Inventory to Functional Areas for a complete description.
- **Assessments Tab** - This tab allows you to Performing Second Tier Functionality Assessments in the Functional Area.

---

<sup>1</sup>Functional Area Functionality Index

- **Graph Tab** - This tab displays the **CI<sup>1</sup>**, **FI<sup>2</sup>**, and **PI<sup>3</sup>** trends of the Functional Area from the date the building was built to the current date.

When you are finished entering the data for the Functional Area, click **Save** at the top left of the content pane.

## Adding Inventory to Functional Areas

Adding BUILDER inventory to a Functional Area allows users to see how various portions of their facility are performing, both in the Functionality Index as well as the Condition Index. The Functionality interface allows you to add specific Component-Sections, specific Components, or even entire Systems to a Functional Area.

### ***Prerequisite***

Before inventory can be added to a Functional Area, the relevant part of the inventory tree must be filled in down to the Component-Section level.

### ***Add Inventory to a Functional Area Using BUILDER***

To add Inventory items into a Functional Area,

1. Click on the Functional Area.
2. Make sure you are at the Components tab. [What should I see?](#)<sup>4</sup>
3. To add one or more System(s), mark the checkbox(es) next to each desired System(s). **If this is all you need, skip to the last step.**
4. To add one or more Component(s) not in a selected System, expand the list of Systems as needed to navigate to and select the desired Component(s). [How?](#)<sup>5</sup>

<sup>1</sup>Condition Index

<sup>2</sup>Functionality Index

<sup>3</sup>Performance Index. See also: BPI.

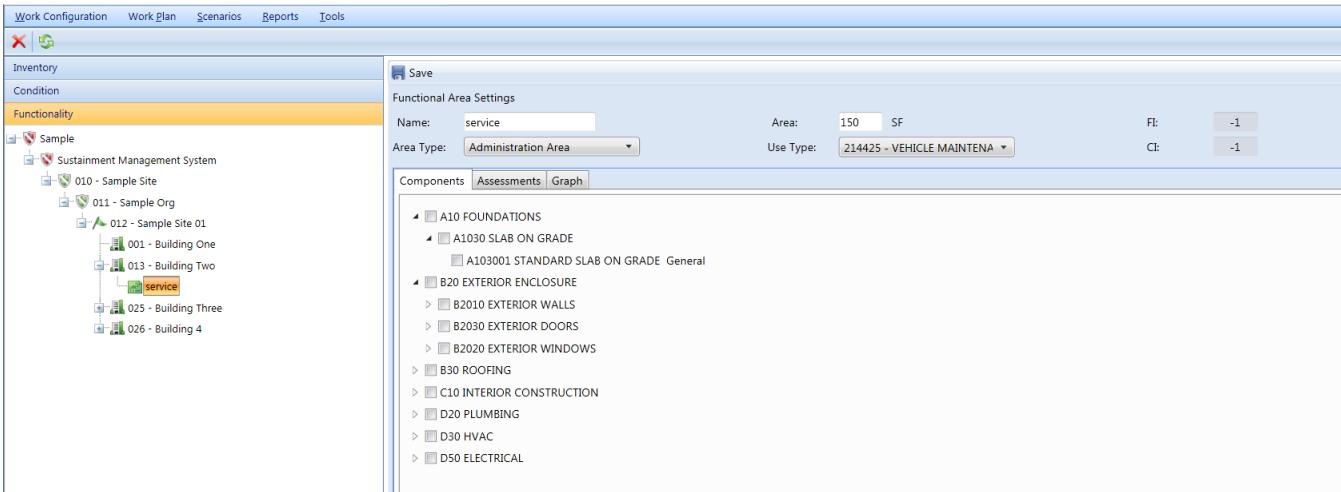
<sup>4</sup>A list of systems associated with the Functional Area's Use Type will appear in the right window pane.

<sup>5</sup>(1) Click the arrow left of a System's checkbox to reveal its Components.

(2) Click the checkbox(es) next to the desired Component(s).

(3) Repeat until all desired Components are selected.

5. To add one or more Component Section(s) not in a selected Component, expand the list as needed to navigate to and select the desired Component Section(s). [How?](#)<sup>1</sup>
6. When your selections are complete, click **Save**.



## Add Inventory to a Functional Area Using BuilderRED

To add Inventory items into a Functional Area,

1. Enter **Functionality** mode, using either (a) the **View** option on the BuilderRED toolbar or (b) the Inventory/Inspections/Functionality toggle in the left-most position on the BuilderRED toolbar.
2. Tap or click the "+" next to the Building containing the relevant Functional Area.
3. Click on the Functional Area.
4. Make sure you are at the Components tab.

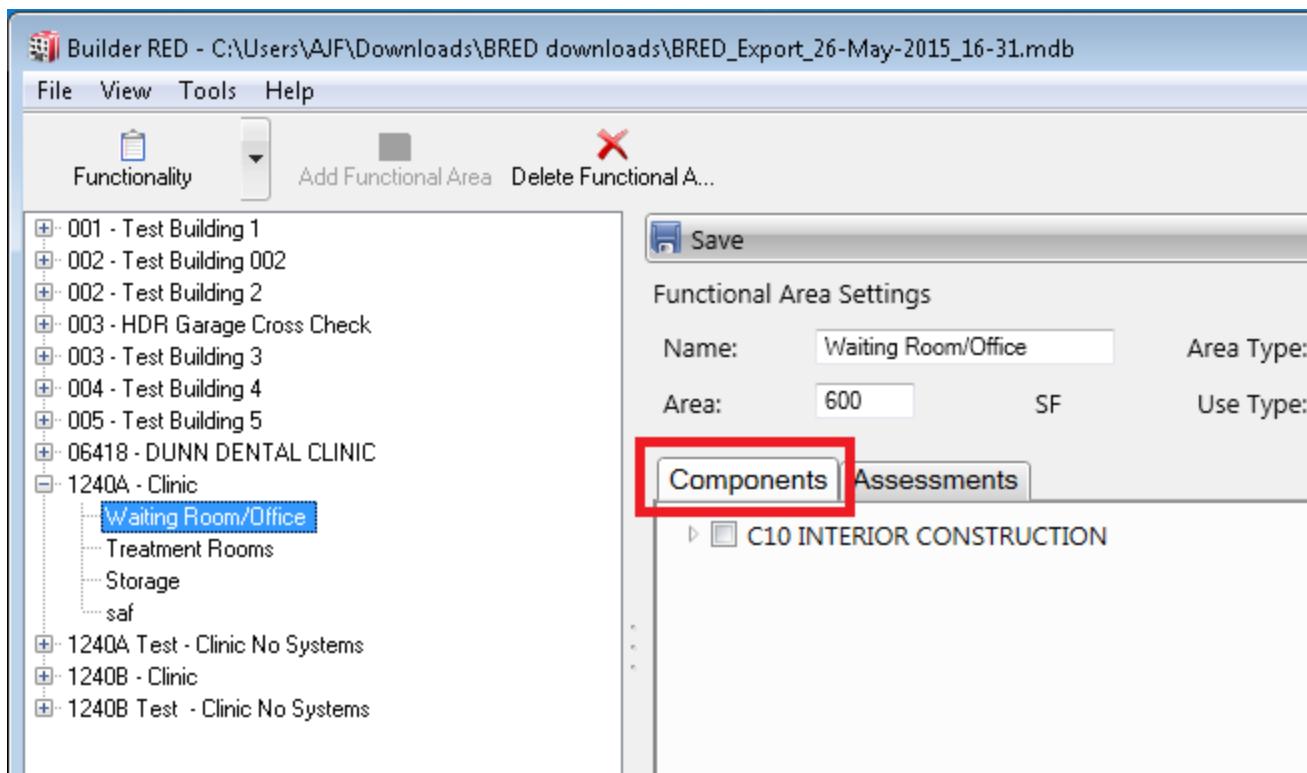
---

<sup>1</sup>(1) As needed, click the arrow left of a System's checkbox to reveal its Components.

(2) Click the arrow left of a Component's checkbox to reveal its Component Sections.

(3) Click the checkbox(es) next to the desired Component Section(s).

(4) Repeat until all desired Component Sections are selected.



5. To add one or more System(s), mark the checkbox(es) next to each desired System(s). **If this is all you need, skip to the last step.**
6. To add one or more Component(s) not in a selected System, expand the list of Systems as needed to navigate to and select the desired Component(s). [How?](#)<sup>1</sup>
7. To add one or more Component Section(s) not in a selected Component, expand the list as needed to navigate to and select the desired Component Section(s). [How?](#)<sup>2</sup>
8. When your selections are complete, click **Save**.

---

<sup>1</sup>(1) Click the arrow left of a System's checkbox to reveal its Components.

(2) Click the checkbox(es) next to the desired Component(s).

(3) Repeat until all desired Components are selected.

<sup>2</sup>(1) As needed, click the arrow left of a System's checkbox to reveal its Components.

(2) Click the arrow left of a Component's checkbox to reveal its Component Sections.

(3) Click the checkbox(es) next to the desired Component Section(s).

(4) Repeat until all desired Component Sections are selected.

# **Performing First Tier Functionality Assessments**

First tier functionality assessments are associated with the Building as a whole.

## ***Prerequisites***

The following are required before performing a first tier functionality assessment:

1. [Create the Building](#). This needs to be done Inventory mode in BUILDER or BuilderRED. If you have not created the Building in Inventory mode with the proper data, you will *not* be able to enter functionality assessment data for it.
2. Be familiar with the concepts in the [Functionality Assessment Overview](#) and the [First Tier Functionality Issues and Sub-Issues](#).

**Note:** With the addition of the [Building Status](#) property in BUILDER , it is possible to have functionality assessment records for non-current buildings. Performing assessments on non-current buildings is done in the same manner as performing them on current buildings.

The following two sections tell you how to create a first tier functionality assessment in (a) BUILDER and (b) BuilderRED; The remaining sections cover how to complete an assessment.

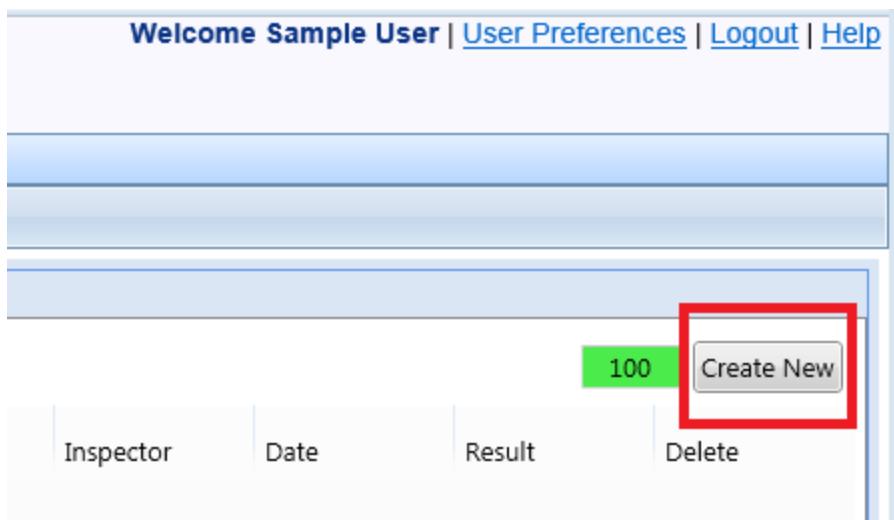
## ***Create a First Tier (Building) Functionality Assessment in BUILDER***

When you are ready to add or edit functionality assessment data for a Building,

1. Select the **Functionality** ribbon in the left pane of the BUILDER application (the ribbon may be either at the top or the bottom of the left pane). The functionality assessment navigation tree will appear.

The screenshot shows the Sustainment Management Systems (SMS) software interface. The title bar at the top reads "SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER". Below the title bar is a menu bar with five items: "Work Configuration", "Work Plan", "Scenarios", "Reports", and "Tools". Underneath the menu bar is a toolbar with two icons: "Inventory" and "Condition". A red box highlights the "Functionality" tab, which is currently selected. The main content area displays a hierarchical tree structure. At the top level, there is a node for "BUILDER - SMS", which contains a sub-node for "WHSD - William S. Hart Union High School District". This district node has three child nodes: "010 - Sample Site", "011 - Sample Org", and "012 - Sample Site 01". The "012 - Sample Site 01" node has several child nodes: "1 - Complex 1", "001 - Building One", "013 - Building Two" (this node is highlighted with an orange box), "Fisher Utility Room", "service", "Temporary", "025 - Building Three", and "026 - Building Four". To the right of the tree structure, there is a panel titled "Assessments" with a "Graph" button. Below the tree, there are two more sections: "Assessment History" and "Assessment Type".

2. [Navigate the tree](#) to the Building you wish to perform the functionality assessment on.
3. Select the Building.
4. In the upper right hand corner of the right-hand window pane is a **Create New** button. Click this button to create a new assessment.



5. In the "Select Assessment Set" popup window, view the available options using the dropdown list. The baseline assessment set is called **Functionality**. There are also assessment sets for Cultural Resources and HPSB Facility.
6. Select the **Functionality** assessment set and click **OK**. Your right window pane should look similar to the image below.

A screenshot of a "Select Assessment Set" dialog box. At the top, there are buttons for "Save" (with a plus sign icon) and "Close". Below that are dropdown menus for "Status" (set to "Current"), "Effective Date" (set to "5/6/2015"), "Use Type" (set to "214425 - VEHICLE MAINTENANCE"), and "Date" (set to "5/6/2015"). The main area contains a list of categories with green progress bars: Access (100%), ADA (100%), Aesthetics (100%), ATFP (100%), Building Services (100%), Building Size and Configuration (100%), Comfort (100%), Efficiency and Obsolescence (100%), Environmental/Health (100%), Location (100%), Maintainability (100%), Missing or Improper Components (100%), and Structural Adequacy (100%).

7. For now, click **Save**, located above the **+** buttons of the list, in order to view general information available about the assessment (for more detail, see Functionality Assessment Data Overview immediately below). Instructions continue with the section explaining how to Fill In the Functionality Assessment.

## Functionality Assessment Data Overview

When a Building is selected in Functionality mode but no assessment is opened, the following will be shown at the Assessments tab:

- **Assessment Type (Read-Only)** - This will show the type of assessment(s) that have been performed on the Building: Functionality, Cultural Resources, and/or HPSB Facility.
- **Inspector (Read-Only)** - This will show the name of the Inspector who has created previous assessments.
- **Date (Read-Only)** - This is the date of the assessment.
- **Result (Read-Only)** - This is the Functionality Index of the assessment. Before assessment questions are answered, this will be 100 .
- **Delete** - This gives the user the option to delete previous assessments.

**Note:** Deleting a functionality assessment is not allowed in BuilderRED.

Assessment Type	Inspector	Date	Result	Delete
Functionality	Sample.User	03/21/14	100	<a href="#">Delete</a>

Once you open a functionality assessment, the following data is available:

- **Issue (Read-Only)** - Displays the list of first tier functionality issues included in BUILDER 3.3. Expand the issues to show its sub-issues by using the "+" next to the issue. If the sub-issues are expanded, they can be collapsed by clicking the "-" next to the issue.
- **Rating (Read-Only)** - Displays the FI rating for each issue, computed from the ratings of its sub-issues.
- **Sub-Issues (Read-Only)** - If the issue has been expanded, its sub-issues will be shown below it.
- **Sub-Issue Rating.** Enter the applicable rating data for the functionality sub-issues in the Building. The rating for each sub-issue consists of a severity color rating, along with a density range for some sub-issues. The hyper-linked text for each sub-issue provides a link to the definition and rating

guidelines of the sub-issue. See also Fill In the Functionality Assessment below.

Save  Close

Status Current Effective Date <M/d/yyyy>  Use Type DOE 140 - Post Office Date 5/13/2015  100

 <b>Access</b>	100
 <b>ADA</b>	100
 <b>Aesthetics</b>	100
 <b>ATFP</b>	100
 <b>Building Services</b>	100
 <b>Building Size and Configuration</b>	100
 <b>Comfort</b>	100
Does the building have the HVAC capacity to be heated adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Does the building have the HVAC capacity to be cooled adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Does the building have the HVAC capacity to be dehumidified adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Does the building have the HVAC capacity to be humidified adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Does the building have the HVAC capacity to be ventilated adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Are the HVAC controls adequate?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Is there disruptive noise in the building?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Is the building adequately lit?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
Are the lighting controls adequate?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A  
 <b>Efficiency and Obsolescence</b>	100
 <b>Environmental/Health</b>	100
 <b>Location</b>	100

### ***Fill In the Functionality Assessment***

To open an assessment, select it from the list of functionality assessments given at the **Assessments** tab:

The screenshot shows a software interface for managing assessments. At the top, there are tabs for 'Assessments' and 'Graph'. Below them is a section titled 'Assessment History'. Under this, there are two rows of items. The first row contains the text 'HPSB Facility' followed by a small blue arrow pointing to its left. The second row contains the text 'Functionality' followed by a similar blue arrow. Both rows have a light gray background.

To complete the assessment, expand issues as you go along to reveal the associated sub-issues. Use the radio buttons to answer each sub-issue question.

Saving your work periodically as you work through the issues and sub-issues is a good idea.

### Rating Sub-Issues with Wizards

For some sub-issues, a wizard is provided to help you perform the rating for that sub-issue. To launch a wizard, click the **Wizard...** link included in the sub-issue row. The wizard for that sub-issue will appear in a new window. Follow the instructions in the wizard to complete the rating. Note that you are not able to directly enter the severity color rating and density from the sub-issue grid for the sub-issues that use a wizard.

### Adding or Editing Comments

By clicking the  Comment icon, you can create or edit comments for most of the sub-issue questions in the functionality assessment. A checkmark on the Comment icon indicates the presence of a comment.

### Adding Images to the Assessment

Wherever you see the  Images icon, you may attach an image that supports understanding of the sub-issue and/or its assessment. A checkmark on the Images icon indicates that one or more images are already associated with the assessment.

**Note:** The image you attach must be in one of the following formats:  
.png, .bmp, or .jpg/.jpeg

To attach an image,

1. Click the Images icon.
2. In the "Image Attachments" popup box, click the **Add Images...** button.

3. Browse to the location(s) where you have images you want to attach to the assessment.
4. Select the desired image, either with double-click, or by clicking it, then clicking **Open** in the file browser. *BUILDER will insert the image and close the file browser window.*
5. Repeat steps 2 to 4 as desired. You can use the small left and right arrows to scroll through the images.
6. When finished adding image attachments, click **OK**. Alternatively, click **Cancel** if you don't want to add the selected image attachments.

### **When You Are Finished**

When you are finished filling in the functionality assessment, click **Save**. The program will save the assessment and close it.

## **Performing Second Tier Functionality Assessments**

Second tier functionality assessments are performed on the individual Functional Areas in the Building.

### **Prerequisites**

The following are required before performing a second tier functionality assessment:

1. You must first [create Functional Areas in the Building](#) with the proper data. If you have not done so, you will *not* be able to enter this level of functionality assessment data.
2. Additionally, you should be familiar with the concepts in the [Functionality Assessment Overview](#) and the [Second Tier Functionality Issues and Sub-Issues](#).

### **Create a Second Tier Functionality Assessment in BUILDER**

When you are ready to add or edit functionality assessment data for a Functional Area,

1. Select the **Functionality** ribbon in the left pane of the BUILDER application (the ribbon may be either at the top or the bottom of the left pane). The functionality assessment navigation tree will appear.
2. [Navigate the tree](#) to the Functional Area you wish to perform the functionality assessment on.
3. Select the Functional Area.

4. Click the **Assessments** tab.
5. In the upper right hand corner of the right-hand window pane is a **Create New** button. Click this button to create a new assessment.



6. In the "Select Assessment Set" popup window, view the available options using the dropdown list. The baseline assessment set is called **Functionality**. At the Functional Area level, there is also an assessment set for Cultural Resources.
7. Select the **Functionality** assessment set and click **OK**. Your right window pane should look similar to the image below. Note that at this level, the questions are the same as for a first tier functionality assessment.

Functional Area	Value
Access	100
ADA	100
Aesthetics	100
ATFP	100
Building Services	100
Building Size and Configuration	100
Comfort	100
Efficiency and Obsolescence	100
Environmental/Health	100
Location	100
Maintainability	100
Missing or Improper Components	100
Structural Adequacy	100

8. For now, click **Save**, located above the **+** buttons of the list, in order to view general information available about the assessment (Functionality Assessment Data below). Instructions continue with the section explaining

how to Fill In the Functionality AssessmentPerforming Second Tier Functionality Assessments.

## ***Functionality Assessment Data***

After a Functional Area is selected, the general data that was input when [creating the Functional Area](#) will be shown at the top of the screen:

- **Name (Optional)** - The name or a brief description of the Functional Area.
- **Area** - Size in the selected units of measurement (SF or SM)
- **Area Type (Functional Use) (Required)** - Select the functional use from the dropdown list that most closely matches the Functional Area. BUILDER allows you to choose from 26 different Functional Area types. This field is helpful when a Functional Area is being assessed against many functional uses to determine its optimal functional use.
- **Use Type (Required)** - Select the use type from the dropdown list that most closely matches the Functional Area. If you are a Department of Defense activity, BUILDER should display familiar category codes for your service. This field is helpful when a Functional Area is being assessed against many use types to determine its optimal use type.
- **FI (Assessment FAFI) (Read-Only)** - Displays the **FAFI**<sup>1</sup>, computed based on the data recorded for the assessment currently selected.
- **CI (Read-Only)** - The Condition Index of the items included in the Functional Area.

Below this data, at the Assessments tab, are additional data associated with functional assessments of the Functional Area:

- **Assessment Type (Read-Only)** - This will show the type of assessment(s) that have been performed on the Functional Area: Functionality or Cultural Resources.
- **Inspector (Read-Only)** - This will show the name of the Inspector who has created previous assessments.
- **Date (Read-Only)** - This is the date of the assessment.
- **Result (Read-Only)** - This is the Functionality Index of the assessment. Before assessment questions are answered, this will be 100 .
- **Delete** - This gives the user the option to delete previous assessments.

**Note:** Deleting a functionality assessment is not allowed in BuilderRED.

---

<sup>1</sup>Functional Area Functionality Index

To inspect further data, select from the list of assessments the functionality assessment you wish to see data for, and click on the link showing the assessment type. All functionality assessments that have been previously recorded will be accessible from this list, and for each of them, the inspector name and date of the inspection is provided. If you have created a new functionality assessment, the current date will be shown in the Date field.

Inside the functionality assessment, the following data are in the header above the list of assessment issues:

- **Status (Required)** - Select the status of the current assessment from the dropdown list. The status options available for a functionality assessment in BUILDER 3.3 are:
  - **Current** - Sets the current functionality assessment to active and is used to compute the current FAFI.
  - **Past** - Sets the current functionality assessment to a past assessment. This assessment data is not used when computing the current FAFI.
  - **To Take Effect** - Sets the current functionality assessment to a future year when user requirements, codes, or obsolescence are expected to change and affect the functionality of the area. These assessments are particularly useful to use when running [Scenarios](#).
- **Effective Date (Conditional)** - Enter the year the status of the assessment will become active, or effective in the Functional Area. This field will be operational only if the **Status** is set to **To Take Effect**. Enter the date in the field provided, or else click on the calendar to select a date from the calendar.
- **Use Type (Required)** - Select the use type from the dropdown list that most closely matches the Functional Area. If you are a Department of Defense activity, BUILDER should display familiar category codes for your service. This field is helpful when a Functional Area is being assessed against many use types to determine its optimal use type.
- **Date (Required)** - Shows the date the assessment was created. Changes may be made to the assessment only within a 30-day window from this date.

**Note:** the 30-day deadline is something that an Administrator can change based on local policy. It may be that your change window is shorter.

- **Assessment FAFI (Read-Only)** - Displays the **FAFI**<sup>1</sup>, computed based on the data recorded for the assessment currently selected. Before assessment questions are answered, this will be 100 .

---

<sup>1</sup>Functional Area Functionality Index

The actual assessment data is displayed and recorded in the grid in the lower portion of the screen and includes:

- **Issue/Sub-issues (Read-Only)** - Displays the [13 second tier functionality issues](#) included in the assessment. Expand an issue to show its sub-issues by clicking or tapping the "+" next to the issue. If the sub-issues are expanded, they can be collapsed by clicking or tapping the "-" next to the issue.
- **Rating (Read-Only)** - Displays the FI rating for the issue computed from the ratings of its sub-issues.

Save  Close

Status Current Effective Date <M/d/yyyy> 15 Use Type DOE 140 - Post Office Date 5/13/2015 15 100

+ Access	100
+ ADA	100
+ Aesthetics	100
+ ATFP	100
+ Building Services	100
+ Building Size and Configuration	100
- Comfort	100
Does the building have the HVAC capacity to be heated adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Does the building have the HVAC capacity to be cooled adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Does the building have the HVAC capacity to be dehumidified adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Does the building have the HVAC capacity to be humidified adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Does the building have the HVAC capacity to be ventilated adequately?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Are the HVAC controls adequate?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Is there disruptive noise in the building?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Is the building adequately lit?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
Are the lighting controls adequate?	<input checked="" type="radio"/> G+ <input type="radio"/> A <input type="radio"/> R <input type="radio"/> N/A 1-10% 
+ Efficiency and Obsolescence	100
+ Environmental/Health	100
+ Location	100

## Fill In the Functionality Assessment

To open an assessment, select it from the list of functionality assessments given at the **Assessments** tab:

The screenshot shows a software interface for managing assessments. At the top, there are tabs for 'Assessments' and 'Graph'. Below them is a section titled 'Assessment History'. Under this, there are two rows of items. The first row contains the text 'HPSB Facility' followed by a small blue arrow pointing to its left. The second row contains the text 'Functionality' followed by another small blue arrow pointing to its left.

To complete the assessment, expand issues as you go along to reveal the associated sub-issues. Use the radio buttons to answer each sub-issue question.

Saving your work periodically as you work through the issues and sub-issues is a good idea.

### Rating Sub-Issues with Wizards

For some sub-issues, a wizard is provided to help you perform the rating for that sub-issue. To launch a wizard, click the **Wizard...** link included in the sub-issue row. The wizard for that sub-issue will appear in a new window. Follow the instructions in the wizard to complete the rating. Note that you are not able to directly enter the severity color rating and density from the sub-issue grid for the sub-issues that use a wizard.

### Adding or Editing Comments

By clicking the  Comment icon, you can create or edit comments for most of the sub-issue questions in the functionality assessment. A checkmark on the Comment icon indicates the presence of a comment.

### Adding Images to the Assessment

Wherever you see the  Images icon, you may attach an image that supports understanding of the sub-issue and/or its assessment. A checkmark on the Images icon indicates that one or more images are already associated with the assessment.

**Note:** The image you attach must be in one of the following formats:  
.png, .bmp, or .jpg/.jpeg

To attach an image,

1. Click the Images icon.
2. In the "Image Attachments" popup box, click the **Add Images...** button.

3. Browse to the location(s) where you have images you want to attach to the assessment.
4. Select the desired image, either with double-click, or by clicking it, then clicking **Open** in the file browser. *BUILDER will insert the image and close the file browser window.*
5. Repeat steps 2 to 4 as desired. You can use the small left and right arrows to scroll through the images.
6. When finished adding image attachments, click **OK**. Alternatively, click **Cancel** if you don't want to add the selected image attachments.

### **When You Are Finished**

When you are finished filling in the functionality assessment, click **Save**. The program will save the assessment and close it.

# Work Planning Overview

With your building inventory, condition assessment, and functionality data in place, you can begin to truly manage the work in your building using BUILDER's powerful tools. Condition assessment data is used to plan maintenance and repair work at the Component-Section level, and functionality assessment data is used to plan modernization work at the building or functional area level.

## Work Items

Regardless of the type of work planned, a work item record is generated for each work activity. The work item stores basic information about what work is planned, including the type of work, description, estimated cost, funding year, and quantity. As a group, work items can be [viewed in several useful ways](#), such as:

- a list of all past, present, and future work in the building
- a list filtered by year, status, system, component, and/or Component-Section.

### ***Creating Work Items***

For Section-level, condition-related maintenance and repair work, there are three ways to create work items. Each method is briefly described below. Click on the hyperlink of each method for a detailed description.

- [Manually entering records](#)
- [Using the automatic work generator](#)
- [Copying work items from a Scenario](#)

#### **Manually Entering Work Items**

The manual method of entering work items is especially useful for recording past work efforts. It gives you an opportunity to capture institutional memory regarding what work you have done and when it was accomplished. Aside from basic details such as when the work was completed, its actual cost, and its funding source, the work item description allows you to add multiple notes about that particular work effort.

## *Manual Entry for Functionality Related Work*

Functionality related modernization work at the building or functional area level can be entered manually or created by the automatic work generator. Modernization work is not generated in Scenarios because **FI**<sup>1</sup>s are step functions over time, unlike the smooth, continuous functions seen in the condition indexes. Because the **FI**<sup>2</sup>s are not smooth, continuous functions, future **FI**<sup>3</sup>s cannot be predicted and modernization work cannot be planned. The only way to determine when and by how much the functionality changes and the associated modernization work is to physically perform functionality assessments in the building.

### *Other reasons for Manual Entry*

You might also choose to enter work items manually as a basic business practice. Your procedure might follow these steps:

- Review BUILDER reports regarding remaining service life, condition index (CI) trends, functionality index (FI) trends, and performance index (PI) trends to identify possible work requirements. Get acquainted with Generating a Report.
- Verify possible work requirements by re-inspecting, especially if you have recorded no recent condition/functionality assessment data for the items. At the same time, collect the more detailed data needed for the work item specifications (exact quantities, manufacturer, scheduling restrictions, etc.).
- Compile a list for approval by your chain of command.
- Enter each work item as it clears the process.

## **Using the Automatic Work Generator**

BUILDER offers you an [automated process](#) of creating work items for your inventory. This requires you to specify [condition and functionality standards and policies, along with a policy sequence](#) that describe your decision process in identifying possible work items in your building. Standards set threshold values for key work indicators; CI and remaining service life for condition, and FI and PI for functionality. Policies link different standards to the various Component-Sections (for condition) and functional areas and buildings (for functionality). The policy sequence pulls the standards and policies together in a way that an automated process can link each Component-Section, functional area, and building with its respective standard. By comparing the Component-Section's, functional

---

<sup>1</sup>Functionality Index

<sup>2</sup>Functionality Index

<sup>3</sup>Functionality Index

area's and Building's properties with their threshold values in its standard, BUILDER is able to create work items for every Component-Section, functional area, and building not meeting its standard.

### **Copying Work Items from a Scenario**

BUILDER 3.3 offers the use of [Scenarios](#), or a simulation model integrated with BUILDER's business rules and databases, to create condition-related work items for your inventory. Scenarios use your inventory database and a set of initial scenario parameters to simulate how your inventory will evolve over the next 5 to 10 years. The simulation works by stepping through each future year generating work items using the standards and policies, [prioritizing the work items](#) based on your [prioritization scheme](#), and funding work items by priority ranking until all [funding levels](#) have been exhausted. When a scenario is complete, the scenario database contains a record of annual work plans constrained by budget. These work plans can be used as the foundation for your out-year plans.

**Note:** As discussed above in Manual Entry for Functionality Related Work, Scenarios do not simulate or forecast modernization work at the building or functional area level.

## **Standards, Policies, and Policy Sequences Overview**

With your building inventory, condition assessment, and functionality data in place, you can begin to truly manage the work in your building using BUILDER's powerful tools. Condition assessment data is used to plan maintenance and repair work at the Component-Section level, and functionality assessment data is used to plan modernization work at the building and functional area level. Before the assessment data can be used in an [automated process](#) to determine the work requirements in your inventory, both condition and functionality standards, policies, and policy sequences must be created.

### *Condition Standards, Policies, and Policy Sequences*

The condition index (CI) and remaining service life (RSL) properties of a Component-Section are excellent metrics to consider when planning maintenance, repair, and replacement projects. This section presents concepts for using the CI and RSL measures to help automate the process of identifying which Component-Sections in your inventory need attention.

Intuitively, when the CI value is high, no work action needs to be taken. When the CI value is low, repair or replacement is necessary. Somewhere between the high and low values of the CI range is a value of the CI that is a threshold, or a point at

which your decision would change from no activity to initiating a work item. This threshold value might be the same for all Component-Sections or it might vary depending upon how critical a particular section is to the overall building. For example a CI of 80 might be the threshold for an air handling unit, while a CI of 65 might be the threshold for an interior door.

Additionally, these thresholds may vary from building to building. A headquarters building might have a threshold CI of 85 for interior doors, while a warehouse might have a threshold CI of 65 for interior doors. Similarly, there is a threshold value for determining whether to repair or replace a section. This threshold value is a ratio of the repair cost to the replacement cost (in BUILDER it is assumed that the cost of repair is variable, increasing as the CI decreases). When the ratio is below the threshold the section will be repaired, and when the ratio is above the threshold the section will be replaced.

When you establish a set of threshold values like those described above, an automated process can use these thresholds to search the entire inventory and identify Sections whose metrics indicate where work should be initiated. With this BUILDER-generated list, you can anticipate the location of condition deficiencies and plan to correct them before failure occurs. If condition assessments are completed regularly, the CI trend analysis can estimate when the threshold CI will be reached, several years before it actually happens. This is valuable information for preparing outyear budgets. In addition, because the search of your inventory is exhaustive, no potential problems "fall through the cracks." All of this supports a very proactive management strategy.

The concepts presented in the preceding paragraphs can be implemented using Builder's [standards](#), [policies](#), and [policy sequences](#). Essentially, condition standards are sets of threshold values that determine whether or not work is needed when applied to a particular Component-Section. Condition policies are rules that define by property which Component-Sections will use which condition standards. When a single Component-Section is covered by more than one condition policy, a policy sequence establishes the order of precedence for applying policies so that only one condition standard is chosen for each Component-Section.

Here is a simple example of how condition standards, condition policies, and policy sequences are used to assign thresholds to every Component-Section:

- Suppose that you have decided that your inventory contains certain Sections that you want to maintain at a CI of 80 or above, or that repair is required when the CI falls below 80. Also, you have decided that if the cost of repairing such a section is more than 70% of its replacement cost, then you will replace it rather than repair it. These decisions are represented in a

condition standard - a set of threshold values. You [create that condition standard](#) and call it "High." Your inventory also contains some Sections for which 60 is to be the threshold CI. You create that condition standard and call it "Low."

- To apply these condition standards, you must [create condition policies](#) that link them to specific Component-Sections. You may want administrative buildings to be maintained under the "High" condition standard and warehouses to be maintained under the "Low" condition standard. You would create a condition policy that links the respective standard with the appropriate buildings. You might also want all of the Sections of an HVAC system in any building to be maintained under the "High" condition standard. You would create another condition policy that links the "High" condition standard with HVAC systems. Note that a policy may not specify standards for every category, such as in the example of the HVAC condition policy which does nothing to determine condition standards for the other Systems in a Building.
- If you want to apply only these two condition policies, several problems arise. You must [create a policy sequence](#) to take care of these problems. First, the two policies mention nothing about the condition standards for training facilities other than the HVAC system. The overall process must be able to determine a condition standard for every Component-Section. To address this problem, a policy sequence has a default condition standard that is used if none of the selected condition policies apply. The default condition standard is one of the standards you have created, and you designate it as the default.
- Second, both condition policies apply to HVAC systems in warehouses. The first sets the condition standard at "Low" and the second sets it at "High." The overall process must be able to select one and only one condition standard for each Component-Section. To address this problem, the policy sequence lists, in the order of their application, all of the condition policies that are to be used. If the HVAC policy is listed after the warehouse policy, then the HVAC policy prevails and the condition standard will be "High." If the warehouse policy is listed after the HVAC policy, then the warehouse policy prevails and the condition standard will be "Low." That is, the last policy in the list governs the applicable Component-Sections.

### *Functionality Standards, Policies, and Policy Sequences*

The functionality index (FI) of buildings (BFI), of functional areas (FAFI) and of the individual functionality issues are excellent metrics to consider when planning modernization projects. Additionally, the Building Performance Index (BPI) property is an excellent metric to consider when planning for building reconstruction.

This section presents concepts for using the FI measures to identify which buildings and functional areas in your inventory need modernization and concepts for using the BPI measure to identify which buildings in your inventory need to be reconstructed.

Intuitively, when the FIs and BPI values are high, no modernization or reconstruction is necessary. When any of these values are low, modernization or reconstruction is necessary. Somewhere between the high and low values of each measure is a value that is a threshold, or a point at which your decision would change from no activity to initiating a work item. This threshold value might be the same for the FIs and BPI, or it could be different for each. For example, 70 might be the threshold value for the **BCI**<sup>1</sup> and **FAFI**<sup>2</sup>, but 50 might be the threshold value for the individual functionality issues and the BPI in the same building. Additionally, these thresholds may vary from building to building. A headquarters building might have a threshold BFI of 80, while a warehouse might have a threshold BFI of 60.

When you establish a set of threshold values like those described above, an [automated process](#) can use these thresholds to search the entire inventory and identify buildings and functional areas whose metrics indicate where modernization or entire building reconstruction should be initiated. With this BUILDER-generated list, you can pinpoint the location of functionality and performance deficiencies and plan to correct them. In addition, because the search of your inventory is exhaustive, no potential problems "fall through the cracks." All of this supports a very proactive management strategy.

The concepts presented in the preceding paragraphs can be implemented using BUILDER's [standards](#), [policies](#), and [policy sequences](#). Essentially, functionality standards are sets of threshold values that determine whether or not work is needed when applied to a particular building and/or functional area. Functionality policies are rules that define by property which buildings and functional areas will use which functionality standards. When a single building or functional area is covered by more than one functionality policy, a policy sequence establishes the order of precedence for applying policies so that only one functionality standard is chosen for each building.

Here is a simple example of how functionality standards, functionality policies, and policy sequences are used to assign thresholds to every building:

- Suppose that you have decided that your inventory contains certain buildings (with functional areas) that you want to maintain at a BFI, FAFI, and

---

<sup>1</sup>Building Condition Index - a condition rating for the overall building.

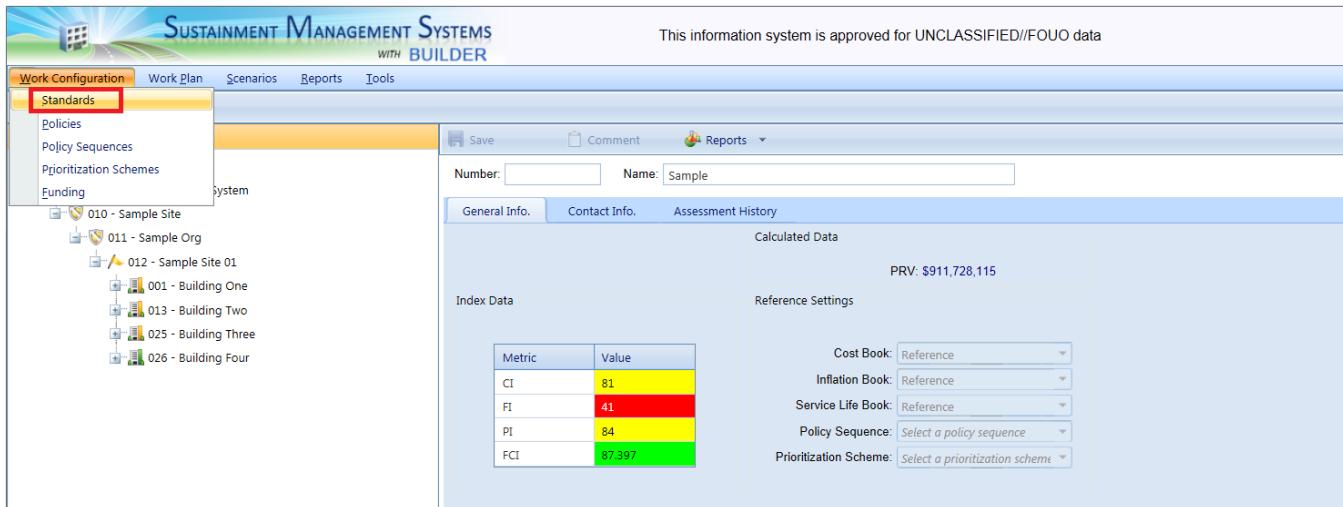
<sup>2</sup>Functional Area Functionality Index

issue FIs of 80 or above, or that modernization is required when any of the FIs fall below 80. Also, you have decided that if the BPI falls below 70, then reconstruction of the building will be required. These decisions are represented in a functionality standard - a set of threshold values. You [create that functionality standard](#) and call it "High". Your inventory also contains some buildings for which 60 is to be the threshold for all the FIs and the BPI. You create that functionality standard and call it "Low".

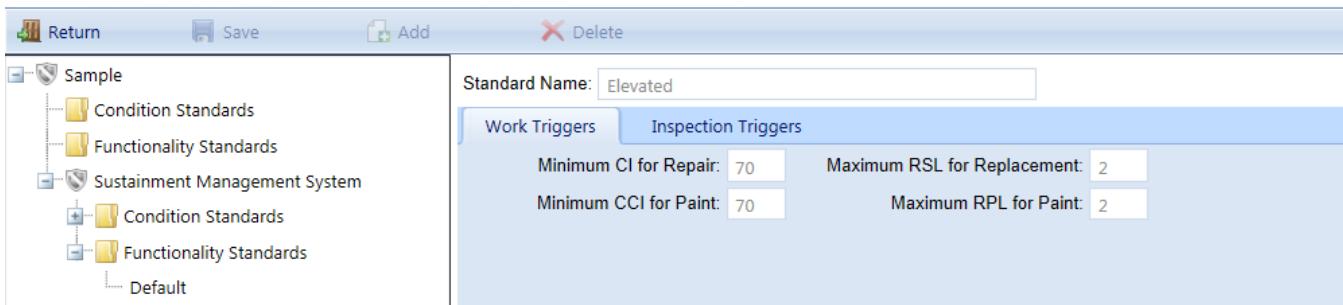
- To apply these functionality standards, you must [create functionality policies](#) that link them to specific buildings and/or functional areas. You may want administrative buildings (and all functional areas in those buildings) to be maintained under the "High" functionality standard and housing buildings (and all functional areas in those buildings) to be maintained under the "Low" functionality standard. You would create a functionality policy that links the respective standard with the appropriate buildings. You might also want all the display functional areas (in all buildings) to be maintained under the "High" functionality standard. You would create another functionality policy that links the "High" functionality standard with display functional areas. Note that a policy may not specify standards for every category, such as in the example of the display area policy which does nothing to determine functionality standards for the functional areas other than display areas in all buildings.
- If you want to apply only these two functionality policies, several problems arise. You must [create a policy sequence](#) to take care of the problems. First, the two policies mention nothing about the functionality standards for non-display functional areas in buildings that are not administration or housing. The overall process must be able to determine a functionality standard for every functional area in every building. To address this problem, a policy sequence has a default functionality standard that is used if none of the selected functionality policies apply. The default functionality standard is one of the standards you have created, and you designate it as the default.
- Second, both functionality policies apply to display areas in administration and housing buildings. The first sets the functionality standard at "Low" and the second sets it at "High" for housing buildings. The overall process must be able to select one and only one functionality standard for each building. To address this problem, the policy sequence lists, in the order of their application, all of the functionality policies that are to be used. If the housing policy is listed after the display area policy, then the housing policy prevails and the functionality standard will be "Low." If the display area policy is listed after the housing policy, then the display area policy prevails and the functionality standard will be "High." That is, the last policy in the list governs the applicable functional areas and/or buildings.

## **Adding and Editing Standards**

To add or edit condition or functionality standards, select Work Planning -> Standards and Policies -> Standards from the navigation menu.



The Standards window will appear.



By expanding the tree at the Site (or group) level, folders for condition and functionality standards will appear. From these folders, new condition or functionality standards can be added and the existing standards can be viewed and edited.

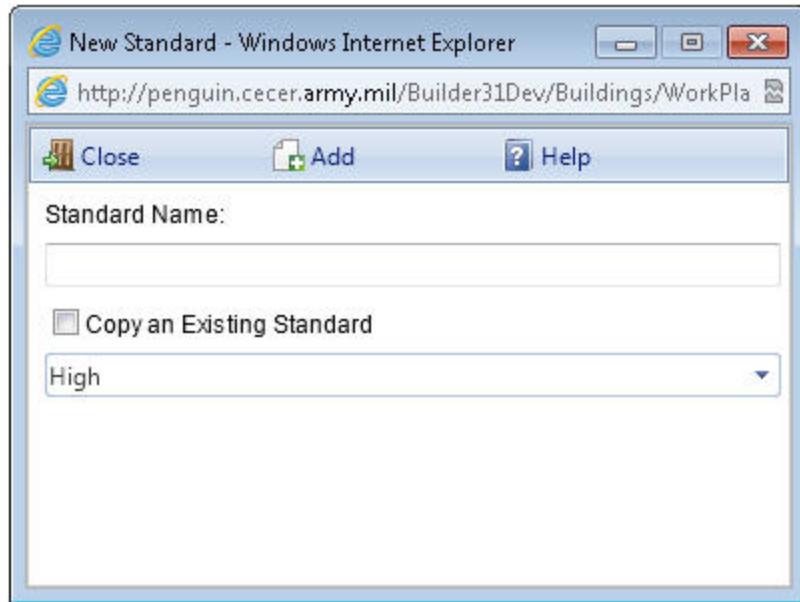
### **Toolbar**

- **Return.** Use this button to close the Standards window.
- **Save.** Use this button to save changes made to the standards.
- **Add.** Use this button add a new standard.
- **Delete.** Use this button to delete the selected standard.

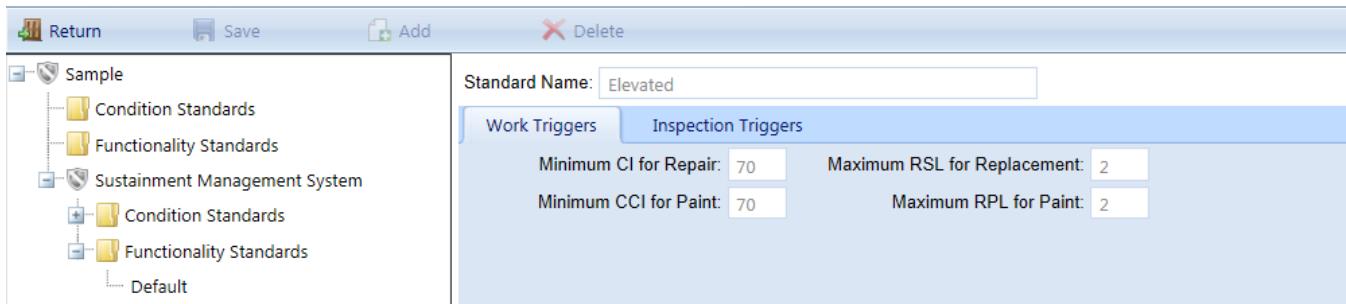
### **Adding Condition Standards**

To add a condition standard, select the condition standards folder on the tree and click the **Add** button in the toolbar. Note that the level on the tree where condition

standards are selected and added denotes the level in the inventory where those standards can be applied. The New Standard window will appear.



Enter the new standard's name, mark the "Copy an Existing Standard" checkbox and select an existing standard to copy if you want to copy data from an existing standard to the new one, and click the **Add** button in the toolbar. The standards window will open as shown below and data can be input for the standard on the work triggers and inspections scheduling tabs (described below).



### Work Triggers Tab

When creating a condition standard, you must enter a set of work triggers, or thresholds, to initiate work items for the inventory of your building.

- **Name.** Enter the condition standard's name, which must be unique and is limited to 50 alphanumeric characters.
- **Minimum CI for repair:** Enter the threshold value for condition index. For Sections with a CI above this value, no work item is triggered. For Sections with a CI below this value, a work item is triggered.

- **Maximum RSL for replacement:** Enter the threshold value for remaining service life. For Sections with a RSL above this value, replacement would not be considered as an option unless it is more cost effective to replace than to repair.
- **Minimum CCI for paint:** Enter the threshold value for the coating condition index. For painted Sections with a CCI above this value, no paint work item is triggered. For painted Sections with a CCI below this value, a paint work item is triggered.
- **Maximum RPL for paint:** Enter the threshold value for remaining paint life. For painted Sections with a RPL greater than this value, no paint work item is triggered. For painted Sections with a CCI less than this value, a paint work item is triggered.

### Inspection Triggers

On the Inspection Triggers tab, additional data can be input to determine when condition assessments should be performed and the type of condition assessment to perform by using the [Knowledge-Based Inspection Scheduling](#) tool.

Return
Save
Add
Delete

Standard Name:

Work Triggers
Inspection Triggers

Condition Trends				
CI Lower	Max Insp Interval	# Insp's in Zone	Degradation Factor	
Zone 1: 85	3	1	2.00	
Zone 2: 75	3	1	2.00	
Zone 3: 60	5	1	2.00	
Zone 4: 40	7	1	2.00	
Zone 5: 0	7			

The data on this tab should be input for each of the condition zones (see the [Condition Assessment Manual](#) for explanation of each condition zone) and includes:

- CI Lower. Enter the lower bound of the CI range of the condition zone. Providing the lower bound for each zone breaks the condition curve as shown in the screen above.
- Maximum Inspection Interval. Enter the maximum amount of time, in years, between condition assessments in each condition zone.
- Number of Inspections in Zone. Enter the maximum number of condition assessments that should be performed in each condition zone.
- Degradation Factor. The ratio of the maximum relative rate of deterioration to the expected rate of deterioration when a condition assessment is triggered. That is, if the deterioration rate were set to 2, any measured deterioration rate greater than twice the expected rate would trigger another inspection.

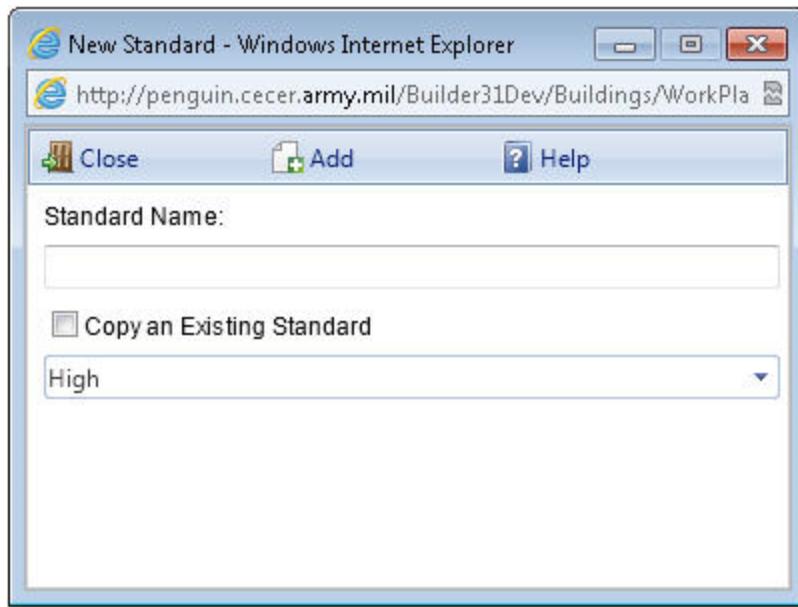
After adding data for a condition standard, make sure to click the **Save** button in the toolbar to save the changes to the condition standard.

#### **Editing a Condition Standard**

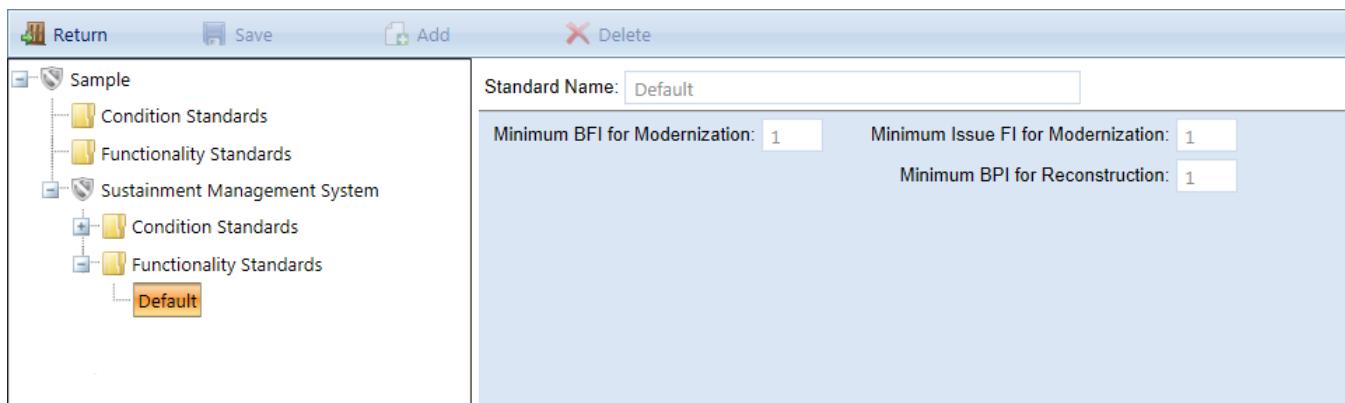
After a condition standard has been added, its data on the work triggers or inspection scheduling tabs can be edited by selecting the standard on the tree. Make sure to click the **Save** button in the toolbar to save any changes made to the condition standard.

#### Adding Functionality Standards

To add a functionality standard, select the functionality standards folder on the tree and click the **Add** button in the toolbar. The New Standard window will appear.



Enter the standard's name, mark the "Copy an Existing Standard" checkbox and select an existing standard to copy if you want to copy data from an existing standard to the new one, and click the **Add** button in the toolbar. The standards window will appear as shown below and data can be input for the standard (described below).



### Required Data

For each functionality standard, you must enter a set of work triggers, or thresholds, to initiate modernization work in your building.

- **Name.** Enter the functionality standard's name, which must be unique and is limited to 50 alphanumeric characters.
- **Minimum BFI for Modernization.** Enter the threshold value for the BFI. For buildings with a BFI above this value, no modernization work is triggered. For buildings with a BFI below this value, modernization work is triggered.

- **Minimum Issue FI for Modernization.** Enter the threshold value for the FIs for each individual functionality issue. For issues in the building with an FI above this value, no modernization work is triggered to correct the issue. For issues in the building with an FI below this value, modernization work is triggered.
- **Minimum BPI for Reconstruction.** Enter the threshold value for the BPI. For buildings with a BPI above this value, no work is triggered. For buildings with a BPI below this value, the building will be scheduled for demolition and reconstruction.

After adding or editing data for a functionality standard, click the **Save** button in the toolbar to save the changes to the functionality standard.

## Editing a Functionality Standard

After a functionality standard has been added, its data can be edited by selecting the standard on the tree. Make sure to click the **Save** button in the toolbar to save changes made to the functionality standard.

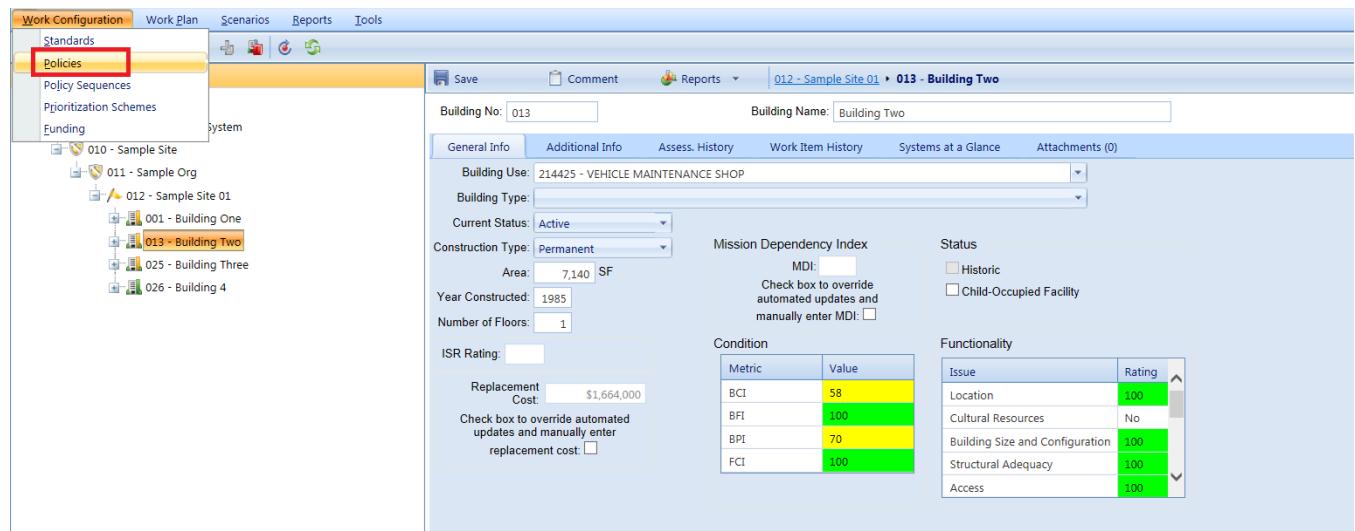
## Adding and Editing Policies

Policies can be made Organization-wide, or alternatively they can be set Site by Site. This topic shows how to add and edit policies.

### Navigating to the Policies

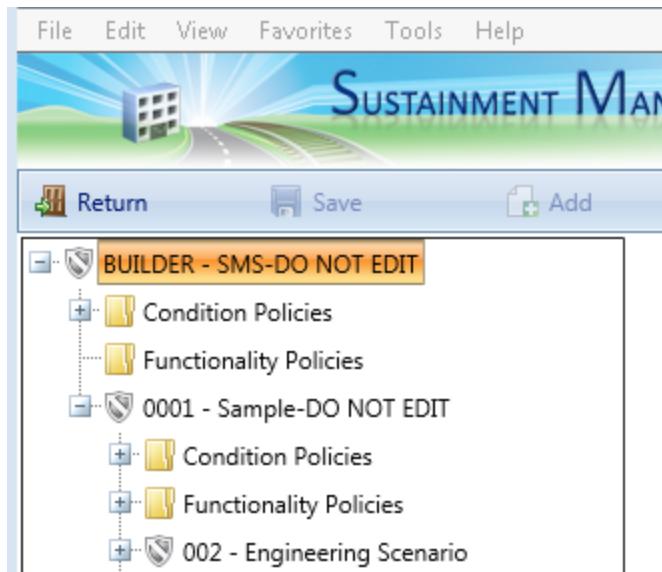
To navigate to the folders where you can add or edit policies,

1. Click on **Work Configuration** in the main menu.
2. Select **Policies** from the dropdown list.



*The screen will change, showing only the top level Organization.*

3. Expand the tree to show folders for condition and functionality policies. From these folders, new condition or functionality policies can be added and the existing standards can be viewed and edited.



### Policy Toolbar Options

In the toolbar above the navigation tree, only the toolbar options that are available at your current location will show as active; others will be grayed out.

- **Return.** Use this button to exit Work Management and return to your previous location.
- **Save.** Use this button to save changes you have made to the policies.
- **Add.** Use this button to add a new policy.
- **Delete.** Use this button to delete the selected policy.

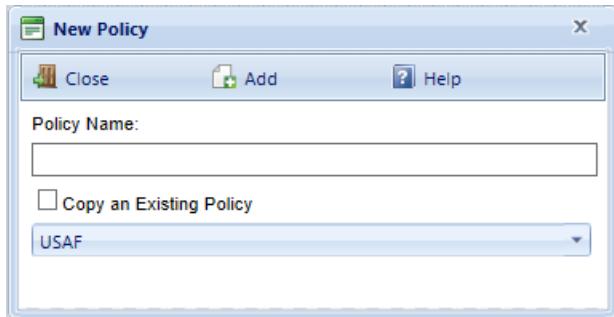
### Condition Policies

#### *Adding a Condition Policy*

To add a condition policy,

1. Make sure that you have Master Planner permission at the Organization or Site level at which you will be working, or above that level.
2. Select the appropriate "Condition Policies" folder on the tree.
3. Click the **Add** button in the toolbar. *The New Policy window will appear.*

**Note:** the Organization or Site level at which you are adding a policy denotes the level at which that policy can be applied.



4. Enter the policy's name in the "Policy Name" text box.
5. If you want to copy data from an existing policy to the new one, mark the "Copy an Existing Policy" checkbox and select from the dropdown list an existing policy to copy.
6. Click the **Add** button in the toolbar. *The policy window will open as shown below.* If the **Add** button is grayed out, this may mean that you do not have Master Planner permissions at that level.
7. Enter data for the policy, as described in the Adding and Editing Policies section below.

**New Policy**

Policy Name: New Policy

Attributes Used to Define Policy

First Attribute:	Facility Mission Dependency Index (MDI)	Third Attribute:	
Second Attribute:	System	Fourth Attribute:	

Select Standards for all attribute combinations that apply to this policy.

Facility Mission Dependency Index (MDI)	System	Standard
95 - 100	A10 FOUNDATIONS	
95 - 100	A20 BASEMENT CONSTRUCTION	
95 - 100	B10 SUPERSTRUCTURE	
95 - 100	B20 EXTERIOR ENCLOSURE	3 High
95 - 100	B30 ROOFING	3 High
95 - 100	C10 INTERIOR CONSTRUCTION	2 Medium
95 - 100	C20 STAIRS	2 Medium
95 - 100	C30 INTERIOR FINISHES	2 Medium
95 - 100	D10 CONVEYING	3 High

### Required Data - Condition

When you add a new condition policy, you must enter the following data:

- **Name.** Enter the policy's name, which must be unique and is limited to 50 alphanumeric characters.
- **Attributes Used to Define the Policy.** Select between one and four attributes of Component-Sections to define the condition policy. These are selected consecutively as First, Second, Third, and Fourth Attribute. These attributes are simply field properties in the Organization/Complex/Building/System/Component/Section hierarchy. The grid shown at the bottom of the window will not be visible until the attribute(s) have been selected.
- **Select Standards for all attribute combinations that apply to this policy.** Assign condition standards to the various combinations of values of these

field properties, so that when a section's hierarchy has field properties matching a given combination of values, it will use the condition standard for that combination. The grid at the bottom of the window will show all combinations of the attributes selected. You do not need to select a condition standard for every combination. The combinations that do not have a selected condition standard are simply not covered by the condition policy.

After adding a condition policy, make sure to click the **Save** button in the toolbar to save the changes to the condition policy.

### *Editing a Condition Policy*

After a condition policy has been added, you can edit its data by selecting the policy on the tree. Make sure to click the **Save** button in the toolbar to save changes made to the condition policy.

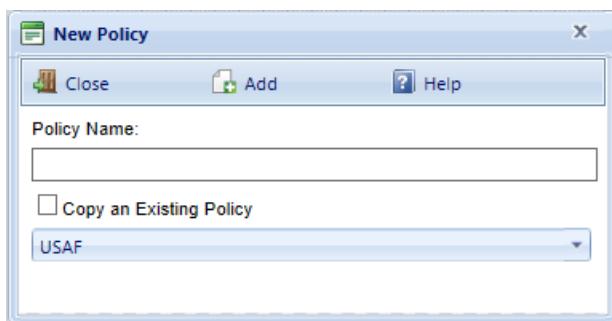
## **Functionality Policies**

### *Adding a Functionality Policy*

To add a functionality policy,

1. Make sure that you have Master Planner permission at the Organization or Site level at which you will be working, or above that level.
2. Select the appropriate "Functionality Policies" folder on the tree.
3. Click the **Add** button in the toolbar. *The New Policy window will appear.*

**Note:** the Organization or Site level at which you are adding a policy denotes the level at which that policy can be applied.



4. Enter the policy's name in the "Policy Name" text box.
5. If you want to copy data from an existing policy to the new one, mark the "Copy an Existing Policy" checkbox and select from the dropdown list an existing policy to copy.

6. Click the **Add** button in the toolbar. *The policy window will open as shown below.* If the **Add** button is grayed out, this may mean that you do not have Master Planner permissions at that level.
7. Enter data for the policy, as described in the Adding and Editing Policies section below.

Facility Mission Dependency Index (MDI)	System	Standard
95 - 100	A10 FOUNDATIONS	3 High
95 - 100	A20 BASEMENT CONSTRUCTION	3 High
95 - 100	B10 SUPERSTRUCTURE	2 Medium
95 - 100	B20 EXTERIOR ENCLOSURE	3 High
95 - 100	B30 ROOFING	3 High
95 - 100	C10 INTERIOR CONSTRUCTION	2 Medium
95 - 100	C20 STAIRS	2 Medium
95 - 100	C30 INTERIOR FINISHES	2 Medium
95 - 100	D10 CONVEYING	3 High

## Required Data - Functionality

When you add a new functionality policy, you must enter the following data:

- **Name.** Enter the policy's name, which must be unique and is limited to 50 alphanumeric characters.
- **Attributes Used to Define the Policy.** Select between one and four attributes of Component-Sections to define the functionality policy. These are selected consecutively as First, Second, Third, and Fourth Attribute. These attributes are simply building and Functional Area field properties. The grid shown at the bottom of the window will not be visible until the attribute(s) have been selected.
- **Select Standards for all attribute combinations that apply to this policy.** Assign functionality standards to the various combinations of values of these field properties, so that when a building or functional area has field properties matching a given combination of values, it will use the functionality standard for that combination. The grid at the bottom of the window will show all combinations of the attributes selected. You do not need to select a functionality standard for every combination. The combinations that do not have a selected functionality standard are simply not covered by the functionality policy.

After adding a functionality policy, make sure to click the **Save** button in the toolbar to save the changes to the functionality policy.

## *Editing a Functionality Policy*

After a functionality policy has been added, you can edit its data by selecting the policy on the tree. Make sure to click the **Save** button in the toolbar to save changes made to the functionality policy.

## **Adding and Editing Policy Sequences**

To add or edit policy sequences, select Work Configuration -> Policy Sequences from the navigation menu.

This information system is approved for UNCLASSIFIED//FOUO data

The Policy Sequence window will appear.

	Organization	Policy Name
<input type="checkbox"/>	Default	
<input type="checkbox"/>	Temporary	

	Organization	Policy Name
<input checked="" type="checkbox"/>	Sustainment Management System	Sample Policy

To create a new policy sequence, click the **Add** button in the toolbar. If you wish to edit a current policy sequence, select the policy sequence you wish to edit from the tree on the left side of the screen.

## Toolbar

- **Return.** Use this button to close the Policy Sequences window.
- **Save.** Use this button to save changes you have made to the policy sequences.
- **Add.** Use this button to add a new policy sequence.
- **Delete.** Use this button to delete the policy selected sequence.

## Required Information

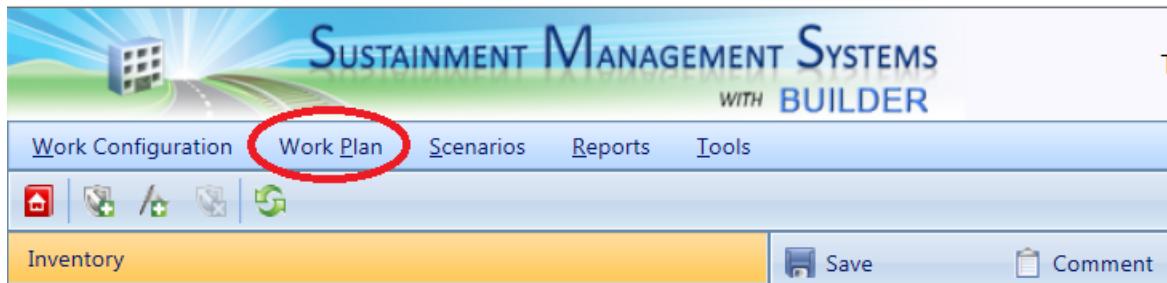
When you add a new policy sequence or edit an existing policy sequence, you must enter the following data:

- **Name.** Enter the policy sequence's name, which must be unique and is limited to 50 alphanumeric characters.
- **Default Condition Standard.** Select a condition standard from among the standards you have previously created to be the default. The application of the policy sequence must be able to determine a standard for every Component-Section in your inventory. If none of the policies in this policy sequence apply to a given section, then the default standard is used.
- **Default Functionality Standard.** Select a functionality standard from among the standards you have previously created to be the default. The application of the policy sequence must be able to determine a standard for every building and functional area in your inventory. If none of the policies in this policy sequence apply to a given section, then the default standard is used.
- **Selected Policies.** Select the policies in the Available Policies list you wish to add to the policy sequence and use the arrow buttons move them to the Selected Policies list. To change the order of application of a policy in the Selected Policies list, select the policy and use the up and down arrow buttons to move it in the list. Arrange the list so that each succeeding policy in the list overwrites earlier policies in the list. That is, the last policy in the Selected Policy list governs the applicable Component-Sections, functional areas, and buildings. You may choose to have no selected policies at all, in which case all inventory will use the default standard.

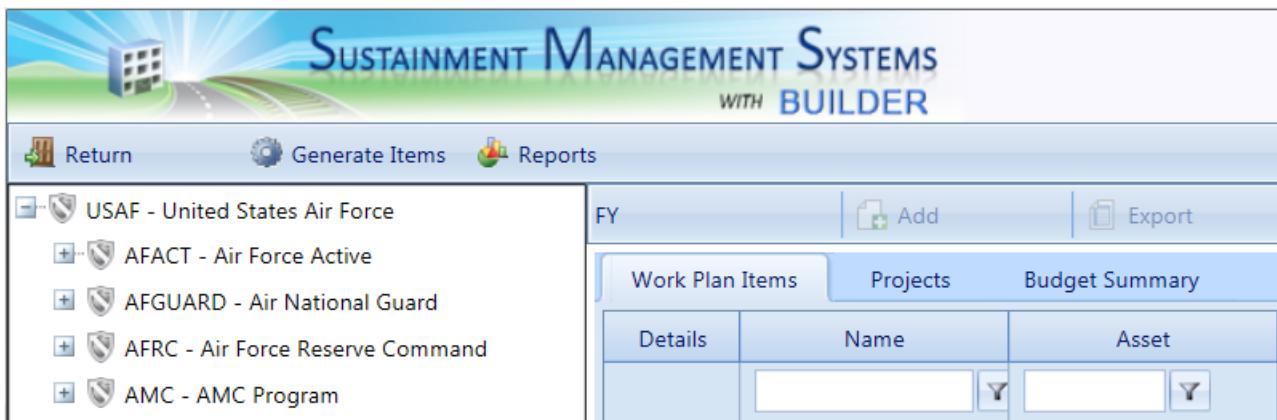
Note that you may create multiple policy sequences. The application of a specific policy sequence could potentially result in a work plan that differs from another policy sequence because each may assign different standards for the Component-Sections, functional areas, and buildings in your inventory.

# Viewing Work Items

The individual work item records, when grouped by fiscal year, become an annual work plan that can be viewed in the Work Items window. To view work plan, select Work Plan from the navigation menu.



The Work Items window will appear.



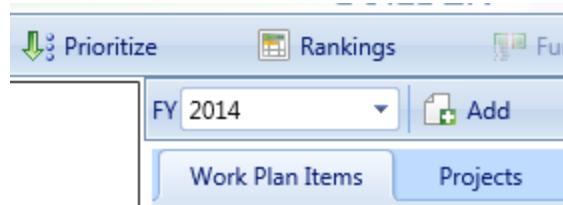
## Navigating the Work Items

### Toolbar

- **Return.** Use this button to close the Work Item screen.
- **Generate Items.** Use this button to [automatically generate work items](#).
- **Prioritize.** Use this button to [prioritize the work items](#) for a work plan.
- **Rankings.** Use this button to [view the rankings of the work items](#) for a work plan.
- **Fund Items.** Use this button to [allocate funding to the work items](#) in a work plan.
- **Reports.** Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to the work items. See [Using the Report Viewer](#).

## Changing the Work Items View

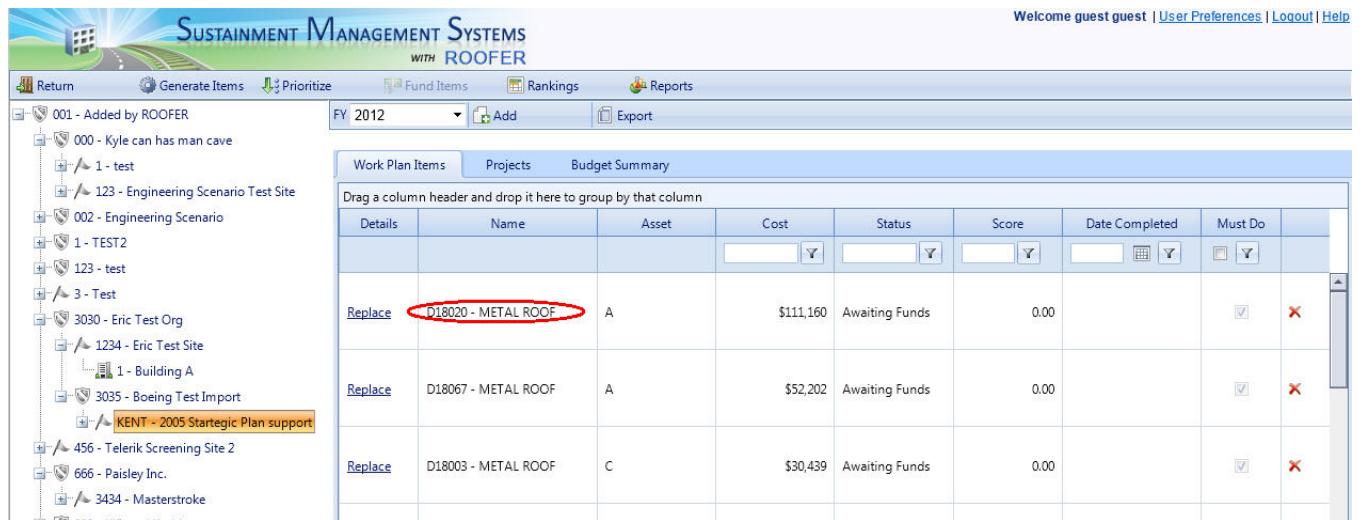
Initially, what is shown in the Work Items window is the work plan for the current fiscal year for the entire inventory. To view the work plan for a particular inventory level, [navigate the tree](#) on the left side of the window to the desired level. The work plan for the selected inventory level will be shown for the current fiscal year. To view the work plan for past or future fiscal years, select the desired fiscal year from the dropdown list at the top of the window:



Once the desired work plan is shown, you are able to sort it using the column headings. Click on the column you wish to sort by once to sort in alphabetically/ascending numerical order. Click on the column a second time if you wish to sort in reverse-alphabetic order/descending numerical order. Initially, the work plan is sorted by name in ascending numerical order.

## Viewing Individual Work Item Details

To view the individual work item details, click on the Details hyperlink associated with a given work item.



Details	Name	Asset	Cost	Status	Score	Date Completed	Must Do
Replace	D18020 - METAL ROOF	A	\$111,160	Awaiting Funds	0.00		<input checked="" type="checkbox"/> <input type="checkbox"/>
Replace	D18067 - METAL ROOF	A	\$52,202	Awaiting Funds	0.00		<input checked="" type="checkbox"/> <input type="checkbox"/>
Replace	D18003 - METAL ROOF	C	\$30,439	Awaiting Funds	0.00		<input checked="" type="checkbox"/> <input type="checkbox"/>

If the work item is a Section-level work item, you will see the [Section-Level Work Item Details](#). If the work item is a Building-level work item, you will see the [Building-Level Work Item Details](#). If the work item is a project, you will see the [Project Details](#) for that project.

## ***Adding and Deleting Work Items***

### **Adding a Work Item**

To add a work item to the current work plan, click the **Add** button while the "Work Plan Items" tab is selected. Work items can be added at the [Section level](#), at the [Building level](#), or as a [project](#). Additionally, work items can be added using [BUILDER's automatic work generator](#) or [copying the results of a Scenario](#).

### **Deleting a Work Item**

To delete a work item from the current work plan, click the red "X" button to the left of the Work Item record.

## ***Exporting the Work Plan to Excel***

The current work plan can be exported to an Microsoft Excel spreadsheet using the **Export** button. After clicking this button, you must choose either to open or to save the Excel spreadsheet. If you choose to save, you must specify the location and name to save the exported spreadsheet.

## ***Creating and Editing a Section-Level Work Item***

A Section-level work item is an individual record of maintenance, repair, or revitalization work on a Component-Section in your inventory. The information stored with the work item is what was or is to be done, when it was or is to be done, its cost, its funding source, and its importance relative to the other work items vying for the same resources at the same time.

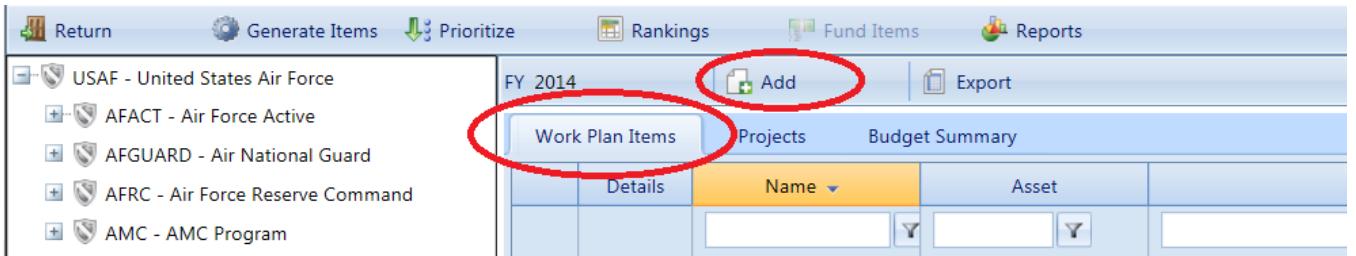
In BUILDER, Section-level work items can be created three ways, each of which is discussed in detail further below.

- **Manual Input** - Allows you to create individual work items manually from the Work Items window.
- **BUILDER Generated Work Items** - Allows you to use the automated work generation feature in BUILDER to create an entire work plan if you have defined [standards, policies, and policy sequences](#).
- **Scenario Generated Work Items**- Allows you to [copy the results of a Scenario](#) and create a multi-year work plan.

### **Creating a Work Item**

#### *Creating a Work Item Manually*

To create a Section-level work item manually, click the **Add** button with the "Work Plan Items" tab selected.



The New Work Item window will appear.

A screenshot of a "New Work Item" dialog box. At the top, there are buttons for "Close", "Proceed", and "Help". Below that, it says "Select the type of Work Item to create:" with three options: "Project", "Building Work Item", and "Section Work Item". The "Section Work Item" option is highlighted with a red circle. Below this, it says "Select the Section to create the work item for:" with dropdown menus for "Building" (set to "00001 - Test"), "System" (set to "B20 EXTERIOR ENCLOSURE"), "Component", and "Section".

Select the **Section Work Item** option, along with the Building, System, Component, and Section for the work item. Then click **Proceed**. The "Component-Section Work Item" window will appear.

Close    Save    Calculate    Help

Section Description: C1010 PARTITIONS - C101001 FIXED PARTITIONS General    Quantity: 2,000 SF

Details     Cost Analysis

\*Projected CI: 100    \*Projected RSL: 36    \*Projected CCI: 0    \*Projected RPL: 0

Current Type: C101001 FIXED PARTITIONS General

Description:	<input type="text"/>		
Work Request ID:	Status:	Awaiting Funds	
Funding FY:	<input type="checkbox"/>	Must Complete as planned	
Work FY:	Funding Source:	<input type="text"/>	
Score:	Estimated Cost:	\$0.00	
Work Code:	<input type="checkbox"/>	Override automatic cost estimate	
Work Activity:	Modernization Year:	<input type="text"/>	
Quantity:	Actual Cost:	\$0.00	
	Cost Book:	USAF	

**ROI Information**

Return:	ROI:
---------	------

\*Projected values are estimated based upon the Work FY

On this screen, the following data for the Section-level work item is displayed and can be edited:

- **Section Description (Read-Only)**. Displays the description Component-Section of the work item.
- **Quantity (Read-Only)**. Displays the actual inventory quantity for this Component-Section.
- **Projected CI (Read-Only)**. Displays the projected Condition Index (CI) for the section in the funding FY. If the funding FY changes, BUILDER will recalculate the projected CI for the new funding FY.
- **Projected RSL (Read-Only)**. Displays the projected Remaining Service Life (RSL) for the section in the funding FY. If the funding FY changes, BUILDER will recalculate the projected RSL for the new funding FY.

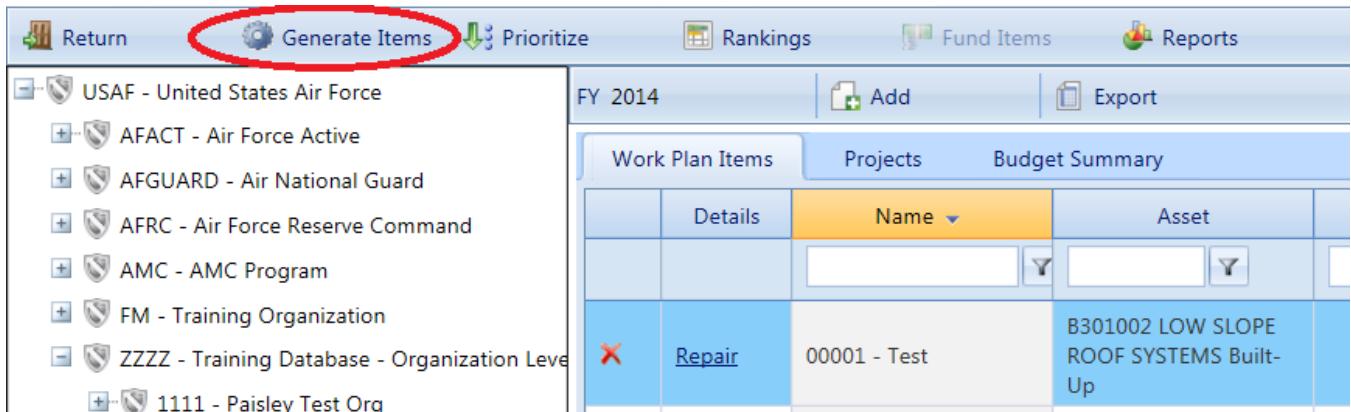
- **Current Type** (*Read-Only*). Displays the material/equipment type and component subtype of the section.
- **New Type**. If the work item activity is Replace, then you will have the option of replacing the current Component-Section type with another. The default is to replace in kind. Select a different type and material/equipment type from the dropdown list of available options if you wish to change the type. If the work item activity is not Replace, this item is not visible.
- **Description of Work Item**. Enter a description of the work item, limited to 255 alphanumeric characters.
- **Work Request ID**. Enter your agency's work request number, limited to 50 alphanumeric characters. This item of data is not used by BUILDER in any analyses.
- **Status**. Select the current status of the work item from the dropdown list of choices. The status will change over time as the work item moves from planning to completion. The values of status are:
  - Awaiting Contract Award
  - Awaiting Funds
  - Awaiting Funds (Special Project)
  - Budgeted
  - Canceled
  - Completed
  - Deferred
  - Funded
  - Funded (Service Call)
  - Funded (Special Project)
  - In Design
  - In Progress
  - On hold
- **Funding FY**. Enter the four-digit fiscal year that the work item was or will be funded.
- **Must Complete as Planned**. Check this box if the work item falls into the "must do" category. Marking this checkbox will force the work item to be funded before all other competing work items that are not marked as "must do" in the Scenarios module.
- **Completion FY**. Enter the four-digit fiscal year that the work item was or will be completed.
- **Fund Source**. Select the [funding source](#) to be used for this work item from the created fund sources.

- **Date Completed.** Enter the date the work item was completed.
- **Estimated Cost.** Enter the estimated cost of the work item. BUILDER provides a means of estimating the initial cost once you have entered the Fund FY, Activity, Cost Book, and Quantity using the **Calculate** button. Note that the cost module is unable to estimate the cost of activities to Add/Install and Alter, so the **Calculate** button is grayed out for those work activities.
- **Score (Read Only).** If you have [prioritized the work items](#), then this work item's score will be displayed here. The default value is 0.000, indicating that the work items have not been prioritized.
- **Override Automatic Cost Estimate.** Mark this checkbox if you wish to override the cost estimated using the **Calculate** button and enter your own estimated cost of the work item.
- **Work Code.** Select the work code of the work item. The available work codes are:
  - Sustainment
  - Modernization
  - Demolition
  - New Footprint
- **Activity.** Select the work activity associated with this work item from the dropdown list. The work activities are:
  - Add/Install
  - Alter
  - Paint
  - Remove
  - Repair
  - Replace
- **Actual Cost.** Enter the actual cost of the work item after completion.
- **Quantity.** Enter the quantity of section involved with the work item. The Quantity listed at the top of the window is the actual Component-Section quantity, but the quantity of the work item may be different. For example, you may replace only 5 of the 10 doors in a Component-Section.
- **Cost Book.** Select the [cost book](#) to be used from the dropdown list.
- **ROI Information (Read-Only).** Displays the return and return on investment for the work item calculated on the [Cost Analysis tab](#).

After entering the data for the work item, click **Save** in the toolbar to save the changes to the work item. If you do not wish to save the changes made to the work item, click the **Close** button on the popup window's toolbar without saving.

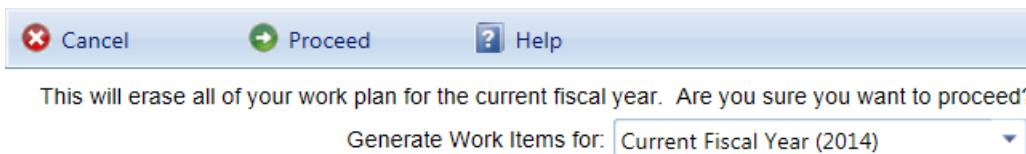
## *Generating Work Items in BUILDER Automatically*

If you have created [condition and functionality standards and policies, along with a policy sequence](#), you may use the **Generate Items** button to create a work plan for the current year.



The screenshot shows the BUILDER application window. On the left, there's a navigation tree with items like USAF - United States Air Force, AFACT - Air Force Active, AFGUARD - Air National Guard, AFRC - Air Force Reserve Command, AMC - AMC Program, FM - Training Organization, ZZZZ - Training Database - Organization Level, and 1111 - Paisley Test Org. On the right, there's a main panel titled 'FY 2014' with tabs for 'Work Plan Items', 'Projects', and 'Budget Summary'. Under 'Work Plan Items', there's a table with columns for Details, Name, and Asset. One row is selected, showing 'Repair' under Details, '00001 - Test' under Name, and 'B301002 LOW SLOPE ROOF SYSTEMS Built-Up' under Asset. At the top of the main panel are buttons for 'Add' and 'Export'. The 'Generate Items' button in the top navigation bar is circled in red.

After clicking the **Generate Items** button, the "Generate Work Items" window will appear.



Click **Proceed** to generate the work items.

**IMPORTANT:** When you click **Proceed**, all of the work items in the work plan for the current fiscal year will be deleted.

Using the [policy sequence](#) defined in the [Site data](#), each Component-Section's, functional area's, and Building's properties with its standard's threshold values to determine where and what type of work should be done. Additionally, the estimated cost of each work item is computed [Using the Cost Book assigned to the Site in the Site General Information tab](#). When the process is complete, the work plan will appear in the Work Items window, displaying all of the newly generated work items. All of the newly generated work items will have the status "Awaiting Funds." You may then refine the work item list as you wish.

Note that BUILDER's work generation algorithms are still primitive in the sense that they are unable to detect work conflicts and precedences. For example, they may generate a need to repair a roof deck without a concurrent effort to repair the roof surface. Your own manual processing of the work item list must address such problems.

### *Creating Work Items Using Scenarios*

If you have run a [Scenario](#), you may copy its results to the Work Plan by right-clicking on that scenario in the Scenarios module. This will create a work plan for the current year as well as future years. See [Creating a Work Plan from a Scenario](#) for more information on using this tool.

### **Editing Section-Level Work Items**

To edit a Section-level work item, click on "Repair" or "Replace" in the **Details** column next to desired Section-level work item on the Work Items screen.

FY 2014				
Work Plan Items		Projects	Budget Summary	
	Details	Name	Asset	Description
<input type="checkbox"/>	<a href="#">Repair</a>	00001 - Test	B301002 LOW SLOPE ROOF SYSTEMS Built-Up	
<input type="checkbox"/>	<a href="#">Repair</a>	00001 - Test	C101001 FIXED PARTITIONS General	Repair C1010 PARTITIONS C101001 FIXED PARTITIONS General
<input type="checkbox"/>	<a href="#">Replace</a>	00001 - Test	RoofA B301002 LOW SLOPE ROOF SYSTEMS Built-Up	

The Component Section Work Item screen will re-appear, titled "Details," and all of the [data described above](#) can be edited as desired.

### **Work Item Cost Analysis**

BUILDER 3 allows you to perform a cost analysis on any given work item. This analysis can show the benefits of repair versus replacement, as well as the consequences of deferring work for a given item. The cost analysis feature is available by clicking the Cost Analysis tab on the work item details screen.

Section Description:	Heating Unit/Plant - Boiler (Steel) Gas/Oil (Steam) 3880-5025 MBH	Quantity:	3	EA
----------------------	---	-----------	---	----

The Cost analysis screen is displayed as shown. The Cost Analysis module uses projected deterioration information about a particular asset to display different work scenarios. This deterioration information is based on the expected life of the asset, and calibrated based on past condition assessments performed throughout the life cycle. In this analysis, four different life cycle curves are presented:

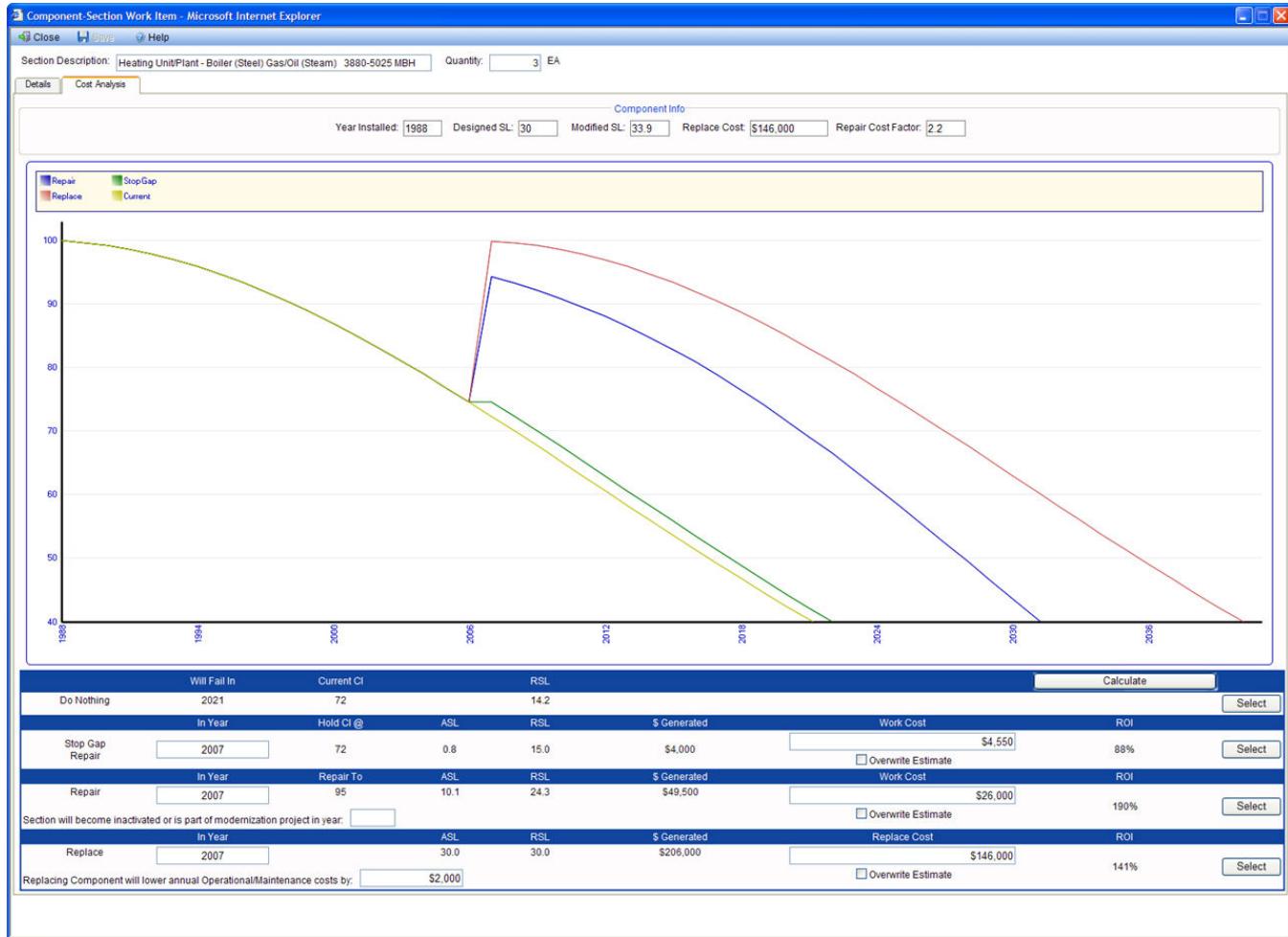
**Current.** This curve represents the projected deterioration of the asset from the year it was installed to its projected failure point (at a Terminal CI value of 40). This is the expected path of the condition if no intervening work action is performed. If the asset reaches the terminal CI value, replacement is required. This "run to failure" option is viable only if component failure does not have a significant impact on mission.

**Stop Gap.** This curve represents the projected deterioration of the asset if stop gap measures are employed at some point. These stop gap measures are assumed to hold the condition of the asset constant for one year. This allows for repair or replacement to be planned in a future year without further degradation occurring. This is applicable for some components where advancing degradation is evident and measures can be taken to slow or halt this degradation for some finite amount of time. These measures are limited in scope and do not improve or restore condition, but they can prevent the component from degrading below some minimum performance requirement until a more permanent solution can be accomplished. Stop gap repairs are usually less attractive from an economic perspective, because they do not improve condition and only defer larger major repairs or replacement for a short amount of time, but may be needed due to a lack of funds for a permanent solution.

**Repair.** This curve represents the projected deterioration of the asset if major repair is accomplished at some point. This repair is considered significant enough to improve the condition index of the asset to 95 out of 100. In addition to an improvement in condition, this results in some extended life for the asset. This additional service life, brought on by repair, defers the capital cost of replacement due from impending failure. Therefore, the monetary benefit of a repair can be calculated by taking the additional service life generated by the repair multiplied by the amortized expenditure of component replacement. This monetary benefit, divided by the cost of the repair, determined the return on the investment (ROI). The repair of a component also has benefits due to improved operational performance and reliability which are more difficult to quantify in monetary terms.

**Replacement.** This curve represents the life cycle of the asset if total replacement is performed. In this case, the Condition index is restored to a maximum of 100, and deterioration clock is reset with a remaining service life equal to the original design service life. Since replacement does not defer capital expense, its return of investment ratio based on the logic described for repair is essentially 1. However,

replacement of a component may involve some modernization, potentially resolving obsolescence issues. This, in turn, can lead to benefits of efficiency and lower maintenance, operations, or energy costs, which should be accounted for in any ROI calculation



In addition to seeing the graphical representation of the asset life cycle for different corrective work options, the Cost Analysis module also displays the alternatives in economic metrics, to be measured by the Return on Investment (ROI). Each work option results in some extension in service life, which defers the capital expenditure of a total replacement of the asset. The monetary return of any work action is thus calculated as the amortized capital cost of the asset multiplied by the number of years capital expenditure is deferred. The investment is simply just the estimated cost of performing the work.

The year a stop gap, repair, or replace action is to be performed can be adjusted by the user. In addition, the user can overwrite the estimated cost of any work action, after which clicking the **Calculate** button will adjust the analysis accordingly. Note that for the Replacement option, an additional benefit in terms of return

can be generated if the new assets results in more efficiency and lower operational/maintenance costs. If this savings is known, the user can input this information into the analysis to account for that. Finally, all calculations account for inflation and discount rate of money (discount rate is assumed at 3%).

After a user has determined the strategy to pursue for that component from the cost analysis, they can click the **Select** button for that work alternative and the results will be copied back to the [work item details](#) tab.

### ***Creating and Editing a Building-Level Work Item***

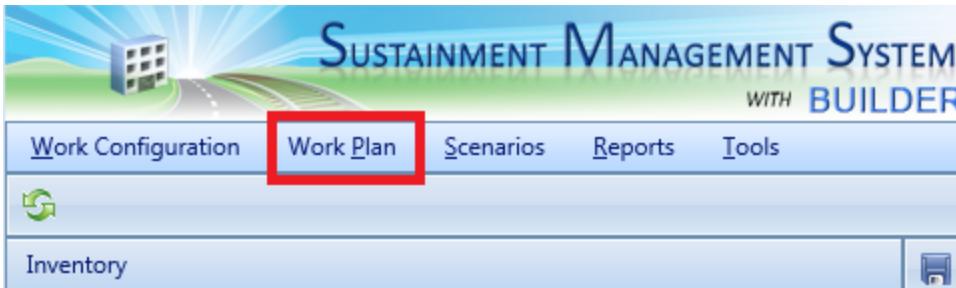
In BUILDER™, work items can be created both at the Building level or at the Section level. Building-level work items are currently limited to three work activities: Demolish, Modernize, and Replace. The Building-level work item allows you to schedule and track these work activities in your work plan and to account for costs in your overall budget. Since you will be entering, updating, and tracking such work manually, the new type of work item will be relatively trouble-free in BUILDER. The automated processes in Scenarios, however, will require some help from you to model funding and completion of this type of work item.

A work item to demolish a Building affects all Sections of the Building, but the effect is counter to the logic associated with prioritizing M&R work, which focuses on valuing work that protects and preserves the various Sections of a Building. For that reason, the [prioritization schemes](#) in BUILDER/Scenarios do not compute a priority score for Building-level work items (the score will be 0.00). In order for such a work item to be funded for completion, there must be a funding source for which it qualifies and sufficient funds in that source to meet the cost of the work item and all other qualified work items. Here are two examples of ways to handle this:

- Create a specific funding source with a criteria that it must be used only for the building that is to have building level work activities.. Set aside sufficient funds in that source for the fiscal year of the work item to cover the cost of the activity.
- Check the "Must do as planned" property of the work item. That will force the Building-level work activity to be funded before all other competing work items that are not marked as "Must do."

### ***Creating a Building-Level Work Item***

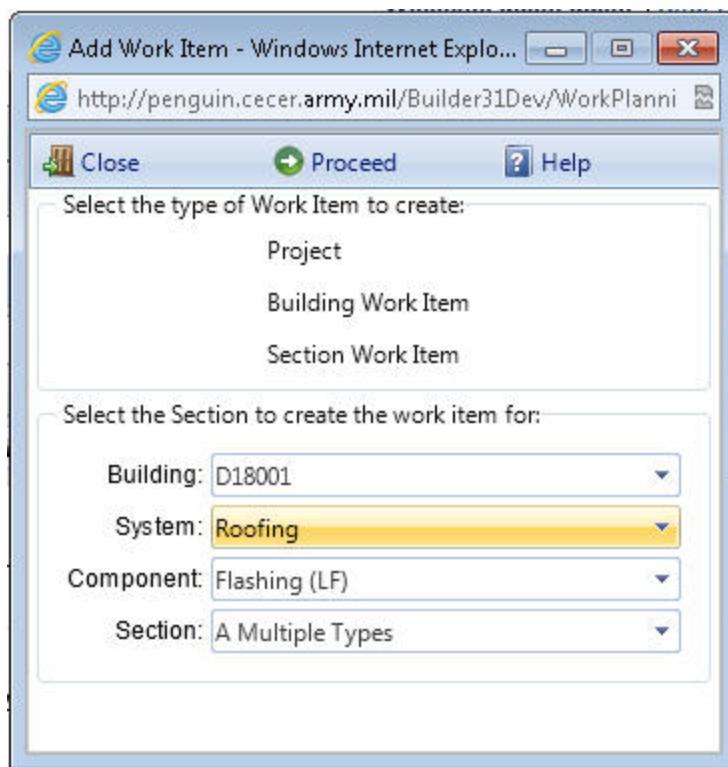
To create a Building-Level work item, first navigate to the Work Plan by selecting Work Plan from the main toolbar.



To create a Building-level work item, click the **Add Item** button on the Work Item screen.

A screenshot of the Work Plan screen. The top navigation bar includes 'Return', 'Generate Items', 'Prioritize', 'Fund Items', 'Rankings', and 'Reports'. The main content area shows a tree view of work items on the left and a grid-based 'Work Plan Items' table on the right. The 'Work Plan Items' tab is selected. A red circle highlights the 'Add' button in the top right corner of the table header. The table has columns for 'Details', 'Name', 'Asset', and 'Cost'. Two rows are visible: one for 'D18020 - METAL ROOF' with a cost of '\$111,160' and another for 'D18067 - METAL ROOF' with a cost of '\$52,202'.

The New Work Item window will appear.



Select the Building Work Item option, select the building of the work item, and click the **Proceed** button. The Building Work Item window will appear:

The screenshot shows a 'Building Work Item' configuration window with a light blue header bar containing 'Close', 'Save', and 'Help' buttons. The main area contains several input fields and dropdown menus. On the left, there's a 'Description' field with the value 'Modernize D18001'. To its right are 'Request ID' and 'Status' fields; 'Request ID' is empty, and 'Status' is set to 'Awaiting Funds'. Below these are 'Funding FY' (set to '2012') and 'Work FY' (set to '2012'). In the center, there's a checkbox 'Must Complete as planned' and a dropdown 'Funding Source'. To the right of these are 'Estimated Cost' (\$0.00) with an 'Estimate' button and a checkbox 'Override automatic cost estimate'. At the bottom, there's a 'Score' field (0), a 'Work Code' dropdown ('Modernization'), a 'Work Activity' dropdown ('Modernize' which is highlighted in yellow), 'Actual Cost' (\$0.00), and a 'Cost Book' dropdown ('Reference').

On this screen, the following data for the Building-level work item can be recorded:

- **Description of Work Item.** Enter a description of the work item, limited to 255 alphanumeric characters.

- **Work Request ID.** Enter your agency's work request number for this work item, limited to 50 alphanumeric characters. This item of data is not used by BUILDER in any analysis.
- **Status.** Select the current status of the work item from the drop-down list of choices. The status will change over time as the work item moves from planning to completion. The values of status are:
  - Awaiting Contract Award
  - Awaiting Funds
  - Budgeted
  - Canceled
  - Completed
  - Deferred
  - Funded
  - In Design
  - In Progress
  - On hold
- **Funding FY.** Enter the four-digit fiscal year that the work item was or will be funded.
- **Must Complete as Planned.** Check this box if the work item falls into the "must do" category. As discussed above, using this checkbox is one of the ways to ensure the work items is funded and completed.
- **Completion FY.** Enter the four-digit fiscal year that the work item was or will be completed.
- **Fund Source.** Select the [funding source](#) to be used for this work item.
- **Date Completed.** Enter the date the work item was completed.
- **Estimated Cost.** Enter the estimated cost of the work item. BUILDER provides a means of estimating the initial cost once you have chosen the Cost Book using the **Calculate** button next to this field.
- **Score.** Work items to demolish buildings are not scored by prioritization schemes in BUILDER, so the score is defaulted to 0.000. Special steps to ensure the work item is completed are discussed above.
- **Override Automatic Cost Estimate.** Check this box if you wish to override the cost estimated using the **Calculate** button and enter your own estimated cost of the work item.
- **Work Code.** Select the work code of the work item. The available work codes are:
  - Sustainment
  - Modernization

- Demolition
- New Footprint
- **Activity.** Select the activity of the work item from the dropdown list. The available activities are **Demolish**, **Modernize**, and **Replace**.
- **Actual Cost.** Enter the actual cost of the work item after completion.
- **Cost Book.** Select the [cost book](#) from the drop down list to be used in estimating the cost of the work item.
- **ROI Information.** Displays information from the cost analysis tab. For more information see [Work Item Cost Analysis](#).

After entering the data for the work item, click the **Save** button in the toolbar to save the changes to the work item. If you do not wish to save the changes made to the work item, click the **Cancel** button on the toolbar.

### **Editing a Building-Level Work Item**

To edit a Building-level work item, click on the **Details** button next to the Building-level work item on the Work Items screen.

The screenshot shows the Work Items screen for the USAF - United States Air Force. On the left is a tree view of organizational units. The main area shows a grid of work items for FY 2014. One row is selected, highlighted with a red circle around the 'Details' button in the first column. The selected row contains the following data:

	Name	Description	Cost	Status
	Sidewalk Repair	Fixing Main Sidewalk outside of Store	\$1,969.06	Awaiting Funds

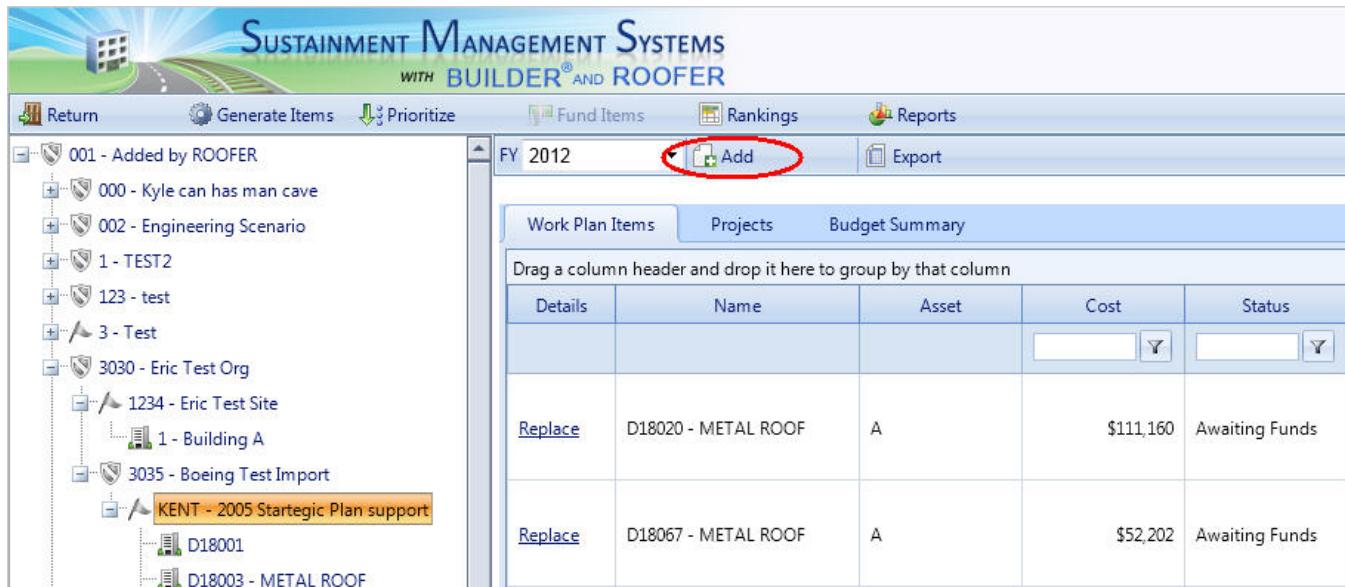
The Building Work Item window will appear and the data described above can be edited as desired.

### **Creating and Editing a Project**

The concept of a M&R work project was added to BUILDER™ with the release of version 2.2. Projects allow you to group work items together to manage them as a single work effort that is prioritized and funded as a whole. The work items in a project may span different systems in a single building, as in a renovation effort. They may also span multiple buildings, as when roofing is replaced on several buildings under one contract. In general, a project is a collection of any work items grouped together in an "all or nothing" work unit with a single funding source and a single work year.

## Creating a Project

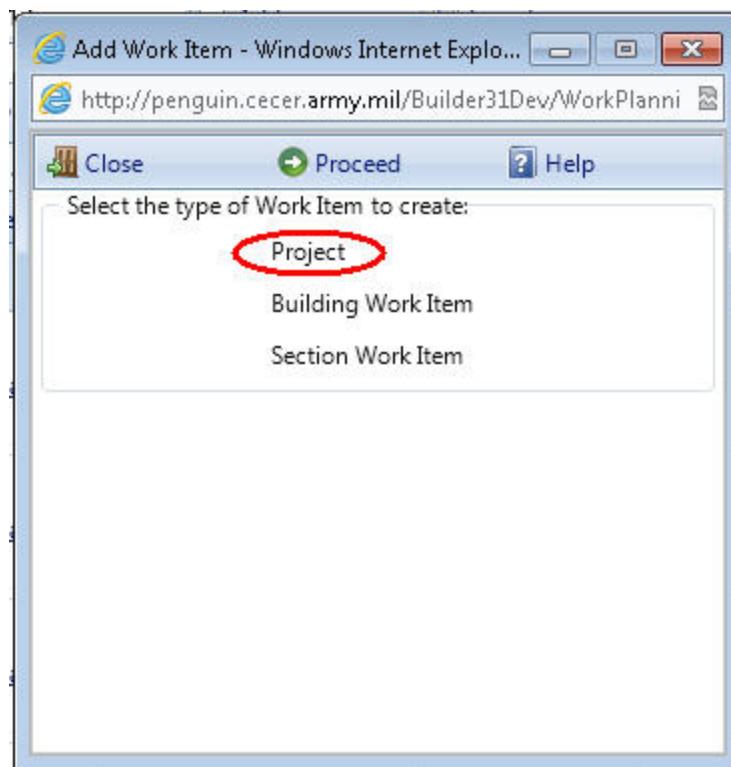
To create a project, click the **Add** button on the Work Item screen.



The screenshot shows the Sustainment Management Systems interface. On the left, there's a tree view of work items. In the center, there's a grid titled 'Work Plan Items' with columns for Details, Name, Asset, Cost, and Status. Two rows are visible in the grid:

Details	Name	Asset	Cost	Status
Replace	D18020 - METAL ROOF	A	\$111,160	Awaiting Funds
Replace	D18067 - METAL ROOF	A	\$52,202	Awaiting Funds

The "Add Work Item" window will appear.



Select the Project option and click the **Proceed** button. The "Projects" window will appear, opened to the **General Information** tab.

The screenshot shows a software interface for managing project information. At the top, there are buttons for Close, Save, and Help. Below that, the 'Project Name' is set to 'Testing Projects 123'. The main area has two tabs: 'General Information' (selected) and 'Work Items'. Under 'General Information', there are several input fields and dropdown menus:

- Description:** A large text area with scroll bars.
- Work Request ID:** Text input field.
- Status:** Dropdown menu showing 'Awaiting Funds'.
- Funding FY:** Text input field containing '2012'.
- Work FY:** Text input field containing '2012'.
- Score:** Text input field containing '0'.
- Funding Source:** Dropdown menu.
- Estimated Cost:** Text input field showing '\$0.00'.
- Actual Cost:** Text input field showing '\$0.00'.
- Must Complete as planned:** A checkbox is checked.
- Override automatic cost estimate:** A checkbox is checked.
- Work Code:** A dropdown menu showing 'Sustainment'.

Below this section, there is a blue header bar labeled 'ROI Information'.

## General Information Tab

On the general information tab, the following general data for the project can be recorded:

- **Project Name.** Enter the name of the project, limited to 30 alphanumeric characters. The project name will be used for selecting, tracking and reporting.
- **Description of Work Item.** Enter a description of the work item, limited to 255 alphanumeric characters.
- **Work Request ID.** Enter your agency's work request number for the project, limited to 50 alphanumeric characters. This item of data is not used by BUILDER in any analyses.
- **Status.** Select the current status of the project from the dropdown list of choices. The status will change over time as the project moves from planning to completion. The values of status are:
  - Awaiting Contract Award
  - Awaiting Funds
  - Budgeted
  - Canceled
  - Completed
  - Deferred
  - Funded
  - In Design

- In Progress
- On hold
- **Funding FY.** Enter the four-digit fiscal year that the project was or will be funded.
- **Must Complete as Planned.** Mark this box if the project falls into the "must do" category. Marking this checkbox will force the work items in the project to be funded before all other competing work items that are not marked as "Must do" in Scenarios.
- **Completion FY.** Enter the four-digit fiscal year that the project was or will be completed.
- **Fund Source.** Select the [funding source](#) to be used for the project.
- **Date Completed.** Enter the date the project was completed.
- **Estimated Cost.** Enter the estimated cost of the project. BUILDER provides a means of estimating the initial cost using the **Calculate** button next to this field once you have chosen the work items in the project under the Work Items Tab.
- **Score.** If you have [prioritized the work items](#), then this project's score will be displayed here. The score for a project is computed as the average of its work items' scores weighted by their estimated cost. The default value is 0.000, indicating that the work items in the project have not been prioritized.
- **Override Automatic Cost Estimate.** Mark this box if you wish to override the cost estimated using the **Calculate** button and enter your own estimated cost of the project.
- **Work Code.** Select the work code of the work item. The available work codes are:
  - Sustainment
  - Modernization
  - Demolition
  - New Footprint
- **Actual Cost.** Enter the actual cost of the project after completion.
- **ROI Information.** Displays information from [Work Item Cost Analysis](#) for the work items in the project.

## Work Items Tab

The Work Items tab is used to build the list of work items for a project. The top grid on this tab displays the list of work items in the project and the bottom grid lists the work items not currently assigned to a project that can be added to the project. Note that work items from all fiscal years are available for selection to the project. If a work item from a different fiscal year is chosen, its fiscal year will be changed to the project's fiscal year before the project is saved.

To add a Work Item to the Project, select the check box next to the Work Item. To remove a Work Item from the Project, un-check the check box next to the Work Item. If you are returning to add additional Work Items to the Project, un-check the "Only Show Selected Project Work Items" checkbox to see all Work Items for the Site.

The screenshot shows a software application window titled 'Project Name: Testing Projects 123'. The top menu bar includes 'Close', 'Save', and 'Help' buttons. Below the menu is a toolbar with icons for 'New', 'Edit', 'Delete', 'Print', 'Copy', 'Paste', 'Find', and 'Help'. The main area has two tabs: 'General Information' (selected) and 'Work Items'. Under 'General Information', there is a section for 'Work Items In Project' with columns for 'Details', 'Facility', 'Description', 'Cost', 'Status', 'FY', 'Return', and 'ROI'. A message says 'No records to display.' Under 'Work Items not currently assigned to any Project', there is a table with columns for 'Details', 'Facility', 'Description', 'Cost', 'Status', 'FY', 'Return', and 'ROI'. The table contains 14 rows of data related to roof replacement projects.

	Details	Facility	Description	Cost	Status	FY	Return	ROI
<input type="checkbox"/>	<a href="#">Details</a>	D18020 - METAL ROOF	Replace Roof Section A	\$111,160	Awaiting Funds	2012	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18067 - METAL ROOF	Replace Roof Section A	\$52,202	Awaiting Funds	2012	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18050 -	Projected Replacement of Roof Section A	\$14,146	Awaiting Funds	2028	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18050 -	Projected Replacement of Roof Section B	\$2,417	Awaiting Funds	2028	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18003 - METAL ROOF	Replace Roof Section C	\$30,439	Awaiting Funds	2012	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18003 - METAL ROOF	Replace Roof Section B	\$216,245	Awaiting Funds	2012	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18003 - METAL ROOF	Replace Roof Section A	\$216,245	Awaiting Funds	2012	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18004 -	Projected Replacement of Roof Section E	\$1,949	Awaiting Funds	2025	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18004 -	Projected Replacement of Roof Section B	\$278,025	Awaiting Funds	2028	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18004 -	Projected Replacement of Roof Section C	\$82,855	Awaiting Funds	2028	0	10000%
<input type="checkbox"/>	<a href="#">Details</a>	D18004 -	Repair Roof Section A	\$11,555	Awaiting Funds	2012	0	1323%

After entering the data for the project on the General Information and Work Items tabs, click the **Save** button in the toolbar to save the changes to the project. If you do not wish to save the changes made to the project, click the **Close** button on the toolbar.

### Editing a Project

To edit a project, click on the **Details** button next to the project on the Work Items screen.

FY 2012		Add	Export					
Work Plan Items		Projects	Budget Summary					
	Name	Description	Cost	Status	Score	Date Completed	Must Do	
Details	Testing Projects 123		\$0.00		0		<input checked="" type="checkbox"/>	

The Projects window will appear and the data on the General Information and Work Items tabs can be edited as desired.

### ***Creating a Work Prioritization Scheme***

If you have constructed a [work plan](#) for a given year, you will need to prioritize it so that your planning efforts and funding allocations can be directed to the most important items. BUILDER™ allows you to do this using a work prioritization scheme. The BUILDER work prioritization method uses a simple additive utility function to calculate a score for each work item and to rank the work items from highest score (most important) to lowest (least important). It does this by allowing you to outline and weight your objectives and to identify specific properties of the work item that can be used as measures of how well a work item meets a particular objective. With a work prioritization scheme that you have tested and calibrated, you will be able to [prioritize](#) and [rank](#) your work plan in a quick, objective, repeatable, and representative method with the touch of a button.

To create or edit a prioritization scheme, select Work Configuration -> Prioritization Schemes from the navigation menu.

The Prioritization Schemes window will appear.

For a description of the prioritization scheme shown above, see the [Prioritization Example](#). The prioritization example also includes an example scoring of a work item using the example shown.

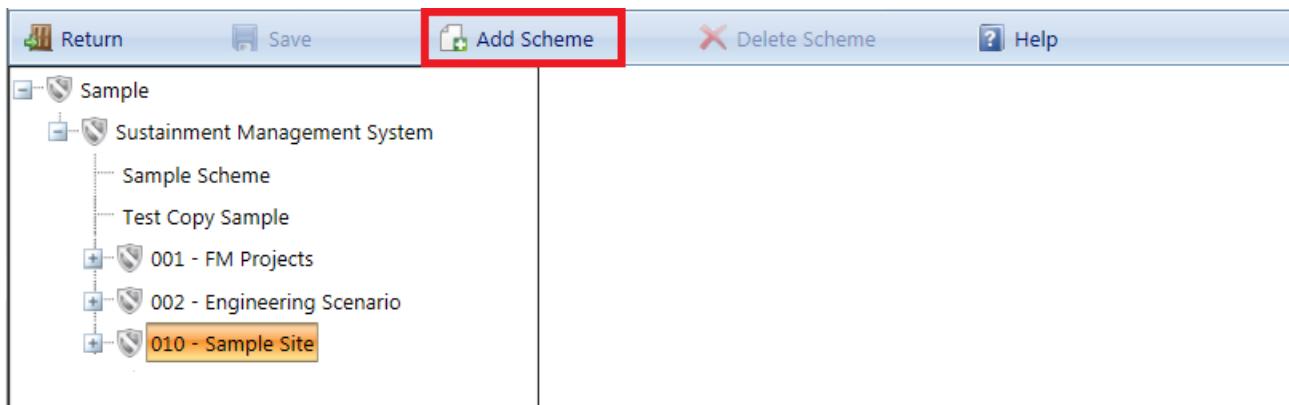
### Toolbar

- **Return.** Use this button to close the Prioritization Scheme window.
- **Save.** Use this button to save changes you have made to the prioritization schemes.
- **Add.** Use this button to add a new prioritization scheme.
- **Delete.** Use this button to delete the selected prioritization scheme.

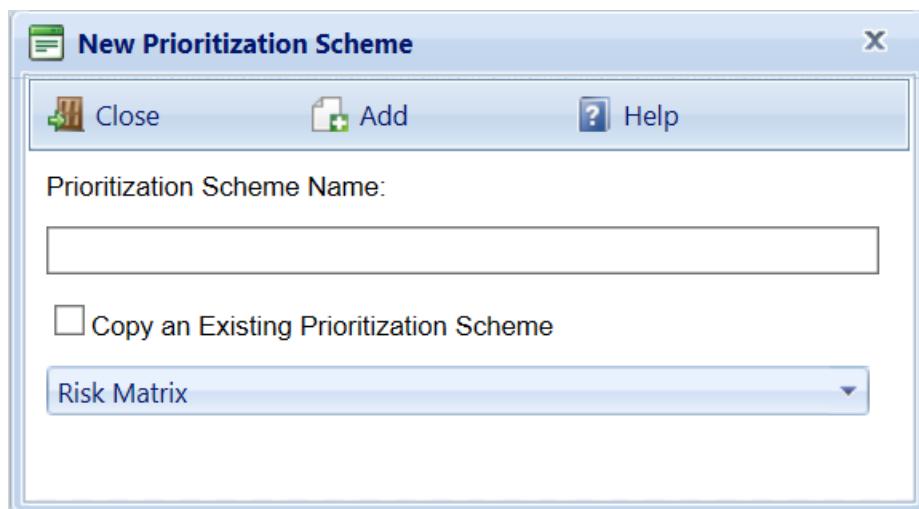
## Creating a Prioritization Scheme

You can create as many prioritization schemes as you like. When you are ready to prioritize a work plan, you will simply choose the scheme you wish to use in the [Site data](#). You may, in fact, wish to use several different schemes and then compare the resulting prioritized lists.

To create a new prioritization scheme, click the **Add** button in the window toolbar.



The New Prioritization Scheme window will appear.



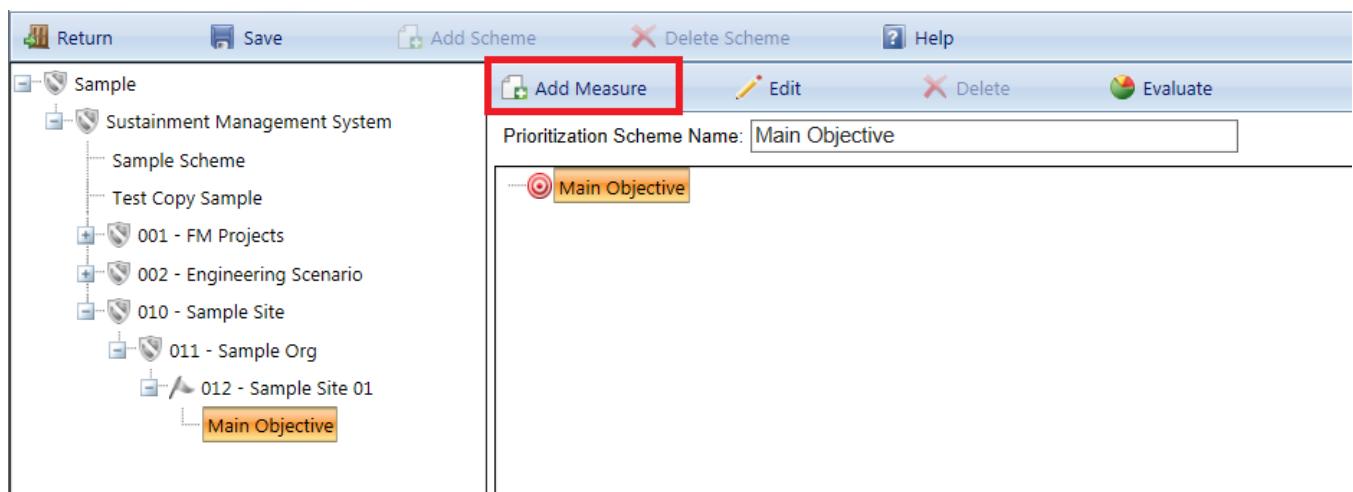
Enter a unique name for the new scheme, which is limited to 50 alphanumeric characters, and click the **Add** button in the toolbar. Initially after creating a prioritization scheme, only the main objective will appear in the scheme. The main objective can be reworded (see **Editing an Objective** below) and subobjectives can be added to it (See **Adding a Subobjective** below).

Note that when you are creating a new prioritization scheme you are able to copy an existing scheme. If you have a prioritization scheme that you have fine tuned and accept as the standard scheme to use, then the ability to copy it can be very useful. If you want to experiment with recalibration of the weights and measures, you can do so with a copy and not destroy your original values. To copy an existing scheme, mark the "Copy an Existing Prioritization Scheme" checkbox, select the scheme to copy from the dropdown list, and click **Add** button in the toolbar.

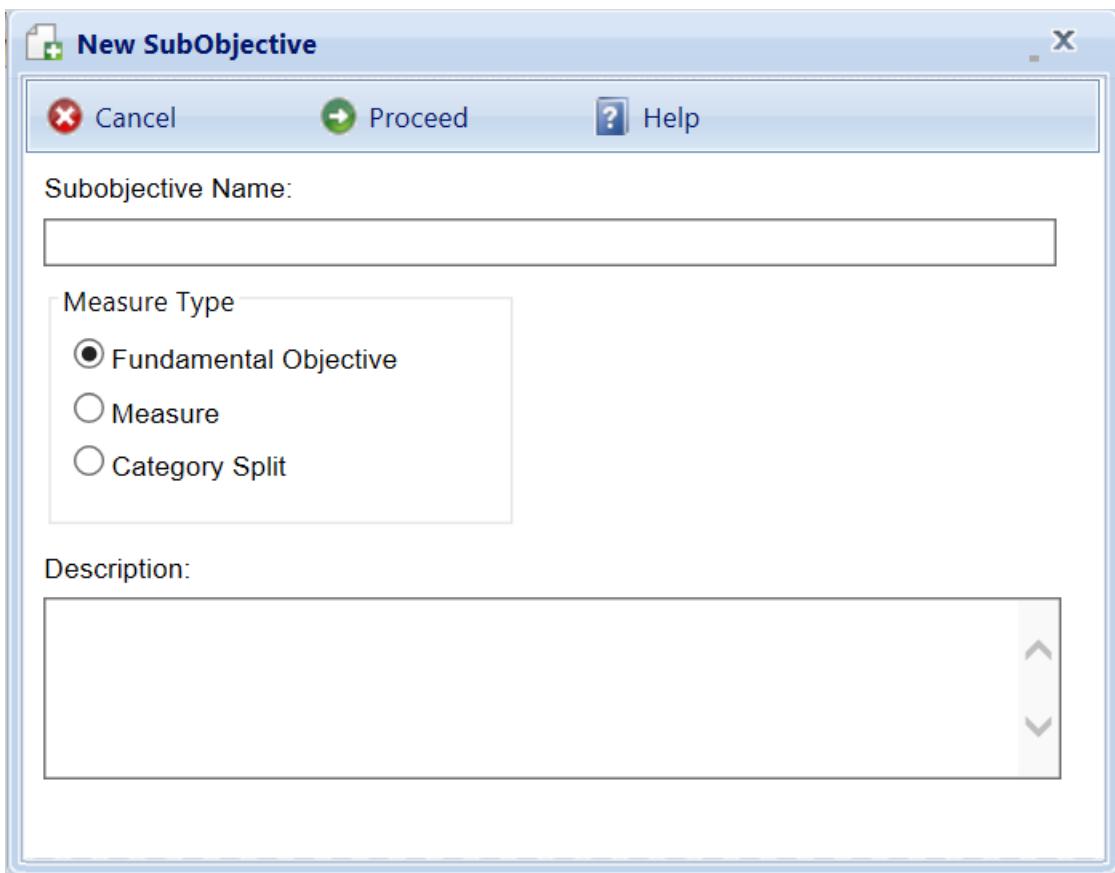
Additionally, there is no way to cancel changes for prioritization schemes. Changes are saved to the database when they are made, and the changes overwrite previous data. A safe way to experiment with a particular prioritization scheme is to copy it by creating an entirely new scheme and then edit with the copy and leave the original alone.

### Adding an Subobjective

To add a subobjective to an objective on the tree, select the objective, right-click it, and select Add Subobjective.



The New Objective window will appear.



To create the subobjective, the following data must be recorded:

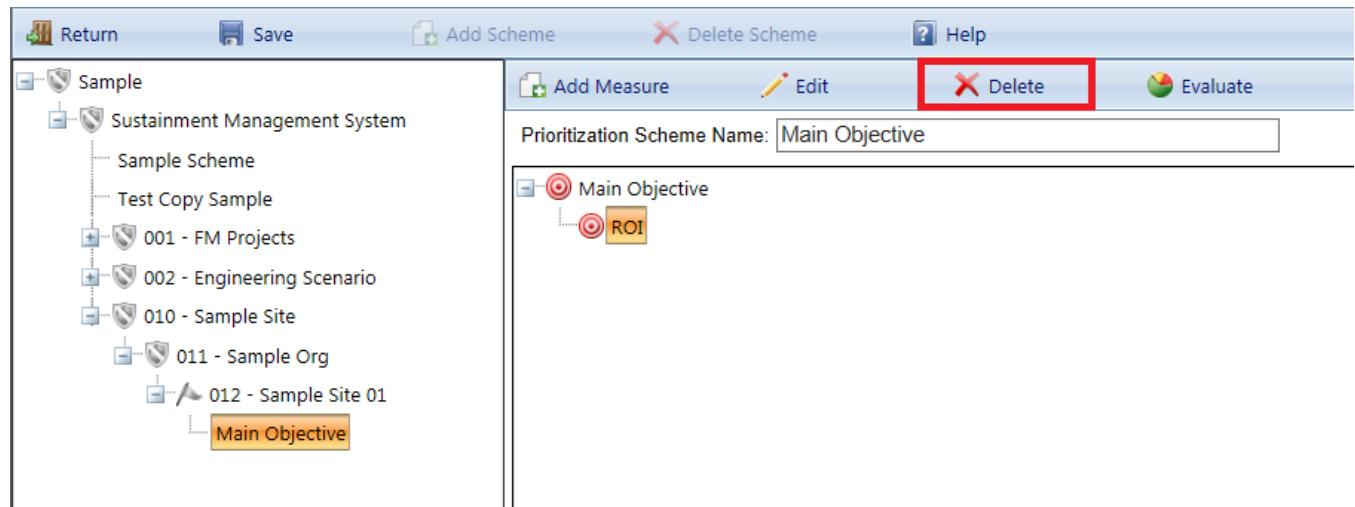
- **Node name.** Enter the name of the objective that will appear in the tree.
- **Measure Type.** Choose the type of objective is to be created from the three available types:
  - **Fundamental Objective.** This is a statement of one of the things you are trying to accomplish with the work plan. It is primarily used to help you outline your thoughts so that you eventually are able to identify properties (measures) in your inventory that you will consider when prioritizing the individual work items.
  - **Measure.** A measure is a property of the work item or of the inventory hierarchy of the work item's Component-Section. A work item's overall score in the prioritization scheme is fundamentally determined by the values of the work item's properties that are used as measures in the scheme, the point values assigned to those particular values, and the relative weights of the objectives.
  - **Category Split.** See **Using Category Splits** below for a further description of category splits.

- **Measure/Split Category.** If you select Measure or Split as the type of objective, select the category to associate with the measure or split, either Building or General. If a fundamental objective is chosen as the measure type, this field will not appear.
- **Available Measures.** If you select Measure or Split as the type for this objective, then you will also have to choose the measure to associate the measure or split. The available measures in the dropdown list depends on the Measure/Split category chosen. If a fundamental objective is chosen as the measure type, this field will not appear.

In addition to this required data, you have the option to add a Description of the new objective, which is limited to 255 alphanumeric characters. When all of the information has been entered, click the **Proceed** button to create the objective. If you do not wish to create the objective, click the **Cancel** button.

### **Deleting an Object from the Tree**

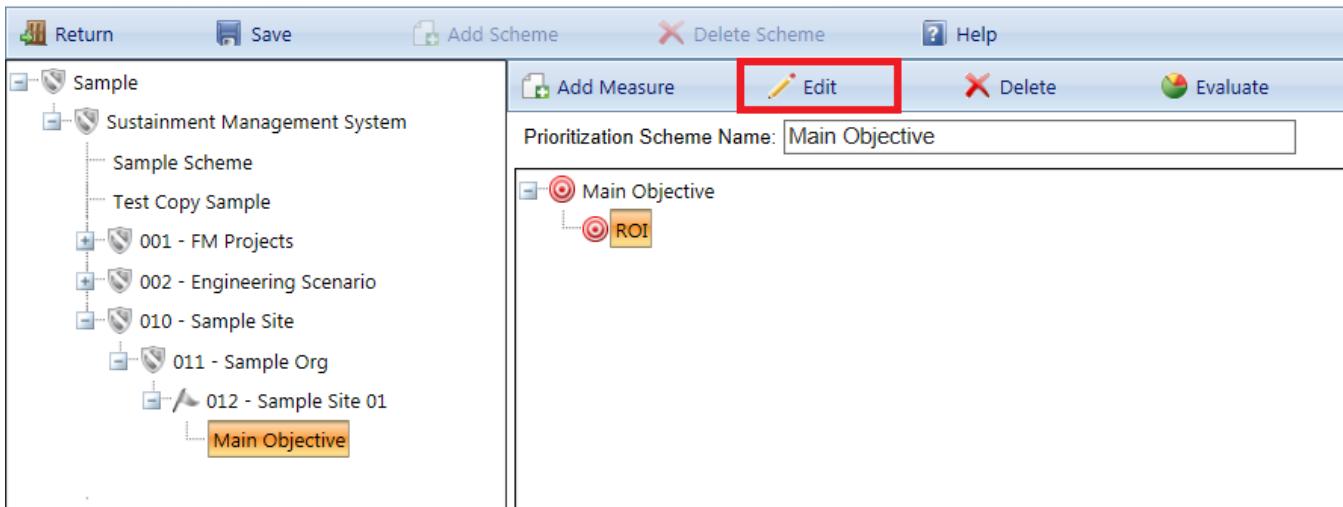
If you want to delete an objective from the tree, select it on the tree, right-click it, and select Delete.



It is important to note that if you delete an objective, the entire subtree under the objective will be deleted as well.

### **Editing an Objective**

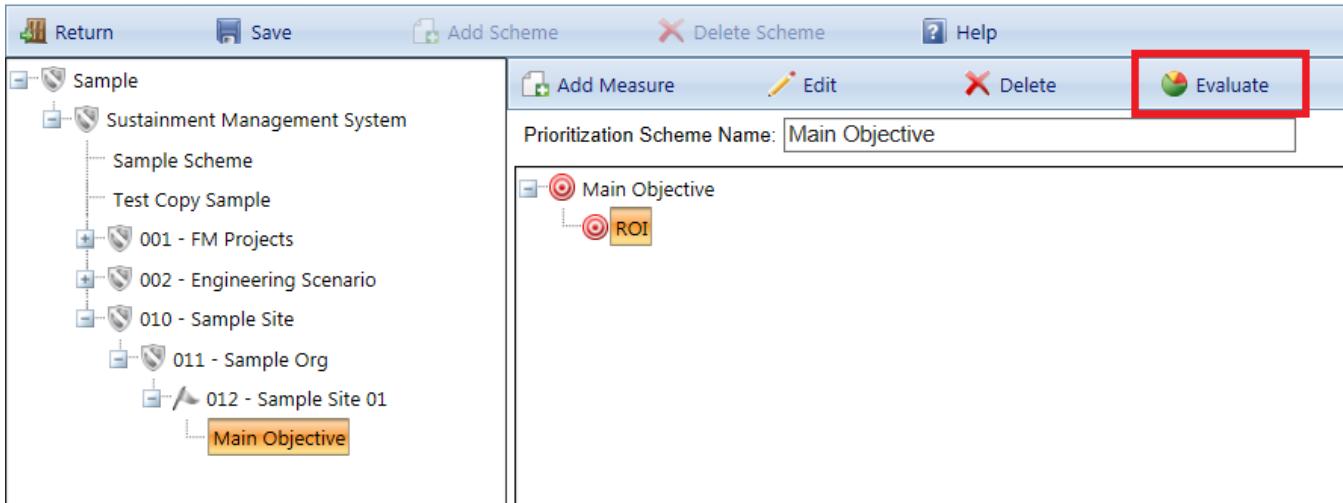
If you want to edit the name or description of an objective, select the it on the tree, right-click it, and select Edit.



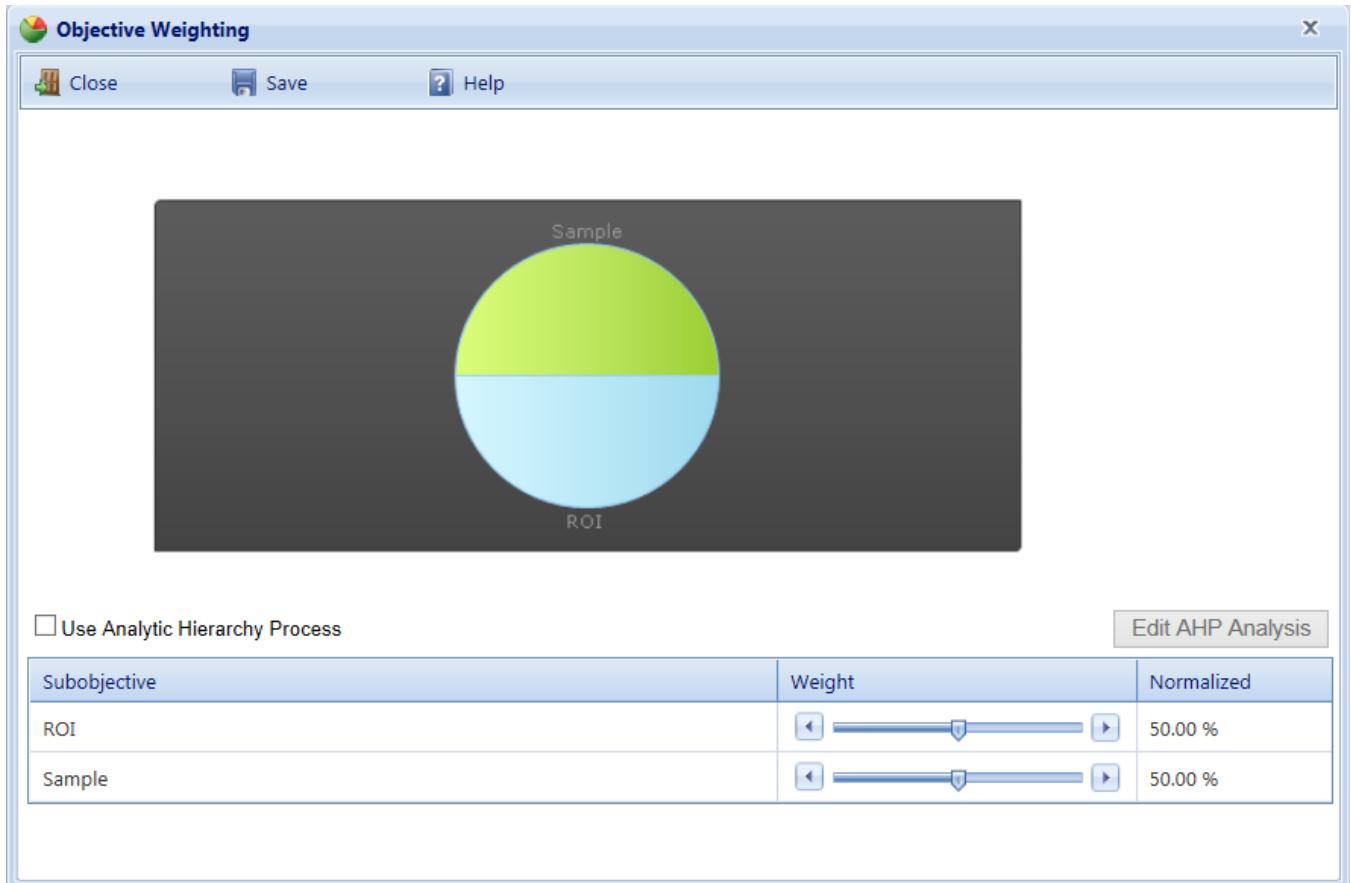
It is important to note that once an objective is created, you may not change the measure type, category, or measure itself, but you can change the node name.

#### Evaluating a Fundamental Objective

To record the relative weights of the children of an fundamental objective, select the fundamental objective, right click it, and select the Evaluate option.



The Objective window will appear:



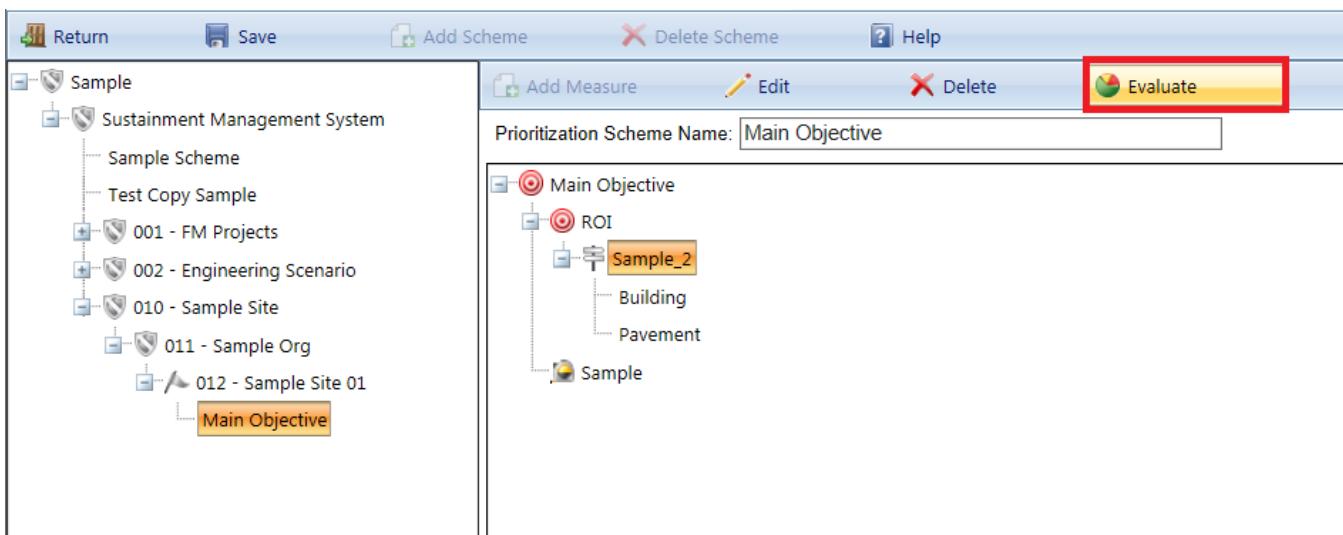
The children of the fundamental objective will be listed in a grid along with their weight. The default setting for the Weight is 100 for all children. That is, all children are equally important to the parent. You may adjust the weights by either:

- Entering a number between 0 and 100 in the Weight column.
- Marking the "Use [Analytic Hierarchy Process](#)" checkbox and clicking the **Edit AHP Analysis** button. The AHP process allows you to establish the weights by doing a binary comparison of the field values. See Using the Analytic Hierarchy Process for a description of this method.

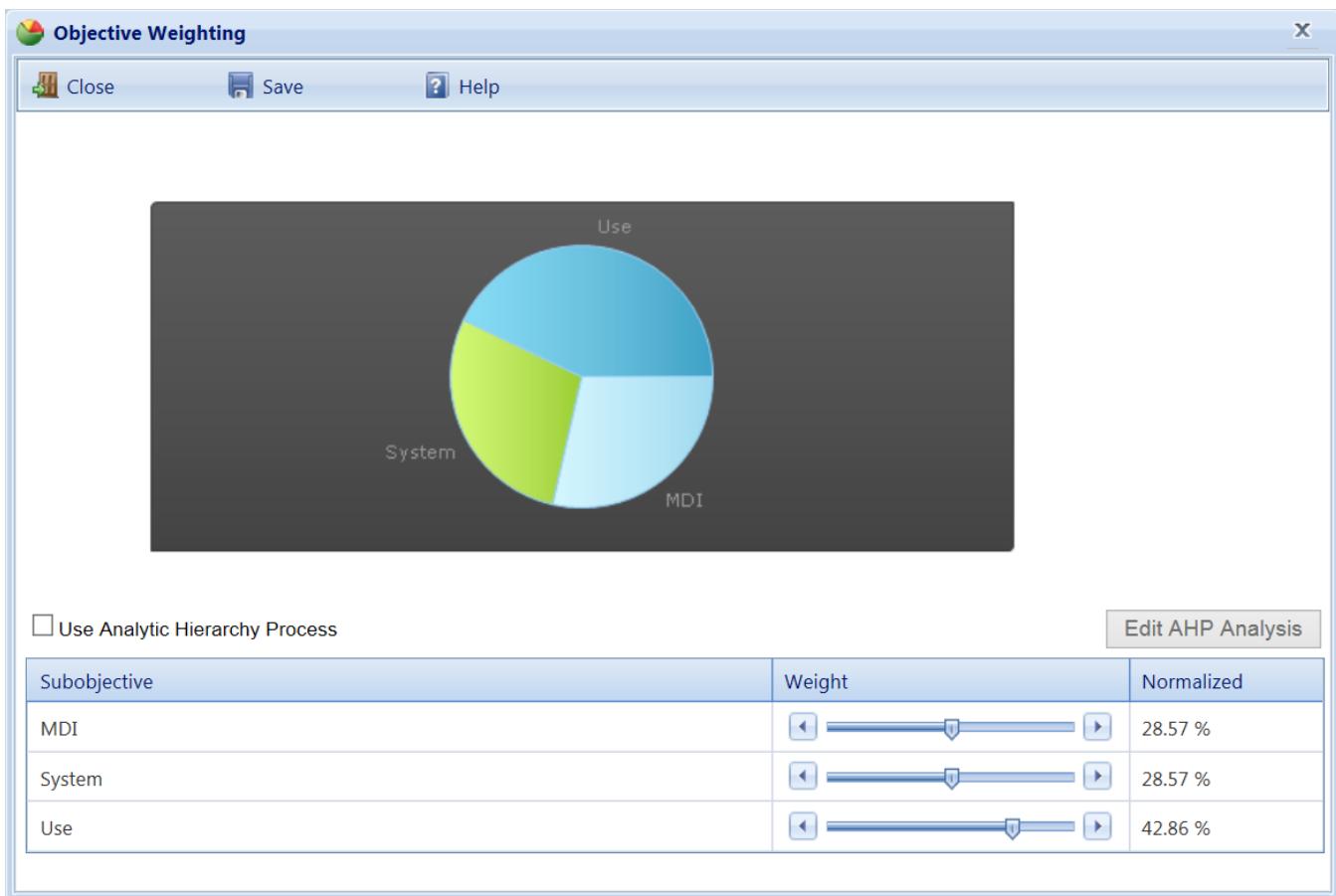
Note that each of these methods results in a normalized weight (which cannot be edited) that is calculated so that the sum of the weights is 100%. This is done by dividing each of the individual weights by the sum of all of the weights. Click the **Save** button to save changes.

### Evaluating a Measure

To assign points to the various values of a measure, select the measure, and then select the Evaluate option.



The Measure Evaluation window will appear:



The possible field values for the measure will be listed in a grid, along with their assigned Point Value. The default point value is 100 for all field values. That is, they are equally important initially. You can edit the point value by either:

- Entering a number between 0 and 100 in the Point Value column.
- If the number of field values is less than 25, marking the "Use [Analytic Hierarchy Process](#)" checkbox and clicking the **Edit AHP Analysis** button. The AHP process allows you to establish the points by doing a binary comparison of the field values.

Use the **Save** button to save changes or the **Cancel** button to return to the previously saved weights.

### Using Category Splits

A category split, denoted by the icon in the Objectives Tree, is associated with a field property in the work item hierarchy and is used when you want to vary how the priority score is computed based on the work item's value for this field property. The subobjectives of a split can only be the various values of the field property.

The subobjectives of a split are called categories. The categories identify which subtree will be used based on the associated field's property value. When the algorithm that calculates the score comes to a split, only the single branch of the tree under the split corresponding to the work item's property value as a category will be used. The screen below shows an example of a split in a prioritization scheme:

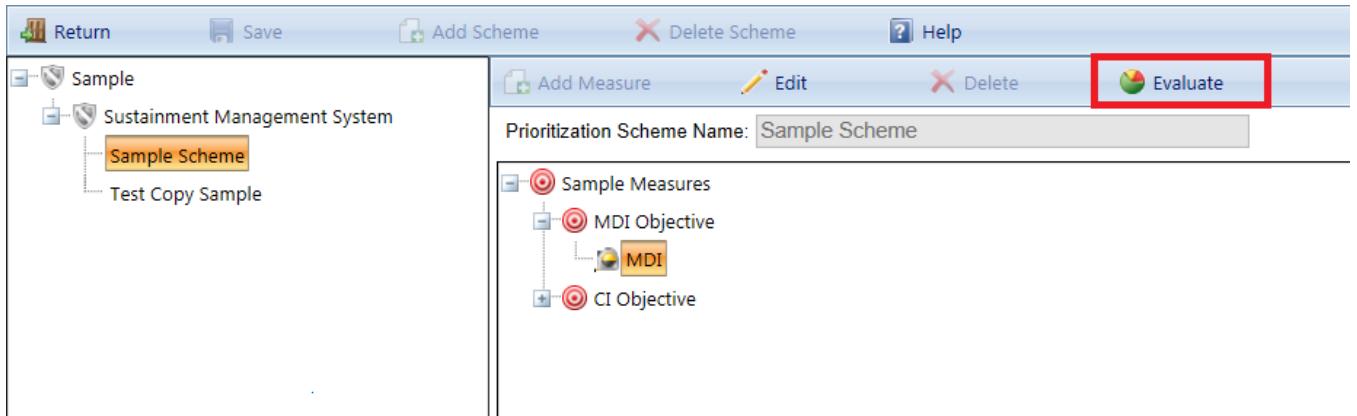


The screenshot shows the Sustainment Management Systems software interface. The main title is "SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER®". The left sidebar lists various projects and scenarios, including "001 - Added by ROOFER", "USMC", "Scheme Testing", "Testing1234", "000 - Kyle can has man cave", "002 - Engineering Scenario", "1 - TEST2", "123 - test", "3 - Test", "3030 - Eric Test Org", "456 - Telerik Screening Site 2", "666 - Paisley Inc.", "999 - KiSung World", "MySite", and "OCT11 - bailey test OCT 2011". The right panel displays the "Prioritization Scheme Name: Test Scheme" and a hierarchical tree structure under "Main Objective". The tree includes categories like "Testing 123", "Help Desk 101", and "Otherwise", with further sub-categories such as "Repair (Building)", "Modernize (Building)", etc.

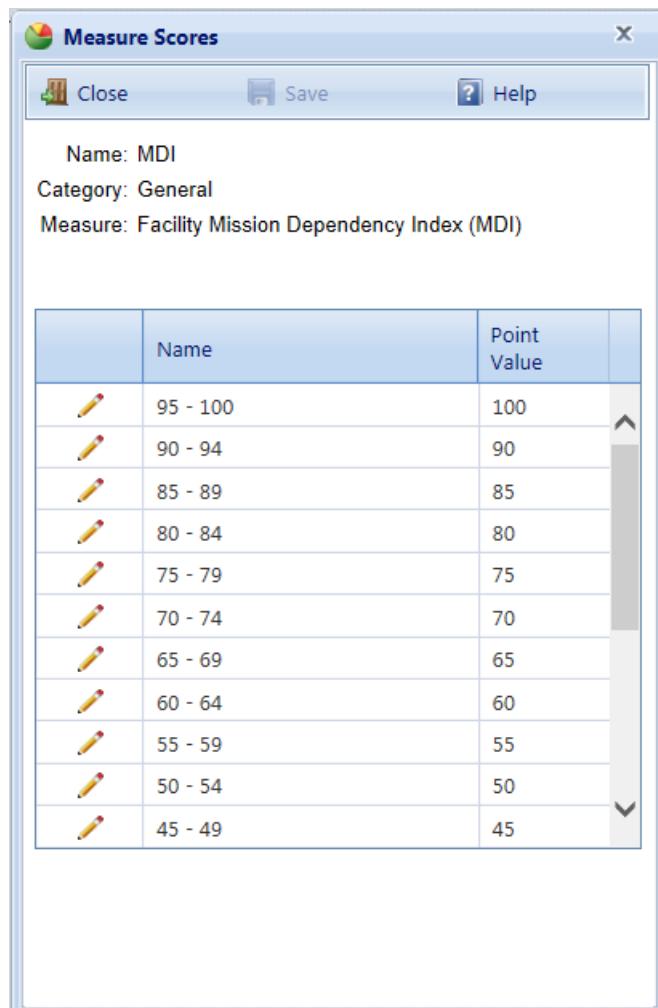
The category split in this example is Type of Work. The associated field is work activity, which has 6 possible values: Repair, Replace, Paint, Remove, Add/Install, and Alter. A category split generally has an added category named Otherwise, which is the branch of the tree used if the value of the field differs from all of the other listed values. In this case, Remove, Add/Install, and Alter will use the Otherwise category. When you first create a split, all of the possible values of the field are listed as categories under it. If you delete a category, then items with that field property value will use the Otherwise category.

In the example above, the work item's CI and RSL are used as the measures for both Repair and Replace. However, the point values assigned to the fields varies by type of work. To replace a Component-Section, the most cost-effective time would be indicated by a very low CI and little or no remaining service life. To repair a Component-Section, the most cost-effective time would be indicated by a mid-range CI and a long remaining service life. The Type of Work split allows the computation of the score to proceed selectively. Since only one of the categories will be used, the relative weights of the categories under a split are calculated differently from other types of objectives.

To assign points to the various values of a split select the split on the tree, click it and select the Evaluate option.



The Objective window will appear:



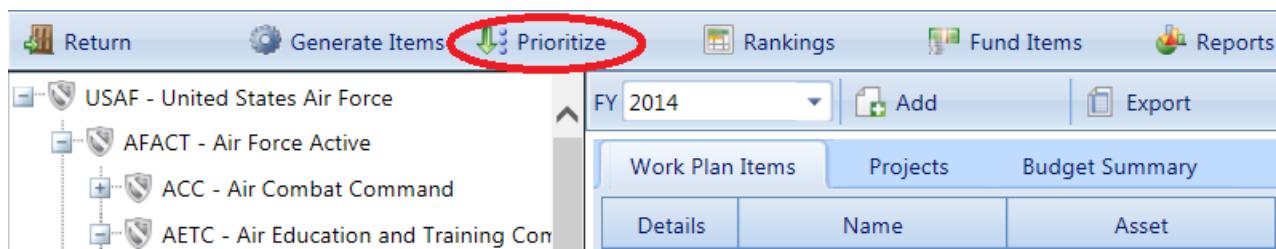
The possible field values for the measure will be listed in a grid, along with their assigned Point Value. The default point value is 50 for all field values. That is, they are equally important initially. You can edit the point value by either:

- Entering a number between 0 and 100 in the Point Value column.
- If the number of field values is less than 25, marking the Use [Analytic Hierarchy Process](#) check box and clicking the EDIT AHP ANALYSIS button.  
The AHP process allows you to establish the points by doing a binary comparison of the field values.

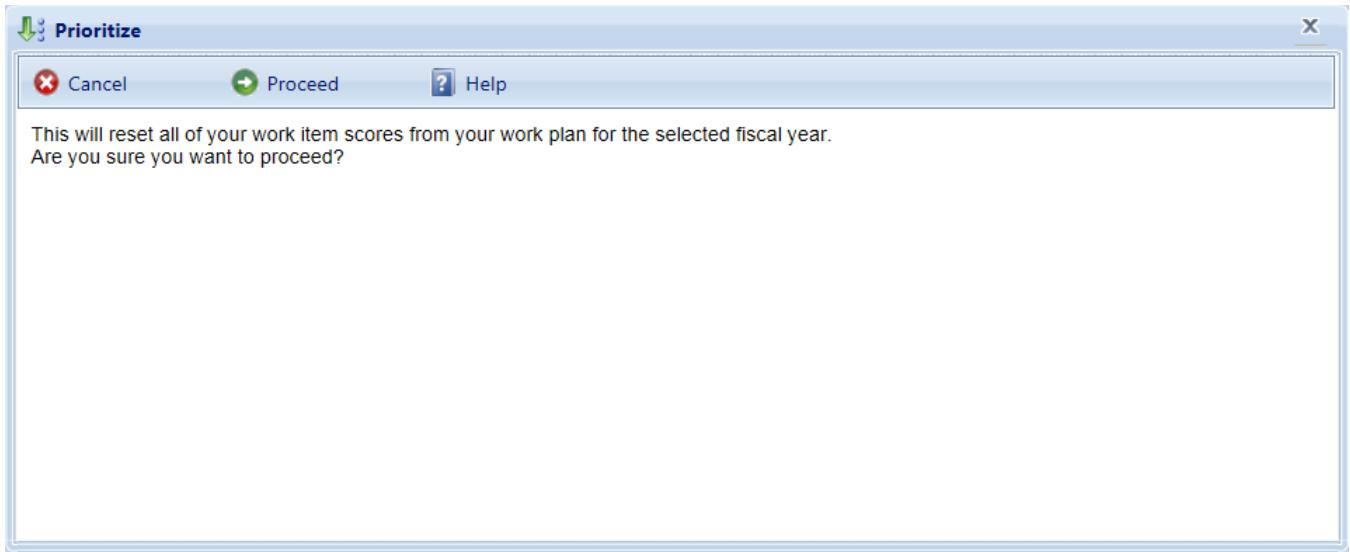
For the Normalized Weight of a category, its Weight is divided by the maximum Weight of the categories in the split. When first created, all of the categories of a split have the same weight and all have normalized weight of 100%. Note that the normalized weight is read-only.

## Prioritizing Work Items

If you have created a [Prioritization Scheme](#), you may prioritize your work plan using the **Prioritize** button on the Work Items window. Click the **Prioritize** button on the toolbar to initiate the process.



A warning will appear that all current work item scores from your work plan for the selected fiscal year will be reset if you continue.



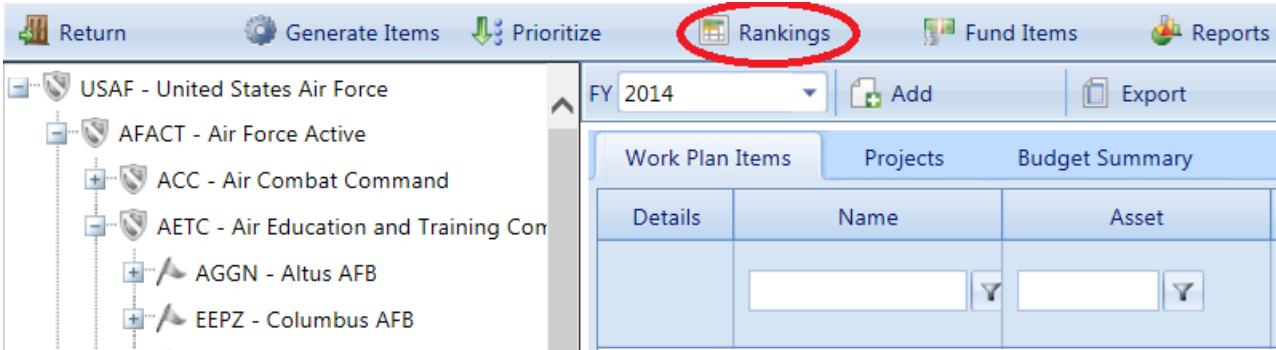
Click the **Proceed** button if still wish to delete the current scores for the for Section-level work items and recompute new prioritization scores using the prioritization scheme selected in the [Site information](#). After a priority score has been computed for each work item, all work items will be shown in the work plan ranked from highest score to lowest. Project priority scores are computed by averaging the priority scores of the work items in the project, weighted by cost. Click the **Cancel** button on the warning screen if you do not wish to perform these actions and return to the work plan.

You can prioritize the work plan as often as you wish. If you add new work items, you should re-prioritize to include the new items. You may also want to use a work plan to calibrate the weights and points you have assigned in a particular prioritization scheme. By considering the order in which work items are ranked and viewing their scores, you may identify measures that should carry more relative weight or measure values that warrant higher points so that the order of the work items is acceptable. The goal of a prioritization scheme is to rank work items by algorithmic calculation into the same order that expert facility managers at your agency would rank them by following sound engineering principles.

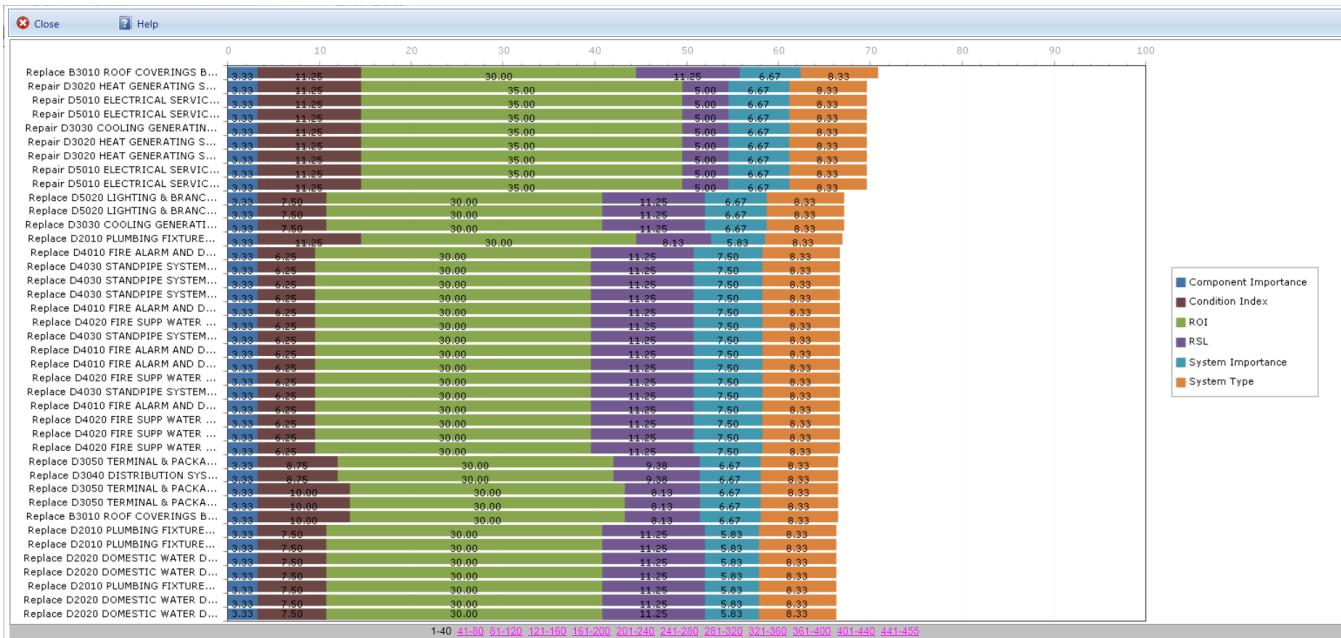
Note that [Building-level work items](#) are not scored in the prioritization scheme. The score for a Building-level work items will be 0.000. In order to have this type of work item completed in Scenarios, mark the work item as "Must do as planned" and provide a fund source with a criteria the work item can satisfy.

### Ranking Work Items

If you have created a [prioritized work plan](#), you may view the rankings of the work items in your work plan using the **Rankings** button on the Work Items window. Click the **Rankings** button on the toolbar to initiate the process.



The Rankings window will appear.

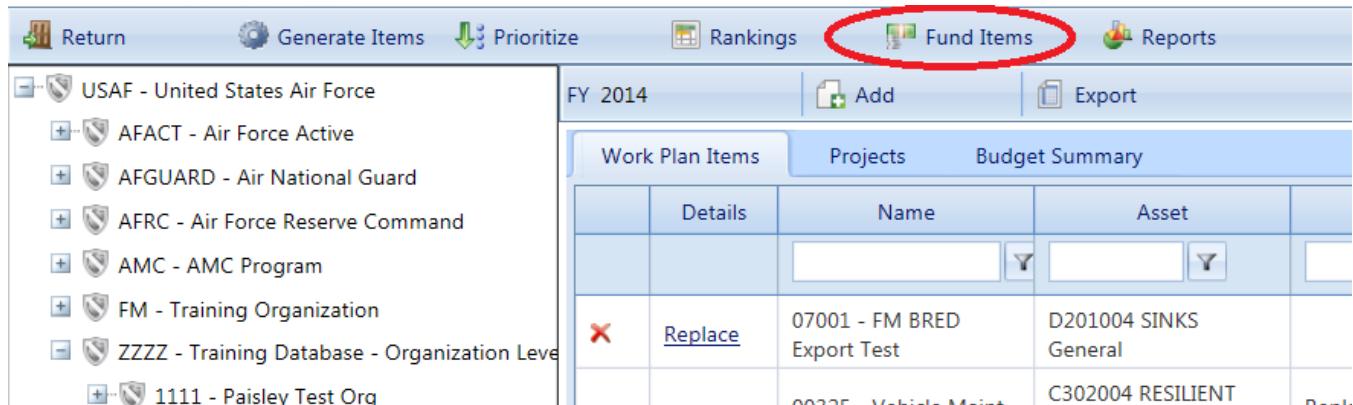


The rankings of each Section-level work item will be shown from highest priority score to lowest. The score for each work item will be broken down into the constituent scores for each measure used in the prioritization scheme. A legend appears at the top of the window correlating the colors to their respective measures.

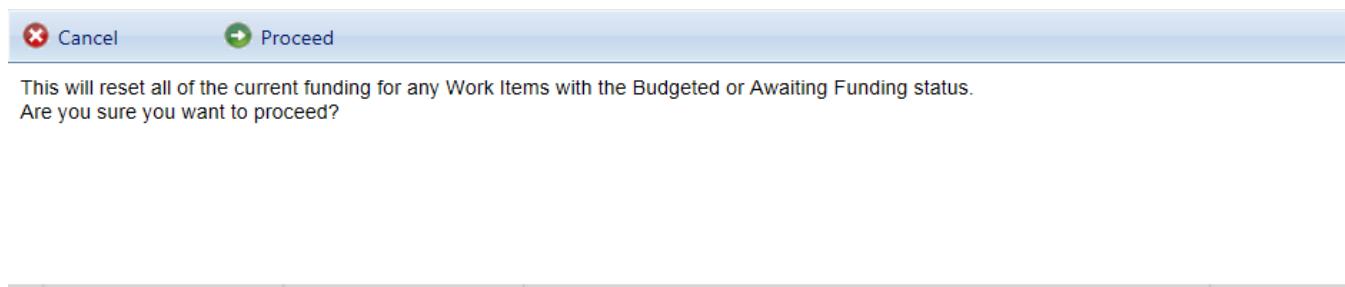
## Funding Work Items

A tool included in BUILDER™ 3.3 is the ability to automatically fund work items based on their [priority scores](#) and the available [fund sources](#). If you choose to use this tool, the work items with the highest priority scores will have their status changed to "budgeted" until all of the funds are exhausted. All remaining work items that are not budgeted will have their status changed to "Awaiting Funding." It is important to note that the funding sources are subject to all the restrictions and precedences that are set in the funding screen.

To fund the work items in a work plan, click the **Fund Items** button on the Work Plan toolbar.



The Fund Work Items screen will appear.



From this window, you have the option of funding the work items for the current or next fiscal year. Select the year you wish to fund the work items in and click the **Proceed** button. After completion, the work items with the highest priority scores will be marked as "Funded" until all applicable sources are allocated, and the remaining work items will be marked as "Awaiting Funds." If you do not wish to fund the work items, simply click the **Cancel** button in the window to be returned to the Work Item window.

## Entering Anticipated Funding Levels

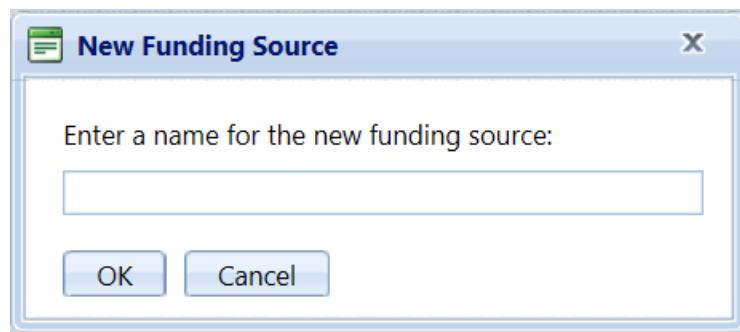
To add, enter, or edit funding levels, select **Work Management > Funding** from the main menu.

The Funding window will appear.

Navigate the tree on the left of the screen to the Site you wish to edit the funding options for. Once a Site has been chosen in the tree, the funding levels, funding restrictions, and funding precedence can be set from the different tabs. Further descriptions of each tab is provided below. It is important to note that the anticipated funding levels only need to be input if you are planning to use the IMPACT feature for multi-year work planning constrained by budget. The funding sources and amounts you enter here will be used as the initial defaults for each scenario you create. You may, of course, edit the amounts in the scenario itself, but you will not be able to add new funding sources, change their restrictions, or change their precedence order in a scenario. For more information see [Scenario Management](#).

## Toolbar

- **Close.** Use this button to close the Funding window.
- **Save.** Use this button to save the changes you have made the funding levels, restrictions, or precedence.
- **New.** Use this button to create a new funding source. After clicking this button, the "New Funding Source" window will appear.



Enter the name of the funding source you wish to add. The name is limited to 50 alphanumeric characters and must be unique.

- **Delete.** Use this button to delete the selected funding source. Note that a funding source can only be deleted from the **Expected Funds** tab. The selected funding source is identified in this tab by the arrow in the left column of the grid.
- **Help.** Use this button to launch the help topic associated with funding.

## Expected Funds Tab

The **Expected Funds** tab provides an editable list of funding sources and amounts for the next ten years. To edit a funding source level for a particular year, click on the pencil icon on the left side of the grid and enter the expected funds for the next 10 years. After completing the funds, click the checkmark icon to accept the changes made.

Expected Funds									
Funding Restrictions									
Funding Precedence									
New									
Fund	2012	2013	2014	2015	2016	2017	2018	2019	
Test123	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	

## Funding Restrictions Tab

The **Funding Restrictions** tab provides a means of establishing [selection criteria](#) that determines whether or not a particular funding source can be used for a particular work item. This tab allows you to identify properties that a work item must have in order to use the selected funding source. To add a funding restriction, select the funding source from the drop down list, click the **Add** button, and enter the data regarding the restriction (selection criteria) in the grid.

The screenshot shows a software interface for managing funding restrictions. At the top, there are three tabs: 'Expected Funds' (disabled), 'Funding Restrictions' (selected), and 'Funding Precedence'. Below the tabs, a dropdown menu labeled 'Funding Source' is set to 'new'. A message 'Refine the record selection process by adding and deleting criteria.' is displayed above a grid. The grid has a header row with columns for 'Property' and other columns that are mostly hidden. A 'New' button with a plus sign is visible at the top left of the grid area. The message 'No records to display.' is shown below the grid.

## Funding Precedence Tab

The Scenarios need to allocate funds algorithmically when it is processing a prioritized list of work items. After the funding sources, the amounts, and the criteria for using sources are set, the only further requirement is to specify how the automated process will determine which funding source to use if a work item satisfies the restrictions (selection criteria) of more than one funding source. The **Funding Precedence** tab provides a means of establishing an order of precedence among the funding sources for a work item. To change the order of the funding sources, select a source and use the up and down arrows to move it in the list. When funds are allocated, the first funding source listed will be checked first, then the second, and so on until funding is found or the list is exhausted.

Expected Funds

Funding Restrictions

Funding Precedence

If a work item satisfies the restrictions of more than one funding source, the precedence ordering established below determines which of the funds will be considered first:

new



# Scenarios

## Scenarios Overview

Scenarios is a simulation tool that uses BUILDER's databases and coded processes to project maintenance, repair, and replacement (MR&R) work requirements for up to ten years into the future. The purpose of this overview is to explain how Scenarios do this and how you can benefit from using its projections to improve your facility management practices.

The data required to construct a BUILDER database and its embedded knowledge and methods regarding condition assessment, component life expectancy, and costs combine to provide a complete model of your facilities and business processes includes:

- Where your facilities are and the effect of location on costs
- Records of each building's use, age, size, construction type, etc.
- Decomposition of each building into its component-sections, specified as to type, material, quantity, age, etc.
- History of past condition assessments of each Component-Section, with a dated condition index rating for each
- History of MR&R work performed
- Cost estimating capability for various work activities related to building components
- Expected service life and paint life of each component by material category and type
- Models for projecting condition and remaining service life on the basis of past condition assessment results
- Standards, policies and policy sequences for determining when work is required
- Prioritization schemes for ranking a given set of work items by their importance to you
- Funding sources with their future expected levels of funding, their restrictions, and their order of allocation.

Scenarios use all of this information as the basis for predicting how your inventory will change over time. BUILDER shows you the past and present for your inventory. Scenarios show you the future. It is able to show you the future in very much the same way that BUILDER is able to show you the past and present. That is, Scenarios show you the future by adding and changing records in your database at each step in simulated time the same way that you add or change records with

the passing of real time. The difference is that, for example, when you add a new condition assessment record, it is based on a physical observation, whereas when Scenarios adds a new condition assessment, it has calculated the expected condition based on prior condition, deterioration rates, and work activity records. As another example, a work item in BUILDER may be subject to a good deal of off-line planning and debate before it is finally funded and complete, while in Scenarios the prioritization scheme and funding algorithms methodically calculate whether or not a particular work item can be completed.

## Outline of Scenarios

Here is a brief description of how Scenarios simulates change in your inventory over a 1 to 10-year period, starting at the date the scenario is run:

- With the current inventory, update all time-sensitive data elements (CI, RSL, Cost) for every Component-Section as of the current date.
- Use the selected [policy sequence](#) to determine the appropriate standard for each Component-Section.
- Cycle through all of the component-sections in the inventory and use each Component-Section's standard to identify and generate necessary work items.
- [Prioritize the work items](#) for the current year using the selected [prioritization scheme](#).
- Allocate [funding sources](#) to the work items in [rank order](#) following the funding amounts, precedence rules, and restrictions established for each funding source.
- Schedule completion of funded work items for later in the current year.
- Set current date to the date scheduled for work item completion and register the effect of the work. That is, create a condition assessment for the current date with appropriate findings, change Component-Section record if replaced or painted, and mark work item as completed.
- Set current date to the end of the current year and calculate CIs for all component-sections, taking into account the appropriate prior CI, deterioration rate, and any work completed.
- The previous 8 steps have completed one year; advance current date to the start of next year and go back to 1 until 10 years have been simulated, or the established length of the scenario set in the set-up process.

This very simple outline of what Scenarios do shows that you will have to specify several key elements of the process before it is able to move through these steps. They include the policy sequence, the prioritization scheme, and the funding levels. You will do this when [managing a scenario](#). The particular policy sequence you choose will affect what work is identified. The particular

prioritization scheme you choose will affect which work items rank highest in a year's work plan. The particular funding levels you choose will affect the amount of work that can be accomplished in any given year. As you might imagine, scenarios in which different policy sequences, prioritization schemes, and/or funding levels are used will yield very different outcomes and can be [compared and analyzed](#) to determine the optimal work plan for your inventory.

#### **Recommended Reading:**

##### [Advantages of Using Scenarios](#)

#### **Related Topics:**

- [Scenario Management](#)
- [Scenario Analysis](#)

## **Advantages of Using Scenarios**

The ability to run the simulation with different settings makes Scenarios a valuable tool in creating a credible long-term MR&R budget. For a manager of a large number of buildings, establishing and defending a budget for the next 5 to 10 years is a very difficult problem. Often, managers use industry-standard planning factors to prepare a budget. Figures such as 2% - 4% of building replacement cost per year are often used. The DoD Facility Cost Handbook publishes a cost per square foot for MR&R by building use (category code), a planning tool similar to several commercial tools which also use a per-square-foot factor for building sustainment. One problem with these methods of forecasting costs is that they are each based on the assumption of a continuing investment that allows the manager to repair what needs to be repaired when it needs to be repaired, which assumes no backlog of MR&R. Very few managers have ever had sufficient funds to meet that assumption. Another problem with these methods is that they are averages that could miss the mark in any given year for any given building by a factor of 2, 3, or much more. The manager of a thousand buildings could be faced with a very large shortfall. Still another problem, budgets prepared with planning factors are difficult to defend. If cuts are to be made, the manager is hard pressed to identify what will suffer. Without the ability to identify consequences, erosion of funds is inevitable.

Scenarios give you the opportunity to prepare a long-term MR&R budget based on your actual inventory in its current condition. When Scenarios have finished a scenario run, it has produced records that tell the story about what is forecast to happen under the scenario parameters. Each Component-Section in the inventory is tracked during the simulation. Dated condition assessments track expected deterioration. Dated work items show when work was done and how much it

costs. When grouped by year, the work items provide an annual work plan constrained by expected funding levels. Annual work plans can be summarized by cost of completed and incomplete work, allowing you know what the backlog was each year and you know which work went unfunded. With roll-up CI values, you can determine how well buildings or even locations did over the simulated period.

Scenarios allow you to run a scenario either constrained or unconstrained by budget. With an unconstrained budget, all work items are completed when they are first recognized. Analysis of this type of scenario will provide estimates of your total annual requirement. With a constrained budget, work items are funded in rank order until funds are exhausted. Work items not completed in one year will be generated the following year at a higher cost due to inflation and, for repair work types, to the cost for additional deterioration. Analysis of a constrained scenario will give you insight into what parts of your inventory will suffer at a given funding level.

#### **Related Topics:**

- [Scenarios](#)
- [Scenarios Overview](#)
- [Scenario Management](#)
- [Copying a Work Plan from a Scenario](#)
- [Scenarios Analysis](#) (deprecated)

## **Scenarios Overview**

Scenarios is a simulation tool that uses BUILDER's databases and coded processes to project maintenance, repair, and replacement (MR&R) work requirements for up to ten years into the future. The purpose of this overview is to explain how Scenarios do this and how you can benefit from using its projections to improve your facility management practices.

The data required to construct a BUILDER database and its embedded knowledge and methods regarding condition assessment, component life expectancy, and costs combine to provide a complete model of your facilities and business processes includes:

- Where your facilities are and the effect of location on costs
- Records of each building's use, age, size, construction type, etc.
- Decomposition of each building into its component-sections, specified as to type, material, quantity, age, etc.
- History of past condition assessments of each Component-Section, with a dated condition index rating for each

- History of MR&R work performed
- Cost estimating capability for various work activities related to building components
- Expected service life and paint life of each component by material category and type
- Models for projecting condition and remaining service life on the basis of past condition assessment results
- Standards, policies and policy sequences for determining when work is required
- Prioritization schemes for ranking a given set of work items by their importance to you
- Funding sources with their future expected levels of funding, their restrictions, and their order of allocation.

Scenarios use all of this information as the basis for predicting how your inventory will change over time. BUILDER shows you the past and present for your inventory. Scenarios show you the future. It is able to show you the future in very much the same way that BUILDER is able to show you the past and present. That is, Scenarios show you the future by adding and changing records in your database at each step in simulated time the same way that you add or change records with the passing of real time. The difference is that, for example, when you add a new condition assessment record, it is based on a physical observation, whereas when Scenarios adds a new condition assessment, it has calculated the expected condition based on prior condition, deterioration rates, and work activity records. As another example, a work item in BUILDER may be subject to a good deal of off-line planning and debate before it is finally funded and complete, while in Scenarios the prioritization scheme and funding algorithms methodically calculate whether or not a particular work item can be completed.

## **Outline of Scenarios**

Here is a brief description of how Scenarios simulates change in your inventory over a 1 to 10-year period, starting at the date the scenario is run:

- With the current inventory, update all time-sensitive data elements (CI, RSL, Cost) for every Component-Section as of the current date.
- Use the selected [policy sequence](#) to determine the appropriate standard for each Component-Section.
- Cycle through all of the component-sections in the inventory and use each Component-Section's standard to identify and generate necessary work items.

- [Prioritize the work items](#) for the current year using the selected [prioritization scheme](#).
- Allocate [funding sources](#) to the work items in [rank order](#) following the funding amounts, precedence rules, and restrictions established for each funding source.
- Schedule completion of funded work items for later in the current year.
- Set current date to the date scheduled for work item completion and register the effect of the work. That is, create a condition assessment for the current date with appropriate findings, change Component-Section record if replaced or painted, and mark work item as completed.
- Set current date to the end of the current year and calculate CIs for all component-sections, taking into account the appropriate prior CI, deterioration rate, and any work completed.
- The previous 8 steps have completed one year; advance current date to the start of next year and go back to 1 until 10 years have been simulated, or the established length of the scenario set in the set-up process.

This very simple outline of what Scenarios do shows that you will have to specify several key elements of the process before it is able to move through these steps. They include the policy sequence, the prioritization scheme, and the funding levels. You will do this when [managing a scenario](#). The particular policy sequence you choose will affect what work is identified. The particular prioritization scheme you choose will affect which work items rank highest in a year's work plan. The particular funding levels you choose will affect the amount of work that can be accomplished in any given year. As you might imagine, scenarios in which different policy sequences, prioritization schemes, and/or funding levels are used will yield very different outcomes and can be [compared and analyzed](#) to determine the optimal work plan for your inventory.

### **Recommended Reading:**

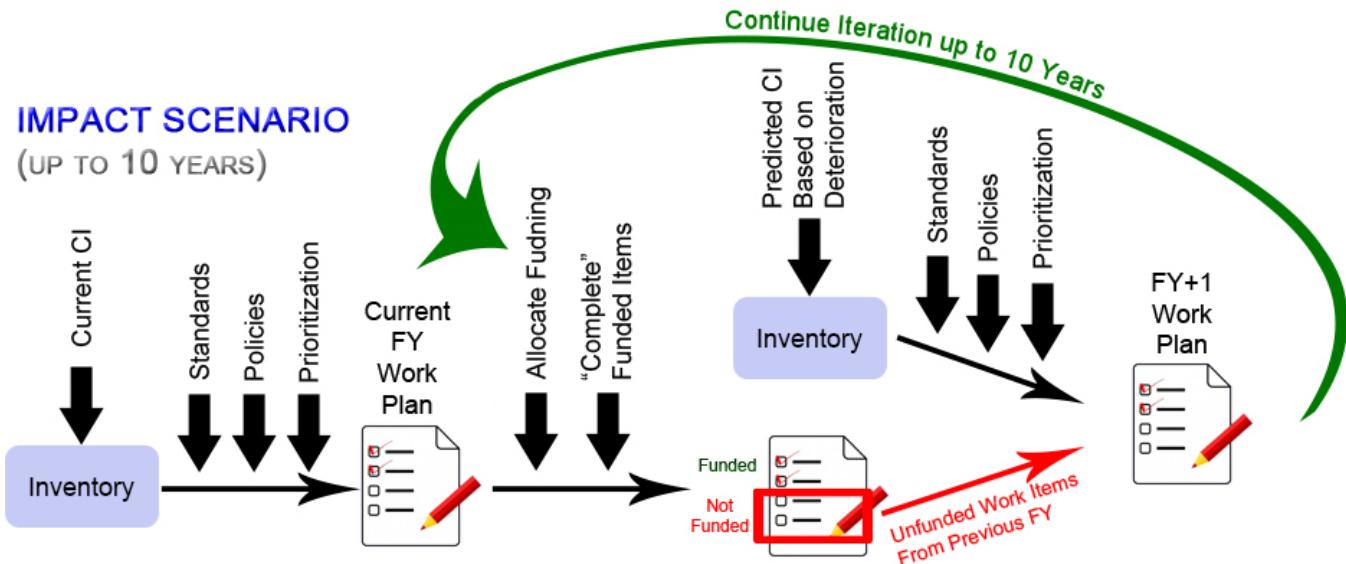
[Advantages of Using Scenarios](#)

### **Related Topics:**

- [Scenario Management](#)
- [Scenario Analysis](#)

## **Scenario Management**

A simplified outline of the Scenarios simulation steps was described in the [Scenarios Overview](#). You should review that topic before proceeding. Shown below is a conceptual illustration of the process:



In Scenario Management, a scenario is a set of data to be presented to the simulation model consisting of particular inventory data and a set of initial parameters. The result of running the scenario is expressed as a copy of inventory records in which the "current date" is sometime in the future, typically 5 to 10 years, and in which the time-stamped records beyond the run date are generated by the Scenario Simulation Model.

The first step in using Scenarios is to create a scenario and establish the set of initial parameters. The initial parameters are a set of values for key elements of the simulation decision process, such as the length of time to simulate, the [policy sequence](#) to use for generating work, the [prioritization scheme](#) to use for prioritizing work, and the [funding levels](#) to use for determining whether or not work can be completed. Additional parameters include specifications for future [building status](#) changes, the addition of new inventory, and the addition of new functionality assessments for buildings and functional areas. After the initial parameters are set, you are ready to run the simulation.

### How To Create a Scenario and Set Initial Parameters

To create or edit a Scenario, select **Scenarios** and then **Management** from the navigation menu.



The Scenario Analysis window will appear.

A screenshot of the "Scenario Analysis" window. At the top, there are tabs for "Scenarios" and "Analysis". Below the tabs is a toolbar with buttons for "New" (blue plus icon), "Delete" (red minus icon), and "Help" (question mark icon). The main area is a grid table with the following data:

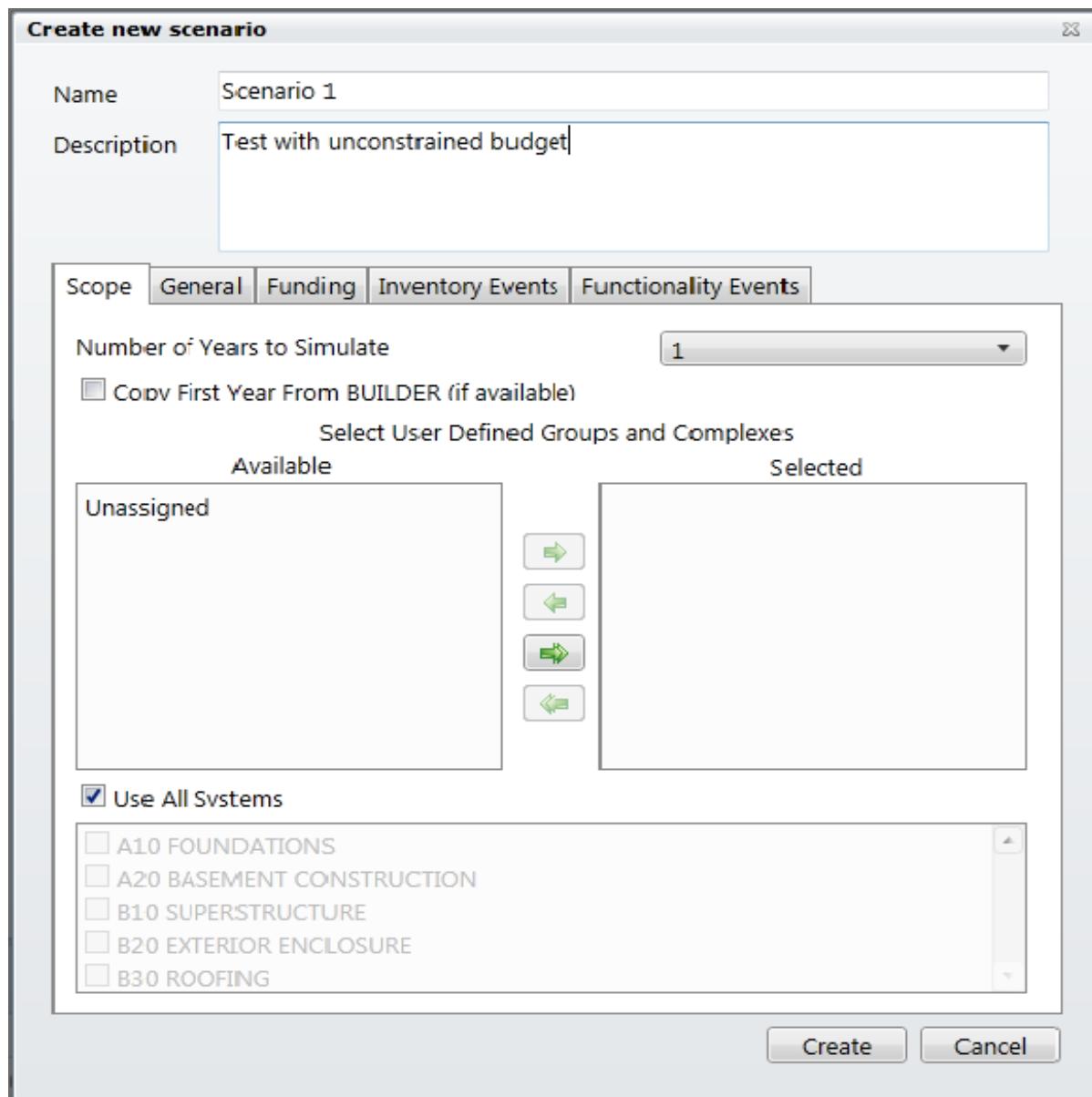
After navigating the tree on the left of the screen, the scenarios for that Site will be listed in the grid on the right. Also shown in the grid is the Site, Name, Description, Status, and Progress of each scenario.

### Toolbar

- **Return**. Use this button, at the upper left of the screen, to close the Scenario Management window.
- **Help**. Use this button to launch the help topic associated with scenarios.
- **New**. Use this button to create a new scenario.
- **Delete**. Use this button to delete the selected scenario.

### Creating or Editing a Scenario

To create a new scenario, click the **New** button in the toolbar. To edit an existing scenario, click its name in the grid. In either case, the Create Scenario window will appear.



At the top of this screen, you can enter or edit the scenario name and also enter a description of the scenario. Additional information for the scenario is input in the six different tabs, which are described below.

### Scope Tab

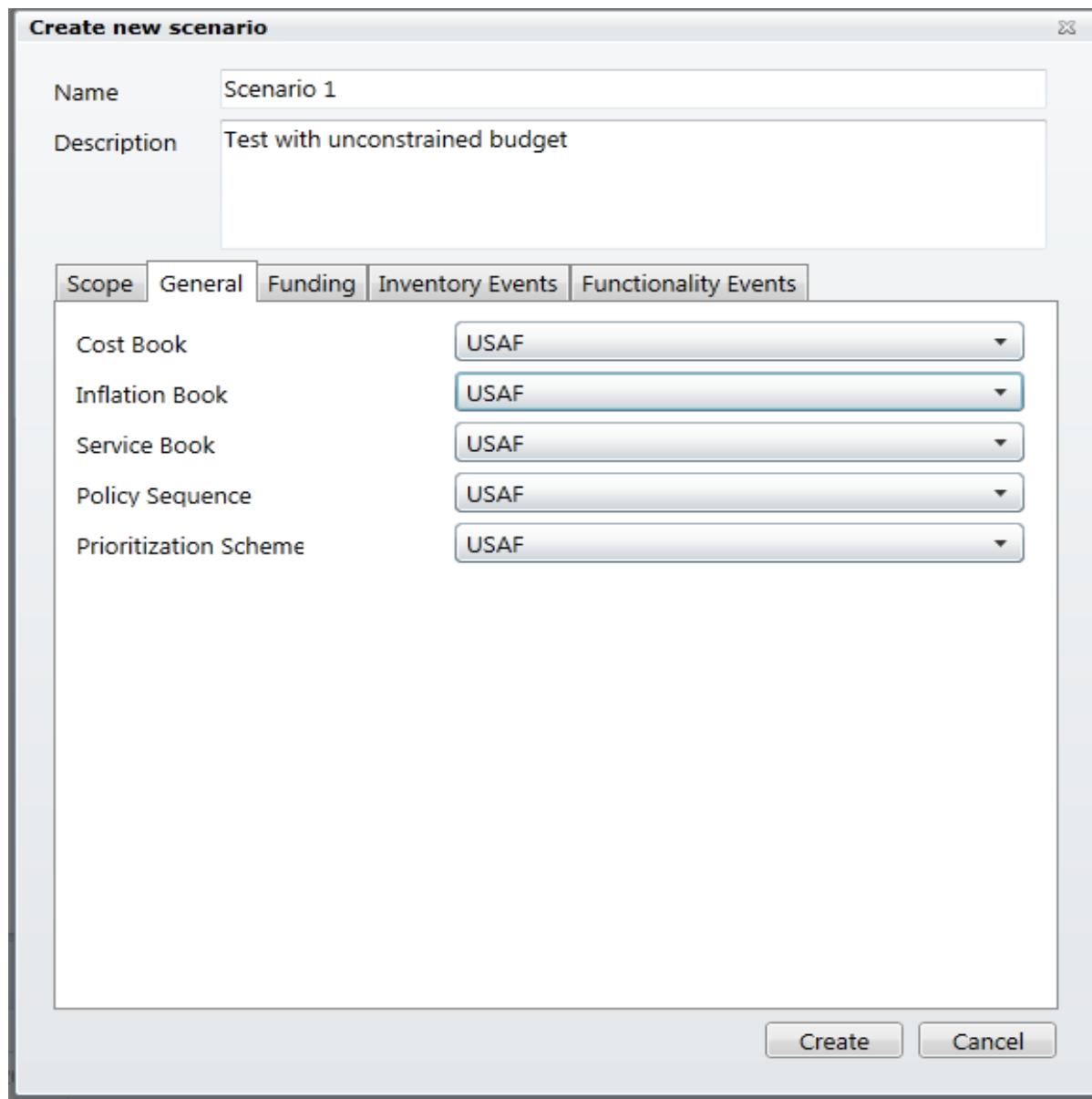
The Scope tab, which is shown above, specifies the planning horizon and the specific buildings to be included in the simulation. The data entered on this tab includes:

- **Number of Years to Simulate.** Select the number of years the simulation will run (1-10) from the dropdown list.

- **Organizations.** Select the organizations that are to be included in the simulation. The Available Groups list contains all of the groups, sites, and complexes currently in the inventory. Use the arrow keys between the two lists to create a list of inventory that is to be included in the simulation. The scenario will only include buildings that are in at least one of the Selected Groups. It is OK if the selected inventory overlap, i.e. if the same building is in more than one of the groups in the Selected Groups list.
- **Selected Systems.** Select the systems that are to be included in the simulation for the selected buildings. This is especially useful if you are simply developing a long-term repair and replacement plan for a single building system.

### **General Tab**

The general tab allows you to set the Cost Book, Inflation Book, Service Book, Policy Sequence, and Prioritization Scheme to use for the scenario. Each option is described in greater detail below.



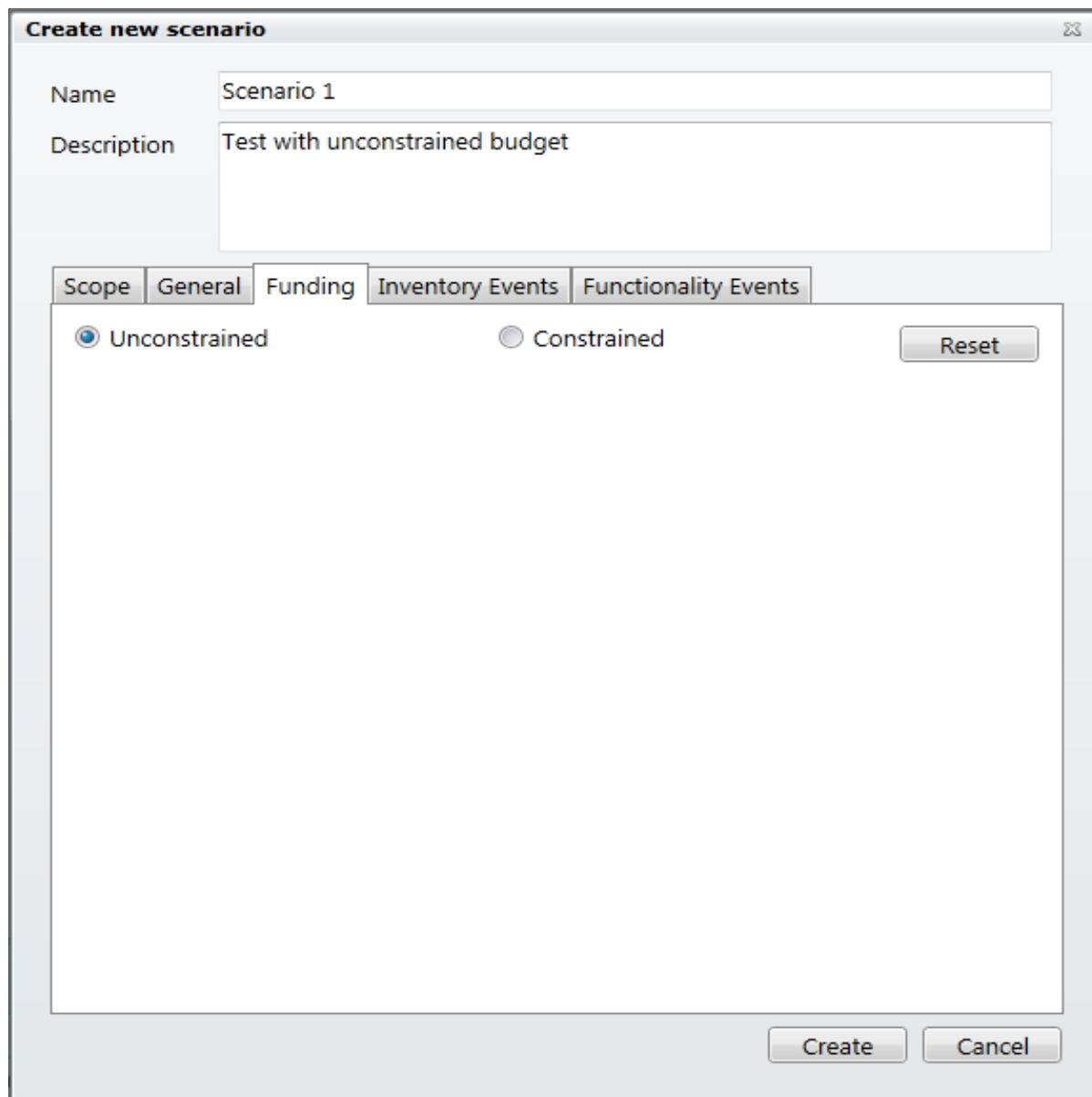
- **Cost Book.** Choose the cost book you wish to use for the scenario from the dropdown list. A cost book is defined so the cost of each work item can be computed. See [Viewing and Editing Cost Data](#) for more information.
- **Inflation Book.** Choose the inflation book you wish to use from the dropdown list. An inflation book is defined to allow the scenario to assess the inflation rates from year to year to be applied to the Work Items costs.
- **Service Book.** Choose the service life cost book you wish to use from the dropdown list. A service life book is defined so that the service life of all Component-Section in the inventory can be estimated.
- **Policy Sequence.** Choose the policy sequence you wish to use for the scenario from the dropdown list. A policy sequence is defined so that when

it is applied to the inventory it will determine a standard for every Component-Section by using its default standard and then by successively applying the applicable policies. See [Standards, Policies, and Policy Sequence Overview](#) for general information or [Adding and Editing Policy Sequences](#) for information on how to add and edit policy sequences.

- **Prioritization Scheme.** Choose the prioritization you wish to use for the scenario from the dropdown list. A prioritization scheme is defined so that a priority score can be calculated for each Section-level work item based on the measures, point values, and weights you have assigned. See [Creating a Work Prioritization Scheme](#) for more information. The Prioritization Scheme will be used only when funding is constrained, but you must select a scheme here even if the funding is unconstrained.

## Funding Tab

On the Funding tab, which is shown below, the funding levels for the different funding sources defined in BUILDER are set and the option of running the simulation with no funding constraints is provided. Each is described in greater detail below.



- **Unconstrained/Constrained Option.** Choose whether the scenario is to be constrained by funding or unconstrained by funding. If unconstrained, all simulated work items will be completed in the year they are generated. If constrained, you must specify the annual funding levels for all funding sources previously identified in BUILDER. In a constrained scenario, work items and projects are ranked by priority and funded for completion in order of rank until funds are exhausted. Work items and projects that are not funded cannot be completed. Projects and user-created work items that are not completed as planned will be carried over to the next year.
- **Funding Sources and Amounts Grid.** If you have chosen the Constrained option, the grid with funding sources and amounts will appear. Initially, the

funding sources and amounts are set to data entered in the [Anticipated Funding Levels](#). You may not delete funding sources here, but you may set their amounts to \$0. Select the checkbox next to the Funds that are to be utilized for the scenario.

### Inventory Events Tab

On the Inventory Events tab, which is shown below, a future "whole building" events can be triggered at particular points in the simulation and completely new buildings can be dynamically added to the inventory during the simulation. Each is described in greater detail below.

**Create new scenario**

Name	Scenario 1
Description	Test with unconstrained budget

Scope General Funding **Inventory Events** Functionality Events

Status Changes

	Building	New Status	Change Yr	Effective Yr

New Inventory

	Building #	Building Name	Organization	Template	Effective Yr

**Create** **Cancel**

- **Status Changes.** Buildings in the BUILDER inventory that have a "To be" type of status will have the implied effects of those status changes represented during the scenario. For example, if a building has a status of "To be demolished" in year X, the Scenario simulation will include the occurrence of the demolition in year X. In addition, you can schedule building status changes in the scenario parameters. This capability allows you to do the following:
  - Add new buildings to the inventory dynamically as the scenario progresses. To do this, add the buildings to the BUILDER inventory with status "To be built" or "To be acquired," with an effective year equal to the year the status is to change to "Active." When the scenario time reaches that year, the status will be changed. At that point, the building will be considered in the automated processes of condition assessment and work planning. If you wish to override the effective year of the status change in BUILDER, you can enter a status change for the building in the scenario for the new year.
  - Plan to demolish or transfer a building as the simulation progresses. You may do this in several ways:
    - Enter a building status of "To be demolished"/"To be transferred" in the BUILDER inventory, with an effective year set to the year the building is to be removed.
    - Enter a scenario status change to "Demolished"/"Transferred" in the appropriate change year.
    - Enter a scenario status change to "To be demolished"/"To be transferred" in a chosen year. Note that this allows you to model the progression of an active building to one that is to be demolished (with perhaps reduced maintenance standards) to a demolished building that is removed from work planning considerations.

To initiate a status change in the simulation, click the **New** button in the Status Change portion of the screen and enter the following data elements:

- **Building.** Select the Building for which the change in status applies.
- **New Status.** Select the new status of the Building using the dropdown list.
- **Change Year.** Enter the year in which the Building's status is to change to the new status.
- **Effective Year.** Enter the effective year of the new status.

- **New Inventory.** BUILDER allows you to add completely new building during a scenario, by clicking the **New** button in the New Inventory portion of the screen and entering the following data:
- New Inventory. BUILDER allows to add completely new Buildings during a scenario, by clicking the **New** button in the New Inventory portion of the screen and entering the following data:
  - **Building Number.** Enter the number identifier for the new Building.
  - **Building Name.** Enter the name identifier for the new Building.
  - **Organization.** Select the Organization to add the new Building to.
  - **Template.** Select the [template](#) to use to estimate the new Building's inventory.
  - **Effective Year.** Enter the year the new building will be added to the inventory.

### Functionality Events Tab

On the Functionality Events tab, which is shown below, a future building and/or functional area functionality assessments can be triggered at particular points in the simulation. Further description of this process is provided below.

**Create new scenario**

Name	Scenario 1
Description	Test with unconstrained budget

Scope General Funding Inventory Events Functionality Events

Building Functional Assessments

Use	Building	Assessment	Effective Yr

Functional Area Assessments

Use	Name	Functional Area	Assessment	Effective Yr

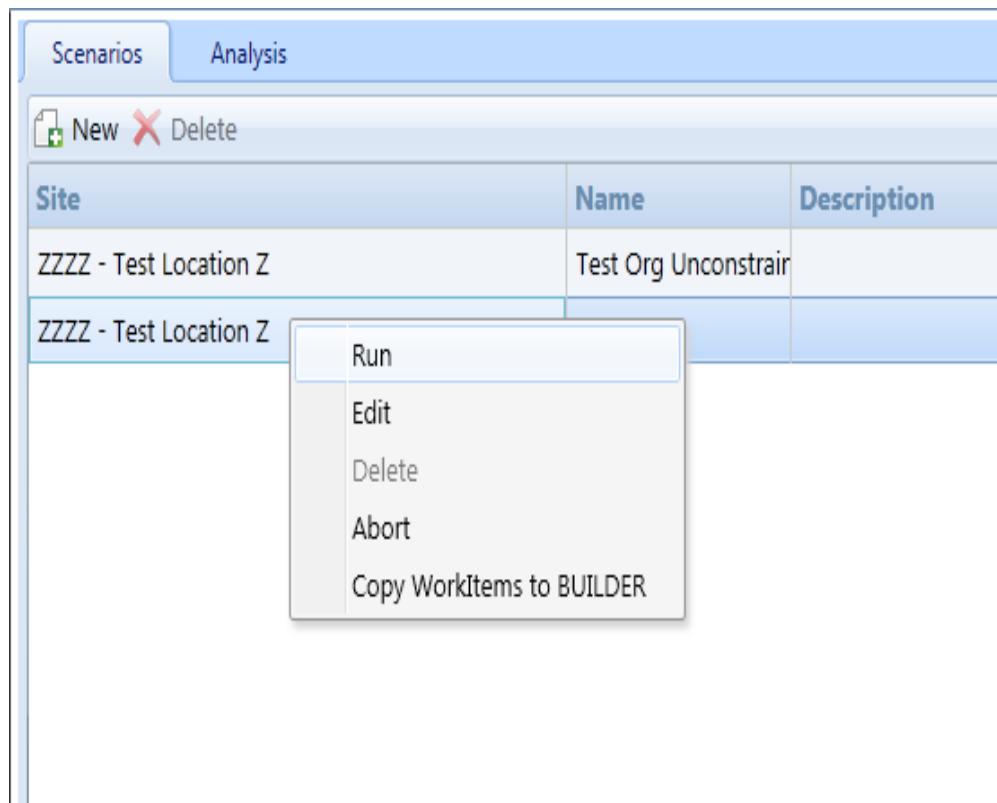
**Create** **Cancel**

- **Building Functional Assessments.** Any Building-level functionality assessments with the status of "To Take Effect" that have been entered for the inventory included in the scenario will be shown in this grid. If you wish to include a future assessment in the scenario, mark the checkbox in the USE column next to it in the grid. For all assessments that area included, the data from the future assessment will replace the active assessment data and be used to compute the BFI for the building in the effective year shown in the grid.
- **Functional Area Assessments.** Any functional area-level functionality assessments with the status of "To Take Effect" that have been entered for the inventory included in the scenario will be shown in this grid. If you wish

to include a future assessment in the scenario, mark the checkbox in the USE column next to it in the grid. For all assessments that area included, the data from the future assessment will replace the active assessment and be used to compute the **FAFI**<sup>1</sup> for the functional area in the effective year shown in the grid.

## Running the Simulation

After all of the initial scenario parameters are set, the simulation can be run by right-clicking on the scenario and selecting **Run**.



A progress report will scroll along the bottom of the window, entering a new line each time a new activity begins. Each line of the progress report begins with the system time on your computer so that you may judge how long each step takes. After the initial setup, the activity stream will repeat from year to year for the number of years in the simulation. By calculating how long it takes to simulate one year you can estimate how long the simulation will be running.

The simulation is a computationally intensive process, and many new records will have to be created in a single run. The simulation run time is very dependent on your computer system's speed and the size of the inventory in the simulation. The

---

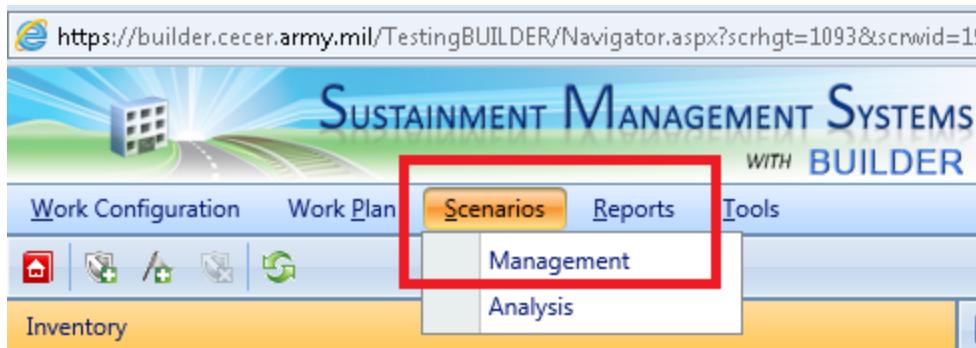
<sup>1</sup>Functional Area Functionality Index

simulation could take from a few minutes up to several hours to finish. It does not allow for any interaction after you have clicked **Run** in the dropdown list, other than allowing you to Abort the run at any time. If you right-click on the scenario and choose **Abort**, the simulation will prepare to finish its current process and stop running the scenario.

When the scenario run is finished, the results can be [compared with the results of other scenarios](#) or used to [create a work plan for BUILDER](#).

## Scenario Analysis

After a [scenario has been run](#), the results of the scenario can be analyzed and compared with the results of other scenarios. To analyze and compare the results of scenarios, select **Scenarios** and then **Management** from the navigation menu.

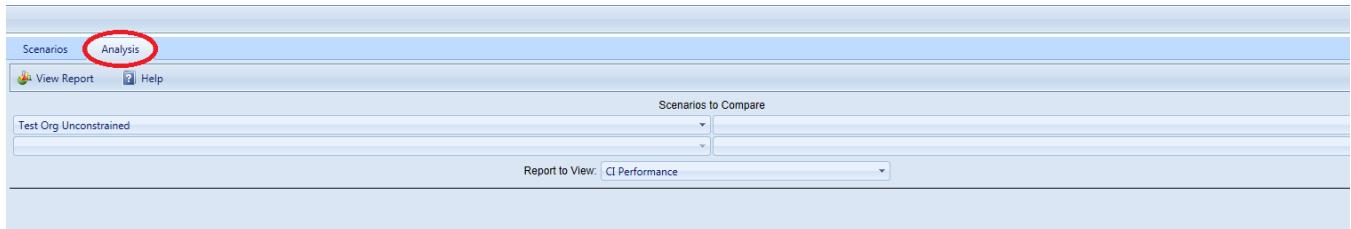


The Scenario Management window will appear.

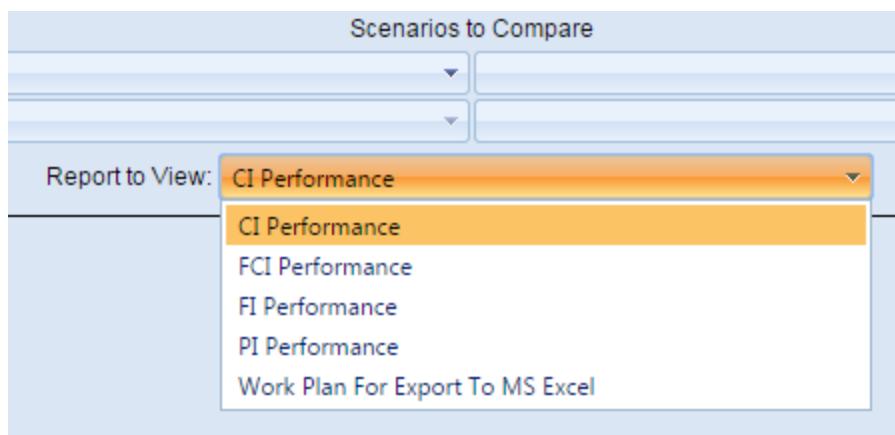
A screenshot of the "SCENARIOS" tab in the Scenario Management window. The top header includes "Welcome Mark Fisher | User Preferences | Logout | Help". The main area has tabs for "Scenarios" and "Analysis". Under "Scenarios", there are buttons for "New" and "Delete". A table lists scenarios with columns for Site, Name, Description, Status, and Progress. One row is visible: "ZZZZ - Test Location Z" with "Test Org Unconstrained" in the Name column, "Complete" in the Status column, and "100" in the Progress column.

After navigating the tree on the left of the screen, the scenarios for that Site will be listed in the grid on the right. Also shown in the grid is the Site, Name, Description, Status, and Progress of each Scenario.

To view the results of a scenario, or to compare the results of multiple scenarios, choose the **Analysis** tab in the right pane.



You can choose to view or compare scenarios for an entire Site, or drill down to a lower level to see analysis results. For example, if you want to see how an individual component section would perform under two different scenarios, you could select that component section from the tree, then select the scenarios to compare from the drop down boxes. You then choose from a number of reports to run to display scenario results.



These results include the following report options:

- **CI Performance.** Displays the year by year trend of the Condition index for each scenario.
- **FCI Performance.** Displays the year by year trend of the Facility Condition Index for each scenario. Only available at the building level or above.
- **FI Performance.** Displays the year by year trend of the Functionality Index for each scenario. Only available at the building level or above.
- **PI Performance.** Displays the year by year trend of the Performance index for each scenario. Only available at the building level or above.
- **Work Plan for Export to MS Excel.** Generates the details of a work plan that can be exported to MS Excel. Note that results for only one scenario can be viewed at a time for this report.

After choosing these settings, click the **View Report** button on the toolbar and the resulting information is displayed.

## Copying a Work Plan from a Scenario

After a [scenario has been run](#), the expected work items for all of the years in the scenario can be copied into BUILDER™ as the annual work plans. If the scenario was constrained by funding levels, then only the future work items with "Completed" status will form annual work plans constrained by budget. To create a work plan using the scenario results, navigate to the Scenario module and expand the tree on the left hand portion of the screen to the desired Site. Once the Site has been selected, the scenarios for this Site will load in the right portion of the screen. Right click on the scenario to be copied and click, "Copy to Work Plan".

When a scenario is copied to the work plan, BUILDER will take the following steps:

- If your work plan contained work items for the years prior to the scope of the scenario, those work items receive preferential treatment so that no conflicting work efforts will be generated during the scenario and the original work items will move along in the process with the simulated work items. The original work items will have to compete for resources if the scenario has funding constraints, so that original work items may not be "Completed" and therefore not re-imported back into your production database during the Copy Scenario process. One way to insure that the manually created future work items already in your production database do not get lost in the Scenario is to mark them as "Must Complete as Planned." This will essentially require that they be completed as planned in the Scenario.
- All current year and future work items for buildings in the scope of your scenario will be deleted.
- All "Completed" current year and future work items in the selected scenario will be imported into annual work plans with a status of "Awaiting Funds," a rank of "1/1", and a score of "0.000."

These steps are rather drastic in their manipulation of work item records, and it is possible for work items to be deleted and/or lost in the shuffle. It would be wise to make a copy of the database and work with the copy to ensure nothing is lost.

By using the Scenario tool, you can refine a work plan. If you start with no future work plan, then running a Scenario should give you a first cut at constructing future work plans. Use the Copy to Work Plan option on the right click menu to import the budget-constrained, completed work items from the scenario into your production database. You can then refine the work items from the [Work Plan screen](#), moving work items from year to year, changing work item properties, perhaps marking those that will definitely be completed as planned so that the next

run of the scenario will insure that each one is completed. You may even re-inspect sections identified as needing work, especially if they have not been inspected for some time. Improvements in the accuracy of your data will improve simulation results as well.

You can then run another Scenario with your new data and the same scenario parameters and use Scenario to Work Plan copy method described above to import the work plan from the new scenario database. Each cycle should improve the work plan generated and the overall scenario results. This is important because the work plan generated will begin to represent your future work plans more realistically, and the scenario results will give you a more realistic view of the next 5 to 10 years and improve your insights into the consequences of a given funding level.

# Reports

## Using the Report Viewer

The Report Viewer provided with BUILDER™ is a commercial report generator supplied by Data Dynamics Active Reports. The report viewer offers a number of powerful capabilities for working with BUILDER's standard reports. It allows you to view reports in a variety of formats, to print the reports, and to export the reports to an electronic file. Shown below is the general appearance of the report viewer:

The screenshot shows a web-based report viewer interface. At the top, there is a header bar with a logo on the left, a title 'Complex Detail Report' in the center, and a building icon on the right. Below the header, the page title 'test (1)' is displayed. A section titled 'Unassigned' contains a table with the following data:

Building	Use Category	Area (UM)	BCI	BFI	BPI	FCI	MDI	Building PRV
1 - test	Administrative Facilities	1,000 (SF)	100					\$143,552
2 - test	Administrative Facilities	2,000 (SF)	100					\$287,104

Below the table, a summary section titled 'Summary for Complex: Unassigned' provides the following information:

CCF:  
CFI:  
CPI:  
Total Building PRV: \$430,656  
Number of Buildings: 2

Complex Comments:

At the bottom of the page, there is a toolbar with icons for saving, printing, navigating, and zooming. The date 'March 02, 2012' and page number 'Page 1 of 1' are also visible.

### Toolbar

- **Close** - Use this button to close the window.
- **Export Type** - Select the view type of the report from the dropdown list. You can view it in Adobe Acrobat (PDF), Excel, or Word (RTF)

Note that one report, "Work Plan for Export to MS Excel," was designed specifically to be used with Microsoft Excel and not to be viewed and printed as it appears in the Report Viewer. By choosing to export this report to Excel, you can format, sort, eliminate columns, add your own columns, etc. as you wish to build your own work plan reports.

-  **Export Report**. Use this button to export the report.
-  **Help**. Use this button to launch the help topic associated with viewing reports.

### *Exporting a Report*

Using Export Report, you can export a report either as HTML or in a format that can then be printed as hard copy. The available formats to choose from are:

- Adobe Acrobat (PDF)
- Microsoft Excel
- Microsoft Word (RTF)
- HTML

To export the current report, select the format type using the dropdown list, then click the **Export Report** button in the toolbar.



The export process will begin, and you will be asked if you wish to open the exported report or save it to file. If you wish to save the report to file, you must specify a file path and name.

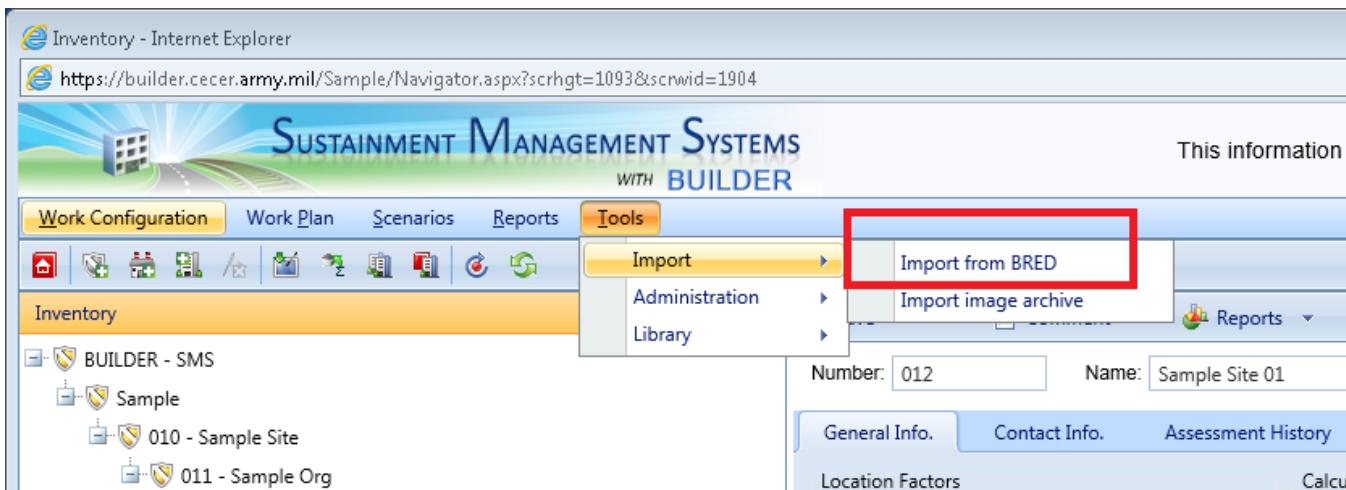
# Tools

## Importing Data from BRED

The BUILDER™ Remote Entry Database (BRED) allows you to collect inventory and inspection data using a Windows tablet or laptop as you walk through the building you are inspecting. To load the data that you have collected using BRED into the BUILDER database, you will need to import the database from BRED into BUILDER. It is important to note that the database file containing your new data must be loaded so that the BUILDER program has access to its path and can complete the importing process.

To import data from BRED, select Tools -> Import -> Import from BRED from the navigation menu.

The Import from BRED window will appear.



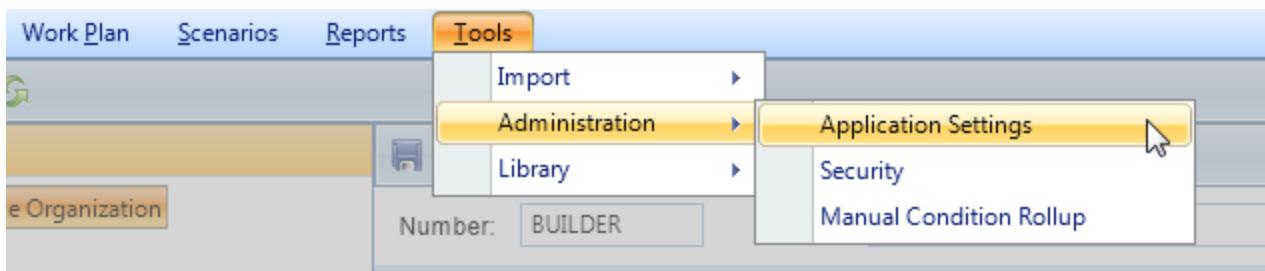
To select the BRED database you wish to import, click on either the **Select** button or the text box next to it. Navigate to the database, select it, then click the **Proceed** button in the toolbar.

**Note:** When the data was exported from BUILDER originally, the inventory records for the exported buildings were locked so that no changes could be made in the BUILDER database while inventory and condition assessment data was entered through BRED. This is done to avoid possible conflicts in the independent editing processes that might take place in BUILDER and BRED. Once the import is complete, the inventory records for the buildings will be unlocked and can be edited again.

# Administration

## Application Settings

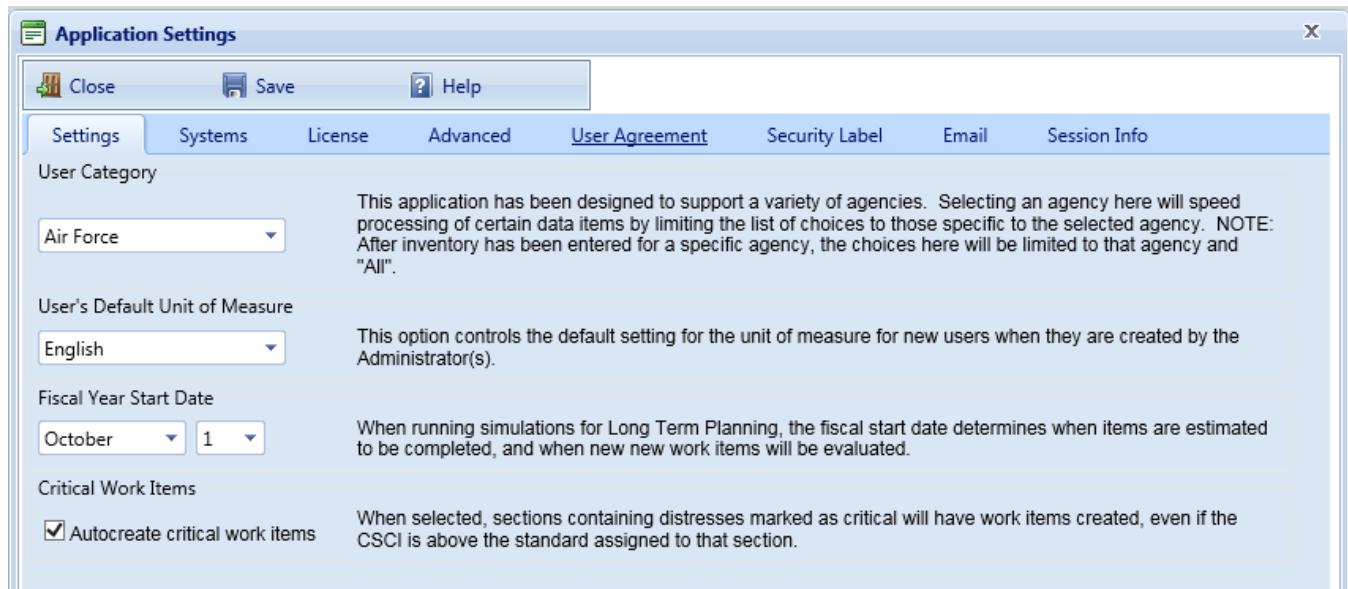
When you create a new inventory database, you should set the preferences in the Application Settings window before proceeding with any additions to inventory. To edit the application settings, select **Tools > Administration > Application Settings** from the navigation menu.



The Application Settings window will appear.

**Note:** only a user with Administrator privileges can change these settings.

### Settings Tab



At the Settings tab, you can set the following preferences for your database:

### *User Category*

When you select a user category, BUILDER will present an agency-specific list of building use types when adding inventory. The available categories are:

- Army
- Navy
- Air Force
- Civilian
- Department of Energy
- All

Choosing the **All** category allows you to enter building use types across multiple categories.

**Important:** Once your inventory contains buildings from more than one category, the only choice here is **All**.

### *User's Default Unit of Measure*

Select the default unit of measure (English or Metric) to be used for the inventory for all users. This is the unit of measure that will initially be shown for all users, but each user can change his or her units of measure at any time with the [User Preferences](#) tool when they are logged into BUILDER.

### *Fiscal Year Start Date*

Enter the fiscal year start date. When running simulations using BUILDER Scenarios, the fiscal start date determines (1) when items are estimated to be completed, and (2) when new work items will be evaluated.

### *Autocreate Critical Work Items*

Mark this checkbox if you want any Section with a current distress marked as critical to automatically generate a work item for it. That is, Sections containing distresses marked as critical will have work items created for them, even if the CSCI is above the standard assigned to that section.

### **Systems Tab**

At the Systems tab, you can specify which Systems will be available to be added and edited in BUILDER.

## **License Tab**

(This is a pending capability) The License Tab provides a location where you can copy and paste your security key.

## **Advanced Tab**

At the Advanced tab you can clear all record locks; also, you can designate an email address for support administration.

**Important:** be sure to read the precautions in the description of **Clear All Record Locks** below:

### *Clear All Record Locks*

Click this button to clear all the locks placed on Building and inspection records by individual users and BuilderRED (BRED). Whereas the **Clear Locks** button in the [User Preferences](#) window only clears locks on records locked by that user, the **Clear All Record Locks** button on this administrative screen unlocks *all* locked records, regardless of how they were locked.

**Important:** To protect data accuracy, all users should exit from the BUILDER program and all BRED files should be imported before the record locks are cleared!

Record locking is used to protect data from inadvertent overwrites by multiple users. BUILDER also locks records when buildings are exported to BuilderRED, to prevent data from being changed in the BUILDER program while inspection is in progress. To protect data accuracy, all users should exit from the BUILDER program and all BRED files should be imported before the record locks are cleared.

### *Support Contact*

Here is where you enter the email address of the BUILDER administrator. This is the email address users will see if they click on [Help](#), then choose **Contact Help** on the login page.

## **User Agreement Tab**

At the User Agreement tab is the text of the User Agreement that will be displayed to the user at login.

## **Security Label Tab**

At the Security Label tab is the text about security that is displayed on the user's login screen.

## Email Tab

At the Email tab are options that assist in the process of responding to user requests to change password or to have their account unlocked.

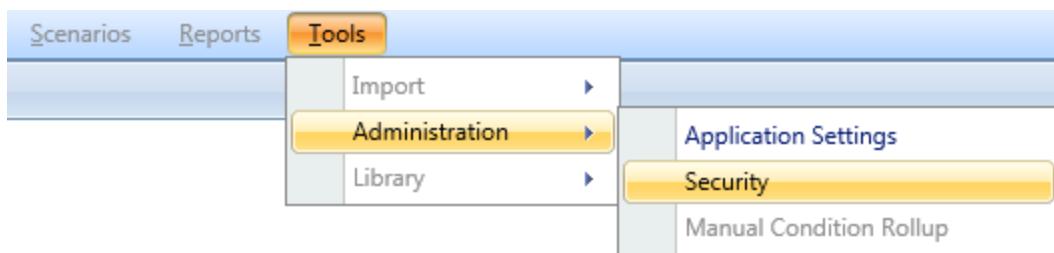
## Session Info Tab

At the Session Info tab you can see session information such as number of users logged in.

## Security

The Security window allows the administrator to view configuration settings, set password parameters, and administer users and roles. You must be logged in as an administrator to access this screen.

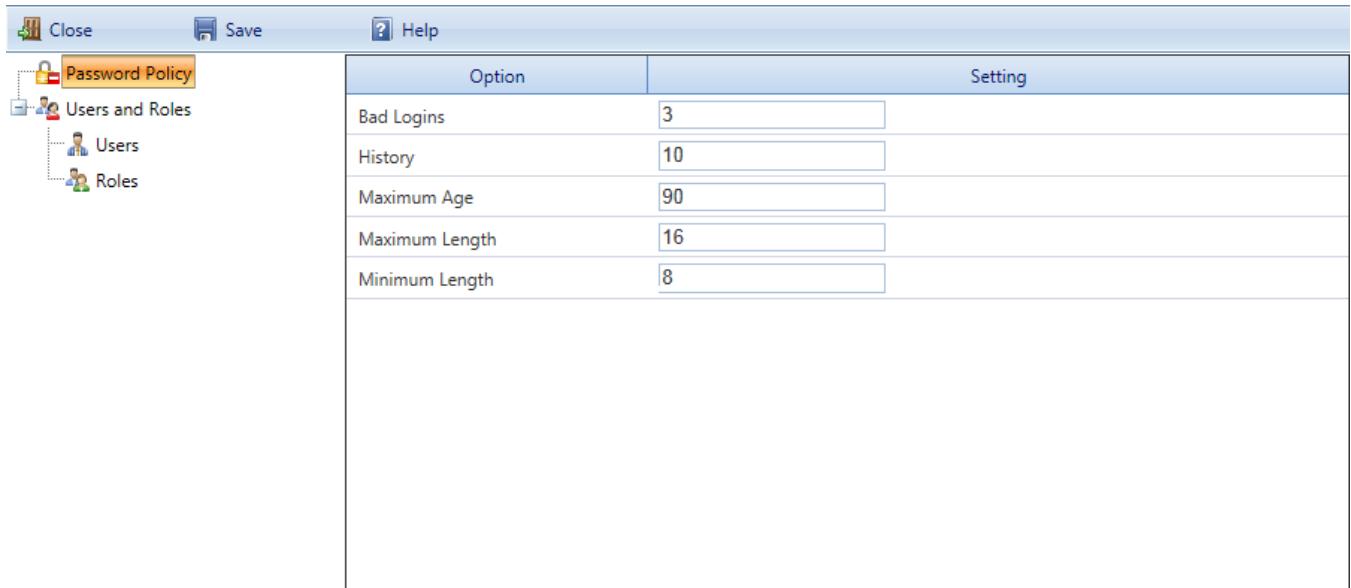
To edit the security features for BUILDER, select **Tools > Administration > Security** from the navigation menu.



The Security window will appear as seen below; Password Policy is selected by default.

## Password Policy

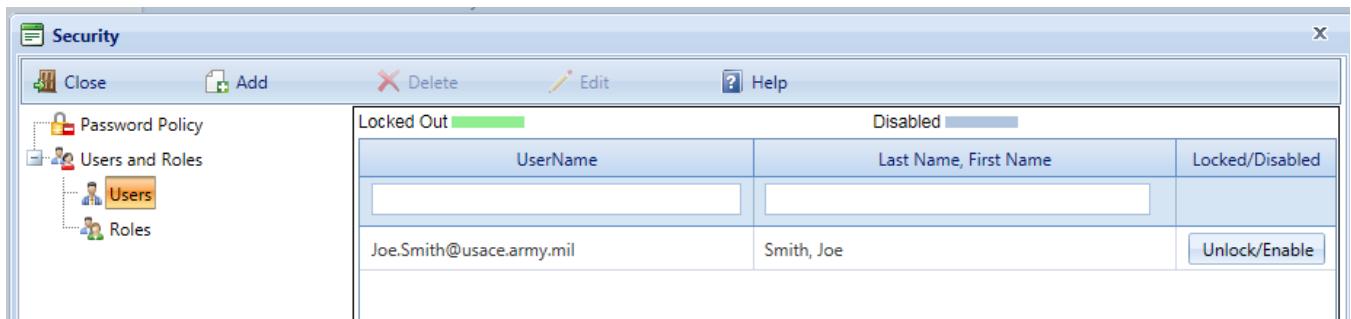
Password Policy lists the chosen BUILDER settings, as set up in the [Application Settings](#). The Password Policy options allow the administrator to set password parameters for users.



## Administering Users

Under Users and Roles, the Users option lists the available users set up for login into the system. This allows each system user to log into their own account, which has rights and privileges associated based on the Role they are assigned to.

Click on **Users** to see the user screen, similar to the one shown below:



## How To Add a User

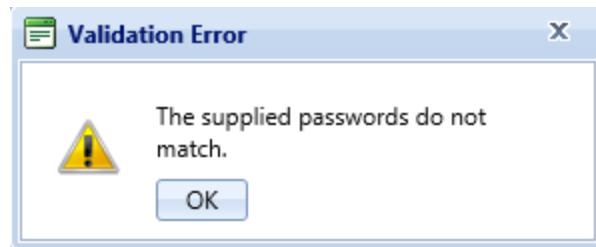
To add a new user:

1. Choose **Add** from the toolbar. (The New User window will appear.)
2. Complete the information for name, user name, and email address (not included in the screen shot below).
3. Set the initial password.

Close    Save    Help

<b>Personal</b>	<b>Unit of Measure</b>
First Name: John	<input checked="" type="radio"/> English <input type="radio"/> Metric
Last Name: Smith	
User Name: john.smith@us.af.mil	
<b>Account Status</b>	
<input checked="" type="radio"/> Enabled <input type="radio"/> Disabled	
<b>Roles</b>	
<input type="checkbox"/> Require CAC Login	

4. After filling in these fields, mark the checkbox to "Require CAC Login" if applicable.
5. Change the Unit of Measure if desired.
6. Click **Save** on the toolbar.
7. Note that after the **Save**, the password boxes will be cleared and a button that reads **Change Password** will appear below them. This is normal. It is also normal for the password rules to remain on the screen. If you make an error in password entry, you will receive a popup message such as the following:



8. Re-do password entry if necessary.
9. Click **Close** on the toolbar to return to the list of users.

## *How To Edit User Properties*

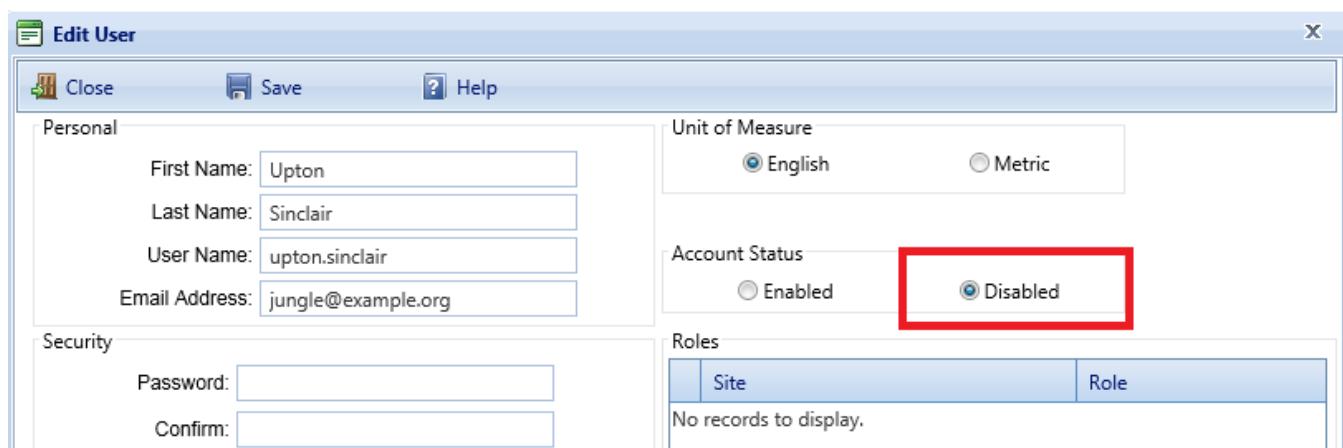
To edit user properties:

1. Select the name from the list of users.<sup>1</sup>.
2. Click **Edit** on the toolbar. (The Edit User window will appear.)
3. Change the desired properties.
4. Click **Save** on the toolbar.
5. Click **Close** on the toolbar to return to the list of users.

## *How To Disable a User*

Disabling a user takes place at the Edit User Screen. To disable a user:

1. Select the name from the list of users.<sup>2</sup>
2. Click **Edit** on the toolbar. (The Edit User screen will appear.)
3. Click the **Disabled** radio button.



4. Click **Save** on the toolbar.
5. Click **Close** on the toolbar to return to the list of users.

---

<sup>1</sup>To select a name, you can either

a. Click on the name in the list, or  
b. Fill in either the UserName or name in the blank boxes directly under the **User-Name or Last Name, First Name** headers

<sup>2</sup>To select a name, you can either

a. Click on the name in the list, or  
b. Fill in either the UserName or name in the blank boxes directly under the **User-Name or Last Name, First Name** headers.

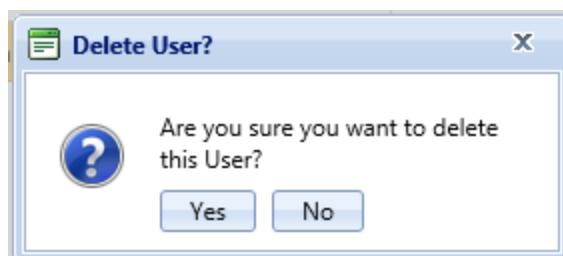
6. You should see that the horizontal bar containing the UserName and name of the disabled user has been colored in to indicate that this user has been disabled.

### How To Delete a User

**Warning:** If there are any inspections that were performed by the user you wish to delete, those inspections will become inaccessible if the user is deleted! A better option in this case is to disable, rather than delete, this user. (See How To Disable a User, above.)

If you choose to delete, follow these steps:

1. Select the name from the list of users.<sup>1</sup>
2. Click **Delete** on the toolbar. You will be asked for confirmation:



3. Click **OK**.
4. Click **Close** on the toolbar to return to the list of users.

### Administering Roles

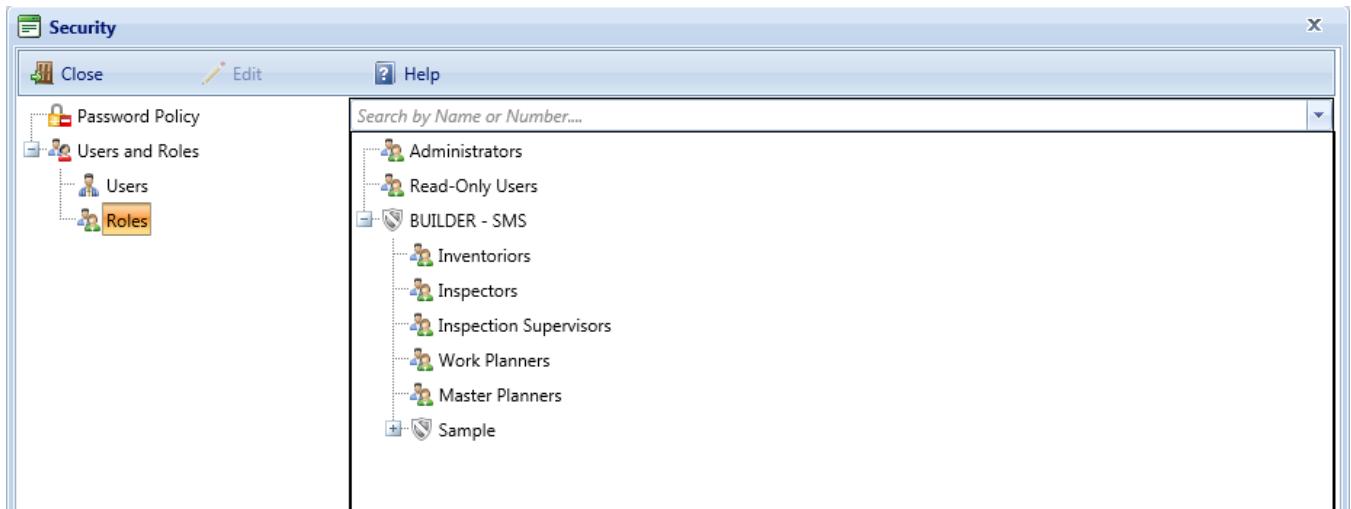
Once users have been created, they can be assigned to Roles, which are allowed varying degrees of program access rights under the system. The different Roles in BUILDER include:

- *Administrators* - can administer users, assign users to Roles, and change BUILDER configuration settings.
- *Inventoriors* - can input and edit inventory information from the Inventory screen
- *Inspectors* - have all the rights of *Inventoriors*, and can input and edit inspection information from the Condition Assessment screen

---

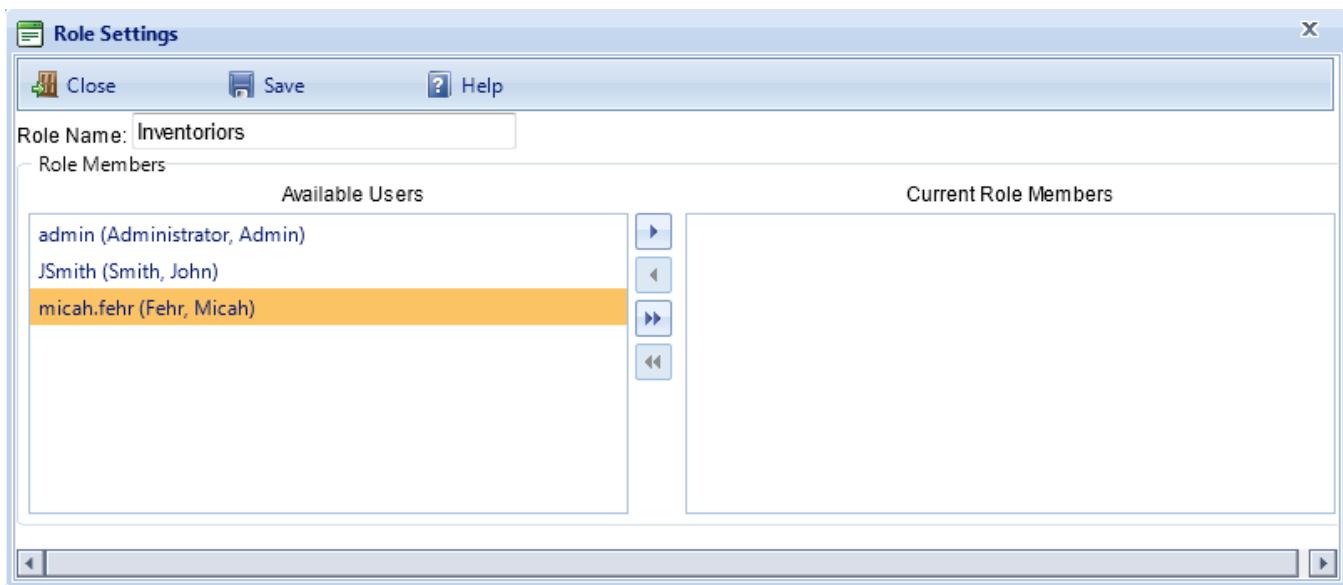
<sup>1</sup>To select a name, you can either  
a. Click on the name in the list, or  
b. Fill in either the UserName or name in the blank boxes directly under the **User-Name or Last Name, First Name** headers.

- *Inspection Supervisors* - have all the rights of *Inspectors*, and can also import/export data to and from BuilderRED and create inspection schedules
- *Work Planners* - have all the rights of *Inspection Supervisors*, and can also create and edit work plans, standards, policies, prioritization schemes, and RSL and cost books.
- *Master Planners* - have all the rights of *Work Planners*, and can also generate multi-year work plan scenarios, and edit any and all data saved by other users of the program. *Master Planner* is the highest level of user privileges.



Because BUILDER can be configured for multiple sites and organizations, each user can have their Role privileges assigned and restricted to the appropriate level. Therefore, a user can be assigned as a work planner only to one site or Organization, or, alternatively, to the entire database globally.

**Note:** Users are typically assigned permissions at the Site level.  
 The screen below shows the Role association. To assign users to a given Role and level, select the node from the tree, and click the **Edit** button on the toolbar. The following screen will come up:



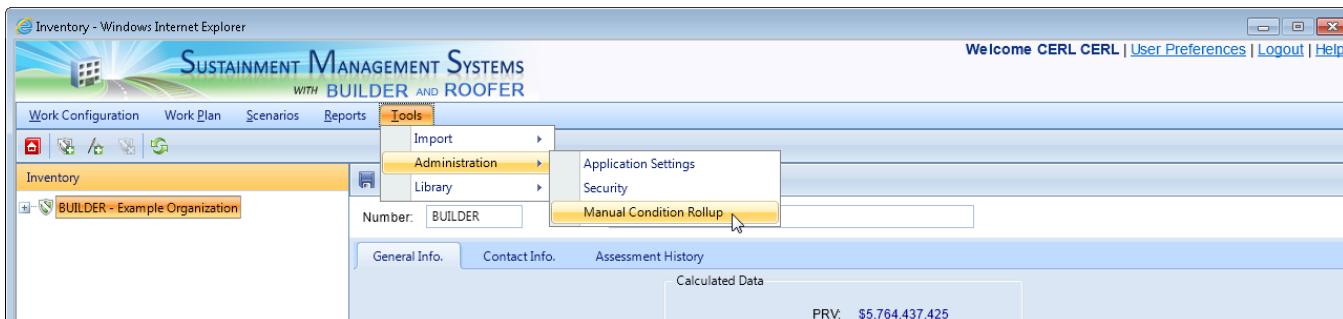
To assign Users to the Role, simply select the user from the Available Users list, and move them over to the Current Role Members

### ***Manual Condition Rollup***

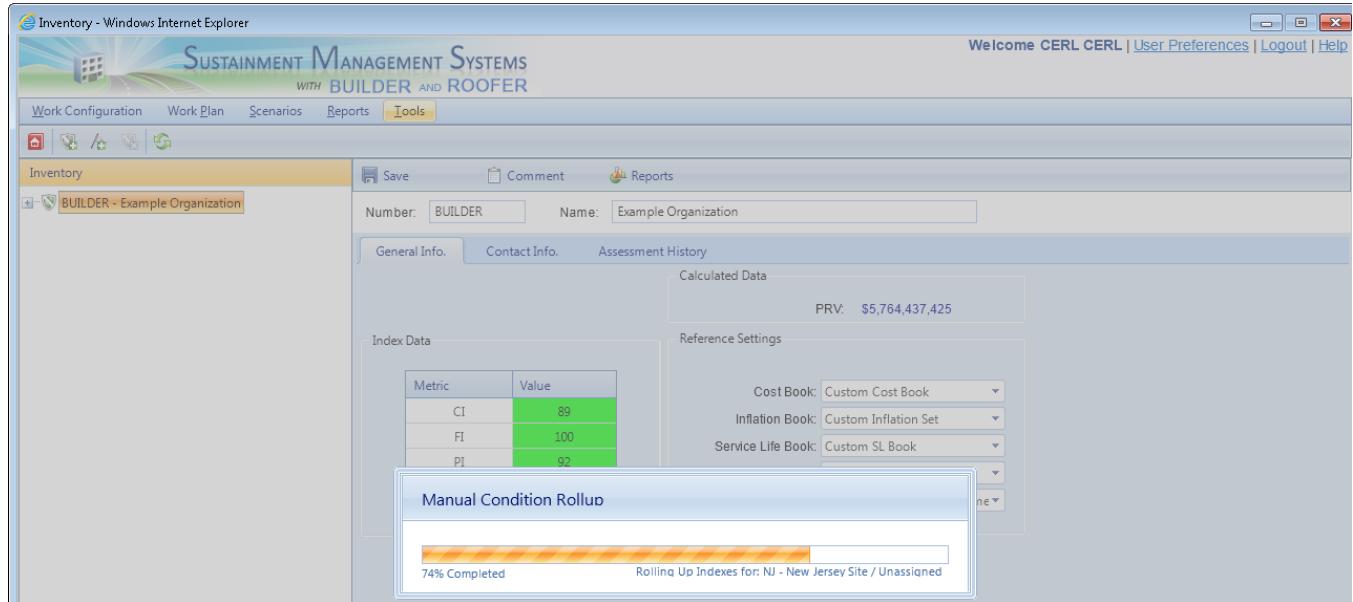
The [Condition Assessment Overview](#) contains a description of BUILDER's process for calculating current CI values for all levels of its inventory. The process "rolls up" the CI values from one level of the inventory hierarchy to the next in a methodical manner, beginning with Component-Sections and ending with the Site (or parent group if one is included in the inventory). BUILDER™ is designed to perform the rollup recalculation on your command. You should perform this rollup calculation frequently, but especially:

- If you have not performed the rollup within the last 6 months
- If you have entered a large number of new condition assessments
- If you need the most current CI measures to develop a new work plan.

To initiate the manual rollup process, select Tools -> Administration -> Manual Condition Rollup from the navigation menu.



The rollup process will begin for all inventory in the database and the Progress window will appear.



The following processes will occur during the rollup:

- Retrieve the latest condition assessment records and estimate a current Component-Section CI for all Component-Sections.
- Estimate the current remaining service life (RSL) for all Component-Sections. The RSL is adjusted by rate of deterioration in CIs.
- Estimate the current CI for all Components by calculating the average of their Component-Sections' CIs weighted by replacement cost.
- Estimate the current CI for all Systems by calculating the average of their Components' CIs weighted by replacement cost.
- Estimate the current CI for all Buildings by calculating the average of their Systems' CIs weighted by replacement cost.
- Estimate the current CI for all Complexes, Sites, and Groups (Organizations) by calculating the average of their Buildings' CIs weighted by replacement cost.
- Retrieve the latest functionality assessment records and determine the Building and functional area FI based on the results of the assessments.
- Estimate the current FI for all Complexes, Sites, and Groups by calculating the average of their buildings' FIs weighted by replacement cost.
- Estimate the current PI for all Buildings using a weighted combination of the current building CI and FI.

- Estimate the current PI for all Complexes, Sites, and Groups by calculating the average of their Buildings' PIs weighted by replacement cost.
- Estimate the Facility Condition Index (FCI) for all Buildings by calculating the total cost of needed repairs in the Buildings, divided by the present replacement value of the building.
- Estimate the current Facility Condition Index (FCI) for all Complexes, Sites, and Groups by calculating the total cost of needed repairs (BUILDER work items) in their buildings divided by the present replacement value of the Complex, Site, or Group.

After the rollup process completes, the Progress window will close and you will be returned to the main BUILDER screen. Building inventory windows will display recalculated current CIs for all elements.

## **Library**

### ***Viewing and Editing Cost Data***

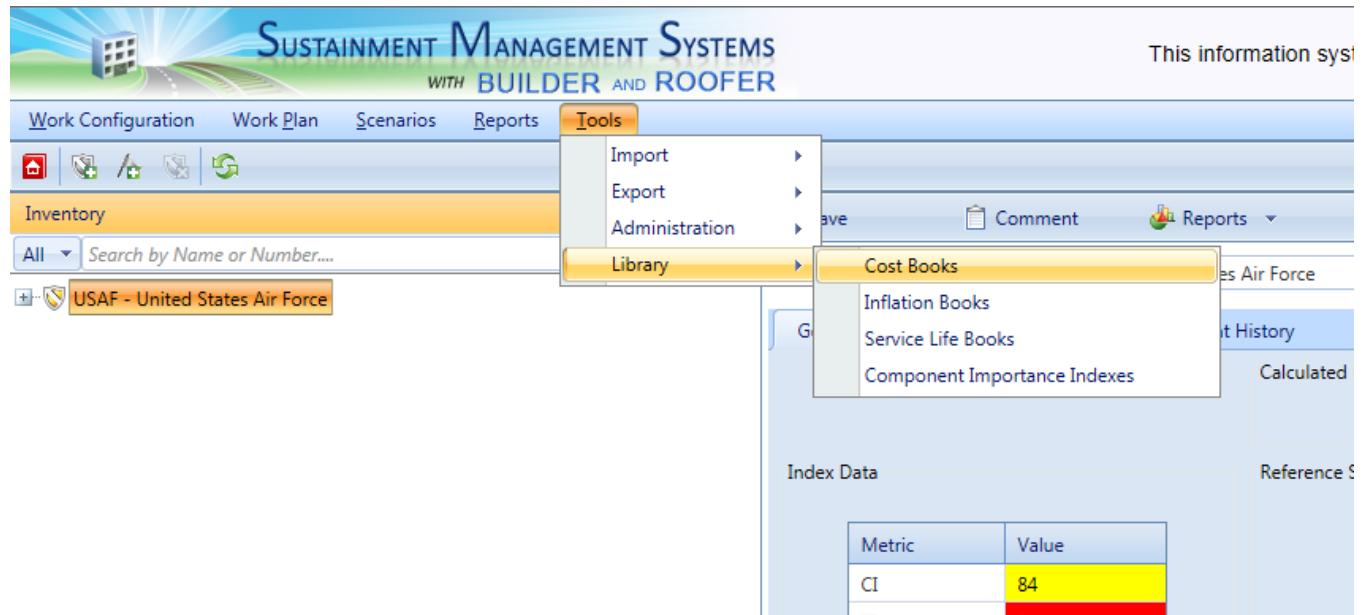
BUILDER has an embedded cost module that is used in two critical areas: work planning and condition assessment. The cost module provides inventory replacement costs for all levels of the building hierarchy. Additionally, replacement costs are used as weighting factors in rolling up CIs in the inventory hierarchy. For work planning, the cost module provides initial programming cost estimates for proposed maintenance, repair, and rehabilitation projects.

The data used in the cost module is derived from the Department of Defense's Tri-Service Automated Cost Engineering System (TRACES), from R.S. Means, and from your own cost data that you may add and use for the cost calculations. While TRACES and R.S. Means both provide electronic systems for cost estimating, BUILDER has its own coded methodology and only uses the cost data from those two sources. There are two primary reasons for this:

- Minimization of detail - Early in BUILDER's design, field input indicated that most users have very limited resources for creating and managing large, detailed databases of their facility assets. The BUILDER inventory and assessment data structures were designed to require as little data input as possible. The BUILDER cost module estimates costs from this minimal information; i.e. it can estimate the cost of a metal personnel door without knowing dimensions, hardware type, and other specifications normally required for most cost estimating systems.
- Flexibility of data - You can input your own cost data into the BUILDER cost module and it will work automatically with your inventory; proprietary cost estimating tools are much more difficult and numerous to integrate.

## Managing Cost Data

To manage the cost data, select Tools -> Library -> Cost Books from the navigation menu.



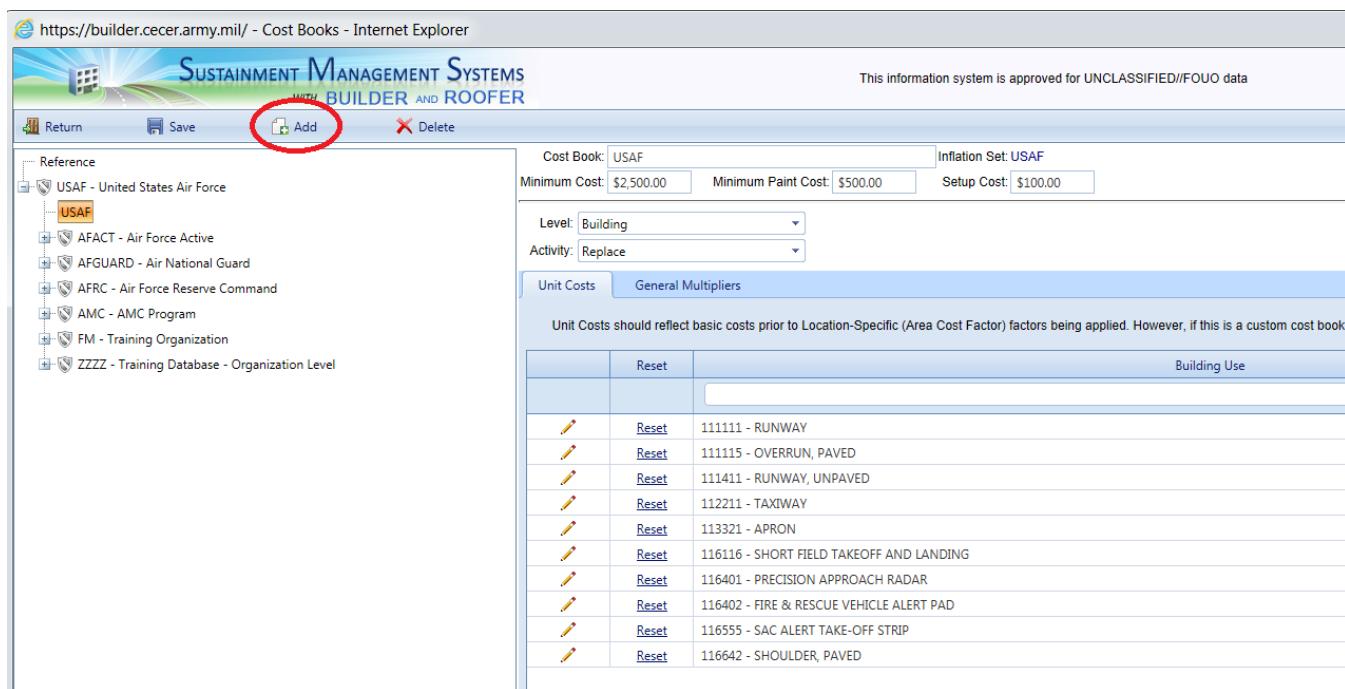
The Cost Management window will open.

This screenshot shows the "Cost Books" management window. At the top, it displays the URL "https://builder.celer.army.mil/- Cost Books - Internet Explorer" and the title "SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER AND ROOFER". It also shows a message: "This information system is approved for UNCLASSIFIED//FOUO data" and a welcome message: "Welcome Mark Fisher | User Preferences | Logout | Help". The window has tabs for "Cost Book" (set to USAF), "Inflation Set" (set to USAF), "Minimum Paint Cost" (\$2,500.00), and "Setup Cost" (\$100.00). There are dropdowns for "Level" (Building) and "Activity" (Replace). Below these are sections for "Unit Costs" and "General Multipliers". The "Unit Costs" section contains a table with columns "Reset", "Building Use", "Current Cost", and "Units". The table lists various items such as RUNWAY, OVERRUN, TAXIWAY, APRON, TAKEOFF, FIRE & RESCUE PAD, SAC ALERT TAKE-OFF STRIP, and SHOULDER PAVED, each with their respective costs and units (e.g., \$17.17 SF). A sidebar on the left shows a tree view of the organization structure under "Reference", starting with "USAF - United States Air Force" which branches into AFACFT, AFGUARD, AFRC, AMC, and FM. The bottom of the window shows a toolbar with icons for various functions and a status bar indicating "1000 items in 100 pages" and the date/time "7:37 AM 3/12/2014".

Expand the tree in the left portion of the window to show the available cost books in the database. Initially, only one cost book, Reference, is available. The Reference cost book cannot be deleted or edited; it is actually the built-in data derived from TRACES and R.S. Means. The Reference cost book is the foundation of all other cost books you create. You are free to use the Reference cost book if you like and not add any data of your own.

## Adding and Editing Cost Data

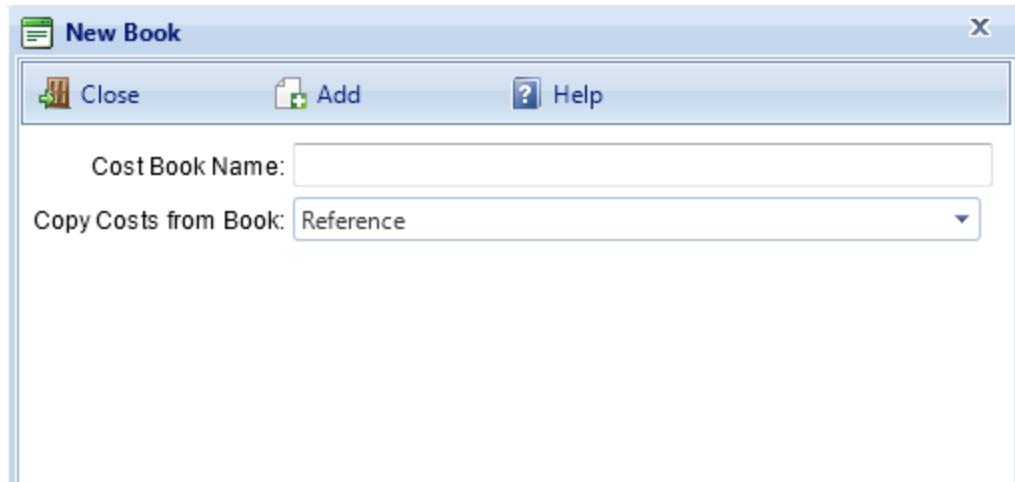
If you would like to edit the cost data, you must add your own cost book first. To do so, select the Organization or Site where the cost book is applicable and click the **Add** button in the toolbar.



The screenshot shows the 'SUSTAINMENT MANAGEMENT SYSTEMS' interface for 'BUILDER AND ROOFER'. The URL is https://builder.celer.army.mil/-Cost Books - Internet Explorer. The top navigation bar includes 'Return', 'Save', 'Add' (circled in red), and 'Delete'. A message states 'This information system is approved for UNCLASSIFIED//FOUO data'. On the left, a tree view shows 'Reference' expanded, with 'USAF - United States Air Force' selected. Under 'USAF', nodes include 'USAF', 'AFACT - Air Force Active', 'AFGUARD - Air National Guard', 'AFRC - Air Force Reserve Command', 'AMC - AMC Program', 'FM - Training Organization', and 'ZZZZ - Training Database - Organization Level'. The main panel displays cost book details: 'Cost Book: USAF', 'Inflation Set: USAF', 'Minimum Cost: \$2,500.00', 'Minimum Paint Cost: \$500.00', 'Setup Cost: \$100.00'. It also shows 'Level: Building' and 'Activity: Replace'. Below these are tabs for 'Unit Costs' and 'General Multipliers'. The 'Unit Costs' tab contains a table with 12 rows, each with a pencil icon and a 'Reset' link, listing various runway and taxiway codes. The table has columns for 'Building Use' and a blank column.

	Reset	Building Use
	<a href="#">Reset</a>	111111 - RUNWAY
	<a href="#">Reset</a>	111115 - OVERRUN, PAVED
	<a href="#">Reset</a>	111411 - RUNWAY, UNPAVED
	<a href="#">Reset</a>	112211 - TAXIWAY
	<a href="#">Reset</a>	113321 - APRON
	<a href="#">Reset</a>	116116 - SHORT FIELD TAKEOFF AND LANDING
	<a href="#">Reset</a>	116401 - PRECISION APPROACH RADAR
	<a href="#">Reset</a>	116402 - FIRE & RESCUE VEHICLE ALERT PAD
	<a href="#">Reset</a>	116555 - SAC ALERT TAKE-OFF STRIP
	<a href="#">Reset</a>	116642 - SHOULDER, PAVED

The New Cost Book window will appear:



Enter the name of the new cost book, select the cost book to copy costs from, and click **Add**. You may then edit the costs in the new cost book item by item on the Unit Costs tab using the dropdown lists to filter the grid at the bottom by inventory level, activity, and system (system only appears for Section-level inventory items). Additionally, you can edit the minimum paint cost and minimum cost for a work item from this tab. To edit different cost books in your inventory, select them in the tree and their data will appear in the grid.

SUSTAINMENT MANAGEMENT SYSTEMS  
WITH BUILDER AND ROOFER

Welcome CERL CERL | User Preferences | Logout | Help

**Cost Book:** Test\_Cost\_Book

**Minimum Cost:** \$65    **Minimum Paint Cost:** \$35    **Setup Cost:** \$0.00

**Inflation Set:** Custom Inflation Set

Level:	Building			
Activity:	Replace			
<b>Unit Costs</b>				
General Multipliers				
Unit Costs should reflect basic costs prior to Location-Specific (Area Cost Factor) factors being applied. However, if this is a custom cost book, inflation is included in cost calculations.				
	Reset	Building Use	Current Cost	Units
	<a href="#">Reset</a>	11110 - FW RUNWAY PAVE	\$16.84	SF
	<a href="#">Reset</a>	11110 - RUNWAY / FIXED WING	\$16.84	SF
	<a href="#">Reset</a>	111100 - FW RUNWAY PAVE	\$16.50	SF
	<a href="#">Reset</a>	11111 - FW RUNWAY UNPAV	\$0.98	SF
	<a href="#">Reset</a>	111111 - RUNWAY	\$16.84	SF
	<a href="#">Reset</a>	111115 - OVERRUN, PAVED	\$6.94	SF
	<a href="#">Reset</a>	11112 - RUNWAY / FIXED WING - UNSURFACED	\$0.96	SF
	<a href="#">Reset</a>	11115 - RUNWAY / ROTARY WING	\$6.94	SF
	<a href="#">Reset</a>	11120 - HELICOPTER LANDING PAD / HOVERPOINT	\$6.94	SF
	<a href="#">Reset</a>	11120 - RW RUNWAY PAVE	\$6.94	SF

### General Multipliers Tab

The General Multipliers tab displays the multiplier that will be used in all cost computations for the items filtered using the dropdown lists at the top of the tab. The general multiplier for the filtered items can be edited from this tab.

SUSTAINMENT MANAGEMENT SYSTEMS  
WITH BUILDER AND ROOFER

Welcome CERL CERL | User Preferences

Return Save Add Delete

Reference Cost Book: Test\_Cost\_Book Inflation Set: Custom Inflation Set

BUILDER - Example Organization Minimum Cost: \$65.00 Minimum Paint Cost: \$35.00 Setup Cost: \$0.00

Level: Building Activity: Replace

Unit Costs General Multipliers

General multiplier to apply to all costs: 1.00

Includes supervision/administration, overhead, design and contract management

## Assigning Cost Books

You can create multiple cost books, and assign separate ones to each Organization or Site. This is done in the Inventory mode by selecting the Organization or Site to assign the cost book to, and selecting the cost book from the drop down menu in the Reference Settings.

Save Comment Images Reports Select

Number: \_\_\_\_\_ Name: Site A

General Information Contact Information Building Information Assessment History GIS

Location Factors

Area Cost Factor:	1
Seismic Zone:	2
HVAC Zone:	6

Calculated Data

Number of Facilities:	34
PRV:	\$78,141,000

Index Data

Metric	Value
CI	81
FI	98
PI	85
FCI	0.028

Reference Settings

Cost Book:	Reference
Service Life Book:	Reference
Inflation Book:	Reference
Policy Sequence:	Default
Prioritization Scheme:	Simple Default

## How Costs Are Calculated

Only two levels of costs are editable, the costs for buildings and for components-sections. A component cost is determined by totaling the costs of the Component-Sections belonging to it. Similarly, a system cost is determined by totaling the

costs of the components belonging to it. Generally, the cost to replace, remove, or paint a Component-Section is determined by the formula:

$$\text{Total Cost} = \text{Quantity} * \text{Unit Cost} * \text{Area Cost Factor} * \text{General Multiplier} * \text{Aggregate Specific Multiplier} * \text{Inflation Factor}$$

where the Aggregate Specific Multiplier is the product of the applicable individual specific multipliers and the area cost factor is taken from the [Site data](#). The cost to demolish a building uses the same formula, with the Aggregate Specific Multiplier = 1.0.

BUILDER uses building replacement cost data from the Tri-Service Military Construction Program in the Reference cost book, and the method described above is essentially the same as the method described in Technical Manual 5-800-4, Programming Cost Estimates for Military Construction, to estimate the replacement cost of each building. See [http://armypubs.army.mil/eng/DR\\_pubs/dr\\_a/pdf/tm5\\_800\\_4.pdf](http://armypubs.army.mil/eng/DR_pubs/dr_a/pdf/tm5_800_4.pdf) for the text of this technical manual.

Costs relative to a specific geographic location are determined by applying a multiplier called the area cost factor to a base construction cost. The BUILDER database of area cost factors is the same database used in the Tri-Service Automated Cost Engineering System (TRACES) and is set in the [Site data](#).

The area cost factor (ACF) accounts for the following geographic differences in costs:

- local costs of construction labor, equipment, and materials
- weather, climate, and seismic requirements
- labor availability

The inflation factor is computed based on the base year of the cost data and the inflation rates given in the default [inflation set](#). If the cost data corresponds to the data in the Reference cost book, then the cost module uses a fixed year for the base year. If you add your own cost book and enter a unit cost different from the Reference set, then the cost module saves the year in which you input that data as the base year for inflation computations.

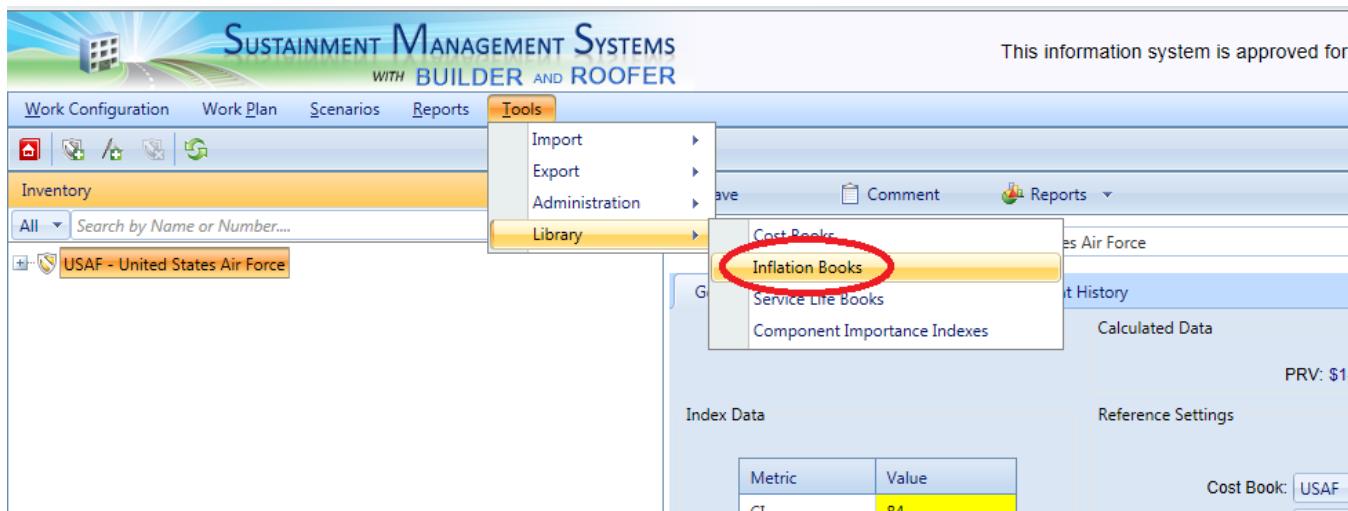
Repair costs are handled differently. The cost module calculates repair costs for Component-Sections as a function of current condition index and the replacement cost computed as above using an algorithm derived through ERDC-CERL's research.

## **Viewing and Editing Inflation Rates**

When costs are computed by the [cost module](#), an adjustment is made to account for inflation. The BUILDER™ cost module initially contains one Inflation Set, the Reference set, which is not editable. The data in the Reference set matches the inflation rates used by the Department of Defense for operations and maintenance costs. As time goes on and the economy's ups and downs yield different forecasts of inflation, you should create new inflation sets to more accurately predict outyear costs.

### **Managing Inflation Rates**

To manage the inflation rates, select Tools -> Library -> Inflation Books from the navigation menu.



The Inflation Set Management window will appear.

The screenshot shows the Sustainment Management Systems software interface. At the top, there is a logo of a building and the text "SUSTAINMENT MANAGEMENT SYSTEMS WITH BUILDER AND ROOFER". Below the header is a toolbar with buttons for "Return", "Save", "Add", and "Delete".

The main area has two sections. On the left is a tree view under "Reference" containing the following items:

- USAF - United States Air Force
  - USAF**
  - AFACT - Air Force Active
  - AFGUARD - Air National Guard
  - AFRC - Air Force Reserve Command
  - AMC - AMC Program
  - FM - Training Organization
  - ZZZZ - Training Database - Organization Level

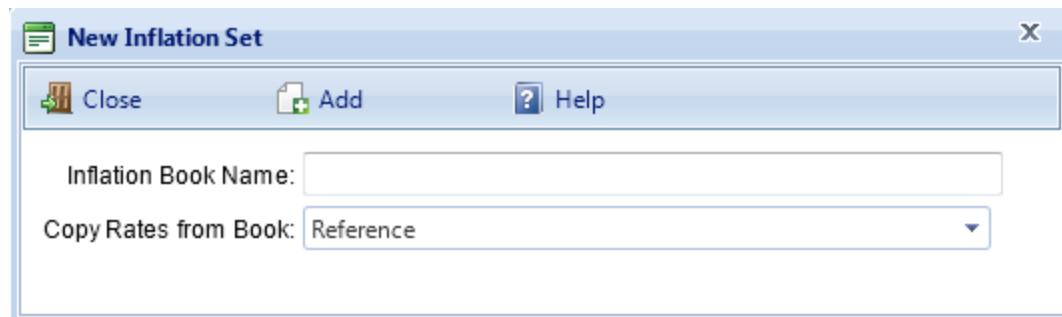
On the right, there is a table titled "Inflation Book: USAF" showing inflation rates from 2014 to 2024. The table has columns for "Year" and "Rate".

Year	Rate
2014	0.02
2015	0.02
2016	0.02
2017	0.02
2018	0.02
2019	0.02
2020	0.02
2021	0.02
2022	0.02
2023	0.02
2024	0.02

Expand the tree in the left portion of the window to show the available inflation sets in the database. As stated above, only the References inflation set is available initially. The Reference inflation set cannot be deleted or edited and serves as the foundation for all other inflation sets you create. You are free to use the Reference inflation set if you like and not add any data of your own.

### Adding and Editing Inflation Rates

If you would like to edit the inflation rates, you must add your own data set first. To do so, choose the Organization or Site where it applies from the tree, then click the **Add** button on the toolbar. The New Inflation Set window will appear:



Enter the name of the new inflation set, choose the set to copy inflation rates from, and click **Add**. You will be returned to the Inflation Set Management window, the name of the new book will appear in the Inflation Set dropdown list, and you will see the data corresponding to the book you copied from. You may know edit the inflation rates on a year-by-year basis for the new set in the grid. To edit different inflation sets in your inventory, select them in the tree and their data will appear in the grid.

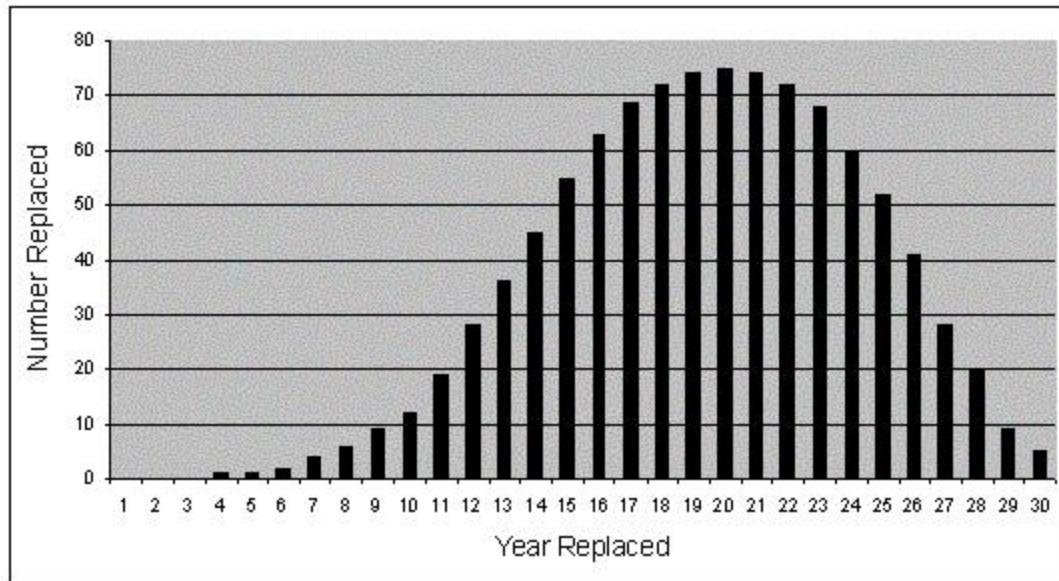
### **Choosing the Default Inflation Rate Data Set**

Once the inflation set is created, it is available from the inventory screen to use for a given Site, region, or Organization.

### ***Viewing and Editing Service Life Data***

BUILDER™ comes with its own data regarding the service life expectancy, in years, of all types of building Component-Sections. It uses the expected service life data in several ways. First and foremost, BUILDER estimates the remaining service life of a Component-Section on the basis of its life expectancy and condition. Second, the expected service life is used in estimating a rate of deterioration in the condition index of a Component-Section when no more than one inspection has been recorded.

An example of how service life data is gathered and used may be helpful. Suppose the BUILDER service life data indicates that a heavy grade carpet under moderate traffic levels has a life expectancy of 20 years. The 20 years is obviously an average of some sort, and you should know that the average is determined more by the experiences and judgment of multiple facility managers than by statistically accurate field data. Gathering statistically valid data is virtually impossible, even for the manufacturer of a specific carpet type, but especially for the BUILDER database which must match service life with a very generic Component-Section type. If you installed a heavy grade carpet into 1000 buildings where the traffic level would be classified as moderate and you tracked how many years each carpet remained in the building before it was replaced, the graph of your data might look something like shown below (keep in mind that this is simply a conceptual picture and does not represent actual data.).



You can see from this simple graph that by year 20, the majority of the carpet in the 1000 buildings has been replaced. You can also see that all along the way, some of the carpet is being replaced sooner than 20 years and some later than 20 years. What makes the difference? Many factors may affect how long a particular carpet may be in use: level of daily and periodic cleaning, climate, actual quality of the carpet and of its installation, mission requirements of the tenant, etc. For those factors which affect the condition of the carpet, BUILDER attempts to relate an estimated remaining service life for a specific carpet Component-Section with the condition index of that section. The CI of the carpet at any given age gives a good indication of whether the carpet will last less than or more than the average life span. When you perform the process of [rolling up CIs](#) for your inventory, one of the computations in the series is to recompute the remaining service life of the Component-Section based on its current CI, its rate of deterioration during the time between its last two condition assessments, and the expected service life of the item.

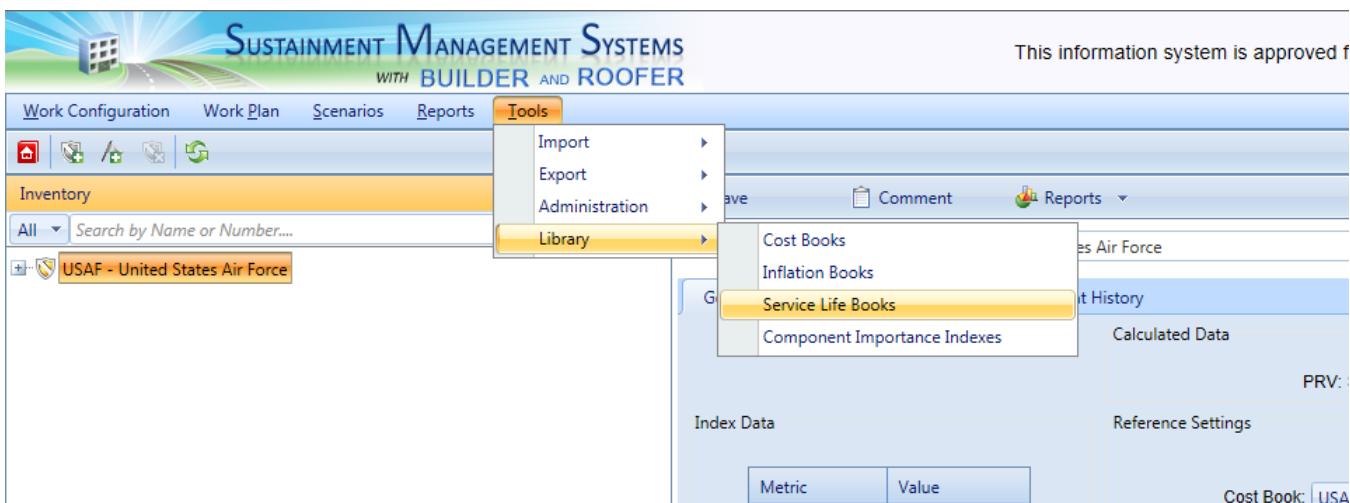
As you can see, the expected service life is a key component in determining two important measures of how well a particular Component-Section is doing. The two are its current condition index and its remaining service life. Service life is used to determine an expected deterioration rate in estimating current condition in the absence of sequential condition assessment data. It is also used in the models that compute remaining service life on the basis of current CI and rate of deterioration.

The service life data in BUILDER's Reference set was derived from data collected during many years of research at ERDC-CERL, both during the BUILDER project and by an earlier study that resulted in the Maintenance Resource

Prediction Model (MRPM), which has served as the foundation for a number of facility maintenance models. Your experience, however, may be different in terms of how long items last in your buildings. For example, your buildings may be in a very wet, windy climate and the roof surfaces may need to be replaced more often, paint may need to be applied more often, wood windows may need to be replaced sooner than the data indicates. BUILDER allows you to edit the service life data to reflect your knowledge and experience with the various building Components you manage.

### **Creating and Editing Service Life Data**

To manage the service life data, select Tools -> Library -> Service Life Data from the navigation menu.



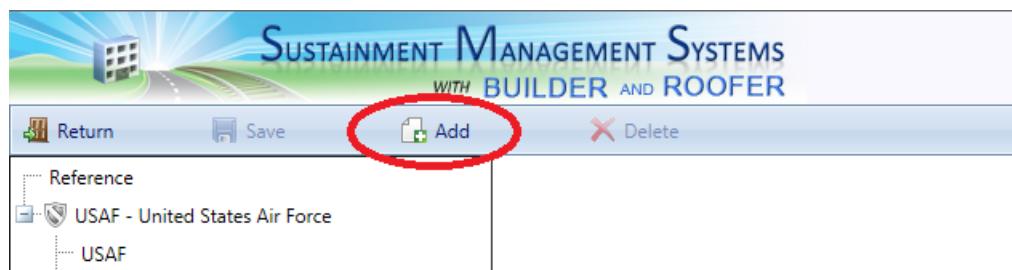
The Service Life Management window will appear when you click on the Reference on the left hand side.

Material / Equipment	Component	Component Type	SL
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	General	30
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Other	30
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Unknown	30
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Adobe	75
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Brick Veneer w/CMU Backup	75
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Brick Veneer w/Stud Backup	75
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Cementitious Boards / Panels	30
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	CIP Concrete	75
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Concrete Block	75
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	E.I.F.S.	50

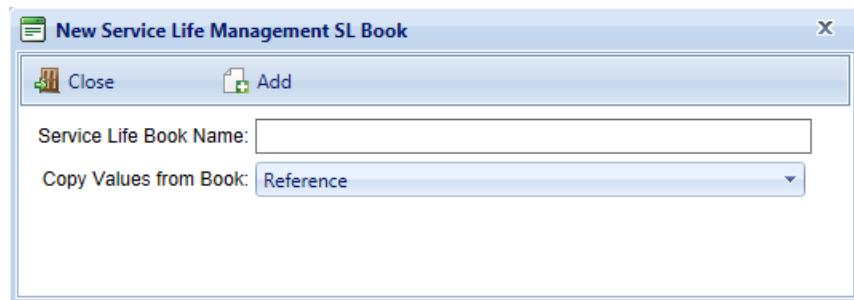
Expand the tree in the left portion of the window to show the available service life data sets. Initially, only one service life data set, Reference, is available. The Reference data set cannot be deleted or edited, and serves as the foundation of all other service life data sets you create. You are free to use the Reference service life data set if you like and not add any data of your own.

### Editing Service Life Data

If you would like to edit the service life data, you must create your own data set first. To do so, click the **Add** button on the toolbar.



The Service Life Management window will appear.



Enter the name of the new service life book, choose the book to copy service life data from, and click **Add**. You will be returned to the Service Life Management window, the name of the new book will appear in the Service Life Set field, and you will see the data corresponding to the book you copied from. You may now edit the service life (SL) and paint life (PL) for the Sections in the grid, which is filtered by system. To edit different service life sets in your inventory, select them in the tree and their data will appear in the grid.

Return Save Add Delete

Reference: USAF - United States Air Force

Material / Equipment	Component	Component Type	SL	PL
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	General	30	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Other	30	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Unknown	30	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Adobe	75	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Brick Veneer w/CMU Backup	75	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Brick Veneer w/Stud Backup	75	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Cementitious Boards / Panels	30	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	CIP Concrete	75	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	Concrete Block	75	8
B201001 EXTERIOR CLOSURE	B2010 EXTERIOR WALLS	E.I.F.S.	50	8

## Assigning Service Life Books

You can create multiple Service Life books, and assign separate ones to each Organization or Site. This is done in the Inventory mode by selecting the Organization or Site to assign the Service Life book to, and selecting the Service Life book from the drop down menu in the Reference Settings.

Save Comment Reports

Number: USAF Name: United States Air Force

General Info. Contact Info. Assessment History

Calculated Data

PRV: \$183,469,792,236

Index Data Reference Settings

Metric	Value
CI	84
FI	1
PI	85
FCI	55.853

Cost Book:	USAF
Inflation Book:	USAF
Service Life Book:	USAF
Policy Sequence:	Org. Name
Prioritization Scheme:	USAF Reference USAF USAF



BUILDER Version 3.3

This program is furnished by the U.S. Army Corps of Engineers ERDC - Construction Engineering Research Laboratory (ERDC-CERL) and is accepted and

used by the recipient with the express understanding that the United States Government, the U.S. Army Corps of Engineers, and ERDC-CERL make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the information and data contained in the program or furnished in connection therewith, and the United States shall be under no liability whatsoever to any person by reason of any use made thereof. This program is a property of ERDC-CERL. The recipient agrees not to assert any proprietary rights therein or to represent this program to anyone as other than government property; furthermore, this program can only be copied for legitimate backup purposes by the user.



## Acknowledgments

We would like to thank the SMS Governance, Configuration, and Support Panel, its members, and its constituent working committees for their support and guidance during development of the Sustainment Management System (SMS), of which BUILDER™ and ROOFER™ are a part.

The following individuals were involved in creating SMS Version 3.3 :

### *Project Management*

Lance Marrano

### *Engineering*

Michael Grussing, PE

Louis "Buddy" Bartels, PE, PMP

Matthew Walters, PMP

### *Software Development*

Kyle Blocher

Eric Brady

KiSung Chon

Brody Finney

James Johnson

Joseph Karbarz

Paul Paisley Mahern

Dan McCue  
Eric Nielsen  
Austin Powell  
Daniel Wilson

### *Technical Writing*

Audrey Fisher

### ***History***

The Sustainment Management System would not be available in any form without the encouragement, support, and funding made available from the U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL); the U.S. Army Center for Public Works (CPW); the U.S. Navy Naval Facilities Engineering Command (NAVFAC); and the US Army Assistant Chief of Staff for Installation Management (ACSIM).

These stakeholders and contributors deserve special mention: Bob Williams, Mike Dean, Phil Columbus, Fidel Rodriguez, Chester Kirk, Dave Williams, and Dave Bohl from the U.S. Army; Richard Caldwell, Jack Feola, Harold Juhola, Harry Singh, Bob Carlsen, Charlie Schiavino, Al Antelman, Chuck Abell, Roy Morris, and Bill Merritt from the U.S. Navy; Don Brotherson from the Building Research Council, School of Architecture, University of Illinois; John Myers from the Center for Architectural Conservation, College of Architecture, Georgia Institute of Technology; and Dr. Mo Shahin, Dave Bailey, Orange Marshall, Vince Hock, Steve Sweeney, Doug Ellsworth, Mark Slaughter, Paul Howdyshell, Mike McInerney, Don Hicks, Veda Scarpetta, and Kelly Dilks from ERDC-CERL.

The following engineers, software developers, and research assistants contributed to previous versions of the SMS:

### *Engineering*

D. R. Uzarski, PhD, PE  
L.A. Burley, PhD  
S.L. Hunter  
J.R. Martin  
Jason Schneider

### *Software Development*

Carol Subick (BUILDER Version 2.0 and 2.1)  
Advanced Information Service (BUILDER Version 1.0)  
John Almy (BUILDER Version 3.0)  
Intelligent Information Technologies, Inc. (BUILDER Version 1.1 and 2.0)  
John Jurewicz (BUILDER RED Version 1.0)  
Kirk McGraw (BUILDER Version 1.0)  
Jeff Morton (BUILDER Version 1.0)  
Russ Northrup (BUILDER Version 3.1)  
Matthew Richards (BUILDER Version 3.0)

### *Research Assistance*

The list of research assistants includes current as well as previous research assistants.

John Borland  
Makesha Bradford  
Robert Butler  
Nicholas Byrnes  
Ryan Culton  
Laura Dean  
Trey Edwards  
James Gerald  
Eric Gould  
Richard Humphries  
John Jurewicz  
Steve Kibbler  
Na'ilah Kituku  
Joann Lavrich  
Eric Lawson  
Heather Lawson  
Yoon Lim  
Jason Martin  
Doug Milburn  
Carrie Olson  
Teresa Pin  
Ronnie Pride

Elizabeth Rutherford

Michael Smejkal

Ryan Smith

Michelle Svetlic

Verge Temme

Christina Vogel

Phil Weightman

Chuck Wittleder

Jeff Zahorak

## **Copyright Warning**

Copyright 2015 US Army Corps of Engineers (USACE)

Protected by U.S. Patent No. 6,058,544 and Patent Applications Serial Nos.  
11/223,251 and 11/194,655

## **Disclaimer**



This program is furnished by the U.S. Army Corps of Engineers Engineering Research and Development Center - Construction Engineering Research Laboratory (ERDC-CERL) and is accepted and used by the recipient with the express understanding that the United States Government, the U.S. Army Corps of Engineers, and ERDC-CERL make no warranties, expressed or implied, concerning the accuracy, completeness, reliability, usability, or suitability for any particular purpose of the information and data contained in this program or furnished in connection therewith, and the United States shall be under no liability whatsoever to any person by reason of any use made thereof. This program is a property of the ERDC-CERL. The recipient agrees not to assert any proprietary rights therein or to represent this program to anyone as other than a government property; furthermore, this program can only be copied for legitimate backup purposes by the user.

# Glossary

---

**BCCI**

Building Component Condition Index

**BCI**

Building Condition Index - a condition rating for the overall building.

**BFI**

Building Functionality Index - computed from the results of a functionality assessment.

**BPI**

Building Performance Index - a measure of a building's overall performance, derived from the BCI and BFI.

**BRED**

BUILDER Remote Entry Database (BuilderRED)

**BUR**

Built-up Roofing

**CCI**

Coating Condition Index

**CI**

Condition Index

**CM**

Corrective Maintenance

**CSCI**

Component-Section Condition Index - a condition rating for the component section

**EMS**

Engineered Management System

**ERDC-CERL**

U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory

**ESC**

Emergency Service Calls

---

**FAFI**

Functional Area Functionality Index

**FCA**

Facility Condition Assessment

**FCI**

Facility Condition Index - the total cost of necessary repairs divided by the replacement cost of the Building. This is a standard index in the industry.

**FI**

Functionality Index

**HPSB**

High Performance and Sustainable Building

**KBCSI**

Knowledge-Based Condition Survey Inspection

**KBI**

Knowledge-Based Inspection

**M&R**

Maintenance and Repair

**M&R**

Maintenance and Repairs

**MDI**

Mission Dependency Index - measures the relative importance of a Building

**N/A**

Not Applicable

**PI**

Performance Index. See also: BPI.

**PM**

Preventive Maintenance

**PMI**

Preventative Maintenance Inspection

---

**RML**

Remaining Maintenance Life

**RSL**

Remaining Service Life

**SCCI**

System Component Condition Index - a condition rating for the system component

**SCI**

System Condition Index - a condition rating for the building system.

**SMS**

Sustainment Management System

**SP**

Single Ply

**SR**

Shingle Roofing

**SRM**

Sustainment, Restoration, & Modernization

**SUCI**

Sample Unit Condition Index



# Index

---

## A

- ACF 29, 331
- Acknowledgements 339
- Adding 23, 29, 36, 63, 68, 72, 212, 215, 238, 243, 248
  - Complex 36
  - Component 68
  - Condition Policy 244
  - Condition Standard 238
  - Functional Area 212
  - Functionality Policies 246
  - Functionality Standards 241
  - Group 23
  - Inventory to Functional Areas 215
  - Policy Sequence 248
  - Section 72
  - Site 29
  - System 63
- Additional 27, 34, 39, 80
  - Complex Data 39
  - Group Data 27
  - Section Data 80
  - Site Data 34
- Administration 315, 318, 324
- Application Settings 315

---

Manual Condition Rollup 324  
Security 318  
User Preferences 18  
Annual Work Plans 250, 310  
Anticipated Funding Levels 285  
Appendix A 198  
Appendix B 200  
    Built-Up Roofing Distresses 200  
Appendix C 202  
    Single Ply Roofing Distresses 202  
Appendix D 203  
    Shingle Roofing Distresses 203  
Appendix E 205  
Appendix F 206  
Application Settings 315  
Area Cost Factor 29, 331  
ASTM UNIFORMAT II 22

## B

Backlogged Report 308  
BCCI 124  
BCI 48, 124  
BFI 48, 209, 221  
BPI 49  
BRED 314  
BUILDER Remote Entry Database (BRED) 314  
Import Data from 314

---

Building 53, 85, 208  
Building Status 47, 53  
Condition Index 48, 121  
Copying 85  
Functionality Index 48, 209  
ISR Rating 48  
Mission Dependency Index 48  
Performance Index 49  
Replacement Cost 48  
Building-Level Work Item 261  
Building Status 47, 53, 55  
Building Templates 92-93, 99-100, 103  
    Copy Building Inventory to 99  
    Creating Building Inventory Using 103  
    Exporting 100  
    Importing 100  
    Managing 93  
    Using 92  
Building Use 47  
Built-Up Roofing (BUR) Distress Survey Definitions 200

## C

CI 120, 324  
Color Rating 150  
Complex 36  
Component 21, 57, 68  
Component-Section 21, 60, 76

---

Component Subtype 74  
Condition Assessment Data 120, 138, 149, 156  
    Data 138, 149  
    Methods 138, 149  
    With Sampling 156  
Condition Index Rollup 120, 324  
Condition Trends 308  
Construction Type 47  
Content Area 9  
Copy 85, 87, 99, 310  
    Building 85  
    Building Inventory to Template 99  
    Sections 87  
    Work Plan from Scenario 310  
Copyright 342  
Cost Book 327  
Creating 103, 252, 261, 265, 270  
    Building-Level Work Item 261  
    Building Inventory Using Templates 103  
    Prioritization Scheme 270  
    Project 265  
    Section-Level Work Item 252  
CSCI 76, 121  
Current Estimated 76  
Latest Inspection 72

---

**D**

- Data Dynamics Active Reports 312
- Default 249, 331, 334
  - Cost Book 327
  - Inflation Set 332
  - Service Life Book 337
  - Standards 248
- Defect Free 139
- Deleting 23, 29, 36, 63, 71, 78
  - Complex 36
  - Component 68
  - Group 23
  - Section 72
  - Site 29
  - System 63
- Demolish 261
- Density 140
- Direct Rating 122, 149, 205
  - Data 149
  - Definitions 205
- Disclaimer 342
- Distress Survey 121, 138, 198, 200, 202-203
  - Data 138
  - Definitions 198, 200, 202-203
- Distresses-General 198
- Distresses - Built-Up Roofing 200

---

Distresses - Shingle Roofing 203  
Distresses - Single-Ply Roofing 202

## E

Editing 23, 29, 36, 72, 238, 243, 248, 252, 261, 265, 326, 332, 334  
Building-Level Work Items 261  
Building Data 46  
Complex Data 38  
Condition Policies 244  
Condition Standards 238  
Cost Data 326  
Functionality Policies 246  
Functionality Standards 241  
Group Data 23  
Inflation Rates 332  
Policy Sequences 248  
Projects 265  
Section-Level Work Items 252  
Section Data 75  
Service Life Data 334  
Site Data 30  
Embedded Building Models 82, 89  
ESC 141  
Estimated Checkbox 74  
Estimating Building Inventory 82, 89  
Expected Funds 287  
Expensed Report 308

---

Exporting 100

Building Templates 100

## F

FA 214-215

FCI 49

FI 208

Functionality Assessments 218, 224

First Tier 218

Second Tier 224

Fundamental Objective 275

Funding 284-285

Precedence 286

Restrictions 286

Work Items 284

Funding Source 286

## G

General Multipliers 329

Generate Work Items 231, 257

Group 23

## H

Historic 49

## I

IMPACT 295, 310

Importing 100, 314

BRED Data 314

---

Building Templates 100  
Inflation Rates 332  
Inspected Checkbox 141  
Inspection 120  
Inspection Scheduling 163, 240  
Inventory 21, 57  
ISR 48

## K

KBI 163  
Knowledge-Based Inspection Scheduling 166

## L

Library 327, 332, 336  
Cost Data 326  
Inflation Rates 332  
Service Life Data 334  
Location Factors 29

## M

Main Menu 8  
Main Objective 272  
Managing Template Library 93  
Manual Condition Rollup 324  
Material/Equipment Category 74  
MDI 48  
Measure 270

---

**N**

Navigating BUILDER 8  
Navigation 9  
    Menu 8  
    Tree 9  
Non-Representative Sample 156

**O**

Objective 270

**P**

Paint Life 337  
Paint Rating 124, 141, 149, 206  
Performing 124, 218, 224  
    Condition Assessments 124  
    First Tier Functionality Assessments 218  
    Second Tier Functionality Assessments 224  
Policy 233, 244  
    Condition 244  
    Functionality 246  
Policy Sequence 233, 248  
Prioritization 270, 282  
    Scheme 270  
    Work items 282  
Project 265  
PRV 26, 32

---

**R**

Ranking Work Items 283  
Rapid Inspection 159  
Reference Settings 26, 33  
Remaining Service Life 334  
Replacement Cost 48, 326  
Report 312  
    Viewer 312  
Rollup 324  
RSL 334

**S**

Sample Locations 156  
Sampling 156  
Scenario 295, 308, 310  
    Analysis 308  
    Creating a Work Plan Using 310  
    Management 295  
SCI 121  
Score 270  
Section 21, 57, 72  
Section Details 80  
Security 318  
Seismic Zone 29  
Selecting a Location 29  
    Location 29

---

Selection Criteria 16, 288  
Service Life Data 334  
Severity 140  
Shingle Roofing Distress Survey Definitions 203  
Simulation 290, 293, 295, 308, 310  
Single Ply Roofing Distress Survey Definitions 202  
SQL 16  
Standard 233, 238  
    Condition 238  
    Functionality 241  
Sub-Issue Rating 221  
Subcomponent 21, 139  
SUCI 123  
Systems 57, 63

## T

Technical Manual 5-800-4 326  
TRACES 326  
Track Non-Current Buildings 55  
Tri-Service Automated Cost Engineering System 326

## U

Unconstrained/Constrained 302  
UNIFORMAT 22, 61  
Unit Costs 329  
User Preferences 18

---

Using 53, 55, 92, 103  
Building Status Property 53  
Building Status to Track Non-Current Buildings 55  
Building Templates 92  
Building Templates to Create Building Inventory 103

## V

Viewing 63, 68, 250, 283  
Component 68  
Rankings 283  
System 63  
Work Items 250

## W

Weight 270  
What's New 7  
Work Item 250, 252, 261, 265  
    Building-Level 261  
    Project 265  
    Section-Level 252  
    Viewing 250  
Work Items 284  
    Funding 284  
Work Plan 231, 250  
Work Triggers 239  
Work Year 252, 261, 265