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BUILDER™ Sustainment Management System Strategic Planning Guide

Jaclyn S. Mathis, Samuel J. Vance, and Lance R. Marrano

September 2016



Sustainment Management System

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Jaclyn S. Mathis, Samuel J. Vance, and Lance R. Marrano

*Construction Engineering Research Laboratory
U.S. Army Engineer Research and Development Center
2902 Newmark Drive
Champaign, IL 61822*

Final report

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Abstract

Traditional facility asset management approaches are based upon run-to-failure or reactive maintenance practices. These approaches do not support investment opportunities wherein relatively small investments yield large lifecycle gains. The Sustainment Management System BUILDER™, developed by the Engineer Research and Development Center-Construction Engineering Laboratory (ERDC-CERL), is a decision support tool that provides the capability to identify investment opportunities for building assets based upon a proactive approach rendering increased asset lifespan and decreased lifecycle costs.

BUILDER methodology is fundamentally different than historical asset management methods, making it important to identify how the methodology will be implemented into a new asset management strategy. This document assists organizations with strategic BUILDER implementation planning through a 10-task process. It identifies 10 tasks and various sub-tasks that must be addressed to implement BUILDER. By addressing each task, an organization is more likely to fully utilize the benefits of BUILDER.

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Preface

This effort was conducted for the Office of the Assistant Chief of Staff for Installation Management (OACSIM) under Military Interdepartmental Purchase Request (MIPR) 10758350, “FY15 BUILDER™ Implementation Plan.” The technical monitor was Mr. Philip Columbus, OACSIM.

The work was performed by the Engineering Processes Branch (CFN) of the Facilities Division (CF), U.S. Army Engineer Research and Development Center, Construction Engineering Research Laboratory (ERDC-CERL). At the time of publication, Mr. Charles G. Schroeder was Chief, CEERD-CFN; Mr. Donald K. Hicks was Chief, CEERD-CF; and Mr. Kurt Kinnevan, CEERD-CZT, was the associated technical director. The Deputy Director of ERDC-CERL was Dr. Kirankumar Topudurti, and the Director was Dr. Ilker Adiguzel.

This work is a compilation of many years of asset management research performed by several individuals at the Engineer Research and Development Center. These individuals are gratefully acknowledged for their contributions to asset management methodology and software development.

The Commander of ERDC was COL Bryan S. Green, and the Director was Dr. Jeffery P. Holland.

Abbreviations

Term	Meaning
ACOM	Army Commands
AR	Army Regulation
ASCC	Army Service Component Commands
BCI	Building Condition Index
BRED	BUILDER Remote Entry Database
CDT	Central Daylight Time
CERL	Construction Engineering Research Laboratory
CI	Condition Index
CMMS	Computerized Maintenance Management System
COA	course of action
DoD	Department of Defense
DRU	Direct Reporting Units
EO	Executive Order
ERDC	Engineer Research and Development Center
FAQ	frequently asked question
FCA	Facility Condition Assessment
FCAC	Facility Condition Assessment Coordinator
FCA QA	Facility Condition Assessment Quality Assurance
FCG	Facility Category Group
FCI	Facility Condition Index
GB	gigabytes
GFEBs	General Fund Enterprise Business System
GHz	gigahertz
HQ	headquarters
ID	identification
IFS	Integrated Facilities System
ISR	Installation Status Report
IT	information technology
HVAC	heating, ventilation, and cooling
KBI	knowledge-based inspection
MB	megabytes
MILCON	military construction
NDAA	National Defense Authorization Act
POC	point of contact
PPE	personal protective equipment
PRV	Plant Replacement Value

Term	Meaning
ACOM	Army Commands
PROSPECT	Proponent Sponsored Engineer Corps Training
PTO	Plan Take Off
QC	quality control
RAM	random access memory
RED	Remote Entry Database
ROI	return on investment
RP	real property
RPAD	Real Property Asset Database
RPI	Real Property Inventory
RPIE	Real Property Installed Equipment
RSL	remaining service life
SF	square feet
SIPR	Secret Internet Protocol Router
SMS	Sustainment Management System
SOW	Statement of Work
SQL	Structure Query Language
SRM	Sustainment Restoration and Modernization
UFC	Unified Facilities Criteria
USACE	U.S. Army Corps of Engineers
VAV	variable air valve

Introduction

Intent of this guidance

This document contains guidance for BUILDER implementation planning at the strategic level. It identifies tasks and decisions that must be considered to implement an asset management program which utilizes the BUILDER™ Sustainment Management System (SMS) software.

The intended audience of this guidance is high-level decision makers in preparation for and during strategic implementation planning activities.

How to read this document

This document is divided into ten tasks. Each task involves key strategic decisions that must be made by an organization to implement BUILDER. It is important that each task, including each subtask, is reviewed for applicability to the organization utilizing BUILDER. Because BUILDER performs condition assessment and work planning in fundamentally different ways than historical methods, it is important to identify how the software is to work within the organization's asset management program. By addressing each task, an organization is more likely to fully utilize the benefits of BUILDER.

Policy adherence

All Department of Defense (DoD) agencies are required to report a Facility Condition Index (FCI), which is the ratio of the repair requirements to the facility's replacement value. In the DoD, this has also been known as the Q-Rating. As of 2013, the Department issued policy that the FCI will be calculated using condition assessments performed using the SMS (see policy section below). A history of the relevant policies is summarized in Table 1.

Table 1. Asset management policies.

Policy	Applicability
Executive Order (EO) 13327, Federal Real Property Asset Management (2004)	<ul style="list-style-type: none"> • Requires all DoD Components to adopt a common process for conducting Building Inventory and Assessment. • Requires an FCI to be recorded for all real property assets. Per Real Property Inventory (RPI) reporting guidelines, Condition Index (CI) is a required data element for all real property assets and is defined as, “a general measure of the constructed asset’s condition at a specific point in time. CI (also referred to as FCI), is calculated as the ratio of repair (and maintenance) needs to Plant Replacement Value (PRV).”
National Defense Authorization Act (NDAA) (2010)	<ul style="list-style-type: none"> • Identifies 30 September 2017 as the date when financial statements of the DoD shall be audit ready (i.e., FCIs for every asset in the Real Property Assets Database [RPAD] are a necessary metric for audit readiness).
DoD Memorandum, Standardizing Facility Condition Assessments (2013)	<ul style="list-style-type: none"> • Requires all DoD components to adopt a common process that incorporates the SMS modules developed by the United States Army Corps of Engineers (USACE) Engineering Research & Development Center’s Construction Engineering Research Laboratory (ERDC-CERL). • Requires all DoD components to properly record an FCI in their respective real property databases for each real property asset on their installations.

Background—More than a mandate

Utilizing new asset management methodologies requires a culture shift. Commonly, many assets are not repaired until a problem becomes critical. Another practice is that repair or replacement tasks are pulled out of a “job jar” with minimal prioritization of such tasks. As a result, many facility managers operate in crisis mode or miss out on economic benefits due to lack of effective prioritization. There are cost savings to be realized from determining the ideal time to invest in equipment and deciding if the best option is to perform a repair or replacement. Further, this type of management does not lead to a standardized method of asset management and often does not enable all levels of the asset management team to be in alignment. The BUILDER SMS is more than just a mandate. When used

effectively, the software can improve the aforementioned issues by providing an *engineering-based* decision analysis tool. This system represents a shift in asset management toward a proactive asset management strategy. Instead of keeping assets operational throughout their lifecycle by relying primarily on corrective repairs, this strategy focuses on condition-based repairs, which can be planned prior to an asset's failure with the support of SMS. This strategy results in higher-performing assets at lower lifecycle costs.

What is the BUILDER Sustainment Management System?

BUILDER is part of a software suite of lifecycle asset management tools (the SMS Suite) developed to assist in the lifecycle management and investment decision analysis regarding building facilities. By considering the entire lifecycle of a facility portfolio, facility managers can optimize the investments that must be made in their facilities. Proper use of BUILDER software allows for the following benefits to be realized:

- Objectively assess infrastructure condition and understand performance across the building portfolio.
- Consistently analyze investment requirements and improve prioritization of limited resources.
- The adaptive model predicts the performance of each unique asset and identifies the best time to invest (“economic sweet spot”).
- Track investments to ensure key stakeholder requirements are addressed.
- Forecast the investment requirements for budget justification, including the justification for early investment to realize future gains.
- Consequence analysis: long-term effects of investment decisions today.
- Course of action: based on the consequence analysis, viable solutions can be evaluated to allow for need-based investments.
- Avoidance of long-term penalties; the software enables proactive investment decision making.
- Maintain mission-ready facilities.

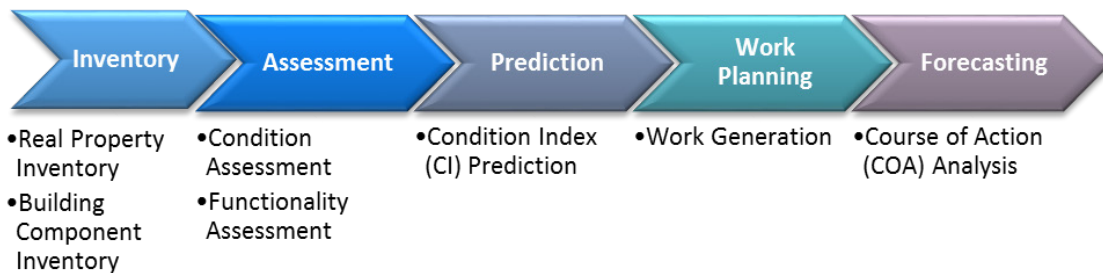
The aforementioned benefits of BUILDER are realized through a cycle of four activities: Assess, Analyze, Prioritize, and Execute (Figure 1).

Figure 1. BUILDER facility management cycle.



There are five fundamental phases in a building asset management process utilizing BUILDER: Inventory, Assessment, Prediction, Work Planning, and Forecasting (Figure 2). First, building information must be collected, including associated systems, components, and real property data. This is called the BUILDER *inventory*.

Figure 2. BUILDER fundamental phases.



The next step is to *assess* the performance state of that inventory, either through condition assessments (required) or functionality assessments. Functionality assessments are assessments performed that are primarily needs-based rather than condition-based, including building codes and standards, requirements changes, compliance, and obsolescence issues.

Assessment data, along with other pertinent lifecycle data, is used to *predict* future trends for condition and facility performance. *Work* opportunities can then be generated to correct existing or expected gaps based on

comparison between BUILDER's calculated level of service and the organization's standard.

Finally, the future predicted condition and performance trends can be used to *forecast* future work requests and develop multiyear work action plans to optimize facility investments. An important aspect of BUILDER implementation is determining the long-term sustainability of this program and how it can be used to best suit specific asset management needs.

Objective rating methodology

BUILDER provides a comprehensive picture of the overall performance of building assets and their key components. A "knowledge-based" philosophy streamlines the BUILDER process and keeps it manageable. Unlike other assessment methods, this condition is expressed with an objective, 100-point scale known as the CI. The level of detail and frequency of these inspections are not fixed; inspections are dependent on: knowledge of component criticality, the expected and measured condition and rate of deterioration, and remaining maintenance and service life. This "knowledge-based" inspection focuses attention on the most critical items at that time.

The condition indexes produced are rolled up to higher-level indexes such as the Building Condition Index (BCI) and FCI, which are used in strategic planning and budgeting. It also provides improved documentation of equipment that includes the history of each component as it is reassessed in the future. This history can provide insight on how the lifecycle of a component is actually performing, compared to how it should be performing theoretically and how certain environmental conditions affect performance. Moreover, this software program enables the records to be easily accessible and in one location. Stakeholders have the ability to log on to the database for data review and real-time reporting. This ability can increase the alignment between employees and keep everyone informed. It is a win-win for all parties involved.

For more information, visit <https://www.sms.erdcdren.mil> for product updates, manuals, and presentation materials.

Limitations

To understand a complex tool, it is useful to understand its limitations. BUILDER provides users with general planning and programming information to aid proactive investment decisions. In contrast with other software packages developed by ERDC-CERL such as ROOFER™, RAILER™, and PAVER™, BUILDER™ cannot produce a list of work requirements that are specific enough to comprise a substantially complete scope of work for a project.

BUILDER requires continuous input from multiple sources that include assessors, facility managers, budget analysts, etc. The benefits that BUILDER provides are limited by the quality and breadth of the inputs. It is not a “push button” engineering tool. The software changes *how* asset managers do their job, but it is not a replacement.

Furthermore, BUILDER is not a Computerized Maintenance Management System (CMMS); however, it can be integrated with such a system. In and of itself, BUILDER is not a preventive maintenance tool.

10-Task Approach to BUILDER Strategic Implementation Planning

Task 1: Assign Roles and Responsibilities

In order to implement and sustain the BUILDER SMS, a team effort is required. The following roles and associated responsibilities represent the roles required to implement and sustain a BUILDER asset management program. A large, complex organization may have several persons responsible for one role, while a smaller organization may require employees to perform multiple roles. Descriptions of these roles are included to aid the organization in gauging the level of effort required.

1.1 Team roles and responsibilities

Implementation Advisor: This person is a BUILDER implementation expert and will provide counsel to the Service Lead (see definition below) throughout BUILDER implementation. Responsibilities include advising throughout the strategic planning and implementation process and providing any updates regarding policies, procedures, and future changes. The implementation advisor can also assist in data migration strategy and the integration of BUILDER with CMMS.

Service Lead: Accountable for overall program for the respective Service. Communicates enterprise-wide guidance for the building asset management program. Liaison with service stakeholders and/or acquisition leadership.

Site/Regional Leads: This role fills the gap between the service lead and individual installations. This role is accountable for assisting with BUILDER implementation for the site or region represented. Responsibilities include validating facility lists and assisting in BUILDER assessment coordination. After implementation, this role includes ensuring that BUILDER data is up-to-date and that policy and guidance is adhered to. Depending on the size of the organization, this role may be performed by multiple people.

Facility Condition Assessment Coordinator (FCAC): The FCAC is responsible for the logistics of the initial condition assessments and data collection. The FCAC plays a pivotal role in buffering the impact on the installation through pre-inspection coordination, answering questions, and troubleshooting issues. Tasks include obtaining building access, camera passes, occupant interviews, and others such as those outlined in the Field Assessment Mechanics section within Task 7 of this document. The FCAC will also work to establish and coordinate with the field assessors, including the following contacts:

- *Building Contact/Escort* – The name and phone number of the person to contact for each building. This person should be someone who has keys to all spaces in the building and is aware of the inspection purpose. This person should also know the building well including maintenance practices, particular problem areas, and historical information, as this knowledge will significantly improve the speed and accuracy of the inspection team.
- *Maintenance Contact* – Points of contact (POCs) for electrical; mechanical; heating, ventilation, and cooling (HVAC); roofing; and other utilities.

All issues regarding the site visit will be communicated to the FCAC. The FCAC will coordinate issue resolution and responses with the Service Lead and with the Implementation Advisor, if needed.

Facility Condition Assessment (FCA) Team(s): The team that will survey and assess building system components on-site. Perform BUILDER assessments adhering to policies and guidance to provide a consistent, quality product. With assistance from the FCAC, assures that all information has been gathered for the site/facilities. Reports any problems such as safety issues, site access issues, and any changes encountered to the FCAC. Adheres to all safety, security, regulations, and rules as well as to local, state, and federal policies and procedures. Completes all required training and meets all requirements for access to the sites.

After the initial implementation, an FCA team remains necessary. A team shall be designated and accountable for entering any new assessments and knowledge based inspections (KBIs) into BUILDER.

Facility Condition Assessment Quality Assurance (FCA QA)

Lead: Government's representative responsible for assurance that data collected by assessment personnel is consistent in quality and that it adheres to the guidance and criteria for inspections. Responsibilities include the following and may be performed by a team under the direction of the FCA QA Lead:

- Consistently and frequently discuss data integrity with the assessment team.
- Ensure that any photographs taken do not depict unauthorized images, that images are properly submitted, and that images conform to the standard naming conventions and sizes in the FCA Report.
- Ensure photographs of deficient inventory items are taken and included in the FCA Report.
- Ensure Level 4 UNIFORMAT II classification for all data collection is followed.
- Ensure all inventory and inspection comments are succinct and accurate.
- Implement and manage quality improvement.

BUILDER Configuration Control Board: The team of leadership at various levels throughout the Army that will use the newly acquired data in BUILDER for prioritizing, planning, budgeting, forecasting, and creating scenarios. Due to the nature of how BUILDER data “rolls up,” it is a useful communication and management tool at many different levels: building level, site level, organization level, etc. This team is also responsible for reviews of standards and policies within BUILDER.

BUILDER Analyst: Maintains BUILDER database through coordination with Regional Leads/Site Leads and Assessors. Assumes quality assurance and control responsibilities upon completion of initial implementation. Pulls reports, work plans, and funding scenarios requested by leadership. Assists and coordinates with ERDC-CERL to apply upgrades and changes in the BUILDER software. The reports will also assist with the quality efforts to provide intelligent views on the data set.

1.2 Software roles and privileges

There are different types of software user accounts (privilege levels) (see Table 2). This task is to determine access requirements for each team's

role. The organization must develop an internal process for assigning user accounts as members join or leave the team.

As of the date of this publication, there is also a requirement to use a “New User Request Form” to be submitted to the BUILDER Help Desk (SMSSupport@erdc.dren.mil). The link to the form and tutorial can be found at: <https://www.sms.erdcdren.mil/Products/BUILDER/Downloads>. This requirement may change in the future.

Table 2. BUILDER roles and privileges.

Software User Accounts	Description	Read-Only Restriction	Corresponding Team Roles (Completed at Strategic Planning Workshop)
Read-Only	<ul style="list-style-type: none"> • Export standard and custom reports. • CANNOT download a BUILDER Remote Entry Database (BRED) file. 	Not applicable.	
Inspection Supervisor	<ul style="list-style-type: none"> • Permission to view and edit the ENTIRE ASSIGNED INSTALLATION inventory and inspection data, and to create KBI schedules. • Can import and export BRED files. • Has the highest level of User privileges. (e.g., Create a building, complex) 	Select accounts	
Work Planner	<ul style="list-style-type: none"> • Permission to view and edit the ENTIRE ASSIGNED INSTALLATION inventory and inspection data, create KBI, and edit Inspection Supervisor’s inspections. • Can import and export BRED files. • Can create or edit work plans and generate multiyear work plan scenarios. • Has the highest level of User privileges. (e.g., Create a building, complex, site) 	Select accounts	

Software User Accounts	Description	Read-Only Restriction	Corresponding Team Roles (Completed at Strategic Planning Workshop)
Master Planner	<ul style="list-style-type: none">• Permission to view and edit the ENTIRE ASSIGNED INSTALLATION inventory and inspection data, create KBI, and edit Inspection Supervisor's and Work Planner inspections.• Can import and export BRED files.• Can create or edit work plans and generate multiyear work plan scenarios.• Has the highest level of User privileges. (e.g., Create a building, complex, site, organization)	Select accounts	

Task 2: Convene the Strategic Planning Workshop

2.1 Workshop attendees and duration

Implementation of BUILDER is a multifaceted endeavor, particularly for large, complex organizations. For that reason, an initial BUILDER Implementation Strategic Planning Workshop is highly suggested. This workshop is fundamental to the success of utilizing BUILDER within an asset management program. The workshop length will depend on the size of the organization and the number of attendees. A large organization (e.g., U.S. Army) should allot one week or more to this workshop. Attendees of this workshop should include high-level executives from the organization who can make policy decisions on the configuration and implementation of the asset management program. The Implementation Advisor will assist with this workshop to ensure that all strategic decisions are considered for discussion.

2.2 Workshop goals

The intent of this workshop is to use this guide, which is structured to identify the major tasks and decisions involved with planning, to develop a unique implementation plan for the organization. During the workshop, agreement should be reached regarding how BUILDER fits within the organization's overall asset management strategy. The Implementation Advisor is a key resource for providing understanding about the capabilities of BUILDER and the associated outputs.

A strategic communication plan is suggested as an output of this workshop, to consistently provide current and accurate information to all levels of the organization. Elements of the communication plan include the following:

- Determine the various communities to be reached, and the appropriate methods and frequency of communications for each community.
- Develop communication templates.
- Consider reporting requirements.

2.3 Training prior to workshop

To ensure that the BUILDER Implementation Strategic Planning Workshop is productive, it is highly suggested that attendees undergo applicable training *before* the workshop. More information about training can be found as part of Task 5 in this document.

Task 3: Assess Resources Required

Factors affecting the resources required for BUILDER implementation are level of detail, prioritization, and matching the scope of work to available resources.

3.1 Level of detail

Once the desired outputs are determined per Task 2, the corresponding rating method and level of detail must be determined. Such factors have an effect on time, cost, and resource allocation. The level of detail of inventory and assessment can be thought of as “low,” “medium,” or “high.” Reasons to increase the level of detail include mission criticality, lifecycle cost advantages, and local priorities. Table 3 summarizes the general practices required for High, Medium, and Low detail options, which are further detailed in Appendix A. Table 4 and Tables A.1–A.3 in Appendix A define the inventory and assessment practices at the component-level associated with a given level of detail.

Table 3. Generalized level of detail options.

Level	Inventory Description	Equipment Details	Inspection
High	<ul style="list-style-type: none"> • Full section capture. Use all section inventory rules to create separate sections based on type, age, and management groups. 	<ul style="list-style-type: none"> • Capture equipment records for each individual piece within the section. 	<ul style="list-style-type: none"> • Age-based assessment for A10, A20, B10, D20. • Direct ratings for C10, C20, C30. • Distress surveys for B20, B30, D10, D30, D40, D50, and for other systems where local conditions warrant additional detail.

Level	Inventory Description	Equipment Details	Inspection
Medium	<ul style="list-style-type: none"> Component section information will be collected at Uniformat Level 4. One section record is to be collected per building for each Level 4 classification (such as B203004 overhead doors). Section year installed should be representative of all items making up that component section. 	<ul style="list-style-type: none"> Ignore capture of individual equipment records. 	<ul style="list-style-type: none"> Age-based assessment for A10, A20, B10, D20. Direct ratings for all remaining systems unless local conditions warrant a distress survey.
Low	<ul style="list-style-type: none"> Populate inventory using Rapid Inventory Estimation module. Verify and correct section material and year installed information, and enter any missing components using desk-side review of inventory reports from BUILDER. 	<ul style="list-style-type: none"> Ignore capture of individual equipment records. 	<ul style="list-style-type: none"> Age-based assessments for all systems unless local conditions warrant direct or distress assessment.

There are three different methods of condition rating, each corresponding to a different level of detail. The methods are described below in order of descending level of detail.

Distress rating is a structured and defined method for assigning a type, severity, and density to an identified distress. A distress is an observable defect (visual cues must exist) which adversely affects condition and can indicate potential failure modes for an asset. These observations are guided and choices are selected from within the BUILDER software. The collection of distress information produces a numerical CI.

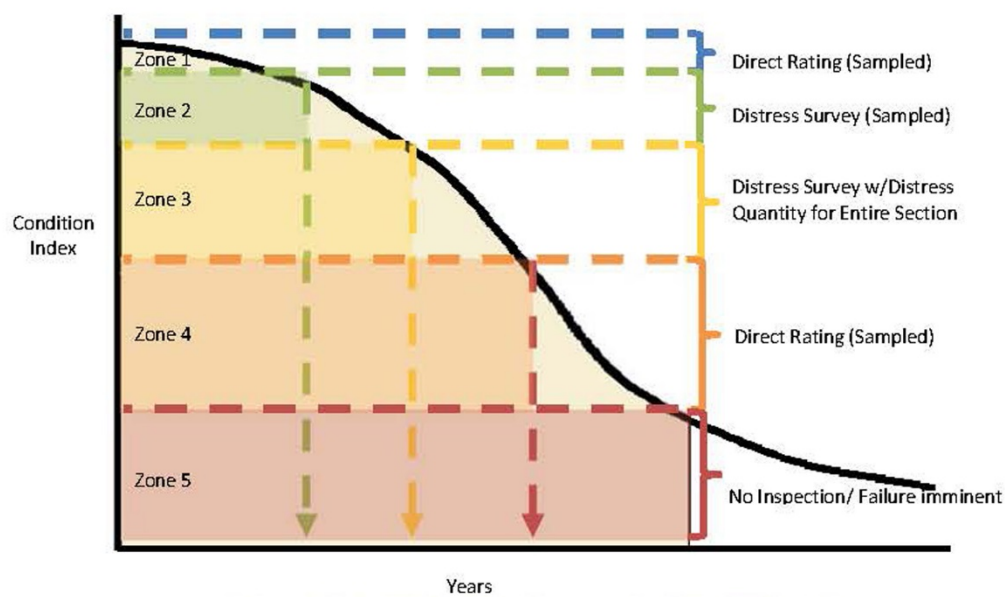
Direct rating is a judgment rating by the assessor. The direct rating method is based on the Good (green), Fair (amber), Poor (red) technique. This method is potentially less accurate but faster to perform than a distress survey.

For example, a distress rating of a condensing/cooling unit might separately evaluate the coils, the controls, the compressor, etc. For a direct rating of the same unit, the assessor would make a single observation about

the overall condition, and the individual subcomponent information would not be gathered.

Figure 3 conceptualizes when each method is most appropriate to use, based on the condition and lifecycle stage. In general, when investment opportunities exist, distress ratings are preferred because the most data is rendered in addition to a more accurate cost estimate.

Figure 3. Rating methodology based on condition and lifecycle stage.



Age-based approach is the third method for assessment. These surveys produce a condition index using only lifecycle predictions, with no observations. Plan Take Off (PTO) data may be substituted for generic model data when accurate drawings are available. This approach is the least preferred and yields the lowest-quality data; it should only be used when resources do not allow for a greater level of detail to be collected.

3.2 Prioritization

During all phases of BUILDER usage, it is necessary to prioritize the organization's building portfolio for inventory, assessment, and reassessment. The priority by which facilities are inventoried and assessed and the level of detail used should be commensurate with mission requirements and available funding. A decision should be made on how to group facilities, such as Facility Category Group (FCG) or by Facility Number, and assign a High, Medium, or Low priority on a building-by-building basis.

The order in which facilities and FCGs are prioritized should take into account several factors:

- Building condition and age
- Projects to be funded in the near future
- Geographical location and arrangement on the installation
- Facility category code
- Facilities supporting broader systems
- Facility tenant(s)
- Army Commands (ACOM), Army Service Component Commands (ASCC), and Direct Reporting Units (DRU)
- Similar unit types
- Visibility on the installation

3.3 Matching funding and resources to scope of work

It is necessary to define the scope of the unique BUILDER implementation so that appropriate resources can be assigned, whether with in-house or contracted personnel.

Cost factors for inventory and assessments

The information provided below can be used to make a cost estimate, based on previous Army BUILDER experience. For initial field data collection, which includes inventory and assessment, a rough cost estimate is \$0.25 per square foot. For a reassessment, the cost is estimated to be \$0.05 per square foot. Considerations affecting the expected cost of inventory, assessments, and reassessments include the following:

- Overall size of the inventory and assessments to be collected, accounting for economies of scale.
 - The level of detail assessments require.
 - Percentage of inventory to be manually collected vs. imported from other sources (see Task 6).
- The average square footage of individual facilities.
- The geographic distribution of facilities across the installation.
- Accessibility of the installation, and of the individual facilities.
- Local security requirements.
- The availability of equipment information and maintenance records.
- The availability of floor plan maps for facilities.
- The repetitiveness of the types of buildings on the installation.

- The availability of premade templates for facilities on the installation.
- The available time that workers will be allowed access.
- The amount of similar work being done at the same time for other installations.
- Other local factors.

When estimating the cost of implementation, it may be beneficial to create a spreadsheet to perform the calculations, similar to the example provided in Table 4. Using the spreadsheet, the cost can be matched to the funds available by adding or removing buildings. Table 4 groups buildings by FCG, and Table 5 considers buildings individually.

Table 4. Guide for calculation of cost of implementation, with buildings grouped by FCG.

Facility Category Group Code	FCG Description	Unit	Level of Detail (H, M, L)	Assumed Cost per Unit	Cost Estimate
F14115	WEATHER STATION	SF			
F14116	FORENSIC LAB	SF			
F14129	TRAINING SUPPORT CENTERS	SF			
F14133	STORAGE SUPPORT FACILITIES	SF			
F14161	EOC/SCIF FACILITIES	SF			
F14169	PRODUCTION PLANT SUPPORT FACILITIES	SF			
F14170	PROD PLT SPT ST	SF			
F14182	BRIGADE HEADQUARTERS BUILDINGS	SF			
F14183	BATTALION HEADQUARTERS BUILDINGS	SF			
	<i>Continuing as needed...</i>				
				Total Cost Estimate:	

SF = square foot

Table 5. Guide for calculation of cost for implementation by individual building.
(Sample calculation numbers included for illustration only.)

Building Number	FCG Number	Building Description	Unit	Square Footage of Building	Level of Detail (H, M, L)	Assumed Cost per Unit	Cost Estimate (\$)
00410	14185		SF	11,600	H	0.25	2,900
00728	14185		SF	57,500	H	0.25	14,375
01001	14185		SF	5,444	H	0.25	1,361
04229	14185		SF	552,000	H	0.25	138,000
04432	14185		SF	5,444	H	0.25	1,361
04452	14185		SF	5,432	H	0.25	1,358
04456	14185		SF	10,298	M	0.15	1,545
04457	14185		SF	21,434	M	0.15	3,215
04467	14185		SF	10,645	M	0.15	1,597
07019	14185		SF	2,577	M	0.15	387
09001	14185		SF	2,577	M	0.15	387
<i>The user should add or remove buildings to match cost to available resources.</i>							
ESTIMATED COST TO IMPLEMENT							166,486

Cost factors for hosting, software maintenance, help desk, and training

It is important to take into account the sometimes-overlooked costs of any type of web-based software package.

The BUILDER software package can be self-hosted or hosted by others. See Task 4 for more information about hosting. Consult the local information technology (IT) department to ascertain the self-hosting costs including procurement, installation, and configuration of a server, plus any ongoing fees. Historically, hosting averages \$30,000 per year.

Software maintenance includes updates and upgrades of the BUILDER software package at ERDC-CERL. Upgrades to the BUILDER program are approved by the DoD SMS Governance Board. Each user of the software may make requests for upgrades to the Board (see Task 10). Maintenance of the software includes repair of software glitches. Discuss the cost for such maintenance with the Implementation Advisor.

Additionally, ERDC-CERL maintains a help desk for all users of the SMS suite (see Technical Support, Appendix D). Generally, costs for the help desk are \$30,000 per year, but costs may be adjusted based on the size of the organization and the stage of BUILDER implementation. For example, an organization early in its implementation of BUILDER will utilize the help desk more than an organization who is in a sustainment phase.

Training is possibly the most important expense to consider (see Task 5). If users do not know how to input and extract useful data from BUILDER, its full benefits cannot be realized. The cost of up-front training, which includes Strategic Planning Workshop training, Planner training, and Assessor training, is easily estimated in consultation with your Implementation Advisor.

Costs for training vary by the type of training desired. Prerecorded and self-paced online training is free to organizations. For prerecorded online training, sufficient time for employees to view the training must be allocated. It is suggested that 40–180 hours be allotted to users, dependent on the individual user's role and projected use of the program. A PROSPECT (Proponent Sponsored Engineer Corps Training) course is also available. Contact ERDC-CERL for information about BUILDER face-to-face training or real-time virtual training.

Task 4: Assess Hosting and Potential Network Challenges

4.1 Minimum system requirements*

Enterprise configuration

Structure Query Language (SQL) Server

- Windows Server 2008 R2
- SQL Server 2008 Express or SQL Server 2008 R2
- 400 megabytes (MB) free storage per million square feet of managed inventory
- 2.0 gigahertz (GHz) or faster processor, 64-bit, 4+ cores
- 8 gigabytes (GB) random access memory (RAM)

Application Server

- Windows Server 2008 R2
- Internet Information Services 7.5
- PowerShell 3.0 or later
- 4 GB of free storage plus desired image storage
- 2.0 GHz or faster processor, 64-bit, 4+ cores
- 8 GB RAM with an additional 50 MB per concurrent user

Single server configuration

- Windows Server 2008 R2
- SQL Server 2008 Express or SQL Server 2008 R2
- Internet Information Services 7.5
- PowerShell 3.0 or later
- 4 GB of free storage plus desired image storage and 400 MB free storage per million square feet of managed inventory
- 2.0 GHz or faster processor, 64-bit, 4+ cores
- 8 GB RAM with an additional 50 MB per concurrent user

*The aforementioned minimum system requirements are as of publication date. Changes to the system requirements can be ascertained by e-mail at SMSSupport@erdc.dren.mil.

4.2 Hosting

BUILDER is a hosted application. The information is stored on a server, and the internet is used to communicate information via the web-based program and the server. Usernames, passwords, and permissions are required in order to work with the data files for a given installation.

The major task is to identify alternatives for SMS data-hosting solutions and estimate the cost for each alternative. The alternatives should be evaluated, and a decision should be made on how the data will be hosted. It is recommended that the organization determine a way to host its information. This determination requires an understanding of the necessary permissions, security, and certification from the IT department. ERDC-CERL may offer provisional hosting temporarily until the organization establishes its own hosting procedures.

4.3 Potential network challenges

It is possible that an agency or organization will require IT certifications for BUILDER and other SMS tools to comply with network security requirements. ERDC-CERL aids clients in their pursuit of required IT certifications. Specific certifications needs vary, so it is vital to account for the time and effort necessary to ensure that network challenges are allayed.

Task 5: Plan Education and Training

5.1 Training expectations

Prior to the commencement of the Strategic Planning Workshop (Task 2), all involved parties shall complete the BUILDER Fundamentals training course in order for the meeting to be fruitful. Additionally, prior to an initial site assessment, the assessors and local facility staff should receive training.

5.2 Course descriptions

BUILDER training is primarily conducted online. Self-paced modules described below are available via the BUILDER website (<https://www.sms.erd.c.dren.mil/Products/BUILDER/Training-Videos>). Access to a BUILDER Sample site can also be provided for hands-on learning during training. Real-time face-to-face and virtual training are also available. Course details for the “BUILDER Assessor” U.S. Army Corps of Engineers PROSPECT course can be found at <https://ulc.usace.army.mil/CourseListDetail.aspx?CtrlNbr=450>. Full user manuals and additional information can be found at: <https://www.sms.erd.c.dren.mil/Products/BUILDER/Downloads>.

The various course modules are described below:

- *Fundamentals Module* gives a general overview of BUILDER compared to traditional FCA processes, introduces the training, and provides general guidance for the course.
- *Inventory Module* covers the collection and management of the inventory, proper techniques and rules, sectioning guidance, and several shortcuts.
- *Data Collection Module* provides an overview of the available options for gathering inventory data, when and how to use templates, and introduces the BUILDER Remote Entry Database (BUILDER RED/BRED).
- *Condition Assessment Module* details the different inspection types including direct ratings, distress surveys, and age-based surveys. Current techniques and rules are described to make the process more efficient.
- *BUILDER Indices Module* explains the types of indices calculated by the system. Primary purpose is to ensure the participant has a clear distinction between condition and functionality in order to determine

- whether a facility predominately has sustainment (condition) or modernization (functionality) requirements.
- *Reference Books Module* describes the Cost Books Library, Inflation Books, Service Life Books, and Component Importance Indexes. Discusses default books and setup of organization or site-specific references.
 - *Work Planning Module* explains the work planning processes in BUILDER including setting standards, policies, policy sequences, prioritization schemes, and funding. Generation and management of work plans, ad hoc work items, and projects are also covered.
 - *Scenarios Module* covers use of the BUILDER Scenarios simulation engine to perform alternative courses of action analysis and bring awareness of the future consequences of decisions which may not be readily apparent after just one or two years of using a particular decision-making policy. Covers how to integrate Work Planning and Scenarios results to manage and manipulate a multiyear work plan to effectively package work for further development of execution packages.
 - *BUILDER Remote Entry Database (BRED)* describes the use of BRED in the field, its integration with BUILDER, and the use of sampling and field-specific techniques for performing inventory and inspection assessments.
 - *Demonstrations* makes available multiple demonstration videos to illustrate the application of concepts covered in other modules.

5.3 Available training tracks

There are multiple training tracks available. The path chosen depends on the responsibilities of the student being enrolled. Training tracks for the Assessor, Assessor Supervisor, Planner, and Planner Supervisor are recommended in Table 6.

Table 6. Recommended training tracks.

Track	Funda-mentals	Inventory	Data Collection	Condition Assessment	Field Assessment	Indices	QC	Reference Books	Work Configuration	Work Plan Generation	Scenarios	BRED
Read-Only	X	X		X	X							
Inspection Supervisor	X	X	X	X	X		X					X
Work Planner	X	X	X	X	X	X	X	X	X	X	X	X
Master Planner	X	X	X	X	X	X	X	X	X	X	X	X

Task 6: Migrate and Integrate Existing Data

6.1 BUILDER inventory hierarchy

A fundamental decision must be made on how assets will be organized. This decision should be made at a high level and performed well in advance of inventory data migration and assessments. For example, will assets be managed by region, state, or by ACOM, ASCC, or DRU? Below is an illustration of the inventory hierarchy tree in BUILDER.

- ❖ Level 1 = Service
 - Level 2 = Region, State, Installation, etc.
 - Level 3 = Parent (optional layer)
 - Site A = Installation A (under parent)
 - ◆ Building

There are two main methods for collecting building-level inventory data: (1) collect and migrate existing data, and (2) collect inventory during field assessments (See Task 7). It is prudent to utilize existing inventory data in order to reduce resources required during field assessments.

6.2 Existing (legacy) data sources

The use of existing data sources is a preferable method if large numbers of buildings are to be included in BUILDER. This method can save considerable time and can aid consistency with the Real Property Database. Examples of databases that can be imported into BUILDER are listed below:

- Real Property Database
- Army Integrated Facilities System (IFS) {Direct}
- Army IFS {Local Template}
- Army Installation Status Report (ISR)
- General Fund Enterprise Business System (GFEBS)
- Self-constructed Microsoft Access® database
- Army MAPPER

6.3 Migration

Once existing data sources are selected for use, the Implementation Advisor will coordinate the migration of data into the BUILDER database.

6.4 Integration

It is possible to integrate BUILDER in some capacity with CMMS programs. However, to do so is a complex technical endeavor. If integration is desired, the Implementation Advisor should be consulted. If contemplated, the following questions should be considered:

1. What data should be transferred?
2. How will data be mapped?
3. What frequency of data transfer is required?
4. What is the system of record?

Task 7: Field Data Collection and Transfer

7.1 Field assessment logistics

A significant amount of preplanning and coordinating the logistics of on-site assessments is required. The primary POC for this stage is the FCAC.

The FCAC will schedule, collect, and/or coordinate the following (if available) for the FCA team:

- *Building contact/escort* – Name and phone number of the person to contact for each building. This should be someone who has keys to all spaces in the building and is aware of the inspection purpose. This person should also know the building well including maintenance practices, particular problem areas, and historical information as this will significantly improve the speed and accuracy of the inspection team.
- *Maintenance contact* – POCs for electrical, mechanical, HVAC, roofing, etc.
- *Building list* – Site name, facility number, category code, facility name, size, unit of measurement, and year built along with renovation dates.
- *Notification* – Have a Command POC notify each building manager, security, and safety personnel regarding the purpose of the inspection, name of the contractor performing the inspection, and the dates of the condition inspection.
- *Security* – What are specific site access and security requirements for the facilities to be inspected (assuming escort is provided by activity for each assessment team)? Some considerations are:
 - form of personal identification required to access the installation,
 - badge requirements (installation/facility),
 - requirements/permissions for use of cameras,
 - vehicle pass requirements, and
 - special security access or clearance requirements (arms vaults, Secret Internet Protocol Router (SIPR), private quarters etc.).
- *Safety* – Safety briefing, required personal protective equipment (PPE), and procedures in the event of a disaster (where are the shelter-in-place facilities, etc.). Additional examples include confined spaces and roof access.
- *Work space/area* – Office/conference room area for the inspection team with 24/7 availability if possible. It should contain tables and

chairs, wall space for maps and drawings, and a power source to operate laptop computers and printer.

- *Communications* – Access to the internet and a telephone.
- *Inspection schedule* – Are there any special restrictions (e.g., certain days, time of day, security, escorts, etc.)?
 - List of any events that may prevent access or the assessment to be conducted on any particular day (e.g., events such as scheduled renovations, construction, maintenance, and/or inspections).
- *Drawings* – Obtain plans (floor plans, roof drawings, and foundation plan, [i.e., basement]) of all the facilities to be inspected. Latest as-built files are preferable.
- *Maps* – Obtain installation site maps which identify building and street names.
- *Maintenance records* – CMMS records and any other maintenance records for all facilities to be assessed.
- *Services calls* – Provide list of active service calls and a 12-month history of completed service calls. Required history includes work input control backlog which may assist inspectors to look at previous work for trends, and a copy of the backlog of work with enough detail for the inspector to locate and validate the problem(s).
- *Projects* – Provide a list of ongoing or planned local Sustainment Restoration and Modernization (SRM) projects, demolition, SRM special projects (with DD1391 form, if available), or Military Construction (MILCON) projects in the buildings to be inspected, and a list of special project/MILCON history for the past 5 years.
- *Reports* – Access to the installation’s Master Plan, Asbestos Plan and Lead Based Paint Plan or surveys, Deficiency Tabulation, and Joint Commission reports (including the Statement of Conditions and any Plans for Improvement).
- *Prior FCA* – Obtain any previous inspection reports.
- *Utility Data* – Utility information from at least the past year for facilities to be assessed, name of all utility companies with contact information, all utility rate/fee structures, historical charges and usage for the last year, and all other relevant utility information if needed for the assessment report.
- *Warranties* – Request a list of any current warranties for the facilities to be assessed.
- *In-brief* – In-brief to address FCA POCs with buildings to be assessed and schedule.

- *Out-brief* – To address findings, additions to inventory, life safety issues, and any other concerns that might have arisen during the site visit.

7.2 Inventory and assessment

In order to provide consistent results across multiple implementation resources at multiple sites, the following set of standards will provide guidance on how to collect inventory and perform condition assessments. All BUILDER behavior, including lifecycle modeling, requirements identification, and forecasting is based on the inventory structure, making consistency and alignment with management practices critical. This section describes the data collection standards and provides lessons-learned and best practices from other large-scale implementations that will streamline and reduce confusion when performing implementation assessments.

BRED data collection

BUILDER has a companion program, the BUILDER Remote Entry Database (BRED or BUILDER RED) which facilitates creating and editing inventory and condition assessment records in the field while not connected to the main (web-based) system. Inspection supervisors check out (download) data files for the buildings they will be assessing and load these onto Microsoft Windows™ laptops or tablet computers. Upon completion of the assessment activity, these files are checked in (uploaded) back to the BUILDER application for import back into the enterprise database.

Prior work has shown that creating individual BRED files for each building for each assessor works best, as this allows the most flexible quality control (QC) processes, balances management effort against data file size (for transferring over the network), and supports backup schemes for auditing. BRED files should be archived on another medium such as network drive, SharePoint, or other format to support auditing.

Assets to be inventoried

As general guidance, the following types of equipment, as defined in Army Regulation (AR) 420-1 and other DoD publications, **shall be included** in the assessment.

- Installed building equipment/ Real Property Installed Equipment (RPIE): Items of real property affixed to or built into a facility that are integral to the facility.

The following types of equipment **shall not be included** in the assessment.

- Personal property (fixed)/ Class III property: Personal property (fixed) consists of capital equipment and other equipment of a movable nature that has been fixed in place or attached to real property, but may be severed or removed from buildings without destroying the usefulness of the facilities.
- Personal property (movable): Equipment that is movable and not affixed as an integral part of the facility is generally accounted for as personal property rather than real property.

Note: Items in storage or on a “wish list” are not included in BUILDER. Ask your Implementation Advisor for the BUILDER catalog, which contains a list of all ASTM UNIFORMAT II inventory items in the BUILDER database. The Whole Building Design Guide (<https://www.wbdg.org>) can also be a valuable resource to look up definitions, if necessary.

Inventory methodologies

In addition to importing and migrating existing data into BUILDER, manually collecting and entering the inventory data is also an option. The latter option is particularly useful when gaps exist between migrated data and actual inventory. Efficiencies can be gained through the use of building templates, copying building inventory from other buildings, and using building parametric models embedded in BUILDER.

Building templates

A template is a model used to estimate the inventory of a building based on the inventory of another similar building. Templates are created by users from existing buildings for reuse later. These templates can be created to encompass either building-level or system-level (such as the 17 ASTM UNIFORMAT II system) inventory. The amount of data contained in a building template depends on the level of detail recorded when the template was created. Templates tend to be most useful for standardized

building footprints, facilities within the same installation, and for facilities of a similar age.

Differences will often exist between the “true” building inventory and the inventory estimated from the template. These inaccuracies may be adjusted through editing on an “as-needed” basis. It is good practice to perform a walkthrough of the building being inventoried to verify the template’s predictions. When more than one team is working on inventory of facilities using templates, it is good practice to have all inspectors together for the actual walk-through when creating the template. In this way, all inspectors will have a common understanding, and inventories will be consistent. This approach will save time by reducing the number of changes and clarifications required.

During pilot projects, the Army has seen successful use of templates with facility category groups: 14815 – Company Operations Facilities, 14812 – Brigade HQ (headquarters) Facilities, 14813 – Battalion HQ Facilities, 61050 General Purpose Admin Facilities, and 72111- Unaccompanied Enlisted Personnel Housing Facilities (barracks). These and all other suitable FCGs should be evaluated for the use of templates prior to inventory work at each installation in order for the Army to receive the best investment value.

Copying building inventory

Copying results in the same advantages and disadvantages as templates. However, copying can only occur within the same database. The distinction between copying a building and using a template is irrelevant when a user only has access to a single database.

Embedded parametric models

BUILDER has a set of embedded building models that construct an initial breakdown of systems, components, and sections based on the building use type, size, age, and number of floors. The building models were established by the DoD under the Unified Facilities Criteria (UFC) system and published in the DoD Facilities Pricing Guide.

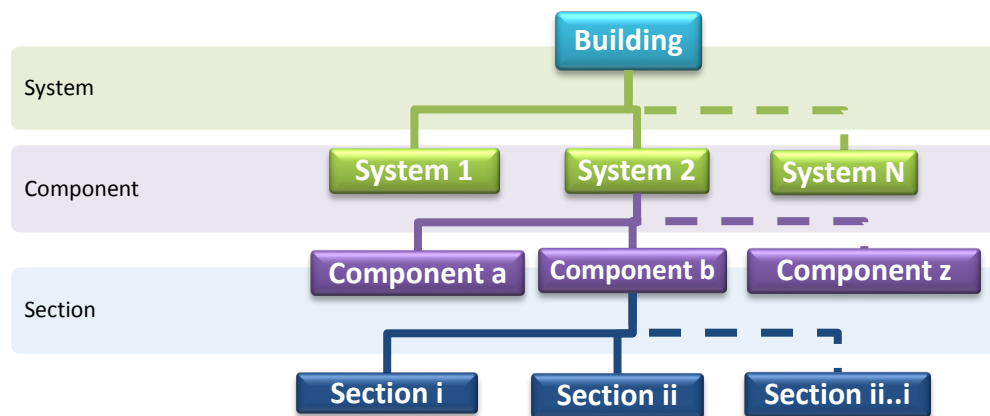
Inventory at the Section level

Component-Section (Section)

The Component–Section (also called simply, “Section”) is the lowest element within the building inventory hierarchy (Figure 4), but it is the most important inventory element in BUILDER. Nearly all inspection, condition assessment, and restoration and modernization planning decisions in BUILDER are made at the Section inventory level. Thus, the Section is the management unit in the BUILDER object model. Conceptually, each Section is unique in its SRM requirements over its lifecycle.

A general rule is that fewer sections are generally preferred to more sections. More sections will entail more data collection and maintenance, and thus, be more expensive to administer.

Figure 4. Building inventory hierarchy.



Level of detail

For some components, a very refined choice exists at the component subtype. An example is pipe diameter for D202001 Pipes & Fittings. Recognizing that different pipe diameters may exist, the use of the most predominant size will normally suffice for sectioning to support condition assessment and SRM planning purposes.

Specific sectioning requirements

Sometimes, it is useful to group inventory objects into a Section. The following sectioning guidelines have proven successful during previous efforts.

- *Physical Characteristics* – Components are divided into Sections when a significant variation exists in material or equipment category, age, construction history, or condition.
 - Example 1 - If a wing or addition was added to an older building, the two areas of the building should be sectioned differently because the age and construction history is different. If building wings were constructed at the same time, the construction history is not significantly different. Therefore, the wing(s) may not be sectioned.
 - Example 2 – If the building roof has multiple levels of similar materials in different conditions, these levels should be sectioned differently to capture the difference in condition.
- *Floors and levels* – Multistory buildings shall be sectioned vertically by floor or level (in the case of a basement or mezzanine).
- *Replacement Value* – Due to approval limits and practical scheduling issues with large and expensive projects, Sections with a rough estimated value greater than \$500,000 should be sectioned separately.
- *Local investment practices* – Sectioning should correlate with investment practices. For example, if one aspect of the building is managed via a different funding source than another, the two should be sectioned accordingly.
- *Different building functional areas*
- *HVAC and fire zones*

Section naming standards

Appendices B and C provide naming convention guidelines that shall be used when a Section name is required or desired to identify the Section. Appendix B shows the equipment naming conventions, and Appendix C shall be used for locations and similar identifiers when additional description is needed.

Not all Sections require names because the data elements associated to that section can uniquely identify it in the field. For an example, if there is only one roof Section, it does not need to be named. BUILDER will assign a default “N/A” value.

Section classification standards

Sections are classified according to the choices available in both BUILDER and BRED, which include options for equipment, material category, and component type. When an exact match is not available but a selection with similar replacement value and design life exists, the assessor shall use the alternate choice. For inventory with no appropriate classification, the assessor should select "Other." Section comments must be completed to indicate the desired classification. If the units of measure for the section quantity do not match the desired units of measure, this should also be noted in the comments. Individual assessors should be consistent with these Section comments to allow the easy identification and addition of these items to the classification catalog for future use. If access is restricted or otherwise unavailable during the inventory phase, assessors shall use the "unknown" classification to document a need for follow-up, along with any comments about the Section.

Section year installed input standards

Determining the install date for a given Section can be difficult to determine in certain circumstances. BUILDER and BRED automatically attempt to estimate the install year based on the facility construction year and design life of the selected section classification, and flag the year installed as estimated. The following pieces of information should be reviewed and considered in order to provide accurate install dates (listed in order of precedence):

1. Equipment tags
2. Drawings
3. Project files
4. Life Safety plans
5. FM staff input
6. Statement of Condition
7. Plans for Improvement

When the exact install date is unknown, the assessor is authorized to make a "best guess" as to the age of the equipment and provide this install date into BUILDER as an estimate (using the checkbox next to the date on the screen). Use of the building construction date as the install date should only occur when, in the judgment of the assessor, such a date coincides with the assessed condition.

Section paint information

BUILDER allows the user to also collect paint or coating information for sections. Users are able to mark an item as painted, enter the date last painted, and specify the type of paint. As of this document’s publication date, BUILDER does not generate work items for paint. A strategic decision should be made to determine whether paint information will be collected in anticipation of future BUILDER capabilities.

Section details – Real Property Installed Equipment

Section details in BUILDER can be used to store equipment details for one or more pieces of equipment being managed in a section. For example, in a single section of variable air volume (VAV) boxes, the information specific to each individual VAV box (barcode/ID [identification]), manufacturer, model, warranty date, location) can be stored as a section detail record under that section, as shown in Figure 5. This becomes critical if integration with CMMS is desired; understanding which equipment is associated with a Section (and resultant work items for that Section) is necessary to link the work together with the CMMS once it is transferred to the requirements module for execution.

Figure 5. Section details example.

Attachments		ID Number	Eq. Type	Eq. Make	Serial No.	Model	Capacity	Manufacturer	Warranty
	x 0	EF-210-G				AP125FSAII20	11,600	York	
	x 0	EF-211-G				AP215FSAII20	9,900	York	
	x 0	EF-207-G				AP215FSAFII20	10,200	York	
	x 0	EF-206-G				AP215FSAFII20	10,530	York	

Assessments

Assessment guidelines

The CI is the metric assigned (on a 0–100 point scale) that is used to describe the reduction in serviceability and reliability that an item experiences throughout its lifecycle. In other words, the CI provides an objective measure of the physical condition of an asset from a standardized distress-based inspection process or prediction from the BUILDER software if a direct rating is performed. A failure of a mission-critical or life-safety related Component-Section can be catastrophic, and thus the risk must be mitigated with conservative ratings.

Figure 6 demonstrates how the Red, Amber, Green condition ratings correspond with the CI, and the degree to which the item is serviceable or reliable. Detailed direct and distress rating guidance can be found in the BUILDER User Manual through the help link within the software or the SMS website.

Figure 6. Condition Index scale.

Condition Index	Descriptor
100-85 Good	Slight or no serviceability or reliability reduction
85-70 Satisfactory	Serviceability or reliability is degraded but adequate.
70-55 Fair	Serviceability or reliability is noticeably degraded
55-40 Poor	Significant serviceability or reliability loss.
40-25 Very Poor	Unsatisfactory serviceability or reliability reduction
25-10 Serious	Extreme serviceability or reliability reduction
10-0 Failed	Overall degradation is total.

If a direct rating yields an Amber condition, comments shall be entered to describe the condition. Furthermore, a distress rating should be considered to capture more detail.

Sampling

Sampling can be used with either the distress survey or the direct condition rating method. Use sampling when a section has many items or is physically separated. For example, use sampling when a section of 100 VAV boxes is to be inspected, and time or physical separation does not allow all 100 to be inspected.

Sample location names

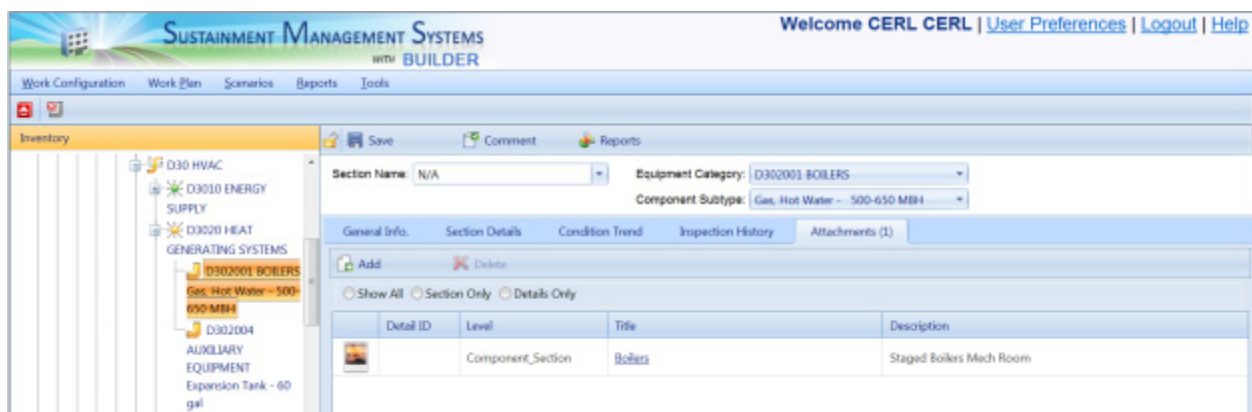
All sample locations require a “Name” for identification purposes. The naming of samples follows the same rules as the naming of Sections. They should be location-specific, clear, and brief. Location verbiage should be descriptive such as by room numbers, spaces, and interstitial spaces (e.g., “Room 101,” “NW Entrance Door,” “Wall between Door 101 and Door 103,” etc.).

Representative vs. Non-representative Samples – Generally, samples will be considered “Representative.” “Non-Representative” samples are characterized by significant variations in conditions due to the environment of operation or other discriminating factors. If a sample is “Non-Representative,” it should be inspected apart from the other samples. For example, a section of 100 unit heaters may have one badly damaged unit as a result of exposure to a roof leak. The single unit could be assessed as a “Non-Representative” sample and rated Red. The other samples would then be assessed as “Representative” of the remaining unit heaters.

Attachments

Documents and images can be added as attachments to the BUILDER at the Site, Building, System, Component, and Section levels. Attachments can also be made for individual inspections. BUILDER accepts these file types: *.jpeg;*.jpg;*.png;*.zip; *.doc; and*.pdf. A screenshot is shown in Figure 7 to illustrate where to add an attachment. It is suggested, at a minimum, that photos be taken of all items rated Amber+ and below and one of the overall facility. Policy should be established regarding the quantity and circumstances requiring photos.

Figure 7. Document attachment at Section.



Task 8: Develop Quality Plan

It is imperative to ensure that integrity of the data is maintained during and after implementation. Thus, a quality assurance and control plan must be developed. It should include the assignment of personnel to perform this role and to define objective and enforceable standards for quality. The quality control and assurance plan must reflect previously determined BUILDER configuration decisions such as assessment criteria and methodology. The following section identifies tools and strategies to aid in the development and execution of quality assurance.

8.1 Quality assurance reports of data collected

BUILDER has a number of reports that have been developed to assist with identification of questionable or incorrect data collected in the field. Quality assurance personnel can use the data reported in these reports to audit and correct any identified discrepancies. A list is given below of available reports and their functions.

1. *Missing/Low Inventory* – Identifies buildings that appear to be missing inventory based on a low section record count.
2. *Section Classification Exception Report* – Identifies sections that are poorly or incompletely classified. Also serves as a process to support identification of inventory catalog items that need to be added (by filling in the comments).
3. *Section Naming Discrepancies* – Identifies user-defined section names that appear infrequently. This may indicate a typographic error, failure to follow naming standards, or such data quality issue that needs to be corrected.
4. *Section Quantity and Age* – Identifies sections that have exceptionally large quantities, potentially exposing a transcription error (usually when assessor puts the year installed in quantity field). Will also identify where section age is substantially greater than the service life for this classification. Finally, will identify sections where the year built/installed is earlier than the building construction year.
5. *Missing/Low Section Details* - Based on the implementation program's requirements, section details for RPIE may or may not be required. This report will identify sections without section details in order to verify and correct missing information if applicable.

6. *Sections with Missing Inspections* – Identifies sections that are inventoried, but do not have any inspections. May indicate that a follow-up is needed due to access issues or situations where a straight age-based deterioration curve is desired.
7. *Section Details with Missing Inspections* – Identifies section details that were inventoried, but the parent section was not inspected. This is similar to the Sections with Missing Inspections report, but focuses specifically on situations where RPIE inventory was collected, but no inspection was performed. This report may only be pertinent when the Statement of Work (SOW) allows RPIE inventory to be performed independently or differently than FCA scope.
8. *Section/Details Discrepancies* – Identifies the Section Detail records with Year Installed records that differ from the parent section's Year Installed. Indicates Section Details that may be improperly sectioned, or that these records have improper dates. Section Details (RPIE) should be as close to the same age as possible when grouped as one section for lifecycle modeling purposes.
9. *Missing Inspection Comments* – Identifies inspections with amber- or red-ranged results that lack an inspection comment to help document the assessor's findings.
10. *Section Condition Analysis Exception Report* – Leverages the analytical models of BUILDER to identify sections with assessment results that have caused exceptional values in the computed metrics, such as initial condition and adjusted service life.
11. *Inspector Results Matrix* – Pivot table of the inspectors by their ratings (grouped according to direct rating ranges). Allows the reviewer to see trends by inspector if inspections are either high or low.

Task 9: Set Standards and Policies

After building inventory, condition assessment, and functionality data is collected, then management of the work in BUILDER may begin. Before the data can be used in an automated process to determine the work requirements, the condition standards, policies, and policy sequences must be created.

9.1 Condition standards, policies, and policy sequences

The CI and remaining service life (RSL) properties of a Component-Section are excellent metrics to consider when planning maintenance, repair, and replacement projects. This portion of the report presents concepts for using the CI and RSL measures to help automate the process of identifying which Component-Sections in the inventory need attention.

Intuitively, when the CI value is high, then 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 a 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 on 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.

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; when the ratio is above the threshold, the section will be replaced.

When a set of threshold values like those described above is established, 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, one 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 out-year budgets. In addition, because the search of the inventory is exhaustive, no potential problems will “fall through the cracks.”

The concepts presented in the preceding paragraphs can be implemented by 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. For example, suppose it has been decided that an inventory contains certain Sections that are desired to be maintained at a CI of 80 or above, or that repair is required when the CI falls below 80. Also, it has been decided that if the cost of repairing such a section is more than 70% of its replacement cost, then it will be replaced rather than repaired. These decisions are represented in a condition standard—a set of threshold values. Suppose also that the inventory contains some Sections for which 60 is to be the threshold CI. In this example, Sections with a CI threshold of 80 constitute a “high” condition standard whereas those with a CI threshold of 60 represent a “low” condition standard.

To apply these condition standards, condition policies must be created that link them to specific Component-Sections. For example, it may be desired to maintain administrative buildings under the “High” condition standard, and it may be desired that warehouses be maintained under the “Low” condition standard. For this situation, a policy would be created that links the respective standard with the appropriate buildings. It may also be desired that all of the Sections of an HVAC system in any building be maintained under the “High” condition standard. In this case, another policy would be created that links the “High” condition standard with HVAC systems. Note that a policy need not specify standards for every component.

Task 10: Plan for Sustainment, BUILDER Configuration and Governance

The organization must consider a sustainment strategy for the BUILDER asset management program. After widespread initial inventory and assessments, the benefits of BUILDER are realized through constant sustainment. Though annual cost of sustainment is lower than initial inventory and assessment costs, strategic leaders must budget for continual reassessment, addition of new inventory, and BUILDER software-related costs.

10.1 Data sustainment

Determine reassessment policy

In order to support the continued effectiveness of BUILDER, it is important to continuously update and maintain the database. Updating the database includes adding new inventory and assessments. Strategic leaders must determine the frequency of reassessments. The goal is to create a knowledge-based inspection plan, because each building component does not need the same level of scrutiny. For example, a brand-new component may not need to be inspected as often or in as much detail as one that may be in need of repairs. Likewise, if a component is known to be in failure, a full inspection is not necessary, because those components already in failing condition will have to be replaced.

Quality control

Quality control will remain an important aspect of data sustainment and integrity. Those filling the quality control role (e.g., BUILDER Analyst) can also ensure that desired results from BUILDER are achieved by identifying any gaps or discrepancies and providing course correction if necessary.

Cost Books – Service Lead shall determine what line items of the cost books require updates on a periodic basis, to be determined at the Strategic Planning Workshop.

10.2 System sustainment

Hardware

The server and hosting capabilities must be maintained, including IT certifications if required. If ERDC-CERL was provisionally hosting during the kickoff, a plan must be developed to transition the hosting to the organization.

Software

Upgrades and updates to the software will continue to be developed for BUILDER and the entire SMS software suite. Announcements will be communicated via the SMS website or the Implementation Advisor.

10.3 Governance structure

Given the wide use of the BUILDER program, a Department of Defense SMS Governance Panel has been formed. The role of the SMS Governance Panel is to act as a service-wide democratic counsel that provides guidance for the SMS program. The SMS Governance Panel decides which upgrades will be developed in the future and provides input on official guidance for user agencies.

The help desk at ERDC-CERL will document requests for features or upgrades of the BUILDER program; however, the SMS Governance Panel has the responsibility for determining which features or upgrades are to be developed.

Appendix A: Inventory and Inspection Listing – Levels of Detail

As examples, the following tables show varying levels of detail for inventory and inspection listings at high (Table A.1), medium (Table A.2), and low (Table A.3) levels.

Table A.1. Inventory and inspection listing at HIGH level of detail (Uniformat II - Level 2).

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
A10 Foundations					
A10 Foundations	A1010 Standard Foundations	5	Historical /Visual	Age-Based /Distress	If readily visible
A10 Foundations	A1020 Special Foundations	5	Historical /Visual	Age-Based /Distress	If readily visible
A10 Foundations	A1030 Slab on Grade	5	Historical /Visual	Age-Based /Distress	If readily visible
A20 Basement Construction					
A20 Basement Construction	A2010 Basement Excavation	N/A			Include with B2020
A20 Basement Construction	A2020 Basement Walls	5	Historical /Visual	Age-Based /Distress	If readily visible
B10 Super Structure					
B10 Super Structure	B1010 Floor Construction	5	historical /Visual	Age-Based /Distress	If readily visible
B10 Super Structure	B1020 Roof Construction	5	Historical /Visual	Age-Based /Distress	If readily visible
B20 Exterior Enclosure					
B20 Exterior Enclosure	B2010 Exterior Wall	5	Visual	Distress	
B20 Exterior Enclosure	B2020 Exterior Windows	5	Visual	Distress	

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
B20 Exterior Enclosure	B2030 Exterior Doors	5	Visual	Distress	
B30 Roofing					
B30 Roofing	B3010 Roof Coverings	5	Visual	Distress	Surfaces & ext. drainage. Insulation is modeled.
B30 Roofing	B3010 Roof Openings	5	Visual	Distress	Hatches and skylights
C10 Interior Construction					
C10 Interior Construction	C1010 Partitions	5	Visual	Direct	
C10 Interior Construction	C1020 Interior Doors	5	Visual	Direct	
C10 Interior Construction	C1030 Fittings	5	Visual	Direct	Site-built items only
C20 Stairs					
C20 Stairs	C2010 Stair Construction	5	Visual	Direct	
C20 Stairs	C2020 Stair Finishes	N/A	Visual	Direct	Include with C2010
C30 Interior Finishes					
C30 Interior Finishes	C3010 Wall Finishes	5	Visual	Direct	
C30 Interior Finishes	C3020 Floor Finishes	5	Visual	Direct	
C30 Interior Finishes	C3030 Ceiling Finishes	5	Visual	Direct	
D10 Conveying					
D10 Conveying	D1010 Elevators & Lifts	5	Visual	Distress	
D10 Conveying	D1020 Escalators & Moving Walks	5	Visual	Distress	

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D10 Conveying	D1030 Other Conveying Systems	5	Visual	Distress	Excludes Process Equipment, i.e. not built-in
D20 Plumbing					
D20 Plumbing	D2010 Plumbing Fixtures	5	Visual	Direct	
D20 Plumbing	D2020 Domestic Water Distribution	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D20 Plumbing	D2030 Sanitary Waste	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D20 Plumbing	D2040 Rain Water Drainage	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible (interior drainage)
D20 Plumbing	D2090 Other Plumbing Systems	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D30 HVAC					
D30 HVAC	D3010 Energy Supply	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D30 HVAC	D3020 Heat Generating Systems	5		Distress	
D30 HVAC	D3030 Cooling Generating Systems	5		Distress	
D30 HVAC	D3040 Distribution Systems	5		Distress	
D30 HVAC	D3060 Controls & Instrumentation	N/A			Requires specialized equipment
D30 HVAC	D3070 Systems Testing & Balancing	N/A			Requires specialized equipment
D30 HVAC	D3090 Other HVAC Systems & Equipment	5	Visual	Distress	Refrigeration systems only

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D40 Fire Protection					
D40 Fire Protection	D4010 Sprinklers	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D40 Fire Protection	D4020 Standpipes	5	Visual	Distress	Excludes Fire Hose Equipment since not Real Property (RP)
D40 Fire Protection	D4030 Fire Protection Specialties	N/A			Equipment not RP
D40 Fire Protection	D4090 Other Fire Protection Systems	5	Visual	Distress	
D50 Electrical					
D50 Electrical	D5010 Electrical Service & Distribution	5	Visual	Distress	
D50 Electrical	D5020 Lighting & Branch Wiring	5	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D50 Electrical	D5030 Communications & Security	5	Visual	Distress	Fire alarm systems and components only
D50 Electrical	D5090 Other Electrical Systems	5	Visual	Distress	Real property Equipment only
E10 Equipment					
E10 Equipment	E1010 Commercial Equipment	N/A			
E10 Equipment	E1020 Institutional Equipment	N/A			
E10 Equipment	E1030 Vehicular Equipment	N/A			
E10 Equipment	E1090 Other Equipment	N/A			
E20 Furnishings					
E20 Furnishings	E2010 Fixed Furnishings	N/A			

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
E20 Furnishings	E2020 Movable Furnishings	N/A			

NOTE: BUILDER survey is not a certification inspection.

Table A.2. Inventory and inspection listing at MEDIUM level of detail.

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
A10 Foundations					
A10 Foundations	A1010 Standard Foundations	4	Historical /Visual	Age-Based /Distress	If readily visible
A10 Foundations	A1020 Special Foundations	4	Historical /Visual	Age-Based /Distress	If readily visible
A10 Foundations	A1030 Slab on Grade	4	Historical /Visual	Age-Based /Distress	If readily visible
A20 Basement Construction					
A20 Basement Construction	A2010 Basement Excavation	N/A			Include with B2020
A20 Basement Construction	A2020 Basement Walls	4	Historical /Visual	Age-Based /Distress	If readily visible
B10 Super Structure					
B10 Super Structure	B1010 Floor Construction	4	Historical /Visual	Age-Based /Distress	If readily visible
B10 Super Structure	B1020 Roof Construction	4	Historical /Visual	Age-Based /Distress	If readily visible
B20 Exterior Enclosure					
B20 Exterior Enclosure	B2010 Exterior Wall	4	Visual	Direct	
B20 Exterior Enclosure	B2020 Exterior Windows	4	Visual	Direct	
B20 Exterior Enclosure	B2030 Exterior Doors	4	Visual	Direct	

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
B30 Roofing					
B30 Roofing	B3010 Roof Coverings	4	Visual	Direct	Surfaces & ext. drainage. Insulation is modeled.
B30 Roofing	B3010 Roof Openings	4	Visual	Direct	Hatches and skylights
C10 Interior Construction					
C10 Interior Construction	C1010 Partitions	4	Visual	Direct	
C10 Interior Construction	C1020 Interior Doors	4	Visual	Direct	
C10 Interior Construction	C1030 Fittings	4	Visual	Direct	Site-built items only
C20 Stairs					
C20 Stairs	C2010 Stair Construction	4	Visual	Direct	
C20 Stairs	C2020 Stair Finishes	N/A	Visual	Direct	Include with C2010
C30 Interior Finishes					
C30 Interior Finishes	C3010 Wall Finishes	4	Visual	Direct	
C30 Interior Finishes	C3020 Floor Finishes	4	Visual	Direct	
C30 Interior Finishes	C3030 Ceiling Finishes	4	Visual	Direct	
D10 Conveying					
D10 Conveying	D1010 Elevators & Lifts	4	Visual	Direct	
D10 Conveying	D1020 Escalators & Moving Walks	4	Visual	Direct	
D10 Conveying	D1030 Other Conveying Systems	4	Visual	Direct	Excludes Process Equipment, (i.e., not built in)

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D20 Plumbing					
D20 Plumbing	D2010 Plumbing Fixtures	4	Visual	Direct	
D20 Plumbing	D2020 Domestic Water Distribution	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D20 Plumbing	D2030 Sanitary Waste	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D20 Plumbing	D2040 Rain Water Drainage	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible (interior drainage)
D20 Plumbing	D2090 Other Plumbing Systems	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D30 HVAC					
D30 HVAC	D3010 Energy Supply	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D30 HVAC	D3020 Heat Generating Systems	4		Direct	
D30 HVAC	D3030 Cooling Generating Systems	4		Direct	
D30 HVAC	D3040 Distribution Systems	4		Direct	
D30 HVAC	D3060 Controls & Instrumentation	N/A			Requires specialized equipment
D30 HVAC	D3070 Systems Testing & Balancing	N/A			Requires specialized equipment
D30 HVAC	D3090 Other HVAC Systems & Equipment	4	Visual	Direct	Refrigeration systems only

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D40 Fire Protection					
D40 Fire Protection	D4010 Sprinklers	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D40 Fire Protection	D4020 Standpipes	4	Visual	Direct	Excludes fire hose equipment since not Real Property (RP)
D40 Fire Protection	D4030 Fire Protection Specialties	N/A			Equipment not RP
D40 Fire Protection	D4090 Other Fire Protection Systems	4	Visual	Direct	
D50 Electrical					
D50 Electrical	D5010 Electrical Service & Distribution	4	Visual	Direct	
D50 Electrical	D5020 Lighting & Branch Wiring	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D50 Electrical	D5030 Communications & Security	4	Visual	Direct	Fire alarm systems and components only
D50 Electrical	D5090 Other Electrical Systems	4	Visual	Direct	Real property Equipment only
E10 Equipment					
E10 Equipment	E1010 Commercial Equipment	N/A			
E10 Equipment	E1020 Institutional Equipment	N/A			
E10 Equipment	E1030 Vehicular Equipment	N/A			
E10 Equipment	E1090 Other Equipment	N/A			
E20 Furnishings					
E20 Furnishings	E2010 Fixed Furnishings	N/A			

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
E20 Furnishings	E2020 Movable Furnishings	N/A			

NOTE: BUILDER survey is not a certification inspection.

Table A.3. Inventory and inspection listing at LOW level of detail.

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
A10 Foundations					
A10 Foundations	A1010 Standard Foundations	4	Historical /Visual	Age-Based /Direct	If readily visible
A10 Foundations	A1020 Special Foundations	4	Historical /Visual	Age-Based /Direct	If readily visible
A10 Foundations	A1030 Slab on Grade	4	Historical /Visual	Age-Based /Direct	If readily visible
A20 Basement Construction					
A20 Basement Construction	A2010 Basement Excavation	N/A			Include with B2020
A20 Basement Construction	A2020 Basement Walls	4	Historical /Visual	Age-Based /Direct	If readily visible
B10 Super Structure					
B10 Super Structure	B1010 Floor Construction	4	Historical /Visual	Age-Based /Direct	If readily visible
B10 Super Structure	B1020 Roof Construction	4	Historical /Visual	Age-Based /Direct	If readily visible
B20 Exterior Enclosure					
B20 Exterior Enclosure	B2010 Exterior Wall	4	Visual	Age-Based /Direct	
B20 Exterior Enclosure	B2020 Exterior Windows	4	Visual	Age-Based /Direct	
B20 Exterior Enclosure	B2030 Exterior Doors	4	Visual	Age-Based /Direct	

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
B30 Roofing					
B30 Roofing	B3010 Roof Coverings	4	Visual	Age-Based /Direct	Surfaces & ext. drainage. Insulation is modeled.
B30 Roofing	B3010 Roof Openings	4	Visual	Age-Based /Direct	Hatches and skylights
C10 Interior Construction					
C10 Interior Construction	C1010 Partitions	4	Visual	Age-Based /Direct	
C10 Interior Construction	C1020 Interior Doors	4	Visual	Age-Based /Direct	
C10 Interior Construction	C1030 Fittings	4	Visual	Age-Based /Direct	Site-built items only
C20 Stairs					
C20 Stairs	C2010 Stair Construction	4	Visual	Age-Based /Direct	
C20 Stairs	C2020 Stair Finishes	N/A	Visual	Age-Based /Direct	Include with C2010
C30 Interior Finishes					
C30 Interior Finishes	C3010 Wall Finishes	4	Visual	Age-Based /Direct	
C30 Interior Finishes	C3020 Floor Finishes	4	Visual	Age-Based /Direct	
C30 Interior Finishes	C3030 Ceiling Finishes	4	Visual	Age-Based /Direct	
D10 Conveying					
D10 Conveying	D1010 Elevators & Lifts	4	Visual	Age-Based /Direct	
D10 Conveying	D1020 Escalators/Moving Walks	4	Visual	Age-Based /Direct	

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D10 Conveying	D1030 Other Conveying Systems	4	Visual	Age-Based /Direct	Excludes Process Equip., (i.e., not built-in)
D20 Plumbing					
D20 Plumbing	D2010 Plumbing Fixtures	4	Visual	Age-Based /Direct	
D20 Plumbing	D2020 Domestic Water Distribution	4	Historical /Visual	Age-Based /Direct	If readily accessible and visible
D20 Plumbing	D2030 Sanitary Waste	4	Historical /Visual	Age-Based /Direct	If readily accessible and visible
D20 Plumbing	D2040 Rain Water Drainage	4	Historical /Visual	Age-Based /Direct	If readily accessible and visible (interior drainage)
D20 Plumbing	D2090 Other Plumbing Systems	4	Historical /Visual	Age-Based /Direct	If readily accessible and visible
D30 HVAC					
D30 HVAC	D3010 Energy Supply	4	Historical /Visual	Age-Based /Direct	If readily accessible and visible
D30 HVAC	D3020 Heat Generating Systems	4		Age-Based /Direct	
D30 HVAC	D3030 Cooling Generating Sys.	4		Age-Based /Direct	
D30 HVAC	D3040 Distribution Systems	4		Age-Based /Direct	
D30 HVAC	D3060 Controls & Instrumentation	N/A			Requires specialized equipment
D30 HVAC	D3070 Systems Testing & Balancing	N/A			Requires specialized equipment
D30 HVAC	D3090 Other HVAC Systems & Equipment	4	Visual	Age-Based /Direct	Refrigeration systems only

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
D40 Fire Protection					
D40 Fire Protection	D4010 Sprinklers	4	Historical /Visual	Age-Based /Distress	If readily accessible and visible
D40 Fire Protection	D4020 Standpipes	4	Visual	Age-Based /Direct	Excludes fire hose equipment since not real property (RP)
D40 Fire Protection	D4030 Fire Protection Specialties	N/A			Equipment not RP
D40 Fire Protection	D4090 Other Fire Protection Systems	4	Visual	Age-Based /Direct	
D50 Electrical					
D50 Electrical	D5010 Electrical Service & Distribution	4	Visual	Age-Based /Direct	
D50 Electrical	D5020 Lighting & Branch Wiring	4	Historical /Visual*	Age-Based /Direct	If readily accessible and visible
D50 Electrical	D5030 Communications & Security	4	Visual	Age-Based /Direct	Fire alarm systems and components only
D50 Electrical	D5090 Other Electrical Systems	4	Visual	Age-Based /Direct	Real property Equipment only
E10 Equipment					
E10 Equipment	E1010 Commercial Equipment	N/A			
E10 Equipment	E1020 Institutional Equipment	N/A			
E10 Equipment	E1030 Vehicular Equipment	N/A			
E10 Equipment	E1090 Other Equipment	N/A			
E20 Furnishings					
E20 Furnishings	E2010 Fixed Furnishings	N/A			

Uniformat II Group (Level 2 "Systems")	Uniformat II Element (Level 3 "Components")	Inventory Level	Inventory Method	Inspection Method	Notes
E20 Furnishings	E2020 Movable Furnishings	N/A			

NOTE: BUILDER survey is not a certification inspection.

Appendix B: Section Naming Standards for Equipment

In BUILDER, it is necessary to use equipment naming conventions to easily identify objects. An example is provided below (Table B1).

Table B1. Sample standard equipment naming convention.

By Equipment Type:		
	ACx	Air Conditioner Unit
	AHUx	Air Handling Unit
	WHx	Water Heater
	VAVx	Variable Air Volume Box
	UHx	Unit Heater
	CHx	Chiller
	RTUx	Rooftop Unit
	RAFx	Return Air Fan
	REFx	Refrigeration Unit
	SAFx	Supply Air Fan
	XFMRx	Transformer
	MAUx	Makeup Air Unit
	SBx	Switchboard
	PANELx	Electrical Panel
	BOILERx	Boiler
	PUMPx	Pump
	HWPx	Hot Water Pump
	CWPx	Chilled Water Pump
	HPx	Heat Pump
	Hex	Heat Exchanger
	FACPx	Fire Alarm Control Panel
	FCUx	Fan Coil Unit
	EFx	Exhaust Fan
	ERUx	Energy Recovery Unit
	DXx	Direct Expansion Unit
	CUx	Condenser Unit
	CTx	Cooling Tower
	UPSx	Uninterruptible Power Supply
	EGx	Emergency Generator

Appendix C: Section Naming Standards by Location

Table C1. Section naming standards by location.

TYPE	NAME	EXAMPLE	NOTES
Building Level	Floor<ID> Basement Penthouse Mezzanine Attic Interstitial Space<ID> Crawl Space Ground Floor	Floor3 FloorBase FloorPH FloorMezz FloorAttic FloorInt6 FloorCrawl FloorGround	<ul style="list-style-type: none"> • Try to avoid using “Ground Floor” for the first floor unless there is a local reason to do so. • Make sure Interstitial Space includes the Floor and the Floor # (FloorInt2) so it is not confused with “Interior” (Int) below.
Building Element	Wing<ID> Bay<ID>	WingA Bay9	
Direction	North South East West Northeast Northwest Southeast Southwest	North South East West NE NW SE SW	
Building Space	Room<ID> Office<ID> Work Room Mechanical Room Store Room Rest Room Roof Corridor Stairwell Addition<date>	RoomB7 Office222 WorkRoom MechRoom StorRoom RestRoom Roof Corridor Stairwell Addition1992	
Building Type	Warehouse Storage	Warehouse Storage	

TYPE	NAME	EXAMPLE	NOTES
Interior/Exterior	Exterior Interior	Ext Int	<ul style="list-style-type: none">• Don't be redundant – in B2010 Exterior Walls or B3010 Roof Coverings, there is no need to put “Ext” in the Section name.• Commas or dashes are not needed after “Ext” or “Int”.• Do not confuse “Int” (Interior) with FloorInt<ID>” (Interstitial Space)

Appendix D: Technical Support

Help Desk

ERDC-CERL operates a BUILDER help desk that is available to assist with all matters related to the operation of the BUILDER software. To reach the help desk, please e-mail SMSsupport@erdc.dren.mil. The BUILDER support team is available 9 a.m. – 5 p.m. CDT (Central Daylight Time) Monday–Friday, except official federal holidays.

Resource Links

The BUILDER website contains additional information including training videos, frequently asked questions (FAQs), user manuals, BRED downloads, and more. The support website can be found at the following link: <https://www.sms.erdcdren.mil/>. New announcements are also posted to this website.

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14. ABSTRACT Traditional facility asset management approaches are based upon run-to-failure or reactive maintenance practices. These approaches do not support investment opportunities wherein relatively small investments yield large lifecycle gains. The Sustainment Management System BUILDER™, developed by the Engineer Research and Development Center-Construction Engineering Laboratory (ERDC-CERL), is a decision support tool that provides the capability to identify investment opportunities for building assets based upon a proactive approach rendering in-creased asset lifespan and decreased lifecycle costs. BUILDER methodology is fundamentally different than historical asset management methods, making it important to identify how the methodology will be implemented into a new asset management strategy. This document assists organizations with strategic BUILDER implementation planning through a 10-task process. It identifies 10 tasks and various subtasks that must be addressed to implement BUILDER. By addressing each task, an organization is more likely to fully utilize the benefits of BUILDER.					
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